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POLITICAL PHILOSOPHY OF THEATRE: THE EXPERIENCE OF AVANT-GARDE AND BLACK THEATRE

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ABSTRACT. In this paper we argue there are three separate senses of the political in theatre – what we call in turn: (1) revolutionary content, a theatre that much in the style of Brecht or Lukacs seeks to represent the truth of class, gender or “race” relations; (2) experimental theatre, theatre that experiments with inventing new rules in the game and sometimes a new game; (3) metatheatricality – the vehicle whereby a play comments on itself, drawing attention to the circumstances of its own production, such as the presence of the audience or the fact that the actors are actors, and/or the making explicit of the literary artifice behind the production. In the first section we trace the relation between theatre and the European avant-garde beginning with the problem of realism in socialist art; in the second section we trace the development and preoccupations of Black theatre and its relation to political philosophy of theatre; and in the third and final section, we make some observations about the concept of metatheatricality.

Keywords: political, philosophy, avant-garde, black, theatre, poetry

> Hamlet: I’ll have grounds
> More relative than this – the play’s the thing
> Wherein I’ll catch the conscience of the King.
> *Hamlet*, Act 2, scene 2, 603–605

1. Introduction

Poetry, music and drama have been given privileged status in philosophy as the paradigm and model for all human activity. Often in the ancient and classical forms particularly with Greek tragedy where all three were combined in the form of the chorus that ranged from fifty in number at the time of Thespis to from twelve to fifteen in classical Greek tragedy and twenty-five in comedy. The chorus provided a rich spectacle against which dramatic action took place: it offered a running commentary; it provided continuity and was a mechanism of stage management; perhaps, most surprising for contemporary audiences, it provided a combination of lyric poetry, dancing and singing, integrated with the dramatic action of the play. Both Nietzsche and Heidegger have commented on the language of the art form as a model for thinking or philosophy. In *The Birth of Tragedy* Nietzsche (1872) remarks on the chorus in a way that enables us to understand the critical relationship between the actors and the audience:

> An audience of spectators, such as we know it, was unknown to the Greeks. Given the terraced structure of the Greek theater, rising in concentric arcs, each spectator could quite literally survey the entire cultural world about him and imagine himself, in the fullness of seeing, as a chorist.

The chorus pulls the audience into the action and redefines its relationship. Aristotle thought that the chorus should be regarded as one of the actors but rather than acting as a conciliatory influence Weiner (1980) argues the tragic Greek chorus acts as an alienating influence between character and audience, a function that Brecht did not invent but merely rediscovers.

Heidegger looked back to the Greeks for his philosophical models and his sustained reflection of Greek thought was recuperated into his own philosophy of Being. His later works dwell on the nature of poetic language as a means of revealing something new. Heidegger regards poetry as the truest form of language and a model of what thinking should be. In 'The Origin of the Work of Art,' Heidegger (1993, orig.1935-7) argues that poetry is in some way the model for all other art forms and the most human of all human activities. The essay is a meditation on the relation between truth and the work of art and he suggests that "all art… is *in essence*, poetry" (p. 197), and "the linguistic work, poetry in a narrower sense, has a privileged position in the domain of the arts" (p. 198). Creation is Greek *poiesis*, one of two ways, along with *techne* in which truth is revealed (*a-letheia*, i.e., "truth" as un-concealing).

Ludwig Wittgenstein said that his goal was to write philosophy as poetry. This remark expressed a deeply aesthetic ideal for Wittgenstein whose greatness as a philosopher in part rests upon the fact that he was as much driven by questions concerning the form of philosophy as he was traditional philosophical questions. In *Culture and Value* Wittgenstein (1984: #24) writes: "Philosophy ought really to be written only as a form of poetry."

In *The Birth of Tragedy Out of the Spirit of Music* Nietzsche outlines a view that suggests that Greek tragedy is an art form that transcends the meaninglessness of life and the nihilism it gives rise to. Ancient tragedy provides a model that combines the music of Dionysian drunkenness and festivals with the static, idealized plastic art in the form of sculpture representing the Apollonian element, transforming it into the highest form of art overcoming pessimism and the suffering of humankind.[1] For Nietzsche art was the highest metaphysical human activity; and Ancient Greek tragedy the highest art form. In this assessment Nietzsche is strongly influenced by Schopenhauer's (2006, orig. 1818) remark in *The World as Will and Idea* that the tragic spirit recognizes 'that life, can provide no proper satisfaction, and thus our devotion to it is not worthwhile'. He sets out his aesthetics in the first paragraph of *The Birth of Tragedy*, thus:

> We will have achieved much for scientific study of aesthetics when we come, not merely to a logical understanding, but also to the certain and immediate apprehension of the fact that the further development of art is bound up with the duality of the Apollonian and the Dionysian, just as reproduction similarly depends upon the duality of the sexes, their continuing strife and only periodically occurring reconciliation. We take these names from the Greeks, who gave a clear voice to the profound secret teachings of their contemplative art, not in ideas, but in the powerfully clear forms of their divine world. With those two gods of art, Apollo and Dionysus, we establish our recognition that in the Greek world there exists a huge contrast, in origin and purposes, between

> the visual arts, the Apollonian, and the non-visual art of music, the Dionysian.[2]

Nietzsche's thesis finds its place geographically and chronologically in that ancient Greek tragedy indeed was the basis of theatrical culture that flourished in the city-state of Athens in the period 550–220 BCE where it was institutionalized as part of the festival honoring Dionysus. The actual word "tragedy" (*τραγωώδία*, tragoidia) is comprised two words τράγος (tragos) or "goat" and ώδή (ode) meaning "song," an etymology that derives from Dionysian cult practices. Western theatre originates in Athens with these Dionysian "tragedies" that were performed on special occasions to worship Dionysus where choral singing played an important part in anticipating the action and helped to establish the play's ethical system commenting upon the relations between the gods and humans.

In the *Poetics* Aristotle outlining his notion of mimesis begins by suggesting:

> Epic poetry then, and the poetry of tragic drama, and, moreover, comedy and dithyrambic poetry, and most flute-playing and harp-playing, these, speaking generally, may all be said to be "representations of life."

Many scholars have argued that Athenian tragedy should be read as a political art form where the concerns of the classical Greek *polis* are reflected in the dramas: not only are the main characters political figures (e.g., "kings") but frequently the dramas dealt with issues and problem of city life, dramatizing the interaction between citizens, or of citizens with the wider with political authority and with the law. Greek theatre was in essence a forum for political reflection manifesting "a concern with the life of the Greek *polis* in general" (Carter, 2007: 19).

Paul A. Kottman (2003: 81–2) puts the matter succinctly:

> The historical complicity of Greek tragedy with the emergence of the Athenian polis has interested political thinkers and classicists alike for some time. Among classicists, this interest has tended to manifest itself either in an analysis of particular dramatists; or certain thematic, conceptual, or linguistic patterns within individual tragic works. In short, the political stakes of the theatre have derived from the exegetical analysis of the theatrical

> works themselves in relation to their context of origin. The pre-dominance that this sort of exegesis continues to enjoy is due not only to the philological care and attention with which classicists, especially, tend to proceed but also to a tendency to understand the dramatic work itself (both the textual artifact, and whatever the archives retain of its context of origin) as the repository of political or social meaning. And this means, consequently, that the political nature of tragedy is implicitly regarded by such a methodology as an effect of the mimetic character of the dramatic work. The determination of tragedy as first and foremost a mimetic work in turn reduces the political essence of tragedy to the legible features of this or that production.

He goes on to contrast the approach of classicists with political philosophers in this way:

> Among political thinkers, the situation is perhaps more complex. Hannah Arendt, in an exemplary and influential discussion of the origins of tragedy, declared that "the theater is the political art par excellence; only there is the political sphere of human life transposed into art." For Arendt, the political essence of the theatre arises from its "pre-philosophical" presentation of human affairs. By "pre-philosophical," Arendt simply means that the theatre is an experience of speech and action as pure actuality, through which each actor reveals "who" s/he is by speaking and acting among others. Indeed, from Arendt's perspective, the theatre – like the praxis it imitates – is also pre-political, for it is precisely the interaction that adheres in speaking and action among a plurality that opens the space of the polis. Thus, what makes the theatre political, in Arendt's view, is not the imitative or mimetic quality of the work as such; rather it is the fact that tragedy "imitates" "man in his relation to others." Put simply, it is the relationality of the scene that lends the theater its political sense (p. 82).

For many modern philosophers poetry provides the model for language, thinking and, indeed, philosophy itself. Poetry came first, systematic rational thinking came later. Poetry was the language of drama, of both tragedy and comedy; and it was inherently political. To say that drama in its inception and development was inherently political is uncontroversial if one accepts that the arts are an outward demonstration of society's culture and that the content of plays will always be connected to society and society's politics. Or that the unfolding of plot and action always involves relationships between characters where relationships are imbued with power. Yet this is a sense of political with a small "p" (in the same way that feminist theory in the 1980s argued that the personal is political) and it does not allow us to differentiate between the overt genre of political theatre and the implicit political nature of all drama. In this paper we argue there are three separate senses of the political in theatre – what we call in turn: (1) revolutionary content, a theatre that much in the style of Brecht or Lukacs seeks to represent the truth of class, gender or "race" relations; (2) experimental theatre, theatre that experiments with inventing new rules in the game and sometimes a new game; (3) metatheatricality – the vehicle whereby a play comments on itself, drawing attention to the circumstances of its own production, such as the presence of the audience or the fact that the actors are actors, and/or the making explicit of the literary artifice behind the production.

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2. The Experience of Avant-Garde

> To begin with, about all one can say is that the Bolsheviks
> simply did not know how to develop a literature. . . .
> the assumption of power by the proletariat
> took literature by surprise.
> Brecht, *Arbeitsjournal*

Avant-garde theatre cannot be separated from the European movement of avant-garde art, although as Antonis Glytzouris (2008) points out in "On the Emergence of European Avant-garde Theatre" historians must be careful not simply to make inferences about theatre from the field of aesthetics in general and he also reminds us that we must make the distinction between theatre and performance studies. Glytzouris (2008: 133) makes the argument that the term *avant-garde* is associated with "anti-bourgeois artistic movements that appeared in the context of modernism" though the two ought not to be seen as synonymous since while the avant-garde is part of modernism, modernism is not limited to the innovations of the avant-garde. Glytzouris (2008: 136) suggests that "avant-garde theater emerged fully when it met symbolism or neo-romanticism: the first reaction not only to bourgeois art but also to its realistic ideals." He details the fact that avant-garde theatre "emerged when modern theatre production had liberated itself and become a special discipline" (p. 136), especially with the independent theatre movement as they were transformed into Sturmbühne, Galleria Sprovieri, Cabaret Voltaire, or the Bauhaus stage workshop and aestheticism was overcome through theatricalism that eventually liberated itself from dramatic poetry. No longer at the service of literature, avant-garde theatre went on to experiment with stagecraft, stage design and began to develop its own stage language. Theatricality, Glytzouris (2008: 139) notes, signifies a break with the past in the post-enlightenment era that occurred at the same time as the emergence of the concepts of aestheticism and avant-garde. It came to denote the attempt by avant-garde directors in the twentieth century to propose a new function for theatre "within the newly emergent mass culture" and to reexamine its relationship not only with the public but also with "other aspects of modern culture, such as commercial theatre, cinema, and television" (p. 141).

There are many different theoretical accounts of the relationship and also the history of their emergence (see e.g., Poggioli, 1981; Egbert, 1967; Calinescu, 1987; Foster, 1994).[3] In *The Theory of the Avant-Garde* (first published in Italian in 1962) Renato Poggioli (1981) attempted to demonstrate that avant-garde artists existed in a critical relationship to tradition, fashion and the public, and were united across the arts in their alienation and opposition to the bourgeoisie. Clement Greenberg (1939) in his famous article argued that the avant-garde, distinctively bohemian, repudiated both bourgeois ("high art") and revolutionary politics and developed in opposition to the mass produced culture of kitsch in order to preserve the living culture we still have. This avant-garde opposition to mass consumerism and its kitsch culture has been taken up by leading members of the Frankfurt school. Peter Bürger (1974) in his *Theory of the Avant-garde* distinguishes the historical avant-garde – Dada, Surrealism, Russian avant-garde after the October revolution – from the "neo" avant-garde (Abstract Expressionism, Pop Art, Noveau Réalism, Fluxus) which simply recycles earlier strategies. He maintains that the historical avant-garde involves a radical break with tradition and opposition to art as an institution such as it has developed in bourgeois society with its insistence on the autonomy of the aesthetic. Its main tendency is the sublation of art in everyday praxis and it reacts against aestheticism that is detached from the praxis of life. Bürger also engages in an extended discussion of Bertolt Brecht (1898–1956) who experimented with Dada and Expressionism, but developed a style more suited his own unique vision in his later work that rejected the commodification of the world.

One of the major questions is whether the avant-garde is still possible – whether its energy, opposition to mainstream culture, and its formal innovation has been totally recuperated by capitalist culture (Habermas) – or whether the avant-garde still has the spirit of criticism that enables it to break the rules of art and go beyond what is accepted (Lyotard). Irmelia Hautamaki (2003) indicates the concept of the avant-garde has both a political and a cultural dimension which are closely intertwined: the concept applied to art was first mentioned in the political programs of French utopian socialists and later used to describe the "most advanced and stylistically innovative art" based on the work of the poets Arthur Rimbaud, Paul Verlaine, Stephane Mallarmé and Charles Baudelaire. As Matei Calinescu (1987: 114) indicates, Marxists used 'avant-garde' as a political term in the 1880s – the party is considered the avant-garde of the working class. Yet Marxist critics also referred to avant-garde literature as "modernist" or "decadent" in contrast to "socialist realism."

This discussion is reflected in the so-called realism (expressionism) debate that took place between György Lukács (1885–1971) and Bertolt Brecht (1898–1924), a debate characterized by Bela Kiralyfalvi (1990) as "primarily a broad discussion of disagreements among Marxist artists and theorists about the values and characteristics of classical, bourgeois and socialist art."[4] The fact that it takes place between Lukács and Brecht is highly significant in this context. Lukács was one of the founders of Western Marxism and primarily a (Hungarian) Marxist *literary* theorist known for his *The Theory of the Novel* and his 1938 essay "Realism in the Balance."[5] By contrast, Brecht was the German Marxist playwright committed to "epic theatre" and often referred to as the founder of modern theatre. Brecht developed a critical aesthetics of materialism and was intent on exploring the theater as a forum for political ideas. He refined the dramatic form but unlike other avant-gardes theorists and artists, especially in the art world, he had no desire to destroy the institution of art but rather to reform and "refunction" it as an arena of social use. In the 1930s debate over Expressionism, Lukács associated artistic expressionism with irrationalism and fascism, while Brecht criticized Lukács' anti-modernism. Kiralyfalvi (1990) poses the debate in the following terms:

> Lukács appeared to continue the tradition of the largely affective critical approaches of Aristotle, Lessing, Kant and Hegel, while Brecht, who came to Marxism shortly before the debate started and was just then in the midst of developing his theory of alienation, summarily rejected any emotion-based aesthetic. … They both favor an art whose ultimate effect on human beings is ethical. They agree that both reason and emotion play a significant role in the aesthetic experience and the obstacles they both want to eliminate are mostly associated with empathy (p. 28).

Lukács' loosely following Aristotle makes catharsis (emotion, empathy) the cornerstone of the aesthetic effect, even if the effect ultimately for him is ethical. Brecht organizes himself against Aristotelian theatre and maintains that in "epic theatre" empathy must be substituted by the alienation effect, a concept he takes from the Russian formalist Victor Shklovsky and Marx of the *1844 Manuscripts*. The alienation effect produces a kind of defamiliarization that "involves the play's structure, the ordering and interrelationship of its scenes, the exposition, the language, the way the conflict is shaped through the dialogue, and how the contradictions are pointed" (Kiralyfalvi, 1990, p. 22).

David Pike (1985: p. ix-x) in his major study writes:

> The incompatibility of Brecht's notions of epic theatre and Lukács' convictions about literary realism was paradoxically engendered by an almost identical aesthetic pursuit that had its roots in the political dogma. Both writers were unrelentingly hostile to the creation of artistic illusions supposedly representing the reality of life. Brecht intended his theater productions to be a reversal of stage depictions of a static, unchanging world,

> and he designed his dramas to show that immediate reality was not historically fixed and unchangeable… Lukács likewise promoted styles of writing that he thought went beyond the representation of a naturalistic, surface reality to reveal the essence of socio-historical phenomena and their effect upon the consciousness and actions of fictional but true-to-life characters. The conflict between the two men inevitably arose because experimental forms for Brecht were an aesthetic requisite to the accomplishment of revolutionary goals, whereas Lukács took "subjective" avant-garde experimentation for literary decadence in the age of capitalist decline – regardless of Brecht's actual intentions – and advocated traditional forms of nineteenth century realism instead.

The idea that the classical realist tradition should be followed by modern writers is a problem that arose our of Lukács attempt to remain faithful to Marxist aesthetics but in view of the development of modernist fiction, art or theatre ultimate unsatisfactory and a kind of assertion that totalizes realism as the objective perspective on the world. Pike (1985) intelligently suggests that "their commitment to a dogmatized and dogmatic political credo was the prime source of their artistic and philosophical inspiration; the dogma inspired them in their quest for aesthetic solutions appropriate to the contemporary political age, the transition from capitalism to socialism, and they both used it to claim exclusivity for their respective theoretical approaches" (p. xi).

This debate is part of the wider canvas meeting of Marxism and Modernism that took place in Germany and elsewhere in Europe that provide a struggle over the very meaning of the avant-garde and its relation to capitalist society. Marxism provides a trenchant critique of capitalist economy and yet its attempt to provide an aesthetics based on the dogma of a "copy" theory of consciousness as a straightforward reflection of objective processes (Lunn, 1984) impugns its usefulness and consigns most of the intelligent thought-provoking, challenging and experimental art, theatre and music to the dustbin of history while aggrandizing the palpably meager achievements of "socialist realism." It is also to rob Marxist aesthetics of its vitality and openness for on this model we would have to occlude, for example, the main currents of American experimental performance beginning with John Cage and American avant-garde theatre including the happening, the Living Theatre, the collective experience of the 1960s, the Performance Group, the Wooster Group (Aronson, 2000) and Richard Schechner's suggestion that the avant-garde has evolved into its own style. As Schechner (1993: 5) remarks in *The Future of Ritual*

> What the avant-garde has become in the last 100 years or so is much too complicated to be organized under one heading. There is an historical avant-garde, a current avant-garde (always changing), a forward-looking avant-garde, a tradition-seeking avant-garde, and an intercultural avant-garde. A single work cannot belong to more than one of these categories.

3. The Experience of Black Theatre

"Uh Huh, But How do it Free Us"
Sonia Sanchez

"Art is political by its very nature.
It has an ideology and reflects its creator's value system"
Amiri Baraka (Reilly, 1994)

Political theatre, revolutionary in content, has influenced various governmental agendas, thus creating the foundations for social movements all over the world. In creation of an authentic Irish identity, the Irish Literary Theatre (1897–1901) constructed cultural nationalism and class unification. The People's Art Movement during the 1980's is oft cited as responsible for establishing a pro-active atmosphere of protest and street activism leading to the ultimate fall of Ferdinand Marcos. Thereby, proclaiming liberation for citizens of Indonesia, India, and the Philippines through political theatre. Exiled Brazilian playwright, Augusto Boal's Theatre of the Oppressed (TO) has not only redefined the purpose of theatre in South America and abroad, but has also birthed an ideology declaring politics and theatre as interdependent.

In the United States, political theatre has created an agenda ripe for social action, particularly social protest theatre written by and for African Americans. The minstrel shows in the 1800's and the contradictions of blackface institutionalized black images and stereotypes. The Harlem Renaissance of the 1920's confronted U.S. racism and questioned American democracy as artists expressed the more realistic injustices endured by black Americans. The historical epochs of the Harlem Renaissance and later the Revolutionary Black Arts Movement of the 1960's encouraged mass protest and resistance through confrontational theatre tactics enveloped in messages of resistance. Through various art forms, black artists promoted positive Black images while taking into account a radical reassessment of race, class, and gender that result in a political content that also includes postmodern considerations of identity ruptures. Considering Black Art Movement icons Sonia Sanchez and Amiri Baraka to celebrated playwrights August Wilson and Susan Lori Parks, Eleni Haviara-Kechaidou (2008, 79–85) writes:

> By resisting both the homogenizing tactics of colonist power and the oppositional and separatist politics of nationalism/culturalism, the black play – at least in its recent manifestations – has managed to destabilize the linguistic and narrative networks of the past and establish a new, subversive theatrical language of substantial political significance in the theatre within and beyond the USA.

In the United States of North America and abroad theatrical performance is not just a physical space for the performance of dramatic narratives, but an institution, social event, and cultural phenomena be to be analyzed politically for its playing out of dominant societal, economic, and cultural conventions (Colleran and Spencer, 1998). The creation of new languages and genres is only one of the many contributions of black theatre. In discerning the political, black playwrights have historically, to present day, presented images of complex human beings dealing with tragic circumstances in opposition to the sometimes unstated but obvious universalizing theatrical norm of tragic black characters who signified the problem for the polis (in which they were excluded). Therefore, whether implicit or explicit the political relations in which plays are produced insure some kind of political message. Black theatre written for and by black playwrights made visible early on the necessity of differentiation and political specificity.

Critically acclaimed playwright and fierce intellectual Lorraine Hansberry (1995: 119–120) answered a fan letter to this point when she explains:

> The more swiftly that American drama comes to believe that my dramatic experience will be larger when I know why the pathetic chap has turned to alcohol and not merely that he has: why to heroin; why to prostitution, despair, decadent preoccupations – the more swiftly, I insist, our drama will gain more meaningful stature. The fact of the matter is that we are all surrounded by the elements of profound tragedy in contemporary life, no less than were Shakespeare and the Greeks, but that thus we (the dramatists, all of us, I think) are still confounded by its elusive properties and colossal dimensions. In certain peculiar ways we have been conditioned to think not small – but tiny. And the thing I think, which has strangled us most is the tendency to turn away from the world in the search for the universe.

To explain how power structured the conditions of the people and to offer solutions through the playing out of character choices for black playwrights offered a politics that extended to non-citizens, marginalized by the polis. This critique not only referred to black playwrights' experiences in American theatre, but also called out intra-group tensions regarding issues of identity, power, and privilege that for example, gendered aesthetics in such a way that the political was too often and singularly conflated with black male militancy.

A critical political issue then, considering the contributions of black theatre, is one of scale. The relations of exclusion and inclusion brought to the forefront by plays about black people, written by black playwrights revealed a politics of expression through content and form. Changing the game by either transforming the rules or inventing a new game altogether became necessary not merely for the sake of experimentalism, but as matter of being so that those who should speak and act, could do so more freely.

For example, performance artist, Guillermo Gomez-Pena noted the theatrical necessity of creating spaces for expression where none previously existed when he wrote, "at that time the U.S.-Mexican border region did not have a developed cultural infrastructures, and so we had to create one. We became community organizers and popular politicians in order to speak" (Fusco, 1995). In calling attention to the specificity of experimentation in order to make possible the recognition of a speaking public or persons relegated to the margins of society, the conditions through which their expression is made possible, must be considered also as a kind of political participation that depends on few in any, of the traditional resources accorded to privilege citizens.

4. Metatheatricality

> Only certain plays tell us at once that the happenings and characters in them are of the playwright's invention, and that insofar as they were discovered . . . they were found by the playwright's imagining rather than by his observing the world. Such plays have truth in them, not because they convince us of real occurrences or existing persons, but because they show the reality of the dramatic imagination, instanced by the playwright's and also by that of his characters. Of such plays, it may be said: "The play's the thing." Plays of this type, it seems to me, belong to a special genre and deserve a distinctive name . . . .
>
> Abel, L. (2003), *Tragedy and Metatheatre*,
> Puchner, M. (ed.). New York: Holmes and Meier, 133–35.

Lionel Abel (1963) first coined the term "metathearticality" when he used it in his ground-breaking work, *Metatheatre: A New View of Dramatic Form* where he claims what characterizes metatheatre is that it is a category that includes dramatic works that "are theatre pieces about life seen as already theatricalized." And he goes on to argue

> By this I mean that the persons appearing on the stage in these plays are there not simply because they were caught by the playwright in dramatic postures as a camera might catch them, but because they themselves knew they were dramatic before the playwright took note of them. What dramatized them originally? Myth, legend, past literature, they themselves. They represent to the playwright the effect of dramatic imagination before he has begun to exercise his own; on the other hand, unlike figures in tragedy, they are aware of their own theatricality (p. 60).

These dramatic works include not only Shakespeare's Hamlet and the works of Euripides, Calderon de la Barca, Corneille, Marivaux, Schnitzler, Pirandello but also standard works like Luigi Pirandello's (1921) *Six Characters in Search of an Author,* Beckett's *Endgame*, Kushner's *Angels in America: Millennium Approaches*, and Stoppard's *Rosencrantz and Guildenstern Are Dead* and *Arcadia*. These are self-referential moments in a play that run against the modernist intent of creating a credible presentation of reality, reminding us of that it is a performance but heightening the dramatic in a moment of theatrical self-awareness and encouraging audiences to question the authority of the text and the imposition of a single narrative view. They impose an extra level of self-consciousness between the work and its audience revealing the dramatist's own conception of their craft and their relation to tradition and genres of performance that uniquely positions their own contribution.

Likewise, performance ethnography becomes a productive example to think through several issues related to metatheatricality. Performance ethnography may be defined as drama based on the systematic observation and participation of a particular culture. Though there are notable distinctions in terminology and accompanying intellectual traditions, performance ethnography is often used as a synonym for ethnodrama, social issues theatre, community based theatre, real life theatre, and theatre for development. Scholar Norman Denzin (2003: P. 105) acknowledges:

> I seek an interpretive social science that is simultaneously autoethnographic, vulnerable, performative, and critical. This is a return to narrative as a political act, a social science that has learned how to use the reflexive, dialogic, dialogical interview… It uses the words and stories that individuals tell to fashion performance texts that imagine new worlds, worlds where humans can become who they wish to be, free of prejudice, repression, and discrimination.

The contribution of performance ethnography is theoretical, instigating a particular kind of analysis that only comes from understanding actions as performances, and practical as the interpretations of performance ethnographers serve as an embodied text that inspires reflection and interaction, thus creates change. Performances are not only thought of as staged theatre, but in all the ways individuals seek to influence others through their actions and/or self performance in everyday life (Goffman, 1959). This becomes critical in changing the game of political theatre as the move from theatre as parochial, to performance as interdisciplinary scholarship so too destabilizes norms. Performance ethnography revels in metatheatricality.

James Thompson and Richard Schechner (2004) argues that social theatre is practiced in times and places of crisis. Black female playwrights wrote and continue to write the extraordinary in context of ordinary or everyday life, often went without proper due. Take the career of Zora Neale Hurston for example. Although cited more often for her novels and short stories, Hurston was also a notable playwright. It was theatre as an art form, where she actually first entered the public domain of storytelling. Though rarely acknowledged in histories of performance ethnography or theatre the field is indebted to her methodological legacy. The pioneering work of Hurston, demonstrates how the scale of tragedy is not mistakenly or ignorantly mapped onto the bodies of those marginalized to only then be represented as pathological. But rather, the conditions of tragedy are exposed through temporal and geographic landscapes that are as diverse as the characters Hurston narrated. We are reminded at once through the works of Hurston and her subsequent embodied legacy or the relationship between metatheatricality and the theatrical works produced, especially by women of color.

In this sense metatheatre and metatheatricality define a new self-consciousness about the artifice of the play and its rules with the combined attempt to go beyond the grammars of modern drama and to experiment with its constituent conventions. In this sense one might argue in the best sense of avant-garde metatheatricality encourages a political sense and direction.

5. Conclusion

This paper has attempted to develop a philosophy of theatre by reflecting on the nature of theatre and tracing its historical moments first the the debates surrounding the revolutionary avant-garde and then in terms of the experience of black theatre in the U.S. and by reference to the notion of metatheatricality. Each moment suggests a different notion of political yet all three are linked to the ways in which drama becomes an experiment with the constituent elements of the play to support, enhance or challenge exisiting conceptions or realities.

NOTES

1. For a discussion on the relation between wine philosophy and eros see Peters (2009) "Dreams of Dionysus."

2. This is taken from the excellent translation of Ian Johnston at http://malaspina.edu/~johnstoi/Nietzsche/tragedy_all.htm.

3. For a full bibliography see José Ángel Garcia Landa's at www. unizar.es/departamentos/filologia_inglesa/garciala/bibliography/Subjects/5. Aesthetics/Movements,Styles/Avant-Garde.doc.

4. Kiralyfalvi (1990) provides the following genealogical and bibliographical footnote: "The debate originated with Lukacs's critique of the work of Willi Bredel in *Linkskurve* (1931) and his comments on Ernst Ottwalt's documentary novel (*Denn sie wissen, was sie tun*) in 1932. Lukacs's 1934 essay, 'Expressionism: its Significance and Decline,' published in *Internationale Literatur*, sparked a long debate conducted mostly in *Dos Wort* until 1939. Those participating in the early debate included Klaus Mann, Alfred Kurella, Klaus Berger, Bêla Balazs, Ernst Bloch, Anna Seghers, Bertolt Brecht and Walter Benjamin. Contributions to the debate by Theodor Adorno, Walter Benjamin, Ernst Bloch and Frederic Jameson can be found in *Aesthetics and Politics* (London: NLB, 1977)."

5. See the archive of his work at http://www.marxists.org/archive/lukacs/ index.htm (though not the 1938 essay).

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THE LANGUAGE OF CLASSICAL PHYSICS

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ABSTRACT. The objectivity of physics has been called into question by social theorists, Kuhnian relativists, and by anomalous aspects of quantum mechanics. Here we focus on one neglected background issue, the categorical structure of the language of classical physics. The first half is an historical overview of the formation of the language of classical physics (LCP), beginning with Aristotle's *Categories* and the novel idea of the quantity of a quality introduced by medieval Aristotelians. Descartes and Newton attempted to put the new mechanics on an ontological foundation of atomism. Euler was the pivotal figure in basing mechanics on a macroscopic concept of matter. The second scientific revolution, led by Laplace, took mechanics as foundational and attempted to fit the Baconian sciences into a framework of atomistic mechanism. This protracted effort had the unintended effect of supplying an informal unification of physics in a mixture of ordinary language and mechanistic terms. The second half treats LCP as a linguistic parasite that can attach itself to any language and effect mutations in the host without changing its essential form. This puts LCP in the context of a language of discourse and suggests that philosophers should concentrate more on the dialog between experimenters and theoreticians and less on analyses of theories. This orientation supplies a basis for treating objectivity.

Keywords: language, classical, quantum, physics, mechanics, objectivity

1. Introduction

Science in general and physics in particular has traditionally been the paradigm case of objectivity, rationality, and progress. In the recent "science wars" this evaluation has been severely challenged by revolutionary philosophers of science, the social construction of scientific knowledge, and the role accorded physics in post-modern deconstructionism. It is misleading to label either of these conflicting views by a common name, suggesting shared positions. However, for introductory purposes I will adapt Pickering's terminology and speak of two idioms: representation and performative.[1] By a gross oversimplification we may indicate the extreme forms of the representational and performative idioms in appraising some characteristics of science: *objectivity*: conformity with reality – intersubjective agreement; *method:* rational argumentation – rhetorical persuasion; *historical development*: progress – changing styles; *core doctrines:* truth – tradition.

In this paper we examine one background issue, the language of classical physics. Though my primary concern is the relation between classical and quantum physics, rather than the science wars, I will indicate the bearing this has on the issues just schematized. The language of classical physics is a linguistic parasite. It evolved from an Indo-European core but can now attach itself to Japanese, Arabic, or any other language while preserving its basic structure and inducing mutations in its successive hosts. It is a language of discourse, particularly the discourse between experimenters and theoreticians. We are particularly concerned with its categorial structure, or the cluster of core concepts. Two considerations motivate this special focus. First, for familiar reasons, the categorial structure of a spoken language reflects and shapes the ontology, or descriptive metaphysics, implicit in normal linguistic usage. Second, as we will attempt to show, the historical evolution of the categorial structure of classical physics manifests an underlying consistency and progressive growth quite at variance with the scenarios proposed by paradigm replacements, degenerating research programs, problem-solving methodologies, and successive replacement of theories considered as separately interpreted units.

Surprisingly, the categorial structure of the language of classical physics has rarely been an object of systematic analysis. A schematic outline of the reasons for such neglect clarifies the issues to be addressed. A strong tradition in classical physics effectively treated the language of physics as a semi-transparent medium. Though opaque to the uninitiated, once mastered it serve as a medium through which one sees reality as it exists objectively. It seems reasonable, accordingly, to ignore the medium and focus on the reality revealed. Logical positivism rejected such naïve realism and made a sharp distinction between the language of functioning physics and the ideal languages proper to a rational reconstruction of physics. The latter involved formal languages for the rigorous reconstruction of theories and an observational language for the experimental reports that served to confirm or falsify theoretical predictions. Though the myth of a to-be-constructed observational language has long since vanished it left a perduring remnant, the designation of non-observational terms in experimental reports as "theory laden."

The reaction against positivism led to the semantic conception of theories. Its developers criticized syntactical reconstructions as being overly dependent on the particular linguistic formulation used in the axioms. Theories admit of diverse formulations, such as the Newtonian, Lagrangian, and Hamiltonian formulation of classical mechanics. Accordingly, it seemed advantageous to conceive of, or reconstruct, theories as abstract mathematical structures, such as the phase-space formulation of classical mechanics or the Hilbert-space formulation of quantum mechanics, interpreted through a family of models. One of these mathematical models is then taken as a model, in a more iconic sense, of some aspect of reality. In this conception, an interpretation of a theory is essentially a model-mediated relation between an abstract mathematical formulation and the things it is a theory of. Language effectively drops out of the final interpretation.

In the background is the sharp separation between analytic philosophy, aka ordinary language analysis, and the philosophy of science, a separation stemming from Wittgenstein's *Philosophical Investigations* and the trend among recent philosophers of science to switch from the holistic systematizing of Quine and Sellars to detailed analyses of particular theories. The net result is that analysts treat language as used, but not physics, while philosophers of science in the Anglo-American tradition treat physics but not language. Though the phenomenological tradition does not have much to say about the interpretation of physics, it makes a distinct contribution to the end-of-philosophy scenario and the issue of objectivity. This, as well as more technical difficulties, will be considered later.

In the current conflict the representational idiom is clearly at a disadvantage. In addition to the notorious difficulties involved in explaining "correspondence with reality," there is the issue of scope. Where the performative perspective includes the social and historical aspects of science, cultural forces, experimental interactions and limitations, and personal decisions, the representational perspective tends to concentrate on the products of science, theories considered as timeless claims. A consideration of the evolution of the language in which such claims are framed would add a social and historical dimension. What I will attempt here is to outline a reconstruction of the language of physics, focusing on its conceptual core. This is part of a larger project to be developed elsewhere. Two preliminary qualifications are in order. First, this survey is concerned with the developing core of scientific language, rather than with normal history. Hence, it treats origins, presuppositions, and linguistic residues of transitory ontologies, rather than the familiar discoveries and theories. Second, to streamline the survey I will rely on and often simply report other accounts. Then, I will relate some historical reflections to the issues just summarized.

1. Historical Development

1.1 The Incubation Period

The new quantitative physics of the scientific revolution emerged from earlier discussions of the quantity of qualities. As Bochner explains it:

> And yet, from whatever reasons, the Greeks never penetrated to the insight that an effective manner of pursuing mechanics, physics, and other science is to articulate qualitative attributes by quantitative magnitudes, and then to represent connecting rules and laws by mathematical formulas and relations in order that the application of mathematical procedures to the formulas and relations may lead to further explications and developments (Bochner, 1966, p. 31).

The seed from which this new way of doing physics incubated was the quantification of qualities, which was rooted in the scholastic treatment of Aristotelian categories. To see this as the point of departure of the language of physics we should begin with the ordinary language basis. Categorization is a basic feature of all natural languages (Rosch, 1999). It provides maximum information with the least cognitive effort. By coding an object or event as member of a class one has a basis for drawing further conclusions concerning normal properties and activities. For such inferences to have a reasonable degree of accuracy the categorial structure must map significant features of the perceived world. In normal usage, including language learning, the categorial system is anchored in basic objects: chair, table, man, bird, cow. These are typically learned by prototypes, rather than definitions or necessary and sufficient conditions. This basis leads to fuzzy or overlapping border. Ordinary usage handles this by various hedges (Lakoff, 1980). While standard objects anchor a categorial system, subordinate levels emphasize differentiation, a kitchen chair as opposed to a living room chair. Superordinate levels play a distinctive role in classifications of events. By "event" we refer to activities that are routinely categorized as distinct units. Thus the students Rosch tested listed their normal daily activities through items such as: getting dressed (putting clothes on), having breakfast (eating food), traveling to the university (using a vehicle), and attending classes. Here, superordinate terms: "clothes," "food," "vehicles," "classes" supply the normal means of categorizing activities. Such higher order activities as the classification of objects in terms of distinctive properties presupposes the establishment of the categorial system.

When categorial systems become objects of study in their own right, then the emphasis changes from particular objects to the systematization. As Hacking (2001, Sect. 2) notes, "category" is used in a broad sense by linguists and psychologists for any class with a common name, and in a stricter sense by philosophers concerned with ultimate classes. Aristotle initiated such a systematic study and the categorial system he developed played a formative role in the evolution of both physics and biology. His list of ten categories is presented in slightly different forms in his *Categories* 4(1b25–2a10) and in his *Metaphysics* 5(1017a7–1018a20). (See Hacking, 2001, Sect. 3.3) Neither account presents any justification of these ten categories as basic. Aristotle's *Categories* is generally treated as the introductory part of his *Organon,* a somewhat fragmentary collection of lecture notes in which Aristotle treats the logic of terms prior to his more mature work on syllogisms, inference, and axiomatic systems. W. Mann (2000) has recently argued that the *Categories* should be interpreted as the discovery of things as things. I would modify this to the claim that in the *Categories* Aristotle discovered a way of making individual things subjects of science.[2] Before considering them we should avert to an important point Mann makes. Aristotle's *Categories* has not been interpreted as a breakthrough chiefly because the basic points made now seem obvious. Since the treatise offers virtually no supporting arguments, the impression is given that these points were obvious even in Aristotle's day. Its revolutionary nature appears only when the doctrine presented is situated in the problematic of the late Academy, where accounts of predication supplied the tool for criticizing the ontological primacy of forms and tackling the foremost problem of the day, making change intelligible.

The striking new claim is that among entities in general (ϑ ∇<ϑ∀), concrete individual things are the really real, the fundamental entities (≅⇔ΦØ∀4). Though this term is generally translated "substance," this translation effectively imposes Aristotle's later metaphysics, rather than the problematic term he shared with Plato. As suggested by Hacking, Aristotle's earlier use of this term will be translated "what a thing is" or "whatness." The crucial citation is (*Categories*, 2b 5–6): "Thus everything except primary whatness is either predicated of primary whatness, or is present in them, and if these last did not exist it would be impossible for anything else to exist."

The doctrine is fairly clear. Its justification is quite obscure. Since we are concerned with the historical role of the doctrine we will consider Aristotle's justification only to the degree helpful in clarifying the doctrine. Aristotle's analysis of predication was concerned with ontological priority. Unfortunately, his analysis is notoriously innocent of any use/mention distinction, so it is not always clear when he is speaking about terms and when about the things terms signify. Further, he seems to equate meanings with definitions. Instead of beginning with such contemporary concerns, it is better to begin by situating the doctrine of the categories between Plato's late dialogs and Aristotle's later metaphysics. For Plato scientific knowledge (episteme, not modern science) must be certain and of what is. Forms, rather than changeable beings fit the requirement. Changeable beings were understood in terms of one quality replacing another, as heat replacing cold or fire either retreating or perishing in the presence of cold (*Phaedo*, 103). Concrete individuals were conceived of, in Sellars's apt phrase, as leaky bundles of particulars. Aristotle was using an analysis of predication to get at the reality of things. Effectively he treated concrete individuals as falling into one of three classes: heaps, natural units, and artifacts. Heaps fit the

Platonic treatment of individuals as leaky bundles of particulars. Aristotle considered natural units to be objects of scientific knowledge, and in fact devoted much of his career to studying them. He constantly relies on the analogy between natural units and artifacts. A piece of leather becomes a sandal because of an imposed form and a purpose. His doctrine of forms came later. In the *Categories* he is concerned with getting at concrete units by analyzing predication. That aspect, however, should be situated in the context of the Socrates of Plato's dialogs unceasingly searching for the true definitions of justice, piety, and other virtues.

Aristotle's initial discussion introduces two types of distinctions in talking about terms. The first set, "equivocal," "univocal" and "derivative" (e.g., gambler, runner) depends crucially on features of language. The second set, "said of" and "present in" do not manifest the same dependence on the terms used (and so are more concerned with things than terms). They differ in transitivity of predication. Thus (as in Greek, omitting indefinite articles) if "Socrates is man" and "Man is animal" then "Socrates is animal" and the definitions of "man" and "animal" can be predicated of Socrates. Affirming "Socrates is pale", however, does not imply that the definition of pale white applies to Socrates. It applies to colors. Putting the two distinctions together yields a fourfold classification. (a) Some items can be both **in** something as subject, and also **said of** something; (b) other items are **in** but not said of something; some items can only be **said of** something as subject but are not **in** anything; finally some items can neither be **said of** anything nor be **in** anything. The last class yields the concrete objects Aristotle treats as basic. The other classes involve problematic features concerning predication.

To get at the distinctive features of the objects Aristotle took as basic we consider the role of definitions. A definition is a phrase signifying a thing's essence (*Topics*, 101b38). It is an answer to the question "What is an X?" Plato thought that there could be no definition of sensible things (*Metaphysics*, 987b). For Aristotle, individual things are what they are because they are beings of a certain kind (*Topics*, 125b 37–39). This kind could be defined by a genus and specific difference. Their designation was through univocal terms that his logic required. Thus, the primary instances of "things" are natural units.

Aristotle clearly realized that his analysis was seriously complete. When he returned to the task in the lectures later put together as Metaphysics his overriding concern was with being as being.

And indeed the question which was raised of old and is raised now and always, and is always the subject of doubt, viz. What being is, is just the question, what is substance? … And so we also must consider chiefly and primarily and almost exclusively what that is which *is* in *this* sense (*Metaphysics*, 1028b 1–6, italics in McKeon).

His metaphysical account is a theory of being as composite of matter, form, and potency that seeks to make change intelligible. This doctrine applies primarily to substantial beings. The net result is that the things that count as subjects of scientific investigation are things belonging to types that admit of definition, at least in principle. Scientific investigation and demonstration is primarily concerned with things categorized as substantial units, which are characterized by their quantity, quality, relation, action, passion, plus further categories, and which can remain substantial units while undergoing accidental changes.

The Aristotelian categorial system, though rooted in basic features of the Greek language, was intended as a means of accounting for reality as it exists objectively. Aristotle treated categories both as "kinds of predicates" ((*ƒ*<0 ϑ™< 6∀ϑ0(≅Δ4™<) and "kinds of being" ((*ƒ*<0 ϑ™< ∠<ϑT<). The boundary is fuzzy. Yet, one clear separation constitutes a basic requirement of Aristotelianism. Some properties are essential for natural kind objects to be natural kinds, regardless of the language in which these properties are expressed. In making individual objects the units to be explained and in striving to make basic explanations independent of the features of any particular language Aristotle initiated the language of physics.

The subsequent evolution of the categorial system involved an increasing detachment from its basis in normal language usage. This heightened the appearance of objectivity, of categories as kinds of beings. Aristotelian writings were transmitted to the West through the medium of works written in Arabic, a non Indo-European language. The earliest Arabic philosophers, Al-Kindi (c. 790–873) and Al-Farabi (c. 870–950) assimilated Aristotelian philosophy through late neo-Platonic commentators. Both insisted that Plato and Aristotle really held the same metaphysics and differed only on terminology. This syncretism discounted the type of language analysis that both Plato and Aristotle used in establishing their positions. Aristotelian philosophy achieved a certain degree of distinctiveness as philosophy and autonomy from the Koran only in the writings of Averroës (1126–1198). He knew the corpus of Aristotle's writings. To combat Al-Ghazzali's (1058–1111) neo-fundamentalist attack on philosophy Averroës distinguished three classes of men: the religious man, who recites the Koran; the lawyer, who interprets the Koran; and the philosopher, who deals with absolute truth and interprets the Koran as allegorical. Though Al-Ghazzali's position became dominant in the Islamic tradition, Averroës had the major influence in the West.

When Aristotelianism was introduced in the West in the mid-thirteenth century the Aristotelian categories were accepted as an objective classification, and their ordering was interpreted as expressing a conceptual necessity. A quality, such as red, presupposes an extended substance. Extension presupposes something extended, a substance. Substance is not predicated of anything. Thus in the order of being, as opposed to the order of perception, the ordering of basic categories: substance, quantity, quality, was assumed to have a conceptual necessity. This seemed to preclude, as it had with the Greeks and Arabs, any quantification of qualities as a reversal of a necessary ordering. Yet, accepted theology demanded some quantification of qualities (See Crombie, 1959, pp. 85–119). The accepted tradition, which supplies the basic structure for Dante's Divine Comedy, is that rank in heaven or hell depends on the degree of sanctifying grace (or of its absence) that the soul possess at death. Thomas Aquinas seems to have been the first to speak of the quantity of a quality.[3] He distinguished between quantity *per se*, or bulk quantity, and quantity *per accidens*, or virtual quantity. A quality can have magnitude by reason of the subject in which it inheres, as a bigger wall has more whiteness than a small wall, or by reason of the effect of its form. A secondary effect of a form is manifested through activity. Thus a man with greater strength can lift heavier rocks. This was within the Aristotelian tradition, where the change in the intensity of a quality involved the loss of one species of a quality and the acquisition of another. Subsequent discussions of the quantity of qualities concentrated, not surprisingly, on ontological issues. How is quality to be understood as a determination of a substance? How is a change in the degree of a quality to be understood in terms of causes[4]?

A significant modification of the Aristotelian sharp separation of categories centered on discussions of the intensification and remission of qualities. The fourteenth-century nominalists, especially William of Ockham, attempted to eliminate the ontological discussions by focusing on the question of when a word admits of the adjectives "strong" and "weak" and when it can be combined with the terms "large" and "small." When the problem was put in these terms, then changes in local motion, rather than degrees of charity, emerged as the prime example of intensification and remission. The mathematization of motion was developed chiefly by the "Calculators" of Merton College in Oxford and later by Nicole Oresme and others at the University of Paris. These calculations were based more on abstract considerations rooted in the system of categories than on empirical data.

Oresme effectively introduced the geometric representation of quantities that culminated in Descartes' analytic geometry:

> Therefore, every intensity which can be acquired successively ought to be imagined by a straight line perpendicularly erected on some point of the space or subject of the insensible thing, e.g., a quality. For whatever ratio is found to exist between intensity and intensity, in relating intensities of the same kind, a similar ratio is found to exist between line and line, and vice versa (citation from Clagett, 1968, p. 165).

In these works there is no mention of actual measurements or units or, until the sixteenth century, any application to falling bodies. However, this treatment of the intensification and remission of qualities introduced a conceptual language that made discussions of measurement possible, and stimulated mathematical analyses of functional relations and of the representation of varying qualities (Murdoch, 1974).

In addition to the abstractness of this treatment, there were two other factors that distanced this burgeoning language of mathematical physics from the lived world of ordinary language. First, teaching and texts were in scholastic Latin. This was the language used in the Catholic liturgy and in the universities. It had long ceased to be a normal spoken language. It was divorced from the lived world. Second, a factor that played a role in the transition from scholastic science to the scientific revolution, there was the discovery of perspective.[5] In linear perspective the space is three dimensional, rather than the flat space of medieval painters. It is a Euclidean homogenous space organized from the standpoint of an outside viewer, with light propagating along geometric lines outlining the space from the foreground to the vanishing horizon. This new way of organizing representations of reality from the perspective of an outside observer rapidly spread to other fields. Classical French drama respects the "Aristotelian" dramatic unities of an integrated story completed in one day at one locale. Aristotle had only insisted on unity of action. The "classical Aristotelian doctrine" was articulated by sixteenth century Italian critics influenced by perspective. It spread to physics when Kepler, influenced by Dürer's perspectival methods as well as Galileo's telescope, showed, in his *Dioptrice,* how a correct geometrical analysis of light rays explained vision. Descartes's *La Dioptrique* extended Kepler's work by giving a correct law of refraction. Perspective entered mathematics with Descartes' analytic geometry and the representation of bodies through coordinates in Euclidean space. Most analyses of this focus on the fact that the geometry is Euclidean, rather than on the portrayal of space from the perspective of an outside observer. The idea of the detached observer regarding physical reality from an external viewpoint culminates in Descartes' *Discourse on Method* and *Meditations*.

1.2 The Scientific Revolution

In the Scientific Revolution the emphasis on basic categories shifted from Aristotelian natural units to properties that could be represented mathematically. Here we will skip the familiar aspects of this revolution and concentrate on an unintended linguistic residue, a revised categorial system. Galileo introduced the distinction between real properties of bodies: shape, size, location, motion, and contact; and qualities such as tastes, odors, and colors that reside only in human consciousness (Drake, 1957, p. 274). The effective criterion was that only properties that admit of quantitative measurement can be considered objectively real. Descartes, an anti-atomist, accorded an ontologically fundamental role with extension the only real property of material bodies. His dualism handled non-material bodies. Boyle tempered this austerity by postulating ontologically real dispositions in bodies that produce secondary qualities in sensitive organisms.

His famous experimental demonstrations supported his claim that these dispositions could be explained through the mechanical properties of ultimate particles: size, shape, motion, and contact action.[6] Thus, the emphasis shifted from substances, or natural units, as the basic subjects of science, to objects with quantitative properties.

Though Newton was an atomist, his corpuscular assumptions never supported the edifice of his mechanical system. The methodology that emerged from his intermittent labors in mechanics is summarized in a Scholium (*Principia*, Book I, Proposition 69). He begins with mathematics, or the mathematical formulation of different force laws in Books I and II, then treats physics, chiefly the application of the inverse square law to the solar system and other phenomena, in Book III. Philosophy should then give a more ultimate explanation through causes and the ultimate constituents of matter (His Third Rule of Reasoning in Philosophy and General Scholion). Though Newton pondered such issues in some detail, he did not publicly develop them as a foundation for mechanics. Two factors influenced this public reticence. He was not satisfied with his own philosophical explanations, especially his private attempts to explain the cause of gravity. His mathematics of fluents and fluxions, an outcome of considerations of the intensification and remission of qualities, assumed continuity rather than discreteness. His atomism was promulgated through the oracular pronouncements appended as Queries 20–23 of the second edition (1706) of his *Opticks*. It differed from Boyle's atomism chiefly in substituting a hierarchy of forces for contact action.[7]

An explanation of the properties of the material universe in terms of its ultimate constituents has remained the Holy Grail of physics. Its foundational role in mechanics, however, proved evanescent. Its explicit rejection occurred in Euler's 1755 paper on hydrodynamics, where he declared that the atomic hypothesis may be true but is absolutely sterile (Euler, Series II, Vol. 12, p. 3). He replaced Newton's molecular model of fluids with a model of continuous homogeneous material. As Truesdell, the editor of Euler's collected works, summarizes it: "Henceforth the principles of mechanics are applied directly to the bodies of physical experience. Atoms are replaced by the fiction of point masses while the continuum model of matter supplies a basis for a formulation of mechanics in terms of differential equations" (Euler, Series II, Vol. 12, pp. ix–cxxv). In his later, immensely popular, *Letters to a German Princess*[8] he refuted the standard arguments for ultimate simples and presented extension, mobility, and impenetrability as the essential characteristics of bodies. This reinterpretation of mechanics reached its culmination in Lagrange's *Mécanique analytique,* where mechanics is presented as a branch of analysis.

Euler's criticism of atomism was part of his larger campaign against materialism. The atomic hypothesis was not generally abandoned, but it no longer supplied even a hypothetical foundation for mechanics. Mechanics was based on the properties of gross matter that admitted of quantitative measurement. At about the same time, Berkeley and especially Hume reinterpreted the distinction between primary and secondary qualities as an epistemological, rather than an ontological distinction, something based on an analysis of how we come to know matter, rather than on how it exists objectively. The net result was that the categorial system of physics dropped the Aristotelian emphasis on substantial units, or relegated it to biology and psychology, and treated quantifiable qualities as the basic properties of objects. The prototypical quantities were quantities of gross matter, not ultimate corpuscles.

1.3 The Second Scientific Revolution

The second scientific revolution centers on the attempts, led by Laplace, to incorporate the Baconian sciences into mechanical account of physical reality. Though it did not achieve the foundational goals intended, nevertheless it had an effect that was not anticipated. It supplied a unified language with a mechanical core that interrelated the different branches of physics. Our primary concern is with this linguistic residue of a failed ontology.

Towards the end of the eighteenth century there was an increased emphasis on quantitative precision in experimentation, together with a concerted effort to standardize methods and experimental devices in a way that would allow for reproducible results.[9] An experimenter in such Baconian sciences as electricity, magnetism, chemistry, or early thermodynamics sought to learn something novel from nature. Phenomena that did not lend themselves to familiar classification or fit standard theories were objects of qualitative studies and sources of aesthetic pleasure. Even the pages of the Philosophical Transactions of the Royal Society were filled with reports of marvelous phenomena and strange experiences, with the hope that an explanatory account would eventually emerge. The new experiments aiming at quantitative precision attempted, as Kant put it, to compel nature to answer our questions. The phrasing of the questions imposed a categorial system on communicable results. We will consider the attempts to incorporate thermodynamics and electrodynamics into a mechanistic system and its effect on the categorial core of the language of physics.

1.3.1 Thermodynamics

In the 1770s the young Laplace collaborated with Lavoisier in developing a chemical physics of heat, the caloric theory. This effort was later extended to hypotheses concerning short range forces and mathematical formulations that could be adjusted to explain heat, affinity, capillary action and other phenomena.[10] This experimental and theoretical work conditioned his transformation of atomism. Descartes, Boyle, and with qualifications, Newton put atomism on an ontological foundation, buttressed by conceptual arguments. The properties of ultimate corpuscles must be all and only the properties of matter as such. Laplace changed this *mechanistic atomism* into *atomistic mechanism*. A foundational role is assigned to the principles of mechanics. Then mechanical hypotheses are introduced concerning particles and short range forces. Since the true intermolecular forces were unknown, Laplace sought confirmation through detailed experiments testing the ultimate consequences of his hypotheses (*Ibid.* Vol. IV, p. 1009, vol. V, p. 466). Poisson coined the term "physical mechanics" to characterize the difference between Laplace's work and Lagrange's analytic mechanics (Taton, 1961, p. 102).

A simplified schematic outline of the development of thermodynamics supplies a screen on which the incorporation of thermodynamic concepts into a mechanistic framework can be projected.[11] Epistemologically sophisticated scientists did not think that heat, a secondary quality, was part of physics. Only Baconian science treated it. In the late eighteenth century Joseph Black and Johan Wilcke, more or less independently, brought quantitative precision to thermal studies through the distinction between temperature and heat, the introduction of specific heats, the distinction between overt and latent heat, and the contention that measurements concerned heat transfer, rather than the heat in a body. Lavoisier's adaption of caloric theory systematized these results by assuming virtually mass-less caloric atoms that repel each other, but are differentially attracted to atoms of gross matter. This supplied a qualitative account of the transition from solid to liquid to gaseous states and, through the assumption of caloric conservation, a basis for calculating the thermal outcome of mixtures of different substances at different temperatures. In spite of a limited success, the assumption of caloric atoms became increasingly suspect due to Rumford's criticisms, the acceptance of the wave theory of light, and the phenomenological thermodynamics introduced by Fourier.[12]

The concept "energy" stemmed from Leibniz's *vis viva* and Mme. Du Châtelet's demonstration that earlier experiments showing that weights dropped onto a clay floor had impact depths proportional to the square of the velocity supported conservation of *vis viva* rather than momentum It achieved a pivotal role through the establishment of energy conservation by Mayer and Helmholtz and Joule's demonstration of the interconvertability of mechanical and thermal energy. As Harman summarized it:

> By the middle of the nineteenth century the concept of energy was being employed to provide the science of physics with a new and unifying conceptual framework, which brought the phenomena of physics within the mechanical view of nature, embracing heat, light and electricity together with mechanics in a single conceptual structure. The establishment of the mechanical view of nature, which supposed that matter in motion was the basis for physical conceptualization, as the program of physical theory, and of the concept of energy and the law of the conservation of energy as principles unifying all physical phenomena, was the distinctive feature of the conceptual structure of nineteenth-century physics (Harman, 1982a, p. 106).

Though thermodynamics was related to mechanism, it featured three distinctively non-mechanical concepts: "temperature," "state of a system" and "entropy." The concept "temperature," was originally based on expansive properties of particular substances: air, water, alcohol, or mercury. This involved both practical difficulties, such as changes of state and non-uniform expansion, and conceptual inconsistencies. The accepted principle that bodies in equilibrium are at the same temperature, aka the zeroth law of thermodynamics, deprives any particular substance of a privileged status in defining temperature Independently Gay-Lussac and Dalton proposed basing the concept of temperature on the coefficient of expansion of gases. By the middle of the nineteenth century, it was realized that this coefficient, 0.00366 per degree, strictly applied only to ideal gases. The theoretical resolution depended on the second distinctive thermodynamic concept.

Carnot's originally neglected treatise on the motive power of heat contained two novel concepts: "state of a system" and "reversible cycle." In an ideal reversible cycle the system returns to its original state. By a qualitative use of caloric theory and an analogy between the relative efficiency of water falling on a paddle wheel and caloric dropping to a reservoir, Carnot reached the conclusion: "The motive power of heat is independent of the working substances that are used to develop it. The quantity is determined exclusively by the temperatures of the bodies between which, at the end of the process, the passage of caloric has taken place" (Carnot, pp. 76–77). This seminal principle had a guiding role both in the development of the concept of entropy and also in the burgeoning process of producing more efficient steam engines. Since it presupposed the concept of temperature it could not of itself supply a non-circular basis for defining "temperature." After considerable confusion Thomson finally defined temperature as T = J/:, where J is the mechanical equivalent of heat and : can be defined in terms of the work done by an ideal engine in a reversible cycle. Though neither J nor: was determined with sufficient accuracy to use Thomson's formula as a practical basis for measuring temperature, it supplied a basis for a concept of temperature independent of the properties of any particular substance (See Cropper, 1987). As Gillispie (1959, p. 367) has noted, the idea of a reversible reaction played a role in the nineteenth century similar to that of inertia two centuries earlier. Just as no real bodies ever persevere in rectilinear motion indefinitely, so no real reaction is completely reversible. Both idealizations supplied concepts which could be readily expressed mathematically. Both the first (energy conservation) and second (entropy) laws of thermodynamics rely on idealized concepts of matter and processes.

Thermodynamics could have been developed as a replacement for caloric theory with energy conservation replacing and broadening caloric conservation and assumptions about molecular motions replacing assumptions about short range attractive and repulsive forces. Clausius deliberately rejected this in favor of a sharp distinction between thermodynamics, developed as a phenomenological science, and kinetic theory:

> Before writing my first memoir on heat, which was published in 1850, and in which heat was assumed to be a form of motion, I had already formed for myself a distinct conception of the nature of this motion, and had even employed the same in several investigations and calculations. In my former memoirs I intentionally avoided mentioning this conception, because I wished to separate the conclusion which are deducible from certain general principles from those which presuppose a particular kind of motion (citation from Brush, 1976, p. 112).

Except for Rankine, the leading developers of thermodynamics, Helmholtz, Thomson, Maxwell, and Tait followed Clausius's lead in basing thermodynamics on its own principles, rather than on ontological considerations. In labeling this "phenomenological" physics I am following the practice of physics, rather than philosophy. The term "phenomenological" was prominently reintroduced into discussion of physics in the mid-nineteenth century by Whewell (adapting Newton's usage) and Helmholtz (adapting Kant's usage) (Olson, 1975, chapt. 5). The net result was that thermodynamics was an idealized science where the basic idealizations were the following:

1) The state of a system can change continuously. One can, accordingly, use differential equations to express infinitesimal changes.
2) Reversible changes can be defined in a way that does not depend on the nature of the working substance.
3) Because thermodynamics is geared to equilibrium conditions, processes can be treated in terms of an infinite number of quasi-static states.
4) The differential formulation of thermodynamic laws signals an end to the question of whether the laws treat the heat in a body or transferred from a body. Since the solution of differential equations involves arbitrary constants of integration, the laws do not specify absolute heat, energy, or entropy, but merely changes.

Thermodynamics could have been developed differently, e.g., by following Rankine's suggestions rather than Clausius's. Prigone (1989) has argued that non-equilibrium thermodynamics supplies a better basis than the thermodynamics of quasi-equilibrium states. In the late nineteenth century, however, thermodynamics seemed to set a new standard for scientific theories. It was based on two laws of unrestricted validity. It could apply to the cosmos as a whole, leading to concerns with heat death. It prescinded from properties of any particular substance. Planck's dissertation defended the traditional concept of entropy against Boltzmann's reduction to statistical mechanics. The aged Einstein, reflecting on his youthful struggles with quantum theory claimed: "By and by I despaired of the possibility of discovering the true laws by means of constructive efforts based on known facts. The longer and more despairingly I tried, the more I came to the conviction that only the discovery of a universal formal principle could led us to assured results. The example I saw before me was thermodynamics" (citation from Schilpp, 1949, p. 53).

1.3.2. Electrodynamics

The development of electrodynamics had a Baconian phase culminating in quantitative concepts and laws (See Heilbron, 1979); new experimental breakthroughs consequent upon the discovery of electrical currents; and two competing theoretical traditions, Continental action at a distance and British field theory. It also featured a creative theorist who manifested an unparalleled critical concern with the status of basic concepts and the experimental support for theoretical hypotheses. For this reason we start with the problematic situation as seen by Maxwell in 1865, when he resigned his chair at King's College, retired to the family estate of Glenlair, Scotland, and began work on the systematic account that was later published as his *Treatise* (Maxwell 1954, original 1871; henceforth cited by pages). He later asserted that the basic purpose of the *Treatise* was to educate himself by presenting a view of the stage he had reached (See Everitt, p. 80).

The underlying problematic was that the two approaches to electrodynamics seemed to be mutually incompatible but empirically equivalent. I use "approach," rather than "theory" because Maxwell insisted he did not yet have a theory. He thought of a theory as an explanation in terms of causes (or sources). In his brutally honest appraisal of his own work he did not even have the beginnings of a theory because he did not know what electricity is or how fast it moves (p. 574), nor whether it is a substance, a form of energy, or belongs to any known category of physical quantities (p. 35). He did not have the roughest idea of the velocity of electrical currents or even their direction (p. 570). His account involved stress in the medium and an account of light in terms of undulations in the medium. Yet, he did not know how this stress originates (p. 644) or what light is (p. 821).

Maxwell's electrodynamics emerged from a protracted attempt to systematize experimental results on the basis of geometrical reasoning (See Wise, 1979). When this proved an insufficient basis for a coherent treatment he adapted Thomson's method of analogies, of adapting a mathematical formalism developed for a different field (See Buchwald, 1977). Thomson developed electricity by adapting the mathematics of heat flow. In his first paper on electrodynamics (1855) Maxwell interpreted Faraday's lines of force as tubes of variable cross section carrying an incompressible fluid. This allowed him to adapt the mathematics of fluids with continuity, sources, sinks, variable flow, and resistance. It also supplied a basis for representing Faraday's concept of an electro-tonic state characterizing the condition of a conductor in a magnetic field by assigning to any point in space a quantity determinate in magnitude and direction. This eventually became the vector potential. This representation, Maxwell insisted, is not a physical theory (Maxwell, Papers I, p. 205).

His next electrodynamics paper (1861–1862) introduced the hypothesis of magnetic vortices with idle wheels. Distortions of these vortices were interpreted as a displacement current. This, the crucial step in transforming electrostatics into electrodynamics, supplied a basis for extending Ampère's law to closed circuits. In this paper he also introduced the hypothesis that light consists of transverse undulations of an ethereal medium. His definitive paper, "A Dynamical Theory of the Electromagnetic Field" (1864, Papers, 526–579)[13] attempted to put his electrodynamics on a less hypothetical basis in two distinct, but related, ways. First, instead of molecular vortices, he now relied on the general assumption of an ethereal medium filling space, permeating bodies, capable of transmitting motion from one part to another and of communicating that motion to gross matter so as to heat it and affect it in various ways. Maxwell thought this was experimentally established by the work of

Faraday, Verdet, and Thomson (Ibid., p. 528). The second novel feature is a reliance on dynamics, rather than mechanics. Since about 1838 British physicists had been using "dynamical" for an explanation based on Lagrange's analytic mechanics, rather than on any particular mechanical model (See Harman, 1982b, pp. 25–27). This entails that the basic explanatory concepts are the mechanical concepts of space, time, force, and energy.[14]

Though this paper presented formidable difficulties (20 equations in 20 unknowns) it emerged as the definitive paper on electrodynamics. Here, however, we will focus on the problems it presented to Maxwell in Glenlaire. In the Continental tradition Weber had successfully answered Helmholtz's objection that Weber's law violated energy conservation. Ludwig Lorentz derived an electromagnetic theory of light by introducing a retarded potential into distance theory. The two approaches, field theory and distance theory, seemed empirically equivalent. Yet, they had different conceptual foundations. In Maxwell's account displacement was the basic concept. Maxwell was not sure what was displaced, nor even in what direction. In his dynamics paper it pointed in the same direction as the electrical field. His earlier account in terms of distortions of vortices gave the opposite direction. Such uncertainties notwithstanding, if one accepts, as Maxwell did, mechanical explanations as basic and fields as real, then the transmission of force through fields requires that something in the field must move. The most likely source seemed to be polarization of molecules through electromagnetic force. Then positive and negative charges are really phenomenological manifestation of displacement on the bounding surface of a dielectric. Current in wires is a phenomenological manifestation of displacement being absorbed and transformed into heat. As Siegel (1986) put it, Maxwell thought of conductors as leaky condensers. This changes the status of some basic concepts. Thus, the dielectric capacity, $,_0$, and the specific magnetic capacity, $:_0$, characterize properties of the medium. The presence of material bodies modifies these properties in ways that depend on the type of substance involved. In the competing view, electricity was explained through sources, the electrons that Helmholtz had postulated, while transmission through space was explained in terms of polarization of a dielectric medium.

In the *Treatise* Maxwell attempted "… a comparison from a philosophical point of view of the results of two methods so completely opposed in their first principles…" (p. 502). He did not, however, compare them as competing theories since, he insisted, "… we must carefully avoid making any assumption not warranted by experimental evidence (p. 574). His method, accordingly, was to work from observed phenomena and experimentally established laws, systematize all that was known about electricity and magnetism and, to the degree possible, explain the role of the medium in terms of inferences, rather than assumptions. The result was a long difficult book with a structure so confusing that even such careful students of the Treatise as Hertz and Whittaker admitted a failure to grasp Maxwell's intentions. With a dependence on theoretical assumptions reduced to a minimum there were only three ontologically significant differences that might be tested experimentally: displacement, the localization of energy in the field, and the interpretation of the vector potential (or electro-tonic state) as a momentum. His development led to suggestions for testing the first two differences.

The *Treatise* is divided into four parts: electrostatics, electro-kinematics, magnetism, and electromagnetism. Each begins in the same general fashion, summarizing the phenomena and established laws and then considering how these are explained by the two approaches. In electrostatics the only significant difference was whether energy resided in the medium or on the surface of conductors. This was untestable, since the methods of calculating energy were mathematically equivalent. In magnetism the competing approaches could be shown to be equivalent.

Maxwell developed in detail one type of situation where the field interpretation could make a difference (pp. 546–604). In a Lagrangian formulation the energy proper to a current could be broken into three components: $T = T_m + T_e + T_{me}$, where T_m is the component of kinetic energy due to the motion of conductors, T_e represents the flow of electromagnetic energy (or of displacement in the medium), and T_{me} represents the interaction of kinetic and electromagnetic energy. By a detailed analysis of the corresponding forces Maxwell concluded that three types of effects due to these forces should be experimentally detectable. The first would be a mechanical force causing a properly suspended circular conductor to rotate when there is a sudden change in current. The second involves the effect of an electric moment of inertia acting on a rapidly moving body. The third involves "mixed forces" acing on a current of electricity. Maxwell built experimental apparatuses to detect the first two effects and found no measurable results. The third should be manifested by the deflection of a galvanometer, but was not detected. Maxwell concluded that either these terms do not exist or are negligibly small.[15]

In electromagnetism the testable difference between the two approaches concerned the medium and the interpretation of , and : as characterizing the medium. Maxwell's theory (a causal account) that the forces responsible for the propagation of light reside in the medium led to the conclusion that the dielectric capacity of a transparent medium should equal the square of the index of refraction, and that conductors should be opaque. With his characteristic honesty, Maxwell reported that the index of refraction depends on the wave length of light, is not well measured, and that the few measurements available do not fit his theory (pp. 788–789). Furthermore, his own experiments with gold leaf indicated a transparency much greater than is consistent with his theory (p. 800). In his final evaluation (pp. 846–866). Maxwell concluded that the two approaches are empirically equivalent, but that he preferred field theory on intuitive grounds.

Subsequent developments will be presented more briefly. As Buchwald (1985, pp. 73−173) showed, Maxwell's followers eventually accepted Helmholtz's atoms of electricity as sources and current as a flow of electrons (a term Stoney introduced) primarily because of the difficulties displacement engendered, and because newly discovered phenomena, such as the Hall effect and the Kerr magneto-optic effect required it. Continental electrodynamics also developed. Helmholtz presented a generalized potential formula with a term, *k.* Assigning *k* a value of -1 led to Weber's potential formula, + 1 gave Neumann's potential, while 0 reproduced Maxwell's potential. Since integration of the potential over a closed circuit yielded 0 in all cases, it could only be tested by an open circuit. Helmholtz thought Maxwell's formula was probably correct, since it yielded transverse vibrations and the correct velocity of light.

Heinrich Hertz, Helmholtz's leading student, learned electrodynamics from Maxwell's *Treatise*. In 1885 he began his epochal research testing open circuits as sources of electromagnetic radiation. When he showed that electromagnetic waves have a finite velocity, that they can be refracted, polarized, diffracted, reflected, and produce interference effects he precipitated a consensus within the European physics community of the correctness of Maxwell's idea of a dielectric medium transmitting electromagnetic vibrations. The acceptance, however, involved some distinct modifications. Hertz accepted the reality of fields (Hertz, 1962, p. 4) and of ether as a substratum which should be explained in mechanical terms. He did not, however, accept displacement as a change of state in the ether, for he did not know what the ether is. This lack of knowledge suggested a change in methodology. Instead of arguing to Maxwell's equations on experimental grounds, he accepted Maxwell's theory as a basis for deductions with the proviso: "Maxwell's theory is Maxwell's system of equations" (Hertz, p. 21, and p. 138). This formal approach led to discounting the physical interpretation of the dielectrical constant and the potentials. The symbol "e" can stand for the amount of electricity contained in a system, something measurable, without speculation about what electricity really is.

