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THE SOCIALITY OF BECOMING:
GEORGE HERBERT MEAD'S
PHYSICS AND METAPHYSICS

by
WAYNE MARAT VANSERTIMA

A dissertation submitted to the Graduate Faculty in Sociology
in partial fulfillment of the requirements for the degree of
Doctor of Philosophy, The City University of New York

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ABSTRACT

THE SOCIALITY OF BECOMING:
GEORGE HERBERT MEAD'S
PHYSICS AND METAPHYSICSby
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This dissertation is an inquiry into the relations among the natural and cultural sciences. It explores the relations among Mead's pragmatist philosophical-scientific cosmology, classical and contemporary social theory, and recent attempts at unified field theories in the physical, biological, and human sciences. Mead's symbolic interactionist social psychology of the self is located within his metaphysics of sociality, and his views of relativity and quantum physics.

Dedicated to Archangel Michael

with

grateful acknowledgements to the Cultural Studies Community,
CUNY Graduate School and University Center, and to

family, blood and extended - they know who they are.

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CHAPTER 1. INTRODUCTION

Today quantum relativity physicists discourse with Indian mystic gurus on the nature of our cosmos. There are attempts to construct grand unified field theories in sciences such as physics and biology, and also attempts to bridge these disciplines with fields such as chaos theory and postmodern theologies of process. There are also attempts at transcultural studies relating cultural theory with historical materialism, feminism, racial and ethnic studies, post-colonial studies, and lesbian, gay, bisexual and transgender studies. This dissertation is written in this spirit of synthesis in that it seeks to relate George Herbert Mead's philosophy of relativity and quantum physics to his larger metaphysics of sociality.

The discipline of sociology has recognized the pragmatist philosopher George Herbert Mead primarily as a classic theorist of the social self, and as the major progenitor of the symbolic interactionist tradition in social psychology. Concomitant with this disciplinary (b)ordering, Mead's *Mind, Self, and Society* (1934) is a canonical foundational text of

theoretical sociological discourse, whereas "metaphysical" works such as *The Philosophy of the Present* (1932\1980) and *The Philosophy of the Act* (1938\1972) are largely neglected by sociologists. Yet the "social psychology" of *Mind, Self, and Society* is but a part -- albeit an important one -- of Mead's syncretic socio-cosmological philosophy of the evolutionary emergence of society, mind, and self in nature.

There is an implicit and sometimes and explicit acceptance of the Diltheyan disciplinary boundaries between the humanities, the human social sciences, and the natural sciences in Mead's reception of scholars. Sociologists such as Blumer (1969) have read the earlier *Mind, Self, and Society* (1934), neglected Mead's later natural scientific writings in *Philosophy of the Act* (1938\1972) and *Philosophy of the Present* (1932\1980), and have constructed Mead as a sociological social psychological theorist of the development of the human self in *human* society through symbolic interaction. Mead's conception of the sociality of *nature* is thereby lost. German philosophers such as Habermas (1987), Joas (1985), and Tugendhat (1986) have appropriated Mead's *Mind, Self, and Society* to construct a version of human subjectivity and consciousness which is

non-Cartesian and non-individualistic. Here their project is to contribute to the discourse of the "the death of the subject" initiated by French structuralism and post-structuralism against the metaphysical idealist notions of consciousness in Descartes, Kant, Fichte, and Hegel. Again the focus is anthropological at the expense of the cosmological. Indeed, Joas specifically invokes disciplinary borders and professionalism as rationale for excluding discussion of Mead's cosmological physics in his work (1985: 12). But Mead's theory of the development of the human self cannot be fully understood when it is abstracted from his larger project of constructing a grand unified field theory of the sociality of human and physical phenomena which appropriated relativity and quantum theory. This dissertation is thus an inquiry into Mead's conceptions of the relations between quantum and relativity physics and his social psychology of the self.

Theoretical Framework and Substantiation: Classical

Let me situate my project in the positivist dispute in German sociology (Adorno et alia 1976). This is the debate

between 1. those sociologists who believe sociology should be modeled on the positivist physical sciences, and 2. the verstehen interpretivists Dilthey (1989) and Weber (1949; 1975; 1978: 4-24) who contended that the subsumption of social action under explanatory nomothetic laws is inappropriate to its subjectivity understandable meaningful nature (Manicas 1987: 127-40). Indeed, the absence of a direct internal critique of physical science has seemed like Hamlet without the prince (Adorno et al. 1976: ix). While Marx did not develop a cohesive philosophy of science in the midst of polemics against critics of historical materialism, he did directly critique mechanical materialism in his dissertation *On the Differences between the Natural Philosophy of Democritus and of Epicurus* (1975b), and the "Theses on Feuerbach" (1975d). Therein, Marx criticizes Democritus and Feuerbach for their deterministic philosophies of nature which are antithetical to human agency or praxis. That Marx was not altogether immune from nineteenth century Newtonian-Darwinian positivism is evident in the base-superstructure formulation in the 1859 "Preface" to *A Contribution to the Critique of Political Economy* (1975c: 24-8) and the discourse of stages and rhetoric of

laws of motion in his work.¹ Like Marx, Mead criticized both positivist and idealistic conceptions of nature, but Mead had available to him developments in relativity and quantum physics which supplanted the Newtonian paradigm in the first three decades of the twentieth century. Thus, Mead was unique among the "classical masters" of sociological theory in his critique of positivist mechanistic social science from the standpoint of twentieth century physics.

Theoretical Framework and Substantiation: Contemporary

The Positivist Dispute in Symbolic Interactionism

The positivist dispute in sociology over the extension of natural scientific methods into the human or social sciences constitutes much of the discourse internal to Meadian scholarship. The positivist dispute in symbolic interactionism has centered around the debates between the (ideal-typical) indeterministic, humanistic, subjectivistic, processual Chicago School of Herbert Blumer and the deterministic, positivist, objectivist, structural Iowa School of Manford Kuhn (Meltzer et al. 1975: 53-67; Turner

¹ For a critique of positivist readings of (early and late) Marx see Manicas (1987: 97-116) and Aronowitz (1988: 35-87).

1986: 332-53). The substantive and methodological divergences of the two schools stem from perceived ambiguities and contradictions in *Mind, Self, and Society* as to the processual, structural, or (in)determinate character of self and society (Kuhn 1964: 63-4). In his programmatic work, *Symbolic Interactionism: Perspective and Method*, Blumer states categorically that "Mead saw the self as a process and not as a structure" (1969: 62). Moreover, Blumer's reading of Mead distinguishes between the "me" as the self's organization of others' attitudes towards itself and the spontaneous impulsive "I" which renders the self indeterminate and relatively unpredictable (Mead 1934: 173-226). For Blumer, the self as a dynamic process of situationally changing interpretive self-indications cannot be appropriately empathetically understood by reifying methods of inquiry which freeze it into a substantial thing, for example, quantitative surveys, variable analysis, and laboratory experimentation. Holding to a distinction between the *Naturwissenschaften* and the *Geisteswissenschaften*, Blumer rejects social science adopting the working procedure of advanced physical science. He advocates the study of social interaction in its own right through participant observation/case studies, open interviews, conversations,

public records, biographies, diaries, and letters (Blumer 1969: 47-60, 66).

On the other hand, Manford Kuhn holds to a positivist unity of science conceived on the classical Newtonian model (Perinbanayagam 1986: 122). Indeed, "Blumer's image of humans led him to a particular methodology," whereas "Kuhn's methodological predilections led him to a particular image of humans" (Meltzer et al. 1975: 61). Hence, Kuhn conceives of the self as an organized hierarchical structure of identities which are internalizations of a person's subjective depictions of their social roles (Kuhn and McPortland 1954). Kuhn, in effect, circumvents the ambiguity of the relation between the indeterminate "I" and the determinate "me" by reducing the self to the "me". While Kuhn appears to agree with Blumer on the need to take the role/enter the perspective of human objects of knowledge, Kuhn eschews sympathetic introspection in favor of statistical operationalization to measure and predict the self. The Twenty Statements Test (Spitzer et al. 1970) developed by the Kuhnian school aims at predicting an actor's behaviour on the basis of knowledge of her reference groups and self-attitudes -- in effect utilizing only those

theoretical aspects amenable to operationalization (Kuhn 1964; Meltzer et al. 1975: 62).

The foregoing polar perspectives set the terms of subsequent discourse on symbolic interactionism. Sheldon Stryker (1980), influenced by Kuhn, propounds a structural role version of symbolic interactionism in order to ameliorate the alleged "astructural bias" of the Blumerian strand. Lewis and Smith of the University of Illinois vivisect American pragmatism into a nominalist idealist camp of James and Dewey, and a realist objectivist camp of Peirce and Mead. They contend that Blumerian symbolic interactionism is continuous with the former and not with the latter as is commonly believed (Lewis and Smith 1980: 151-90). (Philosophical nominalism holds that "reality" is mind-dependent.) Also of the Illinois school, McPhail and Rexthroat (1979) construct Mead as a social behaviorist whose experimental methodology is considerably divergent from Blumer's (Johnson and Shifflett 1981).

Throughout, these debates give scant attention to Mead's philosophy of physics in "*The Objective Reality of Perspectives*" (1927/1932), *Philosophy of the Act*

(1938\1972), and particularly *Philosophy of the Present* (1932\1980). This is also the case with the contemporary German appropriation of Meads's thought by Habermas (1987), Tugendhat (1986), and Joas (1985). While the primary focus of my dissertation is not an extensive internal critique of symbolic interactionist discourse, an examination of Mead's philosophy of physics from the standpoint of the category of "sociality" would demonstrate that (1) the concept of a spatio-temporal field renders the dichotomy between structure and process spurious, and that (2) tensions in Mead's discussions of determinism and indeterminism are not intellectual confusions, but are informed by his profound understanding of the physical paradigm clash between classical determinism, including relativity physics and quantum indeterminism. (Henceforth, "space-time field" shall be synonymous with "perspective," "system," and "frame of reference." In Mead's and Einstein's usage, a perspective is not within a person, but the person is within a perspective).

Sociality

Mead's pragmatism is a dialectical temporalist philosophy of the process or act of evolutionary emergent sociality. One

may use several equally valid categories as entry points into Meads's philosophical system, e.g. the concepts of "act" or "process" or "self". In my (re)reading of Mead, I characterize his corpus as a philosophy of sociality, because it is this category which most evidently links his earlier social psychological concerns to his later cosmological interests (Miller 1973: 188-206). Under the influence of Whitehead in the 1920's Mead transposed the metaphor or concept of sociality from social to physical theory so as to link culture with nature.

"Sociality is the capacity of being several things at once," the ability to be several identities (Mead 1932\1980: 49). The principle of sociality is that "the nature of something in one system affects its nature in other systems that it occupies" (Mead 1938: 610). Sociality refers to the situation whereby the identity of a particular member of a system is constituted not only in (1) its relations to others within that system, but also in (2) the relations between that system and other systems. At the physical inorganic level, there is a dialectical relation between an object-event's matter-energy characteristics and its space-time reference system, and between this system and

others: Einstein's influence on Mead. At the biological organic level, a living organism and its ecological niche mutually determine each other, while this environment is itself relative to another: Darwins's influence upon Mead. At the human cultural level, self and society are dialectically constitutive of each other: Hegel's influence upon Mead. The identity of an event may be constituted at several levels of sociality, because these levels interrelate with one another. Human sociality evolves or emerges from -- but is not reducible to -- the sociality of the biological level which in turn emerges from the sociality of the physical level (Mead 1932\1980: 49-51, 66-7; Mead 1934: 328-36; Miller 1973: 190).

This unified dialectical relational contextualism would be merely a synchronic structuralism if sociality were not temporally emergent, "the form and principle of emergence" (1932\1980: 85). Mead stresses that sociality is the capacity of a novel event to be both a past and a new system:

In dealing with sociality I have laid stress upon the passage in emergence from the old system to the new, emphasizing the fact that in this passage the emergent lies

in both, and is what it is because it carries the character of both at once (1932\1980: 76).

For Mead, the temporal becoming of reality must be taken seriously. The world is a world of processual relations which require temporal passages to be what they are. The universe is open and continually changing. Novel events continually emerge from an old system in a way which -- although related to a causal nexus -- is not completely (pre)determined. "Each morning we open our eyes upon a different universe" (Mead 1936: 292).

Pragmatism and Cosmology

Mead's vision of an open contingent cosmos is in the pragmatist tradition of Peirce, James, and Dewey. In the grand debate between the Parmenidean philosophers of stasis and the Heraclitean philosophers of flux, the pragmatists are on the latter side. Peirce, James, Dewey, and Mead all critique the absolute determinism of the Newtonian mechanical world picture (Morris 1970: 116-36). Peirce's critique of Darwinian determinism takes the form of an evolutionary theodicy of agapistic cosmic love in which chance plays a vital role. James revolts against Hegel's

"block universe" or Absolute in which the future is in principle already immanent in the beginning. Dewey, like James, views the universe as unfinished and still in the process of coming to be, and the future as open and still unwritten. Dewey rejects the notion of the end of history in the Absolute (West 1989: 52-3). For Mead, the universe is "the scene of that emergence which gives always new heavens and a new earth" (1932\1980: 90).

Research Methods/Agenda

Given that this is a theoretical dissertation, my research agenda is already implicit in the textual sources cited and analyzed. Here I remark on (1) the use of metaphor in constructing and reading theory, and (2) reconstructive-deconstructive reading.

Following Mead, I metaphorically transpose concepts from one field to another, thereby producing trans-disciplinary conceptions of sociality, relativity, and identity. Here metaphor is not a decorative literary device, but performs the explanatory function of a theoretical redescription of an object domain in terms of another so as to render both

more intelligible. In this sense of metaphor, similarities between two objects exist not only prior to the metaphor linking them, but are also produced by the metaphor. In such a metaphorical conjunction, the two terms enter into a dialogic interaction with each other with corresponding effects on (our knowledge of) the objects (Hesse 1980: 111-24). Thus, to say that nature is socially organized is to humanize nature and to naturalize society. For Mead, homologies in and among object domains are not formal or merely illustrative, but are ontologically warranted by nature's replication of successful primordial entities at later emergent levels.

By "reconstructive," I refer to the view that every reading of a text is an interpretation from the standpoint of the reader (Barthes 1977). I reconstruct Mead's texts by extrapolating from them in the direction of scientific developments since his death in 1931. I read Mead from the epistemic standpoint of late twentieth century physical, biological, and social theory. For example, Mead lived in the midst of the quantum and relativity theoretical revolutions when much of their experimental confirmations had not yet been undertaken. Mead's texts are particularly

amenable to interpretive reconstruction owing to their "oral" unfinished form. For example, Mead wrote the Carus lectures, published posthumously as *Philosophy of the Present*, on a train journey from Chicago to Berkeley shortly before his death. By "deconstructive" reading I mean an interpretive strategy which aims at explicating that which is absent from/assumed by a text, or at emphasizing ("foregrounding") the marginal. Thus a text purportedly about men may be deconstructed by demonstrating that the text is constituted by what it does not say about women. One may deconstruct a text by demonstrating that it is predicated upon, constituted by, exclusions relegated to footnotes. I have foregrounded a marginal text, *Philosophy of the Present*, and relatively decentered a canonical one (*Mind, Self, and Society*) to construct a reading of Mead as a socio-cosmologist which problematizes the disciplinary boundaries between sociology and physics.

Of course , my centering of Mead's metaphor of sociality and reading of Mead's *Philosophy of the Act* and *Philosophy of the Present* do not aim at the definitive reading of Mead. Given a postmodern polyvalency of text, there is no such definitive reading. My reading here is necessarily a

strategic one to problematize relations between the natural and cultural sciences.

Chapter 2 of this dissertation will consider the relation of metaphor to the constitution of scientific object identity. This entails a genealogical inquiry into paradigmatic metaphors of western epistemes. Chapter 3 will present a synoptic overview of Mead's philosophy of sociality, emphasizing various aspects of the metaphor of the field of sociality. Chapter 4 will discuss the constitution of identity in terms of relativity physics, while Chapter 5 will deal with the constitution of identity in terms of quantum physics. Chapter 6 considers the problematic of the spatialization of time and the temporalization of space. Chapter 7 will be the concluding chapter.

The aphorisms are numbered firstly from Chapter 3 to signify that the whole is prior to the sum of its parts, and then proceed according to the order of composition.

CHAPTER 2. THE FIELD OF METAPHOR AND THE METAPHOR OF FIELD

In this chapter I will discuss (1) the role and functioning of metaphors in the development of scientific thought, and (2) the genesis and structure of three metaphorical systems or sociopsychophysical epistemes:

- (a) the ancient and medieval worldview of essential substances or substantial essences,
- (b) the modern worldpicture of mechanical forces and objects, and
- (c) the postmodern paradigm of the "field," a concept endowed with much philosophical import by Einstein, Mead, and other theorists of process (Ray and Delprato 1989: 81-127).

Of course I am indebted to the work of Foucault [*The Archaeology of Knowledge* (1970) and *The Order of Things* (1972)] for his concept of "episteme" in the following genealogy of metaphors. By epistemes of "socialpsychophysics," I mean power-knowledge systems of interrelated metaphors of

culture, society, biological mind, the self, and the physical cosmos. Each episteme is a set or assemblage of systemically interlinked discourses of cultural, biological, and physical knowledges.

What is the function of metaphors in the revolutionary shift from one episteme to another? Revolutionary transformations in science entail revolutionary transformations of scientific concepts or metaphors. Scientific discourse is not distinct and separate from overtly poetic discourse, because it too is metaphorical (Rorty 1991). The function of scientific discourse is not to mirror accurately the text of nature with corresponding representations but to constitute a cosmos wherein the scientific community can continue to have conversations about such a cosmos. The more creative and novel the metaphors of science, the greater the quality and intensity of scientific discourse.

The function of metaphor is to redescribe the explanandum in terms of the explanans -- the social conjunction of the novel and the not-so-novel. It is through redefining the novel in terms of the familiar that novelty becomes familiarized and -- dialectically -- the familiar becomes

novelized (Hesse 1980: 111-124). The potency of the metaphor lies in the unusual character of this conjunction and, thereby, in its pragmatistic function in fostering communicative transactions among members of a universe of discourse (Rorty 1991).

Hence the revolutionary character of Mead's conjunction of "sociality" and "field" -- the first from the human or social sciences, and the second from the physical sciences. The social becomes naturalized and the natural becomes socialized in and through Mead's metaphor of the field of sociality.

I will now elaborate on the three metaphorical systems aforementioned, beginning with the Greek Pre-Socratics -- for are we not all good Europeans and Westerners? And did not ancient classical Greece lay the foundations of our civilization?

The ancient cosmos and soul of Pre-Socratic Greece were composed of unchanging underlying substances. The very concept "cosmos" signifies the universalizing totalizing gaze of the Pre-Socratic mystic-scientists. The sensible

world of everyday life exhibited change and mutability which the Pre-Socratic sages sought to penetrate and to reduce to relative changelessness and immutability. Sensuous qualities or characters were accidents belonging to more fundamental underlying (id)entities as substances: Greek will to power as atomic reductionism.

This power-knowledge system of substantial cosmos and self -- this regime of truth -- extended into the fifth century B.C. and into the feudal Middle Ages via Aristotle. Thales of Miletus held that all things originated from water as the first primal substance. Anaximander, Thales's disciple, rejected his master's notion of water as primal substance. Anaximander substituted "the indeterminate" for water, an infinite eternal substance from which emerged the forms of matter. Again, the timeless is regarded as fundamentals in this cosmology. Anaximenes, a younger contemporary of Anaximander, held that the primal substance underlying the phenomena of the world was air. On the other hand, Heraclitus -- the successor to these three members of the Ionian school -- believed that the primal substance was fire. While Heraclitus taught that the cosmos was one of continual flux brought about by the union of opposite

principles, he also held that the change in the cosmos was guided by an unchanging universal reason or god. Heraclitus constituted the soul as a union of the opposing fire and water. Similarly, Anaxagoras of the later Ionian school, held that "nous" or mind was an eternal unchanging substance which entered into every opposite-combining object -- cosmos underlying chaos, timelessness underlying temporality, changelessness underlying change. The school of Pythagoras (6th century B.C.) also stressed the importance of substantial form over material content in its mystical romance with numbers, musical harmonies, and the transmigration of the human soul (entombed by the body). The epitome of Greek will to power as changelessness was in the Eleatic School of Parmenides, Zeno, and Melissus. Parmenides was the "antithesis" of Heraclitus in that he held that the universe was a motionless unchanging sphere, and that change was merely an illusion. Zeno invented logical paradoxes or puzzles which demonstrated the impossibility of motion. Melissus substituted infinity for Parmenides' finite sphere of reality (Funk 1962: 4288-4290). Here again the real as that which is outside time and space.

In sum, theorists used the notion of completely self-subsistent, self-moving Aristotelian substances with intrinsic identities to account for natural phenomena (heat: caloric; combustion: phlogiston; light: ether; biological functioning: vital force) and human action as mind or soul (Ray and Delprato 1989: 82).

The second western worldpicture lasted from the seventeenth to the nineteenth centuries. Here the notion of atomistic particulate masses in external relation to one another underlies Galilean-Cartesian-Newtonian-Kantian physics, and bourgeois liberal views of society and individual psychology (Freudenthal 1986).

Mead writes of the cosmological worldview of the Renaissance and the age of rationalism:

Galileo in particular drew upon this conception of the absolute rationality of the world, that is, the view that everything that happens can be explained. The assumption which he used was that god works through natural forces. As an infinitely rational being he must act uniformly in accordance with what Galileo terms the "rational

law of nature"; and he must act in a most perfect fashion, that is in a mathematical fashion. God is conceived of as the supreme mathematician. Objects have certain ways in which they move in reference to one another. These must be expressed and carried out in accordance with mathematical law. If we find out what the important processes of nature are, we also discover the laws which represent their various relations; we find out the laws by means of which God works. For example, one can look at a highly complicated machine without understanding it or knowing its purpose, and yet one can be confident that everything in it was arranged by a mechanic in accordance with natural law (1936\1972: 5).

In the mechanistic physical paradigm, objects existed separately from one another according to fixed deterministic mathematical laws.

This cosmological metaphor extended to models of society, particularly Hobbes'. People are discrete and selfish individuals pursuing their own rational impulses, desires, and interests in mechanical fashion. But this leads to a

war of all against all. The state or Leviathan -- an absolute omnipotent omniscient God-monarch -- acts as the supreme adjudicator and controller of these competing interests (Mead 1936\1972: 14-15).

This mechanistic worldpicture of the cosmos and society extended also to the laboring self and to the self of everyday life. Locke "assumes that property, for example, arises naturally from man's adding value to natural objects by means of his own labor. If an individual has added this value to the natural object, then it becomes his property" (Mead 1936\1972: 15). An individual self was an individual's own property -- his properties or qualities belonged to his identity individualistically.

Mead comments on this care and self-constitution of the self in and through the rise of autobiography from the Renaissance onward:

Our whole literature from the period of the Renaissance has become increasingly more journalese in character. We have become distinctly interested in biographies, for example. Go back again to the ancient world, and you have

in Plutarch the biography of the ancient world...What we fail to find in these biographies as contrasted with modern biographies is just that which commonly goes under the caption of "local color." They do not try to record experiences just as they took place; there is no reference to the form of, say, the food the hero ate, nothing of particular interest in the matter of clothes, or his golf score, the elements which we bring in by way of making a person seem real to us...What the modern biography does is try to reproduce as far as possible those little things which enable you to put yourself into the situation of the individual, so that you get his experiences and experience them (1936\1972: 409).

In the third episteme, theorists use the metaphor of a "field" to theorize identity constituted in terms of its internal relations within a social environment. For example, the electrical charge of a particle is not dependent on its innate individual properties, but upon Maxwell's electromagnetic field (Einstein and Infeld 1938:

157). This field relational concept of identity is evident in Nietzsche's and James' critique of the self as a substance with innate properties (Nietzsche 1968: 261-300; James 1950: 291-401). In Einstein's relativity physics, the spatial, temporal, material, and energy characters of an individual body take on their identities from their environing fields. In quantum physics, quanta are particles of their respective fields. This field concept is related to Giddens' (1984) ontology of structuration wherein structures constitute identities and identities constitute structures. The pragmatist value of the metaphor of the field is that it enables us to conceive of identity as both constituted and constituting.

Thus we have the genealogical background to Mead's conception of the field of sociality and the sociality of the field.

CHAPTER 3. THE BECOMING OF SOCIALITY AND THE SOCIALITY OF BECOMING

In this chapter, I will present a synoptic overview of Mead's (meta)physical system from the perspective of his concept of sociality, the metatheoretical category in his worldview. Mead defines sociality as the "capacity of being several things at once" (1932\1980: 49). Sociality is the becoming of multiple identities simultaneously. Alternatively, the principle of sociality is that "the nature of something in

one system affects its nature in other systems that it occupies" (Mead 1938\1972: 610). The category of emergence is interchangeable with and entails the principle of sociality. Peter Hare (1965: 3) defines sociality and emergence in the following way:

There are various regularities (orders) which before did not in combination produce anything more than a set of distinct regularities (a set of regularities more or less in conflict with one another), but which gradually and becomes more integrated and in combination produce a recognizable phenomenon whose character is not deducible from [or reducible] to any or all of the distinct regularities, and this adjustment is of the same kind that goes on when responses are competing for control of an act. It is in the necessity for and yet the undeducibility [reducibility] of composition laws that we find sociality.

Thus sociality is both 1. the capacity of becoming multiple identities in several forcefields at the same time, and 2.

the emergent becoming of multiple identity forcefields over the passing of historical time.

2

Henceforth I will discuss sociality as 1. the capacity of a thing having multiple identities, 2. the processual becoming of multiple emergent identities over time, 3. historical temporality, 4. act(ivity), 5. society, mind, and self, 6. relativity, 7. quantum identity, and 8. chaos and complexity.

3

Mead was a radical antidualist naturalist in the tradition of the revolt against dualism (Lovejoy) -- but not a reductionistic mechanical materialist. For Mead, the natural is social and the social is natural. A central thesis of Mead's (meta)physics is that the whole is greater than the sum of its individual parts. Mind and culture emerge from matter and nature but are not reducible to them. In other words, he views the personal as embedded in the political -- a feminist tenet -- and the biosocial political as in turn embedded in a larger cultural cosmos.

4

As a radical antidualist and a materialist -- but not a vulgar mechanistic reductionist materialist -- Mead situates the personal forcefield within ever widening fields of emergent sociality.

5

Let us begin at the level of quarks. Quarkfields are embedded in becoming subatomic forcefields in turn embedded in becoming atomic forcefields in turn embedded in molecular fields -- the physical material phase.

6

The physical phase is in turn embedded in the biological phase. Atomic forcefields combine into molecule forcefields which in turn combine into DNA which in turn combine into gene forcefields which in turn combine into chromosomes in turn combine into rhizomes -- as Deleuze and Guattari would say -- which in turn combine into cells which in turn combine into tissues which in turn combine into organs which in turn combine into single cellular organismic forcefields in turn combining into multicellular organismic forcefields -- the biological organic phase, and so on and so forth.

7

The organic biological phase is in turn embedded in the cultural phase -- Mead's concept of biosocial organizing. Robinson Crusoe notwithstanding, human becomings are social or *zoon politikon* as Aristotle has said. Human becomings are embedded in family or kinship groups which are in turn embedded in national groups which are in turn embedded in the worldwide community of the "generalized other." Humankind is in turn embedded in the biosocial world of the planet Earth which is in turn embedded in the biosocial world of the solar system which is in turn embedded in galactic forcefields which are in turn embedded in constellating forcefields which are in turn embedded in the cultural cosmos, the universe, the Hegelian Whole (*Die Wahrheit ist der Ganz*. The truth is the whole).

8

As a holist but nonreductionistic materialist, Mead views the human social interacting forcefield as embedded in the material interacting forcefield but not reducible to it -- thus avoiding the Newtonian mechanical paradigmatic worldview, and embracing the quantum and relativity physical language games. Hence the act in which a human becoming

becomes social lies in the situation that a human personal forcefield may be at once and at the same time quarkite, subatomic, atomic, molecular, genetic, chromosomal, organismic, a fisherman before breakfast, a hunter at lunchtime, a critic after dinner, a wife, a mother, a sister, a daughter, and a variety of other social roles. The human becoming forcefield is thus a constellation of physical, biological, and cultisocial interacting forcefields at once.

9

Again, the category of sociality entails the category of emergence -- the taking of nonmechanistic time into account. The category of emergence entails the category of novelty, of revolution. Since later becomings are determined by earlier becomings -- but not through Newtonian mechanism -- and hence are not reducible to them, there is the possibility of novel becomings emerging in a universe of chance passing through historical time.

10

For Mead, the evolution of time is at once the evolution of matter. The evolution of matter is at once the evolution of

mind. The evolution of mind is at once the evolution of self. The evolution of self is at once the evolution of society -- both nonhuman and human. For Mead, as for Karl Marx, nature is the inorganic body of man, and the naturalization of man is at once the humanization of nature.

11

Thus far, we have not explored the relations between Mead's concept of sociality and his concept of "the act." Mead's philosophy of sociality is at once a philosophy of the act. Indeed, the notions of the act, action, activity, process, and praxis, are basic in Mead as a pragmatist philosopher-scientist.

12

Let us consider the history of the universe from the perspective of Mead's conception of "the act." Famous cosmologists such as Stephen Hawking and Roger Penrose theorize that the universe "began" in time with a big bang. (It is a religious issue whether anything existed before time itself began. What does "before the beginning of time" mean?) The cosmos began -- in the views of these great men of science -- as a pulsing of a self-generating self-creating

thing. Genesis was the activity of a self-creating cosmos. In Meadian terms, the "unit act" of genesis is the beginning of time.

Mead defines the act as follows:

The unit of existence is the act, not the moment. And the act stretches beyond the stimulus to the response. While most of our acts stretch into the world that does not yet exist, they inevitably include immediate steps which lie within the existent world, and the synchronizing, with recorded elements in some uniform process of change, of attitudes in the act by means of the indication of these to the self, affords the only approach to the definition of the span of existence (1938\1972: 65-66).

For Mead, time is not a mechanical thing which can be subdivided into infinitesimally small and mathematically equal parts. A moment is one such part. Again, the principle that the whole is greater than the sum of its parts holds. Of course, Mead's critique of the moment is at once a critique of the Newtonian conception of time -- a conception

of time paradigmatically different from that of such process philosophers as Samuel Alexander, Henri Bergson, John Dewey, and the theologian David Ray Griffin.