Hertz's conception of the ether as a mechanical substratum included the idea that it is dragged along by the earth's motion. Lorentz introduced the idea that electrons interact with the medium as well as other electrons. An electron moving in an electric (**E**) and magnetic (**H**) field experiences a force, $\mathbf{F} = e\mathbf{E} + (e/c)[\mathbf{v} \times \mathbf{H}]$, which can be transmitted to the ponderable body with which the electron is associated and can also be dissipated in the form of radiation. Following Stokes, Lorentz assumed a perfectly stationary ether, one perfectly transparent to matter. Because there is no equality of action and reaction this ether is non-mechanical (See Hirosige 1969 and Nersessian, 1984). This was the penultimate step in eliminating the mechanical ether. The ultimate step, Einstein's special theory of relativity, is presumably familiar.

This protracted development simplified the underlying concepts. Subsequently, the study of electromagnetic phenomena divides rather neatly into two parts. The first is concerned with bodies. In addition to such mechanical concepts as "space," "time," "mass," and "force," one adds a new distinctively electromagnetic concept, "charge." Classical electromagnetism includes the assumption that macroscopic bodies are made up of atoms and molecules, that atoms have electrons, that charged particles produce electrostatic fields, that charged particles in motion produce magnetic fields. Further properties depend on grouping bodies as insulators or conductors; dielectric, paramagnetic, ferromagnetic, etc., and measuring resistance, electrical polarizability, and related properties (See Cook, 1975, chaps. 9–12). The details are not our immediate concern. The pertinent point is the conceptual framework. It is still the familiar world of macroscopic objects, supplemented by the new properties required to explain and systematize electromagnetic phenomena. However, it also includes the assumption that macroscopic bodies are made up of atoms, and that atoms have parts which are held together by electrical forces. It does not include any detailed models of the atom.

The second component is the electromagnetic field. In place of ontological assumptions concerning a substratum it became customary to treat the electromagnetic field as a separate entity. The interaction between the field and matter hinges on the principle of minimal electromagnetic coupling. Charges produce fields and fields act on charges: an electric field on an electric charge; a magnetic field on a moving charge. The electric and magnetic fields were accepted as real because they are measurable. This leads to a familiar ontological interpretation of electrodynamics based on the reality of the electromagnetic field. This may be given the strong ontological interpretation that the field is local, i.e. the field at a point is determined only by its immediate environment, and deterministic. We will briefly consider three subsequent developments that have a bearing on the interpretation of classical electrodynamics.

In 1931 L. Landau and R. Peierls, both working at Bohr's Institute, wrote a paper questioning the logical consistency of quantum field theory. The essential problem was the effect of vacuum fluctuations and radiation reactions on the point-sized particles used to define the electromagnetic field. Bohr, who had come to accept quantum field theory as the only reasonable interpretation of the lightquantum hypothesis, worked with Léon Rosenfeld on a paper establishing the conceptual consistency of quantum field theory.[16] The paper is not concerned with field theory as such or even with actual measurements, but with the conceptual consistency of the assumptions concerning measurement. In place of pointsized test particles one must assume *classical* particles, particles whose dimensions are sufficiently large compared to atomic dimensions that the charge may be treated as a constant over the surface. Since one is assuming a classical particle, one may also assume classical models, e.g., a rigid particle which may be attached to springs to measure momentum, or to a rigid frame to measure position. They conclude that the continuous distribution of energy in space is an idealization valid only in the limit in which quantum effects, such as vacuum fluctuations, are negligible. Thus, the continuous electromagnetic field is an idealization of classical macroscopic descriptions. As such it does not supply a basis for a microscopic ontology, e.g., whether the electromagnetic field is ultimately continuous or discrete.

The second development is the Aharonov-Bohm effect.[17] A charged particle traveling outside a solenoid in which there is a magnetic field should not be affected, since the magnetic field is confined within the solenoid. Aharonov and Bohm predicted that the particle would be sensitive to whether there is a current in the solenoid, a prediction that was subsequently verified. A simplistic ontological interpretation, along the lines given above would claim that what is really real is the vector potential, **A**, the field Maxwell interpreted as representing a momentum, from which **E** and **B** may be derived. Then one might reinterpret measurements as really measuring **E** and **A**. This, however, would lead to ontological indeterminism, since measurements determine **A** only up to a gauge transformation. There is a reasonable consensus that the Aharonov-Bohm effect cannot be properly analyzed within the framework of classical electrodynamics. So, our final consideration concerns the status of quantum field theory.

We are not treating quantum field theory as such, merely considering its significance in determining the nature and limits of classical electrodynamics. Two points seem pertinent. First, the relativistic formulation of Maxwell's equations may be derived by setting up a Lagrangian field density for a matter field, applying the principle of local gauge invariance to the Lagrangian and its first derivatives and deducing a vector field, A., which obeys the relativistic formulation of Maxwell's equations.[18] The second point is the idea of effective field theory. Both classical electrodynamics and quantum field theory may be thought of as successive low energy approximations to an ultimate theory that may be quite different, e.g., string theory or brane theory (Weinberg, 1995, p. xx). If the real local action occurs at the level of unification of strong, weak, and electromagnetic interactions (10^{-17} cm), or at the level of quantum gravity (10^{-31} cm), then at the enormously larger levels proper to classical electrodynamics, any effective theory will look like a field theory. The value assigned to a field at a point is an idealization on the same level as the value assigned to an infinitesimal. Classical electrodynamics has a developed way of representing fields and assigning field values, but it does not have or presuppose an ontology of fields.

1.4 Bohr's Classical Crisis

By 1900 the program of atomistic mechanism was clearly in trouble. For present purposes it is helpful to distinguish the two components: mechanistic foundations and atomic hypotheses. Though there was no minimally adequate atomic theory, anticipated explanations of the properties and activities of bodies in terms of their ultimate constituents had a unifying role in physics. Atomism, however, was in trouble. Thomson (by then Lord Kelvin) abandoned his vortex model of the atoms and suggested new models to accommodate electrical forces as basic.[19] Spectroscopy, kinetic theory, and chemistry suggested different models of atoms with radical differences in the number of degrees of freedom. The large number of internal atomic degrees of freedom that spectroscopy required seemed incompatible with the equipartition of energy. The sustained attempts to give all of physics a mechanistic foundation had effectively foundered. Neither thermodynamics nor electrodynamics had been grounded in a mechanistic foundation.[20] There was a looser linguistic, rather than ontological, unification in the primacy core mechanical concepts had in other branches of physics. Alternatives to mechanistic foundations were developed. There were physical alternatives: electrodynamic foundations based on the electromagnetic theory of mass; and thermodynamic foundations based on energetics. There were also proposals for epistemological foundations such as positivism, conventionalism, and hypothetical deductive reasoning. Boltzmann led the opposition to these proposed innovations and expressed his reasons by using Hertz's terminology of pictures.

I merely wish to work against the thoughtless attitude that declares the old world picture of mechanics an outworn point of view, before another such picture is available from its first foundations up to the applications to the most important phenomena which the old picture has for so long now represented so exhaustively, especially when the innovators have not the least understanding of how difficult it is to construct such a picture (McGuinnes, 1974, p. 258).

The development of the Bohr-Sommerfeld (B-S) atomic theory (or program) was very much in the Boltzmann tradition, using mechanics as a tool, but not as a foundation. On the presumption that the physics is familiar, I will briefly summarize a neglected aspect of this development, Bohr's conceptual crisis. Bohr believed that a physical account must precede and ground a mathematical formulation and that physical accounts related to differing mathematical formulations must have a basic coherence if the theories are to be used together. There was a significant difference between the way the Bohr-Sommerfeld program was treated by Sommerfeld and Bohr. Sommerfeld and his students treated it as a closed theory and focused on the problems that could be solved within the theory. Bohr and his associates treated it as a stepping-stone towards a more adequate theory.[21] The close interaction between experimenters and theoreticians that has increasingly characterized atomic and particle physics began here. This personal orientation was reinforced by Bohr's professional role. As the presiding figure in the atomic physics community he encouraged a close collaboration between experimenters and theoreticians and repeatedly modified his theoretical formulations to accommodate experimental results. I will try to bring out the unifying role of the fundamental concepts that experimenters and theoreticians shared.

The experimental sources that contributed to the development of atomic physics can be roughly divided into two types: those that obtain information from the light emitted, absorbed, or modified by atomic processes; and those that obtain information by hitting a target with a projectile and examining the debris. In neither case did formal theories supply the basic interpretative perspective. Spectroscopes and other high-precision optical equipment relied on interference effects. A precise application of electromagnetic theory required detailed information concerning the material of a particular grating and the shape of its grooves.[22] In calculating wave-packet qualities experimenters relied on Huygen's principle, physical optics, Fourier transforms, and geometrical optics. The underlying presupposition interrelating these different models, fragments of theories, and experimental arrangements is the assumption that 8 characterizes a real periodic disturbance in space and time. Scattering experiments, the second basic source of information, related the controlled input and measured output by assumptions concerning single or multiple collisions, short-range forces, screening effects, radiation, excitation, ionization, energy loss and electron capture. These were not related by some all-encompassing theory, but by the underlying presupposition that electrons and alpha particles travel in continuous trajectories.

The Bohr theory of the atom modified the way experiments were interpreted.[23] Experiments, in turn, modified the interpretation of the theory. The quantum numbers, *n* and *k*, used in the B-S theory to characterize electronic orbits, were also used to classify spectral lines. New quantum numbers, *j* and *m*, and the new selection rules,)*k* = ∀ 1,)*j* = *0*, ∀ *1*, introduced as book-keeping devices in classifying allowed spectral lines, were soon extended to orbital states and eventually accepted as characterizing angular momentum.

Bohr organized this experimental-theoretical dialectic in terms of principles and concepts and accorded the mathematical formalism a merely instrumental role. The two quantum principles basic to his account of atoms and radiation were **stationary states** and **discrete transitions between states**. The concepts he took as basic were the two presuppositional concepts of experimental work already considered, particles and waves. They could be used within the limits set by his quantum principles. Thus, orbital electrons follow trajectories, but orbital transitions cannot be explained through trajectories or any particle model. A wave account covers radiation in free space, but not the production and absorption of radiation.

The crowning achievement of the B-S program, Bohr's account of the periodic table, relied on three formal principles: the correspondence principle,[24] the adiabatic principle; and the *Aufbauprinzip* (adding further electrons does not alter the assignment of quantum numbers to earlier electrons); and descriptive concepts. Bohr had been using a distinction between *descriptive* concepts and *formal* concepts, or concepts whose meaning depends on functioning in a system. Bohr no longer accorded a realistic significance to the way that the *n* and *j* quantum numbers characterized orbital properties, but claimed that it may be stated with certainty that the orbital properties indicated by the *k* quantum number (in contemporary notation $k = l + 1$) correctly describes orbital properties. The ellipticity of orbits was a crucial factor in Bohr's account of helium, carbon, and the rare earth elements. The descriptive significance accorded the *k* quantum number was undermined by Pauli's work and by the work of E.C. Stoner's recasting the account of the periodic table in terms of formal principles rather than descriptive accounts.[25]

Only one descriptive prop remained untouched, the wave account of radiation in free space. The paper published by Bohr, Kramers, and Slater, interpreted atoms formally, as collections of virtual oscillators that interact with a virtual radiation field in a way that preserves the most basic quantum law, $E_2 - E_1 = h<_{12}$. The price was high, abandoning a causal space-time account of the production and absorption of radiation and the conservation of energy and momentum. Internal criticism and experimental refutation forced Bohr to abandon this theory within a few months. Bohr interpreted this as a conceptual clarification, rather than a theoretical setback Undercutting the last descriptive prop entailed "… an essential failure of the pictures in space and time on which the description of natural phenomena has hitherto been based" (Bohr, 1934, p. 34).

This can be recast in phenomenological terminology. The system of classical physics broke down and, through this breakdown, emerged as what it is, a language-based conceptualization of reality. This linguistic crisis was similar, in its methodological effect, to Husserl's epoché and the suspension of the natural point of view. For Bohr the language of physics ceased to function as a transparent medium and became an object of study in its own right. In place of attempting to understand how electrons and light quanta (called photons after 1926) could manifest such contradictory properties as: having and lacking a precise localization, being a particle and a wave; moving and not moving around the nucleus in elliptical orbits, he now focused on the rules for extending and limiting classical predicates in atomic contexts. His doctrine of complementarity and its role in the measurement interpretation of quantum mechanics will be treated elsewhere (MacKinnon, forthcoming). Here I simply wish to emphasize the Gestalt shift from objects to concepts. Bohr originally focused on problematic concepts, then on conceptual frameworks, and finally on the language that made concepts possible. In his later writings he sketched, but never developed, a quasi-transcendental deduction of complementarity from the conditions of the possibility of unambiguous communication of experimental communications (See Honner, 1987).

Bohr and Husserl were not the only philosophers of the period who realized that the familiar categorial system was proving inadequate to modern physics. A.N. Whitehead claimed: "Philosophy will not regain its proper status until the gradual elaboration of categorial schemes, definitely stated at each stage of progress, is recognized as its proper objective" (Whitehead, 1929, p. 12). Whitehead recognized that scientists recording facts do not avert to categorial schemes. Yet, he insisted, this very recording is an act of interpretation, the statement of a partial truth embodying metaphysical presuppositions about the universe. Whitehead found the ontology of material objects inadequate to modern science and ultimately incoherent. Therefore, he proposed replacing it by a new categorial scheme of actual entities, processes, prehensions, and much more. Bohr never attempted to replace the categorial system of classical physics. His overriding task, as the presiding figure in the atomic community, was to keep physics viable. The discourse of physics and the reporting of atomic and particle experiments were grounded in the proper use of classical concepts. Bohr's two quantum principles, stationary states and discrete transitions, remained unscathed. The crisis he experienced stemmed from the unrestricted use of classical concepts. His solution centered on recognizing the language of physics as an extension of an ordinary language core and restricting their usage in contexts characterized by Planck's constant.

2. The Language of Classical Physics

The language of classical physics evolved in such a way that it supported and structured the discourse of physics, and played a background role interrelating the different branches of physics. Yet, the role of language is virtually absent from almost all philosophical analyses of physics. Before venturing into such unexplored waters it is helpful to consider, at least in a cursory way, the principal reasons why it is unexplored. This supplies a rough guide to the problems needing consideration. The neglect stems both from the practice of physics and the current territorial claims in philosophy.

The first is the rhetoric of physics. This commenced when Kepler, Galileo, Descartes, and Newton all stressed a radical break between common sense, systematized in Aristotelian scholasticism, and the new science. Since, both Kepler and Galileo argued, mathematical forms are the exemplars built into creation, one can comprehend the universe only by grasping these forms. Descartes famous dream, in which the angel of truth pointed to mathematics as the sole key that unlocks the secrets of nature, and the formidable mathematics of *Principia I* and *II*, that preceded the application to the system of the world in Book III, both signaled mathematics as the new language of physics. As shown in Part One, the new ontologies, proposed as foundational, never really supported the edifice of physics. Yet the break between common sense views and the growing complexity of mathematical physics reinforced the rhetorical divide and obscured the underlying linguistic continuity.

A second reason for inadvertence to the problem lies in the very nature of language. Fluent speakers of any language converse without any conscious consideration of the presuppositions and structures implicit in the language spoken. It is only when the language itself becomes an object of study that such presuppositions and structures come into focal awareness. Philosophical analyses of modern physics analyze theories, induction, confirmation, formal inferences, statistical hypotheses, but not the language of discourse linking experimenters and theoreticians. Though this is an outgrowth of ordinary language, it has features that sharply distinguish it from any ordinary language. It is highly mathematical and virtually the same in the various languages in which it has been embedded. Ordinary language analysis has not developed methods for handling such features.

On the contemporary scene, the primary reason for the philosophical neglect of the language of physics is the divisiveness of contemporary philosophy. A generation back Quine and Sellars linked ordinary language analysis to the foundations of science. Now ordinary language is central to mainstream analysis and, to a lesser extent, to the hermeneutic wing of the phenomenological tradition. Neither group, however, analyze the language of physics. Philosophers of science treat physics, but have a well-established tradition of neglecting the role of language. The axiomatic method of theory reconstruction, favored by logical positivists, replaced, rather than analyzed, the functioning language of science. The semantic conception of theories rejected the excess concern with language characterizing axiomatics. Since theories admit of different formulations, one should not focus on any particular linguistic formulation, but rather on the underlying mathematical structures. In the context interpretation of theories is seen as a model-mediated relation between mathematical structures and aspects of physical reality. Language analysis plays no role.

It would be misleading to begin with a theory of the language of physics. Rather we begin with two examples that indicate both the role of LCP and difficulties involved in analyzing it. The first is from the "bible" of classical physics, Thomson and Tait's *Treatise on Natural Philosophy* (1867, Vol. I, p. 337). A complete account of the problem of lifting a mass with a crowbar would involve a simultaneous treatment of every part of the crowbar, fulcrum and mass. This, however, is impossible: "... and from our almost compete ignorance of the nature of matter and molecular forces, it is clear that such a treatment of the problem is impossible." In place of this idealized treatment, based on a mechanics of atoms, they outline a practical approach based on macroscopic representations and successive approximations. In the first approximation the crowbar is represented by a perfectly rigid rod and the fulcrum by an immovable point. The second approximation includes corrections due to the bending of the rod. Here again, the ideal treatment would be based on a theory of molecular forces. Since this too is impossible, one substitutes the assumption that the mass is homogeneous and that the forces consequent on a dilation, compression, or distortion are proportional in magnitude and opposite in direction to the deformations. A third approximation is based on the consideration that compression produces heat, while extension develops cold and that both can change the operative length of the rod. Further approximations could include corrections due to heat conduction, thermoelectric currents, and departures from homogeneity (Ibid., pp. 337–339).

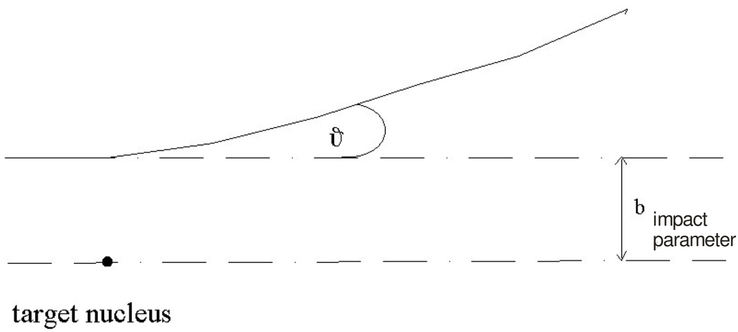

Figure 2

Atomic physics had not yet been developed. Yet, T and T' (J. C. Maxwell's designation) were clear on the explanatory role atoms should play. Ultimately, the properties and activities of gross matter should be explained through atoms and forces. It is worth noting that after an adequate basis for an exact treatment of molecular forces was established (Schrödinger's equation), the T-T' phenomenological approach still supplies the only reasonable method for treating such problems. For us, as for T and T', the operative requirement is that an atomic explanation should be possible in principle. The functional integration of mechanics, thermodynamics, electrodynamics, and speculative atomism depended on an overall view of how everything fit together. This is something shaped by and transmitted through the language of physics. This overall view guides inferences and interpretations by determining which factors are pertinent at which level of approximation. This illustrates the type of reasoning that is the normal practice of experimental physics. One uses appropriate bits of thermodynamics, electrodynamics, solid-state physics, etc. in utilizing and calibrating instruments. These are not treated as theories but, for the most part, as facts about the world. An overall view of the world is a prerequisite to seeing how the parts are interrelated on a functional level.

As a complementary example, we will consider the use of classical physics in a contemporary context, the derivation of the Rutherford scattering formula in a treatise on particle physics (Roe, 1996, pp. 19–25). We will focus more on the role of improper mathematics than on the details of the physics. Rutherford developed (or had a graduate assistant develop) the celebrated formula to explain the scattering of alpha particles through matter. Consider an incident particle with charge, *ze*, and momentum, *p*, with an impact parameter (perpendicular distance from the original path), *b*, relative to a target particle with charge, *Ze* (Fig. 2). If *Ze* is the charge of an atomic nucleus and *b* is very small, then interaction with atomic electrons can be neglected. In this case the angle, 2, characterizing the deflection, may be calculated as the ratio of the perpendicular component of momentum, p_8, to the parallel component, $p_{''}$ 2 . $p_8/p_{''}$ From the definitions of force an the basis of electric force, it follows that

$$p_{\uparrow} = \int F_{\uparrow}\, dt \quad = \int zeE_{\uparrow}\, dt \quad = zeE_{\uparrow}\, dx/v\,,$$

using the relation dx = v dt. A little manipulation and the use of Gauss's law leads to 2 . $2Zze^2/bvp$. The cross section for this happening at impact parameter, *b*, within a width, *db*, is dΦ = 2 B b db. The solid angle integrated over this cross section is dΣ = 2B sin 2 d2. Dividing dΦ by dΣ yields a slightly the Rutherford scattering formula

$$d\sigma/d\Omega = (Z^2 z^2 e^4)/(4[pv]^2\,[\sin(\theta/2)]^4)$$

The interesting feature of this “derivation” is the cavalier treatment of differentials. It was customary in classical physics to treat infinitesimals as vanishingly small quantities. A differential can be added to a quantity to get an infinitesimally larger quantity, x + dx. One can multiply or divide both sides of an equation by a differential, and even interpret the ratio of two differentials as a derivative, as in $d\Phi / d\Sigma$. Most mathematicians would flunk any calculus student who offered such definitions. It was and remains a common practice in classical physics. The issue of justifying such practices will be treated briefly later. The basic reason why physicists concerned with incorporating and accommodating experimental data, rely on sloppy mathematics is that the mathematical forms build on and expressed the physical significance of the quantities treated. As Heisenberg expressed it:

> When you try too much for rigorous mathematical methods, you fix your attention on those points which are not important form the physics point and thereby you get away from the experimental situation. If you try to solve a problem by rather dirty mathematics, as I have mostly done, then you are forced always to think of the experimental situation; and whatever formulae you write down, you try to compare the formula with reality and thereby, somehow, you get closer to reality than by looking for rigorous methods (Heisenberg, 1990, p. 106).

The nineteenth century arithmetization of analysis initiated by Cauchy led to a separation of mathematics from such physicalistic foundations. If mathematical formulations are to supply a foundation for physical theories, then they cannot rely on physical considerations to justify mathematics. Reconstructions of theories, and philosophical analyses based on actual or possible reconstructions, see syntax as foundational and impose semantics on independently developed syntactical structures. We will consider theories briefly later. The pertinent point here is that this method of analyzing physics leaves no role for informal inference, or inferences based on the meanings of concepts and their role in complex changing conceptual systems.

Philosophers of science do not treat the role of the language of physics because the methods of analysis employed are not geared to informal analysis. Any attempt to accord linguistic considerations a significant role in the analysis of physics encounters further obstacles. It would seem to distort two of the most basic features of modern physics. The first is the role of mathematics. If language is assigned a foundational role, the mathematics is relegated to a functional or instrumental role. Bohr is quite explicit on this point. Most philosophers of science would insist that the mathematical formulation of physical theories cannot be regarded as mere inference mechanisms. These formulations have repeatedly led to unanticipated physical consequences. The second feature is the protracted effort to achieve a unified physics. The unity sought is a theoretical one, involving grand unified theories on the part of physicists and analyses of theory reduction on the part of philosophers. The language of classical physics came to play a unifying role in classical physics, especially in the idealization of classical physics contrasted with quantum physics. But this is not a theoretical unification. It is more a matter of shared presuppositions and common meanings. LCP is like an archipelago, supplying a submerged interrelation to the scattered islands of mechanics, electrodynamics, thermodynamics, fluid dynamics, solid-state physics, and many smaller prominences.

Confronted with such formidable obstacles and lacking the guidance of any established tradition, it might seem prudent to bypass of minimize the role of language in a philosophical account of physics. Such an evasion, however, engenders its own difficulties. It cannot treat the interrelation of theories in classical physics. Contemporary particle physics, like the atomic physics that preceded it, develops through an incessant dialog between theoreticians and experimenters. Regardless of how well theories fit reality as it exists objectively, or whether any coherent sense can be made of such a criterion, theories must be made to fit reality as reported by experimenters. The language of their discourse demands analysis. Finally, as will be argued later, a consideration of the role of language is a prerequisite to any clarification of the interrelated problems of the continuity underlying conceptual revolutions in physics and the objectivity of the physics involved.

The remainder of this article follows the following order. First, we consider ordinary language and focus on the problems of informal inferences and objectivity. Second, we consider the transformation of an ordinary language conceptual core into LCP. Third, we consider the relation between the linguistic core of classical physics and theories. Fourth, we consider the major difficulty impeding any significant interrelation of informal and formal analysis, the issue of whether mathematical formulations should be given a merely functional interpretation or be assigned a more foundational role. Finally, we return to the problem of objectivity and consider some objections to the solution proffered. What follows is not intended as a theoretical unification. LCP does not supply a basis for a deductive system. It gradually came to function as a loose unifying structure undergirding the labyrinth of separated theories and experimental traditions. What follows is an initial exploration of the archipelago of LCP and its submerged supports.

2.1 Ordinary Language Roots

We begin with ordinary language and its bearing on the basic philosophical problem that emerged from Part One. The concept of a spatio-temporal object is at the core of our ordinary language, or common sense, conceptualization of reality. It is also at the core of LCP. Traditional realism regards the claim that objects as such really exist independent of our knowledge of them as the ultimate rampart in any defense of realism. This, in turn, grounds the traditional notion of objectivity. The preceding survey led to the conclusion that classical physics, as a coherent system, must be regarded as an idealized conceptualization of reality. As such, it is a phenomenological system relative to quantum mechanics and especially relative to anticipated grand unified theories. This seems to put both "object" and "objectivity" on a subjective basis. We begin accordingly, with some reflections on the conceptual core or ordinary language and the status of objectivity. Since I am not presenting anything novel, I will rely on some basic themes shared by Strawson, Gadamer, and especially Davidson.[26]

Donald Davidson's gradual abandonment of an extensional theory of "true" led to a critical rethinking of the interrelation of truth, language, interpretation, and ontology. I will summarize the overview presented in the concluding article of his latest book (Davidson, 2002, Essay 14). Philosophers have been traditionally concerned with three different types of knowledge: of my own mind; of the world; and of other minds. The varied attempts to reduce some of these forms to the one taken as basic have all proved abortive. Davidson's method of interrelating them hinges on his notion of radical interpretation. My attempt to interpret the speech of another person relies on the functional assumption that she has a basic coherence in her intentions, beliefs, and utterances. Interpreting her speech on the most basic level involves assuming that she holds an utterance true and intends to be understood. The source of the concept of truth is interpersonal communication. Without a shared language there is no way to distinguish what is the case from what is thought to be the case. I assume that her overall speech has a basic coherence and that by and large she responds to the same features of the world that I do. Without this sharing in a common stimuli thought and speech have no real content. The three different types of knowledge are related by triangulation. I can draw a baseline between my mind and another mind only if we can both line up the same aspects of reality. Knowledge of other minds and knowledge of the world are mutually dependent.

This reasoning leads Davidson to two conclusions that others find problematic. First, it is impossible for our general picture of the world and of our place in it to be mistaken. For the second we rely on a citation: "Communication, and the knowledge of other minds that it presupposes, is the basis of our concept of objectivity, our recognition of a distinction between false and true beliefs" (Ibid., p. 217). I will focus on the objection most pertinent to the present context. The rhetoric of science, previously cited, assumes that that our common-sense picture of the world not only can be mistaken, it is mistaken on very basic aspects of reality. This is particularly true of the general picture of the world prior to the scientific revolution. Since then science, not common sense, has gradually provided a more objective view. Common sense, and the ordinary language that reflects and transmits it, achieves increasing objectivity to the degree that it conforms to scientific advances.

Such objections involve a fundamental misconception. Our ordinary language picture of reality is not a theory. It is a shared vehicle of communication involving a representation of ourselves as agents in the world, and as members of a community of agents, supplying tools and terms for identifying objects, events, and properties. Extensions and applications may be erroneous. There can be factual mistakes, false beliefs, incorrect usages, and various inconsistencies. But, the designation of some practice as anomalous is only meaningful against a background of established practices that set the norms. Our description of reality and reality as described are interrelated, not in a vicious circle, but in a developing spiral. Here, a relation with phenomenology is helpful. The "lived world" is something immediate, all enveloping, pre-critical. We advance in understanding of our own language and culture, as well as of alien cultures, through a hermeneutic circle. Individual parts are understood in relation to a whole. Articulation of parts refines and enlarges our understanding of the whole. In the jargon that Heidegger and Gadamer popularized my prejudices supply a point of departure for my attempts to understand an alien language or culture. This is functionally equivalent to Davidson's program of understanding alien utterances by matching them with sentences I hold true, while interrelating truth claims with beliefs and intentions. For this to work, the large amorphous collection of basic claims must be accepted as true of reality. Gadamer's claim: "Language is not just one of man's possessions in the world, but on it depends the fact that man has a world at all. … Not only is the world 'world' only insofar as it comes into language, but language, too, has its real being only in the fact that the world is re-presented in it." (Gadamer, 1985, p. 401) reflects a claim that has Davidson has regularly repeated amid changes in his other positions: "In sharing a language, in whatever sense this is required for communication, we share a picture of the world that must, in its large features be true" (Davidson, 1985, p. 199).

Reality as represented and our representation of reality are mutually reinforcing. This is not a theory of reality, though *faut de mieux* it may ground theories. It is the basis of meaning and truth. Few philosophers have been as concerned with the conceptual core of our ordinary language as Strawson. In 1992 Strawson returned to the basic issues treated in his classic work, *Individuals,* but with the more modest goal of describing, rather than prescribing, the core concepts of ordinary language.

> A concept or concept-type is basic in the relevant sense if it is one of a set of general, pervasive, and ultimately irreducible concepts, or concept-types which together form a structure – a structure which constitutes the framework of our ordinary thought and talk and which is presupposed by the various specialist or advanced disciplines that contribute, in their diverse ways, to our total picture of the world (Strawson, 1992, p. 24).

After criticizing the empiricist tradition for slighting the irreducible role of the subject/object distinction, he concludes that the concepts necessary for describing our experience of the world are precisely the concepts of the world described.

The shared doctrine may be briefly summarized. The world is the public world shaped by and transmitted through the language we share. We learn the language only through the assimilation of a vast number of sentences simply accepted as true: cats have fur, the sky is blue, snow is white, water is transparent, and similar banalities. A large but indefinite number of such beliefs constitute the material extension of truth. They presuppose a conceptual core stemming from a subject/object distinction and conceiving of the world as spatio-temporal objects with properties interrelated through the events they participate in and through various causal connections.[27] In saying they are true of the world we are not presupposing an objectively given world of objects to which language is compared. The world is what is given through language. Davidson categorizes as the third dogma of empiricism the distinction between schema and content, a distinction manifested in attempts to speak of some content which is independent of and prior to the linguistic ordering we impose on it.

2.2 From Ordinary Language to the Language of Physics

LCP functions as a language of discourse. To be interpretable it must share the indispensable core of ordinary language. It has extended and transformed it through the historical developments previously considered. The scientific revolution is generally, and I believe rightly, regarded as the pivot in the transformation from Aristotelian natural philosophy to modern physics. We will skip the details and simply consider its long range effect on the underlying issues of the conceptual core and ontology. The quantitative properties of bodies that admitted of mathematical representation were accepted as the ontologically real properties. After Descartes, a speculative atomism was thought to supply a new foundation for physics. Neither the original mechanistic atomism nor the nineteenth century revision, atomistic mechanism, succeeded in achieving a coherent reductive account of classical physics in terms of the properties of atoms. Yet, the effort had a distinct role in integrating physics and left a linguistic residue, the primacy accorded mechanical concepts. The concepts “space,” “time,” “mass,” “force,” “energy,” and “momentum” are anchored in mechanics but function in all branches of physics. To round out the core concepts one must add two distinctively thermodynamic concepts, temperature and entropy, and one electrodynamic concept, charge. The concept of a classical field became, after its ontological foundations dissolved, a phenomenological concept based on measurement. The classical/quantum boundary makes classical physics a closed system in a special sense.

This categorial framework supports an increasingly complex network of quantitative concepts. According to Mary Hesse's (1974) network model, which I am adapting, any new quantitative concept is under a double constraint. It must fit into a network of concepts in a coherent fashion and it must support a mathematical representation. Quine's great sphere of knowledge supplies a useful analogy for understanding the way coherence is achieved. Reality intrudes on the periphery through the excitations of nerve endings. For the core, Quine proposed first order sentential calculus with or without identity. Between the core and the periphery Quine posited layers, with fuzzy borders: numbers, sets, and various mathematical structures; general principles like symmetry and simplicity; general physical laws; and particular assumptions. The pragmatic strategy for handling the contradictions that routinely rise up is to move contradictions as far from the core as possible and then resolve them by whatever expedient causes the least overall incoherence.

The key difference between this and LCP concerns the core. Quine admitted that spatio-temporal objects with properties is at the conceptual core of our ordinary language, but considered this a remnant of muddy savagery. The logical core he proposed was an anticipation of a reformed future science. For various reasons, including the well-known incompatibilities between standard logic and quantum mechanics, this anticipation does not fit present physics or its foreseeable extensions. The anticipation of such a core reflects a goal Quine shared with many philosophers of science. The reasoning involved in interpreting physics should be formal, mathematics, logic, and the interpretation of formal systems. The conceptual core of LCP features spatio-temporal objects with the basic quantitative properties just listed. The network of concepts it supports plays an inferential role that is neglected in more formal approaches to interpreting physics. However, it is important both for understanding the functioning of classical physics and the complementary role between classical and quantum physics.

2.2.1 Material Inferences

Consider the muddy alternative to Quine's sanitized core. The categorial structure of LCP supports two distinct, but interrelated, types of inferences, which we will simplistically label "material" and "formal." Instead of attempting to develop either I will simply indicate some compatible sources and focus on two points of more immediate concern. First, when material inferences become widely accepted they effectively cease to function as inferences. They become matters of "objective fact." Second, we must consider the way conceptual networks relate to mathematical formalisms. My position on material inference is derivative from Wilfrid Sellars.[28] However, rather than summarizing the Byzantine structure of his language games, rules, roles, language entrance and departure transitions, and ≅quotes ≅, I will begin with an example from a very different field, the ongoing discussions concerning rights: of women, minorities, gays and lesbians, transgendered persons, fetuses, animals, and future generations. Conceptual connections hinge on word–word relations. Thus, "right" has complex relations to other concepts. A right may be exercised, enjoyed, given, claimed, demanded, asserted, insisted upon, secured, waived, or surrendered. A right may be contrasted with: a duty, an obligation, a privilege, a power, or a liability. Such connections are determined by analyzing usage.

Ontological inferences involve word–world connections. For a starter consider the assumption that the only real possessors of rights are those beings who are capable of exercising or surrendering a right, and who also recognize related duties, claims, and obligations. Such word–world assumptions are tested by their consequences. This assumption would deny rights to animals, fetuses, and probably future generations. Those who find such consequences unacceptable propose other ontological bases, or word–world connections, as bases for rights: rationality, sensitivity to pain, or possession of an immortal soul. These have different consequences in according rights to the irreducible comatose, the cognitively impaired, fetuses, and animals (See White, 1984, Chap. 6).

Our concern here is not with the substantive issues, but with patterns of argumentation. At the forefront of development the process of argumentation is complex and multilayered. When once controversial issues become matters of widespread intersubjective agreement, then they are effectively treated as matters of fact. In most of the Western world, for example, there is no longer any need to argue that slavery is a fundamental violation of basic human rights or that possession of civil rights does not depend on belonging to a particular class, caste, sect, or sex. Accepting ontological assumptions as objective facts can reduce complex arguments to bumper-sticker slogans. This is a general feature characterizing developing dialogs. As Gilbert Harman (1973, 1980) has argued, any attempt to regulate belief acceptance by Bayesian norms, or even highly simplified Bayesian-type schemas, would make life impossibly difficult. Each new fact or bit of evidence would require reconditionalizing the relative strengths of a network of interrelated beliefs. This is a practice with little survival value. It quickly overloads our information storage and processing capacities and makes practical decisions almost impossible. A practice with a much higher survival value is an all or nothing acceptance practiced for most basic beliefs. This accords with Davidson's well-known contention that normal discourse presupposes the acceptance as true of a large but amorphous body of claims.

A similar conclusion stems from Kyburg's (1985) account of the confirmation of quantitative laws. The measurements used to test quantitative laws inevitably involve errors and require a theory of error. Even the simplest measurements presuppose a network of assumptions, which are also subject to measurement, testing, and error. To avoid regress into a quagmire of unending testing scientific practice treats established quantitative laws as *a priori* commitments of a body of knowledge and acceptance of a new quantitative law as a matter of practical certainty relative to that body of knowledge. In a similar spirit Shapere has repeatedly insisted that, though any particular presupposition may be called in question, it is not possible to call all in question at once and still practice science.

A similar pattern of development regularly recurs in the evolution of physics. Thus, sociologists and historians of science have shown that the acceptance and interpretation of many discoveries involves argumentation, transformative negotiations, one-upmanship, power struggles between competing cliques, and sometimes dirty pool. The interpretation finally accepted often differs from that of the original discoverer.[29] From the present perspective, this is neither surprising nor undesirable. Any new purported discovery of fact or law is subject to a complex process of adjustment to empirical sources of information, a network of concepts, past theories, intended goals, and mathematical formulations. However, when something is finally accepted as a discovery, then retrospective realism sets in. The discovery is treated as the finding a fact that already had objective existence, much as. The new continents were already there awaiting Columbus's discovery. Such simplification of inference by acceptance is a necessary feature of progress. Thus, experimenters simply rely on the fact, discovered by Ørsted, that a current in a wire produces a magnetic field, while ignoring the historical fact that Ørsted never held such an interpretation (See Caneva, 2001, pp. 2–5).

This may seem to be advocating a social contract theory of truth. Here, however, it is necessary to be aware of a significant difference between the role of presuppositions in discourse and the foundational role often attributed to axioms of a theory. If the axioms are true, then the conclusions derived from them should be true. In discourse, truth is more of a surface phenomenon, predicated of overt claims and reflecting back on presuppositions. Consider a banal example

This shirt is yellow. (S1)

Acceptance of S1 as true seems to entail

Being colored is a property of fabrics. (S2)

The familiar difficulties with primary and secondary qualities might suggest rejecting the truth of S2 and recasting S1 as

This shirt looks yellow. (S3)

As Sellars among others has shown, such an analysis does not work. A white shirt seen under yellow cellophane or in yellow light looks yellow. That is, it looks the way yellow things look under normal circumstances. Since "looks yellow" presupposes "is yellow," it cannot supply a replacement for it. There is something of a growing consensus that it is reasonable to accepts S2 as true, but not interpret it as an ontological or scientific claim that competes with the wave theory of light. It is a pragmatic, rather than a semantic, presupposition (See Stalnaker, 1972). In effect, (S2) is treated as true in terms of its supporting role in discourse, rather than as an isolated ontological claim.

Normal discourse involves both general and contextual presuppositions as well as nested implicit rules of inference. Here I will indicate only one aspect. Consider four examples.

1) The engine won't start because the carburetor is flooded with gasoline.
2) The cat's fur is up because she sees a dog approaching.
3) I am choosing a major in philosophy and a minor in religious studies because it is the easiest way to keep a high GPA without working too hard.
4) If all B is C and all A is B then all A is C.

Sentence (4) is the sort of formal inference that gladdens the heart of logicians. Its validity can be explained extensionally without inquiring into the meanings of "A," "B," or "C," provided they are class terms. The other three sentences involve material inferences. Their validity depends both on the meanings of the terms used, on various word-world connections, and on presuppositions about reality. When we make such inferences we reason in terms of things, their properties, characteristic activities and relations: the proportions of gasoline and air required for combustion; the normal reactions of cats; the undemanding nature of many philosophy, and most religious studies, courses. Particular presuppositions may be doubted or denied. But it is not possible to carry on normal inferences while systematically doubting the conceptual network that supports it. Nor is it possible to carry on normal discourse while treating the nested presuppositions involved as hypotheses with different probabilities.

LCP presupposes a large, but not so amorphous, body of claims accepted as true. One could, for example, use the *Handbook of Chemistry and Physics* to formulate an indefinite number of claims like "The density of magnesium is 1.75 g/cm^{2}"; or "The coefficient of linear expansion of aluminum is 26 x 10^{-6}/ °C." Experimenters routinely rely on the truth of such claims. If a particular statement is doubtful then one checks it by getting better sources or making measurements that are more accurate. One can not cast doubt on all of them simultaneously and carry on the practice of physics. For the most part they are accepted as facts about the world, not matters of inference. From a pragmatic perspective such claims are objective in the sense that there is no further court of appeal. If a particular claim is doubted, then it is checked by doing better physics, not by going beyond physics.

This pragmatic justification, however, does not justify claims to the effect that basic scientific statements are true because they correspond to reality as it exists independent of human knowledge. Both ordinary and scientific claims fit reality as categorized. Claims depend on presuppositions. Presuppositions ultimately depend on a categorial framework. The further we recede from surface claims through presuppositions to the categorial core of language, the less significance there is to assertions of a correspondence with objective reality. What does it mean to claim that a categorial system corresponds to reality?

For a concrete illustration consider a relatively simple experiment that involves extending classical concepts into the quantum domain. In 1914 James Franck and Gustav Hertz performed an experiment, schematized in Fig. 1, in which electrons are emitted from the thin part, D of a current-carrying platinum wire. N is a fine cylindrical platinum wire mesh with a 4-cm. radius surrounding D, and G is a cylindrical platinum foil.[30] The evacuated tube, G, contains mercury vapor at very low pressure. Positive voltage on N accelerates electrons from D to N and then decelerates them on the much shorter trajectory from N to G. As the voltage on N was increased the kinetic energy of electrons striking G increased. When the voltage at N reached 5 volts the number of electrons reaching G dropped to zero. Franck and Hertz interpreted this as the initiation of ionization. Low energy electrons have elastic collisions with the ambient mercury atoms. When an electron has enough energy to ionize a mercury atom it gives up most of its kinetic energy and does not have sufficient energy to overcome the retarding potential between N and G. Further variations in voltage and electron behavior confirmed this interpretation. Bohr quickly pointed out that the energies involved were too low to ionize mercury atoms, but corresponded to the orbital transitions predicted by his new theory of the atom. This was soon accepted as Franck and Hertz's discovery.

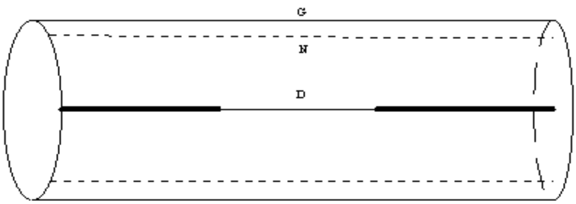

Figure 1

In spite of initial disagreements on interpretation, both Franck and Hertz and Bohr assumed as established fact that: there are electrons; electrons are constituents of atoms; heating a wire causes electron emission; there is a linear relation between applied voltage and electron acceleration; that electrons travel in trajectories; that they collide with atoms; that there are both elastic and inelastic collisions, that the energy lost by an individual electron is absorbed by an individual mercury atom; and that this absorption induces structural changes in the atom. All of these "facts" were subject to earlier, and sometimes later, controversies. Here they function as presuppositions. To compare this functioning with our earlier analysis, consider the propositions:

An electron, emitted at D, that has an inelastic collision with a mercury (F1) atom loses kinetic energy.

This presupposes:

The electron travels in a trajectory from D to the atom and from the atom to G. (F2)

However, in the light of wave-particle duality and the Schrödinger equation, we know that (F2) is not really true. So it might seem that we should substitute

Electrons seem to travel in trajectories. (F3)

In the context of the Franck-Hertz experiment (F3) does not work. This is not an instance of an historical limitation, which has since been overcome. As Cartwright has argued, similar presuppositions are operative in the design and execution of the Stanford Linear accelerator.[31] Any attempt to predict the behavior of electrons in SLAC exclusively by Schrödinger's equation would lead to superpositions upon superpositions without yielding electrons with definite directions and energies. Engineers assume electrons traveling in definite trajectories through drift tubes and accelerating fields between these tubes. The resolution of this conflict is similar to the preceding. If (F2) is treated as an isolated ontological claim about the nature and behavior of electrons, then it cannot be accepted as true. Within the context of the Franck-Hertz experiment, or SLAC, or particle detectors, it is a pragmatic presupposition. This acceptance fits LCP in a way that avoids contradictions if one accepts complementarity as a way of extending and limiting classical concepts in quantum contexts.

2.3 Extending Ordinary Language

Reasoning in ordinary language not only involves material inferences, it also relies on a picture of the world, a cohesive framework in which novel discoveries or conjectures can be related to complex networks of established facts and presuppositions. The major difficulty artificial intelligence projects encountered was their inability to supply such a supporting framework. Attempts to fill this gap brought a realization of how complex and functional our normal world view is. LCP embodies a coherent highly developed view of reality. This supplies a supporting role in interpreting and coordinating inferences. No one familiar with the practice of physics can really doubt this. This language, however, falls between the cracks of contemporary methodologies. Ordinary language analysis, in its various forms, does not accommodate the mathematical representation of quantities. The formal methods that philosophers have developed for reconstructing and interpreting theories can accommodate mathematical formulations and logical structures. This is generally done in such a way that there is virtually no role for linguistic analysis. In a reconstructed theory mathematical formulations are foundational and inferences are formal, i.e., governed by rules independent of the content to which are applied. If a mathematical formulation is to supply a foundational role, then it must be developed rigorously. This not only eliminates the dirty math that justified mathematical formulations on physical grounds. It also eliminates the inferential role that played by physical concepts and the conceptual networks that support them. Philosophers still tend to rely on the myth of an observational language, supplemented by theoretical terms. The basic problem here is not with the practice of physics, but with the inadequacy of such reconstructions.

I do not intend to develop a general theory of LCP. Instead I will exploit the historical development of the first part to bring out two points: the dialectical interplay between mathematical and physical considerations that lead to the acceptance of new quantitative concepts; and the tendency to regard established concepts as facts about the world. On the first point I rely on Mary Hesse's (1974) network model of scientific inference. Any new quantitative predicates introduced into physics are under dual constraints. The empirical constraint stems from the primary process involved in introducing, learning, and coming to use such predicates through empirical association in some physical situation. Here perceived similarities generally supply an initial basis for general terms and stimulate a search for lawlike generalizations among the classes linguistically differentiated. The systematic constraints involve adjusting mathematical representations, physical meanings, and general laws to improve the overall coherence and adequacy of physics. When quantitative concepts are widely accepted and used in practice, then they are generally treated as facts about the world, rather than as parts of an inferential system.

To implement one aspect of this network model we will consider the co-evolution of physical and mathematical concepts. The concept of a quantity is intrinsically related to mathematical structures. As Piaget has convincingly demonstrated, a growing child does not really grasp the concept of a quantity until she realizes that quantity is invariant under simple transformations. Pouring milk from a tall thin glass into a short squat glass does not change the quantity of milk. In the thirteenth century the notion was extended to the quantity of a quality, first the non-physical quality of sanctifying grace, later to quantity of motion. Following Nicole Oresme and Descartes this could be represented by areas which are invariant under change of shape, and later by numbers.

The further extension to heat illustrates one stage in the mutual adaption of physical concepts and mathematical forms. After the development of thermometers various formulas for mixing substances with different temperatures were offered. The one that won general acceptance was Richman's, $2 = (m_1t_1 + m_2t_2)/(m_1 + m_2)$, where m_1, t_1, m_2, t_2 correspond to the masses and initial temperatures of the two substances mixed together and 2 to the resultant temperature of the mixture (See McKie and Heathcote). This fit selected experiments involving similar substances, no changes of state, and sloppy measurements. However, it could not accommodate two types of data. The first was that the same amount of heat (judged by length of heating under standard conditions) led to different temperature rises for different substances of the same mass. The second was that under some conditions the application of heat led to a change of state, rather than a rise in temperature. Black and Wilke, more or less independently, overcame these difficulties by introducing the concepts of specific heats of substances, overt and latent heat, and specific heats of vaporization and freezing. The new and now familiar mixing formulas, where no change of state is involved, balanced the heat gained by a fluid with mass, m_1, and specific heat, c_1, at an initial temperature, T_1, in a beaker of mass, m_2, and specific heat, c_2, also at initial temperature, T_1, by the heat loss by a substance of mass m_3, specific heat, c_3, an initial temperature, T_2, where $T_2 > T_1$. When the substance is immersed in the fluid and the beaker is thermally insulated then the final temperature, T_f, is given by the formula:

$$[m_1c_1 + m_2c_2]\,(T_f - T_1) = m_3c_3\,(T_2 - T_f) \tag{7}$$

Such formulas have properties that were gradually recognized as characterizing quantities. They must be specified in a way that admits of serial ordering and some physical process of concatenation corresponding to addition. A functionally adequate concept of the quantity of heat required embedding this concept in a network of related concepts and practices. As physics advanced, the network of concepts was refined and the mathematical formulations improved. Specific heats were found to be a function of temperature. The concept of temperature, as noted earlier, was finally defined in a way that did not depend on the properties of any particular substance. The key idea behind (7) is the conservation of a quantity. Black simply interpreted it as quantity of heat transferred. Others, notably Lavoiser and Laplace, interpreted it in terms of conservation of caloric. After the development of classical thermodynamics such formulas were interpreted as specialized forms of energy conservation. This could be extended mathematically, e.g., through Fourier's diffusion equation, which put conservation in a differential form. The net results were formulas accepted as true independent of the ontological foundations intended to support them. Heat conservation did not depend on accepting caloric atoms as real. Energy conservation was deliberately developed independent of assumptions about the atomic constitution of matter.

As indicated in Part One, the development of both mechanics and electrodynamics in the British tradition were entangled with considerations of ontological foundations: Newton's hard massy corpuscles, Faraday's ether, Maxwell's displacement. Eventually both classical mechanics and classical electrodynamics could be formulated and function in a way that was not dependent on such ontological foundations. This does not imply that the foundations are false, but simply that they are not foundational within the framework of classical physics.

Even as ontological foundations were deconstructed, the coevolution of mathematical and physical concepts continued. When Maxwell sought a mathematical form that would fit separate components of electrical and magnetic fields he adapted Hamilton's quaternions, which Thomson had dismissed as useless. After Maxwell's death, two of his successors, Heaviside and Gibbs, independently adapted his work to develop vector analysis. One of the great mathematical achievements of the nineteenth century was the theory of analytic functions of a single complex variable. This was adapted to fluid dynamics and electrodynamics, which feature mutually perpendicular vector fields. The adaption required defining potentials and streamlines in a way that fit the formalism. Hilbert developed a theory of eigenfunctions and sought in vain for an equation that yielded both discrete and continuous eigenvalues. When Schrödinger discovered one, his celebrated wave equation, he relied on the newly published treatise of Courant and Hilbert to develop his wave mechanics. Matrices, group theory, and Lie groups supply further examples of mathematical forms that served to guide the formulation of physical concepts. This coevolution of mathematics and classical physics can be indicated in a table.[32]

Physics	**Mathematics**
Mechanics	Differential and integral calculus, Differential equations, Calculus of variations
Acoustics	Fourier series
Thermodynamics	
Acoustics	Complex Analysis
Hydrodynamics,	
Electrodynamics	
Elasticity	Partial differential equations
Hydrodynamics	
Electrodynamics	

The confused relation between the relative priority of physical and mathematical concepts may be illustrated by focusing one basic concept, “continuous,” which was of crucial significance both in the development of calculus and in the classical/quantum divide. Newton’s development of fluxions, or differential calculus, was rooted in doctrines of the intensification and remission of qualities and the assumption that changes were continuous. Leibnitz accorded functions a more foundational role, but thought of functions in physical terms. In effect the continuity of mathematical forms was justified by the continuity of the qualitative changes, or functional forms, they expressed. The nineteenth century arithmetization of analysis initiated by Cauchy led to a separation of mathematics from such physicalistic foundations and the treatment of mathematical continuity through the familiar ,-* limiting process. If mathematical formulations are to supply a foundation for physical theories, then they cannot rely on physical considerations to justify mathematics. Thus functions, expressed in set-theoretic terms, cannot be assumed to be continuous, or analytic, or to have derivatives, simply because they describe well behaved processes. To guarantee continuity one must cover the set with Borel functions.

Historically, the sloppy mathematics that much of functioning physics utilizes was grounded in obsolete ideas on the foundations of calculus. However, when mathematics is treated as a functional tool, rather than as a foundation for theories, then one can still rely on physicalistic justifications for mathematical formulations. Even after the reform of mathematics, physicists still treated “continuity” as a physical notion. In his pioneering study of quantities Maxwell (Papers, Vol. II, pp. 215–229) took the continuity of space, time, and motion as an intuitive given. Historically these developments were involved with considerable confusion about the nature of mathematics. Today, they are best viewed as considerations concerning the selection, rather than the justification, of mathematical forms. Thus, the older treatment of matter, fields, and even fluids and gases, assumed that since these are continuous, they can be represented by smooth continuous functions. This is still justifiable if one thinks of this as substituting idealized concepts for the particulate concepts of matter. The ultimate justification comes from measurement. Measurement of gas pressure, fluid velocity, the density of materials, or field strength, represents an averaging over microscopic differences. Such smoothed out models have continuity built in through the process of idealization. Such quantities, accordingly, can be represented in the small by smooth, continuous, generally analytic, functions.[33] Thus, physical assumptions, once used to justify the treatment of mathematical functions, now serve to justify the selection of a proper subset of mathematical functions. In analyzing functioning physics one can treat the language as basic and accord mathematical expressions a functional, rather than a foundational, role. They may have more than a functional role. Many famous formulas were inspired guesses whose physical significance was originally misconstrued or underestimated. Yet, basic formulas must have a functional role in the normal working of physics.

2.4 The Objectivity of Physics

Many defenses of the objectivity of physics rely on ontological assumptions, e.g., the real existence of objects independent of our knowledge of them. The thrust of the preceding considerations is to put the issue of objectivity in the context of the language and practice of physics. Does this entail an abandonment of objectivity? Instead of a simple "Yes" or "No" I will reply with distinctions and qualifications. The first distinction is between internal and external questions about physical claims. By "internal" I mean internal to the normal practice of physics, rather than analyses of physics as an object of study. The distinction is fuzzy. One cannot practice physics without some interpretation. Yet it supplies a useful point of departure.

For the internal question we begin with some very simple claims involving the type of quantitative concepts we have been considering:

This body has a mass of 8 kg. (8)
This body has a temperature of 13° C. (9)
This body has a net charge of 11 Coulombs. (10)

In the normal practice of physics such claims are routinely accepted as true. Without the routine acceptance of an indefinitely large number of such claims as true the normal practice of physics would be impossible. Few would contest this. Complexities arise when such claims are put in a larger context. The two most basic contexts here are the context of language and the context of theories. They have opposed orderings with regard to the relation between truth and ontology. Roughly in language truth seeps down from the surface. In theories it seeps up from the foundations.

Contrast the previous statements with the type of ordinary language claims considered earlier:

This shirt is yellow (11)
Being colored is a real property of objects (12)
Objects are the primary existents (13)

The acceptance of (11) as true entails a functional acceptance of (12), i.e., acceptance of it as a normal presupposition of discourse rather than an ontological claim. Statement (13) is an ontological claim. It acceptance as true must be based on something more than the truth of claims like (11).

Similarly claims (9)–(11) are claims with functional presuppositions, e.g., that temperature, charge, and mass are properties of bodies. Their normal acceptance as true does not depend on accepting an explicit statement of their presuppositions as ontologically true claims. If we switch to a perspective in which theories are accorded a foundational role, then the situation may seem different. This is starkest in a reductionist context. The ultimate theory is a fundamental theory of everything, or a grand unified theory. String theory is the best present candidate for such a theory. Consider strings as the real entities and all else as aggregates. Mass, temperature, and charge are not properties of strings. So one might be tempred to claim that (9)–(11) are not really true. Before yielding to, or resisting, such temptations we should summarize the linguistic context we have been developing.

LCP stemmed from Aristotle's *Categories* and his philosophy of nature. Though it developed as a specialized extension of the conceptual core of Indo-European languages, it has been successfully grafted on to many non Indo-European languages without any significant change in basic structure. After a technical vocabulary is established, physics, unlike philosophy or poetry, easily admits of precise unambiguous translation. Thus LCP must be understood, in the first instance, as a spoken language. As a vehicle of discourse it must have the basic features requisite for unambiguous communication of information. These include a subject-object distinction, a topic to be considered later, and a characterization of physical reality as an interrelated collection of spatio-temporal objects with properties. The properties basic to LCP are quantitative properties that can be represented mathematically.

The long evolution, schematized in Part One, achieved a basic coherence through a dialectical process. Any new quantitative concept introduced is subject to the dual constraints of overall consistency and quantitative representation. Historically, these constraints were met through the co-evolution of physical and mathematical concepts. Descartes, Newton, Pascal, Leibniz, Euler, LaGrange, LaPlace, Gauss, Cauchy, Fourier, Hamilton, and Poincaré contributed to both fields and often supported mathematical considerations by physicalistic reasoning. This led to ideas on the foundations of mathematics, particularly the interpretation of calculus that most mathematicians came to reject in the early nineteenth century.

Through the course of the long development sketched here, the language of physics has been enriched with a very large number of new terms and a much smaller number of new categories. Most of these new terms are proper to specialized branches of physics. There is also a part of the language of physics shared by virtually all branches of physics. The indispensable core concepts from mechanics, thermodynamics, and electrodynamics include “mass,” “force,” “energy,” “temperature,” “state of a system,” “charge,” and “field.” These are grafted on to a streamlined ordinary language core. By “streamlined” I mean that core ordinary language concepts get specialized or restricted usage in LCP. Thus, the properties of bodies that count as basic do not include vital, psychologistic, or aesthetic properties. Space and time function as metric, or geometric, concepts. Since this is a language of interpersonal communication the spatio-temporal framework of a user anchors the reference system. Special relativity is, in Einstein’s familiar classification, a principle rather than a constitutive theory, concerned with transformations between frameworks.

The most important feature of LCP is that it is a language of interpersonal discourse, not a theory. Its proper functioning must be appraised by methods of linguistic analysis, not the interpretation of theories. Such analyses, however, must recognize distinctive features of LCP. Consider especially the notion of objectivity. In ordinary language the concept of objectivity is grounded in the subject/object distinction, which is at the core of any spoken language. It can also treat subjects as objects with distinctive vital and psychologistic properties. LCP is an extension of the objective side of this division. In its long incubation period it was effectively detached from dependence on any particular language and began to center on quantitative properties of bodies. The leaders of the scientific revolution, all dualists, attempted to put physics on an atomistic foundation. After the gradual realization that the foundation of mechanistic atomism did not really support the enterprise and the revision of mechanistic atomism collapsed, classical physics had a rather dualistic stance. Ontological reductionism remained as a goal, the Holy Grail of physics, and a unifying force in the conception of reality. Yet the informal functional unification of physics that allowed physicists to interrelate personal activities, mechanics, electrodynamics, and thermodynamics in accounts of experiments or analyses of the sun's behavior, was rooted in LCP as an extension of ordinary language.

LCP is a linguistic parasite. It can be grafted onto Russian, Spanish, Chinese, Arabic, or any other sufficiently developed language while retaining its evolved structure and inducing mutations in its successive hosts. The protracted struggle to make this language objective loosened the role of personal and cultural biases and presuppositions. With the limits of its valid applicability established, LCP could be treated as an idealization. In this idealization the subject is the ideal detached observer. Through training and assimilation of tribal customs, young physicists learn to assume the persona of the detached observer.[34] With the role of the subject depersonalized and de-emphasized and ontological reductionism as a guiding goal, it was natural to think of the objectivity of physics in terms of a correspondence with objects as they exist independent of human knowers.

The advent of quantum physics and the growing conceptual crisis it precipitated had the effect of showing the limits of applicability of the language of classical physics. To the degree this realization was actualized it allowed LCP to emerge and be seen as what it is, a language-centered conceptualization of reality. After the linguistic crisis was effectively resolved and receded into forgetfulness, the conceptual revolution was open to reinterpretation. I will indicate the aspect of this reinterpretation that I consider the most serious misrepresentation. This is the claim that classical physics is objective in the sense that physical statements make no reference to the means of observation or reference. Quantum mechanics lacks such strong objectivity, and this is seen as a defect to be remedied. This contrast makes sense when one thinks of quantum mechanics and classical mechanics as competing theories. In the perspective of LCP the appraisal is quite different. The extension of classical concept to quantum experiments brings out the limited applicability of these concepts and of the language in which they function. One cannot simultaneously use complementary concepts in describing a system without generating contradictions. A choice must be made and implemented through the way the experiment is set up and interpreted. The necessity of such a choice brings to the forefront the role of the subject in the functioning of LCP. The alleged subjectivity of quantum mechanics is actually a realization of the nature and limits of classical physics.

From an internal perspective the objectivity of physics is not problematic. The practice of physics entails acceptance of a large, but no so amorphous, collection of claims as true. Here "true" must be interpreted as really true, or true of reality, not merely accepted as true. This does not presuppose an independent access to objective reality that supplies a basis for appraising the truth of physical claims. It simply presupposes that on such issues physics is the ultimate court of appeals. When the truth of particular claims are doubted or denied the only meaningful recourse is to do better physics, not to abandon physics. It is not possible to doubt the truth of all physical claims and continue to do physics. The claim they are true of the world involves the same circularity that Davidson and Gadamer indicated for ordinary language. The world of physics is the world as give to us through physics.

2.5 An External View of Physics

In addition to using physics to understand reality one can make physis itself an object of critical analysis. This is something done in different ways by sociologists, historians, philosophers, and reflective physicists. Here I will only consider two philosophical approaches and only consider them from a sharply limited perspective. Each supports the conclusion that the type of claims just considered may seem objective when appraised on the basis of uncritical internal standards, but cannot be considered objective in a larger more critical context. We will label these interpretative perspectives *The primacy of theories* and *The deconstruction of physics.*

The way LCP has so far been used as a basis for interpretation reflects a purely functional view of mathematical formulations and theories. This is surely inadequate. Mathematical formulas and theories do play a functional role in experimental research, in the dialectical interplay between experimenters, and in much of the work done by theorists. Yet the study of equations in isolation from experimental research has repeatedly led to unanticipated consequences. One can argue that theories encapsulate the greatest advances of physics and should supply the basis for interpretations of physics. Before exploring such a claim we should attempt to situate the type of theories we are talking about.

We begin with Einstein's distinction between principle theories, such as thermodynamics and special relativity, which supply constraints that processes must observe; and constructive theories, which attempt to build a picture of complex phenomena out of the materials of a very simple formal scheme. Many theories only have limited scope, e.g., theories of ferromagnetism, superconductivity, Bose-Einstein gas, neutron stars. The theories that provoke the ontological controversies pertinent to the issues treated here are generally constructive theories of broad scope that are not reducible to more basic theories. Contemporary debates about scientific realism are chiefly concerned with the question of whether acceptance of such theories reasonably entails acceptance of the "theoretical entities" posited or presupposed by these theories.

The chief examples of such deep constructive theories in physics are atomism and particle physics. While speculative atomism has a venerable history, atomism did not develop as a science until the twentieth century. Atomism, especially as developed in the Copenhagen tradition, and particle physics, especially since World War II, have been characterized by a close continual interaction between experimenters and theoreticians. Elsewhere (MacKinnon, 1982) I have attempted to trace the role this dialog, and the language in which it was conducted, played in the development of atomic theory and quantum physics. Almost any survey of the development of particle physics emphasizes an even stronger interaction. Any particular theories offered, e.g., of the anomalous Zeeman effect, of the helium atom, of weak or strong interactions, emerge from and are modified through this ongoing dialog. This requires a common language where the basic terms have meanings through their use, rather than through particular theories. This language is LCP with the inclusion of new terms that go beyond classical physics. The issue here is not the classical/quantum divide, but the conditions of the possibility of meaningful dialog.

Theories as developed by physicists reflect temporal slices in this historical process. However, one can prescind from such temporal and dialectical qualifications and make theories as such an object of philosophical analysis. As van Fraassen (1991, p. 1) put it: "Philosophy of science has focused on theories as the main products of science, more or less in the way philosophy of art has focused on works of art, and philosophy of mathematics on arithmetic, analysis, abstract algebra, set theory, and so forth." This is an appraisal of the role to be accorded theories as such, rather than particular types of theories. The truth of scientific claims is seen as derivative from the truth of theories.[35]

I will not attempt an appraisal of such analyses of theories. Instead I will simply sketch a scenario that calls the objectivity of physics into question. It runs as follows. Questions such as the objectivity or realistic significance of theories are best addressed by isolating a theory from the temporal flux of scientific development and making it an object of study in its own right. An adequate analysis generally requires a critical reconstruction of a theory. Functioning theories often involve dirty math, or mathematical formulations justified on physical grounds. Since they are often tailored to fit experimental discoveries, it is often difficult to separate the consequences of the theory from the interpretative presuppositions of the theorists. This is remedied by supplying a rigorous mathematical foundation and explicit rules of inference.

Different arguments may support the same conclusion that the philosophical consequences of theories are best studied by rational reconstruction of the theories to be interpreted. This, as noted earlier, leaves no role for linguistic analysis or material inferences. There is a renewed reliance on the theoretical/observational distinction. The concession that most observation reports rely on theory-laden terms is minimized by the suggestion that it should be possible in principle to eliminate such theory-laden terms. Theories, so construed, fit into a larger perspective. Physics advances by developing new theories to replace presently accepted theories. Theories rejected as inadequate cannot be considered true. Though the substructures differ markedly, the overall structure is quite similar to scenarios of science advancing by paradigm replacement, the abandonment of degenerating research programs or problem-solving methodologies. In the present case, however, it depends on accepting interpretatively isolated theories as the fundamental units of explanation.

What does this mean for the truth and objectivity of scientific claims such as (8)–(10) (or less simplistic claims with more obviously theory-laden terms)? The thesis of the dispensability in principle of theory laden terms in observation reports would suggest rephrasing them along the lines: "I saw a needle pointing to a figure 2 on a scale and interpreted it as…." This is hardly plausible to anyone familiar with the controversies concerning protocol sentences, an observation language, and similar attempts to develop a radical empiricism. The alternative is to regard the bulk of such claims as theoretical claims, at least in a minimal sense. They may not be deduced from a theory, but their physical significance is theory dependent. As theoretical claims they are all replaceable, at least in principle, when presently accepted theories are replaced by better theories.

The radical skepticism this seems to entail is a bit like solipsism. Very few really hold such positions. Yet it is not easy to find a fatal flaw in the supporting arguments. I will separate rigorous theory reconstruction from Kuhnian relativism and focus on what I take to be the weak link in the chain of arguments just sketched. This is the claim that a rationally reconstructed theory and a functioning theory are the same theory in different forms.[36] This is eminently plausible if one thinks of a theory as a mathematical formulation that is to be accorded a physical interpretation. Why rely on a slipshod foundation when a competent craftsman can build a better one?

What should be recognized as the crucial factor here is that this is a *re*construction. Reconstruction begins with the primacy of pragmatics. A theory is selected as a target for reconstruction because of its established success, or its acceptance by the physics community. The theory chosen is never an empty formalism, but an already interpreted theory. A necessary, but not sufficient condition, for any reconstruction to be considered adequate is that it reproduces the essential features of this interpreted theory. Logically, this requires that there be a prior analysis of the functioning theory and its informal interpretation.

Here there is an illuminating contrast between axiomatic and semantic reconstructionists. The leading logical positivists recognized the need for an informal analysis of the language of functioning science prior to any analysis by reconstruction. Two outstanding examples of relating informal and formal analyses are Reichenbach's analysis of the qualitative properties of time terms (Reichenbach, 1956, Chap. 2) and Carnap's informal analysis of the meaning of "probability" in both ordinary language (Carnap, 1962, pp. 1–51) and in science (pp. 161–191). The need for such an informal analysis has been explained by Reichenbach's leading student (See Salmon, 1979, pp. 3–15).

The key difference between an informal analysis of a functioning theory and a formal analysis of a reconstructed theory is in the semantic component. A functioning constructive theory relies on terms, such as "mass," "energy," "time," "space," and "particle," whose meaning are set prior to and independent of the theory using them. These meanings depend on usage, presuppositions, and ultimately on the categorial core of LCP. Reconstructed theories rely on formal semantics and an interpretation of "true" modeled on Tarski's semantics. On a semantic level, functioning and reconstructed theories are not the same theory. A functioning theory presupposes the basic semantics of the language of physics. This fits it into a larger unit that is loosely organized through functioning presuppositions. It does not at all fit the logical model of a set of sentences closed under implication. An informal analysis of functioning theories stressing the role of the language of physics should precede and ground formal reconstructions of theories. This requirement, unfortunately, is more easily stated than implemented. At the present stage of development this is best done by case studies.

Case studies of low-level theories would be especially helpful theories. There seems to be a general pattern that such theories are introduced as hypothetical explanations of puzzling phenomena on an observational level. Once accepted and entrenched, they effectively become part of the factual background presupposed in the normal working of physics. Such a process was exhibited in the treatment of ferromagnetism, paramagnetism, diamagnetism, fluorescence, phosphorescence, thermionic emission, Cerenkov radiation, semiconductors, superconductors, and many other phenomena. The same pattern is still at a formative stage in accounts of pulsars, quasars, black holes, x-ray bursters, global warming, stellar formation, planetary rings, and many more topics. The discourse of physics, as earlier noted, presupposes the acceptance of a vast, but not so amorphous, collection of truths about the world. The collection grows through the advancement of physics. In place of the theoretical/observational distinction, a strong candidate for the status of the most misleading distinction in current philosophy of science, functioning physics effectively relies on a distinction between established facts and speculation.

This appraisal has a distinct bearing on the issue of Kuhnian relativism.[37] Between particular theories and the broad basis of a shared language are units and structures that philosophers and sociologists have analyzed: themes, paradigms, research programs, problem-solving methodologies, self-accrediting communities. These change and the changes affect the interpretation of physics in complex ways. The difficulty comes in labeling such changes "conceptual revolutions" with the implication that today's truth is tomorrow's blooper. The basic claims we have been considering are embedded in the language of classical physics. Prior to the emergence of quantum mechanics, which will be treated elsewhere, this has not undergone the sort of conceptual revolution required to support Kuhnian relativism.

3. Ontological Relativity Reconsidered

When we return to the issues mentioned in the introduction they might seem problematic in a new light. The positions initially considered fall into two opposing groups on the interpretation of "objectivity." A shared theme loosely linking deconstruction, the end of philosophy movement, ontological relativity, and the social construction of reality is the interpretation of "objectivity" in terms of intersubjective agreement. The various realist alternatives share some version of the claim that crucial aspects of knowledge, or of physics, correspond to aspects of reality as it exists independent of our knowledge: truth as correspondence with reality; truth as bivalent, i.e. propositions as objectively true or false even if the status can never be determined; key theoretical terms as really referring. The epistemological considerations presented here place me more or less in the first camp, linking "objectivity" to intersubjective agreement. It would be more precise to rely on Davidson's idea of triangulation, or of a developing relation between an individual physicist, the ongoing community of physicists, and the reality they share and shape conceptually. Does this entail ontological relativity, or the deconstruction of physics, or a denial that physics is really making progress towards a more basic and comprehensive understanding of reality?

I don't think so. I believe, in fact, that the advancement of physics constitutes the paradigm case of progress in human knowledge. In terms of knowledge of physical reality the type of objectivity physics achieves is the highest humans can hope for. It is misleading to judge the ultimate claims of physics by an appeal to any higher type of knowledge, whether it be a metaphysical system or intuitions of what physical reality must be objectively. On such issues physics sets the ultimate standards, because there is no higher court of appeal. This statement of opinion is open to objections from various fronts. I will only consider one type of objection, one that is pertinent to the issues treated here. The objection is that the type of physics that can be expressed in LCP ultimately represents a secondary type of knowledge. As such it cannot set the standards for objectivity.

This objection comes from two quite different sources: reasonable anticipations of the future of physics; and the critical analyses of Husserl and Heidegger. My answers to the objections take the form of tentative suggestions, rather than a developed position. They are presented primarily to indicate the type of consequences that follow from taking the language of physics seriously. The first objection is fairly easy to state. The standard model is extremely successful in accommodating all the presently available data on particles and interactions. Yet, fundamental particle physicists share a consensus that this cannot be the ultimate theory. It does not include gravity and has two many parameters that have to be put in by hand, as current jargon has it. The theory that will eventually replace it is not clear. However, the leading efforts involve superstrings in 10-dimensional space, M-branes, supersymmetry, esoteric particles, and undoubtedly features not yet anticipated. The relation between classical physics and present quantum physics is debatable. In a larger perspective, regardless of what theories prove successful, classical physics will have the status of a phenomenological system. How can a phenomenological system set standards for objectivity?

The term "phenomenological" has an established use in physics that is independent of its use in philosophy. Roughly, an explanation of otherwise puzzling phenomena is considered phenomenological if a more fundamental explanation is possible, at least in principle. Thus: geometric optics relative to electrodynamics; classical electrodynamics relative to quantum electrodynamics; S-matrix theory relative to field theory; the standard model relative to a grand unified theory. This fits the reductionist goals that characterize the main thrust of fundamental physics. This involves an ontological reductionism, explaining molecules as atoms bound together by forces, atoms in terms of particles, and particles in terms of more fundamental ingredients. This ontological reductionism should be distinguished from the problem of realism.

Realism is a many-splendored thing. We will consider the least of its splendors, the use of "real" in ordinary language. A growing child learns the appropriate use of the terms through simple examples. Horses and dogs are real; unicorns, centaurs, and werewolves are not real. Outside of M.I.T., linguistic analysis works from the surface down. Horses are objects, but accepting horses as real does not entail accepting "object" as a fundamental ontological category. It is a categorical presupposition of normal linguistic usage. One need not know, hold, or even recognize ontology to make objective claims in ordinary language. The objectivity of LCP is a systematized extension of ordinary language usage. It need not entail ontological claims over or beyond the normal claims of physics. If someone wishes to construct an ontology and either ordinary language or LCP represents the limits of what can be said coherently, then the categorical presuppositions of the language used may supply a basis for ontological categories.

No matter how far future physics goes beyond present practice it will still involve people doing experiments, communicating results, and discussing their implications. Bohr's repeated claim that complementarity will remain a permanent part of physics is routinely misinterpreted as a claim that the orthodox interpretation of quantum mechanics is not open to revision. It should be interpreted as claiming the indispensability of LCP, a point to be argued elsewhere. This inevitably involves treating as objective claims like "The coefficient of linear expansion of aluminum is $26 \times 10^{-6}/°C$". This does not involve a metaphysics of reductionism, or an epistemological analysis of physical knowledge. It is the normal functioning of the language of physics.

The second type of objection will probably seem peripheral to most readers. Husserl and Heidegger criticized physics as relying on a misleading sense of objectivity. Few philosopher of science attach any significance to claims that either Husserl or Heidegger makes about the status of physics. That may be sufficient reason to skip the remainder of this article. I am including this for two reasons. First, their appraisals played a significant role in the death-of-philosophy scenario. Second, and more importantly, I believe that Heidegger had a very good grasp of the underlying issues we have been treating and came up with a rather different appraisal of the objectivity and worth of physics. His position is worth considering.

The standard "death of philosophy scenario" does not accord physics any significant role. The reasons for the omission reflect an appraisal of the significance of physics. To bring this out I will revise the familiar scenario to include the role of physics. The traditional scenario is generally presented more like a medical report of a terminal illness than a consideration of philosophical arguments. The underlying issue is not seen as one of appraising philosophical positions, but the more hermeneutic task of trying to understand what type of conditioning would lead people to take such questions seriously. The revisal is presented in the same spirit.

In the rationalist tradition, philosophy was thought of as supplying an ontological foundation for the sciences. In Descartes famous metaphor first philosophy is the root of the tree of knowledge, physics is the trunk, while the other sciences are the branches. In the empiricist tradition, philosophy was not regarded as supplying an ontological foundation. Locke famously pictured himself and as an under laborer, clearing away some of the rubbish blocking the work of such master builders as the incomparable Mr. Newton. Rather than ontological foundations, the empirical tradition was concerned with epistemological foundations, of showing how all knowledge could be reduced to impressions and ideas. Kant changed philosophy from a foundational to a critical enterprise, but retained the traditional emphasis on the individual subject as a knower. In the first Critique he accepted physics and mathematics on the basis of their success, used them as a source to determine norms for a true science and rejected traditional metaphysics for not meeting these norms. A post-Kantian tradition culminating in Hegel considered Absolute Spirit to be something immanent in reality and knowable through reason. The natural sciences played a subordinate role. This idealism began to unravel under the criticism of Soren Kierkegaard, who thought that abstract philosophy could not grasp the reality and sometimes stark irrationality of the concrete individual subject; of Friedreich Nietzsche, who debunked philosophical traditions and examined philosophical classics as examples of rhetoric; and of Karl Marx, who transformed idealism into materialism. This wing culminated in Husserl's critique of European science as resting on a false notion of objectivity, in Heidegger's insistence that engagement with the world is prior to representation, and in Jacques Derrida's radical reconstruction.

Here the end-of-philosophy movement gives philosophical depth to the evaluation of the social constructionists. Realistic interpretations of fundamental physics are seen as relying on a misleading account of objectivity as a correspondence with naked reality, reality as it exists independent of any description and prior to any theory. If this is rejected, then, with a bow to Kuhn, one has a succession of theories, or paradigms, each with its own ontology. Presently accepted theories will undoubtedly encounter the same fate. Nor does it make sense to speak of a succession of theories as approximating the ultimate goal of an objective account. We do not know what the ultimate theory will be. What physics provides, accordingly, is a succession of pictures of reality, useful for theoretical and technological purposes, but pictures nonetheless. Painting and poetry, literature and religion have different successions of pictures of reality, which are useful for other purposes. None can be accorded a privileged ontological status. The most direct way to relate such appraisal to the problem of objectivity is to consider the Heideggerian arguments that spawned deconstruction.

Heidegger's original interest in the role of fundamental categories was manifested in his dissertation on the categories attributed (wrongly, it seems) to Duns Scotus. He had some training in physics and kept abreast of current developments.[38] Yet, when he treats physics in *Being and Time*, Descartes supplies the focal point. This may seem perverse. Yet, it makes sense in terms of the Heideggerian problematic of raising anew the question of the meaning of being. The ideal of the detached observer contemplating a world of objects received its first clear articulation in Descartes' *Meditations* and *Discourse on Method.* "In this way Descartes explicitly switches over from the development of traditional ontology to modern mathematical physics and its transcendental foundations." (Heidegger, 1962, p. 129) This new foundation is being considered as present at hand, something to be contemplated through the eye of the mind. For Heidegger this "objective" presence at hand is not an experience of naked reality. It is derivative from the primordial experience of beings as ready to hand, a pre-conceptual experience. Descartes set the interpretative perspective for physics and thought of philosophy as doing something similar, but on a more fundamental level. Heidegger extends this appraisal to anyone inspired by a *Weltan-*

schauung or a theological attitude. All begin with a comprehensive image of the universe and of man's place in it. The starting point should be *Dasein*, the concrete embodied existence of an individual anxious about adapting, getting by, achieving authenticity. His tortured terminology: "ontic" vs. "ontological," "*existenziell*" vs. "*existential*", "ready-to-hand" vs. "present-to-hand" are all intended to break the intellectual stranglehold of the detached observer and his forgetfulness of the being of being.

Heidegger's goal was the utter destruction of traditional metaphysics by exposing its withered roots. Suppose we grant his point. Any metaphysical system constructed from the viewpoint of the detached observer contemplating objective reality is fundamentally flawed. Yet, classical physics was constructed in just this perspective. The bearing this criticism has on the appraisal of physics depends on how one relates physics to philosophy. Heidegger indirectly treated this in his appraisal of Kant. Heidegger used Kant's efforts to examine whether a critical appraisal of the ground and status of the concept "object" allowed the possibility of a type of knowledge of reality different from and more basic than physics. The two differed in basic attitudes. Kant embraced physics and attempted to give it a more secure critically justifiable foundation. Heidegger regarded physics as embodying a derivative and even degenerate type of knowledge and sought something better. As Macomber (1967, pp. 201–202) noted in his critical study:

> All of the characteristics which Heidegger attributes to science – impersonality, flattening, self-coordinating teamwork, and the vanishing source of meaning – we have already encountered in one form or another in our discussion of decadence. There can be little doubt that Heidegger regarded science primarily – almost exclusively – as an expression of decadence.

I will simply indicate the changing status of the concept "object." Kant taught that we think objects by imposing on the given of sensual perception forms of sensibility, the schematism of the imagination, the categories of understanding, and the transcendental unity of apperception. The result is ontic knowledge, in Heideggerian terms. Here "ontic" should be roughly equated with the customary use of "descriptive metaphysics" or "ontology" (as opposed to speculative metaphysics), i.e. a making explicit of the type of objects countenanced by the conceptual system or theory we bring to experience. Heidegger sought to get beneath this subject-object level. Our primordial experience of reality is not through a categorization of objects of experience, but through our sheer bodily presence, our being there. The analytic of Dasein, accordingly, supplies the only transit from ontic to ontological knowledge.

Heidegger's sporadic attempts to develop proper ontological knowledge are not our immediate concern. I will comment on only one aspect of the differences between the bases of ontic and ontological knowledge. In Heidegger's view, the possibility of the latter requires a primordial regression to the ground of the essential unity of ontological knowledge (Heidegger, 1968, p. 93). Hence, Heidegger's repeated strivings to get beneath the conceptual, or what can be expressed, to the pre-conceptual: the intuition that precedes knowledge as representation; the poet's insight grounding his novel use of language; the pre-Socratic intuition of a wholeness that preceded the divisive articulation of Plato and Aristotle; and, unfortunately, the belonging to a Folk that precedes citizenship in a constitutional state. Such efforts did not lead to evaluations of physics as such, but to criticisms of the dehumanizing effects of technological societies.

We have been focusing on the expression of knowledge through language and especially with the presuppositional role of the core concepts of ordinary language. The overwhelming temptation, nurtured by our historical traditions, is to presuppose that the concept of spatio-temporal objects is foundational because spatio-temporal objects are the primary existents. This foundational concept, Husserl and Heidegger insist, is rooted in our linguistic practice of articulating reality through the imposition of objectifying concepts. This practice presupposes a way of being in the world, or the noetic-noematic experiences in which objects are constituted as correlates of consciousness. It follows that any attempt to understand human beings simply as objects of scientific investigations involves a radical inconsistency. Heidegger extends this to the contention that attempts to understand the being of beings must differ radically from any science of being*s*. He also realized that the language of physics is dehumanizing on a categorical level. The method of physics is impersonal, flattening, self-coordinating teamwork. Physics embodies knowledge based on impersonal acultural representations of reality. LCP represents the limits of what can be consistently said through the one systematic extension of an ordinary language basis that led to modern science. It does not supply any basis for understanding distinctively human characteristics. It would not be improved by any attempt to put it on a more personal or cultural basis.

This existential psychology and fundamental ontology are not our concern. An appreciation of the analysis supporting it, however, can have a liberating influence on the questions we have been considering. LCP is grounded in the core concepts of ordinary language. These, in turn, are grounded in our way of being in the world. The basic categories of LCP are rooted in the macroscopic objects of ordinary experience. Our concept "object" is intrinsically correlated with such macroscopic objects as primary exemplars. An unrestricted extension of this categorical system to quantum experiments led to contradictions. Bohr devised a way of avoiding contradictions by restricting the use of concepts. Heidegger realized that quantum mechanics manifested the basic limitation of the concept "object." His paper, "What is a thing?" was stimulated by hearing Heisenberg lecture on the new quantum theory.[39] Quantum physics, especially in the measurement interpretation, has a symbiotic relation to classical physics. A new fundamental theory with its own proper foundation need not, and probably could not, be grounded in this categorical system. It would be further removed from the basic human condition of being in the world. It could take events as basic, presuppose a 10-dimensional space-time, have supersymmetry as an organizing principle, or some foundation not yet anticipated. On such issues the traditional realism/anti-realism debates are irrelevant. These new theories cannot be ruled out on the grounds that spatio-temporal objects are the primary existents. It is more productive to focus on the role and limitations of a categorical system rooted in our way of being in the world.

Against this background the problem of ontological relativity admits of an easier resolution. Theories (or paradigms or whatever) do propose new entities (phlogiston, caloric atoms, neutrinos, quarks) and new properties (ethereal rigidity, magnetic susceptibility, displacement, spin, strangeness). As hypothetical aspects of a new theory these are tentative, subject to critical evaluation, acceptance or rejection. Those that become so accepted that they supply factual presuppositions for further investigations are embedded in the normal functioning of LCP. LCP is the repository, not the originator, of ontological commitments. Speculative ontological claims are exciting, thought-provoking, controversy-generating. Ontological claims that have become embedded as functional presuppositions of LCP are like dead metaphors, no longer exciting, thought-provoking, or for the most part, even explicitly noted. They emerge from forgetfulness only through crises that provoke foundational analyses, or through philosophical simulacra of such crises. Yet, these embedded presuppositions have evolved to meet the dual constraints of empirical adequacy and conceptual consistency.

Here the familiar thesis of ontological relativity has no deep purchase. LCP had its roots in Aristotle and medieval Aristotelianism. The scientific revolution mediated a major change in orientation from the organismic world view of medieval Aristotelianism to the atomistic reductionism Descartes and Newton intended. When this proved to be more a goal than a foundation, the underlying categorial system was retained in a modified form. This is still a modification of lived world ontology. It is not a fundamental ontology of reality. LCP as such has not undergone major conceptual revolutions involving radical ontological switches. Yet, LCP must be recognized as a phenomenological system, even though an adequate depth replacement is not yet at hand. The type of conceptual revolution this will involve is not yet clear.

NOTES

1. The distinction is from Pickering (1995), Chap. 6. The "science wars" have produced notoriously inflated claims by both social constructionists and their critics. For balanced presentation of both positions see Barnes et al. (1996) and Hacking (1999). Pera (1994) aptly illustrates the switch from methodology to rhetoric as a constitutive feature of scientific discourse.

2. I am also relying on Sellars' privately circulated monograph, "Aristotle's Metaphysics: An Interpretation," and, with considerable reservations, on Anscombe (1961), Chap. 1.

3. St. Thomas Aquinas, *Summa Theologiae*, 1, q. 42, a. 1, ad 1. The relation of such quantitative reasoning to the foundations of Aristotelian science are treated in his *In Librum Boethii de Trinitate.*

4. Such questions continued to be discussed well into the scientific revolution. See Solère (2001)

5. This brief summary is based on two articles, Chevelley (1993) and Frye (1980).

6. This early atomism is treated in Dijksterhuis, pp. 386–491; van Melsen, pp. 81–128; and Kargon.

7. The role of Newton's atomism is treated in A.R. Hall and M.B. Hall (1970); McGuire (1970); McMullin (1978); and Westfall (1971) and (1980).

8. Euler, series III, vol. 2. The basic properties of matter are explained on pages 149–152, while the rejection of atomism is on pages 297–301. These two volumes of popular science were reprinted in twelve French, ten English, six German, four Russian, two Dutch, two Swedish, one Italian, one Danish, and one Spanish edition. This and the French *Encyclopédie* communicated to the reading public of the Enlightenment era the significance of the new science.

9. A general survey of eighteenth physical experiments is given in Hall, (1954), Chap. 12. Kuhn (1977, pp. 31–65) brings out the characteristics of and transition from Baconian science. The emphasis on new instruments and quantitative precision is developed in Feldman, (1985). Rueger (1997) illustrates the striking differences between the goals of Baconian and more quantitative experiments.

10. Thus in Laplace (1825), Vol. 5, pp. 113–132 he treated small spheres with forces proportional to $r^{-2-\forall}$. The value $\forall = 0$ fit gravitation, while $\forall = -3$ supplied a model for molecules in static equilibrium. A further assumption concerning short range intermolecular repulsive forces allowed the deduction of Mariottes's (or Boyle's) law, Gay-Lussac's law, and Dalton's law of partial pressures. Further assumptions about the heat of particles allowed him to deduce the correct result for the speed of sound in air (Ibid., pp. 133–145).

11. This is based chiefly on Truesdell (1980). For the Baconian phase see McKie and Heathcote.

12. For a general survey see Brush (1976).

13. The term "theory" refers to the limited theoretical assumption that variations in the electromagnetic field are causally responsible for the transmission of light and heat. It does not present a theory of what either light or electricity is.

14. Maxwell repeatedly insisted that the concept of energy must be interpreted literally and that mechanical energy be treated as basic.

15. These tests are analyzed in Everitt (1975) and in Buchwald (1985).

16. The papers by Landau and Peierls and the two papers by Bohr and Rosenfeld are translated in Wheeler (1983), Sect. IV. An analysis of the Bohr-Rosenfeld argument is given in Darrigol (1991).

17. This was introduced in Aharonov (1959). Belot (1998) interprets its general significance in a contemporary context.

18. Alternatively, it is possible to assume massless spin one particles, apply the principle of local gauge invariance and deduce the form of the matter field. See Weinberg (1995), pp. 339–343.

19. The vortex model could not explain mass or handle dissipation. After Kelvin accepted electrons (which he called electrions) as atomic constituents he devised new atomic models. See Larmor, *Kelvin, Papers*, Vol. 6, pp. 204–243.

20. Klein (1972) summarizes the difficulties turn of the century physicists encountered in attempts to make mechanics foundational.

21. For discussions of Bohr's early work that stress is concern with conceptual problems and the interaction between experiment and theory see Hendry (1984), Chaps. 3–5; Röseberg (1984), Chap. 3; Folse (1985), Chaps. 2–3; MacKinnon, (1982, Chap. 5), (1985) and (1994); Chevalley (1991), Introduction; Faye (1991); Darrigol (1992), Part B; and Petruccioli (1993).

22. A general survey of the theory and practice of diffraction gratings may be found in Stroke (1967) or in Hecht and Zajac (1974), Chap. 10.

23. See Robotti for changes in the interpretation of spectral lines and Bohr (Collected Works, II, p. 410) for his reinterpretation of the Franck-Hertz experiment.

24. Bohr used the (forward) correspondence principle as a tool for guessing quantum formulas on the basis of classical formulas. Since the 1930's the term has come to refer to the (backwards) correspondence principle that quantum mechanics should merge with classical mechanics in the limits where $\Sigma \rightarrow 0$, or $n \rightarrow 4$.

25. A more detailed account of these developments may be found in MacKinnon (1982), Chap. 5.

26. Gadamer is included for two reasons. First, as Davidson admits, he and Gadamer share similar view on the problem of interpretation (Davidson, 1997, Pap, ref. 2041). Second, and more importantly, standard analytic philosophy does not provide an adequate basis for treating problems of conceptual change and conceptual revolutions. The hermeneutic wing of the phenomenology movement does. It also offers a developed perspective on the problem of objectivity.

27. In addition to the philosophers cited an independent doevelopment of the conceptual core of ordinary language may be found in Jackendoff (1983).

28. See Sellars (1963), Essays 1, 8 and 11 and (1974), Essays 5, 9, 14, and 17.

29. Latour and Woolgar (1986) brought the sociological aspects of discovery to the forefront. Canava (2001) shows how four key nineteenth century electromagnetic discoveries were subject to reinterpretation. The sociological process of reifying discoveries is analyzed in Barnes et al. (1996), Chap. 4, and in Pickering.

30. A translation of the original text is in Boorse and Motz (1966), pp. 766–788).

31. See Cartwright (1983), pp. 172–174. For an illustration of the role inferences based on trajectories plays in particle detectors, see Roe (1996), pp. 44–54.

32. This is adapted from material in Bochner (1988), and Kline (1972).

33. In contemporary terms, $C4$ (M), the set of smooth, real-valued functions on a manifold, M, having infinitely many continuous derivatives is a commutative algebra over the real numbers on which one may define a vector field. See Baez and Munian, Chap. 3.

34. Thus Crane (1972, p. 6) summarized the then standard sociological assumptions concerning scientific activity: "(1) the scientist is expected to evaluate new knowledge critically and objectively; (2) he is expected to use his

findings in a disinterested fashion; (3) scientific merit should be evaluated independently from the personal or social qualities of the individual scientist; (4) the scientist does not own his findings; secrecy is forbidden; (5) he is expected to maintain an attitude of emotional neutrality towards his work." This summary of the ideals inculcated by normal training was written before James Watson shocked people by revealing that creative scientists can diverge widely from such ideals.

35. For a different appraisal de-emphasizing the role of fundamental theories as grounds of truth claims see Cartwright (1983).

36. I owe the explicit form of this claim to a debate with R.I.G. Hughes.

37. The term is somewhat misleading. In his final address to the Philosophy of Science Association Kuhn indicated that on the issue fo radical relativism he had more in common with his enemies than his friends. The term, nevertheless, has become established.

38. See Kockelmans (1985), Compton (1988) and Chevalley (1990) for Heidegger's involvement in physics.

39. See especially Chevalley (1990). My presentation of this final section was stimulated by my correspondence with her.

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NATURAL MEANING FOR NATURAL LANGUAGE

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ABSTRACT. "Fire" means fire, and so does smoke. What then is the connection between linguistic meaning and natural signs? I explore the connections in the context of revisting Paul Grice's classic attempt to distinguish the two forms of meaning in his paper "Meaning". I argue that there are many problems with Grice's attempt to drive a wedge between the two forms of meaning. Dretske-inspired transition cases of non-human instruments that display information using conventional symbols and language show that the line between natural signs and language is at least blurred. I conclude with three possible accounts of a close connection between language and natural meaning, and tentatively endorse one of them.

Keywords: natural, meaning, language, Grice, sign, symbol

1. Introduction

In Book II of the *Essay*, at the beginning of his discussion of language in Chapter II ("Of the Signification of Words"), John Locke writes that we humans have a variety of thoughts which might profit others, but that unfortunately these thoughts lie invisible and hidden from our fellows. And so we devised language to communicate these thoughts. As a result, "words, in their primary or immediate signification, stand for nothing but *the ideas in the mind of him that uses them*…." Perhaps this is the most natural view of natural language: language is a communication tool, an arbitrary conventional code, for letting others know what you think. Natural language derives its meaning from the significance or meaning of the thoughts it represents.

This general view of the status of language has enjoyed a lengthy ascendency. Critics, such as Wittgenstein, have not prevailed. The recent focus by Dretske, Fodor, Pinker, and others, on a semantics for mentalese exists along side followers of Grice, who focus on the role speaker intent plays in determining the meaning of natural language. All hold that the principal bearers and determinants of semantic properties are something other than natural language.

Here I hope to develop an alternative to the view that natural language has meaning only derivatively, as an encoding of thought, the primary bearer of meaning. I'll not follow Wittgenstein into forms of life, but I will try to respect the uses of language. Since I think a primary use of language is to convey information about how things are in the world (and not how things are in the speaker's head), I will fly in the face of Locke's dire warning that taking words as standing "for the reality of things" is a "perverting the use of words, and brings unavoidable obscurity and confusion into their signification, whenever we make them stand for anything but those ideas we have in our own minds."

I will try to show how the meaning of natural language can be understood as a special case of natural meaning. Language, of course, is at least complicated by the presence of an intelligent language user. But I will argue that linguistic meaning is as much like natural meaning as it could be, given the presence of an intelligent agent in the causal chain linking world and linguistic representation.

Let us revisit Paul Grice's classic paper, "Meaning", to see if there is as great a difference between natural meaning and linguistic meaning as Grice makes out. In the course of that we will take a look at physical systems designed to convey information, non-intelligent instruments that are such that their display states mean one thing or another. (This way of proceeding is inspired by Fred Dretske, but without Dretske's commitment to a Gricean approach to natural language.) Having developed a case for an account of the meaning of instrument displays that is related to natural meaning, I'll semantically ascend to natural language and will set out three ways in which meaning for natural language might be understood as derivative of natural meaning. In conclusion I'll indicate which of the three seems to be most promising.

2. Natural Meaning

In the more than 50 years since Grice's "Meaning" appeared, attention to his work has largely focussed on his theory of non-natural meaning. Independently, others have been developing accounts of various types of natural meaning. Much of this work has been done by Fred Dretske, Ruth Millikan and Jerry Fodor, who have been interested in understanding the meaning of mental representations in terms of information they carry. While many have rejected Grice's highly intellectualized theory of meaning, as far as I know they have not discussed Grice's original distinction between the two types of meaning. That distinction remains very interesting, and it is useful, in light of subsequent developments, to revisit his paper.

Grice begins by making a distinction between two types of meaning, then in the rest of the paper he attends almost exclusively to the second of these, which he calls "non-natural meaning." At the very beginning of the paper, Grice invites readers to consider three sentences having to do with meaning:

"Those spots mean (meant) measles."
"Those spots didn't mean anything to me, but to the doctor they meant measles."
"The recent budget means that we shall have a hard year."

These are all cases of natural meaning, or, following Grice, meaning(n). Note that not all bearers of natural meaning are natural events or facts – the last example is a budget. Generally, natural meaning involves symptoms or signs of some state of affairs. Other examples might be "smoke means fire", "that drop in barometric pressure means rain", and "the fact that the car's exhaust is blue smoke means that it is burning oil."

In these cases of natural meaning the connection between the bearer of natural meaning and the state that it indicates does not owe to agency. But even in cases like these one could suppose that although no agent is a component of the causal connection, nevertheless the existence of the causal connection itself is the result of an intelligent agent. For example, one could suppose that God has established the connection between measles and its characteristic red spots, or between fire and smoke. And He has arranged things this way just so that we might know when someone has measles or that there is a fire. If God were to act in these ways, he would be what Dretske has called a "structuring cause" – He would cause it to be the case that measles cause red spots, or that fire causes smoke. The meaning of smoke and spots would still be natural meaning, for God would not on each occasion of the appearance of spots or smoke cause them to appear. Rather He would have arranged things so that in the ordinary course of things, measles cause red spots and fire causes smoke, so that from red spots one may infer measles, and from smoke one may infer fire.

Cases where natural meaning is at work as the result of structuring agents are particularly interesting for exploring the connection between semantics and pragmatics, and the relation of natural and non-natural meaning. Accordingly, let us consider the special case of instruments, devices which are designed to convey information about some condition. These have, as it were, artificial natural meaning.

3. Indicating Systems

The lights and gauges on the instrument panel of a car indicate various facts about the condition of the vehicle. That the leftmost light is on may indicate that the oil pressure is low. Or, as we might also put it, that the light is on means that the oil pressure is low. Although the light is an artifact, it functions as an indicator or symptom of states of affairs. Statements about what the display of an instrument means have the same logic as the natural meaning of red spots on the skin and clouds in the sky. Namely, they support inference to certain states of affairs, and they do not support inference to anyone meaning anything by turning on the light. It is less clear (to use another one of Grice's tests for non-natural meaning) whether they support inference to something of the form:

The fact that the leftmost light is on means "the oil pressure is low."

In part this uncertainty, at least on my part, is because I am not sure that this claim, that a fact means a sentence, is coherent. But perhaps we could say:

The fact that the leftmost light is on means the same as would a talking car that said, "the oil pressure is low."

This would relate the meaning of one state of affairs, the fact that the light is on, to the meaning of another state of affairs, one that involves producing an instance of a sentence. This at least seems coherent, unlike Grice's own example involving a quoted sentence. In any case, it seems reasonable to suspect that Grice's example has paraphrases that are coherent in idiolects other than his own.

The oil pressure light can malfunction. Then its being on might not mean that the oil pressure is low. Of course, it is *supposed* to mean that the oil pressure is low. And it *usually* means that. But, if it is malfunctioning, that is not what its being on *now* means. This may appear to be a difference with some forms of natural meaning, where there is an invariable connection between the thing or state said to have the meaning and the meaning. But it is not unusual even with paradigms of natural meaning for the connection not to be invariable. Clouds that usually mean storms sometimes appear without the storms, (and the storms may arrive unheralded by any clouds). Many disease symptoms can appear in a variety of conditions. So there can be lack of an invariable connection between a bearer of natural meaning and its meaning. We might then say "x usually means p", or that it is a good but not perfectly reliable sign.

Common simple single-purpose dashboard indicators are always each directly connected with the sensors for the conditions they indicate. Such single purpose indicators may be supplanted by more sophisticated indicator systems. And in order to understand linguistic meaning, it may be useful to consider what would happen to meaning in more sophisticated indicator systems.

Suppose then we replace the multiple gauges and indicator lights that typically are placed on the instrument panel of a car with a single digital display that can display numerals and words – a single channel universal display or "scud." A small digital processor, with a simple program, will be part of a scud. Let us turn to some plausible design considerations for a scud.

Traditional multi-display instrument panels display a great deal of information in parallel; a scud is a serial system and can only display one item at a time. It can move through items and display one after another. As a result, scud designers will need to make some decisions as to what will be displayed when, and implement those decisions in programming the scud.

The program for the scud must implement rules or protocols for what symbols should be displayed under what conditions. For example, the display might be capable of displaying

1. an icon of a car outline, next to an icon of a thermometer, next to the numeral string 72.

Or, alternatively, it might display the sentence

2. "The outside temperature is 72 degrees F."

When should these icons or this string be displayed?

First, given the point of having an instrument panel on the car, namely that a driver wants information, we need a display that will provide the driver with information. Icons have their place, but they may well be thought excessively ambiguous and difficult for a driver to discern and interpret. If the primary users of the vehicles will be English speakers, our designers might prefer a linguistic display such as 2). Suppose then our designers decide to program the scud to that it will display 2) only if the temperature is 72 degrees F. They will program the scud computer so that it complies with the protocol.

Protocol: Display (2) only if the outside temperature is 72 degrees F.

Let us call this protocol rule the semantic condition on displaying. Note that it sets a necessary condition, namely that the temperature be 72 degrees, but not a sufficient condition for displaying. It can't be a sufficient condition because other messages must be displayed, messages carrying information that may be more important to the driver – or ones that *should* be more important to the driver, such as information about abnormally high current coolant temperature, even if the driver is unconcerned.

So the sufficient conditions for displaying a scud message will be much more complicated than the necessary conditions. They will be pragmatic. These pragmatic conditions on displaying must take account of when it is appropriate to display different messages.

Another complication arises because automobile instrument displays typically have more than one mode. For example, at startup (key-on, engine not running) traditional automotive instruments may enter a test mode where all the various lights display. This enables the user to detect burnt out light bulbs and other malfunctions in the instrumentation system. Fancier displays than those typically found on autos may also have a “demo” mode in which they demonstrate their capabilities. Or a sufficiently complex system could have a “simulation” mode in which its displays simulate what would be displayed in interesting but non-actual conditions – a simulation that might be for training or for entertainment purposes. These modes all contrast with the normal functioning of instrument displays in providing information about monitored conditions.

Let us then suppose that the scud system has other modes, including test modes or demo modes. Then the conditions we have discussing apply only to the normal mode of providing information. Let us call that normal mode “assert” mode. Thus the semantic condition we have discussed applies only in assert mode, as do the pragmatic conditions discussed above. There will be different pragmatic conditions for test, demo and simulation modes. And the semantic conditions will not be operative in these modes. The necessary and sufficient conditions discussed above then are conditions for assert mode only.

Are these conditions connected with meaning? Consider a case where the scud displays 2). Then it may well be the case that the fact that the scud displays “The outside temperature is 72 degrees F.” means that the outside temperature is 72 degrees F. In the case of the scud, there is an internal program that contains a functional equivalent of the semantic assert condition. This embodiment of the condition thus plays a causal role in determining what this particular displayed string means. The pragmatic conditions do not play a role in determining the natural meaning of the display. Even if the display malfunctions such that it fails to adhere to the pragmatic conditions and so displays 2) when it should be displaying say road speed, as during hard acceleration, as long as the semantic condition is still operative, the fact that it displays 2) will still mean that the temp is 72. It shouldn’t be displaying 2), but not because it is inaccurate.

4. A Conjunction Problem

Suppose we also have as a necessary condition on the scud display that messages be displayed only if the system voltage is between 11 and 14 volts DC – say this is the range in which the system can function reliably. Then can we conclude that the fact that the system displays 1) means that the system voltage is between 11 and 14?

Presumably, yes – it does mean that. However, the voltage condition is of a special type. It concerns a condition for meeting the semantic condition. The semantic condition is concerned with conventions of message – what symbol string shall be indicative of what condition. The voltage condition is concerned with reliability given the conventions. Thus it is more akin to an epistemic condition. Display events should adhere to a convention, should be accurate, and should consider users' need to know. The former is semantic, the latter pragmatic, and the middle is reliability. Reliability conditions are needed for adherence to the semantic convention.

Several counterfactuals are relevant here. Suppose the semantic protocol were changed, so, for example, we made the rule

Display "The outside temperature is 22" only if the outside temp is 72 degrees F.

It would still be the case that, given no other changes in the system, we would need the voltage reliability condition. And similarly, if new system components became available that were more tolerant of supply voltage variation, we might relax the reliability condition. Then the scud's displaying 2) would no longer mean that the voltage is between 11 and 14.

Users are typically interested in an inference from the intrument's display of 2) to the ambient temperature. But a technician might be interested in the inference from the same display to a conclusion about the internal electrical conditions in the system. There is an asymmetry between the two inferences: that *any* message is displayed will mean that the reliability conditions are met, whereas each differing displayed temperature message will mean something different about the temperature.

Moral: a displayed message will mean many different things, for different reasons. We typically single out the semantic meaning, the meaning that reflects the semantic condition. The reasons for doing this are non-arbitrary, and have to do with the information we are interested in.

5. A Disjunction Problem

A second problem may arise from the fact that conditions other than the ambient temp being 72 will cause the scud to display 2): for example, if bright sunlight or other source of radiant heat strikes the temp sensor. This type of problem has been a major concern of advocates of indicator semantics such as Millikan, Dretske and Fodor. The first two have had recourse to some naturalistic way of accounting for what the indicator is supposed to indicate. This is certainly reasonable, and accords with the thought, in the scud example at hand, that the scud is supposed to indicate ambient temp, not level of infrared radiation on its temp sensor. Millikan, interested in biological systems, develops an account of proper function based on evolution, and consideration of how organisms use their indicating states. Dretske, who has interests both in biological systems and in instrumentation, appeals more generally to the "structuring cause", which is what brings it about that the system responds as it does. Both of these accounts are historical. Fodor, on the other hand, tries an ahistorical account in terms of counterfactuals.

But common to all these accounts, it seems to me, is a neglect of a type distinction: between what a current token indication means, and what indications of a type mean. A display of a particular message on a particular occasion is a token display. If one asks what it means that the scud is now displaying 2), the answer, given the way the scud is now operating, is that the outside temp is 72. This is compatible with the truth of the counterfactual that if there were an intense source of IR near the temp sensor, the scud would also display 2) even if the outside temp were substantially lower than 72. With natural meaning, things mean what they mean, and not another thing. These red spots mean measles, even though spots of that kind might be produced by, say, makeup. Those clouds mean rain, even though clouds of that type might be produced by, say, the special effects company Industrial Light and Magic. We might say,

Given the way the scud is affected by the world, its display of 2) means the outside temperature is 72.

This is compatible with it meaning something else if the scud were affected by the world in a different way, as by IR irradiation of its sensors.

We can certainly talk about what displays of this type mean (that is, the type of which string 2) is a token). They will mean different things, depending on circumstances. If that seems unhelpful, as well it might, we can usefully report that displays of this type usually mean such and such, or that they are supposed to mean such and such. But talk of the meaning of a particular token display need not take note of such complications. And talk of what the display was intended by its designers to display may not be very helpful in the case of an instrument that is miscalibrated. For example, it may be the case that whenever my scud displays a temperature reading, it is reported 10 degrees higher than the actual temperature. Then someone who drives my car will be better informed by knowing how my scud reports temp rather than the conditions under which it is supposed to be displaying what it is displaying. Indeed, how it is supposed to read is neither here nor there, nor is it relevant what other scuds read. The only thing that matters is that there be lawlike connections between my scuds displays and conditions in the world. Then they mean something.

Moral: we must be careful to distinguish what it means for this string to be displayed now (a tokening of the string) from talk about what this string means simpliciter, abstracting from actual displayings of the string by particular systems.

With a simple scud system, the semantic protocols programmed into its computer may link entire sentences with conditions. But with even minimal complexity, syntactic rules and substitutional variables will likely appear. Thus even in the temperature case considered so far, it would be very inefficient program design to write rules for each temperature, each of which completely specified the whole sentence. In standard computing practice, we would specify a protocol for the display that had the form:

Display “The outside temperature is” T “degrees.”

where T is a function of the output of a sensor.

“T” is in effect a substitutional variable that will determine what numeral gets displayed depending on conditions. This is in effect a protocol schema, or second order semantic rule for generating the first-order protocols for each specific value of T. If we extend the capabilities of the scud system so that it can report the temperature for not just the outside but also say 22 different components of the vehicle, we may well want new protocols that introduce new substitutional variables, replacing the word “outside” with names of components being monitored. If we add the capacity to report other parameters besides temperature for those same 22 components, we would want a variable instead of “temperature.” Thus some syntactic

competence would be added to the system as a natural result of enhanced information complexity, and in particular, as the result of being able to represent many values of each of a variety of parameters about a variety of different components and systems.
Summary: So far we have seen that in even a simple information display system, there

Will be meaning with the logic of Grice's natural meaning.
Will be both semantic and pragmatic rules.
Will likely also be reliability rules akin to epistemic.
May well be both assertoric and other modes with different rules.
Will be multiple things that any particular displayed message means.
Will be multiple things that any particular displayed message could mean, but these will generally be other than what the display of the message does mean.

The meaning typically of greatest interest to users will be a causal result of the implementation of semantic assertion protocols which establish the dependence of display of a particular string rather than other strings upon certain conditions in the world.

6. Grice's Discussion of Meaning

As noted above in passing, it seems that even simple traditional indicator systems can meet one of Grice's conditions on non-natural meaning, namely "the lights' being on means 'the oil pressure is low.'" I surmise this is elliptical for something like "the fact that the light is on means the same as asserting 'the oil pressure is low.'"

Now let us turn to reconsider the rest of Grice's distinction between natural and non-natural meaning. Grice gives two examples of what he subsequently calls non-natural meaning, and then he draws five conclusions about the difference between natural and non-natural meaning. His examples of non-natural meaning:

"Those three rings on the bell (of the bus) mean that the bus is full."
"That remark, 'Smith couldn't get on without his trouble and strife,' meant that Smith found his wife indispensable."

Regarding these, Grice says that it is characteristic of such cases of non-natural meaning that one can say "x means that p, but in fact not p." Thus his first conclusion is:

1. I can use the first of these and go on to say, "But it isn't in fact full – the conductor has made a mistake"; and I can use the second and go on, "But in fact Smith deserted her seven years ago."

However it seems to me that Grice's remark may not be true of his bell ringing example! If the bus is not full, then *those* three rings on the bell did not mean that the bus is full. Perhaps they are *supposed* to mean that the bus is full, and perhaps they *usually* mean that the bus is full, and perhaps they were *intended* to mean that the bus is full, but they did not in fact mean the bus is full. Similar considerations apply to the second example. The remark – Smith's remarking – did not mean that Smith finds his wife indispensable, contrary to what Grice says, although it is plausible to suppose that it was intended to be taken by Smith's auditors to mean that.

I'll return to this below. Also, as mentioned above, there appear to be cases of natural meaning where there is not an invariable connection between a type of sign and a type of indicated state of affairs. Thus, I can say "spots like those usualy mean measles, but not in this case." And one could say much the same of the three rings of the bell on a bus not yet full. There does not appear to be a difference here that would support a distinction between two kinds of meaning.

Grice's second point about natural and non-natural meaning:

2. I can argue from the first to some statement about "what is (was) meant" by the rings on the bell and from the second to some statement about "what is (was) meant" by the quoted remark.

This point seems correct. However, these sentences seem elliptical for an explicit attribution of agency to the bell ringer and the remarker. It is not that something is meant by the quoted sentence, rather it is meant by the speaker in using the quoted sentence. Compare a statement about what was accomplished by blows to the midriff – this presumably is a covert attribution of agency, elliptical for what x accomplished by x's blows to the midriff. Similarly, in speaking about what was meant by rings on a bell, I am speaking about what x meant by x's rings on a bell, or perhaps in the case of

meaning, what x intended to mean by x's rings on a bell. The construction attributing meaning of this elliptical sort to bell rings and remarks instead of an explicit agent may be a natural accommodation in cases where we don't know who the agent is.
Grice continues:

3. I can argue from the first sentence to the conclusion that somebody (viz., the conductor) meant, or at any rate should have meant, by the rings that the bus is full, and I can argue analogously for the second sentence.

Here Grice appears to be aware for the first time that we might say something about what the conductor *should* have meant, by the rings on the bell. But he does not seem aware that doing this creates difficulties for his theory. For he later go es on to hold that "A meant(nn) something by x" is (roughly) equivalent to

A intended the utterance of x to produce some effect in an audience by means of the recognition of this intention….

But when we substitute this equivalent of "meant' in Grice's third point, we get

(3a) I can argue from the first sentence to the conclusion that somebody intended the utterance of x to produce some effect in an audience by means of the recognition of this intention, or at least should have intended the utterance of x to produce some effect in an audience by means of the recognition of this intention.

But the last clause doesn't make sense – the conductor presumably did intend the rings of the bell to produce an effect in an audience, so what is the point of saying that he should have done this? After all, if he should have intended, but did not intend, to produce an effect in the audience, then presumably his rings on the bell don't mean(NN) anything at all. He was just ringing for the joy of it, or perhaps by accident. On the other hand, if we interpret the "means" in 3 as *natural* meaning, then it does make sense to say that his rings *should* have meant(n) that the bus is full – they should have indicated that the bus is full, they should have been equivalent in meaning(n) to the bus making a certain groaning noise that it makes only when full. Presumably the only reason for having bus conductors ring bells to

indicate busses are full is because busses do *not* reliably make certain sounds all by themselves only when full. Thus it seems Grice is conflicted in point three, wishing to steer the discussion to speaker meaning, but also aware that it seems to make sense to talk about what someone's signalling should have meant. But he seems not to notice that this talk of what should have been meant seems more naturally understood as indicative of something akin to natural meaning and not his own analysis of speaker intentions.
Grice's fourth point:

(4) The first sentence can be restated in a form in which the verb "mean" is followed by a phrase in inverted commas, that is, "Those three rings of the bell mean 'the bus is full.'" So also can the second sentence.

As I have mentioned earlier, I find this an odd construction, saying that rings of a bell mean a sentence. The rings of a bell might have the same meaning as that had by a sentence, or better, the tokening of a sentence, but I don't see how the meaning could just *be* a sentence. If it were so, if meanings could be sentences, then it would seem it should make sense to say that the three rings of the bell mean something with four words, or mean something with no x's, or as in this example mean something that is English only. If the three rings of the bell mean, they don't mean something proprietary to English, such as a particular English sentence.

So I don't know what to make of this fourth point. Grice goes on to give an analysis of it later in the paper (at least, that is what I suppose he is doing):

"x means(nn) (timeless) that so-and-so" might as a first shot be equated with some statement or disjunction of statements about what "people" (vague) intend … to effect by x."

But this won't do as stated, because it is about meaning *that* such and such, and Grice's fourth point was about "x means 's.'" I'm left without knowing what he could have meant in saying that the rings on the bell mean "the bus is full," apart from the paraphrases earlier, to wit: Those three rings on the bell mean the same as saying "the bus is full." But that is compatible with the meaning involved being natural meaning. The bus could have an automatic bell that rings when the bus is suitably weighted down – or an electronic voice

producing the sentence “the bus is full.” Or a human conductor making the utterance. In all cases, the point is to provide information to the passengers, and it seems only economics and the current state of technology might make the choice of means go one way rather than another.
And now Grice’s final claim:

(5) Such a statement as “The fact that the bell has been rung three times means that the bus is full” is not a restatement of the meaning of the first sentence. Both may be true, but they do not have, even approximately, the same meaning.

This of course is a straightforward rejection of one way of attempting to assimilate meaning(nn), such as the meaning of the rings on the bell, to natural meaning. However, Grice does not offer us any explanation of why (5) is true. And he does not pursue the point to see if we can’t capture the way in which the rings on the bell mean as a manifestation of a univocal sense of meaning. Of course, by the end of the paper we are clear that this is because Grice is quite sure that there are (at least) two distinct senses of “mean,” and that his interest appears to be entirely in what he identifies as the second sense, nonnatural meaning.

Grice also says that he thinks the distinction between natural and nonnatural meaning is what people are getting at when “they display an interest in a distinction between ‘natural’ and ‘conventional’ signs.” But as we have seen in this very last point, this is not clear. Grice’s example in point 5, “The fact that the bell has been rung three times means that the bus is full,” appears to centrally involve conventional signs, namely bell rings by a conductor, but Grice says it is not equivalent in meaning to the attribution of meaning that he calls nonnatural. He does not say what this sentence *does* mean, but it seems pretty clear that it is closer to the “logic’ of natural meaning. (In saying that the fact that the bell has been rung three times means that the bus is full, I presumably support the inference to a conclusion that the bus is full, which is a feature of natural meaning and is not a feature of meaning(nn); see Grice’s point (1) above)). If that is true, then even on his own account, the distinction between natural meaning and nonnatural meaning does not parallel that between natural and conventional signs, contrary to what Grice says here.

7. Natural Meaning for Natural Language

Grice's point in "Meaning" was to drive a wedge between natural meaning (as in "Those spots mean measles") and the meaning of language, which he called "non-natural meaning." But the discussion above suggests that the project may not be successful. And there have emerged three ways in which we might understand linguistic meaning in terms of natural meaning. As before, let "means(nn)" represent nonnatural meaning, "means(n)" represent natural meaning. There is yet another sense of "mean" that is common, and may be seen to be at work in attributions of meaning that involves speakers and other human agents. Agents can mean to do such and such – they can intend to do such and such. So let "means(i)" represent meaning in the sense of intending, as in 'x means to reply to her critics."

Then we can provide at least three possible analyses of non-natural meaning in terms of natural meaning:

Assertion s means(nn) that p means
1) assertion of s usually means(n) that p, or
2) speaker S means(i) his/her assertion/utterance of s to mean(n) that p, or
3) assertion of s is supposed to mean(n) that p.

Note first that all of these are compatible with p not following from a particular utterance of s (which as we have seen Grice saw as a key difference between natural and non-natural meaning). In the first analysis, the connection between the utterance and the indicated condition is made probabilistic. In the second two analyses, the connection is embedded in an intensional context, intentional and deontic respectively.

There is something to be said for each. Almost all complex indicating systems sometimes fail, so the connection between the indicator type and the type of the condition indicated will be probabilistic. That the phone is ringing usually means that someone is calling the number – but not always. That Jim asserts that the phone is ringing usually means that the phone is ringing, but not always. Both may issue false positives.

Of course, if there is no agent producing s, one can't infer that someone means something by s. And when there is an agent involved in meaning, an agent with a choice of indicators, we infer that the agent means something by assertion of s. But that does not mean that there are multiple kinds of semantic meaning at work.

Let us look more closely at agent or speaker meaning, as in "x means something" and "x means something by asserting s." We need not take this construction to be complete and explicit. It may be elliptical. It appears to have to do with intentions – what speakers intend to accomplish by their utterances. Perhaps then it is reasonably interpreted as claiming "x means to indicate something (e.g. that p) by asserting s." Thus Jim's meaning something by saying "there's a beer in the fridge" might come down to Jim's intending to indicate something, namely that there is a beer in the fridge, by uttering "there's a beer in the fridge." And if indicating can be understood as a form of natural meaning, then speaker meaning of this sort can be understood as equivalent to:

x means(i) to mean(n) that p by tokening s.

It is certainly reasonable to suppose that if it really does mean this, ordinary use would very quickly collapse it to a shorter form, reducing "means to mean" to just "means." Or, more in the spirit of Grice, "x means something by s" might even mean the same as

"x means(i) to be understood as meaning(i) to mean(n) that p by asserting s."

This makes it a second order intention to mean(n). Either way, on these interpretations natural meaning is at the root of speaker meaning.

The third way listed above of understanding "x means that p" looks to the fact that language is normative: phonology, orthography, syntax – all are governed by norms. It would certainly be surprising if semantics was not also governed by norms. Naturalistic philosophers have not been overly fond of norms, but there is no doubt that norms govern behavior in many areas, including almost all aspects of language. In asking about meaning abstracted from speakers, as in "what does 'Es Regnet' mean (in German)," we aren't interested in what any particular speaker might have meant or intended to mean on some particular occasion of uttering the expression. We might mean to ask about what such utterances usually mean, or are intended to mean or are intended to be taken as meaning. But it may well be that we are asking about proper German usage, German regarded as a rule governed system, and are inquiring about what the German expression is supposed to mean or indicate about reality. And again it seems plausible in all these inquiries to interpret the meaning as natural meaning. At this point I think this third, normative, approach to semantics and conventional meaning is the most promising. In discussing the programming of the versatile scud display we briefly explored how programming rules might provide compositionality for an indicating system. I hope to explore these topics at greater length in the future.

All three of the ways of understanding natural language meaning base that meaning upon natural meaning. And all three invoke additional elements that a) seem required for understanding aspects of natural language and b) account for the differences Grice noted between natural meaning and meaning as it pertains to natural languages. Utterances will not always mean what one most naturally (!) take them to mean – the connection with the world will be probabilistic. Secondly, they will be uttered with specific conversational intent. And finally, there are norms governing how one should use language in indicating. When Alice encounters Humpty Dumpty he tells her that his words mean whatever he wants them to mean. But it seems clear this Gricean linguistic libertarianism, with speaker intentions constituting the sole foundation of meaning, would render Humpty Dumpty useless, or worse, as a conversant.

8. Conclusion

We have seen three ways of understanding non-natural meaning, the meaning of natural language, that base that meaning upon natural meaning. We can understand the attributions of meaning to utterances as probabilistic natural meaning, or as reflecting speaker intention, at one or two removes, to naturally mean, or finally as normative, as reporting what the utterance is supposed to mean. Which of these analyses is best?

With regard to speaker meaning, an appeal to intention seems appropriate. So "x means something by s" seems to be captured by appeal to the speaker's intentions, which often are intentions to indicate or perhaps intentions to be taken to be indicating something about the world. In Grice's example, the bus conductor means something by ringing the bell – namely he intends to indicate the bus is full. To move to the second order, and hold that he intends to be understood as intending to indicate that the bus is full seems to suggest a certain deviousness. And he may well not care what auditors understand, he may just be doing his job, which in part is to indicate that the bus is full when it is full. On the other hand, perhaps his job is not merely to indicate that the bus is full, but to ensure that the bus is not filled past capacity, in which case his intention is that passengers not board when he rings the bell. In that case, he may have the second order intention, namely that he be understood by passengers as intending to indicate that the bus is full. Or he may merely intend that passengers know that the bus is full from his indicating, by ringing the bell, that it is full. In the latter case, he need have no intention that they recognize his intention – passengers may not know that a human causes the bell to ring. They can still know that three rings mean that the bus is full.

In the case of linguistic meaning for an indicative sentence type, rather than a token, e.g. where we are interested in what “Es regent” means, or what three rings on an English bus bell mean, abstracted from any particular situation, we may be interested in what they usually mean, or what they are usually used to indicate. But a pernicious disjunction problem sets it – an utterance of “es Regnet” usually means that it is raining, and it usually means that the speaker speaks German, is alive, thinks it is raining, etc.

Hence it seems best to think of conventional sentence meaning, the semantics of language, as pointing to the operation of semantic norms or protocols that set specific conditions on the tokening of each sentence type. Adhering to these norms allows a token of the sentence to carry information. In asking what “Es regent” means, we are interested in what it is supposed to indicate, in the semantic component of its assertion conditions. On that bundle of conventional protocols that is German, speaker tokening of “Es regent” is supposed to indicate (or mean(n)) that it is raining.

Clever creatures that we are, we can (wink, wink, nudge, nudge) do many ironic, witty and indirect things with language. But language will be of value to even the most naïve, upon whom all this cleverness is lost. At its heart language embodies information about the world. As a result, it is suitable as a medium of communication – and perhaps of thought.

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COMMON GROUND AND MODAL DISAGREEMENT

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ABSTRACT. The common ground in an inquiry consists of what the participants agree on, at least for the sake of the inquiry. The relations between the factual and linguistic components of common ground are notoriously difficult to trace. I clarify them by exploring how modal disagreements – disagreements about how things might be – interact with the linguistic and the factual common ground. I argue that modal agreement is essential to common ground of any kind.

Keywords: common, ground, linguistic, factual, modal, disagreement

I will begin my discussion of common ground and modal disagreement with an illustration of the complex interactions between beliefs about meaning and beliefs about the facts. Andy, Bob and Charles are discussing American politics, when Andy says, “Cheney is a vet. He served in Vietnam.” Bob and Charles dispute this, both saying “What? Cheney is not a vet.” But while Andy and Bob mean *veteran* by “vet,” Charles means *veterinarian*. We know how to describe these disagreements, and even what it takes to resolve them. Andy and Bob agree on the meaning of “Cheney is a vet,” but disagree about the facts while Andy and Charles disagree about the meaning of that sentence, but may otherwise agree on the facts. But now along comes Donald who says “Cheney might have served in Vietnam, but he is not a vet.” Donald believes, as he would put it, that only women can be veterans. As he sees it, it is impossible, and not just false, that Cheney should be a veteran. Superficially, this disagreement looks just like the one between Andy and Charles. But I will argue that this disagreement, like all modal disagreements, cannot be resolved rationally because the common linguistic ground needed to resolve it rationally cannot be found.

I will start by saying some familiar things about common ground, but I will do it within a framework of possible worlds, which might not be so familiar. I find this abstract framework helpful for thinking about the notion of the common ground in an inquiry and for helping to describe the ways in which linguistic and non-linguistic disagreements interact. I will use it show that resolving factual disagreements requires linguistic agreement on meaning and that resolving linguistic disagreements requires modal agreement. We will then be in a position to see why disagreements about what is possible cannot rationally be resolved. (My discussion of common ground relies on the discussions in (Stalnaker 1974), (Lewis 1979) and (Stalnaker 2002).)

The common ground in an inquiry is what all sides agree to agree on, what they are *presupposing*, for the sake of the inquiry. Something does not need to be believed by the participants for it to be common ground; it need only be accepted for the purposes at hand. I might agree for the sake of an argument that Cheney is a patriot and this would make his being a patriot part of the common ground, even though I might continue to believe that he is not really patriotic. So long as we all agree to agree on it, then it is part of the common ground. This agreement need not be explicit; much of the common ground in an inquiry will be stuff that all sides simply take for granted is taken for granted.

The common ground in an inquiry involves a kind of mutual agreement on the facts, on what is the case. This means that the common ground determines a set of truth conditions: the way things would have to be for them to be as those in the inquiry are agreeing to take them to be. We can think of the truth conditions determined by the common ground as a set of possible worlds: it is the set of possible worlds where things are as they are presupposed to be. This set also represents the questions that remain open in a discussion and it can help us to describe and understand the interactions between factual, linguistic and modal disagreements.

But before I get to that, let me say a bit about the notion of a possible world. For my purposes, talk about possible worlds is just fancy talk about how things might be or might have been. To say that there is a possible world where Dick Cheney is a veterinarian is just a fancy way of saying that Dick Cheney might have been a veterinarian. We should think of a possible world as a maximally complete way that things might have been or might be; sort of like an alternate universe with a complete history. Possible worlds are distinct one from another when something is true of one but not the other. I find the notion of a possible world to be very useful for describing and raising questions about the phenomena of common ground. I think that it enables insights that are otherwise hard to obtain. But the notion will not be doing any substantive theoretical work in what follows.

I said that the common ground in a discussion can be represented by a set of possible worlds. (The set is sometimes called the "context set.") The worlds in that set will be similar in some respects and different in others. The similarities represent the common ground, what all the participants agree to, what they are presupposing in the inquiry. The differences among the worlds in the set represent the open questions, the possibilities they have not yet decided on. If all of the worlds are ones where Dick Cheney is a Republican, then his being a Republican is common ground; if he is a Republican in some but not others, then it is an open question whether he is. The participants agree (if only for the sake of the inquiry) that the actual world is one of the worlds in the set, but it is an open question just which world it is. As the inquiry proceeds and open questions are answered, the set of possible worlds is whittled down. Ideally, inquiry ends only when there is but one world remaining.

When the participants use linguistic resources to pursue the inquiry, the common ground will include some *linguistic* common ground. The participants will agree on how to use some of their shared linguistic resources to state what they are presupposing and to describe the possibilities that remain open. The common ground includes not just agreement on which objects have which properties, but also agreement on how to use their words to say which objects have or might have which properties. We can represent this feature of the common ground using the set of possible worlds, but it will be helpful to make a simplifying assumption. It is well known that our use of language is context-dependent, and that sentences can be used to say different things, to express different sets of truth conditions on different uses. Consequently, there is debate among theorists over what semantic properties sentences have. Some deny that sentences are true or false, insisting that it is what speakers say with sentences that is true or false. This debate is familiar, but irrelevant for my purposes here. I will simply assume that agreeing on the meaning of a sentence involves agreeing on its truth conditions, on how things would have to be for that sentence to be true.

Given the simplifying assumption that sentences are true or false, it follows that sentences determine truth conditions, and we can represent a sentence's truth conditions using possible worlds. For instance, the sentence "Cheney is a vet" is true with respect to some worlds and false (or at least not true) with respect to others. Its meaning draws a division or a distinction among possible worlds, between those with respect to which it is true and those with respect to which it is false. We can think of agreement on the meaning of a sentence as agreement on what division its meaning draws among those possible worlds. A disagreement over that division is sufficient for disagreement over its meaning.

Suppose that it is common ground in a discussion that the sentence "Cheney is VP" is true just in case Cheney is VP. In that case, every world in the set is one where that sentence draws the very same distinction among the worlds in that set. The participants may not agree over which of the worlds in the set is the actual one, but they do agree that whichever world is actual, it is one where that sentence draws that distinction in the set. Suppose further that it is an open question in that inquiry whether Cheney is in fact VP. In that case, some of the worlds in the set are ones where he is VP, and so where that sentence is true, while the rest are ones where he is not VP and so where that sentence is false.

I have been describing how the common ground in an inquiry can be represented by a set of possible worlds, and have extended this to the common linguistic ground. The common ground is represented by what all the worlds in that set have in common. The open questions in the inquiry are represented by the differences among those worlds. The open questions might include factual ones. It might be an open question whether Cheney has violated his oath of office. But the open questions might also include linguistic ones. It might be an open question among them what a certain word means, or how it is to be used, or what division among the worlds a given sentence draws. Their goal as inquiry proceeds is to narrow down the remaining factual and linguistic possibilities until only one is left.

Let me make one last point about the abstract structure of common ground. It is a factual matter what the common ground is in a given discussion. This means that it is possible for participants in an inquiry to be mistaken about what the common ground is. A participant might think something is being presupposed when in fact it is not. The mistake may concern what is presupposed about the facts, about whether Cheney is patriotic, say, or it might concern what is presupposed about how to say what those facts might be, about what the word "Cheney" or "vet" means.

Now that I have described how to think about common ground within the possible worlds framework, I want to use that framework to help us distinguish and understand the three kinds of disagreements in my introductory story. The disagreement between Andy and Bob is the most straightforward. They agree about what the sentence "Cheney is a vet" means but disagree over whether it is true. In terms of the abstract framework of possible worlds, Andy and Bob agree on what division that sentence draws among the possibilities, but they disagree over which side of that division the actual world is on. In every world in the set that represents their common ground, that sentence is true just in case Cheney is a veteran, but in some of those worlds he is a veteran and the sentence is true while in others he is not and the sentence is false. To resolve their disagreement, they need to do further work to decide that open factual question.

The disagreement between Andy and Charles is more complex and illustrates the point that resolving factual disagreements requires linguistic common ground. It is a more complex disagreement since it involves a mistake about the common ground. More specifically, it involves a mistake about the linguistic common ground. Andy thinks that the sentence "Cheney is a vet" is true just in case Cheney is a *veteran*, but Charles thinks that it is true just in case Cheney is a *veterinarian*. They disagree over what division that sentence draws among possible worlds. Moreover, each side thinks that its view of that sentence's meaning is common ground. Andy thinks that every world in the common ground is one where it is true just in case Cheney is a veteran whereas Charles thinks that every world in that set is one where it is true just in case Cheney is a veterinarian. This difference over the common ground is a recipe for investigative frustration for it makes a merely terminological disagreement look like a substantive factual one. Despite their apparent disagreement, Charles might well agree with Andy that Cheney is a veteran and not a veterinarian. They might agree on the facts even though they disagree over how to state them. Until they come to agree on how their words draw a distinction among the possibilities, they will find it impossible to agree on what the facts are.

The difficulty that Andy and Charles face illustrates why the meanings of our words must in a certain way be *independent* of the facts. If the meanings of our words depend on the facts, then we cannot know what our sentences mean until we know whether they are true. But we cannot know whether they are true until we know what they mean. We can put this difficulty in terms of possible worlds. If the meaning of a sentence varies from one world to another in the common ground, then we cannot agree on whether it is true until we agree on which world in the common ground is the actual world. But how can we agree on which world we are in unless we first agree on how to *describe* the worlds we might be in? To agree on which world is the actual world we must first agree on how to distinguish one world from another.

I have suggested that meaning must be independent of the facts. Of course, the meanings of our words are not really independent of the facts. It is after all a contingent matter that our words mean what they do. But we can avoid the difficulty that Andy and Charles face so long as the words we are using mean the same thing in every world in the set that represents our common ground. So long as what our words mean is not among the open questions, so long as the meaning of our words is independent of the facts that remain to be settled on, then we will avoid their difficulty.

Andy and Charles can resolve their disagreement if they agree on what is possible. Suppose that Charles agrees with Andy about which of the worlds in the set are ones where Cheney is a veteran and which are ones where Cheney is a veterinarian. Their disagreement would then be a purely linguistic one: it would concern which division that sentence draws among the possible worlds left open by their common ground. Once they identify this linguistic disagreement, they can recover common ground by recognizing that it is an open question among them what that sentence means. From Andy's perspective, recognizing this means adding to the set of worlds ones where Charles is right about the language; from Charles' perspective it means adding worlds where Andy is right about the language. They can then agree on the following conditional: if Andy is right about the linguistic facts, then that sentence is true just in case the actual world is one where Cheney is a veteran, but if Charles is right about the linguistic facts, then that sentence is true just in case the actual world is one where Cheney is a veterinarian. By making explicit their linguistic disagreement, they can find the common ground needed to state their factual agreement.

The disagreement between Andy and Charles illustrates the important point that resolving disagreements about the facts requires agreement on meaning. The disagreement between Andy and Donald which I will now consider illustrates a second and more important point: resolving disagreements about meaning requires agreement on what is possible. Once we see this, we will be in a position to see why modal disagreements cannot be resolved rationally.

Let me first argue for this second point at an abstract level. Agreeing on the meaning of a sentence requires agreeing on which division it draws among a set of possible worlds. But if you and I disagree about which worlds are possible, then we will disagree about what divisions there are to be drawn among those worlds. If we disagree about what divisions there are to be drawn, then there will be some pair of sentences such that one of us thinks they draw the same distinction and the other of us thinks they draw a different one. Thus, if we disagree about what is possible, then we must also disagree about what our words mean, about what they are used to say. But there is more to it. If we disagree about what is possible, then we must also disagree about *what there is to say*, and not just about how to say it; we must disagree about which distinctions there are to *be drawn*, and not just about how to draw them.

This kind of disagreement is illustrated in the dispute between Andy and Donald. At first glance, it seems that Donald agrees with *both* Andy *and* Bob. He seems to agree with Andy that Cheney served in Vietnam, and with Bob that Cheney is not a veteran. But there is more to the disagreement. Unlike Andy and Bob, who thinks it is merely contingent that Cheney is no veteran, Donald thinks that it is impossible for him to have been a veteran, since, as he would put it, only women can be veterans and Cheney could not have been a woman. This is a disagreement not just about how things are, and not just about how to describe how they are, but about how things might be or might have been. It is a modal disagreement.

Like the disagreement between Andy and Charles, the one between Andy and Donald involves a mistake about the common ground. We saw that Andy and Charles could recover common ground by making it an open question what it was that Andy said. In effect, this adds to the common ground worlds where the linguistic facts are different. This retreat to secure common ground allows them to state their linguistic disagreement. But Andy and Donald cannot recover common ground by making it an open question what the modal facts are, for there is no such thing as adding to the set of worlds ones where the modal facts are different in the way we Andy and Bob could add a world where the linguistic facts are different. Worlds do not differ one from another in their modal facts. Modal facts are not facts about a world at all; they are facts about the relations among worlds. To say that something is possible is to say something about the set of worlds, not about any world in the set. There is no way for Andy and Donald to retreat to secure common ground by adding to the set a world where the modal facts are different.

To see this in another way, consider what sort of world would have to be added. It could not just be a world where Cheney served in Vietnam. The set already contains such worlds and Andy and Donald agree on this and may even agree about which ones they are. What about a world where Cheney served in Vietnam but is not a veteran? This won't do either. For Andy thinks there are no such worlds, so he cannot agree to add one, any more than he could agree to add a world where Cheney is a zebra. (Andy agreed to add a world where the linguistic facts are the way Charles takes them to be because Andy agrees that such worlds are possible, since we might have spoken that way.) What is more, Donald thinks that the set *already* contains a world where Cheney served in Vietnam but is not a veteran, so he cannot agree that one needs to be added. Andy sees no way to change the set; Donald sees no need to change it.

I have been discussing Andy and Donald's modal disagreement. It is also true that they disagree about the linguistic facts. They disagree about which division the sentence "Cheney is a veteran" draws among the possible worlds in the set. Could they reach a conditional *linguistic* agreement, the way Andy and Charles did? Could they agree on this: if the linguistic facts are the way Andy takes them to be, then what Andy said is true of those worlds where Cheney served in Vietnam (and perhaps others), but if the linguistic facts are the way Donald takes them to be, then what Andy said is false with respect to those worlds? No. For it is not just that they disagree about which division that sentence draws among the worlds in the set; they disagree about which divisions there are to be drawn among the worlds in the set. While Andy and Charles agreed on what there is to say, but disagreed about how to say it, Andy and Donald disagree about what there is to say.

Because their disagreement is over what there is to say, and not just over how to say it, it is not possible for them to agree on how to state their disagreement. It seems to me that under these conditions there is no way to resolve their disagreement rationally. I am not sure how to argue for this, but it seems to me that it is impossible to resolve a debate rationally unless there is enough common ground for each side in the dispute to state their case. To resolve a disagreement rationally, we have to be able to agree on what we disagree on. But this is not possible in the dispute between Andy and Donald, since Donald sees Andy as trying to draw a distinction he denies exists. The dispute between Andy and Donald illustrates that modal disagreement leaves linguistic common ground out of reach, and without linguistic common ground there can be no way to agree on what the disagreement is about.

Earlier, we saw that meaning must in a way be independent of truth, since otherwise we could not know what our sentences mean without knowing whether they are true. There is an analogous moral here: what there is to say must be independent of the facts too. If what there is to say depends on the facts, then we could not know whether we were saying something without knowing whether we were saying something true. If what distinctions there are to be drawn varies from one world to another in the set that represents our common ground, then we cannot know whether we are speaking nonsense until we know which world we are in. But how can we agree on which world we are in if we cannot first agree on when we are speaking nonsense? This is the difficulty facing Andy and Donald and anyone else engaged in a modal disagreement.

I have claimed that modal disagreements cannot be resolved rationally. But they can come to an end. They end when one side gives in to the other. Perhaps Donald will simply acquiesce to Andy. This may *look* like acquiescing to his linguistic usage, as if the disagreement was really just a linguistic one after all. But it is not like the case where Charles changed his mind on the linguistic facts, and acquiesced to Andy's usage. For Charles changed his mind on how to say things, but not on what there is to be said. If Donald acquiesces to Andy, then, from his point of view, he will be changing his mind on how to say things, but only because he is also from his point of view changing his mind on what there is to say. (We, by the way, are in the same position as Andy: we think that there are more things to say than Donald does. Consequently, we cannot use our words to accurately report what he thinks he is saying.)

In arguing that modal disagreements cannot be resolved rationally, I have been relying on the notion of a possible world and I have represented common ground and meaning using sets of possible worlds. But nothing in what I have said hangs on this. Talk of possible worlds and sets of them is helpful for thinking about three basic theses each of which can be stated independently of the framework of possible worlds. One is that the common ground in a discussion determines truth conditions; the second is that the meaning of a sentence determines truth conditions; the third is that agreeing on the truth conditions of a sentence requires agreeing on what is possible. The point I have been trying to make is that accepting these three basic theses, which I think most everyone does, commits one to the somewhat surprising consequence that modal disagreements cannot be resolved rationally. The framework of possible worlds merely helps to make this commitment clear.

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HOMO PICTOR AND THE LINGUISTIC TURN: REVISITING HANS JONAS' PICTURE ANTHROPOLOGY

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ABSTRACT. There has been a long tradition of characterizing man as the animal that talks. However, the remarkable ability of using pictures also only belongs to human beings, after all we know empirically so far. Are there conceptual reasons for that coincidence? The paper is dedicated to a philosophical programme of concept-genetic considerations dealing in particular with the dependencies between those two abilities: The conceptual relation between the competence to use assertive language and the faculty of employing pictures must be conceived of as being much closer than usually expected. Indeed we conclude there cannot be creatures with only one of them.

Keywords: Jonas, picture, anthropology, language, concept, faculty

1. Homo Sapiens and Homo Pictor

> L'espèce humaine existe sur la terre depuis plus de 4 millions d'années. [...] Avec l'apparition de l'Homo sapiens, une révolution s'est opérée dans le mécanisme de la logique, dans le mode de pensée, dans la capacité d'abstraction et de synthèse. D'après nos connaissances actuelles, cette révolution n'a d'équivalent ni dans les précédentes étapes de l'histoire humaine ni dans aucune autre espèce animale. Le langage visuel, la capacité et le besoin de chercher un sens et un ordre préétabli dans les

formes et les phénomènes de la nature, la recherche d'une communication avec des entités et des énergies immatérielles ou invisibles sont autant d'expressions de ces nouvelles acquisitions nées de cette révolution (Anati 1999: 89).