For Mead, an act entails a variety of temporal phases which are not abstract mathematical entities and equivalencies, but which are of varying ontological import depending on their situation in space and through time.

For example, an act of an historical event is composed of a determining past, a determined present, and a future. Past, present, and future are not -- as in much of classical physics -- "specious moments" (Mead 1938\1972: 65) arraigned along a timeline. "To make a statement about the past is to say that a certain state of affairs persists in the present: it is to state an hypothesis about relations between any future confirmation procedures and their results; it is not about something simply located (a particular space-time slab [a specious present] in the past or future) just as a statement about a society is not about something simply located (individual persons or acts)" (Hare 1965: 2-3). On Mead's view, the act of the present stretches back towards the past while at once it stretches towards the future. The

act of the present\ presentation\presencing is therefore a hybrid constellation of past and future temporalities -- sociality as the becoming of several temporalities at once. More specifically, the historical and ontological status of Caesar before he decided to cross the Rubicon, varied from his status while he was in the process of crossing the Rubicon, which in turn varied from his status after he had crossed the Rubicon and was looking forward to becoming the first Roman emperor.

"And the act stretches beyond the stimulus to the response." Here Mead critiques mechanistic Darwinism and Watsonian (and later Skinnerian) behaviorism. In Watson's stimulus-response model, an organism passively receives a stimulus from its external environment, and responds to this stimulus in a determinable and predictable manner. The temporal phase of the stimulus and the temporal phase of the response are separated from each other, and are what Mead terms specious moments. In Mead's understanding of the relations between stimulus and response of an organism-act, the stimulus contains or stretches towards the response, and the response contains or stretches backwards towards the stimulus. The present of an acting organism is social, and it is at once a

constellation of a selected past, an interpreted present, and an open future. For Mead, an organism is not a passive recipient of stimuli, but is an active selector of stimuli which the organism thinks will enable it to continue as an organism. Mead thus anticipates the dialectical biology of Richard Levins and Richard Lewontin (1985) -- evolutionary biology as a society of Hegel and Darwin. Moreover -- à la Alfred North Whitehead -- an organism is not necessarily a biological organic (id)entity but may be a subatomic particle.

" While most of our acts stretch into a world that is not yet in existence..." Here Mead gestures towards his view of the cosmos as open, indeterministic, novel, surprising, mysterious. À la Nietzsche, the universe is to all eternity chaos.

"...they inevitably include immediate steps which lie within the existent world." These immediate steps that Mead refers to are the acts of the present. " ... and the synchronizing..." Mead is referring to the social synchronic organization of multiple perspectives and (id)entities within the act as a whole. "... with recorded elements in

some uniform process of change... " Mead views causation as a constellation of both determinism (read classical Newtonian and Einsteinian physics) and indeterminism (read quantum physics and chaos\complexity theory). The phrase "uniform process of change" refers to determinism, whereas "acts stretch[ing] into a world that is not yet in existence" is a reference to indeterminism -- causation as a dialectic of determinism and indeterminism. (We will address the issues of recording and memory in the concluding chapter.)

"... of attitudes in the act..." For Mead, sociality as objective reality is a matter of interpretation (Nietzsche: "There are no facts -- only interpretations."). Paradoxically, the real is a matter of perspective or attitude -- the objective reality of relativistic perspectives.

"... by means of indication of these to the self..." It is the spontaneous self -- nonhuman and human -- which indicates attitudes to itself, or defines its situations, or interprets its facts, or socially constructs reality. But since the Meadian and mediating self is not a Robinson Crusoe, and is embedded in wider communities of minds and societies, truths

and realities are dependent on generalized others. It follows that truths, realities, and selves will change according to cultural changes in space and through time. (Nietzsche: "Truth is nothing but a mobile army of metaphors.")

"... affords the only approach to the definition of the span of existence..." Of course, this is a (re)constructive statement if there ever was one, and since it categorically defines the only approach to understanding approaches, the statement (de)constructs itself. Thus the definition of the act at once constructs, deconstructs, and reconstructs -- and Mead's principle of sociality strikes again.

13

So far, we have discussed sociality as the unit act "in itself." We left off at the genesis of the cosmos as a pulse of time. The evolutionary development of nonhuman and human societies and selfidentities is linked to the development of impulse.

Mead's thought has four stages of the act: 1. the stage of the impulse, 2. the stage of perception, 3. the stage of

manipulation, and 4. the stage of consummation(1938\1972: 3-25).

I stated in the chapter on metaphors, Mead transposes the category of sociality from the cultural (Kulturwissenschaften) or social sciences to the natural sciences. This is evident in Mead's reception of Einstein's relativity theory. Of course, this transposition also and at once functions in the reverse direction -- the translation of relativity physics into social physics.

14

In his *Philosophy of the Present*, Mead defines sociality as "the capacity of being several things at once" (1932\1980:49).

Consider the first stage of the act, the stage of impulse.

Mead writes:

1. Sensitivity as a function of response. All perception involves an immediate sensuous stimulation and an attitude towards this stimulation which is that of the reaction of the

individual to the stimulation. This reaction, in so far as the perception does not go out into the instantaneous overt activity appears in consciousness only as an attitude, but as such it is the first stage in the complete response or group of responses which the stimulation in question calls out. Furthermore, there accompanies this attitude of the response some imagery which is taken from past experiences in which the responses have been carried out, boding to the final experiences to which such a stimulation naturally leads. That is, a perception as such involves not only an attitude of response to the stimulation but also the imagery of the result of the response. A perception has in it, therefore, all the elements of an act -- the stimulation, the response represented by the attitude, and the ultimate experience which follows upon the reaction, represented by the imagery arising out of past reactions (1938\1972: 3)

In other words, the acting emergent organism receives sensuous stimulation from its environment, adopts an attitude towards this stimulation, and interprets it in consciousness: organizing as acting preceiving. At this stage of the act, the organism has not responded in overt action, has not touched its environment outside its skin. The memory imagery of past experience is part of the organisms interpretation of its world, and memory and imagery of the past stretches towards the present, and on towards the future. Thus the preceiving organism has in it at once all the phases of the act: perceiving as sociality and sociality as perceiving.

15

Mead continues:

Preception, however, must not be regarded simply from the standpoint of presentation, the presence of material. It is, even taken by itself and ignoring its relation toward later movement, a process of sensing under the conditions noted above, i.e. the conscious attitude of response, and the imagery of the result of the response.

The process of sensing itself an activity. In the case of vision this is most evidently the case. There the movement of the eyes, the focusing of the lens, and the adjustment of the lines of vision of the two eyes require a complicated activity which is further complicated by the movements of the eyes which will bring the rays of light coming from all parts of the object upon the center of clearest vision. The process of perceiving an object through the eyes (and this may be called the normal perception, since our perception through other organs of sense is so largely mediated through the imagery of vision itself) is thus an activity of considerable proportions. The perception by the hand is also one that involves such movement in the exploring processes of hand and fingers and the movements of the skin. (1938\1972: 3-4).

Perceiving is not merely a process in which sense perceptions present themselves to the acting organism, but it is an activity in which the organism spontaneously and

actively represents\interprets data, that which is "given" to it. Hence Mead, like Wilfrid Sellars (1968), critiques "the myth of the given." Sensing a raw feeling is in this sense a minding. Seeing is not the passive presentation of light rays to the eyes. The organism must focus and adjust the lens of its eyes in order to see. Similarly, hand perceiving can only occur when the hand and skin are adjusted or manipulated by the organism -- spontaneous receptivity and receptive spontaneity.

16

"The sensing of the object as so located that the organism takes a definite attitude toward it, involving possible movement toward or away from the object, is thus a part of the process of perception" (Mead 1938\1972: 4). Perception is analysis or definition of the organism's situation which enables it to decide whether to decrease or increase its distance from objects of its environment.

Phenomenologically speaking, the relations between presentations and representations, between imagining and

sensing, constitute the organisms field of selective attunement, its "field of selective attention" (Mead 1938\1972: 5).

The process of selection of an environment -- of construction of a world -- is "frequently found in the anticipatory presentation of the object which is of importance" to the organism (Mead 1938\1972: 5). For example, a man anticipating a dangerous liaison with another man as his erotic object choice, forgets about 9 to five business, selects a gay bar, and "finds" himself in a field of beautiful people. It is no accident that he is surrounded by beautiful men -- he has chosen\constructed such an environment.

Representations and presentations, images, "are not by any means always consciously present. They are most evident when we are definitely looking for an object, when we are hearing a tone out of a clang, or detecting an odor which we are able in some degree to hold definitely in consciousness" (Mead 1938\1972: 5).

There are many degrees of consciousness, of minding, between cognitive sensing and raw hunger. "Between such consciously recognizable images and the attitude of hunger in which the system is predisposed by physiological conditions to be sensitive to certain stimulations there may be many degrees." (Mead 1938\1972: 5). Hence it may seem that Mead views biological or physiological functions as basic, fundamental, and uncultured. But this is not the case. For Mead, biology and physiology are constituted by the social; and the social is constituted by biology and physiology. None, but the most Humean of Skeptics, would deny that there is "raw stuff" out there. Hunger is real. But the conditions under which hunger is felt vary historically through time and across cultures. Pain itself is cultural. Biology is always biosocial. (I avoid the term "sociobiology" here in order to make clear that Mead's (meta) physics is different in kind from the sociobiological paradigm in contemporary sociology).

Again, on the one hand, the familiarities of your customary fieldenvironment barely register on your consciousness.

They are habitual in your habitus. The taken-for-granted of your field are so normal for you that they are relatively unquestioned -- until fields of self and others clash and collide. Thus Europeans of the Old World were constituted as such through their contact with Indians of the New World, and visa versa. The Indians realized that their habits, folkways, and moves were radically other than those of the Europeans -- and visa versa.

(Mead 1938\1972: 5).

On the other hand, "the process becomes active when we are in that state which we are accustomed to call 'curiosity' (Mead 1938\1972: 5). The characteristic of curiosity lies not merely in the restless sensing of everyday life, but in excitement -- not in sensation but in sensationalism." "The characteristic of curiosity is found not simply in the restless process of sensing but in an excitation of the responses of the system to the stimulations received" (Mead 1938\1972:5).

Mead writes:

The hunger for novelty is never a mere readiness to receive new stimulation or a search for that which is merely new. Novelty is always a fashion, a fad of some sort, with a very definite selection implied. The most striking illustration of this is found in the comparatively narrow fields within which the sensationalism of newspapers will run. Nothing is more striking to one who assumes that we are curious in regard to mere novelty than the very meager list of subjects which an experienced newspaperman recognizes as carrying with them the quality of news. We complain not of the richness of material which our sensational papers present but of the wearisome reiteration of the murders, scandals, and war scares which a popular taste seems to demand. Fresh stimulations of a slightly different nature from those to which the public is accustomed are demanded, but the field within which these stimulations may be sought is distressingly circumscribed. The explanation of this is to be found in a physical condition in which certain types of responses are stimulated , and through

their stimulation render the reader peculiarly susceptible to the stimulation which will call out the response. While the detailed content of this stimulation soon loses its power of answering to this attitude of readiness to respond, the type of response remains the same, and the individual craves a new form of stimulation for the same sort of response. The psychology of ennui and of satiation, so far as it is wearying, is found in the irritability of certain types of response and the wearing-out of the particular stimulations which have aroused them (1938\1972: 5-6).

The hunger for novelty is not merely an arbitrary search for something new for the sake of its being new. Even the new, the shocking, the shocking of the new, is culturally constituted. Hence novelty is never an individual event, but is always cultisocial, and within a field of fashion and fad: individuality as sociality. "Fashion" and "fad" imply that there are social others who (re)cognize the "individual" self's style and self-presentation. Consider the fashion of body piercing. The emergent self seeks to

express its individuality by piercing its body. First, the ear lobes. Then piercing ear lobes becomes a fashion. Or, rather, the ear lobe piercing at once constitutes a fashion, a novelty. Then this emergent novelty becomes stale, worn out, and -- to speak of haute couture -- passé. Next come the upper part of the ears. And soon enough nipples and vaginal labia and foreskins and pierced in a desperate drive towards individuality, creativity, bohemianism. The self-will towards creating and maintaining the autonomy of the self pierces it, fragments it, bores it. Before the invention of television, Mead decries the sensationalism of the (news)papers of his day -- yellow as the fashionable color of the dailies. The continual depiction of violence and villainy desensitizes the problematic public which continually craves ever new sensations to get its kicks. But this craving cannot be satisfied, because the field of frenzied feeling of newspaper and public is a narrow and limited one. Such a field is not rich and enriching, but impoverished, impoverishing, dull as dishwater, and deadening. The explanation for this effect -- this defect -- is to be found in "a physical condition" (Mead 1938\1972: 6) in which stimulation produces a response to this stimulation which further renders the self and the public

susceptible to further stimulation -- Jamesian habit, and addiction at once. Consider drug addiction as an example of craving of the new. The self craves new stimulations and sensations. The self uses marijuana to satisfy its craving. But pot fails to satisfy the self's search for novelty, because the self's tolerance of the new stimulations increases. The self becomes bored, suffers ennui, has a blasé attitude. So the self tries acid, and then cocaine, and then heroin. The self seeks a high by any means necessary, and uses varying sensations to get the common response of a high. Desire chases itself like a tiger chases its tail "The psychology of ennui and of satiation, so far as it is wearying, is found in the irritability of certain types of response and the wearing out of the particular stimulations which have aroused them." (Mead 1938\1972: 6).

"THE PROBLEMATIC SITUATION

The situation out of which the difficulty, the problem, springs is a lack of adjustment between the individual and his world" (Mead 1938\1972: 6). There is a rupture between the organizing act's sensations and its sensing. A crisis of knowledge and identity develops, because the emergent is no

longer in time with the environs. It is out of step with the rest of the world; it marches to its own drummer; it keeps its own time; it is in its own nowtime." The response does not answer to the demands which gave the stimulus its power over the organism" (Mead 1938\1972: 6). The organism desires fulfillment, but cannot attain it: it is a tale of a failed love affair, an unconsummated romance novel. "The object was there for the individual, but it has ceased to be the object that it was" (Mead 1938\1972: 6). The craved object, the erotic object of the organisms desire, becomes something other than what it was. The old erotic object emerges as something new, as something the organism cannot quite make sense of. "And yet the object is different for each individual, owing to his perspective and his possibility of response to the object.

One person's God of idolatry is another person's bitter enemy. One person's freedom fighter is another's terrorist. One person's progressive is another's extremist. "There are certain values selected out of the object not only by the sensuous avenues of approach but also by his past experience of the object" (Mead 1938\1972: 6). In Mead's dialectic of

desire and desired, the object is never simply there. The desiring machine selects values or qualities from the object, and (re)constructing these into a love object -- functioning of der Lustprinzip, the pleasure principle. The lusting organism also constructs its loveobject from a hybridity of images past and present. "Even for the preceiving individual in immediate experience there is an object which represents him as distinguished from other individuals and as distinguished from the same individual under other conditions" (Mead 1938\1972: 6-7). Other and the organism in a field are mutually constitutive of one another. Objects depend upon their relation with the organism for their identity, while the organism depends on the objects of its field for its identity. For Mead, there is no inherent intrinsic identity within an individual. Individuals do not exist; (identities exist as fields. "Any object is thus always an expression of a peculiar relation between itself and the individual, but it is an objective relation" (Mead 1938\1972: 7). Paradoxically and peculiarly, objective reality is a reality of perspectival fields.