Characterizing man as the animal that talks in propositional structures has a long tradition. But the curious faculty of using pictures is also particular to human beings alone, as far as we know empirically so far. Are there any conceptual reasons for that empirical coincidence? That is, do we have to conceive of *homo sapiens (sapiens)* by essence as *homo pictor*? Such a question belongs to both philosophical anthropology and picture philosophy.[1]

Hans Jonas has already raised that basic question: In his paper *Homo Pictor and the Differentia of Man* (1966), he discusses the impact of the "picture faculty" on the conception of human nature. Jonas starts with a thought experiment: How, he asks, could astronauts recognize whether creatures they meet on another planet are "humans"? Of course, this does not mean humans as a biological species – after all, we distinguish with good reasons between philosophical anthropology and empirical anthropology (cf. e.g., Tugendhat 2007).

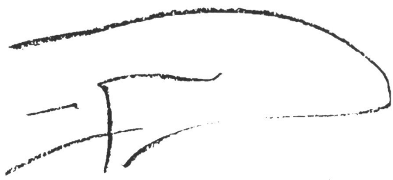

Fig. 1 Reproduction of Moja's Marks (Gardner/Gardner 1980).

What are the symptoms for which criteria that allow the astronauts to deduce: those creatures have indeed "understanding", "mind", "culture", "civilization" etc. – corresponding to the characteristics *sapiens*? The ability of using pictures – i.e., producing and understanding them – appears as a particularly favorable choice as this faculty seems to be less complicated than the faculty of language. Simultaneously, there are no apparent gradual transitions to phenomena that can be purely explained by biology. If those astronauts from the Gedankenexperiment find in a cave some artificially produced lines or other configurations of pigment that they interpret as pictures then, Jonas believes, their spontaneous conclusion had to be: Those who have made these artifacts were humans (in the wide sense). Though, what does it actually mean to be able to use pictures? What has to be presupposed for that competence?

Although the inquiry for the picture faculty does in general not aim at single pictures, looking at a concrete example may help focus our consideration onto important aspects. Let us have a glance at the instance given in Fig. 1, and let us start with a description thereof as neutral as possible: It is the result of an ape dealing with paper and pencil, of which Gardner & Gardner (1980) have reported in the framework of their investigation of the language faculty of chimpanzees. Those lines were spontaneously produced by an individual called Moja, a female chimp having been trained to communicate with the researchers by means of a fragment of *American Sign Language*. When a research assistant present at that time signed at Moja the gestures for "What is that?" the reaction was "bird" in ASL. That answer was interpreted by a research assistant not to refer to the paper as such, but to something depicted there.

This indeed is an empirical variant of Jonas' thought experiment: instead of the unknown creatures of a foreign planet, we are confronted with an individual of another terrestrial species, to which we usually do not ascribe the specific difference of humanity (being discernible for example by means of the lack of a corresponding legal status, as well); an individual, that has not only been observed while producing the artifact, but has additionally provided us with further manners of behaving towards that artifact. Well, has Moja indeed used a picture in that situation? And does that force the conclusion by necessity – as Jonas thinks – that we ought to treat Moja further on as *sapiens*, as a human being in the philosophical sense with all the associated, even juridical consequences?

In the following, the task is to determine what characterizes picture use, i.e., which concepts should actually be brought into play (sections 4 and 5). This leads us to two crucial concepts: the concept of context building (7), which in particular throws a bridge to language use; and the concept of resemblance (6), which comes out less trivial as often assumed. As a methodological preparation for the conceptual clarification, we first recapitulate in two sections the present understanding of "conceptual clarifications" and the manners of their substantiation (2 & 3). The anthropological dimension of the picture faculty becomes prominent in sections 8 and 9: Starting from a concept-genetic schema for the concept "picture", arguments are presented for a close mutual dependency between picture competence and language competence. This in a way contradicts Jonas' basic assumptions at least partially, but indeed strengthen his conclusions on the connection between the (non-biological) concept of personhood as named by the expression "homo sapiens" and the concept entitled "homo pictor."

2. The Concept "Being Human" and the Linguistic Turn

When mentioning language in the following, we think – more precisely speaking – at the use of predicative sentential structures, i.e., the assertions and the types of utterances derived from them (e.g., corresponding questions or imperative forms). They have a typical inner partition we shall investigate in more detail below. Indeed, the language faculty is important for picture philosophy in any case, and it is so in at least three ways, namely in medial, essential, and methodological manners:

(a) In order to communicate any investigations and arguments of picture philosophy we use – necessarily as it seems – language as the central *medium*.
(b) In considerations of picture philosophy, the language faculty can act in an *essential* way, too – namely as a criterion of success: any conceptual determination that might be under investigation at some time can be considered as grasping the desired specific difference only if it allows us to derive also the characteristics of humans as "the animals that talk." The ability of language, thus, acts as a referential mark for determining humanity.
(c) Language plays a special role with respect to *methodological* aspects since picture philosophy deals essentially not with empirical investigations (i.e., investigations that merely apply given concepts). This aspect needs a more extended explanation:

In philosophy, we do not ask whether certain biological, psychological or sociological relations are or are not holding in this or that particular case – important questions as those might be. We are more interested in clarifying the relations between concepts that let us make such empirical distinctions in the first place. As in the modern philosophical theory of rational argumentation (cf., e.g., Ros 1989/90), a concept is conceived of in the following as an *inter-indi-*

vidually accessible abstract means that is used for checking the validity of predicative utterances. This is a rather abstract formulation, but it finally just means that a concept corresponds to a habit of distinguishing that is socially controlled,[2] and the application of which to a particular situation leads (or at least can lead) to empirical knowledge. A clarification of conceptual relations is, thus, concerned with associations between such particular habits of distinguishing.[3]

In the course of the historical development of philosophy, the ideas of those "abstract means for checking the validity of predicative utterances" and of the manners for clarifying them have changed several times. The latest and for our purposes most relevant adjustment is often named the "linguistic turn." It was the relation between concepts and the faculty of language that has then been altered in particular. Before that, concepts have been thought of as purely mental entities, hence being wholly independent from the ability of communication. Any verbal articulation of concepts was, then, something completely secondary to the use of the concepts themselves; thinking without the faculty of speech was logically possible. Philosophers following the linguistic turn are convinced that the concept of concepts can only be considered in a rational manner if such a position is abandoned: Concepts must be conceived of as something that is necessarily constituted by means of language (or more generally: communication).

The linguistic turn represents a radical move away from the philosophical position dominant between the 17th and the 19th century with its focusing on consciousness. It was indeed a result of the impossibility to avoid solipsistic consequences if the concepts – i.e., the criteria for checking the validity of predicative utterances – remain enclosed within a single consciousness thought inaccessible by others: There, they simply cannot accomplish their proper communicative function. That fatal consequence had become very virulent at the beginning of the 20th century, when it led to two quite different reactions. In phenomenological considerations, some philosophers attempted to solve the problem by means of the so-called "epagoge," which means approximately "vision of the essence" – actually a relapse to the ancient philosophy, in which the criteria (e.g., as Platonic Forms or Aristotelian essences) are conceived of as independent entities beyond space and time. Any individually used concept is to be "aligned" with the corresponding entity of essence –

the unique *eidos* – assumed to be somehow given to all individuals so that the problem of solipsistic encapsulation is avoided.

On the other hand, it was undertaken to modify the concepts of mental phenomena (including the older kind of concepts): Psychological expressions are no longer understood as terms that refer to absolutely private entities in the consciousness of someone. Instead they are conceived of as verbal expressions of certain aspects of behavior, thus indeed accessible inter-subjectively to some degree.

While mental phenomena in the older philosophical position were something that could cause actions – and hence had to be something independent of those actions – those mental phenomena are now seen as *aspects* of the actions, hence conceptually *not* independent from the latter. The nub of concepts that are articulated by means of expressions like "representation," "thought," and also "concept," lays in particular ways (each, of course, to be specified more precisely) of viewing the corresponding acts that are constitutive for those concepts. The linguistic turn, thus, is an immediate consequence of the act-theoretic re-conceptualization of mental phenomena.

With this, we can immediately conclude: If concepts are essentially something mediated and determined in a verbal manner, then anything depending on the use of concepts depends on the corresponding language faculty. Thus, the linguistic turn (or more precisely: the act-theoretic re-conceptualization of mental phenomena underlying it) also leads us to the conclusion that the faculty of language is not just an arbitrary symptom of being human (in the anthropological sense), but instead its most central criterion (cf. also Ros 2005).[4] Where, in comparison to this criterion, do we have to position the faculty of using pictures?

3. How to Clarify Concepts

A conceptual clarification of the picture faculty and its anthropological weight indeed means to analyze the logical preconditions – or in Kant's words: the "transcendental conditions of possibility" – we have to presuppose when talking about creatures with the ability of using pictures (or, for comparison, language). Moreover, it has to investigate how we can correctly found those conceptual preconditions.

To that purpose let us first recall some methodological results from the philosophical theory of rational argumentation. That theory distinguishes between conceptual clarifications and justifications of conceptual clarifications (cf. Ros 1989/90). In the nutshell, by means of a conceptual clarification a debatable concept in a dissent is determined as a logical combination of other concepts for the same phenomenal domain: Definitions are typical examples. Those concepts used in a conceptual clarification are, however, often explained with the concept originally determined. Systems of concepts that mutually determine each other are called a field of concepts. One way out of such cyclic determinations is to decide on a small set of basic concepts for the field of concepts in question so that any other concept of that system can be logically reduced to the basic concepts. The basic concepts remain, then, the end of the chain of explanation that cannot, unfortunately, be determined any further. The dissent about a concept is, thus, only solvable if all parties involved in the debate accept the basic concepts as unproblematic.

If this is not the case reasons have to be given that (i) justify or reject one or the other aspect of the system of basic concepts spanning the field in question, and that (ii) can be accepted by all participants. In contrast to conceptual explanations, which always remain *internal* to one field of concepts, those reasons have to be *external* to the field under investigation: It is obvious that a justification of basic concepts cannot be deduced logically within the very field of concepts they originally span – like the axioms of a theory. At this point, *concept-genetic* considerations enter the game of argumentation, i.e., the proposal to consider the field of concepts in question (or the corresponding system of basic concepts) as introduced by means of a systematic combination of other fields of concepts conceived of as being originally independent from each other. Those founding fields, which have usually got an internal structure simpler than the one to be justified, have to be accepted by all the participants. While instances of objects falling under a concept in one of the "simple" fields have properties determined in the other field in a contingent manner only at the best, the combined field of concepts covers instances that show attributes from all the constituting fields in a systematically linked manner.[5] Furthermore, the schema of the combination of fields together with the internal rules of the constituting fields determines the rules governing the combined field of concepts: The schema thus gives us in fact a justification of axioms.[6] The justification of conceptual clarifications by means of concept-genetic considerations rests on two arguments: One can show (1) that some concepts relevant for us cannot be determined in any way in the elementary fields, and (2) that it is possible to define those concepts in the combined field of concepts. This opens an additional option for solving dissents about concepts and their properties – if only all parties involved accept the simpler fields of concepts as well as the schema of combination, and if they also have an interest at all in establishing the concepts debated as common habits of distinguishing phenomena.

We can easily imagine such concept-genetic considerations being an essential part of philosophical anthropology and picture philosophy, as well: Elaborating a possible concept-genetic derivation of one field of concept containing a proposed concept of personhood on the basis of less complex fields of concepts – in particular fields with concepts for simpler creatures than humans – would enable us to demonstrate on which – "transcendental" – preconditions (i.e., conditions of possibility) language faculty and picture faculty rest respectively, and how they relate to each other and to the alternative anthropological *differentiae.*

Concept-genetic considerations are neither identical with reflections on the history of certain concepts (in our case: the concept "human") nor with argumentations in developmental biology (in our case about the species *homo sapiens*) nor with deliberations in cultural history (e.g., about making pictures): Those three mentioned last are essentially *empirical* investigations that refer in the first case to the correct succession of various versions and precursors of the concept under consideration in a certain culture, that focus in the second case on the factual steps of transition of biological species toward human beings, and that aim in the third case at the genuine social processes leading to acquiring certain cultural techniques in a particular civilization. The concept-genetic consideration is, in contrast, interested not in the empirical but the conceptual-structural relations between concepts, and thus tries to contribute to the formation of the habits of distinguishing things that are to be used by us in the future.[7]

4. Hans Jonas' Concept of Pictures

In his paper *Homo Pictor and the Differentia of Man*, Hans Jonas has collected several criteria that are important for ascribing the predicate "(being a) picture." They remain in our focus of attention even today, although some appear in a modified version. Following Jonas, objects are pictures if they have in particular got the following properties:[8]

1. Resemblance with another thing: Jonas mentions this relation between two objects at first place. Resemblance may show spontaneously or becomes recognizable only "on demand" (as a similarity that is only imagined or mediated in some other manner).

2. Internal intentionality: A resemblance must be generated on purpose to count as a criterion for being a picture. With that, the originally symmetric relation of resemblance becomes asymmetric. This is important since something depicted in a picture usually does not count as a picture of that picture, as well. The intention, Jonas writes, has to show itself in the picture. Therefore, the original intention that is bound to the creator of the picture has to appear as an autonomous "inner" intentionality in the resulting creation (i.e., the picture). There, it is assumed to spontaneously communicate to an observer as the intentionality of the representation.

3. Representationality: The object conceived of as a picture acts as a substitute of something else – representing that thing. This characteristic is determined further in three aspects:

a. Inconsistency: The picture may resemble the object depicted, but it certainly is not an object of exactly the same kind. There has to be an intended "difference within the similarity." Thus, the picture stands in contrast to deception, which occurs unintentionally. Pictorial resemblance is restricted to the surface. Jonas understands this aspect of difference as constitutive for pictures, and calls it "ontological incompleteness."

b. Degrees of (un-)similarity: It is mainly a choice of the picture user to determine which superficial aspects are similar and which are not: The degree of freedom can be employed in the sense of economy and mode of expression.

c. Emancipation from literality: That degree of freedom allows the picture users to purposefully utilize deviations to enhance the aspect of representationality. Conventionalizing corresponding abstractions and stylizations can lead, as Jonas implies, not only to canonical sets of styles; they open up the path to ideographic writing, as well.

4. Visuality: At least when speaking of pictures in a closer sense (as examined in this paper) the (human) visual sense has to be essentially involved. This sense is distinct from the other senses, Jonas states, as an object can be found here – unlike to any other medium – in many different appearances and yet as the same thing (with a certain characteristic form): a relation that in a way exemplifies the relation between *eidos* and single object in a paradigmatic manner, and thus might be the origin of further steps of abstraction. Furthermore, different objects can appear in the same visual Gestalt, hence being depicted by means of the same pictures. Thus, Jonas suggests, generality becomes sensual in pictures.

5. Creation of distance: With a picture, several kinds of steps of distancing become effective that finally lead to differentiate between "representation" (picture), "what is representing" (picture vehicle), "what is represented" (picture content) as three ontological levels relevant for the concept "picture." Distancing thus also is the basis for representationality.

a. Inactivity: One aspect of distancing is given by the fact that what is represented in the picture seems to be present but remains deprived from the usual "causal traffic of things." Correspondingly, a movement may be represented, but its normal consequences – the change of place and other movements caused by it – do not occur: the motion remains banned in "static presence."

b. Self-denial of the picture substrate (picture vehicle): In the picture, what is representing – the picture vehicle – is ignored in favor of the depicted. Even the history of that object including its construction has, following Jonas, disappeared from consideration.

5. Signs, Perceptoid Signs, and Pictures

The considerations sketched so far might lead us to the idea that pictures exist independently from their use; in a second step, some creatures with fitting abilities find them and employ them occasionally as pictures. That is, of course, pure nonsense: Something can be regarded as a picture only if it is being used as a picture, i.e., created or received as a picture. Therefore the concept "picture" should be related directly with the corresponding situation(s) of use. In fact, three of the criteria mentioned by Jonas are characteristics of the situation of sign use (in a relatively general perspective): creation of distance, intentionality, and representationality. In the center of such a situation stands an object that is employed by a "sender" to (try to) focus the attention of a "receiver" on something that is usually not also present in that situation. As this holds true for pictures we indeed can take the use of pictures – in which their pictoriality actually shows – as a kind of sign act.

As one person alone observing a picture appears to be the central setting of using pictures, it however may seem a bit far-fetched to determine pictures as a certain kind of signs.[9] In contrast to that, the use of language as a paradigmatic case of sign use is generally considered to take place in dialogical situations: Somebody tells somebody else something (or at least intends to do so by means of the speech act). Since verbal signs are not simply found in nature but have to be produced by a speaker, their use has to be an interaction between two partners – or more precisely, it has to be a communicative interaction. After all, sender and receiver are two further necessary elements of the situation of sign use. Among pictures, on the other side, there are cases that may be considered – at least on first view – as the result of natural processes without the influence of humans: Think at shadows or reflecting surfaces. Indeed, instances of such "natural pictures", as they are often named, are already mentioned in ancient explanations for the ability to use pictures (cf. Plinius 1977: 23, and Scholz 2000: 623).

Perhaps then, the lonely confrontation with a picture is more equivalent to reading. After all, reading involves a single reader, too, who is rather withdrawn and does usually not want to be disturbed by others. However, on a closer look, even reading is a communicative activity, though at least one of the dialog partners is "internalized" and present as an interlocutor only in the imagination.

Now, is it not the case that I when watching my mirror image show something *to myself* (in the perspective of somebody else standing at that other position)? And is it not quite evident that I direct *my own attention* on this or that aspect when studying unaccompanied a picture in a gallery – when I present that picture to myself, so to speak? Thus, it is quite plausible to reduce the lonely use of pictures to communicative acts: Then, whenever we speak of pictures, we must consider a sender (potentially mentally interiorized or merely fantasized) and a (similar) receiver who interact communicatively with each other in particular manners by means of a (pictorial) sign (at least in one's imagination). In exactly this rather unspecific sense we speak in the following of a *sign act*.[10]

As we employ the use of signs as the *genus proximus*, the *differentia specifica* of picture use contrasting it with other types of sign acts might be related with the two remaining criteria of Jonas. In fact, resemblance – conceived of as a constitutive element of sign usage – leads us to the concept of *perceptoid signs*. When utilizing a sign of that category, the sign users also employ in an essential manner their competences of perceiving that are usually applied for perceiving the depicted scene as such, i.e., without the mediation of a sign. Furthermore, the class of perceptoid signs is divided with respect to sense modality. Thus, the way is smoothed to determine the concept of resemblance in an act-theoretic manner, a path that finally explains how resemblance can be systematically embedded in the situation of sign acts.

Let us reflect, at this place, on what Jonas has implicitly excluded from his analysis, and what we do not deal with either in the following. In colloquial language, we indeed employ the expressions "picture" and "image' in many quite different ways, and not all of those uses are equally suitable to let us see distinctly the habits of distinguishing immediately associated with those expressions. In some cases, the concepts "picture" or "image" are used in an indirect manner, e.g., "world picture" or "enemy image." This is true – at least on first view – for the so-called "mental images" or "inner images," as it is not at all clear in which sense they might be part of a sign act. It also remains questionable in what way the competences of visually perceiving what is depicted are relevant for them. In general, we have to distinguish metaphorical transfers from direct applications of the concepts we consider.

Apart from metaphorical uses, we have to expect a transition between central cases and peripheral cases. To the former, our concept "picture" must fully apply. But for the latter, some of the concept's characteristic properties may not hold anymore.[11] For example, for structural pictures (or logical pictures) – like graphical representations of poll movements – the resemblance relation cannot be determined immediately with corresponding perceptual competences: Poll movements are not visually perceivable after all. Following Jonas, we assume that presentational pictures – i.e., pictures of spatial constellations of material objects – are more central cases of pictures than structural pictures.[12]

The objects being depicted in representational pictures are special in that they are individualized. This feature is crucial for the competence of using pictures from an act-theoretic perspective since it is closely related with our ability of spatio-temporal distancing. In philosophy, individualized objects are also called objects falling under sortal concepts, or shortly: *sortal objects*.

6. Context Building and the Step beyond the Here and Now

We usually assume that our world consists (among other things) mostly of individual material objects – teapots and chairs, apples, mice, cars, and streets, etc. Those are things we meet at different times and in some cases also in different places as the *same individuals* even if they have changed in the meantime. As in the example of the caterpillar becoming a butterfly, those changes can be rather severe. We are able to recognize whether we deal with the same individual object at two different instants or with two different objects of the same kind, and we are able to do so only because of the sortal individuation included in the corresponding concept. Take, for instance, a court of justice trying to identify the dagger among the evidence in the courtroom, the pointed object that killed the victim on the other side of the city a year ago, and the knife the accused has bought 13 months ago in a neighboring city (cf. Fig. 2). The sortal concept determines even the possible transformations that do not change the identity of the instances of the according kind (e.g., staining of the knife, dirt, bending of the knife's point – *versus* changing the blade).

But we should be aware that we have no proof so far that small children or animals – even animals that are relatively highly developed – are able to deal with an object as something they can meet at different times as one and the same individual object. For us, being used to sortal objects, it is strangely difficult to imagine what the lack of that ability actually means:[13] In that case, objects can only exist as something concretely at hand, and hence they are always fixedly bound to the present situation of behavior, the current "umwelt" of the creature in question (Uexküll 1909). Moreover, if the focus of attention leaves them they disappear for those creatures, irretrievable. For them, meeting that individual object again merely leads to the perception of an object of the same type. In contrast, creatures that deal with sortal objects can distinguish between the appearance of a sortal individual at a time – i.e., how it is perceived in a certain situation of behavior – and the object as such (with its past and future and even contra-factual appearances). Thus, for example, the different "lifelines" of a real doe and a plaster imitation of a doe can be recognized as such only if that object is conceived under a sortal concept: when being touched we only expect one of them to take flight.

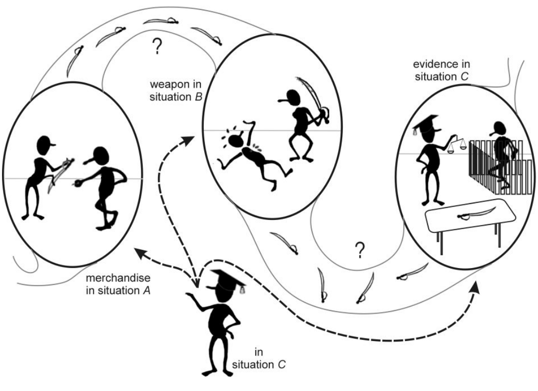

Fig. 2 Identity of a sortal object as an element
of various contexts (Diagram by J.R.J. Schirra).

Note that sortal objects can never appear in isolation: Speaking of them only makes sense as something that exists in more than one context of behavior, acting as the constant figure in front of many backgrounds. The expression "context" is used here for indicating any finite and structured set of intentional sortal objects, i.e., a couple of individual things standing in relations with each other as far as somebody knows about them (or perceives them). However, contexts can also be characterized as situations of behavior (with respect to creatures with sufficiently complex behavior). Although it is tempting to conceive the situations to which a behavior is related simply as a set of objects, it is more appropriate to understand them with Wittgenstein as a system of states of affairs – that which is the case *there and then* – as each "situation of behavior" in fact means an offer for various interpretations.[14]

A context corresponds to what we often call colloquially the "here and now." More precisely that cannot be a single (physical) point of time without duration since the period of attention always covers more or less extended intervals of time. Furthermore, affective bindings with a (desired/loathed) object keep the attention up: Even if those objects are not actually perceivable in the present situation they remain part of the context. Thus, we can visualize contexts as coherent and more or less extended bubbles of space-time around the creature: as far as its current attention spreads. Correspondingly, the attention of a creature remains usually within its current situation of behavior, i.e., is restricted to *one* context.

As far as we know, an explanation of the kind that a creature is able of focusing its attention *on* contexts as a whole – that is to say, too: of comparing several contexts – is not necessary for clarifying animal behavior. To that purpose, it is sufficient to employ – apart from immediate reactions on the direct surroundings (and eventually some autonomous inner control cycles) – concepts of habituation and imprinting, which work without representations of another situation.[15] Dealing with sortal objects requires in contrast the competence of moving one's focus of attention *freely* to *arbitrary* contexts. This is due to the fact that one needs to gain distance from the current "here and now" while focusing on other ways of being given of such an object. In the above-mentioned metaphor: It is not essential to enlarge the space-time bubble of the current situation of behavior in order to gain sortal objects, but to focus our attention simultaneously on one (or even several) other space-time bubble(s) that are not directly linked with the current context.

How can we prove whether Moja, the chimp in the example given above, is capable of such an effort of distancing? That is, indeed, the only manner of confirming the hypothesis of the research assistant that the animal has intended by means of the lines on the paper as well as with the ASL symbol for "bird" to move their centers of attention toward the same individual not present in that situation of behavior. Well, how would we decide if Moja was one of our kind? It is certainly not sufficient to refer to our observations of a certain absent-minded facial expression at some times. Also, the direct manipulations of that object cannot be used as an evident proof that that object is experienced as a sortal individual since any such behavior is bound to the current context alone. More likely, we would ask that person, and we would expect him or her to actively *present him/herself* toward us as somebody who is able to direct his/her attention onto another context.

Thus, only certain rather complex sign acts form in fact the desired criterion, more precisely: those sign acts that contain a propositional content. After all we know, we can solely determine by means of communication whether someone is able to deal with sortal objects because that is the only manner to gain together and with mutual control a stable access to a context that is not the current one. The reference to a remote context is given if one of the interlocutors presents himself toward his partner in communication as somebody who has focused his attention on that context instead of the current situation (cf. Ros 2005: VI.2.1).[16] To present oneself as somebody who focuses his attention on a certain context is therefore a communicative act rather central for the ability to deal with sortal objects, as well as for the picture competence; an act we call further on "context building."[17]

7. Perception, Deception, and Resemblance

Even the ability to recognize similarities depends essentially on comparing several contexts given by context building. This opens us the way to study the interesting combination of sign use and resemblance that appears so characteristic for picture uses. We would be naïve to assume that resemblance is just a simple objective relation between given objects – like a weakened identity or an isomorphism – since the behavioral competences of the creature dealing with those objects – perceiving them, manipulating them, and reacting on them – originally determines what exists as an object for it at all. A concept of resemblance from an act-theoretic perspective can only be established if it is possible to juxtapose an alternative situation of behavior to the actual context. Resemblance in a proper sense can merely be applied to sortal objects, which provide the distinction between present appearance and real being.

Perhaps we state too much with such a proposition? Is it not the case that even relatively simple animals do react on similarity – for example in cases of mimicry or dummies – although they certainly have not got any competences of dealing with sortal objects? Recall the anecdote given by Plinius Secundus of the ancient painter Zeuxis, an anecdote insinuating that birds can be mislead by a picture of grapes if only the picture is similar enough to real grapes. The crucial point for the act-theoretic determination of the concept resemblance is that the behavior of the birds must be recognized as a behavior not fitting the real situation. This behavior would be perfectly adequate however, we as observers think, in another context – a situation with grapes in place of the picture vehicle. In other words, the behavior of the birds demonstrates us that they have been deceived by the wrong appearance. That the appearance is wrong is clear for *us*, the observers. For the birds, however, their behavior is not conceivable as a deception. They might find out after some time, being "undeceived." But at the site where they just now had perceived grapes (*B*-perception in Fig. 3), there remains nothing for them resembling grapes, only something completely unrelated to the fruit (*A*-perception). We only recognize that a creature has a certain perception by means of its corresponding reactions. That holds also for the perception that objects are in some aspects similar and in others different.[18] Furthermore it is characteristic for the perceptual competences on this level of complexity that they only classify with respect to equal properties but do not distinguish individuality. Perception on this level plainly means grouping of similar things – with the consequence that similarity as such cannot be recognized again.

Unlike birds, human beings with their sortal concepts are in principle capable in such a *trompe l'œil* situation of avoiding the dilemma of either being deceived or recognizing no connection at all between picture vehicle and depicted scene. They usually succeed in realizing simultaneously the present representation (*A*-perception in Fig. 3) and the actually absent scene represented in the picture (*B*-perception), and they understand both as different but related entities.

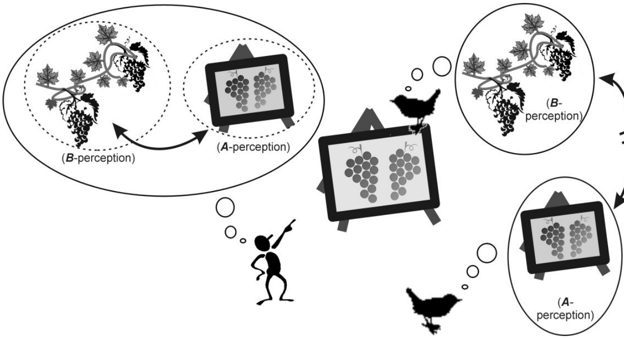

Fig. 3 Recognizing a deception (resemblance) as such needs the ability to compare (Diagram by J.R.J. Schirra).

When ascribing similarity between a part of the picture vehicle and the object depicted by that part, we must be able to conceive a relation between the real context with the picture vehicle and the fictitious context really containing the depicted object. In the example this means for us humans, as well: The fact that we see in the depiction of grapes something resembling grapes and not just grapes depends exactly on the spontaneous – but in this case mistaken – reactions characteristic for perceptions of real grapes. Furthermore, only in as far as the picture vehicle is perceived as something different from grapes can we "undeceive" that spontaneous deception.

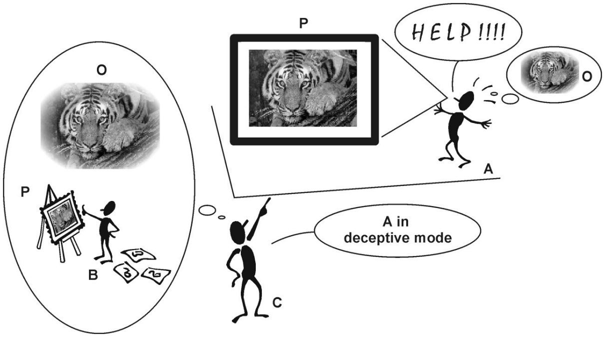

Fig. 4 Ascribing the Deceptive Mode (Diagram by J.R.J. Schirra).

In a close sense we therefore should speak of resemblance only if a creature (a) reacts spontaneously in the current context on an object with a behavior that does not fit to that object (and hence not to that situation) but to another context with a different object at that place; and (b) is aware that such a mistake is taking place; only then is that creature able to build the relation between those two contexts as a relation of resemblance between corresponding parts of the situations.[19]

With this we now gain a more precise determination of the conception of perceptoid signs (and thus: of pictures). Let us first examine the more basic situation of deceptions as in the legend of Zeuxis' birds: The picture vehicle is spontaneously mistaken for the depicted scene, i.e., according (inadequate) behaviors are activated without the deception being realized (Fig. 4). We call this the *deceptive* mode. Obviously, only someone capable of understanding the deception (i.e., not – at least not totally – in the deceptive mode) can ascribe this mode of behavior to a creature observed.

We speak, on the other hand, of the *symbolic* mode if someone recognizes that the (potential) picture vehicle is an essential part of a communicative situation, i.e., there is an object presented by a sender in order to represent – quite literally: to bring into presence – for a receiver something else that is usually not present, as well (cf. Fig. 5). Since resemblance is not important for the symbolic mode, it is not restricted to perceptoid signs but valid for all kinds of signs. As a distinct property of the symbolic mode, one does not have to react on the things represented, take for example a tiger, as if they really are here; corresponding spontaneous reactions are more or less suppressed and do usually not appear as observable behavior.

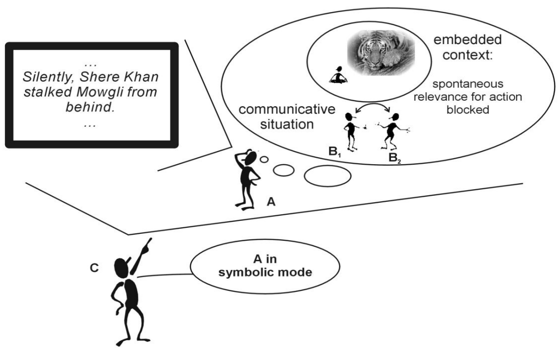

Fig. 5 Ascribing the Symbolic Mode (Diagram by J.R.J. Schirra).

We now suggest characterizing the use of perceptoid signs as a deception systematically amalgamated with a sign use: The sign vehicle is supposed to be conceived as resembling the object represented. It then must activate more or less strongly a false spontaneous reaction, corresponding to the deceptive mode. However, that inadequate behavior does usually not "surface" as it is embedded in the symbolic mode. But its effects are motivating the meaning of the sign act (supposedly) intended (cf. Fig. 6). This is the *immersive* mode. In it, one can experience a deception, and can simultaneously know about it, being thus able of conceiving it as a case of resemblance. Moreover, the sign uses of this kind fulfill the criteria of context building, because the sign act is employed as a means of focusing the attention on the situation in which the inadequate deceptive reactions would be adequate. In the case of a picture that is the situation with the depicted objects really present. It is, thus, plausible to assume context building as the most general communicative function of image use.

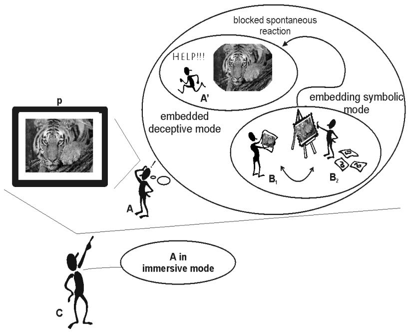

Fig. 6 Ascribing the Immersive Mode (Diagram by J. R. J. Schirra).

There is finally a fourth mode, which Jonas also mentions in the context of the degrees of similarity covering in particular the item "emancipation of literality": Apart from its direct ("literal") use, every sign can also be employed as an example. It then has the purpose to direct the focus of attention of an interlocutor (or oneself in the role of another person) onto certain aspects of the corresponding sign use by exemplification, e.g., syntactic features, semantic properties or relations between signing act and other activities. This *reflective mode* also allows mentioning deficiencies of communicative behavior (cf. Fig. 7).

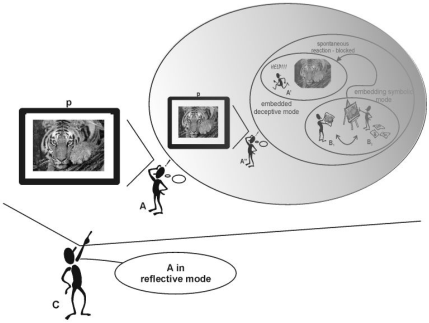

Fig. 7 Ascribing the Reflective Mode (the “fog” is supposed to indicate a focus on syntactic aspects in this case) (Diagram by J. R. J. Schirra).

Typical examples of using pictures in reflective mode are quotations as they are often found, for example, in discourses on picture theory: Figure 1 (*Moja’s* “*picture*”) is such a case. In visual arts, the mode is also quite common. Although the ability of context building plays a crucial part for the reflective use of a picture, too – since the focus of attention is drawn to an external perspective on the current situation of picture use, so to speak – we shall not deal any further with it here. With these four modes, we have coarsely sketched a proposal of a concept “picture” based – just in the sense of the linguistic turn – completely on behavioral notions. There was no need to refer to the *eidos* of the object depicted. Determined as a spontaneously activated inadequate behavior embedded in a sign act that refers to the situation in which the inadequate behavior would be adequate, this proposal contrasts with the more popular version, which uses a presupposed concept of resemblance that remains, actually, rather unclear, and which tends to ignore the close conceptual relations between resemblance, identity and sortal objects.

8. Founding the Concept “Picture”: A Concept-Genetic Approach

The behavioral determination of the concept “picture” in fact leads us quite naturally to a much more wide-ranging proposal for its concept-genetic foundation, which is sketched below as a kind of plan for further research. On the one hand, the picture anthropologists have to consider the fields of concepts for creatures able to use signs on various levels of complexity. On the other hand, they aim for the attribute "perceptoid" as the specific difference, and hence have to observe on successive levels of complexity the fields around the concept of something able to perceive in a more or less ambitious sense. Then, the fields of concepts for those beings that we cannot yet ascribe in the most elementary sense the competences of perception, and sign use respectively, ought to be the origin for those concept-genetic examinations. Ethologic studies and the philosophy of language actually provide sets of correspondingly leveled theories (cf., e.g., Ros 2005). Some aspects have already been mentioned above.

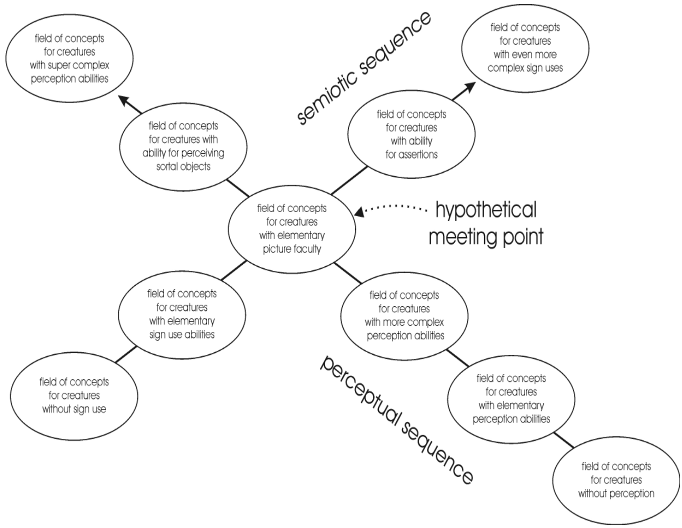

Fig. 8 Hypothetical Schema of the Two Sequences of Fields of Concepts (Diagram by J. R. J. Schirra). The straight arrows indicate concept-genetic constitution relations. At the – merely supposed – meeting point, perceptual abilities and signing skills can be combined into the immersive mode. In the case illustrated, the faculty of using picture is constitutive for the ability to use assertive language.

The goal of those concept-genetic considerations is to reconstruct from the two sequences – the semiotic one and the perceptual one – the (minimal) level that contains the most peculiar combination of symbolic mode and deceptive mode we take as characteristic for (presentational) pictures (cf. Fig. 8). The minimal field with a concept for creatures able to use pictures must, then, hold exactly the determinations essential for that faculty. Starting from that minimal field, more complex fields characterizing higher levels of picture uses can be derived, and metaphorical associations can be explained.[20] Furthermore, we can elucidate the relation to the (minimal) level on which assertions become an option – being a part of the semiotic sequence anyway. It, thus, becomes clear whether the ability to use assertions is a necessary but not sufficient precondition for the faculty of using pictures – or the other way round; or, as a third alternative, whether the two concepts depend on each other so that we cannot rationally speak about beings that have one of the two faculties alone. Jonas in his article seems to expect the picture faculty as primary and necessary (though not sufficient) for the ability to use assertions – this alternative has also been sketched in Figure 8.[21] Such a relation appears quite plausible, at least on first view: Propositional language is generally – and legitimately – considered the more powerful and more complex tool of communication.

However, a counter-argument results from our act-theoretic derivation of the concept "picture":

(a) The faculty of using pictures depends on the ability to recognize resemblance;
(b) Merely a creature that is able to cope with sortal objects can also recognize resemblance;
(c) The ability to cope with sortal objects depends on the competence to evoke arbitrary contexts;
(d) The competence to evoke arbitrary contexts can be confirmed in a distinctive manner only by means of propositional language.

Thus inversely, it is the ability to employ assertions that is necessary (though not sufficient) for elementary picture competence.[22] In the overall picture, such mutual dependencies strongly indicate that we are faced here with competences that stand in a very close conceptual relation and should not be considered independently from each other.

It should be obvious that the detailed elaboration of this plan lastly aiming at a fundamental clarification of the questions characterizing picture anthropology exceeds the frame of this piece of writing by far. Therefore, we finally want to elaborate a bit further only a single aspect of the mutual dependency of the faculties of propositional language and picture use. Before doing so, it pays to recapitulate the uniqueness of the human language faculty. As mentioned before, we focus on assertive utterances, or more generally speaking: those sign acts that have got a propositional content apart from their illocutionary function. This decomposition accounts for the fact that using language always means more than merely uttering sounds or drawing letters (Austin 1962): We *warn* or *promise*, *ask* or *demand*, *assert* or *doubt*, to name just a few examples of illocutionary functions. That aspect, which focuses on the interaction performed with the speech act, is to be distinguished from the intentional aspect mediated by the propositional content: *what* it is that we warn of, promise, ask or demand. The propositional content is again composed of partial acts of two kinds. A speaker tries to communicate with a *predication* which ability of discriminating or classifying phenomena (i.e., which concept) he wants to bring forth in the framework of the complete sign act. With one or several *nomination*s he tries to identify for the interlocutors the (individual) object or objects to which the discrimination/classification is applied: All interlocutors must already know these objects – i.e., they must *exist* in their common "discourse universe." But then, a discourse universe is just a certain context (in the sense discussed in section 6) that is shared by the sender and the receivers in question.

Therefore, assertions are, on the one hand, *context-relativ*e: If the corresponding discourse universe is unknown, an assertive sentence remains essentially incomprehensible. In particular the nominations can only be performed effectively if it is clear which set of objects is at stake at all. But on the other hand, assertions are *context-independent*: Since we can, at least in principle, perform an assertion relative to some context in *any* situational context whatsoever. The two characterizations of assertions depend on each other because it is only possible to speak independently of the *actual* situational context if another context can be explicitly referred to. Hence, assertions require by necessity an act of context building. For example, verbal references to places and statements of times can serve for context building. But we can verbally build hypothetical or fictitious contexts, too, for example by means of a reference to a text of literary fiction: "In Uwe Johnson's novel *Jahrestage*, Gesine has a daughter named Marie." The persons the speaker means by the nominations "Gesine" and "Marie" can only be identified relative to the given literary fictitious context, and we are able to verify the assertions merely with respect to that same context.[23]

While creatures with more elementary communicative faculties always refer with their utterances to aspects of the situation of the utterance (cf., e.g., Tugendhat 1982: lect. 12), the internal differentiation of a sign act in the clearly separated partial acts of the type "nomination" and "predication" presents its advantages solely when referring to facts that are not already present in the current context. Let us leave out of consideration the assertions about the immediate context of the utterance, and let us also restrict our considerations in the following on purely verbal acts of context building: In order to empirically prove right the validity of a fact as stated in the assertion (i.e., that a certain concept indeed holds true with respect to the mentioned objects) we ought to leave the current situation of behavior and move to the context specified. If you cannot (or do not want to) make that context to your current situation – as in the case of fiction – the only remaining option is to logically deduce further assertions, and to test whether those assertions are consistent with what you know already about the context mentioned. However, the validity of the assertion cannot be empirically checked in that manner.

In contrast to that, an additional behavioral situation is evoked when building the context by presenting a picture – a situation that can indeed be perceived (in the deceptive mode) and thus allows the picture users for spontaneous reactions. That is, the sensory-motor test routines of the habits of distinguishing mentioned in an assertion can (at least partially) be applied right away. Unlike the verbally introduced contexts, that context is not utterly separated from the actual situation of the sign use. The two contexts rather appear as partially "fused." Verbal context building can, thus, *gain access* to intentional objects merely *logically*, while pictorial context building can *represent* them *empirically*.

Let us imagine, again in a thought experiment, creatures that, although being proficient of using assertions, are completely incapable of employing any kind of perceptoid signs. Those beings also have access to sortal objects by means of language alone: Perception gives them just the appearances in one context – their current situation of behavior. Only in language they can link the current appearance with appearances in other contexts (verbally evoked), that is, in a manner that excludes any empirical validation.

How could those hypothetical creatures, then, have gained the ability to refer to other contexts at all? Which way has led them to object constitution – i.e., the competence of coping with objects with sortal individuation? Or more precisely: What are the arguments motivating that the concept of such creatures is well formed? Which concept-genetic considerations can lead us to rationally reconstruct the corresponding field? Because the transition from the field of concepts of creatures that can communicate just facts about the current situations – facts that have to be empirically present – to the field of concepts of creatures as in the Gedankenexperiment – with a context building that cannot represent facts but logically –, that transition still remains entirely unclear.

9. Initial Context Building and the Concept of an Inner Image

Is it plausible that the ability of communicating by means of assertions, i.e., independently from the situation, does not just employ contexts mediated by picture uses as one option among many alternatives of context building? Is it reasonable to assume that this special type of communication could only develop with the help of the deceiving potential of picture-like precursors (i.e., potentially deceiving objects)? The questions aim at the *initial context building*, the original act transcending the prison of the "here and now." Admittedly, the use of perceptoid signs remains ambiguous as one can simply face them in the deceptive mode, too, not recognizing that another context be actually meant. But this drawback might turn out to be an advantage for originally introducing the faculty of context building.

Let us start from creatures that have only access to their current situation of behavior *a,* and thus can face a (potential) picture vehicle *B* merely in the deceptive mode – mixing up situation *a* with a situation *b.* This behavior as such, let's say a flight behavior in the face of a dummy, cannot be used for communication. The symbolic mode can only be ascribed if that creature is also able:

(*i*) to *present* that behavior to others: i.e., "showing them bodily that it is mistaking something (without noticing)";
(*ii*) to react on its own presentation behavior *in the same way as the others*;
(*iii*) to *internalize* the performance of the presentation behavior together with corresponding answer behaviors of the receivers, as is characteristic for the performance of any simple sign acts.

For condition *i*, the following may serve as a concrete example from the ethological research: Some primates use acoustic warning signals if certain enemies like large birds of prey or strangling snakes are perceived, i.e., recognized as being present in the current situation. Now it is plausible that an individual of such a species utters a warning signal when finding a rubber snake dummy (perhaps put there by an ethologist), and thus makes its group go running from a snake without a snake actually being there.

However, without condition *ii*, the meaning of such a communicative behavior remains different for sender and receiver. There is, so to speak, one rule linking the perception of the snake to the corresponding sender behavior, and there is another rule binding the perception of the warning signal to corresponding receiver behavior. Perception of a snake and receiver behavior are not immediately connected. That association only becomes possible if the sender also reacts like the receivers (which, by the way, is usually the case for warning signals but not for all animal signals; cf. Tugendhat 1982: lect. 13).

Finally, condition *iii* means, speaking more precisely in the words of Ros (2005: 591), that those presentation behaviors can "become separated from the communicative connections in which they are usually embedded on the level of sign acts, and develop into a private ability of bodily representation" (cf. especially Mead 1934). In that case, a very weak activation of the corresponding nerves would suffice, an almost imperceptible change of the corresponding muscle tonus, which might not be distinguishable externally, but remains effective internally by means of the proprioceptive body awareness.

Now, the deceptive behavior in communicative use is particular in that the answer reaction can be twofold: depending on whether the receiver does or does not fall to the deception, as well. Practically, we may imagine that a certain natural rock formation repeatedly has been mistaken for a hostile animal. If our group of creatures is able to communicate on the level of signals, they could have become habituated to ignore in that context any warning signal of their kind or even to react immediately with a corresponding "all clear" signal. So, we here indeed have a system of one presentational inadequate behavior in deceptive mode and two different reactions: The first creature utters a warning signal triggered by the own current context, namely context *b* (cf. Fig. 9). This is also the context for the behavior of a creature reacting on that warning signal in the normal way, i.e., by flight, while a creature ignoring the signal (as learned by habituation) takes as its current context the situation *a*.

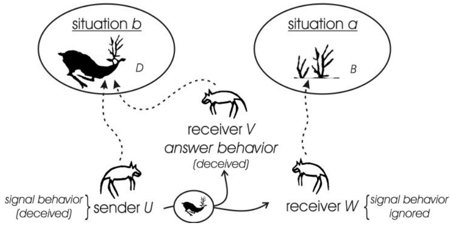

Fig. 9 Schematic sketch on signal communication in a deceptive situation (stag / branches) (Diagram by J. R. J. Schirra).

If the original sign activity in such a potentially deceiving situation is internalized (condition *iii*), it can for the reflective sender (condition *ii*) trigger internally each of the two corresponding options for reaction: This leads to a foundation of the relation between contexts *a* and *b* as something relevant for that creature (over and above the relevance for us observers). We can now legitimately say that this creature *presents itself to others (as well as to itself) as someone perceiving something that it knows is actually not present*. However, this behavior is still completely dependent on the presence of an object *B* in context *a* – an object that is perceptible, and that can be easily mistaken for something else (for object *D*; i.e., *B* resembles *D*). The consideration leads us to the concept of a creature that succeeds in a first incomplete kind of pictorial context building: It has indeed used the picture vehicle in the immersive mode. That short sketch of a derivation of the initial context building by means of a concept-genetic amalgamation of the deceptive mode with the symbolic mode with respect to a potential picture vehicle *B* is, however, not stable yet. There is no mechanism so far avoiding a relapse into the pure deceptive mode.

Most interestingly, human beings involved in an act of verbal context building often mention their imagination as an explanation: They even talk about having “inner pictures” as evoking that verbal context building or serving as the fundament of it. As was mentioned above, those “mental images” do certainly not fall under the concept “picture” we have dealt with so far.

We know that someone imagines something visually by that person telling us so. She or he presents herself/himself to us (and also to herself/himself) as somebody perceiving something visually and acting correspondingly – e.g., by ostensive gestures – although that something is not present. For example, she presents herself as a person who is counting the windows while seeing the front of her house, although that part of the building cannot be seen in that context – just like when viewing a corresponding picture; but there exists no fitting picture vehicle in that situation. Or we deal with somebody who is listening to a life description of a soccer game in radio, thereby imagining those sportive events: that is, who presents himself to himself as someone witnessing the actions described in person and not only by means of a verbal report. To him, the events appear as being not just logically but empirically present (cf. Schirra 1995).

Thus, it is the situation of the initial context building in which those persons pretend to be when mentioning their imagination. Furthermore, this deception of an initial context building takes place in an internalized form of presentation, i.e., as an act of bodily presentation that takes place for that person alone. As the object mediating the deceptive mode in this case, we only find the person and the abilities of perception and expression given with his body; an external picture vehicle is not necessary anymore. In the situation of the initial context building, a behavior used in a sign act and triggered by an object really at hand has been directed at an external reality that is not present. In the case of visual imagery, the sign act triggered by real self-awareness of bodily and mental states, is similarly directed onto another "inner" reality: namely the one that has to be characterized as an internalized bodily presentation of the own states for another situation of *deception* – the situation of the corresponding initial (i.e., pictorial) context building with a picture vehicle *B**. And that indeed is a potential explanation of an act of context building *independent* of a perceptoid sign – a form of context building that does not represent empirically, but purely logically.[24]

That is: in connection with a purely logical (verbal) act of context building, "inner pictures" or the use of (visual) imagery are ascribed to a person if the reenactment of the initial context building by means of a perceptoid sign is suggested as an explanation for the context building not requiring a deceiving medium. Such an explanation directs the focus of attention to the concept-genetic reconstruction of the field of concepts for creatures that are able to deal with pictures, propositional language, and sortal objects. Perhaps it is also the internalized (but in principle communicable) reference to the situation of the initial context building that has a stabilizing effect on picture use against the relapse to the mere deceptive mode. That at least would explain why theoreticians of art often mention an “inner image” they suppose is a requirement for an artist to produce a work of art.

Let us now return to chimpanzee Moja mentioned in the first section: With the theoretical background developed so far, it remains rather questionable whether Moja indeed has sketched the picture of a bird and thus has demonstrated picture competence. Of course, this could be an act of pictorial context building of the incomplete kind: It might be reasonable to assume that the marks of pigment have originally been arbitrarily positioned but then have activated a spontaneous deceptive reaction, which was finally embedded communicatively (ASL sign “bird”). But there is no further evidence that Moja has got a mechanism that socially stabilizes the immersive mode so that the chimp is able to access other contexts apart from the current situation not just sporadically but in a systematic manner. Correspondingly it remains unclear in which respect Moja’s marks are actually supposed to resemble visually a bird – among other things, the relation to the situation in which Moja’s group reacts on the factual presence of birds had to be described and analyzed in detail (cf. also Davidson/Nobel 1996: 72 ff.).

10. Résumé

Inspired by Hans Jonas’ phenomenological reflection on the anthropological *differentia specifica*, we followed the trace of the concept *homo pictor* in the alternative light of analytic and act-theoretic philosophy. The characterization of pictures as perceptoid signs used in that framework has as a consequence that objects are pictures if and only if picture users employ them in a corresponding behavior, namely a communicative act of perceptoid characteristics.

Thus, we have determined as characteristic for picture uses a particular combination of certain acts (sign acts) with certain dispositions of behavior (associated with the action “to recognize resemblance”): a combination that we have called the immersive mode. Someone coping with an object in this mode uses the object as a perceptoid sign. If the resemblance is recognized visually we have found a central case of “picture.” The meanings of pictures do not originate independently from their uses in an “objective” relation between picture vehicle and depicted scene. They rather arise from the characteristics of the situation of use and hence from certain actions.

The most interesting inquiry, namely the one for the distinct preconditions and precise implications of that very special faculty of action, is to be performed by means of an extended concept-genetic reconstruction of the field of concepts in question along the semiotic and perceptual branches, and has to remain a mere research programme for now. In a sketchy manner, we however pursued one problem of particular anthropological relevance: The conceptual relation between the competence to use assertive language and the faculty of employing pictures must be conceived of as being much closer than usually expected. There are, on the one hand, strong arguments that pictorial context building is indeed the initial access to situations that are not present. It thus has made possible assertive language – and, by the way, also the ability of coping with sortal objects. In consequence, picture use is directly linked with the central criterion of humaneness in the philosophical sense. On the other hand, the immersive mode and therefore the picture competence are established in a stable manner only if the difference to the mere deceptive mode can be explained verbally and articulated explicitly by reference to sortal objects. Accordingly, the two competences depend on each other by conceptual necessity: There cannot be creatures with only one of them. In as far as language competence is the central anthropological difference, for picture competence this must also be the case. In this, we, from the act-theoretic perspective, agree perfectly with Jonas’s phenomenological considerations.

By such a determination of “picture”, a relation to the main shift in argumentation theory of the 20th century known as the linguistic turn becomes clear. The linguistic turn stands for the knowledge that concepts (as the inter-subjective reference points for checking the validity of assertive utterances) cannot be determined independently from verbal acts. The term “pictorial turn”, originally applied to merely express that quantity and influence of picture uses have grown substantially for the last few decades, can also be understood in an argumentation-theoretic form: Without their contribution, the assertive foundation of concepts could not be established as something independent of the current context. The faculty of using perceptoid signs is necessary for the referential anchoring of assertive expressions in general and hence for the empirical dimension of concepts.

As the cardinal point of picture competence as well as of language competence – and hence of the anthropological difference as a whole – we have found the ability of context building. This ability gives a creature having it the access to a living space not limited anymore to the narrow space-time bubble of its current perceptual and behavioral situation. Rather it is formed as a system of connected contexts established by mutually controlled rules. This system allows the homo pictor to step out – at least in principle – toward infinity. Borrowing the words from the French paleoanthropologist André Leroi-Gourhan (1993), the concept of a human space and a human time – are originally created with that ability:

> The human being is a human being only in as far as he comes together with his kind surrounding himself with the symbols of his raison d'être. Bare and nude, the high priest like the vagabond are nothing but the corpse of a higher mammal in a time and in a space without meaning since they are no longer the support of a symbolic human system. The human fact par excellence is perhaps not so much the creation of the tool but the domestication of time and space, i.e., the creation of a human time and a human space (Leroi-Gourhan 1984: 387).

NOTES

1. We use the expression "picture philosophy" if the scientific interest turns to the question what it actually means to be able to cope with pictures as pictures; cf. Sachs-Hombach 2003, Belting 2001, Bredekamp 2003, and Schirra 2005b. Therefore, the immediate focus of interest is not on single pictures, but on the faculty to use (i.e., produce and visually explore) pictures. Correspondingly, its research objects are the beings provided with that faculty. Even more precisely speaking, we are interested in the *concept* we can – in a meaningful and rationally controlled manner – form of creatures having the faculty mentioned.

2. Therefore those habits remain in principle inter-subjectively available and even negotiable.

3. Often, a concept is also considered to be the same as the meaning of a corresponding predicatively used expression (like "being human" or "using a picture").

4. Therefore, the assumption mentioned above – that language is unavoidable as the medium for communicating any efforts in picture philosophy – is indeed correct: The medial importance of language for picture philosophy is a direct consequence of its methodological relevance. Again we emphasize that it is not the phonetic or graphic form of our languages that is crucial here but the ability to use a certain form of communication with the specific logico-functional differentiation typical for assertions (cf. below).

5. For example: geometric objects, e.g., a "triangle", have the property "consist of a material" only contingently. The attribute "being of iron" of an iron triangle is a property completely independent of its "being a triangle" – there are no conceptual-logical relations between iron and triangle, since they are considered as belonging to two completely segregated fields of experiences. But we could consider a more complex field of concepts systematically integrating the field of geometrical objects with a field of concepts about objects that consist of materials (more generally: are involved in a number of part-whole relations) but do not have any geometrical aspects. Instances of objects falling under that more complex field have necessarily both geometrical properties and stand in part-whole relations such as "consist of material."

6. Recall for example the foundation of axioms of rational numbers (e.g., n/n being the neutral element of rational multiplication) by means of the rules for the integer numbers and the combination schema originally introducing certain equivalence classes of pairs of integers as a new type of numbers (namely fractional numbers).

7. Of course, we cannot expect that just one concept-genetic step mediates between entities that are described by means of pure biology and human beings in the philosophical sense: We must anticipate that the mental sphere and the complicated social activities connected with it must be introduced in several layers; cf. Plessner 1928, and Ros 2005. Any attempts to bridge this conceptual gap directly oversimplify matters severely.

8. The presentation given here is faithful to the original despite alterations with respect to order and expression employed by Jonas. They are paid for greater clearness and better connectivity with the present discussion.

9. This type of use became more or less paradigmatic for history of art but was lately softened successively; cf. Bogen 2005. Even in a cinema, where many visitors watch the moving pictures together, the presence of those others is not immediately connected with the consumption of the images: after all, the film and its effects do not necessarily change when experienced all alone.

10. This, by the way, also elucidates Jonas' strange conception of *inner* intentionality. The impression that a picture as such appears to take over the intentionality originating from its creator can also be explained by that general competence of anyone receiving the picture: to *imagine* a corresponding sender (picture creator), and to use the assumed intentionality of the act of

creation as the inner intentionality of the picture. With respect to the thought experiment with the astronauts in the cave, this, of course, poses severe problems for Jonas' interpretation.

11. This corresponds to Wittgenstein's proposal of "family resemblances" among concepts (1953: § 66 f.).

12. Certainly, the expression "representational picture" is not a good choice since structural pictures in general also represent something. But lacking a plausible alternative, the term has been established. Conceiving representational pictures as more central than structural pictures does, by the way, not exclude the interpretation of structural pictures as the more general conception: Representational pictures can indeed be understood as a particular kind of structural pictures. If we assume, for example, that a metaphorical projection function from some domain of knowledge to geometric or sortal objects is part of the definition of structural pictures, representational pictures are those structural pictures that employ the identity function on sortal objects as a degenerate but still formally possible projection function. Note that this "internal" metaphorical shift is then part of the definition of the concept "picture" – in contrast to the "external" metaphorical shifts of the concept to other domains mentioned above. Let us remark here, too, that a representational picture neither has to be naturalistic (i.e., as close as possible to the actual visual appearance) – cf., e.g., copper engravings – nor is it restricted to depictions of scenes that really exist (or did so once); see Schirra 2005.

13. Certain neurological pathologies seem to eliminate just this ability (cf. Luria 1987, Sacks 1986: 220 ff., and – in the form of a cinematic dramatization – *Memento* (Nolan 2000)).

14. The characterization as a set of objects is, in a way, a *figural* perspective on a context, which has to be complemented by a *medial* perspective. The latter only offers figural differentiations, and thus better supports the view of a context as a situation of potential behaviors open to interpretations (cf. Schirra/Sachs-Hombach 2007: Sect. 4.2; cf. also Wittgenstein 1922: § 1).

15. With imprinting and habituation, earlier experiences have reformed the relations between sense and reaction as such in a way that another contact with entities falling for that creature under the corresponding sort of objects induces a changed behavior. The fact that simple creatures seem to be able to distinguish individuals – as is often the case with behavioral imprinting on parents – is therefore no argument for their ability to deal with sortal objects as such. These creatures react on simulations, as well, if they are only similar enough: They do not have a means of distinguishing both. Although under usual conditions there indeed is just one individual fitting the characteristic set of properties perceived, e.g., the care-taking parent creature, making that kind of behavior regularly quite successful, it has few connections with the fastidious concept of an individualized object.

16. This is a consequence of the definition of communicative interactions. We distinguish three types of interactions: in *direct interactions*, one creature tries to bodily affect another one, e.g., by grooming or biting. In *object-related interactions*, one tries to familiarize the other one with a certain fact, i.e., showing that this or that is the case (e.g., a parent leading its young ones to the water hole). We speak of *communicative interactions* if and only if one creature tries to present itself to another one as acting in a certain manner in order to intimidate something. A typical yet simple example is the humility gesture of dogs. Furthermore, sign acts are communicative interactions with a common "meaning" for sender and receiver.

17. The "*space builders*" of the linguist Fauconnier (1985) have given the idea to this expression.

18. This aspect is, of course, not adequately visualized in Figure 3: It would indeed be quite difficult to clearly sketch the corresponding situations of behavior in such a simple drawing. "Think bubbles" – well known from comics – here substitute the reactions; but it should be clear that they are nothing but a – easily misleading – simplification of the proper conceptual relation between (ascribed inner) perception and (observable) behavior.

19. In colloquial language, we are used to speak of "resemblance" in cases like that of Zeuxis' birds, as well, although condition (b) does not hold then. Therefore, it might be helpful to distinguish eventually the two cases by means of indices. In (Schirra 2005a), for example, "resemblance$_\alpha$" is used when ascribing a deception to a creature that is not able to penetrate the deception, and "resemblance$_\beta$" in the other case. In other words, when "gaining" sortal objects the concept resemblance$_\alpha$ is differentiated in resemblance$_\beta$ on the one hand, and identity on the other hand.

20. Of course it is no accident that the science of pictures historically presents two branches: a semiotic branch the proponents of which analyze the concept "picture" basically in the framework of sign theory (Goodman 1968), and a branch sometimes named "phenomenological" the proponents of which are essentially interested in the particularities of perception when using pictures (Gombrich 1960 cf., also Lopes 1996). The concept-genetic synthesis promises to overcome this conflict of direction that has often been fought quite emotionally.

21. Cf. in particular: "The *adequatio imaginis ad rem*, which precedes the *adequatio intellectus ad rem*, is the first form of theoretical truth" (Jonas 1961: 40).

22. That follows at least if picture uses (i.e., the immersive mode) are to be well distinguished from the pure deceptive mode.

23. The current situative context certainly plays a distinguished role since the referential anchoring of nominations and predication can be performed in an immediate manner only for assertions on this particular context. Only in this case, the sensory-motor components of the concepts used – i.e., the corresponding habits of distinguishing – can be employed without additional efforts. Acts of verbal context building that indicate

locations like the sentential adverbials "in Prague" tell us in a way a method to transform the current situational context into the context meant to be used for referentially anchoring the propositional content of the utterance.

24. These arguments are to be found in greater detail in Schirra/Sachs-Hombach 2006.

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A MENTALIST FRAMEWORK FOR LINGUISTIC AND EXTRALINGUISTIC COMMUNICATION

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ABSTRACT. We outline some components of a mentalist theory of human communicative competence. Communication in our species is an intentional and overt type of social interaction, based on each agent's capability of entertaining shared mental states and of acting so as to make certain mental states shared with the other. Communicative meaning is a matter of ascription: it is not an intrinsic property of a communicative act, but is instead created here and now as the shared construction of the interlocutors. We then discuss how communicative actions are superficially realized by our species, focusing in particular on the difference between linguistic and extralinguistic (that is, gestural) means of expression. Linguistic communication is the communicative use of a symbol system, whereas extralinguistic communication is the communicative use of a set of symbols. The difference turns out to be a matter of processing rather than of intrinsic structure.

Keywords: communication, linguistic, extralinguistic, symbol, structure, expression,

1. Introduction

In this paper we outline some components of a mentalist theory of human communication. We start with a distinction between communication proper and social interactions at large. Any situation where an agent's mental states are affected by a behavior or state of being of another agent is an instance of social interaction, but not all social interactions are communicative.

Communication is a special type of social interaction whose distinctive features are intentionality and overtness. These depend in turn on each agent's capability of entertaining shared mental states and of acting so as to make certain mental states shared with the other. Our theory of human communication is therefore cast in terms of the mental states types that an agent has to be able to entertain in order to have the capability of engaging in a communicative interaction and of the modifications that these states undergo in the course of the interaction itself.

This view of communication allows us to give a strictly mentalist definition of the concept of communicative meaning. Communicative meaning is a matter of ascription; it is not an intrinsic property of utterances and other communicative actions, but is instead created here and now as the shared construction of the agents involved.

We then draw a further distinction between communication, viewed as a cognitive faculty, and the means of superficial expression that an agent may utilize to make her communicative intentions manifest to and shared with a partner. We focus in particular on two such means of expression, namely linguistic communication and extralinguistic (that is, gestural, in a broad acceptation of the term) communication. In discussing the main features of these two modes of expression, we argue that the former is the communicative use of a symbol system and the latter is the communicative use of a set of symbols.

Finally, we discuss the relationship between our views of the nature of communicative meaning and of the nature of communicative actions. The difference between the linguistic and the extralinguistic modes of expression turns out to be a matter of processing rather than of intrinsic structure.

2. Varieties of Social Interactions

Any situation where an agent's mental states are affected by a behavior or state of being of another agent is an instance of *social interaction*. We discriminate between two varieties of social interactions, which we will call *information extraction* and *intentional communication*.

2.1 Information Extraction

The first type of social interaction occurs when the affecting agent has no overt intention to alter the mental states of the affected one. E.g., if Ann sneezes Bob may infer that she has a cold; if her shirt clashes with her gown he may infer that she has no style, and so on. Bob may construe some of these events (like sneezing) as unintentional of Ann and others (like dressing) as intentional, but, unless he construes them as overtly directed toward him, he will have no reason to suppose that Ann *intended to communicate* to him that she has a cold or that she has no style.

These situations may be accounted for by an extension of Grice's (1957) notion of *natural meaning*. Natural meaning requires no intentionality other than that of the cognizer: if you think to yourself "Those black clouds mean rain," the verb *mean* implies no true meaning, intentionality, or cognition on the part of the clouds. What happens is simply that you notice a certain event or phenomenon (namely the clouds), from which you think you may legitimately draw some inference (namely that it is going to rain).

A similar account may be given for situations like the above, where Bob autonomously infers something about Ann from the observation of some action or event in which she is involved. We have an instance of *(social) information extraction* whenever agent *x*'s mental states are affected by agent *y*'s actions or state of being, with no recognition, on the part of *x*, of an overt intention of *y* to achieve that effect.

It may be worth remarking that we are taking the observer's standpoint in this analysis. What makes the difference between information extraction and true communication then is whether he construes the events in which the actress is involved as (*a*) intentional on her part, and (*b*) as overt, that is, manifestly directed toward him.

Thus, Ann might actually have had the intention of having Bob infer that she has a cold or that she has no style, as part of some private plan of hers. Even if Bob should detect Ann's hidden plans, however, our analysis would not change, because condition (*b*) would not be satisfied anyway. Analogously, in the dressing example, Bob's inference might be viewed as an undesired side effect of Ann's plan to indeed communicate something quite different to him (or to whatever agent observes her). This, again, leaves our analysis untouched, because condition (*a*) would not hold anyway. Intentionality and overtness, to repeat, are definitional of true communication.

2.2 Intentional Communication

In Grice's (1957) analysis, non-natural meaning (that is, intentional communication) involves instead two cognizers, the one overtly intending that the other construe her actions as communicative. Thus, if Ann says to Bob "Take an umbrella when you go out: the TV said that it's going to rain" we have a true instance of communication if and only if she, by uttering that sentence, intends: (i) to induce Bob to take an umbrella, (ii) to let Bob recognize intention (i), and (iii) to have this recognition be (part of) Bob's reason for taking an umbrella.

As shown by Strawson (1964) and Schiffer (1972), however, this account lends itself to certain counterexamples (concerning in particular keyhole recognition) that can only be avoided if Ann also entertains an intention (iv) that her intention (ii) be recognized, an intention (v) that her intention (iv) be recognized, and so on.

Grice's account thus falls into an infinite regression since, for any n-th intention that the agent entertains, it is always necessary that she also entertain an $(n + 1)$-th intention that that intention be recognized. An infinite nesting of mental states, however, is obviously impossible in the real world, making this definition of communication unacceptable.

This problem can be avoided if Grice's account is so modified as to deal with communication in terms of shared mental states. Airenti, Bara and Colombetti (1993) and Colombetti (1993) have proposed that *shared belief* be defined as a primitive mental state: an agent shares that p with a partner if and only if she believes both that p and that the partner shares that p with her.

This allows Airenti, Bara and Colombetti (1993) to also redefine *communicative intention* as a circular primitive of the same sort: in particular, as an agent's intention to overtly make some mental states of hers shared with the partner. That is, an agent intends to communicate that p to a partner if and only if she intends to make it shared with him both that p and that she intends to communicate that p to him (see also Colombetti 1999).

In this account, sharedness is a state of an agent's mind (and therefore a one-sided one) rather than a state of the world. The intentionality of communication is therefore, from the standpoint of the addressee, a matter of ascription. That is, he may wrongly take the actress's behavior as communicative or vice versa, or as communicative that *q* instead of (as in the actress's intentions) communicative that *p*, thus giving rise to different types of failures, misunderstandings and exploitations. (By the way, this should also help clarify our interpretation of the examples made in the subsection on information extraction.)

Strong empirical evidence has been collected in neuropsychology and developmental psychology in favor of a sharedness-based approach to communication (e.g., Airenti, 1998; Bara, Bosco & Bucciarelli, 1999a, 1999b; Bara & Bucciarelli, 1998; Bara, Bucciarelli & Geminiani, 1999; Bara, Tirassa & Zettin, 1997).

2.3 Communication as Competence

The idea that communication requires primitive, dedicated mental states and specific types of inference has led to defining it as *competence*, that is, as a mental faculty that is yielded by the functioning of a distinct, innately specified mental organ (Bosco & Tirassa, 1998; Tirassa, 1997).

The main difference, with respect to other competence-based theories that have been proposed for language (Chomsky, 1980), for visual perception (Marr, 1982), and in much evolutionary psychology (e.g., Cosmides & Tooby, 1994; Cosmides, Tooby & Barkow, 1992), is that communicative competence is here defined in terms of mental states instead than of computational submechanisms. This has both a philosophical import (Tirassa, 1999a) and some remarkable consequences on how the architecture of the human mind/brain is conceived of (Tirassa, 1999b).

In the next sections we discuss some relationships between communicative competence, viewed as a specific mental process, and the superficial means that humans may actually employ in order to express and understand each other's communicative meanings in dialogue.

3. Communicative Actions and Communicative Meaning

We have defined communication as intentional social activity overtly aimed at affecting a partner's mental states via the joint movement on a (one-sided) shared common ground that is (one-sidedly) built, updated, and maintained by the interlocutors.

Communicative meanings are then to be dealt with in terms of ascription. The meaning of a communicative action is that which each agent involved shares with the other about a certain event (like an utterance) brought about by one of them. Thus, if Ann points at the door while communicating with Bob, the communicative meaning of her action is to be found in the interpretation that they share of it: e.g., as a request to him to leave the room, if they are quarreling; as a request to him to open the door, if someone has knocked, and so on.

This position may be contrasted, on the one hand, with the idea that the common ground is objectively given to the interlocutors, something which they can or cannot access, and, on the other hand, with the idea that certain actions are intrinsically endowed with a communicative meaning that they just convey to the interlocutor. In our account, actions have no communicative meaning *per se*: their communicative meaning is instead to be found in the mental states that each party takes as shared with the other. Therefore, the literal interpretation of an utterance has no primacy in the comprehension of its communicative meaning: there exists no fixed, pre-defined repertoire of communicative meanings or actions. Communicative meanings are instead created here and now as the shared construction of each agent involved.

It is a consequence of his account that it will sometimes happen that each interlocutor ascribes a different communicative meaning to a certain action, while mistakenly taking it as shared with the other. This may give rise to failures and misunderstandings that, however clear from a "God's eye" viewpoint, will only become manifest to the agents when an actual breakdown occurs, e.g., when one acts so to make it impossible to the other to still believe (or assume) that the communicative meaning she gave to a previous utterance is indeed shared.

4. Types of Communicative Actions

While communication *per se* is better described at the level of the mental states involved, communicative actions may be superficially realized in several ways. We will distinguish here between *linguistic* and *extralinguistic* modes of expression, describing the former as the communicative use of a symbol system and the latter as the communicative use of a set of symbols.

4.1 Linguistic Communication

Linguistic communication is the communicative use of a symbol system. Language is compositional, that is, it is made up of constituents rather than parts. This means that linguistic expressions may have either an atomic or a molecular structure; the constituents of a molecular expression may be either atomic or molecular in their turn. The semantic content of a molecular expression depends on its overall (syntactic) structure as well as on the semantic content of its constituents.

Thus, the meaning of a sentence like "The cat is under the table" results from the meaning of its constituents ("the cat," "is," "under the table") and subconstituents down to the atomic level ("the," "cat," "is," "under," "the," "table") and from the overall structure in which they are arranged ("the cat is under the table" rather than "the table is under the cat", or "table the under the is cat").

Compositionality allows for the following characteristics of language:

1. *Systematicity*. Language is not punctuated: the capability of dealing with (that is, generating, understanding, drawing inferences from, etc.) certain sentences is intrinsically (that is, non arbitrarily) connected to the capability of dealing with certain other sentences. Thus, an agent who is able to deal with the sentence "The dog chases the cat" should also (and, crucially, for the very same reasons) be able to deal with sentences like "The cat chases the dog" or "The policeman chases the thief" and so on – provided, of course, that the relevant lexicon is available.

2. *Productivity*. Linguistic competence allows an agent to deal with an indefinite number of meanings: an individual who can deal with abstract compositional meanings (like "*x* chases *y*," or, in general, "*x*

does *f* to *y*”) will also be able to deal with an indefinite number of particular instances of theirs.

3. *Possibility of displacement*. The spatial and temporal frames of reference to which language points may be different from the actual ones. This may require that predefined, special-purpose indicators (like “yesterday” or the past tense of verbs) be used, but what is important is the capability of systematically creating dislocated frames of reference, like “at place *p*” or “at time *t*,” where *p* and *t* may be substituted for by whole domains of referents.

Let us be clear that we are not taking any specific stance as to the nature of linguistic competence; in particular, we do not subscribe to the views that syntax is a set of unconscious rules represented in the mind/brain or that cognition consists in the linguistic (that is, syntactic) manipulation of symbols. What we are saying is only that linguistic communication may be viewed as *the communicative use of* a symbol system that is shared among the interlocutors.

4.2 Extralinguistic communication

Extralinguistic communication in the human species comprises an array of activities like gestures, drawings, melodies, rhythms, etc.; our focus here will mainly be on gestures.

A distinction needs first be drawn between communicative and noncommunicative gestures. It follows from our discussion of the various types of social interactions that gesticulations accompanying speech, paralinguistic phenomena (prosody, intonation, and so on), facial or postural manifestations of emotions, etc. are generally noncommunicative. An agent’s mental states may certainly be modified by the actress’s gesticulating, frowning, or blushing, but this is an instance of communication only insofar as he construes it as intentional on her part; else, it is better viewed as an instance of information extraction. (Of course, the actress may so exploit the addressee’s inferential powers as to have him infer something – once again, this is only communicative insofar as it is overt).

Let us instead remind that sign languages like American Sign Language or Lingua Italiana dei Segni have a linguistic, not a gestural, nature. They have an arbitrary lexicon and an arbitrary, compositional, and productive syntax, and their patterns of acquisition in the child and of decline after neuropsychological damage, as well as the brain areas involved, are the same of “normal” language (Petitto, 1987; Poizner, Klima & Bellugi, 1987).

Both points relate to our position that communication and the events that realize it do not have a behavioral or objective nature: the generation and the comprehension of communicative actions are better understood in terms of communicative meanings and mental processes, therefore in a mentalist framework.

Extralinguistic communication is the communicative use of an open set of symbols. That is, it is not compositional: it is made up of parts, not of constituents. This brings to crucial differences from language:

1. *Associativity*. Extralinguistic communication has no systematicity. The communicative meaning of each symbol ends in itself: there is no superordinate, molecular structure. This does not mean that symbols have to stand alone: they may partake in complex communicative actions, whose communicative meaning is however construed by association (that is, juxtaposition) rather than composition. If Ann points at Bob and then at the window with the intention to communicate to him that she wants him to close it, her action is extralinguistic in that it is not compositional: the deictic symbols for “Bob” and “the window” are instead juxtaposed. Of course, she might have achieved a similar effect by producing a linguistic action like uttering “Would you please close the window, Bob?”. An agent’s choice between the expressive means available to her depends on several factors which we will not discuss here and allows further inferences on the part of the partner's.

2. *Practical constraints on productivity*. In principle, even in the absence of a compositional competence, the set of extralinguistic actions available to a community of human agents is open, that is, it has an indefinite size, as yielded by our capability of conventionalizing and learning. In practice, however, to go beyond certain limits would pose insuperable problems in terms of acquisition, memory, recognition, reasoning, etc. Thus, there often is little point in adding a new gesture which will probably be used once and never again: such accretion is more useless than impossible and, in any case, would not be *productive* in the same sense in which language is, that is, as an intrinsic competence feature and a consequence of compositionality.

3. *Irrelevance of displacement*. To point to a spatially or temporally remote frame of reference is not logically impossible in extralinguistic communication: people might, in principle, share gestures for "in the year 1962" or "in North-Western Italy." The problem is that there is no structure for the systematic generation and understanding of these expressions, such as to make it intrinsically possible to generate and understand analogous gestures for "in the year 1963, 1964, …" or "in North-Eastern, Central, Southern, … Italy," and so on. Displacement in extralinguistic communication is thus impossible, or useless, in practice, rather than in principle. This is again a consequence of its noncompositional nature.

5. Conclusions

Our discussion of human communicative competence and of its modes of expression is not cast at the behavioral level, because that is not the right level at which to capture these phenomena (or, for that matter, any mental phenomenon). Actions are neither intrinsically communicative nor intrinsically linguistic or extralinguistic: instead, their nature is better viewed as a matter of processing.

Communicative actions are typically made up of a complex mixture of linguistic and extralinguistic aspects. Each component of the cognitive system will process anything it can: the communicative meaning will result from the balance of these different activities.

Thus, the language module will process whatever aspect of the situation looks like language, no matter whether the input is auditory, visual (e.g., reading, reading lips, reading a sign language, etc.), tactile (e.g., Braille) etc. To say that something "looks like language" should be referred to the types of regularities that the language module can capture in the event observed. Simultaneously, other cognitive subsystems will process other aspects of the communicative situation, that will be called extralinguistic and referred to other types of regularities in the event observed.

A remarkable example of cooperation between the different subcomponent of communicative competence can be observed when we encounter a text in a foreign language we do not speak: we look for recognizable parts of the text (like words that resemble those of some language we speak) and use them to build associations and fragments of sentences, stretching our linguistic and extralinguistic knowledge to their maximum extents.

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LANGUAGE, LOCATIONS AND PRESUPPOSITION

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ABSTRACT. This paper examines the claim that English is committed to the existence of locations in the light of recent work in linguistics by Susan Rothstein. It clarifies that claim, presents Rothstein's discovery, and then argues that her work is more significant for the present issue than related work in logic by David Kaplan. Some might be tempted to draw the conclusion (à la McKinsey) that the existence of locations is analytic, whilst others might conclude only that English encodes a (possibly false) theory according to which locations exist. I suggest a different approach: whether or not locations exist, English contains expressions whose job it is to refer to locations, just as it contains expressions whose job it is to refer to objects.

Keywords: language, location, presupposition, English, expression, object

1. Introduction

Could it ever be right to say that a language – as opposed to a speaker of the language – makes, or presupposes or somehow commits itself to certain claims? Such as that certain kinds of objects exist, or that things are a certain way? It can be tempting to think not, to think that languages are just the neutral media through which speakers make claims. Yet certain, surprisingly diverse, phenomena – analyticity, racial epithets, object-involving direct reference, arithmetic, and semantic paradoxes like the Liar – have pushed philosophers towards views according to which languages can have presuppositions or commitments of their own – to things like the existence of numbers, the marital status of bachelors, the existence of water, and even to contradictions or morally abhorrent views.

In this paper I want to present some recent data from linguistics that supports a less commonly discussed, and rather surprising version of the idea that a language can be non-neutral: namely the claim that English presupposes the existence of locations or places. In section one I do some work to clarify what this claim could possibly mean by identifying some central ways in which languages have been thought to presuppose various things about the world. In section two I present the core of the linguistic data and theory from the work of Susan Rothstein. In section three I compare it to some older work by David Kaplan, arguing that the significance of the new results is greater for the issue at hand, and then in the final section I examine the philosophical significance of this work. One might attempt to draw quite impressive conclusions: such as that the existence of space is analytic, and hence a priori. I will argue that such a conclusion here would be over hasty, and that what we really have is just a surprising fact about our not-so-neutral natural language.

2. Languages and Presupposition

Recent work in linguistics by Susan Rothstein (Rothstein, 2009) suggests that the English language presupposes the existence of certain kinds of objects – locations – where locations can be understood in a fairly intuitive way, as the kind of thing speakers commit themselves to the existence of when they utter sentences like:

(1) The place where we're going is beautiful.
(2) Sarah is hiding in the same place as Tony.
(3) Where we're going is beautiful.

Let's distinguish five ways in which a language might be said to be committed to a certain claim. First, the claim might be expressed by a sentence that is analytic in that language. Thus if "all bachelors are unmarried" is an analytic sentence of English, then we will say that English is committed to the claim that all bachelors are unmarried. If the language has no analytic sentences, or if analytic sentences do not express genuine claims, it follows that it is not committed to any claim in this way. (Herzberger, 1965; 1967)

Second, it might be part of the way the language is structured that much of it can only be useful for describing the world if the world also has a certain kind of structure and contains certain kinds of thing. For example, suppose a language consists of two kinds of expression, simple names, which have the task of denoting objects, and simple predicates, which have the task of attributing properties to the objects so-denoted. Hence, it might be that "P" is a predicate and "a" a name, and "Pa" a sentence that is true iff the object denoted by "a" has the property attributed by "P". If all the language were structured like this, it would be reasonable to say that it presupposed i) that there are objects and ii) that there are properties. For if there were not – if the world were a swimming, unstructured void empty of objects and properties – then the language would be next to useless for describing it.

Third, and more weakly, we might say that a language presupposed a claim if many of the sentences that are normally taken to be true in it could not be true unless this claim were true. Two fairly extreme examples will serve to show how broad a category this is: one might say, in this sense, that the language of arithmetic presupposes the existence of numbers, for many of its sentences which we take to be true could not be true unless numbers exist. But similarly, one might also say that certain African languages presuppose the existence of witches, since many of sentences that are taken to be true by many of their speakers could not be true unless witches exist. From this latter example I think it is clear that this is not the most interesting sense in which a language can be said to presuppose the existence of something.

Fourth, one might take languages to be committed to the existence of the objects which occur in the propositions which they express. To take a more obvious example, a language in which "Hesperus is bright" expresses a Russellian proposition containing the object Venus, might be taken to presuppose the existence (at least at some time in the past) of Venus. After all, if this were not true, the language could not be as it is. A less obvious example might be that a language in which "Hesperus is bright" expresses a proposition composed from the senses of "Hesperus", "is" and "bright" might be said to presuppose the existence of senses. More generally, one can think of languages as relations between expressions and meanings[1] and to presuppose the existence of those meanings – whether those be propositions and the constituents of propositions, or characters, or denotations or whatever other kinds of meaning there are.

And finally, there is the kind of presupposition that comes from conventional implicature. (Grice, 1991) It has often been remarked when discussing racial epithets for example, that if you hold a certain kind of view (such as that the colour of one's skin is not interestingly related to one's value as a human being) then there are certain words (such as "nigger") that one will simply not use. A plausible explanation for this is that the use of such words – in any sentence or its negation – conventionally implicates the negation of the claim you hold. In which of these senses, does Rothstein's work suggest that English presupposes the existence of locations? In order to answer this question it I need to present her view in a little more detail.

3. Locative Semantics for English

Rothstein employs functional type-theory in order to give a semantics for English. Such a theory normally assumes that there are at least two basic types: *d*, which is the type of an expression which denotes an object, and *t*, which is the type of expression which denotes a truth-value.[2] Other types are derived from these basic ones. For example, $\langle d, t\rangle$ is the type of expression which applies to an expression of type *d* to produce an expression of type *t* (that is, it is the type of unary predicates) and $\langle\langle d, t\rangle, \mathrm{t}\rangle$ is the type of expressions which are applied to unary predicates to produce expressions of type *t* (that is, the type of quantifiers, or of names.) $\langle\langle d, t\rangle, \langle d, t\rangle\rangle$ is the type of an expression that when applied to a predicate produces another predicate. An example of an expression of this latter type might be the copula "is", that when applied to the predicate "black" produces the predicate "is black."

Against this background, Rothstein argues that English employs a further basic type, namely that of locations, l. l is the type of locative prepositional phrases (PPs) such as those in italics below:

(4) John is *at the supermarket.*
(5) *Inside the station* you can buy stamps.

One might also take it to be the type of locative indexicals and demonstratives like "here" and "there", as in

(6) I am *here*.

(7) We should set up camp *there*.

Adding a further basic type to the theory brings many derived types with it, and so we will also have expressions of type $\langle l, t\rangle$ (predicates of locations), and expressions of type $\langle\langle l, t\rangle, t\rangle$ (quantifiers over locations) etc.

As it stands, this is an intriguing idea, but one pressing question about it is why we need to add locatives as a separate type, instead of just including them as members of d. The plain old set of expressions of type d surely contains expressions which refer to many different kinds of objects – red objects, abstract objects, times, reasons, satisfactions, successes, beliefs – why think locations need to be included explicitly in our semantics, if red objects and satisfactions do not?

This is one of the questions for which Rothstein's work provides an answer. Her data concerns observations about relative clauses. Relative clauses often contain an expression called a "complementiser", such as "that" or "which":

(8) The apple *which* John ate was from the store.
(9) The pear *that* Mary ate was from the garden.

This complementiser is sometimes obligatory – meaning that the sentence will be ungrammatical if it is left out – and sometimes optional – meaning that the sentence will be grammatical with or without it. In (9) and (10) it is optional, and as a result (11) and (12) are perfectly good sentences:

(10) The apple John ate was from the store.
(11) The pear Mary ate was from the garden.

However in (13) the completementizer is necessary, making (14) ungrammatical:

(12) The market where Sally bought the apple is new.
(13) *The market Sally bought the apple is new.

One might expect the explanation of this to be connected to the position of the gap in the relative clause: in (9) the gap in the relative clause is in argument position, whereas in (13) it is in adjunct position. However, there are relative clauses whose gaps are in argument position where the complementiser is obligatory:

(14) The shelf where I put the book.
(15) *The shelf I put the book.

Rothstein argues that the correct generalisation concerns not the position of the gap in the relative clause, but the semantic type of the variable filling the syntactic gap, and thus the semantic type of the relative clause as a whole. We take the semantic type of an ordinary relative clause like "which Mary ate" to be $\langle d, t \rangle$ and of a locative relative clause like "where I put the book" to be $\langle l, t \rangle$. We can think of "which Mary ate" as denoting the set of things eaten by Mary, and "where I put the book" as denoting the set of locations where I put the book. Predicates like "shop", "shelf" and "book" are also taken to have semantic values that are functions from entities to truth-values $\langle d, t \rangle$, and "place" to have a type $\langle l, t \rangle$.[3] Rothstein's data suggests that complementiser deletion is allowed in just the cases where the type of the relative clause matches that of the predicate. To illustrate:

(16) The apple Sally ate is P.
(17) *The market Sally bought the apple is P
(18) The place Sally bought the apple is P.

In sentence (16) there is no mismatch; "apple" and "which Sally ate" are both of type $\langle d, t \rangle$, and so complementiser deletion is allowed. In sentence (17) however there is a mismatch; "market" is of type $\langle d, t \rangle$ whereas "where Sally bought the apple" is of type $\langle l, t \rangle$. Hence the theory predicts that no deletion is allowed and this explains the badness of (17). In (18) however, both "place" and "where Sally bought the apple" are of type $\langle l, t \rangle$ and hence deletion is allowed.

If Rothstein is right then English distinguishes between locations and other kinds of entity and allowing such a distinction allows us to explain why certain sentences are good English, and others are not. Moreover, English presupposes the existence of locations in at least senses 2 and 4 outlined above. It allows direct reference to locations, suggesting that if locations do not exist, then the expressions would not have the meanings that they have. Moreover some English expressions express functions from locations to truth-values. These expressions would be useless for describing the world if there were no locations, much as colour-predicates would be useless for describing the world if there were not objects with extension.

4. Kaplan's LD and the "Is" of Location

Rothstein's semantics is strongly reminiscent of one of the less well-trampled sections of Kaplan's "Demonstratives." (Kaplan, 1989a;b) Kaplan's logic LD (for "Logic of Demonstratives") is an unusually rich one. LD is not only a quantified modal logic (already too rich for some tastes), but a quantified multi-modal logic (containing both alethic and tense modal operators) with contexts (to allow for the characterisation of indexicals as context-sensitive expressions), and with all that machinery perhaps it is not surprising that commentators rarely get as far as remarking that LD is also a two-sorted logic, which is to say that it uses two different kinds of variable, in this case, one kind that ranges over ordinary entities, and one kind that ranges over places.

The arity of a predicate in LD must then be represented by a ordered pair of numbers $\langle x, y\rangle$, in which the first is the number of individual-terms it takes, and the second is the number of place-terms. Kaplan's logical predicate "Located', for example, has an arity of $\langle 1, 1\rangle$, meaning that it takes one individual term and one place term, as in sentence (19), which is a well-formed formula in LD.

(19) Located (I, Here)

But there might also be ordinary unary predicates of individuals (arity $\langle 1, 0\rangle$) as well predicates which take only place-terms, such as "Between(London, New York, Moscow)" which has arity $\langle 0, 3\rangle$).

Two-sorted languages like this are sometimes seen in philosophy when 2nd-order logic is being introduced – one distinguishes variables that range over objects from variables which range over properties – but given its unusualness in the present context it is surprising that Kaplan doesn't say more, or indeed anything, to motivate this aspect of his logic, either in "Demonstratives" or in "Afterthoughts."

Rothstein's and Kaplan's projects have some striking similarities, but there are two reasons to think that – to the extent that we are concerned solely with the possible commitment of English to the existence of locations – Rothstein's work has greater significance. First, few logicians would take the presence of something referred to as a "possible world" in a structure to be making claims about whether there is or is not such a thing as a possible world. Similarly it is hard to see anyone taking the presence of locations in Kaplan's structures as making a claim about the existence of such things. Structures are mere instruments (though sometimes very suggestive instruments) for use in describing the relation of logical consequence on a set of sentences. Secondly, the language of LD is not English, nor any other entrenched natural language, but an invented, formal language which includes sentences like "$\forall x Located(x, here) \rightarrow Exists(x))$." Even if it could be justified, the claim that the language of LD is committed to the existence of locations does not entail that English is committed to the existence of locations.

Yet comparison with Kaplan's work still suggests some fruitful questions about Rothstein's semantics. For example the language of LD contains predicates that are mixed; they take both individual- and location-terms. Rothstein argues that the English word "place" is a one-place predicate of locations $\langle l, t\rangle$, but are there any mixed predicates? Looking at Kaplan suggests that the "be" in the philosophically controversial sentence:

(20) I am here.

is a natural candidate.

But a moment's reflection also reveals that we are phrasing our question for a logician, and not for a functional type theorist. To the question above such a theorist could at-footedly reply that there can be no mixed predicates, simply because there are no non-unary predicates. But a comparable phenomenon within Rothstein's system would be this: We take the ordinary copula "be" to be of type $\langle\langle d, t\rangle, \langle d, t\rangle\rangle$. Could there also be a "be" of type $\langle\langle l, t\rangle, \langle d, t\rangle\rangle$, that is, a copula that turns a predicate of a location (here) into a predicate of an individual (is here)?

Philosophers since G.E. Moore (Moore, 1962) have distinguished the "is" of predication from the "is" of identity, a distinction that is retained in the linguist's distinction between equational and predicational statements. Rothstein's work suggests there might be a third "is": the "is" of location.

5. Significance

What exactly are the ontological and epistemic consequences of Rothstein's linguistic thesis? If English presupposes the existence of locations, does it follow that locations exist? Is it analytic and therefore a priori that locations exist? I doubt it. Though some might think that English's presupposition (in sense 2) of locations hands us a transcendental argument for the existence of locations, e.g.:

Our language could not be the way it is if there were no locations.
Our language is the way it is.

Therefore, there are locations.

this argument seems as suspicious and paradoxical as McKinsey's famous argument for the existence of water (McKinsey, 1991) which was also based on presupposition in sense 2.

It is the presupposition of locations in sense 4 (according to which the language would not be useful unless the items in question existed) which promises less chimerical metaphysical and epistemological consequences. Some might think that in this case it gives us a defeasible argument in favour of the existence of locations: language only retains expressions which are useful, and the very usefulness of a concept is evidence that it is grounded (to use Jenkins' phrase) or at least satisfied, and so the marking of locations in English is evidence that there are locations. (Jenkins, 2005)

Yet contemporary physics teaches us that locations don't exist, at least not in the intuitive sense according to which a location is somewhere you could come back to at a later date. What we are left with is spacetime points. This is true despite the fact that thinking in classical Newtonian terms – according to which there are locations one may return to at a later date – is useful. Maybe more useful (because easier) for most purposes than thinking in terms of the theories of relativistic physics. It would seem that even if presence in our language entailed usefulness, usefulness does not entail existence.

Another approach that might be taken is Peter Unger's slightly mystical-sounding one, according to which languages may encode the theories of earlier speakers (where here there is no presumption, defeasible or otherwise, of accuracy):

> As it has to other philosophers, there occurred to me the idea of a theory of things embodied in our language, inherited from an ancestor language, or languages. ... The theory in our language represents the thinking, conscious or not, of people a very long time ago. These people were instrumental in the development of our language, by way of creative impact on one or another key ancestor of it. Their language was, or their languages were, developed to express an old theory. (Unger, 1971: 5)

If this is the right way to think of this kind of presupposition in language – as representing a kind of folk-theory – then the ontological and epistemic consequences would seem to be minimal: it just isn't that exciting to learn that people used to think that there were locations.

My preferred response is a lot like one of Frege's in "On Sense and Reference" and it has more significance for the right way to approach the philosophy of language than it does for metaphysics or epistemology. Frege has just argued that the Bedeutung (denotation) of a name is an object, namely, its referent. But then he considers an objection from people who don't believe in ANY objects:

> Idealists or sceptics will perhaps long since have objected: "You talk, without further ado, of the Moon as an object; but how do you know that the name 'the Moon' has any Bedeutung? How do you know that anything whatever has a Bedeautung?" I reply that when we say "the Moon", ... we presuppose a Bedeutung. ... Now we can of course be mistaken in the presupposition, and such mistakes have indeed occurred. But the question whether the presupposition is perhaps always mistaken need not be answered here; in order to justify speaking of the Bedeutung of a sign, it is enough, at first, to point out our intention in speaking or thinking.
>
> (Frege, 1985: 156)

Frege would not infer from the presence of names in our language that idealism is false (because objects exist). Similarly, we should not infer the existence of locations from the existence of locatives in our language.

My view is not exactly like Frege's: I tend to think in terms of the public language more than Frege did, and so I am less inclined to say that it is the utterer's immediate intentions – as opposed to the public meanings of the words – which make the difference between some- thing being a naming-expression or not, and similarly, which make something a locative expression, or not. I still think something similar to Frege though, and that is that even if there were no objects, there are expressions whose job it is, if you like, to refer to objects, and even if there are no locations, there are expressions whose job it is to refer to locations, and others whose job it is to express properties of locations. This teleology does not come from nowhere – it is presumably related to speaker intensions in some way. Perhaps the locatives fail sometimes. Perhaps they fail always. But referring to places is still what these tools are for. If physicists tell us that there are no locations, then that just means that we have constructed a hammer, though there is no nail out there to be struck.

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NOTES

1. I say "relations" rather than "functions", since one might take expressions to have several kinds of meaning – characters, contents etc.

2. Montague originally used *e* for entity, instead of *d*, but Rothstein follows (Landman, 2000) in using *d* to avoid confusion with *e* when it is used in event theory.

3. Rothstein also gives independent evidence for the claim that "place" is of type $\langle l, t \rangle$.

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EVOLVING THE LINGUISTIC MIND[1]

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ABSTRACT. It is sometimes suggested that we can think "in" natural language. According to this "cognitive" conception of language, we have a linguistic mind, or level of mentality, which operates by manipulating representations of natural language sentences. This paper outlines two evolutionary questions that the cognitive conception must address and looks at some versions of it to see which provides the best answers to them. The most plausible version, I argue, is the view that the linguistic mind is a virtual system (a "supermind"), which arose when early humans learned to engage in private speech and to regulate it using metacognitive skills originally developed for use in public argumentation.

Keywords: language, natural, cognitive, mind, linguistic, representation

1. Introduction

It is sometimes suggested that we can think "in" natural language – that natural language not only serves as an input-output system for cognition but is also centrally involved in cognition itself. According to this view, sometimes called the *cognitive conception* of language, we have a linguistic mind, or level of mentality, which operates by accessing and manipulating representations of natural language sentences (e.g., Bickerton, 1990, 1995; Carruthers, 1996, 1998b; Dennett, 1991; Harman, 1973). This view has attractions; there are theoretical reasons for endorsing it and introspection supports it, too. However, I shall not be defending the cognitive conception here. Instead, I shall be asking how a linguistic mind might have evolved.

I begin by outlining two evolutionary questions that a satisfactory version of the cognitive conception must answer. I then look at some versions of the doctrine and ask which provides the best answers to these questions. This will give us a reason for preferring that version, should we decide to endorse the cognitive conception in the first place.

2. An Evolutionary Perspective

Many questions arise once we adopt an evolutionary perspective. For the present, however, I shall concentrate on just two.

How? How did natural language become involved in central cognition? It is widely accepted that the language faculty is a modularized, peripheral system, which is relatively encapsulated from the rest of cognition and which originally evolved for communicative purposes. How did such a system come to play a role in *central* cognition (that is, in flexible, intelligent, nonencapsulated, conscious thought)?

When? When did language-based cognition evolve? Most writers agree that fully fledged grammatical language evolved some time within the last quarter of a million years, and some place its emergence as late as 50,000 years ago. This does not leave much time for the subsequent development of language-based cognitive mechanisms – not, at any rate, if this would have involved substantial alterations to neural anatomy.

Any satisfactory version of the cognitive conception must address these questions, and any version that conspicuously lacks the resources to do so can be ruled out in advance. So, for example, I think we can rule out the hypothesis that a separate language-based general-purpose reasoning system evolved subsequently to the emergence of language. There would simply have been no time for such a system to develop. There remain, however, a number of viable candidates.

3. Language and the Off-line Mind

According to Derek Bickerton, language and central cognition co-evolved (Bickerton, 1995). Bickerton argues that structured non-demonstrative thought ("off-line thought" as he calls it) requires a system of schematic representations and a set of combinatorial principles defined over those representations. Language, too, requires a set of schematic representations and a combinatorial syntax, and parsimony suggests that the same neural resources play both roles.

This suggestion has attractions. If Bickerton is right, then there is no problem of how language got involved in central cognition; it *is* central cognition – at least, in so far as central cognition involves off-line thinking. The "when" question is also dispelled. There was no need for further adaptation after the development of language; the development of fully grammatical language was also the development of structured off-line thought.

The proposal has some serious drawbacks, however. I shall mention two. First, it is unlikely that language possessed cognitive functions from the very start. For it would have been simpler to build a purely communicative language system than to build one that had both communicative and cognitive functions. A communicative language system requires only syntax, phonology, and comprehension systems, together with a lexicon. And while these could be adapted to play a role in cognition, they would not in themselves constitute a cognitive system. Additional subsystems would be required, in particular, some sort of central processor. (Syntax alone might give you structured *thoughts,* but not structure-sensitive *thought-processing*.) But if it would have been easier to construct a purely communicative language system than one that also had cognitive functions, then we should expect the former to emerge before the latter – assuming (as seems plausible) that purely communicative language would itself have carried significant benefits.

Second, the proposal overlooks evidence for modular structure within central cognition. Bickerton tends to view the whole of human central cognition as language-based, and thus to suppose that it is a fairly recent system with little inherited structure. Yet there is mounting evidence that we have lots of innate cognitive competences, realized in functionally distinct, partially encapsulated modules, which have developed gradually over the last million years or so and in many cases predate language (e.g., Barkow, Cosmides, and Tooby, 1992). Such evidence tends to undermine Bickerton's solution to the "how" problem. If the linguistic mind is not the whole of central cognition, then how is it related to the rest of it?

4. Language and the Modular Mind

Is the cognitive conception compatible with a modularist view of central cognition? Peter Carruthers has argued that it is, building on suggestions by Steven Mithen (Carruthers, 1998a; Mithen, 1996). According to Mithen, the human mind developed in three phases. In phase 1, it consisted of a rudimentary general-purpose problem-solving system. In phase 2, this was supplemented by a number of self-contained domain-specific modules, which were fast but inflexible and did not communicate with each other or with general intelligence. Finally, in phase 3, there was a growth of "cognitive fluidity." The previously isolated central intelligences began to communicate with each other and with general intelligence, either through direct channels or through the mediation of a metarepresentation supermodule. Carruthers argues that this picture naturally supports a version of the cognitive conception. Even while remaining internally isolated, he points out, the central modules would have formed input-output links with the language faculty. Natural language would then have been the obvious vehicle for inter-modular information transfer, once the internal barriers started to come down. In this way, natural language would have come to serve as a cognitive lingua franca.[2]

I have two worries about this proposal. First, it does not amount to a full-blooded vindication of the cognitive conception – not, at least, if we take that doctrine to involve the claim that language can act as a medium of *inference* as well as *thought*. In Carruthers's scenario all the real inferential work is done within modules, using their own internal representational media, and natural language serves merely as a conduit between them. Second, the proposal does not fully answer the "how" question. A neural lingua franca may be a necessary condition for inter-modular co-operation, but it is not a sufficient one. Coherent trains of thought do not just spring into existence spontaneously; a problem has to be identified and the various modular resources deployed intelligently to its solution. Some kind of executive would be needed to marshal the problem-solving resources of the different modules and to co-ordinate their outputs. Moreover, this system would need to process sentences in a way that was sensitive to their semantic properties. But then it starts to look like the sort of hard-wired language-based cognitive processor whose existence we have already ruled out.

5. Language and the Virtual Mind

We have been thinking of the linguistic mind and the processing mechanisms that support it as *part* of the brain. But perhaps this is wrong. Perhaps it is more like a *program* running on the brain, a feature of our mental software rather than our neural hardware. Such a view has been defended by Daniel Dennett (Dennett, 1991). The modern human mind, Dennett claims, is not a biological system at all, but a *virtual machine*, the product of learned behaviours (Dennett calls them "good tricks" or "memes"), which have reprogrammed our biological brains. The behaviours in question, Dennett suggests, are linguistic. We acquire virtual minds by talking to ourselves – producing, rehearsing, and rearranging sentences in overt or silent soliloquy. This stream of private verbalization transforms the activity of the biological brain, causing its parallel, multi-track hardware to simulate the behaviour of a serial, single-track processor, operating upon natural language sentences. Dennett calls this softwired system the *Joycean machine*.[3]

This story is particularly attractive from our current perspective. There is no special problem about how or when such a virtual mind could have evolved. Its development would have involved a process of memetic, cultural evolution, rather than the emergence of new neural structures, and there would have been ample time for it to occur after the development of language.

Still, the story will not do as it stands. The problem lies in the way the Joycean machine is supposed to work. According to Dennett, the key mechanism is one of *self-stimulation*. Inner speech is channelled through a feedback loop from speech production to speech comprehension. Internally generated sentences are then processed by the comprehension system just like externally produced ones, often evoking similar responses. So, for example, questioning yourself may prompt an instinctive verbal reply, just as a question from another person might. This reply will then itself be processed by speech comprehension, like any other heard utterance, giving global neural publicity to the information it carries. In this way, information that was previously held by just one neural subsystem can be made available to them all. Dennett suggests that subsystems routinely compete for control of the vocal system and the self-stimulatory mechanisms it supports. As a result, the Joycean machine comes to act both as a bulletin board, where locally stored information is made globally available, and also as a sort of virtual executive, focusing attention, marshalling resources, and co-ordinating the activities of the different subsystems.

It is likely that inner verbalization does have a self-stimulatory function of this sort (Diaz and Berk, 1992). But this cannot be all there is to the linguistic mind. For one thing, it is doubtful that self-stimulation could generate sustained trains of intelligent thought. It might help to produce some regularity and consistency in one's inner verbalizations, but it is hard to see how it could give rise to coherent inferential sequences of the kind involved in dedicated problem-solving. In such cases, it seems, our inferential subsystems are not *competing* for vocal control, each shouting out its favoured (and not particularly bright) solution. Rather they are *co-operating*, each subordinating its activity to a global objective. And it is hard to see how they could be induced to do this without executive supervision of some sort. Second, self-stimulations will not have the cognitive role typical of linguistic thought. Consider the sort of cases that lend intuitive support to the idea that we can think in language. I notice that the steering on my car is uneven and say to myself, "The wheel alignment needs checking." Here, it seems, I am not instructing or encouraging myself to think that the wheel alignment needs checking; I am *judging* that it does. And this judgement may have long-term effects, such as getting me to the garage the following day, which a transient self-stimulation would not have.

6. Language and the Supermind

Dennett gives us part of the story, then, but important features of the linguistic mind remain unaccounted for. Can we complicate his picture in order accommodate these features? I think so.[4] The trick is to think of linguistic reasoning as, to some extent, under personal control – as something we *do*, rather than something that happens in us. The linguistic mind, I suggest, is indeed a virtual one, developed through the discovery and transmission of good tricks. However, these include, not only inner verbalization, but also various metacognitive and metalinguistic skills. We do not only speak to ourselves, I suggest; we also adopt attitudes towards our inner verbalizations and perform explicit inferential operations upon them. In particular, we adopt some of our private utterances as expressions of premises and goals, and manipulate them so as to construct chains of explicit reasoning, using learned inferential skills. I have suggested elsewhere that these activities constitute a distinct level of mentality, which is intentionally formed and sustained and which constitutively involves natural language. I call this the *supermind*. (The term is intended to capture the idea that the states and processes that constitute this level of mentality supervene on intentional states and processes at a more basic level.)[5]

This proposal retains all the advantages of Dennett's. Like the Joycean machine, the supermind is the product of memetic and cultural evolution, rather than changes in neural anatomy. Indeed, there is a plausible story to tell about how it emerged. The metalinguistic and metacognitive skills needed to develop a supermind – the ability to think about one's thoughts and words and to articulate cogent trains of argument – are just the skills needed for engaging in reasoned argument with one's peers. Such skills would have carried many benefits in early human society – in securing social influence, resources, and mates – and there would have been strong independent pressure for their development. And once they were in place, supermental abilities would have followed naturally. Humans would have begun to develop linguistic minds as soon as they started to internalize their skills in interpersonal argument, reasoning and debating with themselves. (The development of these metacognitive and metalinguistic abilities might also have involved some neural changes, of course, but these would have been minor in comparison to those involved in constructing a distinct language-based general-purpose reasoning system.[6])

This view can, I believe, resolve the problems facing Dennett's account. Take the question of executive control. For self-conscious agents, equipped with metacongitive skills, problem solving will assume a dual aspect. They will be able to think, not only about the first-order problem of what to do or think next, but also about the metaproblem of how to solve that problem. Suppose they have some general ideas about how to solve this metaproblem. So, they want to evaluate candidate hypotheses as they occur to them, preferring those that harmonize well with premises and goals they have previously endorsed, and rejecting those that conflict with them. And as a subgoal they want to trace out the implications of each hypothesis, searching for data that might confirm it or refute it or indicate how it should be revised. These desires then drive their subsequent attempts to tackle the first-order problem. As various candidate hypotheses occur to them (thrown up, let us suppose, by modules), they set to work evaluating them, in line with their metacognitive goals. They persist in this, refining and complicating their hypotheses, until they reach a solution that satisfies those goals. In this way, a person's metacognitive attitudes can *regulate* their first-order problem-solving activities. In effect, people can act as their own central executives, marshalling and directing their low-level cognitive resources.

This view also offers an explanation of how inner verbalizations can assume a direct cognitive role, rather than a merely self-stimulatory one. We can *decide* that an inner verbalization will have the role of a thought by deciding to adopt it as a premise and use it to guide inference and action. Executing such a decision will involve using one's explicit reasoning skills to make sure that the verbalized proposition has the appropriate inferential role – for example, by taking it as a premise in one's explicitly constructed syllogisms. Language-based reasoning will thus be genuinely computational, though the computations in question will be carried out at an explicit, personal level.

Of the candidates reviewed, then, I suggest that the last is the best placed to provide a full-blooded and neurologically plausible defence of the cognitive conception. If we have a linguistic mind, then it is most likely to take the form of a supermind.

NOTES

1. This is a revised version of a paper delivered at the 3rd International Evolution of Language Conference (Paris, 3–6 April, 2000) and published in the conference *Proceedings*, edited by J-L. Dessalles and L. Ghadakpour (Ecole Nationale Supérieure des Télécommunications, 2000, pp.104-8).

2. Carruthers develops these and related ideas at much more length in his 2002, 2006, and 2009.

3. This is in tribute, of course, to James Joyce's depictions of the stream of consciousness in his novel *Ulysses*.

4. The following sketch draws on my 1998a and 1998b. The ideas in question have been developed at more length in my 2004 and 2009.

5. I have argued elsewhere that the supermind corresponds to the "System 2" posited by dual-system theorists in cognitive and social psychology (Frankish, 2009).

6. Note that I am not suggesting that metacognitive processes are themselves language-based; the claim is that they *shape* linguistic thinking, not that they *constitute* it.

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WITTGENSTEIN, TURING, AND THE "FINITUDE" OF LANGUAGE

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ABSTRACT. I consider the sense in which language is "finite" for Wittgenstein, and also some of the implications of this question for Alan Turing's definition of the basic architecture of a universal computing machine, as well as some of the vast technological, social, and political consequences that have followed from it. I shall argue that similar considerations about the relationship between finitude and infinity in symbolism play a decisive role in two of these thinkers' most important results, the "rule-following considerations" for Wittgenstein and the proof of the insolubility of Hilbert's decision problem for Turing. Fortuitously, there is a recorded historical encounter between Wittgenstein and Turing, for Turing participated in Wittgenstein's "lectures" on the foundations of mathematics in Cambridge in 1939; their interactions are documented in the text *Wittgenstein's Lectures on the Foundations of Mathematics* edited by Cora Diamond.[1] Although my aim here is not to adduce biographical details, I think their exchange nevertheless evinces a deep and interesting problem of concern to both. We may put this problem as that of the relationship of language's finite symbolic *corpus* to (what may seem to be) the infinity of its meaning.

Keywords: Wittgenstein, Turing, language, philosophy, mathematics, symbolism

I

Wittgenstein's philosophy of mathematics has sometimes been described as finitist; but, as I shall argue here, his actual and consistent position on the question of the finite and infinite in mathematics and language is already well expressed by a remark in his wartime *Notebooks*, written down on the eleventh of October, 1914: "Remember that the 'propositions about infinite numbers' are all represented by means of finite signs!" (Wittgenstein 1979, p. 10) The point is neither that signs cannot refer to infinite numbers nor that propositions referring to them are meaningless or somehow otherwise out of logical order. It is, rather, that *even* propositions referring to infinite numbers – for instance the hierarchy of transfinite cardinals discovered by Cantor – must *have* their sense (and hence their capability to represent 'infinite quantities') by and through a finite symbolization, for instance through a proof of finite length. That is, it must be such a proof – given in a finite number of steps and stated in a language with a finite number of symbol types – that gives us whatever epistemic access we can have to infinite quantities and numbers. This is closely connected with the remark, made several times in the *Notebooks*, that is also destined to serve as a kind of *leitmotif* underlying the *Tractatus*' discussion of analysis, showing, and the elusive nature of logical form: that logic must "care for itself." Here, this means that all the forms of possible meaning must already show up in the (formal) possibilities of signification in a finite, combinatorial language. Wittgenstein concludes the entry for the eleventh of October by noting: "The propositions dealing with infinite numbers, like all propositions of logic, can be got by calculating the signs themselves (for at no step does a foreign element get added to the original primitive signs). So here, too, the signs must themselves possess all the logical properties of what they represent" (pp. 10–11). Thus, the problem of the meaning of the infinite is a problem of the *logic* or *grammar* of finite signs – of how, in other words, the (formal) possibilities of signification in a finite, combinatorial language can give us whatever access we can have to infinite structures and procedures.

In the lectures delivered in Cambridge in 1939, Wittgenstein proposes to discuss the "foundations of mathematics," but not in order either to contribute to the analysis and description of such foundations or to give new calculations or even interpretations of calculations in mathematics itself.[2] Rather, his aim is to remove certain misinterpretations or confusions that surround the analysis of the "foundations of mathematics," particularly with respect to what is involved in the understanding and meaning of mathematical structures.[3] Wittgenstein emphasizes that in speaking of understanding a mathematical structure, for instance a regular series of numbers or indeed the sequence of counting numbers themselves, we may speak of coming to "understand" the sequence; we may also speak of gaining a capability or mastering a "technique." Yet what it is to "understand" (to "know how to," or "to be able to," continue "in the same way") is not clear. The issue is the occasion for Turing's first entrance into the discussion, in lecture number II:

> *Wittgenstein*: We have all been taught a technique of counting in Arabic numerals. We have all of us learned to count – we have learned to construct one numeral after another. Now how many numerals have you learned to write down?
> *Turing:* Well, if I were not here, I should say $\aleph_0$.
> *Wittgenstein*: I entirely agree, but that answer shows something.
> There might be many answers to my question. For instance, someone might answer, "The number of numerals I have in fact written down." Or a finitist might say that one cannot learn to write down more numerals than one does in fact write down, and so might reply, 'the number of numerals which I will ever write down.' Or of course, one could reply " $\aleph_0$", as Turing did.
> Now should we say: "How wonderful – to learn $\aleph_0$ numerals, and in so short a time! How clever we are!"?—Well, let us ask, "How did we learn to write $\aleph_0$ numerals?" And in order to answer this, it is illuminating to ask, "What would it be like to learn only 100,000 numerals?"…
>
> I did not ask "How many numerals are there?" This is immensely important. I asked a question about a human being, namely, "How many numerals did you learn to write down?" Turing answered "$\aleph_0$" and I agreed. In agreeing, I meant that that is the way in which the number $\aleph_0$ is used.
> It does not mean that Turing has learned to write down an enormous number. $\aleph_0$ is not an enormous number.
> The number of numerals Turing has written down is probably enormous. But that is irrelevant; the question I asked is quite different. To say that one has written down an enormous number of numerals is perfectly sensible, but to say that one has written down $\aleph_0$ numerals is nonsense. (Diamond 1976, p. 31)

Notably, Wittgenstein does not, here, *at all* deny the validity of the response that Turing initially (if guardedly) offers to the question about the capacity to write down numbers. Indeed, in endorsing Turing's answer he distinguishes himself quite clearly from the finitist who would hold that the grammar of "can" goes no farther than that of "is," that I cannot justifiably say that my capacity includes any more than actually has occurred or will occur. In knowing how to write down Arabic numerals, a capacity we gain at an early age and maintain throughout our rational lives, we possess a capacity that is rightly described as the capacity to write down $\aleph_0$ different numbers. The attribution of this capacity is not, moreover, an answer to the "metaphysical" question of how many numbers there *are*; the question is, rather, what *we*, as human beings possessing this familiar capacity, are thereby capable *of*.

Yet how is this recognizably infinitary capacity underlain by our actual contact, in learning or communication, with a finite number of discrete signs (or sign-types) and a finite number of symbolic expressions of the rules for using them? It is not difficult to see this as the central question of the so-called "Rule-Following Considerations" of the *Philosophical Investigations*, some of which was already extant in manuscript by 1939 (see, e.g., *PI* 143–155; 185–240). However, we may also, I think, see this very question as *already* decisive in Turing's development of the definition of a "universal computing machine" and its application to demonstrate the unsolvability of Hilbert's decision problem in the remarkable "On Computable Numbers, with an Application to the Entscheidungsproblem" written three years earlier, in 1936, and published in 1937. Turing's aim is to settle the question of whether there are numbers or functions that are not computable; that is, whether there are real numbers whose decimals are not "calculable by finite means" (Turing 1936, p. 58). He reaches the affirmative answer by defining a "computing machine" that works to transform given symbolic inputs, under the guidance of internal symbolic "standard descriptions," into symbolic outputs.

According to what has come to be called "Turing's thesis," (or sometimes the "Church-Turing" thesis) every number or function that is "effectively" computable at all (in an "intuitive" sense of effective computability) is computable by some Turing machine, and thus that the architecture of the Turing machine indeed captures, replaces, or formalizes the "intuitive" notion of computability. The thesis is, today, almost universally accepted; however, this should not blind us to the depth of the philosophical issues involved in this particular way of understanding the nature of a technique or procedure and the kind of relation between a finite calculus and its (potentially) infinite application that it suggests. According to Turing's thesis, for instance, what it is for anything (function or number) to be calculable at all is for it to be calculable by "finite means" (here, using only a finite number of lexicographically distinct symbols and finitely many symbolically expressible rules for their inscription and transformation). Twice in the article (p. 59 and pp. 75–76), Turing justifies these restrictions by reference to the finitary nature of human cognition, either in memory or in terms of the (necessarily finite) number of possible "states of mind";[4] similarly, he supposes that we can distinguish between at most finitely many "mental states;" accordingly, it is necessary that a Turing machine can have only finitely many distinct states or operative configurations, and that its total "program" can be specified by a finite string of symbols.

These restrictions prove fruitful in the central argument of "On Computable Numbers," to show that there are numbers and functions that are *not* computable in this sense. The first step is to show how to construct a *universal* Turing machine, that is, a machine which, when given the standard description of any particular Turing machine, will mimic its behavior by producing the same outputs (pp. 68–69). Because each standard description is captured by a *finite* string of symbols, it is possible to enumerate them and to work with the numbers (Turing calls them "description numbers") directly (pp. 67–68). Given that we know how to construct a universal machine, we now assume for *reductio* that there is a machine, H, that will test each such description number to determine whether it is the description number of a machine that halts when given its own description number as an input (p. 73).[5] It does this by simulating the behavior of each machine when it is given its own description number as an input. We also know that H itself, since it always produces a decision, always halts. However, the machine H itself has a description number, K. Now we consider what happens when the hypothesized machine considers "itself," that is evaluates whether the machine corresponding to the description number K halts. We know by hypothesis that the machine H halts; however, as Turing shows, it cannot. For in considering K, the machine enters into an unbreakable circle, calling for it to carry out its own procedure on itself endlessly. We have a contradiction, and therefore must conclude that there can be no such machine H.[6]

The result at the heart of Turing's paper is thus an application of the general formal or metalogical procedure, first discovered by Cantor, known as "diagonalization." The procedure underlies Cantor's own identification of the transfinite cardinals, as well as Gödel's two incompleteness theorems. Gödel's application of a procedure of "artithmetizing" syntax is, indeed, quite similar to Turing's numbering of the Turing machines; and as Turing points out, Gödel's first theorem is indeed itself an implication of his own result.[7] It is no accident that both of these decisive results of metalogic rely on what Turing calls an application of the "diagonal procedure," in which the enumerability of syntax (here: of standard descriptions) is the key to the possibility of an application of the regular structure of a symbolic system to "itself," and hence to produce a particular local configuration (the Gödel sentence or Turing's machine H) that stands, almost paradoxically, both within and without the system whose logic it captures. As Graham Priest (2002) has recently argued, the general structure of diagonalization can in fact be seen as underlying an exceedingly wide variety of problematic and paradoxical results in the history of philosophy, whenever theoretical reflection grasps the limits of thought in their (paradoxically thinkable) determinacy. With respect to language, this is equivalent to the attempt, common to Gödel and Turing, to model the formal capabilities of a system within that system itself, by way of arithmetization or enumeration. It is in this way that the determining syntax of the system – the rules determinately responsible for all of its capabilities – are captured and metalogically reflected "back" into the system itself, producing the point of undecidability or indeterminacy.

The basis for this possibility in the results of Gödel and Turing alike is the possibility of "numbering" symbolic strings and so intervening on them. In this respect, one can say that diagonalization (whatever else it may be) is *always an intervention on symbolic expressions*; that is, it depends in a decisive way on the fact that meaningful procedures are *necessarily* captured, if at all, in a combinatorial symbolic expression that itself combines one or more signs according to definite rules. That is, diagonalization is in each case an intervention, not on procedures or numbers themselves, but on the *ways* procedures and numbers are necessarily expressed by means of finite strings of finitely many distinct symbols. This syntactical reference is essential for all forms of diagonalization, and it may thus be seen that the possibility of diagonalization and its results depends *essentially*, in each case, on the fact that language must make use of finitary means – a finite stock of symbols and a finite expression of rules – to accomplish its infinitary powers of symbolization.[8]

Now, it is familiar that Wittgenstein held, in general, a dim view of the purported *results* of various forms of the "diagonal procedure," including both Cantor's multiple infinites and the truth of Gödel's "self-referential" sentence. Do these doubts, expressed prominently in the *Remarks on the Foundations of Mathematics*, imply that there is not a very similar concern about the relationship of finite symbolism to infinitary techniques operative in Wittgenstein's own thought about rules and symbols? I think not, for the following reasons. In his critical remarks about the Gödel sentence as well as about Cantor's multiple infinities, Wittgenstein emphasizes that the existence of a procedure – even one with no fixed end, like the procedure of writing down numbers in Arabic numerals – does not imply the existence of a superlative *object*, either a "huge number" or a completed list of decimal expansions that itself contains "infinitely many" members. To a certain extent at least, these suspicions extend to the "diagonal procedure" itself. Though Cantor can, with some justice, say how one *can* generate a decimal expansion that, as one can show, does not appear anywhere on an "infinite list" of expansions, he has not *in fact* generated it; diagonalization is always in fact the "outcome" of an infinite procedure and cannot be said to have finished. However, Wittgenstein does not deny that there *is* such a procedure, and even that we can speak of it, with some justice, as one that shows (by giving sense to the proposition) that there is, for any set of decimal expansions, one that is not in this set (*RFM* II-29). Cantor has given us a procedure that allows us to say: *given* any series of numerical symbols, we *can* (i.e. we have a method that lets us) generate a different one. However, in understanding the possibility and implications of this procedure, we must also keep in mind that there is a difference between series of numerical *symbols* and series of *numbers* in the mathematical sense. *A series in the mathematical sense is not a sequence of signs but a method for generating sequences of signs*.[9] There are analogies between the two uses, but they are different; and given the difference, Wittgenstein suggests, the existence of a sign ("$\aleph_0$") that expresses the unlimited possibility – the unlimitedness of the method – of generating sequences of signs does not by itself ground a further calculus with this sign, for instance one relating it to "other" infinities or other sizes of infinity. Nevertheless, as we have seen, it is just this ambiguity between sequences of signs and methods for generating sequences of signs upon which the claim of diagonalization to establish "positive" results depends. Diagonalization intervenes upon what are in fact sequences of signs (series in the non-mathematical sense) to produce a new number, a new sequence of signs which may itself be unlimited. What operates in this ambiguity, and creates the "crossing" at infinity (real or illusory) between procedures and their symbolization that is essential to diagonalization, is our presumed *infinitary* capacity to produce symbols according to well-defined rules.

In adducing these distinctions and casting doubt on the positive results of diagonalization, Wittgenstein's point is emphatically not, however, to show the nonexistence or invalidity of diagonalization as an (infinitary) *technique*. Rather, it is to emphasize the extent to which this procedure or technique, as infinitary as it is, has a place within a human life, and does not derive its meaning or sense from any other source than this life itself. Much later, in *RFM*, Wittgenstein comes back to this point:

> The concept of the rule for the formation of an infinite decimal is – of course – not a specifically mathematical one. It is a concept connected with a rigidly determined *activity* in human life. The concept of this rule is not more mathematical than that of: following the rule. Or again: this latter is not less sharply defined than the concept of such a rule itself.—For the expression of the rule and its sense is only part of the language-game: following the rule. (*RFM* VII – 42, p. 409)

Again, Wittgenstein is not here denying that there is a valid concept of the rule for the formation of an infinite decimal; nor that this rule is a rule for the formation of something that is indeed infinite. He is, rather, affirming that this formation – even in its strictness and rigidity – necessarily takes place as part of a human life, and gains its meaning and sense from this life. As it is capable of such infinite results, it would not, it seems, be quite right to call such a life, or the practice of following a rule within it (the language-game) that brings these about, "finite." Rather, the practice is *precisely* a technique: something of which beings with a finite spatiotemporal extent are capable, but whose *extension* is in principle without limit. It is thus neither the finitude of language nor the infinitude of meaning that makes possible its effect, but rather the gulf between them, in which Wittgenstein recognizes the openness of a human life.

There are, I think, two preliminary conclusions that can be drawn so far. The first is exegetical: Wittgenstein was certainly not in 1939, and probably never was, a finitist. That is, he *never* held that the finite character of language implied the non-existence or non-reality of infinite procedures. Rather, his focus is uniformly on the problem of the *grammar* of the infinite procedure: that is, just *how it is* that finite signs handled by finite beings gain the sense of infinity. This is none other than the radically posed question of the later Wittgenstein's thought: the question of the nature of a technique or practice. And it leads to the second conclusion, which is not exegetical but philosophical: that the infinity of technique is not an extension or intensification of the finite; nor is it a superlative or transcendent object that lies "beyond" all finite procedures. The infinity of technique enters a human life, rather, at the point of what might seem at first a radical paradox: that of its capture in finite signs, the crossing of syntax and semantics wherever the infinite rule is thought and symbolized as finite.

II

Given this suggestion of a rather close connection between the implication of diagonalization and the upshot of Wittgenstein's own rule-following considerations, how should we indeed view the sharply critical attitude he takes, both throughout the *Remarks on the Foundations of Mathematics* and elsewhere, toward Gödel's incompleteness theorems themselves (surely to be reckoned among the most important outcomes of the "diagonal procedure")? These remarks (where they have not been assumed to show that Wittgenstein simply "misunderstood" Gödel's result) have often been taken as support for an interpretation of his philosophy of mathematics as finitist or intuitionist, in that they have been taken as resting on a finitist denial of the utility or possibility of the "diagonal procedure." But although it is true that, as Wittgenstein reminds us, diagonalization is *essentially* an infinite procedure, he does not, as we have seen, deny its existence or possible utility. Moreover, in considering his response to Gödel, we ought to keep in mind Wittgenstein's remark in *RFM* that his purpose is not to address Gödel's proof (that is, presumably, not to affirm *or* deny it) but rather to "bypass it" (*RFM* VII, sect. 19). In particular, as Floyd and Putnam (2000) have recently argued, close attention to Wittgenstein's most notorious remarks about Gödel's proof shows that his point is not at all to deny Gödel's formal proof, but rather to suggest alternative possibilities for its interpretation. Here is the most crucial portion of these remarks:

> I imagine someone asking my advice; he says: "I have constructed a proposition (I will use 'P' to designate it) in Russell's symbolism, and by means of certain definitions and transformations it can be so interpreted that it says: 'P is not provable in Russell's system'. Must I not say that this proposition on the one hand is true, and on the other hand is unprovable? For suppose it were false; then it is true that it is provable. And that surely cannot be! And if it is proved, then it is proved that it is not provable. Thus it can only be true, but unprovable."
> Just as we ask; "'provable' in what system?", so we must also ask, "'true' in what system?" 'True in Russell's system' means, as was said: proved in Russell's system; and 'false in Russell's system' means: the opposite has been proved in Russell's system. — Now what does your "suppose it is false" mean? *In the Russell sense* it means 'suppose the opposite is proved in Russell's system'; *if that is your assumption*, you will now presumably give up the interpretation that it is unprovable. And by 'this interpretation' I understand the translation into the English sentence.—If you assume that the proposition is provable in Russell's system, this means it is true *in the Russell sense*, and the interpretation "P is not provable" again has to be given up. If you assume that the proposition is true in the Russell sense, *the same* thing follows. Further: if the proposition is supposed to be false in some other than the Russell sense, then it does not contradict this for it to be proved in Russell's system. (What is called "losing" in chess may constitute winning in another game.) (*RFM* I, Appendix III, sect. 8, pp. 118–19)

As Floyd and Putnam emphasize, although Wittgenstein does not dispute the validity of Gödel's proof itself, he raises the *question* of its correct interpretation. This does *not* involve disputing any of the mechanics that leads to the derivation of the "Gödel sentence" which "asserts" its own "unprovability." It *does* involve, however, raising a series of questions for the usual interpretation of the Gödel sentence that began with Gödel himself and has continued to be presupposed in most discussions of it. On this interpretation, the sentence shows the existence of a "mathematical truth" that cannot be proven by a formal system such as *Prinicipia Mathematica* and thus demonstrates the *incompleteness* of that system.[10]

Although this interpretation is still presupposed in virtually all discussions of Gödel's proof, it is reached, as Gödel himself pointed out, only through an essentially *informal* argument. (The argument is that *P* must be true, since if it were false "it would be true" that it can be proven, which cannot be the case, assuming the soundness of *PM*; and that since it can thus not be proven, and this is just what it "asserts," it is therefore true).[11] And although countless interpreters have followed Gödel in seeing his result as demonstrating the capacity of the human mind to grasp truths unprovable in any formal system, there *is*, as Floyd and Putnam point out, an alternative interpretation suggested by Wittgenstein's remarks. On this alternative, there is not (or at least there has not been shown to be) a unified sense of "truth" that subsumes the use of this predicate both *within* the formalism of *Principia Mathematica* and in the ordinary language in which the *informal*, metalogical argument is given. If we relax this assumption of a unified sense of "truth" between intra- and extra-systematic contexts, then we can see Gödel's formal result as having quite a different significance than Gödel himself suggests.

Specifically, recall that Gödel's first theorem constructs a sentence *P* such that, as is provable in *PM* or a related system, $P \leftrightarrow$ ~Prov([*P*]), where *Prov* is a one-place "provability predicate" and enclosure in square brackets gives the Gödel number of the formula enclosed. Additionally, the "provability predicate" itself is defined by means of the predicates NaturalNo(*x*), and Proof(*x,t*), where NaturalNo(*x*) is interpreted as "*x* is a natural number" and Proof(*x,t*) is interpreted as a relation supposed to hold between two numbers when *x* is the Gödel number of a proof whose last line has the Gödel number *t*.[12] (Here, *t* abbreviates an expression which calculates out to the Gödel number of *P* itself). All of these are, of course, interpretations, and might be resisted under the right circumstances. *In particular*, suppose we actually assume that *~P* is proven in *PM* (or, one day, actually come across a proof of it). Then we are in a position, of course, also to prove Prov([*P*]). In this case, however, as Wittgenstein points out, we might well be justified in dropping the *interpretation* that holds that Prov([*P*]) is *in fact* a provability predicate. And if we drop this interpretation, there is no need to conclude that the Gödel sentence is indeed something that is "true, but unprovable in *PM*."

How, though, might we justifiably drop the interpretation of Prov([*P*]) as "*P* is provable in *PM*"? As Floyd and Putnam point out, we might take the (successful, as we are now supposing) proof of *~P* to demonstrate that *PM* is (not inconsistent but) ω-inconsistent.[13] If *PM* is ω-inconsistent, though, then in every admissible interpretation of *PM* (i.e., every interpretation which fits at least one model) there are, in addition to the natural numbers, entities which are *not* natural numbers; and NaturalNo(*x*) can no longer be interpreted as "x is a natural number." Moreover, Proof (*x,t*) can no longer be interpreted as relating the Gödel numbers of two formulas (one of which is a proof of the other), since in every admissible model its extension will contain some elements that are not natural numbers at all. This means that – supposing that there is a proof of *~P* – it would no longer be tenable to *interpret* the Prov(x) predicate, defined in terms of the Proof (x,t) and NaturalNo(x), as "*P* is provable in *PM*." We would have to, as Wittgenstein suggests, "give up" this interpretation, and *along with it,* give up the interpretation of *P* as *saying* that it, itself, is unprovable.

Accordingly, Floyd and Putnam argue, it is in fact not possible simply to *assume* the informal interpretation that Gödel gave to his own theorem, that of showing the existence of "mathematical truths" that cannot be proven or disproven in any given system such as *PM*. As Wittgenstein effectively points out, we must distinguish here between what is actually established by the mathematical result itself, and the "metaphysical" claims that are made on its behalf:

> That the Gödel theorem *shows* that (1) there is a well-defined notion of "mathematical truth" applicable to every formula of *PM*; and (2) that, if *PM* is consistent, then some "mathematical truths" in *that* sense are undecidable in *PM*, is *not* a mathematical result but a metaphysical claim. But that if P is provable in *PM* then

> *PM* is inconsistent and if ~P is provable in *PM* then *PM* is ω-inconsistent is precisely the mathematical claim that Gödel proved. What Wittgenstein is criticizing is the philosophical naivete involved in confusing the two, or thinking that the former follows from the latter. But not because Wittgenstein wants simply to deny the metaphysical claim; rather, he wants us to see how little sense we have succeeded in giving it.[14]

More generally, at the heart of Wittgenstein's critical remarks about Gödel's proof is his skepticism that there is such a well-defined notion of "mathematical truth" that can be held in common between a system such as *Principia Mathematica* and the English "translations" of various of its notions, and so can license the usual interpretation of Gödel's result as showing that there are "truths" that cannot be proven in *Principia* (or any given system). In particular, if, as Wittgenstein suggests, there is indeed no *neutral* sense of "truth" that can be used to characterize both sentences in *PM* and their English translations, then there is no reason to suspect that Gödel's proof indeed shows what it has most often been taken to, that there is a "truth" that cannot be proven or disproven by *PM*. What we have, instead, is simply a particular sentence in *PM*, one that formulates a "perfectly ordinary" and undistinguished arithmetical claim, one that bears literally no implications for the powers or structure of the system as a whole.

When Gödel's theorem and its broader philosophical implications are discussed, the usual framework of discussion is a *model-theoretic* conception of truth. That is, the truth of the Gödel sentence *P* is conceived as a matter of its holding for a (natural) model, where it is assumed furthermore that there is at least one model where all of the objects of which it holds are natural numbers. As we have just seen, even remaining within a model-theoretic conception of truth, this last assumption is disputable, and might indeed well be disputed if a proof of ~*P* were to be given. However, just as importantly, the model-theoretic conception of truth itself might be disputed. Wittgenstein himself never held such a conception, tending to suggest instead a disquotational or redundancy theory.[15] On such a theory, as he suggests in the passage on Gödel's proof itself, there is no language- or system-independent notion of truth, and so there is no absolute sense to the claim that the Gödel sentence *P* expresses a "mathematical truth." Instead, as Wittgenstein suggests, the only available sense of "true" that is evidently applicable to the Gödel sentence, conceived as a sentence of *PM*, is the sense "proven in *PM*." Under the assumption that this is indeed the only relevant sense of "true," though, the Gödel sentence simply collapses to a version of the "Knower Paradox" (the sentence P that says: "P is known to be false") or the liar paradox: *P* iff it is not true that *P*.[16] (Here, we are still maintaining that *Prov*(x) can be interpreted as a "Proof predicate" (and accordingly, under these assumptions, as a truth or knowledge predicate).)[17] This may again tend to suggest the inconsistency of *PM*, but crucially, it does not at all suggest that Gödel's proof bears witness to a substantial "truth" that is beyond the capacity of *PM* to prove.

To summarize, then, there are at least four ways, implicit in Wittgenstein's remarks, that we might resist the strong claim usually associated with Gödel's first incompleteness theorem (i.e. that it shows there is a "truth" that is beyond the capacity of *PM* to prove or disprove). First, we might simply abstain from interpreting the Gödel sentence *P* in terms of truth, falsity, provability, or "self-reference" at all. On this option, the derivability of the Gödel sentence in *PM* simply shows that a "perfectly ordinary" and unremarkable arithmetical sentence of *PM* is derivable. There are then, quite simply, no further consequences for the nature or structure of *PM* at all. Second, while agreeing to interpret the Gödel sentence in terms of issues of truth and provability, we might refuse the model-theoretic conception of truth and opt for a disquotational notion. Then the Gödel sentence is just equivalent to the Liar paradox, and raises the same issues as does that paradox. These may (but do not obviously) include the implication that *PM* is inconsistent.[18] Third, we might *agree* to both the interpretation in terms of truth and falsity and the model-theoretic conception of truth, and still resist the interpretation of "Prov(x)" as a "provability predicate"; this is the interpretation suggested by Floyd and Putnam, according to which there is no admissible interpretation of *PM* whose models do not contain objects that are not natural numbers, and *PM* is accordingly ω-inconsistent (although not necessarily inconsistent outright); and fourth (and finally), we may, on any of the first three options or for other reasons, take the Gödel sentence to show *PM* to be (outright) inconsistent.

On *any* of these four options, the Gödel sentence does not have the consequence of showing that "there is" a mathematical truth that can be neither proven nor disproven in *PM*. This is enough to underwrite Wittgenstein's marked suspicion about the result as it is usually presented, and to show that it would be over-hasty simply to concur with the metalogical interpretation that Gödel himself gives. It is not, in fact, completely clear which of these four "deflationary" options Wittgenstein himself favors; in his explicit remarks on Gödel's result he seems to waver among them. However, we may nevertheless draw some general conclusions from the availability of these four options itself. Significantly, on any but the first option, the Gödel sentence effectively *suggests* the inconsistency or at least ω-inconsistency of *Principia Mathematica* (or any system for which there is a Gödel sentence). This may seem, at first, an alarming suggestion, but note that this suggestion just amounts, in each case, to the suggestion that a sentence that has the "special" form of the Gödel sentence will produce a contradiction or antinomy; there is, as yet, no implication as to the further consequences or implications of such a contradiction.[19] And since the first option – on which the Gödel sentence is taken simply as a normal, arithmetical sentence of *PM* – seems to amount more to opting out of metalogic than pursuing it, we may well take this general implication of the other three options to be a generally legitimate one, assuming we wish both to interpret the Gödel sentence metalogically and resist the usual interpretation in terms of "incompleteness." Indeed, it seems we here have, once again, a vivid illustration of the general choice that the phenomena of systematicity and self-reference universally face us with: the choice between (consistency with) incompleteness (Gödel's interpretation, and the usual gloss on his result) *or* inconsistency and paradox (with the completeness of a system understood to be capable of formulating – though inconsistently! – its own logic of proof, or truth, entirely within itself).

It might seem at first as if this second way of looking at things is simply incoherent, or ruled out on metalogical grounds. Are we not in a position to *know* that *Principia Mathematica*, for instance, is not inconsistent, and so that it cannot contain the kind of contradiction that threatens to appear within it, on this interpretation? If the answer is indeed affirmative, then it might seem that we can rule out a Wittgenstein-style interpretation of Gödel's result and must indeed opt for the Gödel-style interpretation on which it demonstrates incompleteness. However, it is highly significant that we can "verify" the consistency of a system such as *Principia Mathematica* (for instance, by means of a model-theoretic soundness proof) *only from* *the position of a metalanguage* outside the system whose consistency is thereby proven. Moreover, Gödel's *second* "incompleteness" theorem shows precisely that the consistency of a system cannot be proven *by* that system itself. Thus, while we may be able to convince ourselves of the consistency of a system like *Principia Mathematica*, which we can step "outside of" and treat from the position of a metalanguage (here, English), where we are concerned with the *very system* we are ourselves using, we do not have this option.[20] In this case, it indeed becomes much more plausible that the constructability of the Gödel sentence for the system indeed implies the existence of contradictions, such as a sentence that says of "itself" that it is not (provable and hence not) true.

But does not the presence of such a contradiction vitiate the system in which we are working entirely, since (as can be formally shown) *anything* can be proven from a contradiction? The claim that it does, and hence the vehement desire to prohibit or rule out contradiction at virtually *any* cost, is one of the most prominent supports of the "foundationalist" picture of formal systems that is, in all of his engagements with the philosophy of mathematics, one of Wittgenstein's most central critical targets. This criticism leads him to interrogate the "superstitious dread and veneration by mathematicians in the face of a contradiction,"[21] as well as the whole conception of the work of the researcher in mathematics or mathematical logic that follows from the attempt to detect or preclude "hidden" contradictions. In particular, as Wittgenstein suggests, there is in fact no way that a "hidden contradiction" can vitiate a calculus as it is actually used. For if the contradiction remains "hidden," it has no effect on our actual practice of calculation; and if it is "discovered," then we need not act on it, and so again it can cause no harm. Thus:

> One may say, "From a contradiction everything would follow." The reply to that is: Well then, don't draw any conclusions from a contradiction; make that a rule. You might put it: There is always time to deal with a contradiction when we get to it. When we get to it, shouldn't we simply say, "This is no use—and we won't draw any conclusions from it"? (Diamond 1976, Lecture XXI, p. 209)

Elsewhere, Wittgenstein likens the situation of being faced with a contradiction to that of being given two conflicting orders, or being faced with two arrows pointing in opposite directions. That, in these situations, we do not know what the rules or orders are telling us to do and so, in that sense, "could" do *anything* "in accordance" with them, does not mean that we *must* do anything at all; we might simply abstain from acting. Or we might indeed take it that "anything is now permitted," but this would amount not so much to showing that the original calculus was out of order, as to giving up on the possibility of using a regular calculus to determine our action at all. Thus, there is no special need to worry about the presence of "hidden contradictions" and seek to develop a calculus.