Again, "the character of the individual selects out of the object as it exists what answers to the nature of the individuals in his present attitude a selection which answers both to his immediate sensitivities and to his experience" (Mead 1938\1972: 7).

17

At this stage of Mead's discourse, "the self" makes a dramatic entry. "The material which failed to call out the appropriate response and that which was found in the object as that which would have answered to the response which has been inhibited -- these remain and, with the appearance of a self, are referred to that self" (Mead 1938\1972: 7). A problematic situation emerges when there is a rupture between self and world, custom and cataclysm, the old order and the new, tradition and taboo -- when all that is solid melts into air. With this critical condition, the selfbody becomes no longer in touch with its world. Self and world lose contrast with each other, with the real. Paradoxically ("It's a paradox, a paradox, a most ingenious paradox."), the disruption of the self is at once the constitution of the self -- the self as self-consciousness. If there is no

distance between self and world, then the self is barely conscious of itself as a self; it tends to operate on automatic pilot, "instinctually." For example, the tennis star Bjorn Borg has said that he is not conscious of himself while in the act of a tennis match. He does not consciously choose his shots after years of practice and play. He became so at home in the fieldworld of the tennis match that he can only report to us after the event, ex post factor, why he "chose" to come to the net at a particular moment, or why he "decided" to stay back beyond the baseline and trade groundstrokes with his opponent. This is why we feel ourselves more in a crisis -- whether a crisis of ecstasy, enchantment, mystery, revolution, disenchantment, depression, despair. We feel ourselves most alive -- or most dead, depending on perspective -- in times of crisis. In Heideggerian terms, we only know the value, function, and reality of a hammer as a physical thing when the hammer breaks, when it no longer works as a hammer, and when this "problematic situation" demands that we fix the hammer or find\invent\create a new tool.

That is, the character of the self's referent is that it is mind(ing), and "not a thing", although it has "the character of a thing" (Mead 1938\1972: 7). The real, the referent, is at once both a thing and not a thing: sociality of the physical acting. The thing is a thing of nothing.

19

This problematic thing, this (id)entity in question, "has failed to call out the response which gives the stamp of reality to experiences" (Mead 1938\1972: 7). Again reality is a matter of attitude -- and an attitude of matter.

20

"It could, and in the experience of the lower animals it presumably does, disappear, while readjustment take place in a trial-and-error fashion" (Mead 1938\1972: 7). Reality, mind (self) consciousness, disappear in the experience of the lower animals while they strive to reconstruct reality and to restore order by trial-and-error -- sociality as bricolage. Mead uses "presumably" to gesture towards his

uncertainty of the identity and constitution of the minds of "lower animals."

21

But what distinguishes human animals from lower animals is that human animals have the capacity of consciousness of self, whereas lower animals do not -- perhaps. "That it does not disappear in the conduct of the human animal is sufficient evidence that its retention serves a purpose, or at least does some good. Its new function is indicated in the attitude assumed toward it as contrasted with that which is assumed towards things. The attitude which we, and all forms called intelligent, take towards things is that of overt or delayed response. The attitude which we take toward the contents of mind in their relation to the world is that of explanation" (Mead 1938\1972: 7). The attitude of all intelligent living forms toward objects is reaction, whether overtly displayed in conduct or inhibited\delayed. But the attitudinal stance of human animals towards themselves, their consciousness of consciousness, is that of explanation. "From the standpoint of future conduct explanation is such a reconstruction of the object, toward

which conduct has failed to elicit the proper response, that this defeat may be avoided in the future" (Mead 1938\1972: 7). The reinterpretation or reconstruction or reconstitution of an object identity in question under explanation is such that the quest(ion)ing organism is able to avoid the problematic situation in the future by learning through explanation. If you understand the causes of a crisis condition, then you can take steps to remedy the situation. "That is, explanation is substituting another object, with which we will be *en rapport*, for that which confessed its unreality in the experimental test of conduct. The goal of this reconstruction is that of bringing out the other aspects of the object beside that which has led to defeat, and so coordinating them that the inhibition, which was the evidence of defeat, may cease and conduct may go on. Hence Mead views the goal and function of intelligent explanation is to release inhibition of organismic response and thereby enable the organism to continue acting. "The [experimental or hypothetical] method is that of referring the invalidated aspects of the object to the individual in the form of the self" (Mead 1938\1972: 7-8). The hypothetical instrumental operational scientific method is thus not an abstract entity removed from the rest of the social body. It is not in a

separate distinct disciplinary domain removed from life, and under the control of scientists as high priests of a sacred cult. Science is life itself; it is not cult -- but culture. To paraphrase Antonio Gramsci, everyone or every self is a scientist. "This can take place only when the individual has become an object to himself through the use of those gestures which can affect himself as they affect others, and only in so far as the individual acts towards himself as another, that is, takes the role of another toward himself" (Mead 1938\1972: 8). At this phase of Mead's *The Philosophy of the Act* (1938\1972), the familiar formulation of *Mind, Self and Society* (1934) emerge and become evident. In this social psychology from the standpoint of a pragmatist behaviorist, there is "the implication that, in the experience of the object by the individual, what is not object must be individual" (Mead 1938\1972: 8). Mead's distinction and differentiation between objective and subjective is analytical and not ontological -- for Mead is a critic of the antinomies of subject-object, mind-matter, individual-social, culture-nature. There Mead means that it is the biocultisocial which defines reality -- not an abstracted reified alienated individual. The identity of "genius" hence comes into

question. "It is the appearance of the self that makes it possible to carry out this implication, e.g., he indicates to himself his seeing an object at a certain distance with the object actually at another distance" (Mead 1938\1972: 8). The reality\identity of distance and of measurement -- of space itself -- emerges as an historical problematic, existence, epoche, Zeitgeist. "In this fashion the false character of the object gets a local habitation and a name as the experience of the individual, and the true characters as tested by successful conduct are placed under this reflective attitude as in the same category; while the task of reorganizing the object so that the individual with both tendencies (those to react unsuccessfully and successfully) may continue to act becomes that of so envisaging the object that conduct may go on" (Mead 1938\1972: 8). The more local, individuated, particular, and abstract from the social whole an (id)entity is, the less its reality. "This attitude carries with it the implication that what was unreal may become real through reconstruction. As unreal, it is mere experience of the individual; as real, it becomes part of the object" (Mead 1938\1972: 8). Thus we human animals socially construct or create reality -- physical, organic, and cultural. Mind, self, and society constitute

the reality of the world -- as in the human creation of subatomic particles in the act of quantum mechanics.

22

Perception is the second stage of the act. "Perception is a relation between a highly developed physiological organism and an object, or an environment in which selection emphasizes certain elements" (Mead 1938\1972: 8). As a dialectical phenomenological monist materialist, Mead views organism and environment as mutually constitutive of each other (Bologh 1979). "This relation involves a duration and a process" (Mead 1938\1972: 8). Perception is processual, emergent, and takes time. "The process is that of action through media which affect the sense organs of the biologic individual. The process takes times, and the effect produced upon the organism is later than the disturbance of the medium and still later than the influence of the object upon the medium." (Mead 1938\1972: 8). The acting insurgent organism does not exist in a specious mathematically abstract reified present, but through time -- not in simultaneity but through duration (Bergson 1955). "The

customary interpretation of this statement identifies the perception with the effect within the organism, regarding these bodily effects as significant of the things that have mediately affected them, justifying this significance by the fact that any object or event such as an organism is significant of the rest of nature and therefore of the particular objects which are involved in the process of perception; the selection of this particular object being due to the sensitiveness of the organism to the relation, one relation of which is found in the nervous excitement within the organism" (Mead 1938\1972: 8-9). The identity of an entity is thus not of the essences of a substantial thing, but is field relational.

Mead continues:

This overcondensed statement implies a nature which is in so far given that the objects which arouse the activity in the media, the sense organs, the central nervous system, and the motor apparatus of response are all within the field of experience. They are all the preconditions for the analysis of perception into these parts(1938\1972: 9).

Mead, like Richard Portry and other pragmatist critics of Philosophical skepticism, views the ontology of the social world as monistically related to the ontology of the natural world, and see no reason why (we should think that) there is an essential disconnection between the world we exist in and the world we know. "The chair that is preceived is not there before the influence exerted on the medium, or before the waves in the medium" (Mead 1938\1972: 9). Following Kant's *Critique of Pure Reason* (1900), the conditions for the possibility of *perceiving* objects are at once the conditions for the possibility of the *existence* of objects. "They are all simultaneously there, and this simultaneous presence is essential to the explanation which relates the succeeding stages of the perception. Even the objects which lie beyond the range of immediate experience are brought within that field by an extension of the field so that they are regarded as simultaneously there as a basis for the explanation of our knowledge of them" (Mead 1938\1972: 9). Since explanation depends on the extension of your field, the fullest most complete explanation emerges from the widest field. Now we "might state the conditions under which any perceptual object may appear, but in making such a statement we must presuppose a perceptual world within which this explanation takes place"

-- in the first place (Mead 1938\1972: 9). In other words, we do not doubt the existence of a natural world with physical material objects. À la Marx and Heidegger, we are thrown -- projected -- into the world that is there, and we have no choice but to deal with our surrounding world, to think in acting, to act in thinking -- thinking is not contemplation(Heidegger 1962; Marx 1975d).

"The further implication of this statement is that the explanation, or statement of the conditions of perception, is in reality a statement of the method of discovering what the actual object of perception is"(Mead 1938\1972: 10). Being is being measured -- Galileo. Hence Mead gestures towards his pragmatist materialist monist view of the operationalism and instrumentalism of science or explanation or thinking or minding -- the science of naturalism and the naturalism of science. The scientific method is the method through which we human social animals critically reflect on and explain our biosocial environment. Scientific knowledge as natural human power is the process through which we create our world. It is in this naturalized epistemological sense that nature is mind-dependent (Aronowitz 1988). "What we do actually in making such a statement of the conditions of perception of a

particular object is to enable ourselves to identify a specific object and determine what the nature of the perceived object is "(Mead 1938\1972: 10). Hence identifying creates identity.

"For this purpose [of identifying and constituting an object] we abstract from characters which inhere in particular objects and their situations and fasten our attention upon what is uniform in all objects and in all processes of perception. This enables us to identify the object of perception in its relation to the whole field and to account for the illusions of sense perception, such as reflected and refracted objects" (Mead 1938\1972: 10).

The truth is the whole; the false is the part. Verity is the universal; the lie is the particular. the Darwinization of Hegel and the Hegelianization of Darwin.

23

Mead and his dialogic interlocutors -- and they are the same thing -- continue in good Hegelian style to present the

genesis, development, and structure of the second stage of the act as follows:

2. THE SENSUOUS CHARACTERS OF THINGS

The unsophisticated person finds nothing contradictory in regarding red as a character of an object for the normal eye and some shade of the yellow as the character of the same object to the color-blind eye (Mead 1938\1972: 10).

Here Mead deconstructs the dichotomy between primary essential qualities and secondary accidental qualities -- categories inherited from Aristotelian (meta)physics, and passed down through the ages like nightmares weighing upon the shoulders of the living. Mead demonstrates that there is no difference between essence and appearance -- Kuhnian revolutionary science. Absolute Truth and essential Reality disappear for all becomes "appearance." And all that is solid melts into air. But let us see how the dialectic discourse develops.

"In each case the colour is assumed to be a character of the object [by naive sense perception], though there seems

to be here an ascription of two different qualities to the same object -- and qualities which exclude each other" (Mead 1938\1972: 10). How can an object be the same object if mutually exclusive qualities define it in one case and another?

"In explaining the seeming contradiction, the individual would refer to the difference in the vision of the two eyes, thus implying that the quality in question involves the structure of the object, the passage of light waves, and the reaction of the organism" (Mead 1938\1972: 10-11). The identity of (the quality of) the object as a physical thing is therefore *decentered*.

"This explanation does not make of the quality a relation" (Mead 1938\1972: 11). Suddenly, a novelty appears; an anomalous phenomenon shows itself. Why is the explanation\quality\thing not a relation since fieldidentity is relational? We have to probe further into Mead's definition of relationality.

In the seventh "categorical fragment" of the "miscellaneous fragments" of the "supplementary essays" of Mead's *Philosophy of the Act*, he defines relations thus:

Realists say that all relations are external. For the idealist, all relations lie inside the object, the meaning of the object is to be found in its relations. If we ask what anything is, we come back to a number of relations. But if, on the contrary, objects as meanings are not relations, they become relational only when we analyze them (1938\1972: 639).

Hence Mead spaces the relations among the philosophical paradigms realism, idealism, and pragmatism. And he goes beyond objectivism and relativism with pragmatism (Bernstein 1983). For Philosophical scientific realists, there is one absolute objective external reality, and we can get a true picture of this reality if we see beyond the merely phenomenal appearances of the things of the world to an underlying reality which is essential, necessary, and not affected fundamentally by human participation\intervention in it. Reality is "out there" separate and distance from the knowing act\ "the subject" -- dichotomous dualism of

subject and object, antinomy of bourgeois thought. On the other hand, philosophical-scientific idealists hold that reality is internal relations, subjective, and mind-dependent. So reality is relations for both worldviews. Pragmatist philosophers Peirce, James, Dewey, and Mead propounded their philosophy as a third path between realism and idealism. Reality is at once objective and mind-dependent: the objective reality of perspectives. Again, reality is simultaneously relational and not relational: the sociality of relation and the relation of sociality. Reality is not relational when we pretend in bad faith that we are not meaningful and meaning making parts of the fields of realities. Reality emerges as relational -- and hence fully real -- when we surrender the idol of objectivity, confess or own up to our condition human and ungodlike, freely create value\meaning, and iconoclastically celebrate the uncertainty and mystery of the cosmic dance.

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The identity of an objectvaluemeaning comes only into question when reality bites and the normal flow of everyday life is disrupted, disturbed, deranged. "The question

whether a certain object has a certain color or not (or any other character) arises only when the conduct which the characters of the object call out does or does not reach a successful conclusion" (Mead 1938\1972: 11). Before we constitute the relational field through reflective critical science, "the object as it exists in the complex situation including object, medium, and organism is simply there, and is what it is" -- the given, raw data (Mead 1938\1972: 11). Mead writes:

If the colors and sharpness of outline lead to a twenty minutes excursion to a mountain that is ten miles distance, we consider the perception deceptive without questioning the fact that in the complex situation of object and organism such an object was there with its characters. If the inability to distinguish between the colors of two objects which are different to the vision of others leads the individual to recognize that his visual apparatus is different from that of others, he does not question that in his situation the object was there with the particular shade which he recognized. What is done in each of these

instances is to take those characters which hold both for the immediate perception and for later conduct, for his visual apparatus and that of others, and identify the object. If in such an identification the conditions for the different characters ascribed to the same object can be harmoniously stated, the whole situation is taken into account (Mead 1938\1972: 11-12).

Hence even a faulty particular perception of an object does not totally negate the existence of that object. There is truth even in error. Science as reflective minding of the business of the organism entails the coordination or organization of multiple perspectives on the scientific object, and the possibility that disparate viewpoints may be brought together to constitute the (truth of the) object in question.

Mead continues to discuss the emergence of critically reflective scientific knowledge in the perception as the second stage of the act:

It is only when this question has arisen that knowledge as such appears as an element in the

experience. Otherwise the individuals perspective is simply the reality that is there. Such a selection of characters which are identical for all experience, or nearly so, and are identical for all individuals gives us the scientific object. They constitute an object of knowledge. The immediate perception is simply there and not an object of awareness or knowledge except as some question as to conduct or agreement with the perceptions of others arises to lead us to reflect upon it. It should be noted further that the whole method and apparatus of scientific analysis and experiment imply an unquestioned world of perception surrounding and validating the results of scientific procedure (Mead 1938\1972: 12).

It is only when there is a disjuncture between a particular perception -- an anomaly -- and universal perception consensually accepted by the worldwide community of scientists -- common sense -- that true knowledge emerges in the experiencing act. For the organizing act only reflects critically on *its* worldsituation when this is out of joint with the world. When abnormal science clashes with normal

science, either abnormal science is reconstituted to fit in with existing normal science, or normal science is itself revolutionarily reconstituted to fit in with abnormal science: Mead's anticipation of Kuhn's *The Structure of Scientific Revolutions* (1996).

Moreover, Mead critiques philosophical skepticism of human perception and of the merit of scientific method and at the same time implies that science is only one way towards understanding the world we live in. Since science as theory, method, and practice relies, and rests on sense perception of phenomenal data for its power, it is illogical to doubt the reality of perceptions and to test their existence by science. We human beings are projects thrown into the existing world, and we have no option but to deal with it. And scientific knowledge as will to power has enabled us to dominate nature and to perpetuate the species. It is indeed ironic to dispel doubts of science by appeal to the very phenomena upon which science is founded in the first place.

Mead develops the dialectic of the act and the act of the dialectic further:

"3. THE REALITY OF THE OBJECT IN PERCEPTION

The object in perception is a distant object" (1938\1972: 12). Objects distant on the horizons of our biosocial world call out to us. They attract us. But we do not know if it is a situation of love at first sight at this early stage of communicative interaction. We may hypothesize\have a hunch that these objects have value and meaning for our lives. But we do not really know when we are in the distant mode whether there should be fright, flight, or fight -- or whether we ought to embrace the phenomena. "It [the object] invites us to action with reference to it, and that action leads to results which generally accomplish the act as biological undertaking" (Mead 1938\1972: 12). The sexy object of an organism's desire invites this act to make contact with it and to make beautiful harmonious music together: love enhancing life via sensuous consummation of desire. "This does not necessarily imply past experiences. In the case of young infants and certain lower animal forms, notably insects, actions which perception invites may lead to successful conclusions which cannot have been

experienced" (Mead 1938\1972: 12). Young human infants and insects such as bees are comparable organisms in that both of these types of organizing acts are relatively inexperienced, and may be said to function impulsively or "instinctually." An example of such functioning is the neonate human animal's first attempt to make contact with its mother's breast.

Now we may object "that these perceptions, notably perceptions of touch, are not distant objects" (Mead 1938\1972: 12). Mead writes:

The reply to this objection is that the object perceived through contact experience is such only in so far as it possesses an outline and position with reference to the whole environment which give it the character of a distant object. The distance perception not necessarily that of vision or sound. It may be even that of tactile experience and the bodily experience's that go with this. For example, in a dark room one may with an outstretched arm locate the article of furniture which one wishes to avoid in the moving

through the apartment. The tactile response to currents of air and changes in temperature may reveal the distant object (1938\1972: 12-13).

Although skin may not touch skin, and flesh touch flesh, the act's contact with a distant object may still be tactile. Again, the reality of the object is a matter of contention and contestation until the act fields feels the object -- and even then the identity of the object may still be on trial. "In any case, however, the object in perception is an integral part of the environment. Perception focuses this whole in the object" (Mead 1938\1972: 13). Hence perceiving objectifies the object; perceiving creates the object of perception. "Thus the tactile experience of a distant object provokes an action which gets its implied value in an ultimate contact experience". (Mead 1938\1972: 13). Intention leads to perception which leads to consummation. "It may be that the seeming satisfaction of the suggested act is found in the sight of a face or the sound of a voice. Yet these perceptual experiences still have a reality behind them that, if pushed to the limit, would demand action that culminated in some contact experience" (Mead 1938\1972: 13).

The act of love and its beloved object may drink to each other with their eyes only at first, but this may soon lead to more vigorous contact experience entailing bodies rubbing against each other. "The 'what a perceptual thing is' is found in the contact experience alone, but it is a contact experience which is the last term in an act which originates with an experience of something distant, though this distant experience may be found in the action of any sense, even that of touch" (Mead 1938\1972: 13). Thus act and object may be both out of touch and in touch at once: yet another instantiation of Mead's principle of sociality.

Mead continues to elaborate on the character of distant sense perception:

There is a further objection that may be advanced against this statement. It is that many of the experiences in a perceptual environment are not of things in the sense here indicated. A sound maybe heard, an odor sensed, or a temperature felt which is not located. We seem to have no definite located in perception toward which possible action is directed. Whitehead has referred to these

contents as sense awarenesses rather than perceptions. I find in these experiences only indefiniteness of location, not an absence of it. They still belong to the perceptual environment and still imply possible location and identification with a something that could, if the contact suggested by the experience were fully carried out, bring us into contact with something to be realized in contact experience, though this something were only the definite air waves or chemical substances floating in the atmosphere. The difference is only one of degree in definiteness of location and subtlety of the thing perceived (Mead 1938\1972: 13).

Thus an (id)entity of distant experience is only potentially an object of reality, and it only fully realizes its actuality to the degree that it is in direct interaction and relation with the field of the act.

"There are two different attitudes which we assume toward these perceptual objects as parts of an organised

environment. In the attitude of immediate experience the object as seen and then as felt is simply there" (Mead 1938:13-14). In the terms of the Hegel of the *Phenomenology of Spirit* (1977), all sense certainty is able to know of its object is that is simply "here" or "there", that there is "stuff" out there. "In this experience the individual may see and feel portions of his own organism, and these are simply parts of the whole perceptual field. In this immediate experience the distance characters of the object are not translated into contact terms" (Mead 1938\1972 :14). Again, the difference between distant and contact identity is between potentiality and actuality. "It is true that the reality of the seen object will be tested if need be by the completion of the acts which distance perception invites; but when the object is actually in the hand, it does not thereby lose its color or odor or sound, nor are these characters translated into contact terms. If one grasps a dimly seen friend in the twilight to be sure he is there, his seen color and form do not disappear in the contact experience" (Mead 1938\1972: 14). Here Mead very carefully distances himself from both the subjective idealism of Berkeley and the objective idealism of Hegel, Bradley, and Royce in favor of monistic materialist naturalistic

pragmatism, a worldview wherein reality is *both* perspectival and objective. "Nor would he be tempted to ascribe what he had seen to some process going on within his nervous system. He realises that the eyes must be open and the hand in actual contact if the experience is to take place, but this fact does not lead him to locate the experience in a consciousness situated in his head or elsewhere" (Mead 1938:14). In other words, although the act of perceiving necessarily involves a perceiving act to perceive a perceived object, this does not mean that perceptual reality resides in an individual consciousness. Again, in Hegelian dialect, it is the whole field that constitutes the truth: the act of perceiving, the perceiving act, the perceived object of sense perception, and the fields these inhabit. Hence the "perceiving individual in the experience is simply at the center of the perceptual field, located perhaps at the cyclopean eye, or in the throat, or in the chest. [Note well Mead's antihumanism here.] The rest of the organism is part of the field which he may see or feel but is not the effective center of perception. The reality of the object is what is seen or heard and actually or possibly felt, but keeping all its characters in the perception" (Mead 1938\1972: 14).

On the other hand, the "second attitude, that of reflective analysis, does resolve the whole field, including the organism, into physical elements which could conceivably be the objects in a hypothetical perception; that is, their characters of location, effective occupation of space, inertia, and motion are those characters which appear in actual contact experience as the ultimate reality of the objects in perception" (Mead 1938\1972: 14).

Ultimate reality is at once both objectively hypothetical and probabilistic and hypothetically and probabilistically objective.

"This analysis substitutes for the color, sound, odor, taste, temperature, and even the feel of the object, structures and motions which cannot be any of the characters which they undertake to account for" (Mead 1938\1972: 14). Reflective analysis or scientific explanation rationalizes sensuous experience into the scientific objects of deep structures -- à la structuralism. These "structures and motions" are determinative of "secondary qualities" such as color, sound, smell, and feel, but are not constitutive of them. Scientific objects are indeed most paradoxical and

peculiar entities. "This is true even of the contact experience, though the physical elements into which this analysis resolves things are those of contact experience." (Mead 1938\1972: 14). Lest we believe that Mead elevates\lowers these primary structures to the ontological status of foundation or ground, we must always bear in mind that it is the act of critical reflection and analysis which constitutes and invents these originary structures. The fundamental structures of the cosmos are nothing but free creations of the human mind -- the role of metaphor in Einstein, and the role of Einstein in metaphor. "The actual contact, experience, however, cannot be the characters of these physical elements, for their structure and motions are the preconditions for the experience itself" (Mead 1938\1972: 15). Here Mead encounters the crisis of causality of modern physics, natural science in general, the social sciences, and the humanities. On Mead's view, these originary primary structures cannot be identified with secondary characteristics, because they are the preconditions or possibilities for the existence of these physical elements. How can something that is a prior condition or cause be a result of that cause? Which comes first, the chicken or the egg? One possible resolution is

to invoke the principle of sociality and to demonstrate that something can be both a cause and an effect at once -- its own cause as its own effect. Perhaps, the notion of equiprimordiality is relevant here. Or perhaps -- moreover -- classical consideration of causality need to be revolutionized altogether. But Mead and his interlocutors\editors do not entertain this possibility here, although it is immanent in the text's discourse.

So Mead continues: "There are in these propositions two different implications which need to be carefully distinguished. It is certainly true that what is the precondition of an experience cannot be the experience itself" (Mead 1938\1972: 15). Now this last certainly begs the question of causality, cause, effect and condition, because it is these critical categories that are revolutionized in the change from classical to quantum relatively physics -- and Mead is a part of this quantum leap. But Mead is in the mode of being of classical mechanics at this developmental stage of his dialectical discourse. Hence Mead is in the social mode of becoming in both classical and nonclassical physical paradigms at once.

"Thus the hardness of a stone may be said to be the precondition of John Smith's experiencing that hardness" (Mead 1938\1972: 15). John Smith cannot experience the "hardness" of an object if that object did not have something which *could* be experienced as hardness within Smith's field presence in the first instance. Mead seems to be saying that the falling tree in the forest *does* produce something which *could* be perceived as "sound of tree falling" by an organism *if* it were present at this event. Again, the "hardness that John Smith experiences in some measure different from that which is experienced by James Brown. In this sense the color of the book as it exists before it comes to the eyes of John Smith or before the eyes of anyone, is a precondition of its being experienced" (Mead 1938:15). "In this sense, it may well be that matter as effectively occupying space, its resistance, its inertia, its mobility, as we experience these characters, belong to matter in finer divisions than those which we actually do or could experience, and these particles could still be the preconditions of the existence of the physical bodies which we do experience and also the preconditions of our own

organisms which are necessarily involved in this experience" (Mead 1938\1972: 15). Mead alludes here to the crisis of vision -- or rather of lack of vision -- brought about by the epistemic seachange comprising the quantum leap from the classical mechanical universe with its bouncing billiard balls to a chaotic cosmos with its probability structures of subatomic wave-particles: failure of vision and crisis of metaphor à la Lord Kelvin (Mead).

Again, Mead writes:

We could not experience the characters of matter which are the preconditions of the actual experience which we have. In the first place, these particles of matter with their characters must have been there in advance of our experiencing them, even assuming an imaginable experience of these particles with these same characters, and, in the second place, the actual experience of these characters is in any particular case in some sense different from that which we could have in any other case (Mead 1938\1972: 15).

Mead thereby oscillates between a thoroughgoing cultural constitutionism and an empiricist realism so as to avoid the charges of idealism and solipsism. He advances an argument that is at odds with his dialectical phenomenological quantum philosophy, namely that physical objects exist out there along with their characters before we human acts enter the field to experience them. Both in phenomenological and quantum discourse, it is a moot\mute point whether the preceived object exists outside the perceptual field of the act of perceiving: this question is not asked in quantum physics -- for it becomes unaskable in that paradigm. The problem is that [1] Mead does not distinguish between "raw stuff" and the ascribed characters or qualities of this stuff, and [2] his conception of the category "experience" is overly narrowed to exclude determinatively imaginary mathematical constructions -- but is precisely these kinds of objects which have increasingly constituted the object domain of quantum relativity physics-philosophy.

But in the next discursive breath, Mead takes the role of a cultural constitutionist of reality: "We could still ascribe to matter in its finer divisions, which enter into

the structure of bodies which we experience and into the structure of our own bodies, the characters which we ascribe to matter in our actual experience of it" (Mead 1938\1972: 15). So although we may be unable to see and sense the physical bodies of the subatomic realm, we can still give or write them characters or (primary) qualities which we ascribe to our and other object bodies we do experience in the ordinary Newtonian sense. Hence "(t)his is the assumption of the physicist when he thinks that he has attached an electron to an oil drop. He has added inertia, increased the volume of the whole, and the mobility of the whole includes that of the electron" (Mead 1938\1972: 15). The acting physicist does not passively discover the qualities of her world out there but actively creates them -- puts them there. She not only (re)presents the world, but intervenes in it; she not only interprets the world, but changes it (Hasking 1983; Marx).

Mead and his text -- but they are sociality speaking one and the same thing -- summarize(s) this moment of the dialectical development of discourse on discourse thus:

The other implication, which does not apply to this case of the fundamental characters of matter, is this: that distance experience of any sort is of a different sort from that of ultimate contact and that ultimate reality of the distance experience is to be found in that of contact experience. The physical explanation of the so-called secondary characters of bodies in terms of the so-called primary characters is, then, but an elaboration of the test of the reality which we may apply to anything seen at a distance, i.e., actually handling it. In the elaboration of the test we extend the statement in terms of contact experience to the body at a distance and to the media by which the relation of the body and the organism is effected, thus obtaining an exact [six] scientific statement of the controllable conditions under which the distance experience arises (1938\1972: 15-16).

Hence Mead reiterates here that distance experience of any kind is potential reality -- only potentially hypothetically

real -- unless and until such experiencing is actualized\realized\objectified\fieldtested through the act or process of contact experiencing hands on experimenting -- as in quantum physics which is the most useful understanding physical paradigm we have or rather are currently. This rhetoric of a discourse of the body, of contact, of feeling living experience, of handling, of manipulation, instantiated here is a theory of object relations which should be of interest to feminists of all kinds and of all disciplines. But there is here no cult of body worship -- no idolization of the flesh -- of a variety of foundationalist feminism or phenomenology. For Mead deconstructs the foundationalist dichotomy between "primary" and "secondary" qualities\characters. (Note well the dramaturgical ring of "characters.") The ontological difference and distinction between primary and secondary characters of matter are mooted, overcome, sublated. For both types of physical characteristics are not in a correspondence but a functionally pragmatic relation with reality. Hence there is no nature out there which first philosophy mirrors clearly and objectively without perceptual "error" and perspectival "distortion" (Rorty

1979). Reality emerges as the conditions of the organism's production of its social mind, self, and world.