This emphatically does not mean that we do not or even *should* not attempt to reason in accordance with the law of non-contradiction; indeed, Wittgenstein takes the fact that we do in fact do so, and regularly criticize those who violate it, to be an important and deep constitutive fact about (what we call) reasoning itself, such that anyone who did not reason in general in accordance with the law of noncontradiction, or respect its status as an overarching principle, would not be doing anything that we could recognize as reasoning or calculating at all. Also, we *can* and *do* construct our calculi with a view to avoiding – as much as is possible, anyway – the likelihood of encountering the situation of contradiction in which we, "entangled in our rules" as it were, are stopped and do not know how to go on. Wittgenstein's consideration of contradictions and their "status in civil life" does not show, therefore, that it is not an important and even *constitutive* element of our ordinary practices that we are committed, in practice, to avoiding them.[22] But it suffices to show that the existence of contradictions alone is not enough to completely vitiate these ordinary practices or render them ineffective.

This position about the role of contradiction is not at all implausible when applied to reasoning in a natural language such as English; for it is *extremely* plausible that there are contradictions in English, but this clearly does not make it rationally possible to "draw any conclusion at all" or vitiate the usefulness of reasoning in English. Nevertheless, when applied to "artificial" systems and techniques of calculation that we create, it is sufficiently counter-intuitive, or at least at odds with the ordinary particular self-conception of mathematicians and logicians, that it is regularly rejected by them as absurd or obviously incoherent. From the perspective of foundationalist assumptions, indeed, it can seem just obvious that the presence of a contradiction within a system, hidden or not, *must* have profoundly destructive consequences for the integrity of that system and cannot simply be handled in the offhand way that Wittgenstein suggests. This conception is regularly accompanied by a conception of logical systems or calculi as more or less "accurate" to the extra-logical reality that they concern, a conception which suggests that there could be calculi that are more or less effective and that a calculus containing contradictions would not be effective at all.

In the 1939 *Lectures*, Turing himself suggests that at least one of the problems with tolerating contradictions in a calculus is that the presence of a hidden contradiction in a calculus used for a technical application, say building a bridge, could lead to errors which cause the bridge to fall down.[23] Wittgenstein seizes on this claim and attempts over the course of the next several lectures to demonstrate that it is mistaken. That is, there are, according to Wittgenstein, *only* two ways in which our use of the calculus can lead to the bridge falling down: either because we use a wrong *physical* law (or get the value of a coefficient wrong, etc.) or because somebody makes a mistake in *calculation* and gets a wrong answer (although what counts as a wrong answer as opposed to a right one still must be somehow determined).[24] In either case, however, it is not a contradiction in the *calculus* that leads to the bridge falling down, and if such a contradiction actually arises we can choose to act on it as we like, or not at all. In any case, the technical *efficacy* and utility of the calculus is not adversely affected by the presence of a contradiction, and so there is no need for "foundational research" directed to assuring the universal absence of contradictions in our logical systems.

III

What, then, are the implications of Wittgenstein's way of looking at the significance of the results of Gödel and Turing for the issues of computation, human capacities, and finitude?

Interpretations of Gödel's theorem have spawned a large literature on issues of computationalism and the nature and capacities of the human mind. Much of this literature simply assumes Gödel's way of looking at his own result in terms of incompleteness, but Wittgenstein's way of looking at it evidently suggests an alternative. In particular, Gödel himself thought that the existence of the sentence *P* shows, for each formal system such as *Principia Mathematica*, the existence of a mathematical "truth" that that particular system cannot prove or disprove. Such "truths" are, according to Gödel's informal argument, accessible to the human mind in a way that essentially transcends the powers of any formal system; thus Gödel himself thought (e.g., van Atten 2006, p. 256) that his result demonstrated a *superlative* capacity of the human mind to grasp mathematical truths in excess of the powers of any formal system.[25] Subsequently, Lucas (1961) and Penrose (1994) have generalized this suggestion, holding that the combination of Gödel's and Turing's result show that the human mind (for instance that of a human mathematician) is not mechanical in the sense that it cannot be modeled by any formal system or Turing machine. Thus, both conclude, the human mind has capacities for grasping mathematical truths that exceed those of any machine or wholly mechanical system. There are certainly many problems with this argument, some of which have been pointed out over the years; in the present context, however, it is sufficient to note that Wittgenstein's different way of looking at the upshot of Gödel's result in fact provides a dramatic alternative to it.[26] As we saw, Wittgenstein's remarks on Gödel suggest that he take it as showing at least that the actual production of the Gödel sentence will lead to contradictions or antinomies, although it is not evident that these contradictions must have the profound destructive *significance* that foundationalist assumptions about mathematics portray them as having. In any case, however, Gödel's proof on the interpretation Wittgenstein probably intended *does* show that there is an essential limitation to the ability of any formal language to model itself *completely and consistently*; this is why the Gödel sentence, which "encodes" the logic of proof (and hence, on Wittgenstein's reading, truth) for the system as a whole, leads to contradiction and antinomy.

In a little-discussed 1985 paper, Putnam considers the implications for computationalism of taking Gödel's result in just this kind of way.[27] As Putnam notes, projects in artificial intelligence and cognitive science have relied centrally on the distinction between (actual) performance and (ideal) competence. That is, according to a longstanding conception originating from Chomsky, at least part of the aim of such projects is to give a description of how the mind is "supposed" to work, how we would be thinking if we were *ideally* competent. Both Harman and Chomsky himself have suggested that such an idealized "competence" description is indeed a description "of correct thinking in the normative sense."[28] However, even if there is such a description, would it be possible for us to know it? By way of a proof whose core is Gödel's proof itself, Putnam shows that it would not. That is: "if there is a complete computational description of our own prescriptive competence – a description of the way our minds ought to work, where the ought is the ought of deductive logic or inductive logic – then we cannot come to believe that that description is correct when our minds are in fact working according to the description" (p. 144). The reason for this is just the same as that underlying Gödel's and Turing's results – that it is impossible, on pain of contradiction, for a formal system completely to model itself. It follows that, as Putnam argues, if the aim of cognitive science is indeed to give such an idealized description of our own competence, then cognitive science is essentially looking for something that we *cannot* find. In particular, even if we did find what is in fact the "correct" description of our ideal competence, we could not know that it *was* the correct one.

What more general conclusion should we draw from this? As Putnam suggests, we may take the upshot in either an "optimistic" or a "pessimistic" way: "Like everything else, this theorem can be viewed either optimistically or pessimistically. The optimistic interpretation is: Isn't it wonderful! We always have the power to go beyond any reasoning that we can survey and see to be sound. Reflexive reflection cannot totally survey itself. The pessimistic interpretation is: How sad!" (p. 144). Here, the "optimistic" and "pessimistic" ways of looking at the failure of reflexive reason to survey itself essentially correspond to the two ways of looking at Gödel's result that we have already considered: Gödel's own, on one hand, and Wittgenstein's, on the other. In particular, the proponent of a Gödel-style interpretation sees the necessary failure of formal reason to survey itself as the sign of a superlative power or capacity, an ability of the human mind to non-formally exceed or "go beyond" all that formalism can model in itself. The proponent of the "pessimistic," Wittgenstein-style interpretation, on the other hand, takes the result wholly negatively – simply as showing that, as Putnam says, "reflexive reflection cannot totally survey itself," without taking this to imply any superlative capacity of the human mind.

With respect to computability, the analogue is apparently to take Turing's result itself wholly negatively – that is, as showing that it is not possible, on pain of contradiction (or at least paradox) for our rational procedures to model themselves completely. This suggests that there will be, among these, some infinitary procedures that, although perfectly determinate, are not effectively computable. This by itself does not suffice to show *what* these procedures actually are, or to guarantee our access to them. But such infinitary techniques, fixtures of human life that are not fixed, in their totality, by any finite symbolism, may be just what Wittgenstein is alluding to when, resolving the rule-following paradox of the *Philosophical Investigations*, he suggests that:

> 201. There is a way of grasping a rule which is *not* an *interpretation*, but which is shown in what we call 'obeying the rule' and 'going against it' from case to case.

And:

> 199. To understand a language means to be master of a technique.

Here, what Wittgenstein is suggesting is, importantly, *not* a superlative capacity of human thought to grasp "truths" or follow "procedures" that are inherently beyond the grasp of any mechanical system. Indeed, one of the central aims of the "rule-following considerations" is obviously to criticize any such conception of human ability to "leap beyond" all the finite examples and see an infinitary structure "all at once," a conception that yields metaphors of the use of a word being present all at once "in a queer way" and of grasping the entirety of a use of a word "in a flash."[29] This conception is also of a piece with the conception of rules as "rails laid to infinity" and thus as capable, by themselves, of determining infinite usage mechanically and completely.[30] On any of these metaphorical pictures, the whole use of a word – or the whole (infinite) extension of a mathematical series – is something that can be present "all at once" in the symbolism that expresses the rule. However, given any such symbolism, it is of course always possible to interpret it in various different ways. This is what leads to the problem to which section 201 gives an answer, the problem that "no course of action could be determined by a rule, because any course of action can be made out to accord with the rule." Given this, it looks as if it is indeed necessary to "give one interpretation after another," interpreting each (symbolic expression of a) rule with another until we realize that the second does no better than the first at guaranteeing the correct application, and so forth.

This paradox is more or less unavoidable, on the assumption that a rule as symbolically expressed must be able to determine its own infinite extension completely. This means that to resolve the paradox, we must get beyond the conception of rules according to which they are "self-interpreting," or capable of determining their own applications completely and without contradiction. To see that there is indeed a close analogy with Turing's own formal result here, consider again the details of Turing's formal argument for the undecidability of the halting problem. To establish this result, we posited (for *reductio*) a universal Turing machine capable of solving the general halting problem, and then considered whether it halts when given its own machine number. The result was the contradiction that it both does and does not halt, and accordingly that there can be no such machine (on pain of contradiction, at least). The general reason for this contradiction was that, in determining whether the machine with each description number halts, the posited machine must consider itself, and thus is apparently involved in an infinite regress. This regress is similar to the regress of symbolic interpretations that occurs inevitably if we assume that a rule must be able to determine its *own* application. In particular, the demand that the rule determine the application of another one is essentially similar to the requirement that a particular Turing machine determine the halting status of another one; and the demand that a rule must be able ultimately to determine its own application is then analogous to the requirement that a universal Turing machine determine its own halting status. In both cases, the demand of self-determination leads to an intractable paradox that shows that this demand is not completely and consistently satisfiable. Just as there is no mechanical procedure that solves the general halting problem, and thus no machine that can ultimately guarantee whether it, itself, halts, there is thus no way for any rule to *guarantee* the correctness of its own infinite application.

This does not mean, of course, that the correctness of a rule's application *is* guaranteed by something else, for instance (as we may now be tempted to think) an ineffable insight, or a power of human judgment or discernment that "essentially exceeds" anything mechanical. Rather, as Wittgenstein repeatedly emphasizes, the right move when faced with the gap between the demand that the correct application *must* be determined by something "present to mind" and the rule's incapacity to do so is not to appeal to any supplemental figure of ineffable force to fill the gap but rather to relax the demand that produces it. The result is that there is indeed no finite, symbolic expression – and hence nothing that can be "present to mind" all at once, or already implicit in any determination of first principles or fundamental axioms – that indeed suffices *by itself and outside of its practical context* to determine and guarantee the distinction between correct and incorrect application in all cases. On the other hand, a "technique" or "practice" is, rather, essentially something that unfolds over time, and in the relationship between people.[31] Thus, no symbolic expression or finitely capturable "capacity" has, as we may now say, the absolute *force* of a law which would be capable of determining the distinction between correctness and incorrectness all by itself. The task of philosophical criticism and "therapy" then shifts to a radical diagnosis and replacement of the assumption of (and the demand for) such a force.

IV

I have suggested, then, that Wittgenstein's way of looking at the results of Gödel and, implicitly, Turing, gives us a way of conceiving of their implications that, although it bears important implications for the question of computationalism, does *not* tend to show (as the Gödel-Lucas-Penrose interpretation alleges) that the "mind is not a formal system" in that it has access to mathematical truths in excess of the grasp of any formal system. This does not, of course, imply that Wittgenstein would have agreed to the opposite claim that the "mind is a formal system," or even would take it, ultimately, to have much of a clear sense.[32] Indeed, one of the deepest aims of the whole line of argument that is developed in the rule-following considerations is to formulate a kind of critical resistance to pictures that identify human techniques and capacities with what are conceived of as the capacities of formal systems and as wholly present in their underlying structure. This resistance is deeply connected to Wittgenstein's critical interrogation of the conception of "logical inexorability" and "necessity" that these pictures suggest, and ultimately to his more basic inquiry into the sources of "logical necessity" and "rational compulsion" themselves.[33] According to Wittgenstein, when we picture to ourselves the compulsory force of logical rules, we are led to think of logic as a kind of machinery underlying our actual practices of reasoning and inferring. Such a machinery would determine "in advance" and without exception the correct practices of logical inference and derivation; in this respect, it is akin to a kind of "super-rigid" machine that contains all of its possible actions in itself by virtue of its ideal construction:

> A machine as symbolizing its action: the action of a machine—I might say at first – seems to be there in it from the start. What does that mean?—If we know the machine, everything else, that is its movement, seems to be already completely determined. (*PI* 193, p. 66)

If we are to conceive of an actual machine this way, we must of course forget or abstract from the empirical possibility of its parts "bending, breaking off, melting, and so on." It is in fact just such an abstraction that is essential to our symbolizing the machine as such (for instance by means of a functional blueprint) and it is this alone that permits the movement of formalization whereby we consider *any* actually existing machine actually to "realize" or "amount to" an "ideal machine" such as a Turing machine or a computer. Wittgenstein's point is not that this forgetting or idealization is not sometimes justified, but that it encourages a conception of logical necessity that is itself deeply misleading. For:

> …when we reflect that a machine could also have moved differently it may look as if the way it moves must be contained in the machine-as-symbol far more determinately than in the actual machine. As if it were not enough for the movements in question to be empirically determined in advance, but they had to be really – in a mysterious sense – already present. And it is quite true: the movement of the machine-as-symbol is predetermined in a different sense from that in which the movement of any given actual machine is predetermined. (*PI* 193, p. 66)

The ideology of the super-rigid machine, in which all of its movements are already present, is thus the same as that of rules as self-interpreting or as rails laid to infinity: in both cases, it is only by virtue of a movement of idealization and abstraction from actual cases that we gain the conception of an underlying presence that is actually *effectively* capable of determining the entirety of an infinite extension in advance. And this conception of a presence as capable of such an infinite determination is itself the same as the conception of the force of logical determination as that of a "super-hard" or inexorable law.

How, though, do we first arrive at such a conception? In a passage from the 1939 lectures devoted to the idea of a super-rigid "logical machinery," Wittgenstein compares the source of the underlying idea of the "inexorability" of logical law to that of the inexorability of the law as such:

> Perhaps it would help to take the example of a perfectly inexorable or infinitely hard law, which condemns a man to death.
> A certain society condemns a man to death for a crime. But then a time comes when some judges condemn every person who has done so-and-so, but others let some go. One can then speak of an inexorable judge or a lenient judge. In a similar way, one may speak of an inexorable law or a lenient law, meaning that it fixes the penalty absolutely or has loopholes. But one can also speak of an inexorable law in another sense. One may say that the law condemns him to death, whether or not the judges do so. And so one says that, even though the judge may be lenient, the law is always inexorable. Thus we have the idea of a kind of super-hardness.
> How does the picture come into our minds? We first draw a parallel in the expressions used in speaking of the judge and in speaking of the law: we say "the judge condemns him" and also "the law condemns him". We then say of the law that it is inexorable – and then it seems as though the law were more inexorable than any judge – you cannot even imagine that the law should be lenient. (Diamond 1976, p. 197)

The image of the ideal inexorability of the law is thus, like the picture of the super-rigid machine itself, produced out of a kind of false parallel or crossing between two expressions, one that is used ordinarily to describe judges, and another that is used (perhaps metaphorically) to speak of the law itself. The diagnosis does not imply that either the picture of the inexorability of the law or that of the super-rigidity of logical machinery is completely out of order, false, or nonsensical; either picture may indeed have its legitimate uses. However, it does suffice to show that both are grounded in a kind of essential confusion:

> …if I say that there is no such thing as the super-rigidity of logic, the real point is to explain where this idea of super-rigidity comes from – to show that the idea of *super-rigidity* does not come from the same source which the idea of *rigidity* comes from. The idea of rigidity comes from comparing things like butter and elastic with things like iron and steel. But the idea of super-rigidity comes from the interference of two pictures – like the idea of the super-inexorability of the law. First we have: "The law condemns", "The judge condemns". Then we are led by the parallel use of the pictures to a point where we are inclined to use a superlative. We have then to show the sources of this superlative, and that it doesn't come from the source the ordinary idea comes from. (Diamond 1976, p. 199)

That is, it is only by means of this sort of crossing or confusion between two pictures that we gain the idea of the inexorable law of logic, and hence of its *force* in regulating our life and practices. This corresponds, as we have seen, to what is often called "normative" force, and conceived as a distinctive *kind* of force that is both distinct from and stronger and more inexorable than any kind of empirical or physical force. This conception is the same as that of the normativity of logical rules, or of the "self-applying" rule which is able to determine its own application in a logical and normative sense. The diagnosis of the *origin* of these pictures in a crossing or confusion between the empirical attributes of actual machines (for which it makes sense to say that one is more or less rigid than another) and the posited non-empirical attributes of an ideal machine makes it clear that the conception of the inexorable normative force of logic is itself grounded in such a confusion, and dissipates with its successful diagnosis.

This does not mean that the "normativity" that is involved in ordinary practices of rational deliberation and calculation which proceed, in part, by way of the citation and discussion of explicit rules, should be dismissed as simply illusory or fictitious. But it does imply that the underlying source of this normativity cannot be in these rules themselves (as symbolically expressed or expressible), but must have a deeper ground in the kinds of "agreement" and "attunement" that constitute our "forms of life," and thereby precondition the possibility of all techniques and practices as such. We can draw much the same conclusion, moreover, about the "normativity" exhibited by instruments and techniques of calculation, including actual symbolic computing machines or computers. Here, as the results of Turing and Wittgenstein both show, the ability of such instruments and devices to determine the distinction between correct and incorrect results (or, for instance, correct and incorrect ways of extending a function) does not and cannot rest entirely on anything given or wholly determined by the actual construction of the instruments and devices themselves. It depends, instead, on the pre-existing practices, techniques, and ways of life in which these instruments and devices have their normal roles.[34]

If this is right, though, and the practical interpretation of a given object or piece of machinery depends on our pre-existing ability to distinguish between "correct" and "incorrect" instances of computation, then the normativity involved in this distinction again essentially *cannot* be given wholly by any computable system of rules itself. It must, instead, already be a precondition of our ability to take any set of symbols or physical system *as* the expression or implementation of any such system. This implies, again, that any attempt to ground our judgments of correctness or incorrectness in the inexorable force of a "logical machine" that determines the interpretation of its own symbolism, or the implementation of its own computations, all by itself and outside the context of any human practices, must inevitably fail. Our practical attitudes toward the rules embodied in actual computers, and the kinds of normative force they represent or enforce, are to the contrary very much aspects of our everyday lives and practices with them, and accordingly cannot be separated from these ordinary practices. The normativity that we expect from, and regularly find, in the actions of computers is not simply an outcome of their actual construction or their "ideal" architecture, but is rather possible only on the basis of the kinds of "agreement" that first enable us to engage in shared practices at all. As Wittgenstein emphasizes, this agreement is not underlain or guaranteed by any technical or technological form of regularity or repetition. At the same time, however, it is not at all a *contingent* agreement on specific (as it may be, "historically situated") practices, norms, or conventions. For:

> …the logical 'must' is a component part of the propositions of logic, and these are not propositions of human natural history. If what a proposition of logic said was: Human beings agree with one another in such and such ways (and that would be the form of the natural-historical proposition), then its contradictory would say that there is here a *lack* of agreement. Not, that there is an agreement of another kind. (*RFM* VI-49, p. 353)[35]

NOTES

1. Some discussions among Wittgenstein, Turing, and Wittgenstein's student Alister Watson had reportedly taken place earlier, in the summer of 1937, but there is no record of these. (Hodes 1983, pp. 109, 136 – cited in Floyd and Putnam (2000))

2. Wittgenstein (1939), p. 13.

3. Wittgenstein (1939), p. 14.

4. "We have said that the computable numbers are those whose decimals are calculable by finite means. This requires rather more explicit definition … For the present I shall only say that the justification lies in the fact that the human memory is necessarily limited" (p. 59); "The behaviour of the computer at any moment is determined by the symbols which he is observing, and his 'state of mind' at that moment. We may suppose that there is a bound B to the number of symbols or squares which the computer can observe at one moment … We will also suppose that the number of states of mind which need to be taken into account is finite. The reasons for this are of the same character as those which restrict the number of symbols" (pp. 75–76). Turing also emphasizes (p. 79) that there must at any moment be a symbolically stateable description which, if the computer broke off work at any particular stage, would determinately instruct another as to how to continue.

5. More specifically, H combines the universal machine U with a "decision machine" D which, when given the description number of any particular machine, determines whether that machine halts.

6. The demonstration is on pp. 72–73.

7. Since, as Turing argues, "If the negation of what Gödel has shown had been proved … we should have an immediate solution to the Entscheidungsproblem," (p. 85) it follows that Turing's result – that there is no solution to the Entscheidungsproblem – implies Gödel's first incompleteness theorem.

8. It may be objected that the original proof of Cantor's theorem, which establishes the superiority of the cardinality of the power set over the initial set, does not make use of syntactic reasoning (I owe this objection to a discussion with John Bova, although it does not represent his view). But: i) since Cantor's proof does not obviously involve entertaining or carrying out any infinite procedure, it is not clear that it is an instance of the "diagonal procedure" at all;

and ii) insofar as it involves the assumption for reduction of a 1-1 *correspondence* between sets and their subsets, it does involve (at least where the sets are infinite) something like a comparison of the infinite set with its finite elements, something very similar to the "comparison" of an infinitary procedure with its finitely expressed rule in syntactical diagonalization.

9. *RFM* II – 38: "Here it is important to grasp the relationship between a series in the non-mathematical sense and one in the mathematical sense. It is of course clear that in mathematics we do not use the word 'series of numbers' in the sense 'series of numerical signs,' even though, of course, there is also a connexion between the use of the one expression and of the other. … A 'series' in the mathematical sense is a method of construction for series of linguistic expressions" (p. 136).

10. Gödel's original article is titled "On Formally Undecidable Propositions of *Principia Mathematica* and Related Systems I" and mentions "incompleteness" only once, in a footnote: "The true reason for the incompleteness which attaches to all formal systems of mathematics lies – as will be shown in Part II of this paper – in the fact that the formation of higher and higher types can be continued into the transfinite (cf. D. Hilbert 'Über das Unendliche', *Math. Ann.* 95, p. 184), while, in every formal system, only countably many are available. Namely, one can show that the undecidable sentences which have been constructed here always become decidable through adjunction of sufficiently high types (e.g. of the type w to the system **P**). A similar result holds for the axiom systems of set theory." (footnote 48a, pp. 28–29).

11. Thus: "From the remark that [R(q); q] asserts its own unprovability it follows immediately that [R(q); q] is true, since [R(q); q] is indeed unprovable (because it is undecidable). The proposition undecidable in the system *PM* is thus decided by metamathematical arguments" (p. 9). As Gödel emphasizes, this remark comes as part of a "sketch of the main ideas of the proof" that does not make "any claim to rigor" (p. 6).

12. Floyd and Putnam (2000), p. 625. For further discussion, see Steiner (2001), Bays (2004), and Floyd and Putnam (2006).

13. Floyd and Putnam (2000), pp. 624–26. A system is ω-inconsistent if, for some property T of natural numbers formulable in the system, the system proves T(0), T(1), and so forth, but also proves *that there is some* natural number *n* such that ~T(*n*). Note that a system may be ω-inconsistent but still consistent.

14. Floyd and Putnam (2000), p. 632.

15. Cf. *PI* 136.

16. Cf. Priest (2004).

17. Priest (2004), p. 213: "Consider the sentence *A*, of the form '<*A*> is not provable' – this sentence is not provable – angle brackets represent some naming device. Here, provability is to be understood in the naïve sense of being demonstrated by some argument or other. If *A* is provable, then, since what is provable is true, *A* is true; so <*A*> is not provable. Hence, <*A*> is not provable. But we have just proved this; that is, <A> is provable. This is a version of the 'Knower paradox'. Sometimes it is called 'Gödel's paradox'. In fact, if one

identifies truth with provability, as does Wittgenstein, Gödel's paradox and the liar collapse into each other."

18. Cf. Priest (2004), p. 223: "According to the model-theoretic account of truth, the equivalence (I) [viz. the *interpretation* of the Gödel sentence as saying '*P* iff *P* is not provable in *Principia*'] is unproblematic. In the context that Wittgenstein is operating in, it is not, and this allows him to question it. In particular, he can ask exactly what the right-hand side means. This allows him to take the discussion into areas beyond those normally countenanced in discussions of Gödel's theorem. In particular, Wittgenstein deploys the idea that the meaning of a sentence is determined by its proof conditions. In virtue of the fact that there are object-level proofs and meta-level proofs (to put it in modern terminology), this still leaves the notions concerned in (I) ambiguous. Except for one circumstance [i.e. that *Principia* is inconsistent], however, he thinks that once one clarifies the relevant meanings, the equivalence (I) should be rejected. In this case, no contradiction is forthcoming."

19. Of course, *PM* (etc.) contain rules establishing that "from a contradiction, anything follows." However, it is clear that there are grounds for being skeptical that, even if this is true, and "anything follows" in the formal sense, a single contradiction is indeed enough to render the calculus useless; see below.

20. What, though, *is* in fact the ultimate basis for our belief in the consistency of a system such as *Principia Mathematica*? The usual basis is model-theoretical arguments, but if we dispute that a model-theoretical notion of truth is appropriate here, we may well doubt these arguments. Moore (2001, p. 177–180) argues in a related context that we can take the set-theoretical axiom framework ZF to be sound (and hence consistent) if we can "recognize" its axioms as intuitively correct. However, what is the ground for such a "recognition"? In any case, because of the Gödel sentence, Principa Mathematica is certainly *not* consistent if we allow the "disquotational" rule Prov(x) -> x.

21. *RFM*, I, appendix III, remark 17 (p. 122).

22. *PI* 125.

23. Lecture 21, p. 211.

24. Lecture 22, p. 211.

25. Thus, Gödel wrote in 1963: "Before my results had been obtained it was conjectured that any precisely formulated mathematical yes or no question can be decided by the mechanical rules of logical inference on the basis of a few mathematical axioms. In 1931 I proved that this is not so. i.e.: No matter what & how many axioms are chosen there always exist number theoretical yes or no questions which cannot be decided from these axioms. Combining the proof of this result with Turing's theory of computing machines one arrives at the following conclusion: Either there exist infinitely many number theoretical questions which the human mind is unable to answer or the human mind … contains an element totally different from a finite combinatorial mechanism, such as a nerve net acting like an electronic computer. I hope I shall be able to prove on mathematical, philosophical, & psychological grounds that the second alternative … holds" (van Atten, 2006).

26. The most important of the problems with the Lucas-Penrose argument in the present context is that it requires the actual *manifestation* of a true formula T of arithmetic such that a certain actual computer C *cannot* give a proof of T, but there is a human mind, M, that can. No one has ever actually manifested such a formula, and there is reason to think that it indeed *cannot* be demonstrated by any effective procedure. To see this, observe that to find such a formula, given any *actual* computer C, we would have to first distinguish those portions of its output that actually count as proofs from those that do not. As Priest (1994, pp. 111–115) argues, there is, however, probably no effective way to do this; and even if we do, the set of theorems T proved by any actual computer C will probably turn out to be inconsistent. Priest writes: "The only way … that offers any hope of getting T to be consistent is to suppose that M (and so any C which is supposed to be M) is not only a mathematical mind but an ideal mathematical mind, that never makes mistakes of any kind: either of memory, inference, judgment, or output. But this is sufficient to destroy the argument. After all, the only candidate for a mind of this kind is God's. So at best, we have a (theo)logical proof that God is not a computer" (p. 113).

27. Putnam (1985).

28. Putnam (1985), p. 149.

29. *PI* 191, 195.

30. *PI* 218.

31. Cf. *PI* 199: "Is what we call 'obeying a rule' something that it would be possible for only *one* man to do, and to do only *once* in his life?—This is of course a note on the grammar of the expression 'to obey a rule'.
It is not possible that there should have been only one occasion on which only one person obeyed a rule. It is not possible that there should have been only one occasion on which a report was made, an order given or understood; and so on.—To obey a rule, to make a report, to give an order, to play a game of chess, are *customs* (uses, institutions).
To understand a sentence means to understand a language. To understand a language means to be master of a technique."

32. Cf. *PI* 359–60.

33. Cf. *RFM* I–117: "In what sense is logical argument a compulsion?—'After all you grant this and this; so you must also grant this!' That is the way of compelling someone. That is to say, one can in fact compel people to admit something in this way.—Just as one can e.g. compel someone to go over there by pointing over there with a bidding gesture of the hand" (p. 81).

34. This is particularly evident in connection with what have been called "triviality" arguments about computation and effectiveness. According to such arguments, every physical object (or every object of a certain, very minimally specified level of operational complexity) at every time trivially implements every possible computation, since there is always *some* function that maps the internal physical states of the object onto the computational states involved in carrying out any particular computation. Thus, on Searle's memorable formulation: "…the wall behind my back is right now im-

plementing the Wordstar program, because there is some pattern of molecule movements that is isomorphic with the formal structure of Wordstar. But if the wall is implementing Wordstar, if it is a big enough wall it is implementing any program, including any program implemented in the brain" (Searle 1992). Such arguments have been used as well, most notably by Putnam himself (in Putnam 1991) to argue against computational and functionalist theories of mind by showing that there is no *unique* functional description that characterizes the operation of the human brain (or any other mechanical system) at any time, and accordingly no hope for the "computationalist" project which attempts to discover such a (unique) description. As respondents to the triviality arguments (e.g. Block 1995, Chalmers 1995) have pointed out, we can solve the problem of triviality if – and only if – we can already *presuppose* a distinction between the correct and incorrect functioning of the machine. Thus, for instance, I can "interpret" the machinery in front of me as calculating the "plus" function only if I am in a position to distinguish between correct and incorrect responses to (what *I* interpret as) a query, for instance "2+3=?"; and I will indeed be *inclined* to interpret the machinery as calculating the "plus" function only if I can assume that it *reliably* gives (what I deem to be) correct responses to this query. It is important to note, however, that there is nothing that guarantees such reliability (any actual machine might "break down" at any moment), and no sharp line between what kinds of behavior count as "reliable" and what evidences "unreliability" in this sense.

35. Earlier and shorter versions of this paper were presented at the Austrian Ludwig Wittgenstein Symposium in Kirchberg am Wechsel, August, 2009, and at the North American Wittgenstein Society in San Francisco, March 2010. I wish to thank John Bova for extensive discussions about the issues considered here, and Jack Woods for his extensive and helpful commentary on the paper at the NAWS session.

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LANGUAGE AND MEANING

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ABSTRACT. Contemporary philosophy of language and semantics rests on an unjustified and largely unacknowledged Platonism. This Platonism misdirects inquiry in unfruitful directions, seeking what meaning "really is", and what terms "really mean". Arguing against the sorts of hypotheses put forward by Kripke and Putnam as well as the theory of two dimensional semantics, I claim that if meaning is to be construed in any philosophically interesting way, it must be thought of in strictly internalist terms: meaning is "all in the head", or else it is a colloquial term with no precise meaning whatsoever. Construed internalistically, however, meaning is no less mysterious an aspect of consciousness than the oft-cited redness of red. Squeamishness about facing up to this mystery can only hamper attempts to get to the heart of the matter, and find out what semantics is really all about.

Keywords: language, meaning, semantics, philosophy, Platonism, intension

Usage is right
Usage wins
All language is folk language
All language is slang

1. Introduction

Philosophy of language has been quite an active field for the past half century or more, and understandably there is considerable overlap between it and philosophy of mind. It is hard to talk about words, sentences, and their meanings without running up against questions about concepts, and how they are created and manipulated in the mind. Likewise, it is hard to ask how the mind works without running into questions about how it manipulates symbols and how the symbols it manipulates may affect its working in turn. We may not think entirely in words, but there seems to be a strong connection between the way we think and the way we articulate.

Philosophy of language went off into the weeds for a while during much of the 20th century. There was a great collective effort to “naturalize” the notions of reference, meaning, and a bunch of others, which effectively means an effort to explain them in reductive materialist terms. This effort is doomed, because it is a flail in the direction of admitting that there is something mysterious about semantics, while trying to ignore the elephant in the room, namely consciousness.

Moreover, most formal investigations into semantics and meaning are infected with a naive realism about meaning, bordering on Platonism. There often seems to be a pretheoretic assumption that a given term has a True Meaning that we may only perceive partially, with our use of the term muddled by our imperfect sensory apparatus, or limited cognitive abilities, and our incomplete scientific knowledge. It is assumed that, armed with a correct philosophy of language, we would be in a position to determine what any given term *really means*.

There is no “really means.” It makes no sense to speak of the meaning of a term unless you know who is doing the meaning and why. What does the user of the term know or believe about the term? What about the term is important to the user and the user’s audience? What is the user trying to accomplish by using the term right now? What sorts of habits and objectives are baked into the speaker’s entire notion of how and why they might coin and use terms in the first place? What are the preconditions that would have to hold in order for the user and the audience to be satisfied that the term was being used with only a tolerable amount of ambiguity? Note in particular that these preconditions might differ considerably from those that you might insist upon before you thought the term was being used unambiguously. Nor should we allow the limitations of a given language-using community’s scientific knowledge impugn their use of the term, and their idea of what the term *means*.

People are sloppy with their terminology. Depending on context and audience, they use terms with varying degrees of precision. Some contexts call for more precision, and so people coin new terms. Technical fields are full of specialized jargon for this reason. Sometimes people even use a familiar term in a more restricted sense than most people do sitting around the dinner table. There is something about the phenomenon of language, though, that beguiles investigators into thinking that all language could and should be made infinitely precise. There are urgent and interesting questions about language and minds, but on the way to considering those things it seems that few make it past the rocks, lured by the siren call of theories of Platonic infinite precision.

2. Intentionality

Of central importance to any discussion of language and meaning is the notion of *intentionality*. Intentionality is the property of being *about* something else; it is sometimes informally defined as "aboutness." Beliefs, desires, and propositions all have intentionality, rocks and teacups do not. Intentionality is real, it exists as a feature of the universe. There are some things that really are, inherently, about other things. All such things, however, are exclusively in minds. In a purely objective, extrinsic, materialistic world, everything that happens does so strictly according the the laws of physical causation, like so many beer cans perched on fence posts hit with rocks. No matter how many beer cans you have, and no matter how they may be connected (with dental floss, perhaps) there is no inherent sense in which some set of them "come together" to be *about* another set of them. They just do what they do because they must, each of them blind to all of the others, with no subset of them "representing" other subsets (or anything else for that matter) except insofar as we choose to see them that way with our conscious minds.

Sometimes it is convenient for us to speak and think as if things out there were really about other things (road signs about gas stations, for example), but this is a may-be-seen-as kind of thing, a way of talking about what is, at heart, lots of complex physical interaction. Left on their own, the mechanics of the physical road sign, and its interactions with photons of light, up to the point at which those photons interact with your nervous system, are well understood without recourse to any notions of "reference."

When someone points to something, they are telling you to do something – look over there. A reference is a pointer, and as such, it is prescriptive, not descriptive. It commands. Even this, though, gives it too much credit. It doesn't actually do anything – it just sits there. It is a lot like an algorithm in this sense, and in fact is a degenerate case of an algorithm. As such, unto itself, it is neither true nor false, it neither represents nor misrepresents, it just does its physical interaction as do all physical things. If intentionality is to be a really-there thing at all, and not merely a may-be-seen-as thing, it is a spooky, mysterious, in-the-mind-only kind of thing, like the redness of red. Like redness, it really exists, but in order to account for it properly we will have to overcome our unease at its spooky mysteriousness.

3. Extension

Terms are about things. "Water" refers to, is about, water. "Cat" is about a cat, or cats in general. So far, so good. The stuff out there in the world that a term "picks out," the actual cat(s) or the actual water, is called the *extension* of the term.

There are aspects of meaning that are not done justice by simply pointing out the extension of a term, however. Often there is, implicit in a term, not just what the term actually refers to, but how it refers to it as well. One of the most well known examples is that of renates and cordates. Renates are creatures that have kidneys, and cordates are those with hearts. As it turns out, everything that has a kidney has a heart, and vice versa. So "renate" and "cordate" both have the same extension; they both refer to exactly the same set of actual animals. Nevertheless, it should be intuitively clear that the terms do not have exactly the same meaning. One can imagine a creature that is a renate but not a cordate, or a cordate without being a renate. The terms "renate" and "cordate" have perfectly distinct meanings, and it seems like an accident of nature that they happen to coextend.

4. Intension and Possible Worlds

If extension is the actual stuff that a term picks out, intension is *how* the term picks it out. Intension is the questions a term asks the world before it decides that some aspect or part of the world is denoted by that term or not. (If all this anthropomorphizing terms themselves seems a little suspect to you, rest assured, I couldn't agree more. Bear with me.)

To capture and formalize the idea of intension, philosophers of language have come up with *possible worlds scenarios*. Renates and cordates are the same creatures in our world, but there are possible worlds in which some renates are not cordates. To put it in mathematical terms, intension is a function of possible worlds to extensions in each world. That is, to nail down a term's intension, you let your imagination range over all possible worlds, and for each possible world you determine what the extension of the term would be in that world. When you are done, you have the original (infinite) set of all possible worlds, and for each one, the extension of the term in that world. The resulting (infinite) set of pairings completely captures the term's intension, which comes much closer to the term's meaning than simply specifying its extension in our world.

This talk of possible worlds has always struck me as a clunky and unnecessarily extravagant way to talk about why we use the terms we use the way we do. Surely when ordinary language users use a term like "renate," infinite sets of possible worlds do not actually play any role in their mental processes. If theories based on possible worlds scenarios are not theories of our mental processes as we learn, interpret, or use terms in everyday life, then what are they theories of? I honestly do not know, but I detect a whiff of Platonism – the faith that semantics is something real (albeit non-physically, or metaphysically real), something we could have theories of, theories that could be objectively right or wrong independent of our mental processes. Be that as it may, if infinite sets of possible worlds seem a bit unwieldy, hold on – it gets worse (see "Two Dimensional Semantics" below).

Moreover, talk of possible worlds often seems to assume that picking out the extension of a given term on a particular possible world is unambiguous. It is always admitted that on some worlds, a term just might not have an extension, but on the ones in which it does, there are generally seen to be no real problems picking it out, and there are no real problems telling which are the worlds in which the term has an extension in the first place. All that matters is the final answer: that crisp, neat mapping of possible worlds to extensions that defines the intension.

If possible worlds are interesting fodder for speculation at all, it is because of the ambiguous cases. Are terms defined absolutely, because of some inherent essence of the thing described? Or are terms (and concepts, for that matter) defined relationally, in terms of their functional interactions with other things? Was John Muir right: "When we try to pick out anything by itself, we find it hitched to everything else in the Universe"? To the extent that we admit that our idea of what a thing is depends on its relations to other things (perhaps even, transitively, *all* other things) any change a possible world exhibits from our own puts the burden of proof on someone who claims that a term is directly transferable from our world to that possible world. Could there really be Pepsi worthy of the name in a world with no Coke? Most people would say "probably," but it gets tricky depending on context.

In how many possible worlds is there an extension of the term "Albert Einstein"? What if there were a world just like our own, but the man we credit with discovering special and general relativity, and who adorns countless dorm room walls, was named Albrecht Eisenstein? What if there were a man named Albert Einstein who was raised exactly as our Einstein, in exactly the same family, with exactly the same genetics, but who made his living as a piano tuner, never entering the world of science at all? What if Albert Einstein discovered relativity, but was a blond Englishman? What if, in addition, his name was Edwin Chillingsworth? In how many of these worlds (and any of the others that we could come up with for hours and hours) can we definitely pick out the extension of the term "Albert Einstein"? It depends on the kind of conversation we are having. Sometimes, even with proper names (the paradigmatic examples of what are called "rigid designators"), we are speaking more abstractly, sometimes less. Moreover, when we speak abstractly, or figuratively, we do not always carry out our abstraction along the same axes, abstracting away the same kinds of details as we might at other times, in different conversations.

Let us imagine, for example, that there is an alliance of advanced civilizations that calls itself the United Federation of Planets. This federation never makes overt contact with a newly developing civilization until that civilization is on the verge of inventing warp drive, which would allow the civilization to explore the cosmos. In the midst of clandestinely monitoring one such emerging civilization, a Federation captain might have a conversation with his First Mate in which he asked, "Have they had their Albert Einstein?" This might be a slightly awkward way to phrase the question, but nevertheless it would be reasonably unambiguous, and the First Mate could answer "yes" or "no," perhaps following up with some detail as to the exact state of the civilization's technological development. Obviously, the captain was speaking somewhat abstractly. He did not mean to ask if the civilization had produced a wild-haired, slightly comical man born in 1879 in Ulm, Germany. If the planet being watched was populated with gelatinous green blobs that communicated through their highly developed sense of smell, and had no ears or eyes, the First Mate could still perfectly truthfully answer "yes" to the captain's question. The captain is interested in certain of Einstein's characteristics, but not others.

On the other hand, what if Mileva Einstein (Einstein's first wife) found herself sucked out of our universe through a wormhole and ended up on the bridge of our Federation starship. Once it was clear that she had no hope of ever returning to her own world, she might ask, "Does this world have an Albert Einstein?" She would not take yes for an answer if the Albert Einstein being referred to was a gelatinous green blob that had discovered relativity. She might very well, however, take yes for an answer if the Albert Einstein were our piano tuner. She is also speaking abstractly, but she is abstracting along different lines than the Federation captain is. Both abstractions are perfectly valid, in their respective contexts.

So it is not enough to think that we may speak of something either abstractly or specifically. It is not even enough to see that we may speak more or less abstractly, along a continuum. In different contexts a term may be abstracted along different lines, in a continuum, holding different properties as essential. That is, we cannot even talk about speaking abstractly, even allowing it to be a matter of degree rather than admitting discrete states, unless we know who is doing the abstracting and what their interests are, what they consider essential properties of whatever it is they are talking about, and what they assume their audience will consider essential properties.

Ours is the only world we are forced to deal with, and it quickly becomes clear if someone is flat out using a term to refer to something that other people would not use the term to refer to. But as soon as we enter the realm of possible worlds, we open the door to legitimate disagreements, for a given world, as to what constitutes the extension of a given term. Once we start hypothesizing in this way, it is often by no means obvious whether the extension of a term exists, or exactly what its extension is in a given world. There may be no way, even in principle, of answering these questions absolutely, depending on the context of the usage, and depending on who the speakers and listeners are, and what their interests in communicating are. It is these sorts of inherent ambiguities that possible worlds scenarios should get us talking about, but which most possible worlds thought experiments ignore. One of the most well known such thought experiment is Hillary Putnam's Twin Earth.

5. Putnam's Twin Earth

In his widely cited paper, "The Meaning of 'Meaning'" (1975), Hilary Putnam argues against the sort of internalist characterization of meaning that I argue for. Putnam's most memorable example is a possible world scenario involving a hypothetical Twin Earth. Twin Earth is just like our Earth, perhaps even including a twin me and a twin you, with one exception: on Twin Earth, the substance that they call "water", while drinkable, odorless, transparent, and in all other "superficial" ways identical to our water, is really not made of H_2O. It is instead made of some other chemical compound, that Putnam abbreviates as XYZ. The question that presents itself immediately, of course, is whether or not XYZ is really water.

Putnam flatly claims that it is not. If water is H_2O, then the extension of the term *water* is the set of all quantities of H_2O, anywhere in the universe that they occur, and nothing else. Anyone who uses the term *water* in such a way that it has a different extension is simply wrong, or is essentially speaking a different language than English as it is spoken on Earth. Putnam's main point is, as he put it, that "meaning ain't all in the head." My twin and I may be in identical mental states as we use the term *water*, but we mean different things by virtue of the fact that our respective uses of the term *water* have different extensions. For Putnam, the *meaning* of a term depends crucially on its *extension*.

Putnam also says that before about 1750, no one knew that water was H_2O, even though it really was. If it turned out that some, but not all, "water" on Earth was really XYZ, it would thus turn out that people who had referred to quantities of XYZ as water (the pre-1750 people) were wrong all along. Putnam claims that the usage of pre-1750 speakers of the term "water" to denote XYZ would be retroactively invalidated by future scientific discoveries, even though they lived and died in a community of speakers, listeners, and readers who used the term with unanimous and unambiguous (to them) agreement as to its meaning. I find this claim downright bizarre.

Usage is right. Usage wins. All language is folk language. All language is slang.

Water is a cluster concept – a collage of properties, memories, associations, nuances, connotations, descriptions, expectations, and "scripts" or algorithms for dealing with particular types of watery situations. All of the elements of this collage tend to be correlated in our world, so we draw a line around them with a purple crayon and slap a label on them, *water*, and go about our lives. We don't have to consider the relative importance of the different elements of the collage (in terms of being defining characteristics of the collage) until some clever philosopher comes up with a contrived thought experiment, and asks us to consider the collage if one of its elements were removed or changed. In Putnam's thought experiment, the element that is swapped out is the fact of water's microphysical constitution, a fact that most of us learned in high school but which has little impact on our day-to-day lives. I suspect that many of our concepts are loose aggregates in this way, and that because their separate components or properties tend to be correlated in our experience, we assume that the entire cluster is much more tightly integrated than it necessarily is.

How many things could turn out to be different about water before you really felt that you could no longer call it "water"? Do you know how heavy water is? What if it were a hair heavier than you thought or a hair lighter? What if it had some magnetic properties you had somehow managed to avoid hearing about until right now? What if you just read that in certain fields, generated in high-energy physics laboratories, water turned orange and viscous? These things might surprise you, but they would hang like Christmas tree ornaments on the core concept "water." Other, more abstract concepts are more tightly integrated in our minds. I would argue, for instance, that there are no superficial properties of the concept "three." There is not a thing you know about the mathematical concept of three that you could change without inarguably wrecking the whole thing. If you change a whisker on three, it just can't possibly be three anymore. Water might glow in the dark, (but only in the southern hemisphere during a lunar eclipse) and possibly still be water, but a number that is exactly like three but not prime just isn't three.

Because we on Earth have only ever been exposed to water as H_2O, we have not had to consider the possibility, but perhaps we have a “big tent” concept of water. Maybe *water* is multiply realizable, like the term *building*. Buildings, after all, get to be buildings by virtue of their use, their functional characteristics, but can actually be constructed out of a great many things. We think of water as being H_2O, because that is the only kind we have run up against, but maybe water made out of XYZ would not phase us.

On the other hand, we have strong intuitions that what something is made of, even if we can’t see it and have no direct evidence of it without sophisticated equipment, has a lot of authority in deciding what it *really is*. So maybe XYZ isn’t water after all, and the microphysical constitution element of the collage trumps all the others. I don’t know, and neither does Hillary Putnam. The question is a sociological one, not a philosophical one. We could send a colony to Twin Earth, give them full knowledge of the chemical difference between Earth water (H_2O) and Twin Earth water (XYZ), and let them go for a generation or two, and check back to see if they call both *water* or if they have come up with another term for the XYZ kind of water. Maybe they all use the term *water* for both kinds of stuff, but every now and then an annoying pedant among them corrects people, the way some people tend to compulsively point out split infinitives. Maybe both H_2O and XYZ get to be called water in everyday conversation, but the scientific journals use some long Latin names for the chemical formulae on those rare occasions when they need to differentiate between the two. However they go, there's your answer.

We cleave our concepts along lines that are important to us. Microphysical constitution is important to us, so it gets a relatively high ranking. We have found it useful or satisfying in some way to let this criterion determine the extension of water. We have been told a very plausible physical story about the world around us, one involving atoms and molecules, and we believe it (for good reason). So when we make distinctions among the things in our world, we tend to give credence to distinctions rooted in this story. The point is that any authority or importance microphysical constitution has in determining whether something is water or not derives from our goals, rules and conveniences, and not from any immutable natural laws or any Platonic Meaning Of “Water.”

6. Saul Kripke

Saul Kripke, in a series of lectures collected in *Naming and Necessity* (1972) notes that at some point scientists figured out that whales are not fish, and that is really the right way to talk about it: they did not *change* the standard usage of the words "whale" and "fish"; they *corrected* the standard usage. Moreover, most reasonable people at the time would quickly acknowledge this, upon being told of the biological details involved. This is because, as Kripke says, an interest in natural kinds was built into the original enterprise of classification. When people coin and use terms, they tend to like to think that they are thereby distinguishing fundamental types. Distinctions made in terms of our current best story about what it means to be a fundamental type are ones we like to make and formalize in our language. Right now, for most of us, that story is the one about microphysics.

Kripke defends exactly the sort of Platonic understanding of meaning that I argue against here. His main intention is to argue against what he called the Frege/Russell understanding of meaning, which he characterizes as identifying a term with a bundle of descriptive properties. I said above that water is a cluster concept. Kripke says that Frege and Russell would agree, and they would identify "water" with the cluster. That is, to Frege and Russell, the term "water" is just a shorthand for that cluster of properties. A consequence of this, according to Kripke, is that if some of the properties in the cluster turn out to be invalid, the whole term must be thrown out. Kripke's take on Frege/Russell semantics is that the cluster does not have one of those clauses that lawyers stick into contracts saying "even if some clause herein is found to be invalid, the rest of the contract is still in full effect."

One of Kripke's examples involves gold. One of the properties of gold is that it is a yellow metal. According to Frege/Russell semantics, this is a definitional property of gold: one of the things that makes gold gold is that it is a yellow metal. What if, due to some highly implausible optical illusion, it turned out that gold was blue, and had been blue all along, but we had only thought it was yellow? Kripke rightly points out that we almost certainly would not say that since gold had been *defined* (among other things) to be a yellow metal, this new discovery means that gold does not exist, and we have some new, blue, metal in its place. Rather, we would just say that it turns out we were wrong, and gold is blue, not yellow.

Kripke says that when we link a term to a cluster of properties, we are not *identifying* the term with the cluster. Rather, we are *fixing a reference* with the cluster. When we coined the term "gold," we referred right through the superficial properties by which we identified gold, to the actual thing or stuff that (as it were) lay behind those superficial properties. Any of the superficial properties could thus turn out not to be actual properties of the stuff at all, and that would not affect our reference. Stretching the point a bit (but not too much – he produces some pretty compelling examples), Kripke suggests that *all* of the properties in the cluster could be not real properties of the referent, and the reference would still hold. We may use the cluster of properties to identify the thing referred to, but it is implicitly understood by all users of the term that the properties themselves are somewhat provisional, that the important thing is whatever it is that we (for the moment, anyway) believe possesses the properties. The properties are not the thing itself, but just a way of pointing out the thing.

This is a good example of the Platonism I spoke of earlier. The properties are the shadows on the cave wall, pointing in the direction of the reality that lies behind, or beyond the (mere) superficial cluster of properties. Kripke confronts head-on my claim that the coiners and users of a term ought to have the final say in deciding what counts as being picked out by that term. He illustrates his point using the common example of Hesperus and Phosphorus.

"Hesperus" and "Phosphorus" are the terms the ancient Greeks used to denote the evening star and the morning star, respectively. Although the ancient Greeks (before Pythagoras, anyway) did not know it, both were actually the single object we now call the planet Venus. Kripke says that Hesperus and Phosphorus just are Venus, and always were from the moment the terms were coined. There may be worlds in which Venus does not exist, but there is no possible world in which Hesperus and Phosphorus are different objects from each other, or anything but the planet Venus.

Now I can imagine a possible world in which there are two distinct objects in the sky. Let us call them (with apologies to Dr. Seuss) Thing 1 and Thing 2. I bet I could arrange this world in such a way that if we were to teleport the ancient Greeks to that world, they would accept that Thing 1 is Hesperus and Thing 2 is Phosphorus.

We should think long and hard before we say that the Greeks are simply wrong to call them that. They coined the terms, after all, to make distinctions that were important to them in their lives. They lived and died happily in their use of those terms. They used them with perfect (as far as their purposes were concerned) unanimity and unambiguity as to their meaning. I think that this gives them a fair amount of authority in deciding what the terms mean, and if they decide that Thing 1 is Hesperus and Thing 2 is Phosphorus, you had better make a very good case that they are wrong.

It is not enough to point out that the ancient Greeks' scientific knowledge was wrong or incomplete. That is not what is at issue here. They would probably have changed their terminology if they had figured out that Hesperus and Phosphorus were both Venus. But for now I am interested in the ones that never did know that, and their use of their terms that they invented to make sense of their world as they experienced it and thought about it. They used the terms, and the terms had meaning for them. How did this meaning work?

Kripke says that the Greeks had ways of identifying Hesperus in the sky, and ways of identifying Phosphorus. But these clusters of properties, these ways of identifying them, are not what Hesperus and Phosphorus *are*, even to them. By coining the terms, the Greeks were fixing a reference to Venus, even though they did not know it at the time. In effect, they referred right through the properties by which they identified Hesperus and Phosphorus, to the actual thing behind them, namely the planet Venus.

Kripke's arguments have some intuitive appeal. But rather than argue about whether the Greeks were really using "Hesperus" as shorthand for a bundle of observed regularities in the sensory input they received from their environment, or they were really fixing a reference to Venus, I'd like to take a step back and ask: on what basis could either claim be right or wrong? By virtue of what, exactly, can Kripke say that the Greeks were fixing a reference rather than identifying a cluster of properties?

When the Greeks used the term "Hesperus," did they thereby instantly pick out something several light-minutes away, and if so, does this process of picking out violate relativity theory by traveling faster than light? Could we verify or disprove Kripke's claims by building a device to detect the invisible meaning rays that connect a user of the term "Hesperus" to Venus? Of course not. Reference is not an actual physical process that happens in the real world. So if reference is not a process of physical causation, what is it? It is nothing. Nothing, that is, except some (admittedly mysterious) stuff happening in the mind. If you hear me use the term "water" (more physical causation, involving vocal chords vibrating, waves of pressure moving through countless air molecules, pushing on an ear drum, etc.) then I induce some stuff to happen in *your* mind. Some of this mental stuff may include certain "raw feels," expectations, equivalence relations and tests, and who knows what all else. But it is *mental* stuff, in the mind only.

The only real questions about semantics concern what minds do under the influence of terms, both internally and externally generated. Put another way, once God created all the physical facts of the universe, as well as the facts about consciousness (or, depending on your outlook, *including* the facts about consciousness), there simply was no more work for Him to do to create all the facts about reference. Except insofar as it reflects something about how minds work, reference is an explanatorily useless concept. Moreover, I see no reason to think that it constitutes any kind of phenomenon in need of explanation beyond straightforward physical causation (except, again, insofar as it is a product of conscious minds, in which case it is very much in need of explanation, as are all conscious phenomena). So if reference is not a physical phenomenon, and does not even supervene on physical phenomena (reference travels faster than light, after all), and reference is explanatorily useless and does not itself constitute an explanandum worthy of the name, how is it that anyone could have a theory of reference that they claimed was "right," and that other theories were "wrong"?

What does Kripke himself cite as the final authority to back up his claims about fixing references? He produces some good examples (like the blue gold described above) that incline us to think that his claim about "fixing a reference" accords with our intuitions about the way reference ought to work. Is this enough to convince us that reference really does work that way, though? Ultimately, Kripke seems to think that his particular Platonic notion of reference goes through because we want it to. Perhaps it isn't so much the case that Kripke does not think that this Platonism is objectively true of the universe, but rather that it holds true because all language users are Platonists at heart. As Kripke puts it, a desire to classify things into categories of natural kinds was built into the original enterprise of language use. We all go about our lives knowing that whatever clusters of properties we use to identify things are somewhat ad hoc, and subject to revision if we come across evidence that the underlying reality is different than what we thought it was.

When phrased this way, assuming I haven't badly misunderstood and/or misrepresented Kripke, his arguments are not so different than mine. This reference-fixing, the Platonism, is not an actual feature of the universe, it is a fact about how our minds work, and our needs and desires with regard to language construction. We want to classify the world in certain ways, so we build that imperative into our notions of reference. The final authority for deciding that water is really H_2O, then, is our goals and intentions in using language in the first place, and that's why the Greeks were *really* referring to Venus even though they didn't know it.

Unfortunately, I think this does misrepresent Kripke. While he does talk about our desire to classify things in a certain way, it is pretty clear from the absolute way in which he phrases his claims that he thinks of reference as a really-there, actual fact of the universe sort of thing, in a robustly externalist way. It is *necessary* that Hesperus is Venus, and it is *necessary* that water is H_2O, and the Greeks would be wrong to call my Thing 1 Hesperus, not because of caveats and codicils they had written into their original charter establishing the goals and rules of their particular linguistic enterprise, but simply because they would be absolutely, objectively wrong, and that's that. He would strongly disagree, I think, that questions about reference are sociological or psychological, not philosophical ones.

7. "Picking Out" Extensions

Extension is the stuff in the universe that a term "picks out." Of course, terms do no such thing. With apologies to the National Rifle Association, terms don't pick things out, people do. Extension seems like a reassuringly concrete idea: the extension of the concept of water is a set of actual molecules out there in the actual world. But extension is not so clear cut. Putnam allows that determining extension requires an equivalence relation. We can not specify all the occurrences of water on Earth without having a way of saying "all the stuff that is equivalent to this stuff here in this glass." This equivalence relation, the criteria we use to decide if something is water or not in various real or imaginary scenarios, is the intension. Extension is supposedly concrete, while intension is rather more abstract (remember that intension is a function that maps possible worlds to extensions on those worlds).

But you can't get to the extension without going through the intension. Thus extension is itself something of an abstraction: we can never, in practice, enumerate all the molecules of water in the universe, so we can never actually *pick out* the extension of the concept of water. We are always at a certain remove from anything's extension; all we really have at our immediate disposal is intension. All we can really do is talk about the general kinds of things we would consider water. What we really are talking about when we use the term *the extension of water* is a bunch of tests we can apply to different situations, ways of applying some equivalence relation.

Importantly, *we* apply those tests, *we* pick out the water. By itself, a term just sits there. By itself, in a sense, a term doesn't even exist.

8. Putting Meaning Back in The Head

How do we know about water's microphysical constitution, anyway? Most of us simply read it in a book or were told it in school and accept it. Some of us ran tests with instruments. Originally, sometime after 1750, someone ran such tests, and inferred the microphysical constitution of water from the results of those tests. But the results themselves, the raw data, are functional properties of water, facts about how water behaves in different circumstances. These sorts of properties are no different in kind than the results of the "tests" I run when I smell water, dip my hand in it, taste it, etc. The fact that in one case the instrumentation involved was built by people, and in the other case the instrumentation consists of devices I was born with (tongue, fingers, eyes, etc.) does not make any difference in terms of the type of property of water we are talking about. For the Twin Earth thought experiment to go through, there must be at least some "superficial properties" of H_2O and XYZ that differ. Otherwise, how would any scientist ever have told the difference? At some point, if you feed H_2O into a mass spectrometer you get one result, and if you feed XYZ in, you get a different result. Different raw data equals different "superficial properties," just as much as if H_2O and XYZ tasted different. The microphysical constitution that Putnam regards as the absolute determinant of true wateriness, is a story that we inferred from various different superficial properties.

Now I happen to like that story. It is remarkably powerful and parsimonious in its ability to link all kinds of phenomena in the world, confer cognitive power upon us, organize our mental economy efficiently, and ultimately, help us invent microwave ovens and rocket ships and all sorts of other things. But it is not the only imaginable story.

We should steer clear of the assumption that the pre-1750 people used their rough and ready conception of water only provisionally, and that they were waiting for science to tell them about water's microstructure so they could be more precise. Pre-1750 people, whether or not they had ever heard of Aristotle, were basically Aristotelians. They already knew the elemental constituents of water – namely water. Water was simply one of the basic kinds of stuff their world was made of, and most people didn't question whether or not water might be made of anything still more basic. Their understanding of science was wrong, but their ability to refer was working just fine.

What if there were a prescientific tribe of people somewhere that had two words for water. *Water* referred to the water from the river, that brought life and was good and blessed by the gods, but *shwater* referred to the evil water from the spring that was cursed. No explaining that water was chemically identical to shwater would make them change. Microphysical constitution is just an unimportant property to them compared to the essential goodness or evil of the water/shwater. The goodness or evil determines what the substance "really is." Perhaps they are not prescientific, and they understand about chemistry and H_2O, but still hold their religious beliefs, with full acceptance that there is no empirical basis for them. They have chosen a different property, a different element of the collage to define the essential nature of water/shwater.

Lore has it that the Eskimos have 100 words for snow (the actual number seems to vary a lot depending on where you read this old chestnut). Let us imagine that one of their 100 words is spelled and pronounced exactly like our word "snow." This is like the situation with the pre-1750 people calling both XYZ and H_2O "water," only with us playing the part of the pre-1750 people, riding roughshod over what to others (the Eskimos in this case) are important distinctions. We aren't right and the Eskimos aren't right. We all just make the distinctions that are important for us to make, and we don't waste time coining a lot of extra terms to allow us to split hairs we don't have to split. A term is only as precise – can be only as precise – as is necessary to make the discriminations of interest to the community of users of the term. How narrowly or broadly I define my terms is something I (or my culture) decide in the interests of setting up my conceptual and linguistic pallatte in such a way as to get the maximum cognitive or communicative bang for the buck. There is no right or wrong answer as to the narrowness or breadth of my definition of the term "water."

The success of a particular scientific theory or another does not absolutely (and retroactively!) determine meaning. Whenever we have a collage of data (superficial properties), we infer a story to bind it all together. The story is the purple crayon we use to demark the collage. It is this story that we cling to as the determinant of meaning, the crucial defining characteristic of each of our concepts. It determines the equivalence relation, the intension, that in turn determines our tests for inclusion in or exclusion from the extension. This story, and thus meaning itself, *is* in the head.

There is some stuff out there in the world (water), and our interactions with it have lead us to attribute some "superficial" properties to it. We also have a story in our minds, an explanatory framework that we have found to be very useful (our current physical theories about atoms and molecules and such). Some of this stuff's superficial properties have lead us to infer that it fits comfortably into a particular place within this explanatory framework. I believe that this phrasing of the situation with water is appropriate because it is accurate and maximally conservative, in that it makes few unsupported assumptions. But when the situation is put this way, it should be clear that it makes no sense at all to speak of something that shares all of water's "superficial" properties but isn't really H_2O. For it not to be H_2O, it must differ in some superficial properties.

I suppose someone could still insist, for the sake of the argument, on hypothesizing a substance that behaved exactly like H_2O as far as current science was able to determine, but which really was not H_2O. I could take the standard cop-out that people sometimes take with thought experiments and demand details. I guarantee that no one could possibly specify such a situation at any satisfying level of granularity. But the standard cop-out would lose a larger and more important point. It is in principle, literally nonsensical to speak of something that behaved exactly like H_2O, and wasn't really H_2O. As I and lots of others have pointed out (Gregg, 2010), science doesn't really claim, at heart, to tell us what is really going on out there in the world. It only specifies a bare schema, a circularly defined pattern of functional dynamics, but it is silent about what is doing all that functional interacting. To act exactly like an electron is to be an electron. There is no such thing, by definition, in principle, as something that acts exactly like an electron but really isn't an electron. By the same token, there is no way something could behave exactly like H_2O but somehow not be H_2O.

When it comes right down to it, our relationship to the outside world is entirely functional. That is, we know everything we know about the world because of the world's dispositional properties, its behavior. Water is as water does. There simply is no essense of water that does not manifest itself functionally, at least none we could ever know, even in principle. Any time we speak of reference with regard to something out there, we are talking about reference to a bundle of functional dispositions. This is functionalism turned on its head: it is not the mind that must be understood in functionalist terms, but the world.

The main point here is that the story about molecules and such, the explanatory framework, is entirely in our heads (although there is a strong likelihood that there are things out there whose dynamics map nicely to this framework). We can not say what anything "really is" beyond where it fits into our explanatory frameworks based on its observed "superficial" properties, which is to say, based on certain sensory experiences we have had. Speculation to the contrary is the kind of pursuit that gives philosophy a bad name.

So what is going on in our minds when we use the term "water", either saying it, hearing it, or thinking it? That is the $64,000 question. A very interesting question, yes, but a question about what is going on in here, in the mind, and not a question about any notion of "meaning" beyond that. I have characterized the concept of water as a cluster, a collage, but I have said that it involves equivalence relations or tests we apply to situations, and that it is delimited by a story that we infer from experience. Obviously this all needs a lot of clarification. Do I even have one single thing in my mind that I can call my concept of water? Does it, strictly speaking, have a fixed identity that persists over time? If so, how much of it can you change before you must call it a different concept altogether? Do concepts subsume other concepts? What part do qualia, the what-its-likeness of water's wetness, its (lack of) taste, etc., play in all of this? How much relative weight does Kripke's project of language use (that of dividing things into categories of natural kinds) have? These are the truly interesting questions about the limits of the meaning of the term "water," but these are all straightforwardly questions about minds. There is a lot of stuff going on in our heads and it will take considerable work to sort it all out.

One thing we can speak of with confidence, however, is the relationship between all this mysterious stuff happening in our heads and the outside world. We do not directly perceive matter. There is a long, twisty causal chain that links certain events that happen in the physical world with percepts and concepts in the mind. Or perhaps more suggestively, our concepts and percepts are constrained or influenced by these events. Until we understand the concepts in our heads better, the details of the influence of the external events upon them will remain murky.

I say *events* rather than *matter* because as far as the causal influences on the mind are concerned, matter only manifests itself in the form of particular events – photons bouncing off objects, being refracted by a lens, striking rods and cones in the retina, kicking off a whole series of neural firings, etc. No two people are ever subject to the same series of such events. "Matter" and "the external world" are just a hypothesis we come up with to account for the largest number of these events in the greatest detail, subject to whatever as-yet improperly understood cognitive limitations there may be. Over the course of my life so far, I have had a huge number of sensory experiences. Some of these experiences have lead me to infer the existence of something called "Great Britain." My concept of Great Britain is a hypothesis I have formed, one that makes sense of a lot of particular sensory experiences (whatever "makes sense of" turns out to mean). It may well be an overwhelmingly plausible hypothesis, but a hypothesis it is nevertheless, formed under the physical causal influence of my senses.

Note that none of this makes any claims as to the similarity or difference between the stuff happening in my head and the stuff happening in yours or anybody else's. There may be a great deal of variation possible among the possible concepts of water (or Great Britain) in peoples' heads, as long as whatever the different concepts are, they allow for an appropriate correspondence or mapping between matter in the world (or the events by which matter impinges upon us) and our linguistic behavior.

So where does that leave us and our term "water" and our associated concept of water? We have 1) molecules of stuff somewhere out there in the world in our rivers and streams. These molecules, as we encounter them, cause physical events to occur, which cause still other events, etc. until some event(s) in this chain ultimately impinge in some way upon 2) some mysterious things happening in our heads; and finally we have 3) our observable linguistic behavior, which presumably is caused or influenced by 2). We have a long way to go before we understand 2) and the exact relationship between it and 1) and 3), but once we do understand these things, there will be nothing left to explain about language and meaning.

It is sometimes said that meaning is merely *mediated* by causal connections between the outside world and our minds. I, however, would say that meaning *just is* those causal connections, plus some mysterious stuff happening entirely within the mind. Any talk of meaning beyond this has no explanatory or predictive power at all. There simply are no facts about the universe, either extrinsic, third-person "scientific" facts, or subjective phenomenal what-its-like-to-see-red-type facts, that are explained by assuming invisible magic meaning rays connecting our thoughts to trees, cars, and the Milky Way galaxy. The causal chain between physical events that happen in the world and the concepts we form in our minds may get very complex, but it is still just billiard balls knocking together. There is no other kind of connection between the stuff out there and our concepts in here. The problem with the term "extension" is that it strongly inclines us to believe that there is. It presumes a sort of spooky mystical connection between the collection of molecules of H_2O in the universe and our internal concept of *water*. There is no such connection.

If you ask me as an English speaker if XYZ counts as water, I may think for a moment or two then give you my opinion, which I made up just then. I may then give you arguments for my opinion, that you may or may not accept. My opinion may or may not be in accord with that of the majority of the rest of my linguistic community. It may or may not even be in accord with the dictionary definition of the term "water." But my answer is still just something I made up. Of course, that is what all language ever is – at some point, someone just makes stuff up, and other people adopt it in their speech. If, on the other hand, you ask me as a philosopher if XYZ *really* counts as water, I'm afraid I would have to ask you to rephrase the question, because as stated it is too loaded with presuppositions to admit a yes/no answer.

I would like to emphasize, though, that my deference to usage is not a sort of black-box behaviorism, or functionalism. Usage is not strictly inter-personal; a great deal of our usage of terms takes place entirely between our own ears. We use language not only to communicate with one another, but to think. In stressing *usage* I am not trying to equate meaning strictly with observable linguistic behavior, but also with the cognitive use we make of words and expressions, and the ways in which terms are related to concepts in our minds.

9. Modes of Presentation

Sometimes the notion of modes of presentation is invoked to solve semantic problems. The idea is that Lois Lane knows that Superman can fly. Yet it would surprise her greatly to discover that Clark Kent can fly. But Clark Kent and Superman are one and the same person (that is, the term "Superman" and the term "Clark Kent" have the same extension), so in some sense the claim that Superman can fly and Clark Kent can fly should convey exactly the same information. They both make the same claim about the same individual. To resolve the apparent conflict, it is argued that any given claim must be understood under the proper *mode of presentation*. Superman and Clark Kent may in fact be the same collection of molecules, but facts about them are subject to their mode of presentation.

I find talk of modes of presentation very fishy. As far as I can tell, attributing any explanatory power to modes of presentation is just a way of covering for incomplete or incorrect information. Lois Lane knows that Superman can fly but would be surprised to find that Clark Kent can fly because she walks around with an erroneous model of reality in her head in which Superman and Clark Kent are two distinct individuals. She has drawn incorrect inferences about the world. She has, in fact, been deliberately and systematically deceived by the individual who is both Superman and Clark Kent.

Any problems in thinking about this situation stem directly from the intuition of the invisible magic meaning rays that connect our thoughts and references with the outside world – the idea that *ref-*

erence is exclusively or even primarily some kind of instantaneous connection between something in our thoughts (or Lois Lane's thoughts) and the outside world. I do not know exactly what reference is or how it works, but if it is to have a precise meaning at all in the sense of being philosophically interesting or useful, it must be defined as a relationship of some kind between thoughts. Lois Lane's term "Superman" refers to a Superman concept in Lois's mind. There is nothing problematic in saying that for Lois, the claim that Superman can fly and the claim and Clark Kent can fly convey very different information because for Lois, the concept "Superman" is simply a different concept than the concept "Clark Kent." She formed both concepts by drawing inferences from lots of perceptual experiences she had. The concepts then contribute to her expectations of the kinds of perceptual experiences she is going to have in the future.

10. The Contents of Our Thoughts

An idea closely related to that of the invisible meaning rays and Platonic Meaning is that of the *content* of our thoughts. Many writers use the term with confidence that it has meaning, then go on to spend a lot of effort trying to analyze it and figure out what the content of our thoughts is, or whether content is narrow (dependent on one's internal state) or broad (dependent on one's state plus the state of the world). It always seems to go without saying that there is some fact of the matter. The content of a thought is a lot like the extension of a word. It is whatever the thought is "about." I find the term at best to be a strong pretheoretic nudge in a particular direction, and at worst grossly misleading.