27

At this phase, Mead discusses the third stage of the act: the stage of manipulation of "perceptual and scientific objects":

"The perceptual object is primarily the organisation of the immediate environment with reference to the organism. Perception here has no other significance than that of the sense apparatus in its adjustment to the environment, in its function in selection of the stimulation needed for the reaction of the organism through its relation to the central nervous system, and in its calling-out of the appropriate response. The "what" of the object is, then, the expression of the whole of which both environment and organism are essential parts (1938\1972: 16)."

Thus the object of analysis -- the ontological unit -- is for Mead not a physical thing but a relation -- a fieldrelation. It is the acting of social relating that is logically, ontologically, and epistemologically prior.

"If the function of perception in its immediacy were that of knowledge, it would be necessary to add to this object as it exists *for* [my italics] the organism a capacity for awareness located in the organism" (Mead 1938\1972: 16). Here Mead distances himself from stimulus-response Watsonian mechanistic behaviorism in favor of a stimulus-organism-response *social* behaviorism. The Meadian and mediating organism calls out to the cosmos, hails and interpellates the cosmos, the cosmos responds to this call and returns the organism's call, the organism minds the call of the cosmos, "knows" it in the Biblical and cognitive sense, and in turn responds in action.

"There seem to be two reasons for the assumption of this awareness" on the part of the organism (Mead 1938\1972: 16). "One is found in the reflective process in which knowing the perceptual object becomes a definite part of conduct, and

the other is found in the identification of the organism with the social self" (Mead 1938\1972: 16-17). There is hence no separation between knowing and doing, thinking and functioning, critical understanding and praxis, theory and technology. Mead deconstructs the antinomies of classical Greek and bourgeois thought and life as well as the hierarchy of the contemplative over the active life. Another instantiation of consciousness of the acting insurgent organism is its self-consciousness: its identification of itself as a self by itself, and social others. "The process of identifying the object and correcting our attitudes in the presence of unsuccessful conduct through the use of significant symbols (social in origin) in inner conversation is itself only a form of conduct, and as conduct is as immediate as any other type" (Mead 1938\1972: 17). Again, there is no dichotomy between behaviour or conduct and thinking or talking internally to ourselves through socially significant symbols. Linguistic communication and interaction, whether "internally" with ourselves or "externally" with others, is one form of pragmatic functional action. It is thus that the pen and the sword are at once one; and it is thus that the weapons of criticism are at once the criticism of

weapons. (This is why one remedial treatment for "hyperactivity" and "attention deficit disorder" in a child is to teach her to verbalize more and to write down her lifeissues -- and thereby transfer muscular energy to discursive power).

"In its reference to the object which is being analyzed and reconstructed it is mediate, and in its imagery of past and future conduct it sets up a field of experience which is in sharp contrast with that of the surrounding world of perceptual objects" (Mead 1938\1972: 17). In terms of its explanatory mode, self-consciousness becomes more removed from immediate sense perception, and in its mode of ontological understanding and prediction self-consciousness establishes a thoughtfield which is even more distant from the surrounding environment of sense certainty.

Mead elaborates further on the relations between critically reflective social self-consciousness and its lifeworld:

When we refer the perceptual world to the social self that functions in this reflective process,

there has been postulated a consciousness which is the receptacle of the immediate perception. In making this assumption, we overlook the fact that reflection *presupposes* [my italics] the immediate world as given and that the self arises within social conduct within this field (Mead 1938\1972: 17).

The perspectival perceptual world is not within the social self. It is the social self which emerges and becomes within this worldfield. The cosmos is not within consciousness -- idealism -- but consciousness is within the cosmos. But neither is the physical material world without mind: empiricist positivism. The idealists trumpet "No matter," whereas the positivists declaim "Never mind." But the cosmos is at once *both* mind and matter -- the sociality of pragmatism and the pragmatism of sociality.

"What has further confirmed thought in this assumption [that reflective self-consciousness is a receptacle wherein the world inhabits] has been the appearance of the scientific object, which is not the object of immediate experience and

yet has been regarded as the reality of that object" (Mead 1938\1972: 17). The emergence of scientific objects such as logical and mathematical constructions which can be imagined but not sensuously perceived -- compounds the illusion that the worldfield is within the self.

Mead concludes: "Thus the object of immediate perception has been placed in consciousness, as the experience of this social self, while the real object is placed outside experience, revealed only by thought" (Mead 1938\1972: 17). Thus as in a camera obscura, the real becomes imaginary and the imaginary real -- "Western" philosophy of substance as inversion.

28

Next elaborates a philosophical discourse of the primary and secondary qualities of a substantial thing:

The beginning of this separation of the object of immediate experience from the scientific object was found in the distinction between the primary and the secondary qualities. The primary

qualities were those of extension, solidity, and motion; the secondary were those of color, sound, odor, taste, and temperature. The real object was that which existed and moved in space and time, occupying space to the exclusion of other things, while the other character of the object were conceived as states of consciousness of the self or soul (Mead 1938\1972: 17).

Hence primary character is to mediate experience as secondary is to immediate experience. In historical philosophical discourse, the physical thing is a cartesian *res extensa* existing in absolute Newtonian space and time. The reification of objectivity in thought and life produced an abstract(ed) rationalized object with its sensuous characters being relegated to the narrow confines of a particular self-consciousness.

"There were two powerfully contributing considerations to this distinction" between primary and secondary attributes, and between mediate and immediate experience (Mead 1938\1972: 17). One reason was "found in the fact that both

the organism and the environment could be stated in terms of these primary qualities as a so-called fundamental matter" (Mead 1938\1972: 17).

The second reason was "the fact that it was possible to state the conditions in terms of matter and motion under which the secondary qualities arose. It became possible to regard the secondary qualities as effects produced in consciousness by the action on the organism of matter in motion" (Mead 1938\1972: 17-18). Here Mead critiques the reductionism of mechanistic materialism wherein the sensuousness of the perceived world -- still evident in the categories of medieval science and philosophy -- is translated into the mathematical geometrized rationalizations of the classical epoch of the seventeenth century and the era of Enlightenment of the eighteenth. This analysis thus parallels that of Husserl's diagnosis and critique of "the crisis of European sciences and transcendental phenomenology" (1970), and that of Lukacs' critique of the antinomies of bourgeois thought in "Reification and the Consciousness of the Proletariat," *History and Class Consciousness* (1971).

"This still left extended inert matter in motion both in and out of consciousness. Locke and, later the Scottish school assumed that there was an immediate awareness of this, while the secondary qualities were given only in presentation" (Mead 1938\1972: 18). Here Mead critiques the naive empiricism of Locke and the Scottish School which at certain universities of his day. "Berkeley's and Hume's analysis easily showed that there was no passage from consciousness to an object outside consciousness in the case of the primary qualities if this passage had been denied in the case of the secondary qualities; and the Mills formulated the doctrine that our knowledge was solely of states of consciousness and that a world outside these was purely an assumption" (Mead 1938\1972: 18).

The idealist Bishop Berkeley and the empiricist David Hume further developed this discourse of the relations of primary and secondary qualities of physical perceptual objects. They deconstructed Locke's dichotomy between primary and secondary qualities, and argued that what hold true for primary qualities must also hold true for secondary

qualities. And father James Mill and son John Stuart Mill stood on the shoulders of Locke, Berkeley, and Hume, and demonstrated that consciousness could know only consciousness and that the external world is a regulative hypothesis - an "as if."

"In the meantime scientific analysis had carried the structure of matter far beyond the range of any immediate experience, and the mathematical analysis of space and time had substituted a conceptual space and time for that of immediate experience" (Mead 1938\1972: 18). With the move into the novel sub-atomic physics of the twentieth century and the rewriting of the discourse of the five experiential senses to produce a discourse of mathematical scientific conceptual objects which are beyond the domain of physics -- literally metaphorically so.

Mead concludes:

Thus the real world was conceived of as made up of elements which by definition could not be objects of immediate experience, while the action of these

elements was supposed to be the causes of the
conscious experience, immediate and mediate
(1938\1972: 18)."

Mead refers here to the crisis of sensual imagination entailed in the new revolutionary physics of his day: a physics of which Baron Lord Kelvin complained that solid objects had melted into air, and that he could not visualize the new Bohr atom. How does one visualize matter when it is dissolved into mathematical equations, probability functions and four dimensional Minkowski space-time? The old metaphorical idols could no longer represent truth, and new metaphors were called for. This discursive shift shook the foundation of classical mechanistic physics to its core, and the edifice came crashing down, revealing that the house of Being had really all along been built on shifting silt and sand -- the transvaluation and deconstruction of positivism by positivism itself!

But "[t]he scientist still uncritically assumed that the space and time of his experimental science was that of

ultimate reality and that the elements of matter were but minute portions of the extended things of immediate experience" (Mead 1938\1972: 18). Here Mead critiques Machian positivism once again. For the consciousness of positivist realism has no basis on its own account of truth and reality to hold that the space, time, and matter of its experimental interaction\communication with nature are constitutive elements of that nature's ultimate essential reality. For space, time, and matter of the novel physics are regulative pragmatist postulates of a natural reality which cannot be "directly immediately observed." Thus positivism is hoist with its own petard: the deconstruction and transvaluation of the values of positivism by positivism itself! (We can almost see the long shadow cast by Nietzsche's ghost at this moment.)

"Thus we have been left with what has been called a "bifurcated nature" " (Mead 1938: 18). Mead concludes that the result of the discourse on primary versus secondary qualities is the production of a dual nature, a divided world, a false dichotomy of subject versus object, mind

versus matter, process versus structure, internal versus external, humanity versus nature.

The reality of this reified world "was found in the motions of physical particles endowed with inertia and exhibiting varying forces in their motions. With whatever epistemological justification, this matter and its motions seemed to belong to immediate experience, or could be so conceived -- at least all observation and experimentation went upon this assumption" (Mead 1938: 18). Mead says "seemed," because he holds the view that human experience is never merely and simply immediate but is always mediated by significations.

Mead continues:

But the color, sound, taste, odor, and temperature of this world was lodged in a consciousness. The most convincing justification for this division has been found in the statement of the scientific object. This object in its structure and in the effects which it produces on the organism

directly, but chiefly through media, is conceived of as the cause of the secondary qualities. It could, therefore, not have these qualities themselves. Surfaces which reflect waves of ether cannot themselves be colored, since they are preconditions of the experience of color. Extension and solidity may exist both in and out of consciousness; but color and sound, being caused by the action of extended things, cannot inhere in the things. This position is, of course, entirely uncritical. If physical objects must be thought of as the causes of color, sound, odor, etc., through their action directly or indirectly upon the nervous system, they must also be thought of as direct or indirect causes of the consciousness of extension, duration, and solidity in so far as these are characters of things; but physical theory seems itself to have already left immediate experience in its minute subdivisions of matter into molecules, atoms and electrons, although for the imagination of the physicist these physical elements are nothing but smaller and smaller bits of the matter which he has under

his hand. However, though these minute particles could not themselves be experienced and in their combinations are thought of as the causes of the sensations of extended, inert matter, pressure, and force, we can still think of these particles as not only smaller bits of the matter about us, but the characters of inertia, of pressure, and force can be also indefinitely subdivided in imagination without losing their characters of immediate experience (1938: 18-19).

The scientific object in its conception and practical use in science is the epitome of this structural dichotomy between a primary and a secondary nature. Again, sensuous characters of this cosmic drama act as the phenomenal appearances of a more fundamental essential nature, as the effects of originary causes. Since essence is the cause of accident, it cannot itself -- at least in this physical worldview -- be of the character of accident. Hence essential surfaces which reflect and effect accidental waves of ether (the mystical substance of the pre-Einsteinian cosmos) propagating color and sound cannot themselves

possess color or sound, because they are the prior *preconditions* of the experience of color and sound. Mead points out the uncritical positivistic character of the position which holds that color and sound cannot inhere in things in themselves because they are the *after effects* of these things. For Mead -- as for Kant -- the conditions for the possibility of the existence of objects are the conditions for the possibility of the *experience* of these objects -- a nondualistic reading of Kant in which existence and experience are one. And in which synthetic phenomena of the world are united with a priori categories of consciousness in a priori synthetic judgements of experience. But physical scientists of the twentieth century have not followed Kant's critical philosophy, and have uncritically constituted a cosmos in theory and practice that is deeply dichotomously divided between immediate experience of secondary qualities on the one hand and mediate cognition of primary qualities on the other. This division of the world into primary and secondary nature is replicated in the division between scientific theory and practice. For physical theory has left immediate experience behind in its constitution of molecules, atoms, and electrons, whereas scientific practice *pragmatically*

conceives of these (id)entities in terms of immediate experience it handles in the laboratory.

29

Mead writes of the relations between the constitution of atomic theory and the discourse of primary and secondary qualities thus:

Thus we can think of the electron even as a bit of matter pulling away from or toward electrically charged plates, just as we can feel a piece of iron pulling toward a powerful magnet. But we cannot think of the surface which absorbs certain light waves and reflects others as having the color which we say we are conscious of when the reflected ray has affected the retina and the central nervous system. Physical theory itself lifts the color, sound, and other secondary qualities off from the object, leaving in their place certain structures and motions which are the indirect causes of the sensations but are as structures and motions qualitatively different from the sensations themselves. For current

uncritical scientific imagination the physical particles have the same qualities which we call the primary qualities of sensation. They cannot even for an uncritical imagination have the characters which we call those of the secondary qualities because physical theory has substituted for the secondary qualities certain structures and motions which are the causes of the appearance of these sensations in consciousness. Physical theory may be said to be explaining secondary qualities in terms of the primary qualities (1938: 19-20).

Here again, Mead foregrounds the disjuncture between contemporary physical scientific theory and practice. This has come about by the increasing abstraction, rationalization, quantification, mathematicization, geometricization, formalization, and (in Lukacsian and Husserlian terms) reification of relativity and quantum theory on the one hand, and the practical imaginative technoscientific requirements of human social interaction with and intervention in nature on the other. And this

crisis in the relations between theory and praxis is concomitant with and entails a crisis of metaphor, of visualization, of metaphorical visualization.

Husserl(1970), of course, thought of this crisis as an internalist crisis of European sciences, whereas Lukacs (1971) thought of it as a representation in the categories of bourgeois philosophical thought of the crisis of bourgeois capitalist society. Hence in the discourse of mathematical physics we can think of the electron as a quantum probability function, but in the discourse of laboratory pragmatics\handling and -- democratically everyday life we can also imagine the electron as a tiny ball spinning around its nucleus conceived as a bigger ball in a way similar to the revolution of a planet around our sun. It is indeed interesting that here Mead locates creative imagination with the pragmatics of handling or manipulating matter, and of constitutively manufacturing scientific facts ("manus" = "hands") -- but, after all, he is a pragmatist philosopher.

Now Mead disrupts the discourse of primary and secondary qualities with his pragmatist discourse of *social* behaviorism, shifting the rules of the language game:

An explanation of the secondary qualities in terms of the primary is compelled to present the distant object, seen or heard or smelled, in contact terms, for the ultimate three-dimensional physical thing exists for us as something that could be conceivably handled and broken up by a sort of crumbling process into smaller parts of the same material character (1938: 20).

Mead translates the discourse of primary and secondary qualities into a discourse of contact and distant experience: primary is to contact as secondary is to distant. The problematic of primary versus secondary qualities and of matter versus mind emerges changed as a question of the degree of social field interaction between acting organism and perceptual-scientific objects.

Mead continues in his discursive emergent revolution:

When we regard a colored object at a distance, its reality for physical explanation is found in the object as we could come into contact terms with it, but now at a distance sending out original or reflected waves through a medium to the organ of vision. This analysis breaks up the whole perceptual situation that includes the distant object, the medium, and the organism, and recognizes a temporal process with earlier stages that precede the completed process (1938: 20).

Hence the physical thing as an (id)entity is pragmatically eventual\provisional or hypothetical and open to question. The thinghood of a thing becomes identified in a relational field of sociality comprising the acting organism, the intervening medium, and the distant perceptual-scientific physical thing. The perspective is therefore not in the subject, nor is it in the object -- but both subject and object are within the perspectival field. Moreover, the establishing of the identity of a physical thing is predicated upon 1. the existence of timespace distancing the object from organism, and 2. the processual removal of this spacetime distance with contact.

"In so far as these earlier stages [of establishing organism-object contact and hence thing-identity] are occupied with objects, they could not be coloured, for the whole situation is not given" (Mead 1938: 20). In other words, the distant perceptual-scientific object is only a *potential* physical thing which only becomes actualized as a thing when it contacts the organism.

Again, the Meadian subject-object is not centered, given, and present(ed) in one space at one time, but is decentered, fractured, polyspatial, polytemporal, and comprises a field constellation of multiple sites, spatiotemporal perspectives, and worldviews. "In the case of contact experience the whole situation is there whenever the experience is present" (Mead 1938\1972: 20). As with Hegel, the truth and reality of experience is in the whole context of the situation of actionexperience.

Mead privileges the reality, the this-sidedness, of contact experience of an object thus:

If we present a distant planet, its matter is presented as we would actually sense it if we could place our hands upon it. It is true that even in this case there is implied a process in the nervous system between the contact and the excitement of the central tract, but even here elements and motions are also presented in contact terms as molecules, atoms, or electrons. In the case of colors and sounds we present elements of contact experience which must be active before the experience of color or sound can arise, and these cannot be presented in terms of color or sound.

Our explanation of color and sound, then, implies objects as existing before the experience of color and sound can exist. This does imply, however, that as over against the whole mechanism of object, medium, and organism the object has not these characters as genuinely as *contact objects* [my emphasis] have the characters of extension and solidity and motion (1938\1972: 20-21).

Thus Mead transforms the metaphysical problematic of the reality of objective experience into a pragmatist program

for action -- reflexive, creative, experimental, and ongoing action.

Mead stresses that "It is important to recognise that, in our explanations in terms of physical science, the organism is a part of the physical world we are explaining" (1938\1972: 21). In other words, the explaining organism must itself be explained as a physical phenomenon inhabiting the world it explains. It is bad faith to omit, forget or pretend that (we) subjects are not part and parcel of the international fields we are located in.

"There is an uncritical tendency to identify the organism with a so-called "consciousness", to make it in some sense subjective as over against an objective world of things" (Mead 1938\1972: 21). There Mead revolts against subject-object dualism, and "the philosophy of consciousness" (Habermas 1992; Joas 1985; Tugendhat 1986). Again, as a pragmatist philosopher of the act, he translates the (meta)physical problems posed by the philosophy of consciousness into procedures of practical-theoretical

experimentation. The acting of living is an experimenting and the acting of sociality is hypothesizing.

"There is a certain justification in speaking of the individual as perceiving the world and in identifying him with his organism. In this case we think of him as explaining his colour experience in terms of the light waves reflected from an object through a medium to his retina and so exciting a central nervous system, all of which are stated in contact terms" (Mead 1938\1972: 21). Now there is a certain sense in which we may say that the individual is an organism perceiving an external objective world, because we may conceive of the organism explaining experiencing color via an object-wave reflection-medium-retina-central nervous system process.

But "(t)he individual, however, who is making this explanation is not the organism in the abstract terms of physical science" (Mead 1938\1972: 21). The particular perceiving person is not a colorless thing abstracted from social life.

"At his end of the process of explanation, he is a social being in an unanalyzed perceptual world, only a small portion of which is brought within the range of his investigation" (Mead 1938\1972: 21). The perceiving particular as living acting organism is a social being in a perceptual world which is mostly taken for granted, a lifeworld or Lebenswelt. Against metaphysical skepticism which doubts the existence of all existence, the pragmatist particular doubts strategically in accord with its life interests. Only a fraction of the organism's lifespace is at any time under investigation, in need of identification, on trial, in question, put "under erasure", rubbed out.

"The full statement of the reality must replace what contents have been removed in the explanation and must replace them in the perceptual objects, not in a consciousness" (Mead 1938\1972: 21). The complete theory of the reality inquired into must replace the color and sensuousness abstracted from an "enchanted world" and (re)enchant this disenchanted world -- social change as a

revolutionary transformation from disenchantment to enchantment.

The purpose of acting insurgent pragmatism in lifescience is not to enrich the realm of Reason contemplatively, but to transform the lifespace of living for the better. "The philosophers have only interpreted the world; the point, however, is to change it" (Marx 1975d).

"The explanation states what a being with only contact experience would [my emphasis] find if he could [my emphasis] follow out the physical process from the object to the organism and its central nervous system; and also affirms that in the temporally extensive process of distance experience the earlier stages can only be presented in contact terms as the preconditions for the distance experience" (Mead 1938\1972: 21).

Mead uses the conditional "would" and "could" to emphasize the conditional, provisional, hypothetical, uncertain

character of objective experience. Moreover, experience is not a thing -- but a process, an emergent event.

Now Mead poses a question which is unaskable in the regnant paradigm of quantum physics, and which shows his location in a period of revolutionary transition from one physical paradigm to another: "Does this analysis of physical science present us with a picture of the world as it exists in independence of perception? To the Marxist, this is a queer question. For the dialectical phenomenological philosophy of Marxism holds that subject and object are mutually constitutive of each other (Bologh 1979). To the Sartrean existentialist engaged in the struggle against Fascism, this is a queer question. For existentialist philosophy holds that the world exists for us. And to the quantum physicist, this is a queer question. For the philosophy of quantum physics holds that subject and object are inextricably imbricated in a common field of sociality.

What is Mead's answer to this question? "If colour and sound express a situation involving the entire mechanism of object, medium, and peculiarly developed organism, can we

say that extension, volume, motion, and inertia do not imply a situation in which are involved also objects and organisms of specially developed types" (Mead 1938\1972: 21). Now here the discourse takes an extremely interesting twist. So far -- or at least in the preceding paragraph or so -- the discourse was one of humanism with the organism equated with "the individual" "he"/"him", but now Meads speaks of "peculiarly developed organism" and specially developed types" -- special (id)entities which perhaps critique speciesism. Mead's point is that since the "soft" (feminine?) characters of objective reality express a self-world relation, then the "hard" (masculine?) characters also express this self-world relation.

31

Now I said "self" in relation to "peculiarly developed organism." But can a self be nonhuman, and can a peculiarly developed organism be such a nonhuman self? And can we say "that a world which is conceived of as independent of such situations may not be of an entirely different character?" (Mead 1938\1972: 21-22). If a worldsituation has

emerged for we human peculiarly developed organisms, then it is entirely possible that other worlds have emerged for other nonhuman peculiarly developed organisms. Do cyborgs dream of electronic sheep? Here Mead follows the Enlightenment Kant in allowing for the possibilities of "alien" lifeforms with categories of consciousness different from those of human beings. For in the eighteenth century, prevailing sacred and secular knowledge conjectured the possibilities of alien lifeforms. On the secular viewpoint, there was no (traditionally conceived Christian) God, no reason to suppose that the earth was the center of God's universe, and hence no reason to rule out the existence of nonhuman intelligences. On the sacred viewpoint, there was a God, nonhuman intelligences were signs and wonders of God's omnipotent plentitude, and there was every reason for the faithful to believe in the existence of nonhuman intelligences created by a beneficent God. Thus on *both* the sacred and secular worldviews, queerly developed organisms were distinct possibilities!

"The most that physical science seems to accomplish in this direction is to free our perceptions and analyses of them

from the idiosyncrasies and perspectives of particular observers" (Mead 1938\1972: 22). In this speculative mode of philosophizing, Mead critiques (normal) science for its narrow-mindedness and inability to imagine an other world. The most that the physical sciences seem to be able to do *within* their existing framework of reference is to universalize human scientific discourse. Who might these "particular observers" be? Might they not be "nonWestern" peoples, peoples of colour, workers, women, and queers? Queerly developed organisms indeed!

But physical science "finds uniformities which holds for all observers and thinkers" (Mead 1938\1972: 22). Following his pragmatist predecessor Peirce, Mead holds that legitimate scientific knowledge is that which is produced, circulated, consumed, and reproduced, by the widest possible community of thinkers acting in the scientific method -- we are all method actors. A society as *communis sensus* was also Dewey's pragmatic utopian ideal. But we live in a world rent apart by culture and science wars -- for knowledge is the continuation of war by other means. For Quine, the language of the university is not the language of the

universe. The problem is that it *is*. For universities have increasingly become the sites for the production, reproduction, and legitimization of new knowledges -- and hence battlefields upon which battalions of intellectuals fight it out.

32

Although physical science seeks to universalize and totalize its knowledge for all (human?) observers and thinkers, "[i]t does not transcend the fundamental conditions of contact observation itself" (Mead 1938\1972: 22). Try as they might, the headworkers cannot escape the grasp of the body. Positivism says, "Being is being measured." Very well, then! Let us measure! But we need a body to measure -- or a simulacrum that stands in for or represents the body. A measuring rod.

Let us see how the values of positivism will be transvaluated by the values of positivism themselves, how positivism\operationalism will be hoist by its own petard.

"Ultimate physical particles in science are still in terms of the occupation of space, mass, and inertia" (Mead 1938\1972: 22). Bodies exist. "Ultimate space is that of the space of the measuring rod, the rod that can be applied by the hand; and the ultimate fact of physical reality in experience is that of the effective occupation of space by the physical individual, both in the experience of resistance to what invades his place and in the advance to occupy other places, together with the sense of boundary which comes with the tactile surface experience" (Mead 1938\1972: 22). Bodies are. The being of bodies is the measurement of bodies. Measurement is with a measuring rod. The measuring rod makes bodies. Living embodied reality is nothing but the constitution of our cosmos through our social interaction-communication with it. Our flesh presses the flesh of the world -- and we make it. But positivism's position is that external bodies exist independently of our human internal bodies. Thus positivism self de(con)structs, its values transvalued, its moment of consciousness sublated, and it is revolutionary transformed into postmodern science.

Let us recapitulate this new musical harmony of the spheres. Take Einstein's theory of relativity. Einstein operationalizes or instrumentalizes time and space, the metacategories in physical science Kant: time is measured by a clock; space is measured by a measuring rod. Einstein asks, "What is time?" And his answer to this self-posed problematic is, "Time is that which is measured by a clock." He also asks, "What is space?" And the answer is, "Space is that which is measured by a measuring rod." Well then, let us measure space and time in two different coordinate systems (or frames of reference or consentient sets) moving at varying velocities relative to each other. In the faster coordinate system, time runs slower than it does in the slower coordinate system. How can we prove this? Measure time in both systems, and compare one time with the other. Place a clock in one system and another identical one in the other system, and compare the times measured on the clocks. What do we observe? The clock instrument in the faster coordinate system measures a time slower than that measured in the slower coordinate system. Is Einstein a mad scientist? Well then, let us be good positivists. Let us attempt to replicate his findings. Measure and measure over and over again. And what do we find? Time is not absolute

but relative. Repeat a similar procedure for space. Only this time use two identical measuring rods, one in each coordinate system. What do we observe? Spatial distance in the faster coordinate system contracts\foreshortens in the direction of motion more so than it does in the slower system. How can we prove this? Use our measuring instruments. And what do we "discover"? The measuring rod in the faster coordinate system measures less distance than it does in the slower one. Space is also not absolute but relative. Measurement has scientifically demonstrated to a community of authorized scientific subjects that the absolutes of space and time of Newtonian physics are relatives constituted by human experimentation in a field of sociality. Positivism is hoist with its own petard, because scientific measurement dethrones absolute time and space, and -- since God is absolute -- kills "God": the death of God as a revolutionary transformation from modern to (post)modern physics.

In the premodern cosmos, the earth is in the center. In the modern cosmos, the sun is in the center. But in the

(post)modern world, each place is the center --
deconstructively decentering the very notion of "center."

33

We arrive at the moment of:

THE STAGE OF CONSUMMATION

In the perceptual world the distance experiences are primarily stimuli to which the individual responds by approaching or withdrawing from the stimulus (Mead 1938\1972: 23).

Distant stimuli either primarily attract or repel the organism. Stimuli call out to it, and it is up to the organism to answer the call or turn away from it. "The dominant stimulation from a distance is that of vision, and the organized spatial world of perception is in that sense a visual world" (Mead 1938\1972: 23). We human animals have constituted through evolution a visual cosmos. When our hominid ancestors descended from the trees in "the ascent of man," they began to walk upright. Upright posture was achieved by mutations of spinal column and pelvis as well as

of the central nervous system. There came a time when our ancestors no longer walked on all fours or their knuckles, put their noses to the grindstone, and smelled the world into existence. Upright posture allowed "man" to stand tall and proud with eyes which faced forward, and which saw a world into existence. Freud theorizes that upright posture, the consequent visual display of genitalia (or "shop goods," vernacularly), and the ever readiness of this seeing-eye animal for sex rendered our ancestors ever on the lookout for sexual contact and sexual consummation. Here was a desiring machine if there ever was one! "As Berkeley pointed out, the visual experience is or becomes a sign of the experience which results from the approach which the visual stimulus calls out" (Mead 1938\1972: 23). In Berkeleian semiotics, the distant visual experience is a signifier representing the future contact experience of a present to be. "The full completion of the act which the distance stimulus initiates is found in some such consummation as that of eating" (Mead 1938\1972: 23). Mead's editors of *The Philosophy of the Act* comment in their "Introduction" that:

At least two basic facts distinguish a response from an acceleration. First, a response is not merely a change of position of an organism. It is a spatial movement toward an object in which an organism passes from one qualitative kind of being to a different kind of existence. A food response is a motion in which an organism passes from a hungry being into a satiated being, and the organism's attainment of this new kind of existence marks a termination of its response to the object (food). A response is a spatial change which has three properties: (1) rate, (2) direction with respect to a perceived thing or things, and (3) the quality of existence which an organism becomes in the consummatory phase of a response. For example, at the termination of a food response an organism is a satiated thing instead of a hungry animal. This third factor is the prime difference between a response of a body and an acceleration of a body. It is this factor which makes behaviour teleological rather than mechanical in form (1938: xxiv).