I may have a box. If I put a cake in the box, then the cake constitutes the contents of the box. I could have put the cake in a different box, in which case that other box would have had the same contents that this box now has. Or I could have put some old newspapers in the box, in which case the same box would have different contents. The box is blank, empty, until I put some contents into it. These are the sorts of images and relationships we drag into play as soon as we invoke the highly loaded term "content." I have thoughts, that is all. As far as I can tell, I have no separate "contents" of those thoughts.

11. Two Dimensional Semantics

Two Dimensional Semantics is getting a lot of attention these days. Chalmers has been writing about it, as have other people. The motivation for 2D semantics is the opinion that intension alone, characterized in the possible-worlds sense, does not quite capture meaning. Specifically, there are terms whose intension is the same (i.e. the terms pick out the same extension in all possible worlds), but that seem as though they have different meanings anyway. As Chalmers puts it:

> According to Kripke, there are many statements that are knowable only empirically, but which are true in all possible worlds. For example, it is an empirical discovery that Hesperus is Phosphorus, but there is no possible world in which Hesperus is not Phosphorus (or vice versa), as both Hesperus and Phosphorus are identical to the planet Venus in all possible worlds. If so, then "Hesperus" and "Phosphorus" have the same intension (one that picks out the planet Venus in all possible worlds), even though the two terms are cognitively distinct. The same goes for pairs of terms such as "water" and "H_2O": it is an empirical discovery that water is H_2O, but according to Kripke, both "water" and "H_2O" have the same intension (picking out H_2O in all possible worlds).

So Kripke's claim as paraphrased by Chalmers is that because we now know that they are both just Venus, Hesperus and Phosphorus both must pick out Venus in all possible worlds, and so have the same intension (same extension in all possible worlds = same intension). Yet most people would agree that "Hesperus" does not quite mean exactly the same thing as "Phosphorus." To accommodate this in our theory of semantics, the following reasoning is invoked. Because of the way our actual world turned out, Hesperus is Phosphorus is Venus, and this must hold true across all possible hypothetical worlds. But if we imagine for a moment that our actual world had turned out differently, and in our actual world Hesperus was a different object than Phosphorus, and *then* we let our imagination range across all possible worlds, we might come up with a different intension for each world so considered. So essentially we set up a grid: first, along one axis (say, the vertical axis), we lay out all possible worlds, and imagine that for each of them, that is the way our actual, real world might have turned out. Then for each of those, we do the old-school possible worlds exercise, considering each possible world as hypothetical (along the second axis, the horizontal one) given that the possible world on the first axis is being considered as actual.

2D semantics is motivated by the Platonic impulse: the certainty that what something "turned out" to be in our actual world somehow fixes its meaning absolutely for all time and in all contexts. Thus, in order even to toy with the idea that things might have "turned out" differently in our world, we have to add a whole new dimension to our already infinite array of possible worlds. So instead of simply (!) considering infinite possible worlds, you consider infinite possible worlds for each possible world, with the possible world on the vertical axis imagined as the way the actual world "turned out." If possible worlds scenarios are clunky, then 2D semantics is clunkiness squared.

Does anybody imagine that when a little kid learns a new term, say "Mommy," that kid constructs a two-dimensional array in her head and fills in all the spaces in that array with the appropriate instensions and extensions of "Mommy" in all possible worlds as demanded by two-dimensional semantics? No – no one thinks this. So if two-dimensional semantics is not a theory of what actual language users do when they acquire and use terms in the real world, what is it a theory of, exactly? The same question could be asked of many theories of semantics. If two-dimensional semantics is the answer, what was the question?

12. Turning Out

The whole point of needing a second axis (i.e. the second dimension) in 2D semantics is that in our world, renates all turned out to be cordates. Hesperus and Phosphorus both turned out to be Venus, and water turned out to be H_2O. We may imagine possible worlds in which things could have "turned out" differently. This phrasing is misleading in that it draws a sharp distinction between a "superficial" acquaintance with the concept of water on one hand, and what water "turned out to be" on the other. Water has not turned out to be anything. We could still find out all kinds of things about water that would surprise us. I could be in the Matrix with a cable jacked into the back of my neck, in a "real" world in which physics is completely different, and in which there is nothing remotely resembling water. Perhaps in prescientific times, peoples' conception of water underwent revisions along the way, before people figured out about atoms and molecules.

Imagine a stone-age people who had a word, "pog" that meant, to them, "tool or weapon." As time went on, and the civilization advanced, the same term, "pog," might come to mean more specifically "pointed stick used as a weapon." Later still, it might mean "spear made of ash." Would it be right, then, to characterize the situation by saying that "pog" *turned out* to mean a spear made of ash, and that really had meant a spear made of ash all along? That the stone-agers who called a rock a pog *turned out* to be wrong? Would anything interesting be revealed about what meaning is or how it works by hypothesizing a Twin Earth in which the inhabitants used the word "pog" to refer to spears made of birch?

I have a model of reality in my mind (I am not hereby endorsing any particular theory about how we represent reality, much as this seems to imply the existence of some sort of database or something – I am using "model" *very* loosely). My memories and sensory experiences are somehow more or less integrated into this model, and the model gives me some predictive and/or explanatory powers as I move about in my world. As I experience more, the model changes. My knowledge about the world is always expanding, and I often acquire new facts and new perspectives that make me think of things I thought I knew well in a new way. In real life, concepts do not float free, then one day "turn out." They are always turning out; they never stop turning out.

A pre-1750 person, say Isaac Newton, had a significantly different model of reality in his head, but he had experiences and memories similar to mine, and he fit his experiences and memories into his model. In both our cases, "water" is defined, at least in part, relationally – in terms of where it fits in the reality-model relative to lots of the model's other elements. But my concept of water has certain associations within my reality-model that Newton's does not have, associations that further constrain the concept. There are fewer possible universes that contain stuff I would agree was water than there are for Newton (assuming that I buy into the idea that water is and must be only H_2O).

I prefer my model of reality to Newton's. I like the neatness, the power, the integrity, etc. of my scientific picture of the world. But in terms of what is going on when we refer, water has not "turned out to be" anything. Newton and I have different reality models, with different constraints upon the universe. Based on our different models, our concepts of water have different satisfaction criteria.

This is not oops-my-brains-just-fell-out relativism. I like science. I believe in science. Atoms are real. Newton was ignorant. But it is a strange form of scientific hubris to build Newton's ignorance of our science into a theory of reference, or to reify the distinction between "prescientific" notions of water, Hesperus, or anything else on the one hand and the way things "turned out to be," or the way they "really are," on the other, and to imagine that this alleged distinction tells us anything interesting about meaning. Just because a cathedral is made of stones, it does not follow that my concept of a cathedral is made of my concept of stones, and just because water is made of H_2O, it does not follow that my concept of water is made of my concept of H_2O.

The external world seems to fit nicely into a certain type of reductive framework. As we try to figure out how concepts and terms behave in our minds, we should not assume that they are arranged in a sort of hierarchy that matches the structure that our science tells us that the outside world exhibits. Any discrepancies between my internal model of reality and the outside world may interfere with my ability to reach efficacious conclusions, and may limit my ability to communicate effectively with other people, but such discrepancies do not automatically invalidate my ability to refer.

13. Symbol Resolution

Terms never do "turn out": while sometimes we do discover big important things about stuff we thought we already understood pretty well, the process of turning out is unfolding all the time, and is never finished. We never resolve symbols "all the way down." A possible exception to this might be things that are defined as part of a self-contained system in which everything is circularly defined explicitly in terms of other things within the system, as in mathematics. But even then, we may still discover new truths and untruths within the system that reflect back on our original basic terms.

Consider my car. I have an abstract notion of my car in my mind, and one might think that it maps straightforwardly to some specific collection of molecules, and that this mapping pretty much resolves the notion of my car all the way down. But is the gasoline in the tank part of the car? If not, then there are situations, not all that far-fetched, in which I might have access to my car, all of my car, but be unable to drive it, and this would surprise me. On the other hand, if the gas is part of the car, its molecules are constantly being spit out the tail pipe, and I periodically put new ones in the tank. Which incarnation of my car am I invoking each time I refer to my car? Is the air in all the hoses and ducts and manifolds part of the car? How about all the other fluids, that the car needs to run but which pretty much stay put (unlike the gasoline), but which still need to be replaced occasionally? Are the oil filter and the air filter parts of the car? How about the after-market floor mats? And what can we make of the car collector who claims to have replaced all of the parts of his vintage 1950's convertible, but still thinks of it as the same car he bought at a junk yard ten years ago? What collection of atoms constitutes the car?

All of these questions go away if we accept that we humans deal with vagueness all the time, easily and naturally. When I speak of my car, I'm not talking about a collection of molecules. I'm talking about whatever it is that roughly, more or less, conforms to my notion of my car. Vagueness is easy. It is precision that takes effort. You have to think carefully and hard to give consistent answers to the questions above about exactly what does and what does not constitute the extension of my term "my car." You may, after some thought, be able to answer the questions in a way that satisfies you, but only after effort and creativity on your part. In expending this effort, you would not be telling the truth about your pre-existing concept of my car, but rather you would be making up answers in response to this novel challenge. You might easily have gone to your grave without ever having answered those questions, and without even ever realizing that the questions existed to be answered, and this is perfectly fine. It is much easier to live with the ambiguity and not even notice it. It strikes me as backwards that some philosophers of language write chapters in books about The Problem Of Vagueness. We don't have to resolve the term "my car" all the way down, so we never do. "My car" has not, and never will, turn out to be one single, unambiguously specifiable collection of matter.

The mathematical notion of symbol evaluation is partially to blame for the bias philosophers have for this idea of "turning out." In algebra, you can have a variable, x, that everyone can see is a variable. It can be manipulated as a variable, but at some point, you may resolve it, by substituting a number, like 43, for it. There is an unambiguous, explicit delineation between the variable before it was resolved, and the value it has afterwards. There is also a universally understood sense in which x is unresolved, and exactly what aspects of it obey certain mathematical rules anyway, and what aspects of it are left unspecified.

In real life, as we generate and parse natural language, things are almost never that neat. Symbol evaluation in natural language is not an either/or kind of thing, as it can be in mathematics. For most of the terms we use in daily life, there are various degrees of specificity of resolution, and we resolve terms or inhibit their resolution to the appropriate degree, and in the appropriate order according to all kinds of rules of context as we string terms together in our thoughts or utterances. Modern semantic theory posits a very sharp distinction between a term's intension and its extension. The trouble is, rigidity of designation, to use the philosophical term, is a sliding scale. Parsing and generating language is less like symbol resolution as traditionally conceived than it is like tuning a complicated musical instrument.

14. Early vs. Late Binding

In certain contexts in computer science, the term "binding" is used to describe symbol resolution: a variable expression is "bound" to a particular value, and thus ceases to be a variable. Furthermore, there is an idea of "early binding" and "late binding" of variable expressions. The idea is that you can have a variable, and you can resolve it right away (early binding), then feed it into other calculations, or you can let it exist as a variable in those calculations, then resolve it to a specific value at the end (late binding). Sometimes you can get very different results depending on when you do your variable bindings. Some of the sense of this can be illustrated with the slightly awkward sentence, "By the year 2050, the president of the USA will be black." The likely intent here corresponds to late binding of the term "the president of the USA." We let that term float in the abstract as we evaluate the sentence, knowing that it will not be resolved until 2050. Or we could bind it early: as I write this, the president of the USA is George W. Bush, so the term "the president of the USA" resolves immediately to "George W. Bush," and the sentence then states that by the year 2050, George W. Bush will be black, a considerably less likely claim. Different terms seem to call for earlier or later binding, more or less specific resolution depending on context (which, of course, is made of other terms, which need to be resolved as well).

A great deal of the jargon associated with philosophy of semantics can be recast in terms of early vs. late binding. To me, this is often clearer and more intuitive. When Kripke speaks of fixing a reference as opposed to identifying a term with a cluster of properties, he is talking about early binding as opposed to late binding. When the Greeks coined the term "Hesperus," they bound it early (if unknowingly) to the actual thing, Venus (at least, that's what Kripke thinks). Kripke attributes to Frege and Russell the counterclaim that it is OK to bind terms late, and that the Greeks let the properties float free of any binding, so there could be a possible world in which Hesperus is something other than Venus. If the "superficial properties" are the x, and Venus is the 43, Kripke says that as soon as the Greeks said x, they immediately meant 43 even if they didn't know it. Frege and Russell, on the other hand, say that it is fine to let x stand in its own right, and we could perfectly meaningfully find out later that x is 43, or 23, or 101.

Gareth Evans' example about Julius also boils down to early vs. late binding. The idea here is that we allow the term "Julius" to refer to whoever invented the zipper (if anyone did) in whichever particular possible world we are considering. Semantic hijinks ensue from considering how, and to what extent, "Julius" refers to an actual person in any given world. Here we see that by hypothesis, "Julius" floats free of any binding (i.e. it is late-bound). "Julius" is defined by a descriptive criterion only, and is not bound to a particular individual until we touch down in a particular world, at which point the variable gets bound to the actual person who invented the zipper in that world. Once again, though, the example is somewhat contrived. It is set up to mimic mathematics rather than real life. "Julius" is a bistate term: either unbound or bound. In its unbound state, it is strangely specific about how to bind it, and there is a clear, unambiguous distinction between its bound and unbound state. It seems designed to be as close to an algebraic *x* as English prose can get.

Another example is one that William Lycan cites in his introductory book *Philosophy of Language* (2008): "I wish that her husband weren't her husband." In the first instance of the term "her husband", it is early bound, and picks out an actual guy, but the latter instance of "her husband," it is late bound (or rather, not bound at all within the sentence, but still waiting to be bound by the time the sentence ends). In its late bound state, the term is allowed to persist as an abstract specification, as binding criteria for some future binding to an actual person.

This distinction between early and late binding is really what motivated 2D semantics. In ordinary 1D semantics, with only a single infinite array of possible worlds to consider, you bind your terms early, according to what they mean in our actual world. This early binding corresponds to what is sometimes called a term's *secondary intension*. So water's secondary intension is H_2O, for example. Then, once that meaning is fixed, you let your imagination range over all possible worlds, picking out the extension on those worlds (i.e. the H_2O on each world). This, at least, is how Kripke characterized it in his objection to 1D semantics that Chalmers paraphrased above. But in 2D semantics, you allow for some late binding as you consider possible worlds. In the first part of the 2D semantics exercise, when you are considering each possible world as actual, you let some more abstract version of the term float over all possible worlds, and do your binding in each imaginary possible world, *then* with the meaning so fixed, let your imagination range over all possible worlds. This is sometimes called the *primary intension* of a term. While water's secondary intension is H_2O in all possible worlds in the 1D semantics case (we bound it early, in our actual world), water's primary intension is H_2O in our world, but XYZ in Putnam's Twin Earth (we bind the abstract specification – the watery stuff – to the actual extension late: after we've switched our attention to the hypothetical XYZ world, i.e. considered it as "actual").

It is assumed that there is no ambiguity in deciding what aspects of a given term should be allowed to float free across possible worlds to be bound by the contingencies of each one, and what aspects are constant across all worlds, both considered as actual and as considered as counterfactual. That is, which aspects of water are to be considered part of the abstract characterization (e.g. its odorlessness), and which aspects are the actual essence that the "superficial" properties "turn out" to be (e.g. water's microphysical constitution). It is also assumed that there is the abstract characterization (unbound) of a term, and the actual extension (bound), and none but those two completely discrete states. That is, you have the variable, the x (the watery stuff in the environment) and the value it resolves to (H_2O or XYZ).

But early and late are relative terms. Moreover, the whole notion of binding, no matter how early or late, is really the same thing as symbol resolution, and subject to the same problems. How narrowly do we construe or intend terms? How figuratively are we speaking or interpreting a term at a given moment? What aspects of a concept do we consider fair game to abstract away and what aspects do we hold constant as we do our figurative construing? In the Twin Earth thought experiment, it was taken as a given that water's "superficial properties" were to be held constant, and its microphysical constitution could be abstracted away as we considered different scenarios. But in real life, the narrowness or broadness of construal of a term, and the aspects of a concept we choose to hold constant and the aspects we feel free to abstract away, and exactly when we bind our terms to specific extensions ("resolve" a more abstract characterization of a term to a more specific extension) can vary wildly, often along a continuum, and are highly context-dependent, even within a single sentence.

15. Some Tautologies

A tautology is an expression of the form x = x. Since x is always equal to x, regardless of what x actually is, tautologies, in theory, convey no information about x or anything else. But as with so many aspects of language, theory and reality do not always line up. Let me indulge here in a bit of fiction.

Jimmy and Frankie grew up together in the same working class neighborhood. In their pre-teens they stole hubcaps together, then later whole cars. Soon enough they hooked up with the mob and worked together. Some years go by, and their bosses become aware that Jimmy is skimming a little off the top each month. As a test of loyalty, they send Frankie after him. Frankie has no trouble cornering his old friend, and in the ensuing confrontation, Jimmy pleads, "Frankie, it's me, Jimmy. I've always been there for you, Frankie, more times than I can count. This can't be the end, Frankie. Not like this. I know I screwed up, I screwed up bad. And you know I'll make it up, Frankie, you know I will. Come on, Frankie, please!" Frankie says nothing for a moment, just looks at Jimmy with his expressionless unblinking eyes. Then he quietly says, "Business is business, Jimmy."

Or how about this conversation:

"Every time I think about the holocaust, it shocks me all over again. You'd think that after hearing and reading about it all these years, I'd be jaded, or numbed, but no. I still can't get my head around the enormity of it, the reality of it."

"Hey, what happened, happened."

"What do you mean? It wasn't just something that happened. Real people did it! A government staffed by human beings coolly presided over the deaths of millions!"

"People are people."

"How can you say that? Killing six million Jews is not normal human behavior!"

"Well, you know, Jews *are* Jews after all."

"You jerk! What kind of a Nazi are you, anyway?!"

Then there is always the trendy "It is what it is." Along the same lines, there is the saying that by the time you are thirty, you must accept that no one is your mother, not even your mother.

For poor Jimmy, the supposedly information-free tautology is literally a matter of life and death. The point here is that these are not particularly special cases. People talk like this all the time. They convey lots of information in ways that a logician would say is impossible. The uses of the terms in these tautologies are perfectly valid, and must be accounted for by any theory of meaning. In these tautologies, the same term is interpreted narrowly or broadly, bound earlier or later, considered abstractly or specifically in different ways and to different degrees depending on its use in different places within the same sentence. The meanings of the terms in question are determined on a case by case basis, on sliding scales. Dictionaries seduce us into thinking that there is a discrete number of meanings any term can take on. To be sure, there are some stakes in the ground, but between these stakes there is often a continuum of meaning, and people slide up and down that continuum so effortlessly that they almost do not notice it.

In modern usage, the word "quick" means fast. When Shakespeare referred to the quick and the dead, he meant "alive." It may well be that in Elizabethan times, that was a common sense of the word "quick," one that has fallen out of favor. But to our ears, it is a poetic turn of phrase, a case of Shakespeare speaking figuratively. This figurative sense of the word "quick" plays off of its more restricted sense, and makes sense to us. It is just a broadening of the term. How broadly or narrowly we use terms is in constant flux, and highly context dependent. There is no distinct line we cross when we use a term to mean one thing, but take liberties with its breadth, and when we use a different sense of the term.

The other day on the highway I saw a flatbed truck carrying an enormous underground water tank. Obviously the tank was not underground, yet you probably never thought of the term "underground" as referring to a type before. You probably always thought that it must mean literally, under the ground. We very often, perhaps almost all the time, do not speak literally. Am I speaking figuratively, metaphorically, then, when I mention the underground oil tank when it wasn't underground at all? Well kind of, I guess, but no, not exactly.

Most people are perfectly comfortable using a term figuratively in one breath, and literally in the next, to varying degrees depending on all kinds of variables. Ambiguity lurks everywhere. Determined and ingenious people can tie themselves into knots, finding ambiguity just about anywhere they look hard enough. No one seems to have a problem with this except philosophers, a fact that does not speak well of philosophers.

16. Conclusion

My strictly internalist construal of intentionality and meaning may seem counterintuitive or flat-out wrong. A naive realist about meaning might say, "Look, there's a lawn mower. Its really there, you can touch it. It isn't a hypothesis or an inference, and when I think about it or talk about it, I'm thinking and talking about *it*, period." When I call the lawn mower a concept I have formed from lots of sensory experiences, and when I say that my thoughts about the lawn mower are really thoughts about that concept in my head, and not truly about the actual, physical, out-there-in-the-world lawn mower, this sounds at best like a needlessly indirect and awkward way of characterizing the situation.

Perhaps, but is there a good way to decide really and actually whose is the right way to think about reference? What empirical result could ever decide the issue? What rides on the outcome? What possible objective difference could it make who is right and who is wrong? If the answer is that there really is no difference, then right there we have a concession that there is no real, objective thing called "meaning" that exists between a concept or perception in my mind and a lawn mower. No invisible magic meaning rays beam from my forehead to the lawn mower. It comes down to a choice of how we want to characterize the terms "meaning" and "intentionality," and (to my mind) a trade-off between a desire to respect our pre-theoretical intuitions and a desire to carve Nature at the joints, as the slightly grisly cliche says. We should feel free to define terms in such a way as to facilitate clear and fruitful analysis going forward. This is one of those situations in which the philosophical latitude to define terms any way we want, and then go on to prove all kinds of things on the basis of those definitions has lead generations of epistemologists to build castles in the air. As we define (or perhaps more loosely, merely characterize) our terms, when given the choice between respecting our intuitions and common usage on one hand, and zeroing in on a potentially unique phenomenon in the universe on the other, I prefer the latter.

Now I will continue, in my everyday life, to speak *about* things in the outside world. "About" is a perfectly good colloquial English word, and from a very early age we all use it as if it darn well *is* a connection between our minds and the outside world (I have thoughts, desires, etc. *about* stuff out there in the world), and even between some things in the outside world (like molecules of ink on paper) and other things in the outside world (like fire hydrants). I am just saying that the use of the term in this way does not reveal anything about how the universe works. If you are interested (as I am) in reference as something that is really there, at work in the universe and not just one of those may-be-seen-as kinds of things, and if you believe (as I do) that there is, in fact, some really-there aspect to reference, then you are forced to the admittedly indirect internalist characterization of intentionality and meaning. The externalist take on meaning will always be reducible to other stuff, and in itself is as explanatorily useless as the luminiferous ether.

The only respectable way of construing meaning externalistically that I can see is to take meaning as really just a shorthand way of talking about an unwieldy amount of physical causation, plus some mental stuff. For my current purposes, it is the mental stuff that I would like to zero in on and figure out, and I do think that "reference" and "intentionality" and "meaning" entail some unique and interesting mental happenings, above and beyond the redness of red. Like seeing red, these mental phenomena are actual, fundamental facts of the universe, and are worth exploring. I believe that this is an important part of the puzzle of the mind, the part that will allow us to put what it's like to see red together with what it means to think in the same big picture. Clinging to the naive realist position, with its invisible magic meaning rays just serves to obscure what is really interesting about these phenomena, and to postpone serious inquiry into them.

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NIDA'S THEORY OF DYNAMIC EQUIVALENCE

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ABSTRACT. Nida argues that language must be viewed as a shared set of habits using the voice to communicate, and as potentially and actually idiosyncratic and sociosyncratic. Nida suggests that we must analyze the transmission of a message in terms of dynamic dimension. Nida and Taber state that dynamic equivalence is to be defined in terms of the degree to which the receptors of the message in the receptor language respond to it in substantially the same manner as the receptors in the source language.

Keywords: Nida, language, dynamic, equivalence, symbol, translation

1. Introduction

Nida claims that interpreting differs from translating primarily because of the pressures of time and exigencies of the setting, says that translating often represents specialized skills and can require aesthetic sensitivity, and emphasizes that language consists of more than the meaning of the symbols and the combination of symbols: it is a code functioning for a specific purpose or purposes.

2. The Advantages of a Sociosemiotic Approach to Translating

Nida argues that language must be viewed as a shared set of habits using the voice to communicate, and as potentially and actually idiosyncratic and sociosyncratic. Discourse becomes as much a matter of fashion as any other element of communication. According to Nida, the advantages of a sociosemiotic approach to translating are to be found in: (1) employing a realistic epistemology which can speak relevantly about the real world of everyday experience; (2) being at the cutting edge of verbal creativity; (3) recognizing the plasticity of language, the fuzzy boundaries of usage, and the ultimate indeterminacy of meaning; and (4) being essentially interdisciplinary in view of the multiplicity of codes.[1] Hatim and Munday note that, as Nida puts it, semantics is the "*science* of meaning." Nida borrows Chomsky's surface structure–deep structure concepts in his analysis–transfer–restructuring model of translation, and adopts current ideas from semantics for the analysis of meaning across languages. Nida's "scientific" approach to translation exerts influence notably for the many practical translation examples that it provides.[2]

Hui-juan reveals that there are some fundamental differences between Jin Di's theory of equivalent effect and Nida's theory of dynamic equivalence in three aspects: (1) Nida's theory is reader-oriented while Jin's is text-oriented; (2) Nida's theory is flexible while Jin's tends to be inflexible; and (3) Jin's theory is an ideal one in the sense that it cannot be realized in translation practice whereas Nida's theory is a realistic one. Hui-juan explores the two major reasons that lead to such discrepancies: (1) the deficiency of Nida's theory in dealing with transference of aesthetic elements for literary translation; and (2) the influence of traditional Chinese translation theories upon Jin's translation principle. Hui-juan says that Nida's theory has some limitations in guiding literary translation because it fails to address the transference of aesthetic elements for literary translation. Jin turns to traditional Chinese translation theory and classic literary criticism to seek for support for his translation theory of equivalent effect.[3]

3. The Meaning of Words and the Practical Contexts of the Communication

Nida suggests that we must analyze the transmission of a message in terms of dynamic dimension. The production of equivalent messages is a process of matching parts of utterances and of reproducing the total dynamic character of the communication. "Without both elements the results can scarcely be regarded, in any realistic sense, as equivalent."[4] Nida maintains that the task of the true translator is one of identification. "As a Christian servant he must identify with Christ; as a translator he must identify himself with the Word; as a missionary he must identify himself with the people."[5] Nida explains that a close examination of successful missionary work reveals the correspondingly effective manner in which the missionaries "were able to identify themselves with the people – 'to be all things to all men' – and to communicate their message in terms which have meaning for the lives of the people."[6]

Nida holds that translation actually takes place in our brains (we do not know precisely what actually happens), and states that the society of speakers collectively possesses a language and can accordingly change the forms. In many instances the meaning of words depends on the practical contexts of the communication. Differences in texts often suggest distinct social levels in the use of language. We exist in a multiple world of communication and we need theories that will make our world linguistically and culturally understandable.[7] The goal of translation is to reproduce the total dynamic character of the original communication. Nida explains that all translating must be concerned with the response of the receptor: the ultimate purpose of the translation, in terms of its impact upon its intended audience, is a fundamental factor in any evaluation of translations. "This reason underlies Leonard Forster's definitio of a good translation as 'one which fulfills the same purpose in the new language as the original did in the language in which it was written.'"[8]

4. The Role of the Translator

In Nida's view, the Vulgate was the only source of authorized Roman Catholic translations and it became the exegetical standard of the Roman Catholic Church, "even supplanting the Greek text itself — not only officially, but emotionally. Cardinal Ximenes, for example, regarded the Latin Vulgate, which he printed in his Complutentian Polyglot between the Hebrew and the Septuagint, as being like the Lord between two thieves, with Hebrew the unrepentant thief."[9] Nida suggests that until we have a fully acceptable theory of language based on the working of the human brain, "we cannot expect to have one dominant and comprehensive theory of language and translation. There are too many different kinds of languages, too many different types of texts, and too many different audiences with diverse needs."[10] Nida puts it that successful translating involves one of the most complex intellectual challenges known to mankind: the need for extensive, accurate and effective communication between those using different languages "gives the translator a position of new and strategic importance."[11] On Nida's reading, Luther deserves full credit for having sensed the importance of full intelligibility. "He also carefully and systematically worked out the implications of his principles of translation."[12]

Nida and Taber write that translating consists in reproducing in the receptor language "the closest natural equivalent of the source-language message, first in terms of meaning and secondly in terms of style."[13] Translation can be defined as "the reproduction in a receptor language of the closest natural equivalent of the source language message, first in terms of meaning, and second in terms of style"[14] Nida and Taber state that dynamic equivalence is to be defined in terms of the degree to which the receptors of the message in the receptor language respond to it in substantially the same manner as the receptors in the source language. "This response can never be identical, for the cultural and historical settings are too different, but there should be a high degree of equivalence of response, or the translation will have failed to accomplish its purpose."[15] Nida and Taber claim that "anything that can be said in one language can be said in another, unless the form is an essential element in the message."[16] Languages agree far more on the level of the kernels than on the level of the more elaborate structures. Contextual consistency is the quality which results from translating a SL word by that expression in the receptor language which best fits each context rather than by the same expression in all contexts.[17] Nida contends that "words only have meaning in terms of the culture of which they are a part."[18] The role of the translator involves primarily communicating the intentions of the original author.[19] Semantics deals with the relationship of signs to referents.[20] The personal problems which confront the average translator are largely unconscious predispositions about translation procedures which tend to color his work.[21] As Nida puts it, in the case of stylist-scholar teams, the usual process of translating should be reversed. "Rather than having a scholar prepare a somewhat literal translation which is then revised by a stylist, it is the stylist who should prepare the first draft, but only on the basis of extensive preliminary discussions with the biblical scholar. Only later is the text gone over carefully by the scholar and various options discussed."[22]

5. Conclusions

Nida insists that all persons engaged in the complex task of translating possess some type of underlying or covert theory. A satisfactory theory of translating should help in the recognition of elements which have not been recognized before. Nida maintains that a fully adequate theory of translation consists of a group of general and coherent principles in matching the semantic contents of verbal utterances, and points out that stylistic models have a very important role in communication (creative verbal communication needs elastic rules).

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THE COGNITIVE CHANGES INDUCED BY NEW FORMS OF MEDIA AND THE RISE OF SELF-ORGANIZED GROUPS ONLINE

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ABSTRACT. Shirky maintains that we are living in the middle of the largest increase in expressive capability in the history of the human race. Johnson emphasizes that what media has lost in moral clarity it has gained in realism. Jones thinks that the nation's traditional news organizations are being transformed into tabloid news organizations.

Keywords: media, online, news, organization, tabloid, group

1. Introduction

Shirky claims that most of the barriers to group action have collapsed, and that without those barriers, we are free to explore new ways of gathering together and getting things done: these changes will transform the world everywhere groups of people come together to accomplish something, which is to say everywhere. Johnson holds that the mass culture is getting more intellectually demanding. The online world offers resources that help sustain more complex programming in other media. The specific ways in which the neurological appetites of the brain, the economics of the culture industry, and changing technological platforms collide play a determining role in the type of popular culture we ultimately consume (the popular culture has been growing increasingly complex over the past few decades). Jones points out that newspapers may have a mission, but they are also businesses: all traditional news organizations are trying to find ways to transform themselves so as to survive in a digital world. The future promises an abundance of *commodity news* (e.g., plain vanilla news that is generated by a few news companies and sold cheap). The Internet and digital technology have sent the news business into a frenzy of rethinking. The quasi-news programs on television look to the core for ideas and inspiration.

2. Shirky on the Interrelated Effects of the Topology of Social Networks and Technological Networks

Shirky holds that people respond to incentives. "If you give them more of a reason to do something, they will do more of it, and if you make it easier to do more of something they are already inclined to do, they will also do more of it."[1] A profession exists to solve a hard problem, one that requires some sort of specialization. "Professionals become gatekeepers, simultaneously providing and controlling access to information, entertainment, communication, or other ephemeral goods."[2] The question that mass amateurization poses to traditional media is "What happens when the costs of reproduction and distribution go away? What happens when there's nothing unique about publishing anymore, because so many users can do it for themselves?"[3]

Shirky writes that in a world where publishing is effortless, the decision to publish something is not terribly momentous. "Publishing used to require access to a printing press, and as a result was something limited to a tiny fraction of the population, and reaching a population outside a geographically limited area was even more restricted. […] An individual with a camera or a keyboard is now a non-profit of one, and self-publishing is now the normal case."[4] The distinction between communications and broadcast media was always a function of technology "rather than a deep truth about human nature."[5] Shirky affirms that the bloggers and the social network users operating in small groups are part of a community, and they are enjoying something analogous to the privacy of the mall.

> On any given day you could go to the food court in a mall and find a group of teenagers hanging out and talking to each other. They are in public, and you could certainly sit at the next table over and listen in on them if you wanted to. And what would they be saying to one another? They'd be saying, 'I can't believe I missed you last night!!! Trac talked to you and said you were TRASHED off your ASS!' They'd be doing something similar to what they are doing on LiveJournal or Xanga, in other words, but if you were listening in to their conversation at the mall, as opposed to reading their post, it would be clear that you were the weird one.[6]

Shirky notes that the idea of publish then filter is in response to "the brute economic logic of allowing anyone to create anything and make it available to anyone. […] No group of professionals will be adequate to filter the material."[7] Communities of practice (be they professional or amateur) are a rich source of information: by providing an opportunity for the visible display of expertise or talent, "the public asking of questions creates a motivation to answer in public as well, and that answer once perfected, persists even if both the original asker and the answerer lose interest."[8]

Shirky maintains that we are living in the middle of the largest increase in expressive capability in the history of the human race. "More people can communicate more things to more people than has ever been possible in the past, and the size and speed of this increase, from under one million participants to over one billion in a generation, makes the change unprecedented, even considered against the background of previous revolutions in communications tools."[9] The more an institution or industry relies on information as its core product, "the greater and more complete the change restructuring will be."[10] In daily life, we have often been taught that getting paid is the only real motivation for serious work. "And now we have to unlearn that lesson because it is less true with each passing year."[11] Shirky proposes three basic emotional motivations to contribute to a participatory system: (i) the emotion of feeling smart; (ii) the emotional pleasure of "vanity" (making a mark on the world is a common human desire); and (iii) the desire to do a good thing.[12] With many more possible groups competing for the average individual's time, "the speed with which a group can become unglued has also increased."[13] Shriky says that there is a steep decline from a few wildly active participants to a large group of barely active participants (this is the general pattern in social media). "The most active participant is generally much more active than the participant in the number two slot, and far more active than average. A common power-law distribution across all emerging participatory systems."[14] Shirky explains that, on YahooGroups, half the proposed groups fail to get enough members to be viable, "while almost three-quarters of proposed open-source projects on SourceForge have never gotten to the degree of completeness and utility necessary to garner even a single user."[15] Shirky argues that the following elements are needed to make the blend of social and technological factors that comprise social media work: those instances that flourish demonstrate a successful fusion of a plausible promise, an effective tool and an acceptable bargain with the users.

> The promise is the basic 'why' for anyone to join or contribute to a group. The tool helps with the 'how' – how will the difficulties of co-ordination be overcome, or at least be held to manageable levels? And the bargain sets the rules of the road: if you are interested in the promise and adopt the tools, what can you expect, and what will be expected of you?[16]

According to Shirky, our principal challenge is not deciding where we want to go, but rather in staying upright as we go there. "The invention of tools that facilitate group formation is less like ordinary technological change, and more like an event, something that has already happened. As a result, the important questions aren't about whether these tools will spread and reshape society, but rather how they do so."[17]

Shirky says that a good social tool is like a good woodworking tool, "it must be designed to fit the job being done, and it must help people do something they actually want to do."[18] Shirky claims that collaborative production is considerably harder than simple sharing, but the results can be more profound: we are living in the middle of a remarkable increase in our ability to share, to cooperate with one another, and to take collective action, all outside the framework of traditional institutions and organization. "Getting the free and ready participation of a large, distributed group with a variety of skills has gone from impossible to simple."[19] Shirky insists that young people are taking better advantage of social tools, extending their capabilities in ways that violate old models.

> I'm old enough to know a lot of things just from life experience. I know that newspapers are where you get your political news and how you look for a job. I know that music comes from stores. I know that if you want to have a conversation with someone, you call them on the phone. I know that complicated things like software and encyclopedias have to be created by professionals. In the last fifteen years I've had to unlearn every one of those things and a million others, because they have stopped being true…. Meanwhile my students, many of whom are fifteen years younger than I am, don't have to unlearn those things, because they never had to learn them in the first place.[20]

Shirky argues that failure is free, high-quality research, "offering direct evidence of what works and what doesn't."[21] Technology allows advocates to "lower the hurdles to doing something in the first place, so that people who cared a little could participate a little, while being effective in the aggregate."[22] Shirky describes collaborative production as the situation in which no one person can take credit for what is created, and the project could not come into being without the participation of many.[23]

3. The Rise of the Internet

Cooper argues that different types of media serve different functions. There is much greater commonality in the production of news for the traditional mass media. Analysis of media market structure must be concerned about performance in terms of democratic discourse. Television provides the announcement function, whereas newspapers provide in-depth coverage. The uniqueness of newspapers stems from the fact that news is their primary function. Cooper remarks that the use of online media has not substantially changed individual news sources. The central concern with media ownership as it affects civic discourse must focus on news and information.[24] Peters says that media scholarship can benefit from thinking of media as renewable, that most media history is already new media history, and that the strength of new media studies and media history lies in their merger: all media contain, constrain and combine fundamental ideas about what constitutes communication itself.[25] Hargittai analyzes data on the Internet uses of a diverse group of young adults who are all connected: beyond basic access, quality of use context matters for how people incorporate the Internet into their everyday lives. Autonomy of use and Web user experience are both positively related to skill. Internet user skill is strongly associated with diverse types of uses. The Internet certainly has the potential to level the playing field by offering numerous opportunities to its diverse users.[26]

Johnson emphasizes that what media has lost in moral clarity it has gained in realism. Popular television shows have increased the cognitive work they demand from their audience. Johnson contends that multiple threading is the most acclaimed structural convention of modern television programming. Television is a brilliant medium for assessing other people's emotional intelligence or AQ (politics has gravitated toward the television medium's emotional fluency). The most intricate social networks on television have come in the form of soap operas. The process of acclimating to the reality of networked communications has had a salutary effect on our minds. Johnson claims that the rise of the Internet has challenged our minds in three related ways: by virtue of being participatory, by forcing users to learn new interfaces, and by creating new channels for social interaction. Television is a delightful medium as a vehicle for narrative and first-person intimacy, but as a source of information, it has its limitations. The new social networking applications widen our social networks and create new possibilities for strangers to share ideas and experiences. Johnson holds that mass media is supplying an increasingly rigorous mental workout. Most of the media technologies introduced over the past thirty years have been repetition engines. Technology introduces new platforms and genres at an accelerating rate. Adapting to an ever-accelerating sequence of new technologies trains the mind to explore and master complex systems. The rise of the Internet has forestalled the death of the typographic universe.[27]

4. Exploring the Impact of the Web on News

Jones claims that each form of core news is in jeopardy of shrinking in proportion to how expensive it is to produce. The digital revolution has hit the news business with crushing force. The resources of a news operation will be whatever its audience can generate. Newspaper advertising and circulation revenues are under enormous pressure and are declining at many papers. A gradual slackening in commitment to news as a social responsibility has become a headlong rout. Newspapers are overwhelmingly dominant in the actual gathering and reporting of news. Traditional news organizations have lost part of their ability to persuade people with facts. On Jones' reading, media conglomerates now typically include a range of types of media. Each form of media makes its own contribution to our democracy. The mission of the traditional commercial media is to be accurate, meaning to report truthfully and to provide a factual basis for what appears in news columns. The traditional media is part of the ethos of the traditional media to give prominence to journalism that fulfills a watchdog mission. The financial success of the news organization is essential to the journalistic mission. In tabloid journalism, the news function is rarely performed. If news is important to democracy, it comes mostly from traditional journalism.

Jones thinks that the nation's traditional news organizations are being transformed into tabloid news organizations. The culture of Web journalism generally does not support news in depth or investigative journalism. A great deal of what makes journalism good is entwined with *authentic journalistic objectivity*. Journalistic objectivity is an effort to discern a practical truth. Objective journalism is a matter of how reporting is conducted and articles are written, and is embedded in the decisions editors make about what news will get covered. Being a part of one culture should not keep you from being objective in your journalism. Objectivity is a state of mind that begins with the belief that a journalist's obligation is to the truth. Media bias has become the default response to any news that delivers an unwelcome message. Jones states that journalism is an exercise in applied morality. News organizations move rapidly toward the more elastic standards of tabloid journalism and nonobjective news coverage. The Web imposes the culture of speed on news gathering. A journalist must bring both judgment and integrity to ethical decision making. Jones fears that newspapers are trending toward becoming businesses built overwhelmingly around what people *want*. Reporting the important news has been the principal demonstration of a covenant that newspapers have with their readers.

Jones argues that newspapers are trying to cope with their revenue problem with three basic tactics: reinventing the newspaper both online and on paper to keep old readers and attract new ones, creating totally new products to generate new revenue, and cutting costs to the greatest extent possible. Newspapers are trying to re-invent and significantly expand, but with a reduced staff. Jones observes that the culture of the Web favors news in small bites, the Web prefers attitude and edge and opinion, and the Web tends to favor novelty and entertainment value over substance that may take some effort to digest (the Internet media landscape is far too changeable and dynamic to try to define). The economic model for traditional news has collapsed because of other sources of news and because there is much more competition for time and attention. Jones stresses that the act of saving the news should include a goad and a prod to news organizations to be more rigorous. The world of the future is going to be centered on the Web and digital technology. An enduring solution for preserving the iron core of news and traditional journalism standards is a commercial one. The Web newspaper must be viewed as a separate business and a separate news organization. Each of the traditional forms of media has a culture of its own that needs to be respected. If any business has a corporate social responsibility,[28] it is the news business.[29]

5. Conclusions

Shirky says that sociability shows up in almost every aspect of our lives as both cause and effect. Johnson thinks that we overestimate the extent to which our core values are transmitted to us via the media. It is in the nature of myth and storytelling to explore the edges of a society's accepted beliefs and conventions. Different forms of media can alter our brains in significant ways. Television shows and films have cognitive rewards that we should better understand and value. Jones states that the real impact on iron core news has been from the economic ravaging of newspapers. Cold metrics will largely determine what is spent on news. Much of the headline news is the act of journalists bearing witness to events.

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THE SYMBOLIC CONSTRUCTION OF REALITY IN ADVERTISING

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ABSTRACT. Zeng et al. examine how social identity and group norms of online community members may influence perceptions of and behavioral responses to advertising, and explore how community members perceive and react to advertising in community sites. Ketelaar et al. think that the presence of a prominent visual is more likely to indicate openness of an ad. Callister and Stern aim to better understand how visual imagery functions in relation to expectations, and to closely review the sources of schema-based expectations commonly used in processing print advertising. Lowrey explains that discussing the effects of complexity in terms of textual factors overlooks what really goes on when individuals encounter advertising messages.

Keywords: symbolic, construction, reality, advertising, community, visual

1. Introduction

Zeng et al. focus on community members' group intentions with regard to accepting advertising in communities and evaluating such advertising. Ketelaar et al. discuss characteristics of ads that may contribute to an increase of openness, and holds that openness may be affected by the combination of the following characteristics: (a) presence of a prominent visual, (b) presence of undercoded rhetorical figures, (c) absence of verbal anchoring, (d) absence of the product, and (e) low brand anchoring. Callister and Stern assert that the relationship between visuals and viewer expectations is complex and elusive. A visual that violates multiple schemata may prove a useful advertising strategy in gaining and sustaining attention. According to Lowrey, consumers have limited abilities when it comes to processing advertising information.

2. Perceptions of and Behavioral Responses to Advertising

Kelly et al. explore teenagers' attitudes toward advertising in the online social networking environment. Advertising in the online social networking environment should be an attractive proposition for marketers. If advertising is perceived as not being relevant, neither the medium nor the message can be considered credible. Social networking sites represent an "anything goes" communication channel. Advertising agencies could improve perceptions of advertising by improving the quality of the messages.[1] Brannon and Brock hold that the ability to cause evil that is attributed to subliminal messages is more than matched by their alleged ability to make things better, and explain the psychology of belief in subliminal persuasion and why the belief will thrive indefinitely. Subliminal manipulation is more likely to be imputed to advertising for products that are enjoyable but unhealthful. Consumers have frequently processed the term *subliminal* in conjunction with terms such as *persuasion, advertising,* and the like. A message that maximizes self-generated responses will have more long-term effectiveness. Quite undetectable symbolic stimulation in the form of very brief sights and sounds may have some serious consequences.[2]

Zeng et al. examine how social identity and group norms of online community members may influence perceptions of and behavioral responses to advertising, and explore how community members perceive and react to advertising in community sites. Group intentions to accept advertising in online communities shapes community members' perceptions of that advertising. Communities are fluid and flexible, and may be based on a wide range of cultural interests and social affiliations. Zeng et al. affirm that when social identities of community site members are stronger, their group intentions with regard to community advertising are more affirmative.

Stronger advertising alignment establishes explanatory links that help consumers determine the advertiser-consumer connection. Embedded advertising should be relevant to community themes. A community member with a strong group identity should contribute more to the community and anticipate reciprocity. When community members possess strong group benefit norms, they tend to do good for the community. When community members perceive advertising in the community as more useful, they are more likely to exhibit positive behavioral responses.

Zeng et al. investigate how two key social characteristics of online communities (i.e., social identity and group norms) may influence members' responses to advertising (these two factors affect community members' group intentions to accept advertising in online communities). In social networking community Web sites, the identity of community members and their norms help shape the formation of group intentions to accept advertising. Operators can identify ways in which they can exert influence on users' group benefit norms and social identity. Online communities that seek to garner advertising revenue must first build a strong sense of group identity and a robust group benefit norm through various means. Advertisers that hope to harness the power of community advertising should shift their focus from the individual to the group level. Zeng et al. say that strong group identity enables members to spot the relevancy of community advertising. Strong group identity and group (benefit) norms may lead to more concrete group intentions to accept community advertising. A strong group norm leads to lower relevancy perceptions about community advertising among community users. Most of the advertisements that appear in online social communities are not relevant for most users. Certain kinds of social communities have stronger negative predispositions against accepting advertising than others. China is a good representative context for future trends in social networking communities, as well as online advertising development. Online community members' responses to community advertising depend on their perceptions of the relevance and value of community advertising. Community sites in pursuit of advertising revenue should strive to create strong identity and group benefit norms among members.[3]

3. The Concept of Openness Relates to the Central Goal of Persuasive Communication

Ketelaar et al. think that the presence of a prominent visual is more likely to indicate openness of an ad. When verbal anchoring is absent, consumers have more options for choosing an interpretation. The concept of verbal anchoring is used to explain the relationship between verbal copy and rhetorical figures. Absence of the product in the ad can be characterized as absence of product anchoring. Brand associations or brand schemas can affect the amount of guidance toward a certain interpretation. Brand schemas or associations represent consumers' knowledge about brands. Ketelaar et al. contend that the individual consumer's *need for cognition* interacts with the effect of openness on attention, recall, interpretation, and attitude toward the ad. The absence of differences in attention duration between open and closed ads characterizes a larger population of ads situated on a broad part of the openness continuum. The open strategy does not increase recall of the ad, but does increase recall of the product.

Ketelaar et al. remark that openness stimulates a high level of cognitive elaboration that, in turn, improves recall. Openness increases the number of consumers who are unable to create an interpretation and decreases the number of consumers who creates the intended interpretation. The concept of openness relates to the central goal of persuasive communication (i.e., to communicate certain commercial messages). Consumers are able to distinguish between ads with regard to their level of openness. Brands may differ in their ability to anchor interpretations because consumers have different perceptions of brands.[4]

4. How Visual Imagery Functions in Relation to Expectations

Callister and Stern aim to better understand how visual imagery functions in relation to expectations, and to closely review the sources of schema-based expectations commonly used in processing print advertising. The source of expectations from the rhetorical perspective comes from the consumers' past experience with the functions and depictions of visuals in ads. Visual figures can violate the conventional use of signs or texts. Callister and Stern argue that a visual can deviate from themebased expectations or create expectations concerning the content of the verbal text. In advertisements, regularities may exist within a product category that creates expectations for the consumers. Fictional brand names are a necessary means of controlling extraneous sources of error arising from subjects' experience with actual brands. Repeated viewing of ads for brands that carry recurring elements will invariably result in a brand schema. Brand schema is susceptible to change with repeated exposures to patterned content.

Callister and Stern maintain that consumers' unique cultural conventions underlie their different responses to visuals. The function of a cultural schema is in the creation of expectations for what symbols are conventionally used to communicate certain messages in a given culture. We may see an ad with visuals that deviate from reality. A visual that violates multiple schemas may prove a useful advertising strategy. Consumers have expectations upon which they judge ad elements. Visuals often motivate consumers to reconcile the incongruities and search for additional meanings. Callister and Stern contend that consumer processing and responses may be differentially affected by the number or type of incongruities requiring reconciliation that a visual excites. Exploring the possibility of schema layering among *visual* elements may result in incremental processing gains and attitudinal responses. The order in which ad elements are processed will impact the order in which schema are activated.[5]

Lowrey explains that discussing the effects of complexity in terms of textual factors overlooks what really goes on when individuals encounter advertising messages. Both the specific words selected and how the words are strung together into sentences can impact message complexity. A textual factor that may contribute to complexity is overall length of the text. Some media may contribute to processing constraints more than others. Extratextual factors such as the advertising medium and individual difference variables serve as "shifters" along the complexity continuum. Lowrey claims that if one is highly motivated to process, the effects of complexity may be less severe. The extratextual factors basically deal with ability and motivation to process messages. Whether an ad appears in print or via broadcast has implications for processing capabilities. High levels of motivation enhance message processing and low levels hinder processing. Lowrey reasons that extratextual factors should be taken into account when assessing the effects of complexity based on textual factors. Textual factors could be viewed as major contributors[6] to the resources required.[7]

5. Conclusions

Zeng et al. develop a conceptual model that illuminates the key factors that underlie community members' responses to advertising in online social networking communities. Ketelaar et al. insist that an ad for a brand that evokes strong associations is likely to decrease openness. Elements in open ads are better recalled or recognized than elements in closed ads. Callister and Stern explain that *message incongruity* and *visual rhetoric* have made important contributions to the understanding of the nature and impact of schema incongruity. Lowrey states that for those with high cognitive ability and motivation to process, moderate complexity can enhance memory for and the persuasiveness of advertising.

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UNDERSTANDING MUSICAL ACOUSTICS

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ABSTRACT. Pressnitzer et al. affirm that sounds that activate the same or largely overlapping populations of neurons are perceived as forming a single stream. Cousineau et al. hold that to understand speech or appreciate music, one has to process sequences of sounds (pitch has a peculiar importance for human listeners), and reassess the processing of pitch sequences and loudness sequences. Kostek claims that the relationship between music and motion is fundamental to music processing. Koelsch et al. emphasize that irregular musical events (such as music-syntactically irregular chords) give rise to emotional responses.

Keywords: musical, acoustics, sound, auditory, perception, neural

1. Introduction

Pressnitzer et al. claim that segmenting the complex acoustic mixture that makes a typical auditory scene into relevant perceptual objects is an important challenge of the auditory system. de Cheveigné and Pressnitzer examine a mechanism by which delays can be synthesized by phase interaction between cochlear channels. A delaylike operation can be approximated using a model of cochlear filtering. Kostek provides insights into perceptual mechanisms underlying the processing of sound and music in different environments, and shows examples of the implementation of computational intelligence methods in musical signal and music analysis. Koelsch et al. use excerpts from classical piano sonatas, played by professional pianists, to investigate music-syntactic processing.

2. Visual and Auditory Perceptual Organization

Cousineau et al. hold that to understand speech or appreciate music, one has to process sequences of sounds (pitch has a peculiar importance for human listeners), and reassess the processing of pitch sequences and loudness sequences. Cousineau et al. evaluate sequence processing using tones differing in (1) loudness (condition L), (2) pitch produced by resolved harmonics (condition P-R), and (3) pitch produced by unresolved harmonics (condition P-U). The high performance of listeners in the P-R condition cannot be based on independent processing of the elements of the sequences. Cousineau et al. introduce transpositions in the pitch or the loudness domain, in order to investigate whether the pitch-sequence advantage remains with transposed material. Human listeners are sensitive to *relative* loudness only for rather large loudness changes. Pitch has access to a specific and efficient short-term memory store.[1]

Pressnitzer et al. affirm that sounds that activate the same or largely overlapping populations of neurons are perceived as forming a single stream. Streaming can change dynamically over time, even if the stimulus itself remains constant. Pressnitzer et al. investigate whether subcortical neural processing may take an active part in auditory perceptual organization. Neurons in the CN display strong multisecond adaptation in response to the long-duration tone sequences. Adaptation in peripheral auditory neurons can be influenced by descending feedback from upper processing stages. Pressnitzer et al. say that fundamental neural-response properties at early stages of the auditory system (frequency selectivity, forward suppression, and multisecond adaptation) can predict perceptual streaming for tone sequences. Adaptation is a key feature of sensory systems allowing for efficient encoding of information. The sounds to be organized into streams will contain several frequency components and may overlap in time.[2]

Pressnitzer et al. demonstrate that bistable perception occurs in the auditory modality. Auditory and visual alternations share common principles of perceptual bistability (these common principles are implemented at least partly independently across sensory modalities). Pressnitzer et al. propose that visual and auditory perceptual organization could rely on distributed but functionally similar neural competition mechanisms aimed at resolving sensory ambiguities. Pressnitzer et al. investigate whether the rules governing the alter-nation of perceptual states are general principles of brain function or specific to the visual system. There is a formal correspondence between the visual and auditory stimuli chosen in terms of organization of the sensory scene. Pressnitzer et al. investigate the effect of observer intention on the reported percepts for auditory streaming and visual plaids, and propose that auditory streaming can be considered as an instance of perceptual bistability. Measures of temporal dynamics could provide valuable new tools in the investigation of auditory streaming. Pressnitzer et al. observe strong similarities between bistability in the two sensory modalities.[3]

3. The Subjective Recognition of Musical Sounds

de Cheveigné and Pressnitzer assert that level affects mainly the relative *amplitudes* of the early and later segments of a chirp-shaped impulse response. de Cheveigné and Pressnitzer implement phase shifts by adjusting the phase term of the gammatone impulse response. Delays are required by hypothetical cancellation mechanisms involved in binaural or periodicity-based processing and sound segregation. The same mechanism that produces the ACF can also produce a cancellation-based statistic. Both statistics could be based in part on inhibitory as well as excitatory interaction. Synthetic delays cannot be applied to components for which there is no phase locking, and cannot exceed the impulse response duration of cochlear filters activated by the signal to be delayed. The synthetic delay mechanism can be used to implement a delay-based pitch model such as autocorrelation. de Cheveigné and Pressnitzer's model involves peripheral filtering and phase manipulation, and could conceivably be reformulated in terms of pattern matching on a complex spectral representation.[4]

Kostek claims that the relationship between music and motion is fundamental to music processing. Musical style is a term denoting the manner in which a work of art is executed. Music analysis is the basis of systems that allow the automatic composition of a musical piece in a given style. A musical fragment can be described by its form, rhythm, melodic contours, harmony, etc. Pitch detection is one of the most difficult tasks in speech and musical signals processing. Kostek puts it that any study on musical sounds should take into account the physical way in which sounds are generated and the subsequent effect on the listener. The starting transients are the most important phase for the subjective recognition of musical sounds. Musical sounds include polyphonic sounds and human voice sounds (speech and singing). Kostek states that there is not yet consensus on the choice of parameters for musical instrument sound description. The multistage of musical sound classification often starts with a pitch detection algorithm. Differences between the estimated pitch and the tone frequency of a sound are caused by musicians playing solo. The pitch detection algorithm used in the automatic classification of musical instruments consists of three main stages: signal spectrum acquisition, harmonic peak detection, and pitch detection. On Kostek's reading, the music of Western culture is based on simple relations of frequency to fundamental frequency. The most basic notion in musical acoustics, i.e. sound timbre, remains unresolved. Higher level auditory processes offer universality in complex mixtures of speech, music and external environmental sounds. Kostek points out that human perception forces the use of consonants in music, which results in the overlaping of aliquots from many instruments. The analysis of a musical phrase depends both on the quality of a musical phrase representation and on the inference engine. A musical pause is a musical event as well. Individual musical structures may show significant differences in the number of elements. There are two methods of classifying musical phrases that use artificial neural networks and rough sets: the method of classifying phrases on the basis of the sequences of musical data, and the method of classifying phrases on the basis of the parameters of musical data. There are two types of neural networks for classifying musical phrases: the classifier, assigning phrases to single objects from the reference phase set, and the neural comparator, analyzing similarities between musical phrases. Kostek holds that relationships between the objectively measured parameters of musical instrument sounds and their subjective quality as assessed by listeners cannot be crisply defined. The soft computing approach to music instrument classification is justified with recognition scores.[5]

4. The Neural Mechanisms Underlying Harmonic Integration and Processing of Musical Meaning

Gill and Purves examine the possibility that the thread tying together the scales that have been preferred in music worldwide is their overall similarity to the spectral characteristics of a harmonic series, assessing whether the scales with the highest degree of similarity to a harmonic series are the scales commonly used to make music. Musical scale preferences are predicted by the overall similarity of their component intervals to a harmonic series. The musical scales used over human history have resulted from a preference for collections of dyads that most resemble a harmonic series. Gill and Purves note that many musical traditions use tones that fall between formal scale tones. Scale preferences seem to be based on the harmonic series that derive from vocal fold vibrations. Decreasing the number of scale tones decreases the variety of intervals available for musical composition.[6]

Koelsch et al. say that irregular musical events (such as music-syntactically irregular chords) give rise to emotional responses. Expressive intentions by performers (such as tension and relaxation) are encoded by expressive cues (e.g., tempo and loudness) to communicate emotion in a musical performance. Harmonically unexpected chords are played by performers in a way that produces an emotional response which is larger than when played without musical expression. Koelsch et al. maintain that investigate ERPs, SCRs, and HR in response to unexpected chords in a condition in which musical excerpts were played with musical expression by a pianist, and in a condition in which these excerpts were played without musical expression by a computer. The emotional response elicited by an unexpected harmony can be enhanced when perceived in a musical context played with emotional expression (using variations in loudness and tempo). SCRs are more suitable to investigate sympathetic effects of emotional responses to harmonic irregularities in music. Koelsch et al. think that the neural mechanisms of music-syntactic processing operate independently of the emotional factors communicated by musical performance. The outcome of music-syntactic processing (which leads to the perception of unexpectedness of a harmonically irregular chord) has clear effects on emotional processes. Musical expression affects the neural mechanisms underlying harmonic integration and processing of musical meaning.[7]

5. Conclusions

Pressnitzer et al. say that subcortical structures may contribute to the analysis of auditory scenes. Auditory scene analysis of complex scenes is based on interactions between subcortical and cortical neural processes. de Cheveigné and Pressnitzer maintain that synthetic delays are restricted to the extent of impulse responses of the filter bank. Relatively large "synthetic" delays may be produced by cross-channel phase interaction at the output of a cochlear model. Kostek states that musical object classification using learning algorithms mimics human reasoning. The musical theory and the musical psychology focus on high-level modeling of musical structures, dealing with such structures as key, metrum, or harmony. Koelsch et al. produce non-expressive counterparts of the expressively played musical stimuli.

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VOCAL EXPRESSION, MUSIC PERFORMANCE, AND COMMUNICATION OF EMOTIONS

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ABSTRACT. Juslin and Laukka contend that the same selective pressures that shaped the development of the basic emotions should favor the development of skills for expressing and recognizing the same emotions. Kivy insists that the texts must be expressively appropriate to the music for which they are provided. Robinson emphasizes that music arouses mood states from which we readily enter into emotional states.

Keywords: emotion, vocal, expression, performance, communication, music

1. Introduction

Juslin and Laukka hold that to understand emotions one must consider how they reflect the environment in which they developed and to which they were adapted. Kivy maintains that music cannot be a source of philosophical insight and illumination. Robinson notes that there may be a physical basis for the expressiveness of certain musical timbres and dynamics. The art that in many ways succeeds best in communicating emotions is the art of music.

2. Vocal Expression of Emotion and Musical Expression of Emotion

Juslin and Laukka say that the same selective pressures that shaped the development of the basic emotions should favor the development of skills for expressing and recognizing the same emotions.

There are some systematic relationships among acoustic measures and emotions. Distinct physiological patterns reflect environmental demands on behavior. Depending on the specific physiological state, one may expect to find specific acoustic features in the voice. Juslin and Laukka explain that human vocal expression of emotion is based on phylogenetically old parts of the brain that are in some respects similar to those of nonhuman primates. Vocal expression of emotions typically involves a combination of push and pull effects. The hypothesis that there is an iconic similarity between vocal expression of emotion and musical expression of emotion applies primarily to those features of the music that the performer can control during his or her performance such as tempo, loudness, and timbre. The same piece of music can be played in a number of different ways, and the way in which it is played may convey specific emotions to listeners. Music performers are able to communicate basic emotions to listeners by using a nonverbal code that derives from vocal expression of emotion. Juslin and Laukka predict (i) that communication of basic emotions would be accurate in both vocal and musical expression, (ii) that there would be cross-cultural accuracy of communication of basic emotions in both channels, as long as certain acoustic features are involved (speed, loudness, timbre), (iii) that the ability to recognize basic emotions in vocal and musical expression develops early in life, (iv) that the same patterns of acoustic cues are used to communicate basic emotions in both channels, and (v) that the patterns of cues would be consistent with Scherer's physiologically based predictions. The errors made in emotion decoding are similar for vocal expression and music performance. The developmental curve over the life span appears similar for vocal expression and music but differs from that of facial expression. Juslin and Laukka concentrate on those features that may be independently controlled by speakers and performers almost regardless of the verbal and musical material used. A number of variables in musical compositions (e.g., harmony, scales, mode) do not have any direct counterpart in vocal expression, and vice versa. Anger and fear are primarily associated with high pitch, whereas tenderness is primarily associated with low pitch. Communication of emotions may reach an accuracy well above the accuracy that would be expected by chance alone in both vocal expression and music performance. Juslin and Laukka argue that the ability to decode basic emotions from vocal expression and music performance develops in early childhood at least. Music performance uses largely the same emotion-specific patterns of acoustic cues as does vocal expression. Expression and music performance share many characteristics that are unique to acoustic signals (e.g., timbre). Vocal expression is the model on which musical expression is based. Individuals react emotionally to music as they do to vocal expressions of emotion. The emotion perception modules do not recognize the difference between vocal expressions and other acoustic expressions. On Juslin and Laukka's reading, many musical instruments are processed by brain modules as superexpressive voices. Cues in vocal expression and music performance are probabilistic and intercorrelated to some degree. Synthesized sound sequences may be regarded as computational models. Music performers communicate emotions to listeners by exploiting an acoustic code that derives from innate brain programs for vocal expression of emotions.[1]

3. The Expression Theory of Absolute Music

Kivy insists that the texts must be expressively appropriate to the music for which they are provided. Composing is, in part, a matter of *selecting* musical materials. The expression theory of absolute music is part and parcel of the narrative theory. Motion words are appropriate descriptions of music in some figurative, attenuated sense. Formalism is compatible both with the view that absolute music can be described in emotive terms and with the view that absolute music arouses emotion. Kivy puts it that only music the listener experiences as great or beautiful or outstanding music moves the listener emotionally. The persona theorist can find no fictional circumstances in the music to tell us *what* emotion to feel. We hear *patterns* in absolute music. The concept of absolute music, pure instrumental music, is quite clear and uncontentious. "Absolute music" is music without representational, narrative, semantic, or other extra-musical content. Music moves in virtue of its perceived beauty. Kivy confines himself to two accounts of how absolute music might influence human *moral* behavior: the *emotive* account and the *recognition* account. Absolute music does not possess the materials necessary to arouse the garden-variety emotions in listeners. The experience of absolute music in its higher manifestations is the experience of a character-uplifting, consciousness-expanding kind. Absolute music possesses no narrative content to be cognized by the mind. Kivy reasons that music is not merely a thing of the sense, but a thing of the mind as well. The serious music lover listens to cognized musical events under whatever descriptions his or her musical concepts and vocabulary facilitate. The pleasure of absolute music is an *aural pleasure of the mind.*[2]

4. Investigating the Cognitive Processing of Musical Structure

Robinson emphasizes that music arouses mood states from which we readily enter into emotional states. Music is the pre-eminent art of expression. Music expresses emotional life by mirroring its dynamic structure in some sense. Music can mirror the cognitive or evaluative aspects of emotion (it can mirror the streams of emotional experience), and can convey changes and modifications in emotion. The music expresses cognitively complex emotions. There are pieces of pure or absolute music that lend themselves to psychological interpretation. In Robinson's view, among music that seems to express somebody's emotions, the degree to which it articulates and individuates the emotion expressed varies greatly. It is all right to postulate characters or personae in music if doing so explains anomalous aspects of a piece. An interpretation of a piece of music should be consistent with what is known about the composer. Some Romantic pieces of music should be experienced as containing a persona whose unfolding emotional life is portrayed in the music. The Romantics put themselves into their music as characters or personae. Robinson thinks that the emotions music arouses are not always the same as those it expresses (the emotions that we feel as we listen to music can sometimes mirror and reveal to us what the music expresses). Paying attention to the emotions music arouses may alert us to important features of the structure and expressiveness of the music. Although music is sometimes a cognitive object, it can also function as a stimulus object of emotion. If composers succeed in expressing emotions in a piece of music, then a criterion of their success is that qualified audiences will feel appropriate emotions in their encounters with the music.

Robinson maintains that a piece of music may express *nostalgia* although the emotion it evokes in me is *melancholy*; a piece may express *fear* while evoking in me only *anxiety*. Not all qualified listeners will understand the music in exactly the same way. The emotions a piece of music evokes can help listeners understand the more purely structural aspects of the piece. The emotions evoked by a piece of music may alert listeners to what is expressed in the music. How we feel in response to music affects what we hear the music expressing. Different listeners may respond somewhat differently to the structure of a piece. People listening to classical music suppress their action tendencies and motor activities. The emotions that music expresses are not always exactly the same as the emotions the music arouses. Robinson contends that the emotions we experience in listening to music help us to understand it: they reveal to us musical structure and musical expression (listening to music is an established empirical fact). Robinson notes that listening to music without having one's emotions evoked will prevent the listener from detecting some of the ways in which both musical structure and musical expression gradually emerge as the music unfolds. Robinson says that part of our pleasure in music may come from having our emotional experiences of it managed and guided by the musical form. Happy and sad music makes us happy and sad by affecting us physiologically. There are multiple sources of our emotional responses to music. Robinson explains *how* music evokes moods and emotions, even ones of some complexity. Music directly affects us physiologically and acts directly on the motor system. Music with a particular happy or sad character induces expressions characteristic of the corresponding emotional states. Listeners regularly attribute *emotions* to themselves as a result of listening to music. Music induces a mood which is interpreted in different ways depending on the context the listener brings to the music. When we listen to music a state of arousal is induced. In listening to music we often feel that we are in some kind of emotional state. Tense music is arousing: it affects our autonomic and motor systems in various ways. Not all great music does tell a story or express the emotions of a suffering or triumphing persona. Robinson says that music can express *blends* of emotion, *ambiguous* emotions and emotions that *shift and modify* from one moment to the next. If one is listening to good and complex music, paying attention to the state of one's body as one listens, may help us recognize developments in the music. Any emotional response to an expression of emotion is influenced by the direct physiological effects of the music.[3]

5. Conclusions

According to Juslin and Laukka, evidence of basic emotions may come from a range of sources that include findings of (a) distinct brain substrates associated with discrete emotions, (b) distinct patterns of physiological changes, (c) primacy of development of proposed basic emotions, (d) crosscultural accuracy in facial and vocal expression of emotion, (e) clusters that correspond to basic emotions in similarity ratings of affect terms, (f) reduced reaction times in lexical decision tasks when priming words are taken from the same basic emotion category, and (g) phylogenetic continuity of basic emotions. Kivy claims that the emotive character of the music should be made by the composer to coincide with the emotive character of the words. The arias will be self-contained musical movements, in recognizable musical forms. Robinson claims that in Romantic instrumental music it is often appropriate to posit a persona in the music. Some of the emotions aroused by music can play an important role in helping us to understand it.

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EXAMINING THE ROLE OF PERFORMANCE AS PART OF MUSIC EDUCATION

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ABSTRACT. As Dodd puts it, the fact that a score instructs performers to use specific instrumentation does not entail that a properly formed performance *must* use the instrumentation specified. Morris holds that performances of musical works are themselves both musical and works. Davies claims that it is not unusual for a composer to tinker with the work during rehearsals or after its premier, as it is prepared for publication. Cross and Tolbert remark that music must be recognized as referring beyond itself in being expressive of emotion.

Keywords: performance, musical, emotion, composition, understanding, language

1. Introduction

Dodd holds that a satisfying account of the ontology of works of music must do two things: (i) it must enlighten us as to musical works' *ontological nature* (i.e., tell us to which ontological category such works belong), and (ii) it must explain how musical works are *individuated* (i.e., provide an informative account of when we have one and the same work of music and when we have numerically distinct such works). The type/token theorist should treat the types that are works of music as *norm-types.* Morris contends that there is something puzzling about musical works: we find it difficult to understand what kind of thing musical works are. Davies says the composition of a musical piece can fall short of the work's completion (the process of composition sometimes outlives the work's completion). In Cross and Tolbert's view, we cannot use music to refer to a state of affairs in the world in the ways in which we can use language: music does not seem capable of bearing the types of meaning borne by language (an analysis of musical meaning in terms of sense and reference is unfeasible). Musical meaning fits ambiguously with any distinction between natural and conventional signs.

2. Performance and Understanding

Dodd says that a suitably nuanced sonicism can repel the challenge presented by instrumentalism, presents *timbral sonicism* as the face-value theory when it comes to the question of musical works' instrumentation (the theory that we should accept unless it is defeated), and claims that the arguments offered by instrumentalists are insufficient to defeat it. Sonicism is the default position when it comes to musical works' individuation. Intuitively, the vehicles of musical meaning are the sounds we hear. Timbral properties are normative within works (their presence determines many of a work's aesthetic properties). An appreciation of timbre is essential to our experience of sounds as music. In order for an audience to hear a performance as it ought to be heard, the performers need produce sounds with the sonic appearance of sounds produced by certain specific instruments. As Dodd puts it, the fact that a score instructs performers to use specific instrumentation does not entail that a properly formed performance *must* use the instrumentation specified. A philosopher appreciative of sonicism's status as the face-value theory and sensitive to the problems besetting sonicism in its purest form should adopt timbral sonicism. The crux of dispute between the timbral sonicist and the instrumentalist concerns whether performance means-properties are normative within works. Composers often *believe* their own instrumental instructions to have the status of exceptionless instructions for performers. Dodd states that the composer's instruction to use certain instruments can be viewed as provisional. The simple specification that a piano be used must be *interpreted* in the light of the nature of our musical experience. Aesthetic and expressive properties *are* genuinely possessed by works of music. We must hear a performance of the piece *as* played on the piano, if we are to grasp the full gamut of its aesthetic qualities. Aesthetic substance is determined by how the music sounds. The vehicle of a work's musical meaning is those sounds themselves, whatever their origin.[1]

Morris holds that performances of musical works are themselves both musical and works. The fact that a work can be performed repeatedly requires there to be such a thing as a note-perfect performance. Works of art are not only meaningful, but *essentially* meaningful (the essential parts and features of a work of art are those which are essential or central to its meaning). The meaning of a work of art must be due to those properties of the medium (the artist's intention produces something meaningful, but it does not determine the particular meaning it has). Morris claims that understanding a work of art is a matter of understanding the medium which is intentionally exploited. Performance lets a musical work be understood by letting it be heard. A performance seems to be connected by understanding to the work of which it is a performance: its nature as a performance is defined functionally, and the performance only counts as a performance by itself depending on an understanding of the work. The notion of a performance cannot be explained without the notion of understanding. Morris reasons that the connection between a performance and the work of which it is a performance depends on understanding. The philosopher of music needs to be attentive to the true nature of musical works (a performer needs to be attentive to the true character of a particular work she wants to perform).[2]

3. Work Versions, Performance Interpretations, and Interpretation Versions

Davies claims that it is not unusual for a composer to tinker with the work during rehearsals or after its premier, as it is prepared for publication. Even if works with multiple versions are equivocal, we can usually individuate their versions clearly enough. Davies maintains that work versions should be distinguished from performance interpretations (the prescriptions addressed to the work's performers underdetermine the detail of the performance). Accurate interpretations respect what is work-constitutive. Interpretations within some performance traditions share important characteristics with work versions. Interpretations can achieve standing in their own right as repeatable, persevering entities. Work versions should be distinguished from performance interpretations and interpretation versions (they must be separated from derivative yet distinct new works). Davies regards transcriptions as new works: they involve changes in instrumentation that alter the work's medium and its medium-specific contents. Transcriptions usually achieve a degree of independence from their sources that versions do not. Work versions recompose their sources in a deliberately restrained way. Davies puts it that it is common to distinguish artforms with works that must be singular from those in which multiple instances of the work are possible.[3]

4. The Meaning of Musical Activities

Cross and Tolbert remark that music must be recognized as referring beyond itself in being expressive of emotion. Locating the bases for music's meaning in its structures suggests that musical meaning is quite distinct from linguistic meaning. The majority of philosophical approaches to understanding meaning in music have differentiated musical meanings from "everyday" meanings. Cross and Tolbert emphasize that the meaning of musical activities is complementary to the specific circumstances that incorporate the music. Music is interpreted as fulfilling an instrumental function in the formation of social groups. From the perspective of the cognitive sciences, emotional responses to music belong to subclasses of emotional responses in general.[4]

Patel claims that structural prediction is a candidate for a shared cognitive mechanism between language and music. Language and music both involve the prediction of upcoming structural categories in sequences.[5] Bowie claims that music's meaning might lie "in the fact that we cannot say in words what it means – why does music exist at all if what it 'says' could be said just as well in other ways?"[6] Bowie regards the philosophy of music, not as the philosophy whose job is conceptually to determine the object "music," but rather as the philosophy that emerges from music.[7] Longing plays a central epistemological and ontological role to do with the idea that the motivation of philosophical thinking "is the desire to attain something which can never be present, but which yet demands to be attained."[8] Le Guin reasons that the listener will identify with the instruments as fellow sounding bodies,

> her nerves set vibrating as are their fibrous strings; she might further identify both herself and them with the great, vibrating universal sensorium. […] The more fanciful, the more hypersensitive, the more intimately, hypochondriacally fantastical our reading of musical passages like this, the more in tune with them we have become; our 'most active and finest parts' have been engaged in the music's 'most delicate sensation and taste.'[9]

Ford remarks that Husserl uses the example of a melody to develop his explanation of phenomenological time, identifying music with the object-free realm of the feelings if "feelings" are thought to be an ill-defined part of nonconceptual experience. Expectations are component parts of what is now. Music enters into the time of the negative unity of self-consciousness, shaping it from within. We offer ourselves up to musical experience within the freedom of a collective style. Sound has only a transient and insubstantial objectivity.[10]

5. Conclusions

Dodd considers whether the sonicist is right in thinking that the properties normative within works of music comprise merely acoustic properties. Morris calls the view that musical works are *types*, of which their performances are *tokens*, the *type-token view*, providing the best explanation of the following facts: (i) musical works can be heard; (ii) the existence of a musical work does not depend on any particular performance; (iii) the same musical work can be performed many times. Davies' concern is with the case in which the composer's post-completion efforts result in a change or addition to the finished work, and calls the result a *version*. Cross and Tolbert write that engagement with music can lead to responses that are identical to those that occur when we encounter situations in the real world that induce emotional responses.

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THE PHENOMENOLOGY OF THE EXPERIENCE OF LISTENING TO MUSIC WITH UNDERSTANDING

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ABSTRACT. Boghossian states that an inference from the legitimacy of our emotional responses is not the only sort of evidence that we have for the existence of musical meaning. Robinson puts it that to describe music metaphorically is not the same thing as to treat a piece of music as itself a metaphor. Juchniewicz insists that the uniqueness of the musical listening experience makes it difficult to pinpoint exactly how music is perceived by the individual listener. Cross presents a three-dimension account of meaning in music in which biologically generic, humanly specific, and culturally enactive dimensions of the experience of music are delineated. Ford observes that all musical experience depends on the interweaving of the style of a particular piece of music and listeners' familiarity with that style.

Keywords: musical, meaning, listening, experience, listener, metaphor

1. Introduction

Boghossian remarks that we often respond to a musical performance with emotion. Robinson points out that there are better and worse ways of metaphorically conceiving of a particular musical work. Cross proposes that the human capacity for musicality is integral to the human capacity for culture, and that the key feature of music that motivates its efficacy is its indeterminacy of meaning, or *floating intentionality*. Ford distinguishes between *resonating* and *resounding*: whilst music from the past has the potential to *resonate* with the nonconceptual world of its production, music of our own time can *resound*, in the sense of give voice to, our own world (the way that contemporary music resounds our own world seems almost necessary, inevitable). Juchniewicz emphasizes that musical expression is attained through communication and interactions between the performer and the listener.

2. The Phenomenon of the Meaning of Music

Matravers points out that some properties of music cause the experience of expression in a listener. The way in which we process the music has a phenomenological upshot: we hear it as expressive. The experience of expression is the experience of resemblance (experienced resemblance is not a good account of the experience of expressive music). We can hear music as being either an expression of emotions from the outside, or as a vehicle for our own emotion. Matravers notes that a passage of music is expressive if it is *appropriate* that it bring about a certain experience.[1]

Boghossian observes that our hope of vindicating the range of emotional responses that we have to absolute music depends on our being able to see absolute music as *telling us things*: we need to be able to assimilate the problem of absolute music to the problem of "feeling for fiction" by finding meaning in absolute music. Boghossian states that an inference from the legitimacy of our emotional responses is not the only sort of evidence that we have for the existence of musical meaning: the sheer phenomenology of listening, our *evaluative* thinking about music, and the role that music plays in opera or film are three other sources. Boghossian concludes that the real problem for musical meaning is not to justify belief in its existence, but to explain its possibility. Sounds are heard as having the expressive properties they have *because* they are heard as having certain musical properties.[2] Ridley affirms that the construction of a persona is sometimes necessary, sometimes not (whether the construction of a persona is necessary or not depends upon the particular character of individual pieces of music). What interests Ridley is the *appreciation* of expressive music, rather than the bare possibility of hearing music as expressive.[3]

3. Describing Music Metaphorically

Robinson writes that Goodman's analysis of expression as metaphorical exemplification contains the germs of two different conceptions about musical meaning and expression: (i) musical expression is just a matter of a musical piece or passage metaphorically having or possessing certain expressive qualities, and (ii) musical expression sometimes goes beyond the mere possession of qualities. Some pieces of music are appropriately heard in terms of a particular overarching structural metaphor (it may be appropriate to hear such music as *expressing* something about the emotional life of the characters participating in the discourse). A piece of music as a whole can function as a metaphor of emotional life. It is difficult to describe the way music sounds. Music as an art has historically been conceived of in terms of certain large-scale or umbrella metaphors. Music has always been understood in terms of one or another conceptual metaphor. Unless we grasp the metaphors that structure a piece of music, we do not hear it as it was meant to be heard. Our experience of music as a conversation reflects a new and different experience of the music. When we consider music as some sort of discourse, our main attention is on the music. We think of music in terms of the metaphors that *apply* to it. Robinson puts it that to describe music metaphorically is not the same thing as to treat a piece of music as itself a metaphor. There is room for multiple interpretations of the same piece. Composers can express their emotions and attitudes through the interplay of voices or characters that they create. There are fundamental metaphors which do not just describe the surface of music but structure our whole experience of it. On Robinson's reading, Goodman points out that works of art are symbols in symbol systems (certain qualities in a work are more aesthetically significant than others). The music refers to or signifies those qualities that it metaphorically possesses. It is the critic's task to decide which of a work's properties it exemplifies and expresses. Interpreters are restricted to finding the qualities that a work of art actually has. Robinson says that Goodman's account of expression as metaphorical exemplification can be read both as an account of expressive qualities of parts of the musical surface, and as an account of the "expressive meaning" of a piece as a whole.[4]

Juchniewicz investigates the influence of a pianist's physical movement on the listeners' perception of musical performance, and explores relationships between three movement types ("no movement," "head and facial movement" and "full body movement") by the musical elements of phrasing, dynamics, rubato and overall performance. Music evaluators should take notice that all rating scales are influenced by the physical movements of the performer. The use of physical movement affected the listeners' ratings of musical expressivity. Listeners can perceive expressivity in specific musical elements even under different performance conditions. Juchniewicz insists that the uniqueness of the musical listening experience makes it difficult to pinpoint exactly how music is perceived by the individual listener. Listeners may expect specific musical and non-musical characteristics of a performing musician and their overall musical presentation. Juchniewicz thinks that if physical movement is an acquired part of musical expression, then investigating the development process seems essential. The presence of physical movement influences the listener's assessment of musical performance.[5]

4. Neural Correlates of Music Processing

Cross presents a three-dimension account of meaning in music in which biologically generic, humanly specific, and culturally enactive dimensions of the experience of music are delineated. Music becomes part of the repertoire of modern human behaviour as an exaptive consequence of processes of progressive altricialisation in the hominin lineage. Music is inescapably biological and profoundly cultural. Music is functional in human development and interaction because of its attributes of *embodying, entraining and transposably intentionalising sound and action.* Cross stresses that music can best be interpreted as a mechanism for motivating and sustaining shared intentionality. Musicality is related to the capacity for culture, helping to support and sustain it. Music is not just structured sound that evokes emotion but that fails to express semantically decomposable propositions. Commonalities at the level of musical structures afford unstable foundations for an account of generic musicality. Musical sound has been used as a means of inducing altered mood states in experiments exploring the cognitive and neural correlates of anxiety and depression. Cross notes that music cannot be conceived of as a purely sonic phenomenon. Music in many societies can constitute a temporal framework for interactions. The social functions of music may be multifarious. Music fulfils a huge range of social functions in the form of interactive musical behaviours. Cross affirms that music functions as a framework for social and intentional action, and can be culturally or personally emblematic in a variety of ways (music has a multiplicity of functions across cultures in group and individual contexts which derive from its affective, social, and emblematic potencies). The functions of music are almost as irreconcilably diverse as do musical structures. Cross remarks that the motivational-structural dimension of musical meaning is based on local and global characteristics such as tempo, tessitura, timbre, mode of articulation, and intensity. The socio-intentional dimension rests on inferences that relate not so much as to *what* unfolds musically as *how* music unfolds. Music can be interpreted as providing a medium within which participants can interact in ways characteristic of shared intentionality. Music affords a risk-free medium for the exercise and rehearsal of social interaction. Musicality is integral to the human capacity for culture.[6]

Ford claims that Hegel's phenomenology of music brings together music and listeners into a unity, recognizing music's ephemeral temporal and sonic nature (music, because of its temporal nature, does not stand over and against us as something concrete and fundamentally other). The subject and its object are in a dialectical unity, whilst nonetheless standing apart from one another. Hegel recognizes the systematic nature of music. Music constantly passes away in time but it is not any less objective than anything else. Music comes into presence by way of absorption "into an immediate temporal disappearance," because of its ephemeral nature. The inner world of feeling is entirely self-contained as a negative subjective unity. The cyclical nature of self-consciousness is in continuous temporal flux. Music is not *in time*, and neither does it move through time (musical time is *how time is* for music and its listeners). Self-consciousness "interrupts the indefinite series of points" of musical time into spans or fields of presence. Music involves a continuous and constant "running off" of sounds into the past. The protentive aspects of musical or any other form of phenomenological time involve the content of its retentions.[7]

5. Conclusions

Boghossian argues that the fact that we can rationally respond to music with real emotions is indirect evidence that there must be musical meaning. Robinson says that if pure music is conceived of as metaphorically a kind of discourse, it can contain expressions of emotion of this sort. Cross maintains that from an evolutionary perspective, a focus on music's commonalities of function across cultures provides an appropriate framework for theorising the roles and the operational features of music's indeterminacy of meaning. Ford reasons that the truth of music is its coming into presence by standing forth from mere sound *as music* together with its resonance or resounding of a nonconceptual world**:** musical revelation can resound entirely new and unfamiliar ways of being in the nonconceptual temporality that is peculiar to it. Juchniewicz thinks that physical movement and visual characteristics are part of the musical performance and influence all listeners, regardless of experience or gender.

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ANALYTICAL AND INTUITIVE UNDERSTANDINGS GAINED THROUGH MUSIC EXPERIENCE

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ABSTRACT. Zemach and Balter insist that two central characteristics of music make it amenable to situational irony: (i) music raises expectations (competent listeners project situations they consider right for the musical conditions at hand), and (ii) listeners compare and contrast the anticipated situation (a musical event) with the one that does occur in the work. According to Graham, performance should reveal the sonic properties of a musical composition in a way that no musicological analysis of the "meaning" of the piece or study of the emotional life of the composer could do. Scruton says that our ways of grouping and streaming individual sound events reflect a peculiar metaphysical feature of sounds. Cross and Morley explain that music may have *developed from* functions evolved for particular life-supporting purposes.

Keywords: music, listener, performance, composition, sound, interpretation

1. Introduction

Zemach and Balter show why there are many kinds of irony and how music displays them, analyzing one example of each musically realizable kind of irony. Graham observes that music is for listening to as nothing else is. Music is one of the *performing* arts. Dominance of "art music" over folk music has given listening to music a certain prominence. Scruton argues that perceptual information must be assembled into comprehensible units if it is to guide us around the world. We could group sounds into coherent temporal figures without hearing them as music. Cross and Morley observe that music never seems to achieve direct or unequivocally interpretable reference to things beyond itself.

2. Interpretation in Performance and the Exploration of Sound

Zemach and Balter insist that two central characteristics of music make it amenable to situational irony: (i) music raises expectations (competent listeners project situations they consider right for the musical conditions at hand), and (ii) listeners compare and contrast the anticipated situation (a musical event) with the one that does occur in the work. Zemach and Balter assert that *dramatic irony* is a modification of situational irony (it interprets the real situation *via* a possible counterpart). General irony is modal (its evaluation in reality depends on its evaluation in alternative worlds). *No* alternative to the real situation can make a difference. Romantic irony criticizes an element *in* the work or alerts us to the nature of the work as an artefact. Zemach and Balter posit that musical parody is a real piece of music which suggests that another real object, being its counterpart, also has its manifest drawbacks. Every musical parody is a borrowing. Romantic irony is the epitome of all irony (all irony is, essentially, self-directed).[1]

According to Graham, performance should reveal the sonic properties of a musical composition in a way that no musicological analysis of the "meaning" of the piece or study of the emotional life of the composer could do. The musical sound itself is the principal object of the attentive mind in the experience of listening. Graham argues that reflection and analysis can help us to hear the properties of a piece of music. In the business of listening both composer and performer have a crucial role. Listening to music is a matter of sound pouring into a receptor and of the mind being directed through a series of perceptions. Musical sound can be described in affective language. The meaning and value of the composer's and performer's work requires realization in the ears of the listener. Graham claims that there is no gap, either temporal or conceptual, between composition and performance. Interpretation in performance is a significant further avenue for the exploration of sound. Conventional music provides for a collaborative exploration of sound by composer and performer, while in digital composition the composer does everything (performance and composition can never be separated in the way that they are in conventional music). A digital composer must have mastered the same technology that needs to be deployed in performing it.[2]

3. Multi-faceted Layers that Contribute to the Significance and Meaning of Musical Experience

Scruton says that our ways of grouping and streaming individual sound events reflect a peculiar metaphysical feature of sounds. Auditory streams can be organized internally, by reference to audible features of the sound events. Scruton points out that musical experience involves the importation of a spatial framework, and the organization of the auditory field in terms of position, movement and distance. The concepts that provide the fundamental framework for musical perception are applied metaphorically. By metre Scruton means the measuring and parcelling out of the temporal sequence. Metre is a form of measurement, in which time-values are ordered into repeatable segments. Metrical order and rhythm are distinct. Rhythm is a phenomenal, not a mathematical, property of a sequence (our capacity to perceive it is dependent upon our wider ability to respond to movement). Scruton notes that metrical divisions coincide with significant junctures in the rhythm, and claims that this coincidence can occur in two quite distinct ways: (i) the metre is laid across the movement like a grid, and (ii) it *emerges* from the movement in the way that the hexagonal cells of the honeycomb are precipitated out of the honey-making within them. Speech-rhythms are both patterns and constraints when set to music. A useful contrast should be made between composers whose rhythmic organization primarily reflects dance patterns, and those for whom speech patterns are more important. Scruton emphasizes that "beat" denotes a pattern of time-values and accents, while "rhythm" denotes the movement that can be heard in that pattern. A piece of music may have a strong beat but little or no rhythm. Often a composer presents accompanying figures which shift the accent sideways through the music. Swing cannot be reduced to a metrical outline: it is a phenomenological feature of the music (it is not understood by counting but felt in the musical line). Scruton states that metre is the frame, while rhythm is the life that grows on it, and draws a contrast between ostinato rhythm in which a relentless beat subjects the music to a discipline that might have nothing much to do with its melodic and harmonic movement, and rhythm which adapts to and takes its accents from the musical movement. Accent, stress and grouping are fundamental to the rhythmical order. Measure is never sufficient in itself to determine rhythm, even when made fully explicit to the ear. Scruton holds that musical order is achieved when voices move together towards closures that are harmonically driven and melodically complete, and says that we should see tonality as in part a rhythmical system (the difficulties of atonal music are experienced as much at the rhythmical as at the melodic and harmonic level). Rhythm sustains and is sustained by the harmonic and melodic relations. Rhythmic organization is fundamental to musical meaning.[3]

4. An Understanding of How Human Society Responds and Experiences Music

Cross and Morley explain that music may have *developed from* functions evolved for particular life-supporting purposes. Music is something of a universal social fact. There are many instances where music's sonic patterns have a structure and identity that is inseparable from the "doing" and regulation of the actions. Music is better understood as a thoroughly *embodied activity of human agents*. Most of the contexts in which music occurs are *participatory*, involving overt and active engagement of persons in musical activities of the group. Cross and Morley assert that musical interaction between human subjects is rooted in intuitive, mind-generated, processes of pulse abstraction/generation within the individuals: music as an interactive *social behavior* affords the means for synchronising the deployment of a participant's experience of moving with that of other participants. The denotational significance of music can rarely be pinned down unambiguously. Music can be interpreted as referring both to itself and beyond itself, and generates allusion to future possibilities of unfolding. While aspects of music's sense may be disambiguated, its objective *reference* cannot. In certain circumstances music can appear to bear meanings in much the same way as language. Music and language can both function in the conceptual-intentional domain as "acts of meaning." Music embodies, and exploits, an essential ambiguity. Cross and Morley define music as *embodying*, *entraining*, and *transposably intentionalizing* time in sound and action: it is capable of engaging and rewarding groups or communities and individuals, and both entrain movement and experience. Music's ambiguity may serve as a medium for participation and contribute to the maintenance of social flexibility. Music can function as a concept-linking medium for mature members of a culture. Musical behaviors can be interpreted as providing ways of interacting that are likely to minimize social conflict. Music's ambiguity allows for the exploration and rehearsal of skills in interacting with others. Music may aid development of the individual's cognitive flexibility. Music and language both provide purposeful syntactic frameworks that serve human needs of joint action and interaction. Cross and Morley stress that there is no good evidence that musicality is not a universal human attribute. Music's effects are more far-reaching than simple and immediate hedonic response in individuals. Music usually involves co-ordinated *interaction* rather than display in individual performance. There are close functional correspondences between music and language. Music appears to have significant *proximate* effects. Cross and Morley think of both music and language as two complementary mechanisms for the achievement of productivity in human interaction though working over different timescales and in different ways. Musical capacities are built on fundamentally important social and physiological mechanisms. Music production and perception is handled by the brain in ways that are complex and related to interpersonal interaction and the formation of social bonds. Musical participation can act on the brain in ways that are appealing to humans.[4]

Ford maintains that music exists but it does not persist, and insists that musical sound stands forth from all other sounds as sufficient to itself (it is distinguishable from sonic matter because notes are far more acoustically focussed than noise). There are two levels of musical matter before primary musical matter can serve and be regenerated by musical creativity. *Secondary musical matter* arises from the differentiation of these basic musical sounds, while *tertiary musical matter* forms when these evenly spaced series of notes are divided into unevenly "spaced" scales (tertiary musical matter *has* changed through history).[5]

5. Conclusions

Zemach and Balter note that if music can be ironic that property must lie in the music itself. Verbal irony in music is extremely rare (use of words is not essential to irony). Graham contends that music may prompt in us emotional experiences or intellectual insights.

Sound can have properties more sophisticated than those of volume (loud or soft), pitch (high or low), and tempo (fast or slow). Scruton points out that sounds become music when organized rhythmically, melodically or harmonically (each form of organization is sufficient to provide an experience of music). In Cross and Morley's view, in language the meaning of an utterance with reference to some object in the world can be specified with some precision.

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METAPHOR IN MUSICAL EXPERIENCE

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ABSTRACT. According to Ockelford, an effective way of explaining zygonic theory is through analogy with the construction of meaning in verbal language. Budd explains that the judgement that a musical phrase sounds melancholy is purely descriptive. Robinson insists that some music has the power to affect our feelings without much, if any, cognitive mediation.

Keywords: metaphor, musical, experience, zygonic, cognitive, sound

1. Introduction

Ockelford's "zygonic" theory of music-structural understanding puts it that *Imitation*, which can occur in all domains of perceived sound and at all levels, is the ultimate organizing force in music. Budd contends that hearing music with understanding consists in hearing music in such a manner that apt figurative descriptions would be appropriate to the experience. Robinson analyzes the relation between the expression and the arousal of emotion by music. Music frequently *expresses* emotional qualities and qualities of human personality.

2. Ockelford's "Zygonic" Theory of Music-Structural Understanding

According to Ockelford, an effective way of explaining zygonic theory is through analogy with the construction of meaning in verbal language. Musical meaning must stem from the fabric of music itself – from the sounds and the relationships between them that make up pieces. The zygonic theory stems from musical "canons," which are explicitly structured through one musical line consciously being made to copy another. Zygonic relationships are *hypothetical constructs*: conceptual shorthand for a range of logically equivalent cognitive processes that occur during listeners' engagement with music. Ockelford states that the notion of a zygonic relationship can offer only a much-simplified version of certain cognitive events that may be stimulated by participation in musical activity. The single concept of a zygon bequeaths a substantial perceptual legacy. Zygons may function reactively, in assessing the relationship between extant values, or proactively, in ideating a value as an orderly continuation from one previously presented. Zygons apply potentially to *any* features of musical sounds. The imitation through which derivation is thought to occur may be exact or approximate.

Ockelford writes that zygonic theory has found a place in its own right as a way of explaining how musical structure "works," has found service as an analytical tool, has proved useful as a *meta*theoretical and *meta*-analytical mechanism for interrogating other theoretical and analytical approaches, has proved valuable in mapping the blended conceptual space that music and words together inhabit in song, has found application in music-psychological contexts, has been used to analyse musical influence and interaction in the context of improvisation, is being utilised to gauge how the structure and content of music are reflected in expressive performance, has been of value in modelling the musical development of children and young people with complex needs, and has been used in epistemological discourse, to clarify the distinction between the modes of thinking of characteristic of music theory and music psychology. Ockelford says that the zygonic approach seeks structural features of any type that are founded on imitation, and provides a conceptual and schematic framework within which findings of potential interest can be captured and interrogated. It is in the domains of pitch and perceived time that the great majority of "background" organisation occurs. In addition to its own internal logic and derivation from stylistic archetypes in the domains of harmony and rhythm, the accompaniment shares with the melody a mutual sense of agency. What makes music effective is the manner in which its inherent (or learnt) expressive qualities are integrated with structure through zygonic relationships. Ockelford considers how zygonic theory can be deployed *meta*theoretically. "Zygonicity" is an expression of the proportion of the *potentially* zygonic relationships between identical values of a given rank to the total number present.[1]

3. The Intrinsic Nature of Music Experience

Zbikowski proposes that the sequences of sound events proper to music can provide analogs for dynamic processes and is interested in how cognitive capacities associated with categorization, analogy and the use of conceptual models are manifested in our understanding of music. Both the organization and meaning of music are central to its grammar. The gestures that accompany our speech reflect a mode of thought that is independent from but coordinated with language. The sonic analogs of music processes operate within contextual frames provided by musical rhythm and musical pitch. Musical pitches provide a framework for gauging the similarity of and difference between musical events. In many cases our characterizations of musical gesture have a metaphorical basis. Zbikowski's analysis of the relationship between the music and lyrics of "The Way You Look Tonight" shows how musical materials can shape our understanding of words. Gesture gives access to a dynamic, imagistic mode of thought that is inaccessible to language. Both music and gesture draw on a common pool of cognitive resources to create analogical representations of dynamic processes.[2]

Budd explains that the judgement that a musical phrase sounds melancholy is purely descriptive. Unless we find a musical work intrinsically rewarding to perform or listen to, we do not value it as music. Budd concentrates upon the nature of the experience that a listener has if he hears a musical work with understanding. One aspect of understanding a particular musical work is knowing how the work should sound in performance (it is easy in particular cases to specify necessary conditions of someone's understanding a musical work). Extra-musical concepts are integral to the experience of listening to music with understanding. A relatively unified musical work is a hierarchical structure of temporal groupings. Budd says that to experience music with musical understanding a listener must perceive various kinds of musical process, structure, and relationship. The ability to articulate music in musical terms is essential to understand and engage in the practice of musical analysis and criticism. The task of musical analysis is to explain what the relationships among events in a particular musical work are. Our perception of music is informed by our awareness of the notes as being produced intentionally by some external cause or other (it is properly often colored by our awareness of the nature of the cause).[3]

4. The Expression of Emotion by Music and the Physicality of Music

Robinson insists that some music has the power to affect our feelings without much, if any, cognitive mediation. Music can induce physiological changes and a certain quality of inner feeling. Emotions vary in degree of cognitive content. The perception of certain rhythms may be enough to evoke tension or relaxation, excitement or calm. To feel unrequited passion involves a fairly complicated conception of one's situation. Robinson notices that the expression of a feeling by music can sometimes be explained straightforwardly in terms of the arousal of that feeling. The musical expression of complex emotions is often a function of the large-scale formal structures of the piece as a whole. We are a long way from showing how unrequited passion can be expressed by a piece of music. The emotional experience aroused by the music is essential to the detection of the emotional expressiveness in the music itself. Robinson confines her attention to the question of how the expression of emotion by music is related to the arousal of emotion in the listener.[4]

Robinson notes that a piece of instrumental music can express attitudes or emotions in its (implied) author. There are no literal agents in instrumental music. It is not as if we are doing something very different when we imagine a persona in a piece of instrumental music. We *treat* some pieces of music as expressions of emotion in a persona whom we imagine in the work. Robinson says that a piece of music can be sad in a boring mindless inexpressive way or in a more revealing and expressive way. Music directly affects the motor system, and puts us into a bodily state characteristic of the emotion in question. To be expressive of an emotion requires that the music reveals something of what that peculiar emotion is like by actually enabling us to feel (or to imagine feeling) that emotion.[5] Robinson explain how music can *express* emotions and *arouse* emotions. "Representation" in music is not strictly representation at all. Expressing emotion in music in the full Romantic sense is primarily something that a composer or a persona in the music *does* or achieves. Robinson puts it that music arouses emotions and moods in a more direct bodily way as well, influencing the autonomic system and the motor activity of listeners.[6]

Le Guin holds that in carnal musicology the boring notion of an authoritative reading auto-digests, "leaving us with its compost: that complex layering of interpretations that builds up around any work of art, and, culturally speaking, constitutes the nourishment it must have in order to survive."[7] Le Guin insists that the visible element of a musical idea will function in varying degrees for the listener-observer, confirming or resisting that idea's sonic presentation (a performance- and body-oriented musicology is positively obliged to account for the visible). "All experienced performers develop considerable awareness of what they look like in performance, even if only in order to restrain themselves from gestural excess."[8] Le Guin asserts that in the Adagio of the String Quartet in E-flat Major, Op. 9, no. 4, G. 174, Boccherini's textural, lineless music offers passages that invite the listener to suppose something "barely announced." "With this disappearance of line we lose all sense of piece-as-oration. […] No one in particular is speaking to us here; the orator has apparently stepped down from his podium to take a stroll beside us, exchanging disjointed sweet nothings in a twilit garden."[9] Boccherini reminds us that in real life (the life that necessarily involves others) reminiscence is not always or only confirmatory. "It can be perceptual destabilization, the uncontrollable permeability of current experience by the past. Through the glass of repetitiveness he forces us to watch not only the progress but the inevitable slippage of the 'same' thought – and thus the 'same' self – as a direct result of its socialization."[10]

5. Conclusions

Ockelford emphasizes that when one musical feature was created by imitating another, then, to the musical mind that recognised the replication, it was as though the first metaphorically exerted some form of control over second. When listening to the music, imitation is the vehicle that drives musical logic and coherence at the motivic and thematic levels. In Budd's view, the nature of the experiences of the elements of music (tones, melody, rhythm, and harmony) can be described only by means of metaphors. On Robinson's reading, music frequently *affects* us emotionally: it evokes or arouses emotions in us. The obvious way to clarify the nature of music in which we can detect unrequited passion would be to specify its cognitive content.

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THE SOCIAL AND RELATIONAL ASPECTS OF MUSIC MAKING

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ABSTRACT. Zbikowski posits that conceptions of musical gesture are framed in terms of the motion of bodies through space. Dillon argues that meaningful music making for life proposes a way of engaging with the tensions at the interfaces between cultures and times. Oliveira et al. maintain that emotion and meaning are not mutually exclusive properties of musical listening or any other esthetic experience.

Keywords: emotion, meaning, musical, listening, esthetic, experience

1. Introduction

Zbikowski holds that musical events that provide tension must progress to musical events that provide release (profound musical tension will be followed by profound musical release). Dillon examines the idea of music making as a decolonisation process as a part of transformation of self through the deeply political notion of decolonisation. Oliveira et al. relate the concept of musical meaning to the notion of abductive reasoning as described in the pragmatics of C.S. Peirce: such logical notion could complement theories that have been developed by taking exclusively psychological elements into account.

2. The Intrinsic Nature of Music Making

Zbikowski posits that conceptions of musical gesture are framed in terms of the motion of bodies through space. Our embodied experience of musical pitch is not limited to the bodily sensations we associate with the production of "high" and "low" pitches. Mapping *up-down* onto pitch allows us to import the concrete relationships through which we understand physical space into the domain of music. We must be able to draw correspondences between the musical domain and that of our embodied experience. Zbikowski says that our characterizations of music in terms of tension and release demand either pairs of events or a systematic account of why a series of events is "tense" or "relaxed." The appeal of making a place for the body in our theories of music may extend beyond what is intuitively satisfying.[1]

Dillon argues that meaningful music making for life proposes a way of engaging with the tensions at the interfaces between cultures and times. Music making has a powerful influence on emotions and the potential to facilitate social and personal transformation (it can afford us a relationship between cultures that has potential to foster understanding) and to convey something of "others" through embodied understandings. Music making has the potential to engage people across cultures in ways that can be themselves transformative. Dillon explains that music represents knowledge and is a container and vehicle for knowledge transfer. Music is only ephemeral because of its time dependence, and provides opportunities that are both linear challenges and cyclic depth. The intrinsic nature of music is the natural focus of music learning. Access to flow producing experience and the modelling of autotelic behaviour is integral to music learning. It is useful to understand which aspects of music making have the potential to be intrinsic and flow producing. Personal meaning refers to the music makers' own relationship with music. The meaning of music changes in relation to the context. The complexity is inherent in the largeness of musical and social structure. The educative qualities lie in the use of music as a creative expressive vehicle. As Dillon puts it, cultural meaning is possible when music product meets the community. Being part of an audience is as much a learned response as preparation for performance. Performance adds another dimension of complexity and challenge to music making. In aesthetic music performance, we encounter the notion of judgement by the domain of music itself. Pragmatic performance is clearly linked to more emotive music/mood invoking music. The skills of assessment, choice of appropriate materials, preparation and reflective practice are inherent to all music making. Dillon states that pragmatic/functional music making can contain aesthetic and expressive qualities (it may be more simply structured and focussed by the function). The best understanding of the structure of music comes from experience with creating musical form. It is necessary for music making to be both pragmatic and aesthetic. There is a need for awareness of the inter-connection of music experiences. Syncretism raises complex issues associated with ethical appropriation of musical knowledge.

Dillon insists that music making experience can provide a self-motivated and personal experience. Flow may not emanate directly from participating in the music making or perception experience. The music discourse provides an endless set of aesthetic challenges for individuals. Dillon remarks that personal meaning is a powerful motivating force to be involved in making and perceiving expressive music. Openness to musical experience engenders confidence in participating in new music. Decolonizing or culturally challenging experiences affect our perceptions of musical values. The benefits of experiencing culture through music making are beneficial to personal growth. Drill and practice music technology is seldom personally meaningful in a musical sense. Music making as a means of communion with others is a powerful idea for self-formation and promoting social inclusion. Music is a means of expressive communication in a symbolic form, and provides a basis and medium for social interaction. Meaningful experience is a reason for participating in music making. Dillon stresses that the micro-aesthetic or micro-flow experience constitutes the first experience with something meaningful with music. In performance music becomes an expressive aural medium. Music making has the potential to ground humanity in social interaction. Dillon describes the relationship between making music and forming identity through meaningful engagement with music making. The identity formed by our relationship with music is an emotional one.[2]

3. Embodying the Intuitive and Aesthetic Aspects of Musical Expression

Matthen emphasizes that the visual consciousness that humans enjoy is, according to the Cartesian conception, "an image of the image cast by the lens of the eye, a picture of a picture of the world."[3] Sensory systems create ordered relations of similarity and dissimilarity among stimuli, relations "which grade the degree of similarity that one sensed object bears to another."[4] Solomon holds that insofar as the emotions can be defended in terms of a kind of activity or action, it is not the fully conscious intentional action that should be our paradigm. "But the realm of semi-conscious, inattentive, quasi-intentional, habitual, spontaneous, and even 'automatic' activity and action has received little attention in philosophy, despite the efforts of such seminal figures as William James and Maurice Merleau-Ponty."[5] Damasio claims that an emotion ("patterned collection of chemical and neural responses that the brain produces when it detects the presence of an emotionally competent stimulus"[6]), and a feeling are "mental representations of the physiological changes" that were induced by the chemical and neural responses produced by the emotionally competent. Winston and Dolan note that the amygdala "links pre-conceptual or pre-attentive sensory processing with emotion" and is responsible for "the heightening of perceptual processing in relation to emotionally salient stimuli."[7] Cacioppo et al. point out that negative affect "serves as a call for mental or behavioral adjustment and problem solving," while positive affect "serves as a cue to stay the course or explore the environment." This allows creatures to "enjoy the benefits of exploratory behavior and the self-preservatory benefits of a predisposition to avoid, scrutinize, and withdraw from threatening events."[8]

4. The Nature of Aesthetic Constructions of Music

Oliveira et al. present the two main aesthetical perspectives of musical meaning: the theory of mimesis and the formalism of Hanslick (musical meaning can be thought of in terms of the dynamical process of listening to music's phenomenal developments, in relation to expectations and frustrations), show how the psychological theory of Meyer on musical meaning tried to overcome such a duality (the emotional response that accompanies musical listening is a direct consequence of the process of structural listening), and present the theory of musical expectation of David Huron, which brings an experimental and biological perspective into account (the past listening experience a person has is the basis for his or her expectation, and it could be adequately described by statistical analysis of a repertoire). Oliveira et al. consider the nature of the abductive reasoning and its role in the acquisition of knowledge. Oliveira et al. maintain that emotion and meaning are not mutually exclusive properties of musical listening or any other esthetic experience, and point out that what Meyer called hypothetical meaning (which is the basis of the process of signification) is an instantiation of what Peirce called abductive reasoning (which forms the inferential basis of the process of acquisition of knowledge). Musical signification is a particular form of a general process of signification that is instantiated primarily and initially by means of abduction. Induction (and deduction) alone could not constitute the act of musically listening (the work does not tell us how it should be listened to even after several expositions to it). Oliveira et al. reason that within a diverse musical environment, musical habits have to be generated and adapted more often. New listening habits might be generated every time a new musical style or system emerges. Listening habits and esthetics beliefs are elements of a music-conceptual space. The listening habits and aesthetical beliefs are constantly being altered by abductive reasoning.[9]

5. Conclusions

Zbikowski argues that the gulf between the concepts at the core of music theory and our embodied understanding of music may be little more than an illusion born of an outdated theory of mind. Dillon thinks that there is potential for music to become a site of cultural interchange and understanding through interaction with embodied experiences. Oliveira et al. investigate the question concerning the possible existence of a general *logical* principle underlying the suppositions on the emotional meaningful response that accompanies musical listening.

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THE INFLUENCE OF MUSICAL PERFORMANCE ON MUSIC PERCEPTION

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ABSTRACT. Huron proposes that the emotions evoked by expectation involve five functionally distinct physiological systems: imagination, tension, prediction, reaction, and appraisal. As Bicknell puts it, caution must be exercised in drawing general inferences about the phenomenon of musical quotation from one listener's experience of a single composition. Zbikowski claims that the kind of consciousness associated with attending to music is different from the kind of consciousness associated with attending to language. On Perlovsky's reading, music evolved for maintaining the balance between differentiation and synthesis. Alpemon argues that hearing, listening to, and making music provide a direct and intimate entree to music for most people.

Keywords: emotion, musical, listener, consciousness, experience, language

1. Introduction

Huron claims that emotions add subtle nuances that color our perceptions of the world. Bicknell examines the listener's experience of reference in musical quotation, paying attention to the presence of auditory clues, familiarity of quoted passages, and the larger compositional context in which they are found. Perlovsky claims that music serves a most important and concrete function in evolution of the mind and cultures. Egermann and Kopiez hold that subjects' behavior is influenced by their presumptions about subliminal messages and not by the information masked by the music.

2. Music's Emotional Power

Brown holds that music and language are homologous functions that evolved from a common ancestor that embodied their shared features: the domain-specific features of music and language (such as meter, absolute pitch, word lexicons, propositional syntax) show a diversity of arrangements that are distinct from those related to the shared and parallel features.[1]

Huron asserts that musicians have demonstrated an exquisite skill in evoking "the profoundly sad, the twistedly absurd, and the deeply awe-inspiring." In music, composers absorb a number of clichés: *tragedy* can be evoked by using predominantly minor chords played with rich sonorities in the bass register, *suspense* can be evoked using a diminished seventh chord with rapid tremolo, and *surprise* can be evoked by introducing a loud chromatic chord on a weak beat. Music involves mimicry of some natural emotional expressions. Nature's tendency to overreact provides a golden opportunity for musicians. It is nature's knee-jerk pessimism that provides the engine for much of music's emotional power. Huron proposes that the emotions evoked by expectation involve five functionally distinct physiological systems: imagination, tension, prediction, reaction, and appraisal: the purpose of the *imagination response* is to motivate an organism to behave in ways that increase the likelihood of future beneficial outcomes; the purpose of the *tension response* is to prepare an organism for an impending event by tailoring arousal and attention to match the level of uncertainty and importance of an impending outcome; the purpose of the *prediction response* is to provide positive and negative inducements that encourage the formation of accurate expectations; the purpose of the *reaction response* is to address a possible worst-case situation by generating an immediate protective response; the purpose of the *appraisal response* is to provide positive and negative reinforcements related to the biological value of different final states.[2]

3. The Phenomenon of Musical Quotation

Bicknell holds that, according to Howard, loose analogues of language and other symbol systems may enliven music's capacity to add nuance to what exists primarily as an auditory experience. The requirement of containment is fulfilled whenever the passage bears closely similar auditory properties to the original. Quotation in music does not enjoin the strict criterion of syntactic replication required for direct quotation in language. Bicknell remarks that Howard entertains and rejects the possibility that familiarity might be a criterion for reference. Howard rejects the possibility that musical quotation might be assimilated to onomatopoeia, and overlooks the fact that in spoken language, reference can be secured without formal devices such as quotation marks. Bicknell writes that, for Goodman, there are two necessary conditions for direct or indirect quotation: containment and reference. The quotation must refer to or denote what is quoted, either by naming it or by predication. Indirect quotation is indicated by the word "that" and other expressions. The quotation must contain a syntactic replica of the quoted expression, or its semantic equivalent. Standardized clues such as context, emphasis, and pause might constitute an auditory device for reference in music. There is no auditory equivalent to quotation marks.

Bicknell limits herself to compositions in which the secondary musical material is by a different person from the composer of the primary work in question. Familiarity of the quoted melody is often a symptom of musical denotation, but it cannot be a criterion. A musical quotation, like an onomatopoeic sound, is familiar, and similar to another sound. As Bicknell puts it, caution must be exercised in drawing general inferences about the phenomenon of musical quotation from one listener's experience of a single composition. In seeking to understand music through analogues with language, one must examine how language users actually communicate. Investigations of the experience of listening to music to music must take style seriously as an aesthetic issue. The listener must do some work to understand those of the composer's intentions crucial for comprehension and appreciation of the music.[3]

Zbikowski claims that the kind of consciousness associated with attending to music is different from the kind of consciousness associated with attending to language. Awareness involves having various mental images derived from perceptual and proprioceptual cognitive activity. The cognitive functions basic to memory systems are essential to consciousness. Memories are highly dynamic cognitive constructs that are constrained by the biological mechanisms through which they are maintained. Zbikowski notes that consciousness is shaped by both short-term processes such as working memory and long-term processes that allow us to retrieve information from the distant past. To the extent that musical knowledge deals with actual musical events, it is shaped by tonal and metrical frameworks that define and articulate temporal spans. Musical materials have the *potential* to serve as analogues for motor movement.[4]

Perlovsky writes that emotional signals evaluate concepts for the purpose of instinct satisfaction. Aesthetic emotions are inseparable from every act of perception and cognition. The main mechanism of interaction between cognition and language is a dual concept-model. The main mechanism of interaction between cognition and language is a dual concept-model. Language contributed to differentiation of conceptual ability and to differentiation of psychic functions of concepts, emotions, and behavior. Differentiation may lead to emotional disconnect between conceptual knowledge and instinctual needs. On Perlovsky's reading, music evolved for maintaining the balance between differentiation and synthesis. Language evolved in the direction of enhancing conceptual differentiation ability by separating it from ancient emotional and instinctual influences. The knowledge instinct itself was directed not only at maximizing the overall harmony, but also at reconciling constantly evolving contradictions. Perlovsky says that music has two interrelated purposes fundamental to the functioning of individual minds and to evolution of the mind and culture: (i) to differentiate aesthetic emotions (music creates differentiated emotions required to reconcile conceptual contradictions) and (ii) to connect concepts to instinctual needs (music reconnects conceptual knowledge to instincts and emotions).[5] Perlovsky argues that the key to music's mysterious power lies in its unique relationship to the basic mechanisms of the mind. Music serves a dual purpose: it evokes new emotions and, by creating associations between conscious emotions and unconscious archetypes, it promotes synthesis or wholeness in the human psyche. Music is a mechanism of synthesis, a means of creating harmony and wholeness in the human soul.[6]

4. Deepening and Broadening Listener's Musical Competence

Alpemon argues that hearing, listening to, and making music provide a direct and intimate entree to music for most people (music is a familiar part of the furniture of our worlds). Music admits of an astonishing variability of means and materials. The structure and organization of sounds in music are extraordinarily diverse. For most people music seems a deeply personal affair. Music is capable of moving us in unusually intimate and distinctive ways. Alpemon states that the gap between the air of deep meaning in music and our inability to describe it adequately serves to reinforce the idea that musical expressiveness is both profound and mysterious. People might agree about the beauty of a piece of music, but they cannot agree about the specific emotional content supposedly represented.[7]

Emotion is an integral component of expression in music (music can elicit emotion in the listener).[8] Egermann and Kopiez examine the effects of subliminal text messages in music on choice behavior. Musical tempo and customers' music preferences are the best predictors for strength of influence. Worded messages can be embedded and hidden in music with the intention of manipulating the listener's behavior. Egermann and Kopiez focus on auditory subliminal messages and claim that there are five ways to embed worded messages in music: (i) the target words or messages are placed in the music below the auditory threshold; (ii) it is possible to use words with an inverted time-structure and mix them above the perceptual threshold; (iii) backward-masked messages can also be used subliminally; (iv) highpass-filtered worded messages (containing frequencies above 15 kHz) can be used; and (v) time-shrunk subliminal messages (played back twice as fast as recorded) can be hidden in the music. Effects of backward masked messages within music are much more unlikely compared to subliminal (forward) masking only. Language cannot be treated as a tone impulse just as music cannot be considered continuous noise.[9]

Ford points out that Husserl's theory tells us nothing about musical processes and structures: it does not explain how music defines the duration or extent of retentions and protentions by means of periods, up-beats and cadences. Ford discusses the content of style and what it means for both producers of music and for listeners, and observes that all musical experience depends on the interweaving of the style of a particular piece of music and listeners' familiarity with that style. Musical competence does not require any ability to conceptualize music: every new musical experience contributes to deepening and broadening listener's musical competence. Style is the primary form of mediation between music and listening.[10]

5. Conclusions

Huron posits that the performing arts have figured prominently in attempts to understand the dynamics of emotion. Bicknell discusses the problem of reference in musical quotation as formulated by Goodman: it has to do with whether a quoted passage can be aurally marked as different from a passage that is merely *contained* by another without being quoted. Bicknell proposes a solution based on the listener's experience of musical quotation. Perlovsky considers emotions as neural signals connecting instinctual and conceptual brain regions. Egermann and Kopiez investigate whether choice behavior can really be influenced through subliminal messages in music: subliminal worded messages in music have no effect on choice behavior in a non-directed listening situation.

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CONCEPT FORMATION AND CONCEPTUAL METAPHOR

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ABSTRACT. Botha notes that metaphors are pervasive both in thought and in language and in human subjective experience in general: in conceptual metaphor theory metaphors are analyzed as stable and systematic relationships between two conceptual domains. Mittelberg explores the semiotic work gestures perform in visualizing abstract concepts and structures, insisting on the different types of iconic modes discernable in gestural representations of the metaphorically conceptualized domain of grammar. Evans considers the cognitive preadaptations that may have paved the way for the emergence of semantic knowledge.

Keywords: concept, formation, metaphor, semiotic, semantic, knowledge

1. Introduction

Botha explores some of the current views concerning the grounding of metaphorical meaning in experience and embodiment. Mittelberg points out the role bodily semiotics plays in the teaching of grammar and linguistic theory. Conceptual metaphor is instrumental in accessing and concretizing abstract domains. Goldwasser claims that the events occurring in the hieroglyphic picture-script render mental processes that are made visible for our inspection. Evans holds that intentionality and the ability to recognize communicative intentions are necessary prerequisites for the evolution of symbolic representation in language (an important prerequisite of a code is to be able to encode and externalize humanly-relevant concepts and combinations of concepts).

2. The Relationship between Concept and Language

Botha notes that metaphors are pervasive both in thought and in language and in human subjective experience in general: in conceptual metaphor theory metaphors are analyzed as stable and systematic relationships between two conceptual domains (the analysis of metaphor leads to the recognition of the presence and role of embodied spirituality in the process of meaning formation). The bodily based conceptual structure which lies at the basis of linguistic articulations of conceptual metaphor is grounded in a deeper ontic structure of the world and of human experience (concepts, conceptual domains and metaphors are constrained and conditioned by a deeper, ontological framework). Botha asserts that metaphors always rest on some form or sort of analogy which relates to differences and/in similarities and express more than merely lingual states of affairs. Reality reflects the diverse coherence of meaning nuances. The neural grounding of metaphorical meaning is an essential and constitutive basis of all other forms of meaning.[1]

Teranishi considers how speakers form concepts through iconic metaphorical extensions, examining how they metaphorically extend one concept to another: all speakers use the same ways of forming metaphorical extensions and control metaphorical extensions according to their intentions and contexts. Teranishi discusses the role of iconicity in metaphorical understanding, the relationship between concept and language, and metaphorical extensions as tools of concept formation. Teranishi conducts experimental investigations to examine the speakers' associations in relation to basic shapes and the degree of iconicity in metaphorical extensions (concepts, although probably stored in the mental space, are recreated every time they occur). Teranishi proposes dynamic and universal models which represent the way in which a speaker forms concepts, connecting a linguistic form and a mental picture and controlling iconic metaphorical extensions.[2]

3. Gestural Representations of Grammar and Metaphorical Understandings

Mittelberg explores the semiotic work gestures perform in visualizing abstract concepts and structures, insisting on the different types of iconic modes discernable in gestural representations of the metaphorically conceptualized domain of grammar. Mittelberg demonstrates some of the ways in which working with Peirce's modes of representation (the different semiotic modes at work in a given process of signification may overlap to various degrees) provides a way to capture both fine distinctions and transient cases regarding the different types of cognitive-semiotic relations: the different iconic modes (*image iconicity, diagrammatic iconicity,* and *metaphor iconicity*) may interact in gestural representations of grammatical phenomena (iconicity is one of the central semiotic modes underlying gestural representations of both concrete and abstract objects and actions). A metaphorically motivated gesture does not necessarily represent the source domain iconically.

Mittelberg characterizes the different sign-object relationships put forward by Peirce and the interaction of semiotic modes within referential gestures of the abstract, tracing some common ground between Peircean semiotics and cognitive metaphor theory. Exploring *similarity* and *contiguity* relations in co-speech gesture can account for a wide range of meaning-making processes in the data. The recognizable analogy between real world objects or events and the products of their semiotic transformation are vital. In indexical signs, the relation between sign and object is based on *contiguity.* Mittelberg observes that the way in which an object represents a single abstract idea is an example of *image iconicity within metaphor*. The architecture underlying a sentence is in and of itself an icon of relations. The intricacies of the iconic modes Peirce distinguished can be discerned in metaphoric gestures. Icons, indices, and symbols are reflections of different types and stages of experience. Image schemas provide basic conceptual structures for metaphorical projection, motivating the iconic properties of the schematic structure of the source domain that gets mapped onto the target domain.

Mittelberg argues that gesture can provide additional insights into how humans conceptualize abstract concepts via metaphor. Gestural representations of grammar have the propensity to reveal metaphorical understandings. Iconic modes interact with indexical modes in making abstract entities present and graspable in the immediate context. Image schemas and conceptual metaphor may motivate spontaneous gestural representations of abstracta.[3]

Goldwasser puts it that the Egyptian language is a nonclassifier language recorded in a classifier script (its classification is represented by graphemes). The conceptual system may be more detailed and developed than language (metaphors are in essence a categorization process). The graphemic metaphors occur at the conceptual level (they are part of the detailed representation of the conceptual world organization). Goldwasser states that the animal hieroglyphs may offer themselves more readily than other icons to the metaphorical use in the script. The data provided by the Egyptian classifier system confirm the existence of knowledge organization and conceptual structures that are divorced from language. Sometimes a conventional "deep structure" conceptual metaphor surfaces in the script. The Ancient Egyptian language reflects many conceptual metaphors, some identical to the metaphors that emerge in the script.[4]

4. Symbolic Representations in Language and the Availability of a Conceptual Structure

Evans considers the cognitive preadaptations that may have paved the way for the emergence of semantic knowledge. Symbolic units serve to "parse" sensory or perceptual experience into component parts. Until the referent has been experienced in a number of contexts, it is not clear which aspect of the referent is being indexed. Symbolic representations in language take personality traits as the first lexical concepts. Evans examines how humans organize the world and their experience of the world into concepts. Semantic structure is the form that conceptual structure takes for expression in language. The nature of our visual apparatus determines the nature and range of our visual experience. The concepts we have access to, and the nature of the "reality" we think and talk about, is a function of our embodiment. The very first lexical concepts were those for individuals. Some form of conceptual integration allows humans to combine and manipulate concepts in order to produce more complex ideas. It is only primary metaphors that are grounded in perceptual experience. Lexical concepts are culturally embedded (an important aspect of the evolution of semantic knowledge involves the development and evolution of cultural knowledge).[5]

Allbritton et al. maintain that the framework created by a conceptual metaphor can aid in the comprehension of new information. Connections can be made with metaphor-based schemas even under relatively minimalist processing conditions. Metaphor-based schemas are part of the world knowledge that readers bring to the process of text comprehension. The entailments of a conceptual metaphor that form a metaphor-based schema are better captured by phrases or clauses than by single words. Allbritton et al. emphasize that only text elements instantiating the same metaphor are associated in memory. Metaphor schemas are part of the world knowledge that readers bring to the process of text comprehension. The use of metaphors can have a measurable influence on how information related to those metaphors is represented.[6]

Bortfeld and McGlone describe the explanatory value of a relativistic account of metaphor processing in which different modes of metaphor interpretation are assumed to be operative in different discourse contexts, and explain why people might favor attributional interpretations of figurative expressions in some circumstances and analogical interpretations in others (some of the competing models may describe different points on a continuum of metaphor processing). Bortfeld and McGlone say that presenting people with supplemental semantic information can induce a processing set that can bias people's interpretations of polysemous words. The notion of different processing sets may be used to account for a significant portion of the observed variability in metaphor interpretation. The attributional and domain-mapping models are descriptions of distinct processing sets that are activated in different inter-pretational contexts. Bortfeld and McGlone observe that attributional and analogical interpretations are likely to be preferred for metaphors that are predominantly attributional or analogical in nature. The availability of a conceptual structure is context independent. The manner in which figurative expressions are interpreted is only partially determined by their linguistic structure.[7]

5. Conclusions

Botha's theory of conceptual metaphor, meaning and embodiment grounds metaphorical meaning and meaning change in an ontological and anthropological framework which recognizes the presence and conditioning functioning of radially ordered structures for reality

(Botha's ontology recognizes the radial, structural stratification and categorization of human bodies, human relationships, human experience and reality). Mittelberg contends that figurative thought is at the heart of meaning-making processes in both speech and manual modalities. Manual modality can provide additional evidence for conceptual metaphor (gesture has the potential to depict embodied aspects of abstract concepts). Exploring bodily communication is a natural endeavor to gain insights into situated aspects of cognition and knowledge mediation. Goldwasser insists that the prominent feature of the hieroglyphic script which Egyptologists call "determinatives" is an elaborate graphemic *system of classifiers.* The hieroglyphic script completes almost every word with a "silent icon" that carries no additional phonetic value of its own. Evans explores (i) possible cognitive preadaptations for the development of semantic knowledge, and (ii) the range and nature of conceptual structure as encoded in language. A language consists of a structured set of "symbolic units" consisting of form and meaning components.

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Book Reviews

Semiotics of Programming

Kumiko Tanaka-Ishii (University of Tokyo)

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2010, 217 pp.

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Tanaka-Ishii has written a valuable, thorough, and thought-provoking book and her analyses are perceptive and well-considered. *Semiotics of Programming* is undeniably valuable and offers a great deal of fodder for contemporary philosophical debates in the study of semiotics.

Semiotics of Programming provides a semiotic analysis of computer programs along three axes: models of signs, kinds of signs, and systems of signs, and considers the question of what computers can and cannot do by analyzing how computer sign systems compare to those of humans. Tanaka-Ishii reconsiders reflexivity as the essential property of sign systems (a *sign* is considered a *means of signification*), claiming that a sign is essentially reflexive, with its signification articulated by the use of itself. Tanaka-Ishii writes that programming languages are artificial languages designed to control machines. The application of semiotic theories to programming enables the consideration of the universal and specific nature of signs in machine and human systems (the difference between computer signs and human signs lies in their differing capability to handle reflexivity).

Tanaka-Ishii holds that an analysis of recent, well-developed programming languages may reveal significant aspects of human linguistic behavior, and treats a language as a relation among linguistic elements and their interpretations. The pansemiotic view allows comparison of computers with humans at the same level of the sign system. The arbitrariness of signs is obvious within the context of programming: computer signs are specified by the programmer who introduces identifiers (in natural language people have to use the same sign to mean almost the same thing to communicate with each other). A program consists of two parts: the definition part (in which identifiers are defined in terms of their content), and the use part (in which identifiers are used through expressions). A sign defined by self-reference is articulated by a signifier, which is arbitrary. Self-reference is the definition of a sign referring to itself. Careless self-reference in programming languages can lead to nonhalting execution (description by self-reference is frequently preferred by programmers). In a computer language a large number of signs are defined non-self-referentially. Most natural signs are defined self-referentially. Tanaka-Ishii argues the role of the signifier within a sign through consideration of a minimal computer language framework, the lambda calculus, and shows the degree to which sign models specify the design of a computer program ontology. The ontological difference between "being" and "doing" emerges depending on which side of the triadic sign model is emphasized in constructing an ontology. The sign model is what defines the ontological framework. Tanaka-Ishii maintains that in computer programming the contrast of "being" and "doing" is remarkable when applying triadic modeling of signs but not when applying dyadic modeling. A computer language is a formal, well-defined language, and the signs within are not always self-referential. In programming languages the abstract data type has become more important as software complexity has increased.

Tanaka-Ishii analyzes the two types of ontological constructs used in object-oriented computer programming: the class, which relates data structures according to features (taking a "being" ontology), and the abstract data type, which relates data structures according to functions (taking a "doing" ontology). Tanaka-Ishii considers the ambiguities of computer signs appearing in programs, and applies the sign classification approaches of Hjelmslev and Peirce: a value is represented by a sign in a stratified manner: a value, and address, and/or a type. Tanaka-Ishii formulates the three representation levels by applying Hjelmslev's connotative and metasemiotics from the dyadic framework and Peirce's sign classification from the triadic framework. Tanaka-Ishii considers the various kinds of represented content and examines how signs are involved in such representation. The differences among paradigms are differences in their ways of description and the paradigms are compatible. The universal categories are categories concerning forms (the notion of how a sign represents a form of a category is a different issue). Computational description concerns the human activity of modeling a purpose through inductive abstraction, generation of instances through instantiation, and calculation through deduction. The sheer separation of class and instance requires deconstruction when attempting to understand the nature of significant instances and the process of their instantiation.

On Tanaka-Ishii's reading, both machine calculation and human thinking are in a sense based on the processing of signs. The uses and content of a sign change over time, and the whole represented by the signifier evolves (derived signification of a sign often activates further, different uses of the sign). It is often difficult to precisely define the concrete content and meaning of a natural language sign. The meaning of a natural language sign exists floating among the network of signs that are used in expressions referring to the sign. A signifier represents everything that is related to the sign with respect to the content and uses. Self-reference can be completely enclosed in the fixed-point function through the use of scope in a radical way. As Tanaka-Ishii puts it, a constructive system is a system in which a larger element is generated as a composition of smaller components, and notes how different a sign system formed as a natural language is from one formed as a computer language. Natural sign systems handle self-reference by leaving ambiguity as is. In computer sign systems, programs must be constructively generated by using procedures that are guaranteed to halt. Tanaka-Ishii examines the computer signs present within a computer program, and considers the structural aspect of a sign system, concluding that communication is an important feature of a sign system for both machines and humans.

Tanaka-Ishii focuses on the description of interaction within the sign system, and considers a sign system communicating with other sign systems, inclusively of itself by using the interactive function. In natural language, the meaning of a word can change, which corresponds to the value change of signs in a computer program. In the case of computer signs, change easily occurs (a computer language system does not have any restrictions corresponding to the social conventions that stabilize sign values. A natural language system is naturally reflexive because of its structural nature. Computational sign systems are inherently reflexive (this is the nature of a sign system in general).

Semiotics of Programming is a comprehensive review of complex developments over a significant period of time, and boasts an extraordinary level of scholarship. Among Tanaka-Ishii's book's many strengths is the completeness with which he shows the many ways in which human languages and computer programming languages are interrelated.

Seeing Wittgenstein Anew

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Seeing Wittgenstein Anew is hugely stimulating, offering a clear guide to key aspects of Wittgenstein's remarks on the concept of aspect-seeing. It is a model of precision and clarity, and covers an impressive amount territory in a clear fashion. *Seeing Wittgenstein Anew* is a provocative, strikingly insightful, important and timely book, assessing the current state of Wittgenstein scholarship that surrounds aspect-seeing.

Day and Krebs claim that Wittgenstein's aspect-seeing remarks help to clarify the intrinsic relation between his writing and the problem of philosophical self-knowledge (Wittgenstein's conception of philosophy demands a way of seeing and a way of attending to the aspects of things that are most important for us humans but that we are driven to repudiate). *Seeing Wittgenstein Anew* is organized around four "aspects" of Wittgenstein's aspect-seeing remarks that are significant both to Wittgensteinian studies and to the goals and methods of philosophy generally: (i) the essays of the first section

("Aspects of 'Seeing-As'") make the case for a revision of philosophy's idealized conception of "seeing" in favor of a conception which includes our *responsiveness* to what is seen; (ii) the essays of the second section ("Aspects and the Self") turn the lesson of the experience of aspect-seeing the other way around, considering how the phenomenon of a change in aspect can direct us to a new understanding of the self as the source and sufferer of alterations and transformations of "what is seen;" (iii) the essays of the third section ("Aspects and Language") focus on the second half of Wittgenstein's aspect-seeing remarks and on their suggestion that the concept of aspect-seeing provides a key to understanding our life with words and the absence of "life" in our words; (iv) the essays of the fourth section ("Aspects and Method") take Wittgenstein's innovations in philosophical method as their topic: their claim lies in their proposing that this method can be elucidated through considerations of the concepts of aspect-seeing and aspect-blindness.

Batkin holds that if we find significance for aesthetics in Wittgenstein's remarks in *PI* II.xi, it is by analogy. We might speak of the form of a picture in very much the terms that Wittgenstein speaks of the "organization" of a visual impression. The notion of "manifest form" and the idea of the "organization" of a visual impression may depend upon similar ideas or the same idea of what constitutes a pictorial image. It is a lesson of Wittgenstein's remarks about seeing-as that in considering the examples he gives we may look for changes in our visual impressions or experience when we should be considering the circumstances of what we say and do. Laugier brings out certain difficulties raised by Wittgenstein for the idea of perceptual sense. To see the problems that Austin was raising in their full depth, one needs to confront the question of a linguistic phenomenology as it is posed in Wittgenstein. Wittgenstein asks us to see judgment as itself a kind of seeing. Gould writes that Wittgenstein is trying to puzzle out issues about the conceptual intersection of seeing and thinking and interpreting, and that Wittgenstein speaks more often of the mythological than of the allegorical. There is a significant asymmetry between Wittgenstein's treatment of pictures and his treatment of aspects. Pictures first attract Wittgenstein's attention by the fact that they work to the detriment of a perspicuous view of our words and world. On Gould's reading, there is a glaring difference between the affliction of aspect-blindness and the dangers that lie in our misuse of pictures. Cavell points out that Wittgenstein says that the importance of seeing lies in its connection with experiencing the meaning of a word and with our attachment to our words (some idea of the attachment to our words is indispensable to Wittgenstein's fundamental procedures in the invocation of ordinary language). Wittgenstein wants to reveal our intellectual disappointment with our philosophical explanations, such as positing the existence of universals. We are right to look for a sense of essence or necessity in our concepts, only we are looking in the wrong place.

Hagberg maintains that Wittgenstein does not directly repudiate the interlocutor's presumption, but rather provides the means to "shift" when we need to (i.e. to break the twin molds of the generic objective/subjective and perceived/projected dichotomies. Wittgenstein undercut the picture of human experience that both traditional empiricism and behaviorism share (i.e. that we subjectively construct the objects of the world out of objectively given raw data). There is no sharp delineation between what we are led to call the intellectual content and the sensory content, between thinking and seeing, between mind and eye. Hagberg asserts that Wittgenstein is not working toward a reduction to a single comprehensive account of aspect-perception or seeing-as (he is adding layer after layer of complexity, of difference, of case-supported nuance). Krebs shows that the generalized blindness involved in Frazer's stance and extended by Wittgenstein to traditional philosophy is a main concern behind the exploration of "seeing aspects." Wittgenstein rethinks our conceptions of inner experience and subjectivity. Imagination is the means by which Wittgenstein sees the significance of things beyond their merely logical sense. The ethical tone of Wittgenstein's remarks is essential to his thoughts. The spiritual intensity of Wittgenstein's writings constitutes the original *ethos* from which to discern the underlying purpose behind his writings. Krebs states that Wittgenstein connects "internal relations" frequently to the gestural or the expressive. The kind of understanding involved in seeing internal relations is not only conceptual but also sensible and mimetic. Wittgenstein distinguishes the kind of awareness that results from a merely mental grasp from that which is also anchored in the body. Learning and using language is as spontaneous and corporeal as learning and making new gestures. It is our connection to the sensible root of the language we use, our *aesthetic* sensitivity in calling things by words, that makes us capable of seeing aspects. It is the disconnection from our sensible experience that is responsible for the pseudo-problems that plague philosophy. Krebs reasons that thinking becomes for Wittgenstein a matter of continuous conversion, of overcoming our resistance to the sensible. Cerbone contends that on the one hand, Wittgenstein is unrelenting is his attempts to turn us away from an "occult" or "magical" conception of the mind, and that on the other hand, Wittgenstein insists on the legitimacy of the concept or category of the *soul*. Wittgenstein describes the concept of hope as something embedded in human life, and his appeal to transparency is bound up with his interest in the concept of seeing. Wittgenstein wants to remind us of the multiplicity inherent in the concept of seeing, and frequently rejects the idea that emotions and attitudes are things that we *infer* from more "neutral" data. Eldridge argues that Wittgenstein's work fits into the tradition of philosophical investigations of the nature and basis of discursive consciousness: Wittgenstein connects his investigation of aspect-seeing more closely with the learning of language than might initially meet the eye. Wittgenstein's treatment of aspect-seeing offers us a way of thinking about human discursive consciousness that is an elucidatory redescription of what we do when we employ concepts within acts of seeing (Wittgenstein places the idea of a person as an agent among agents at the center of thinking about discursive consciousness). Wittgenstein's elucidatory redescription is an invitation to see human mindedness, discursive consciousness, as *like this*: to notice *its* aspects.

Minar puts it that Wittgenstein's philosophical criticism calls out a sensitivity to language comparable to the aesthetic sensibilities of the art critic. Minar explores how Wittgenstein's investigations of aspect-seeing contribute to our understanding of his views on the nature of philosophical conflicts and confusions. Aspect-seeing is internal to our relation to pictures. Wittgenstein examines the role of images in the perception of aspects, and remarks that seeing aspects requires a capacity for imagination. Minar thinks that one way of advancing with the question of Wittgenstein's preoccupation with seeing-as is to look at the philosophical significance of the possibility of *meaning*-blindness. Wittgenstein teaches us to see how the meaning, far from having to be breathed into a rule, lies in its use. Philosophy as Wittgenstein practices it opens us to the facts of our lives in language by testing our agreements. Day points out that Wittgenstein wants to create rather than dissipate a cloud of philosophy with the concept of aspect-blindness. Wittgenstein's example of "noticing an aspect" is the experience of seeing a likeness in a face. Wittgenstein's interest in the concept of aspect-blindness develops out of a preoccupation with our attraction to the familiar philosophical ideal of perfect, mutual intelligibility. Wittgenstein characterizes good philosophical writing as writing that shows "a genuine style." A task of philosophy is to model in one's writing an interest in one's experience.

Baz holds that Wittgenstein's remarks on aspects are meant to bring us back to situations of speech. The seeing of an aspect cannot, grammatically, be *continuous*. Wittgenstein tries to arrive at an unobstructed overview of the conceptual domain within which varied experiences assume their sense. Mulhall maintains that so much of the language Wittgenstein finds that he needs in order to articulate and prosecute his interest in aspect-seeing had to be coined by him. Wittgenstein's denial of the idea that rules of grammar approximate to calculi with fixed rules finds its methodological expression in imagining language-games, in coining metaphors and similes, and in the liberating resonances of aphorism. Wittgenstein explores the capacity of language to generate secondary meanings. A grammatical investigation can discover new ways of establishing philosophical self-possession, by allowing itself to be informed by a transfigured sense of the necessities and limits of grammar in which the word "grammar" tolerates projection into a context which is intolerant of rules. Mulhall takes Wittgenstein to be stressing three interrelated points: (i) when we see a picture-object, we see what it depicts; (ii) our grasp of what a picture-object is comes out in the ways in which we unquestioningly relate it to that which it depicts; and (iii) we relate to such picture-objects in the kinds of ways in which we relate to the objects they depict. Affeldt says that Wittgenstein is concerned with how and why the aspects of things that are most important for us are hidden, and with how those aspects may be made available and their significance appreciated. The duck-rabbit is the most familiar example of seeing aspects: its central features are shared with Wittgenstein's further examples of the schematic-cube, the triangle, and the double-cross. The phenomenon of understanding is an occasion for recurrent self-mystification. Affeldt observes that Wittgenstein has deliberately crafted a jarring example in which language use appears lifeless and mechanical. A remark or question only derives its sense from the circumstances of its natural employment. Wittgenstein reveals *that* we recurrently turn toward emptiness, and concretely and specifically *why* we do so. Narrowly philosophical moments of emptiness express aspects of our human nature.

In Cioffi's view, Wittgenstein stresses that there are perplexities which are misaddressed when further information is sought to resolve them (the appropriate method of dealing with these perplexities is by the construction of overviews). Wittgenstein's analogy demonstrates that we engage in non-instrumental, expressive transaction with images. Floyd claims that, for Wittgenstein, there is nothing objectionable *per se* with relying on pictures, diagrams, and other visible symbolic and representational structures. In the *Tractatus*, Wittgenstein's philosophical task is to examine his own uses of language with an eye toward seeing them *in* the general form of proposition. Bearn thinks that Wittgenstein's fear of wanting to make fine distinctions goes to the heart of his philosophy. When the subject is fine aesthetic differences, then it is a matter of which words would be appropriate. The difference between seeing the figure as a duck and seeing it as a rabbit is not a difference in the figure itself. Wittgenstein teaches us how to find our way around the language of our life.

Seeing Wittgenstein Anew is a stimulating presentation of a wide-ranging and sophisticated perspective, rigorous and yet generous with argumentative opponents, and making a significant contribution to the literature on the Wittgenstein's later thought as a whole. *Seeing Wittgenstein Anew* brings together in a unified theory the many ideas that show that aspect-seeing is a pervasive and guiding concept in Wittgenstein's efforts to turn philosophy's attention to the actual conditions of our common life in language.

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