"It is not [so much; my edit] the consummation of the act, however, which is the perceptual thing that the distance stimulus sets going. One eats things" (Mead 1938\1972: 23). It is not the consummation or *completion* of the act which is the physical perceptual object of reality, but a process or procedure which *precedes* the completion of the whole act of sociality. "In other words, there is an experience of contact with the object which *constitutes* [my emphasis] its perceptual reality and comes in-between the beginning of the act and its consummation" (Mead 1938\1972: 23). Again, social contact experience of organism-object constitutes the cosmos. "To this experience is referred both the visual experience and the consummatory. They both become characters and adjectives of the thing (Mead 1938\1972: 23-24). Thus the thing is not a thing, but a process or event. And qualities or characters of the thing are likewise processes or events of objective experience of reality.

"This contact experience is not the bare contact with the surface of the organism.... The physical thing arises in manipulation" (Mead 1938\1972: 24). Mere superficial

contact of the organism with object does not constitute the object. The object must be handled or manipulated if its fullest reality is to eventfully emerge into existence. "There is in manipulation the greater fineness of discrimination of the tactual surfaces of the hand, the three-dimensional experience which comes from grasping, and, of more critical importance, there is the instrumental nature of the manipulatory experience" (Mead 1938\1972: 24). The social evolution -- and the evolution of sociality of upright posture was at once the evolution of the human brain, hand, and eye. Hence the importance in ontogenetic development of hand-eye coordination. For the hand must be able to seize what the eye sees and the brain thinks. From the point of view of the desiring interests of the organism, what is the point of it all if it can see but not touch the object of desire? Again, the fine-grained musculature and nervous system of the hand proceeds apace with the developmental delicacy and dexterity of the brain's neurons -- hand power wedded to brain power. Manipulatory muscle power is magnified by the instruments of labor, the developing forces of production. "This instrumental nature involves bringing the act to a temporary pause. It does not go through to its consummation at once" (Mead 1938\1972:

24). In Hegel's terms, the desiring organism carries with its object: knowledge and the developing of consciousness as coitus interruptus. In the case of the ape, almost all of the manipulatory processes are simply steps in approach or withdrawal. There is no arrest of the ongoing act as initiated by the distance stimulus. In the human animal, this preliminary termination of the act in the contact of the hand is or may be the starting point of a more complex process in which a physical thing appears as a mediation of the entire act" (Mead 1938\1972: 24). Here Mead seeks to establish a distinction between the instinctual nature of our ape cousins and the civilized culture of ourselves. But he did not have access to current research in primatology which demonstrates that our primate brothers and sisters manipulate twigs to gather their food. We have seen how gorillas choose their tool twigs, and how they adjust these tools to the requirements of the task at hand by breaking them at just the right position to make them the right length. We have seen how these apes then poke their tools into holes containing grub, grubs -- they grab their grub. In childhood, apes learn through play how to manipulate their instruments of labor: unlike us, there is no distinction among our "dumber" relatives between play and

work, pleasure and labor. "The arrest affords the opportunity for competing tendencies to response to arise within the act" (Mead 1938\1972: 24). Play and pleasure with the object desired and fondled entails freedom and choice. hence arrested action does not arrest development of mindmatter but indeed promotes it: consciousness must be stopped if it is to progress. Indeed, it is for this reason that the bodyaction of children labeled "hyperactive" is often arrested through therapy\medication, transferring this energy towards overt speechaction and covert inner conversation -- what is called thinking. The hyperactive child's overt action is arrested so that her covert action may develop more "normally". "The critical importance of this stage [of arrested action] is indicated in the fact that we come very early the distant field by means of the attitudes of manipulatory contact" (Mead 1938\1972: 24). Thus both phylogenetically and ontogenetically in human animalsocial developing, we experience early the distant field on the horizon of our desire via emotional-cognitive perspectives of handling and fondling objects of our desire and pleasure.

"We approach the distant stimulus with the manipulatory processes already excited" (Mead 1938\1972: 24). The object of my desire calls\hails me from the horizon of my expectations, and I approach it attracted with intentionality and always already excited desire: interpellation and subjectification of the subject of desire. "We are ready to grasp the hammer *before* [my emphasis] we reach it, and the attitude of manipulatory response directs the approach" (Mead 1938\1972: 24). I am expectantly and excitedly ready to grasp my toolhammer before I reach it, and my aspects of perspectives direct me down the sensuous avenue of my approach to this object of desire. Desire equals pleasure equals play equals labor. "What we are going to do determines the line of approach and in some sense its manner" (Mead 1938\1972: 24). I spy the object of my desire calling out to me. It subjectifies me as I objectify it at once: sociality as a dual-process of subjectification and objectification. I constitute the object as the object constitutes me. I see myself as the object sees me. I know what I intend to do before I do it. And this foreknowledge determines how I approach the desired object, and how I handle it. I see a waiter in the restaurant. This erotic object choice calls out to me,

invites me, "Come. Approach." He subjectifies me as I objectify him. I constitute him as he constitutes me. It is an affair of mutual attraction (hopefully, at least). I see him as I desire him to see me. I know what I want to do before I make direct body contact with him. So I approach with hope in my heart. Hope, the poets say, springs eternal in the human breast. I say to myself, "How do I handle myself. How do I handle him? How do I handle this situation? What line of approach should I use?" "It is the latter process already aroused in the central nervous system, controlling the earlier, which constitutes the teleological character of the act" (Mead 1938: 24).

34

At this moment, the thematic of temporality enters the discourse explicitly with "later". And Meadian time is a very queer time, for moments of its *future* determine moments of its present and past, reversing the "normal" past, present, future of commonsense and Minkowski space-time. The that which is to become determines the-that-which-is-

becoming, and the-that-which-has-become. Future is at once present and past: sociality as temporality.

It is sociality as temporality which constitutes the teleological character of the act. The act is not mechanical but purposeful and intentional. The intentionality of the act -- of activity, of practice -- is constituted by temporality as duration and not as mechanical blocks on Zeno's line in the Paradox. What is the distinction between time as duration and time as space? In time as space, the future cannot determine the present and the past. But in time as duration, the future does determine the present and the past. This is Henri Bergson's remarkable insight in *Simultaneity and Duration* (1955).

In time as duration, the future *stretches* back into the present which socially stretches *forward* into the future and *also* stretches back into the past: sociality as duration.

And the doors of chaos theory and complexity theory are burst asunder.

36

"Into this situation there enter the alternative manipulations that the distant stimulus arouses. For the time being [or, rather, becoming] they inhibit one another and so the act" (Mead 1938\1972: 24).

37

"Different stimuli compete for setting free the act" (Mead 1938\1972: 24). The act comprises multiple alternate potentialities. Labor is thus the technoscientific letting go and letting becoming of the objects of desire -- the (un)covering of these objects, and the letting appearing of them as phenomena.

38

"If a nail has to be driven in the absence of a hammer, the eye wanders from a stone to the heel of a boot or to an iron bar" (Mead 1938\1972: 24). The object of desire is a

driven nail. It calls out to the acting organism, "Come hammer me." I respond, "I'm coming. I'm coming." I look around for a hammer ready to hand, but one is not there. What shall I do? I can use this stone or boot heel or I can use this iron bar over here. "Finally, one or the other assumes control of the act which is thus directed by this distant stimulus rather than the other" (Mead 1938\1972: 24-25). The desired object is hence not an object at all -- not a *substantial* object -- but an ensemble or assemblage or constellation of acting potentialities. This acting of sociality and sociality of acting is structured like the Schrödinger wave function of quantum physics, for the Schrödinger wave function is also a social constellation of multiple potentialities and identities. (We shall see more of this similarity in Chapter 5.)

"The human animal thus sees physical things, i.e., the initiated manipulatory response in the distant stimulus that sets free the activity of the organism" (Mead 1938\1972: 25). Again, the physical thing is not a thing; it is no thing; it is nothing -- but an acting. The human acting physical thinging sees the objective acting physical

thinging, because it is in the interests of the organizing to respond to stimulating and exciting desiring and desired objects in order to releasing the acting of this organizing.

"Such an aroused future act has always a hypothetical character. It is not until this initiated response is carried out that its reality is assured" (Mead 1938\1972: 25). The aroused future acting of sociality is always already a that-which-might-be, a possibility, a potentiality. This potentiality is only one of multiple potentialities capable of becoming emerging actualized objectified reality. This potentiality is only one of multiple identities capable of becoming emergent actualizing objectifying reality. What is it that turns an acting potentiality into an acting objectifying and objectified reality? It is the acting sociality of an organizing. It is only in acting that truth and reality are realized as objective reality identities. Let us take as an example the social acting of measuring the location of a quantum identity in an experimenting. "The experimental method is imbedded in the simplest process of perception of a physical thing" (Mead 1938\1972: 25). In the same way that all

(wo)men are philosophers, all (wo)men are experimenting scientizing of physical objectifying. It is only in the social acting of measuring the location of a photon -- a quantum of light -- that the photon is realized, objectified, identified, created. But this identity is always a fractured fragmented identity. Following Heisenberg's indeterminacy\uncertainty principle, the identity of the photon can only become identified in part at any one time. Hence when we identify the photon as located objectparticle, we cannot identify the photon as wavelength. Hence when we create the photon as particle, we cannot create the photon as wave and vice versa. Thus the sociality of wave-particle duality and the wave-particle duality of sociality.

"In this sense the future is [always] already in the act" (Mead 1938\1972: 25).

"And the past is also in the act, for facility and familiarity are products of past reactions" (Mead 1938\1972: 25). Again, the act is of sociality, because it has the capacity of becoming more than one thing simultaneously --

in this moment, time: sociality and becoming as time. Acting comprises (1) the-future-of-events-to-become, (2) the-past-of-events-that-became, and (3) the presenting-becoming. Past practise of practice produces the technoscientific facility of laboring interacting of organizing and cosmos. "The physical thing, then, as distant from a stimulus, is a hypothetical, hence future, accomplishment of an initiated process, to be tested by the contact experience" (Mead 1938\1972: 25). The thing is not a "thing" at all, but an emerging event of questionable (id)entity to be tested experimentally in bodily contact. "If it sets free the initiated processes, e.g., driving the nail, it is a hammer" (Mead 1938\1972: 25). Activity determines identity. "The environment around an individual is a set of such hypotheses, in so far as it is made up of physical objects" (Mead 1938\1972: 25). The lifeworld or lifespace of the acting organism is a set of potentialities. "The assurance arising from facility and familiarity constitutes [my emphasis] them objects which are there, but is after all a provisional assurance which may collapse at any moment (Mead 1938\1972: 25).

"Every act, however, is moving on from its physical objects to some consummation" (Mead 1938\1972: 25). Labor is therefore a project of desire and value. "Within the field of consummation all the adjectives of value obtain immediately. These objects are possessed, are good, bad and indifferent, beautiful or ugly, and lovable or noxious. In the physical things these characters are only mediately present" (Mead 1938\1972: 25). Here Mead distinguishes between fieldidentity which is real, consummate, and consummated, and thingidentity which is unreal, questionable, and unconsummated by bodily contact or experiment. "There is nothing good nor bad, but thinking makes it so." The value of an (id)entity does not reside in the entity *itself*, but elsewhere -- in the field of potentialidentities of which the entity is an instantiation. Identity is thus located not in one particular space and at one particular time, but is socially dispersed or scattered or deterritorialized within a field. It is the body which constitutes value: it is only when bodies rub against one another that they are "possessed, good, bad, and indifferent, beautiful or ugly, and lovable or noxious" (Mead 1938\1972: 25).

"Physical things are means, and means for ends which often have to be discovered. They have an existence which is indifferent, therefore to ends, and *constitute* [my emphasis] the field of mechanism. Their hypothetical character is to be distinguished from that of the attainment of the end. In scientific method they are the indication in distant experience of a contact experience which *constitutes* [my emphasis] the ultimate reality of what is given in an observation or an experience -- the reality, that is, of the physical thing, not of what it might imply; in other words, the reality of scientific data" (Mead 1938\1972: 25).

Physical things *in themselves* have no meaning or significance; they emerge as meaningful (id)entities only within the *context* of a wider surrounding lifespace or field. They are means or mediations to a teleological end but are not ultimate ends in themselves. And these ultimate ends or values are never simply given but must be actively, interestedly, and interestingly constituted by acting organizing. God is dead. And if God is dead, then it is we who have killed him. Are we worthy of this revolutionary momentous (post)modern event? If so, then we must

constitute our own values, morals, ethics. We can no longer look to a foundational God, "first philosophy," fundamental ontology, or any other religion to present us as humanizing acting organizations with a value system ready made and ready to wear -- identity and value must be worn self-consciously self-reflexively as collage, bric a brac, assemblage, ensemble, pastiche, and bricolage. We must technoscientifically take what is ready to hand to constitute our cosmos and (un)cover or (dis)cover our ultimate objective reality. Bourgeois capitalist individualistic identity becomes lost to be replaced by a found object! Physical things hence exist "indifferently" to ends in the sense that they can become one or the other object depending on their final determination in the contextual consummation of acting. Physical things hence exist as potentialities to become realized in acting consummating of bodies rubbing against one another. These physical things therefore constitute a lifeworld of potentialities of mechanism. Their uncertain indeterminate identities are distinct from those of the attaining of consummating ending of an acting. And they appear as phenomena which show themselves in technoscientific acting a signs of a distance experiencing of a contact experiencing constituting the ultimate

realizing of what is given in observing experiencing -- the objective reality of scientific data: the constitution and creation of scientific facts (Aronowitz 1988; Nietzsche 1967, Pickering 1992).

39

Now let us recapitulate these harmonies of the spheres. At the moment of our discourse when we introduced the genesis of the cosmos, we said that the cosmos was created as an acting of self-perpetuating potentiality -- the Big Bang as the beginning through\of time and space of a cosmic dance of chance. Recall that Nietzsche has said that the universe is to all eternity chaos.

40

Let us consider sociality as timespace relativity of organizing perspectives. Our discourse at this moment of our dialectic will use as its (pre)text Mead's "Fragments on Relativity" (1938\1972: 549-605).

Mead begins these fragmented perspectives or relativity, form matching content:

A. CLASSICAL AND RELATIVE MEASUREMENT

All scientific objects are assumed to be in motion. This implies that if we isolate any one in its relations to those about it at an assumed instant, it would be impossible to find at the next instant any group of objects which have maintained the same relations to this object which they occupied at the preceding instant (1938\1972: 549).

The cosmos is one of continual becoming not Being, of Heraclitean flux and not Platonic essence and eternity. This is Mead's Nietzschean fundamental cosmological assumption, his starting standpoint. They are philosophers of Parmenidean Being, and philosophers of Heraclitean becoming in terms of their fundamental posture towards life and thought. Perhaps it is a matter of "temperament" whether one chooses to define the cosmic situation as Being or becoming -- as Fichte has said. For Mead, the cosmos is assumed to be one in continual relative motion, and unlike

Laplace's deterministic cosmos, we cannot determine the relations among the innumerable bodies of life from one constructed instant to another. Specious instants or moments are abstractions from the flux of cosmic life for the purposes of scientific study.

Again, "motion with which experimental science deals must be regarded as taking place in a field of objects which do maintain the same relations to one another, i.e., motion with which science deals implies rest; otherwise stated, motion cannot be measured except with reference to points which, so far as this motion is concerned, are fixed" (Mead 1938\1972: 549). Motion must be viewed pragmatistically as *if* it were frozen in time for the purposes of experimenting and measuring. Measuring is impossible without fixed reference points. Contrary to classical Newtonian Laplacean cosmology with separate, distinct, and individual bodies mechanistically interacting with one another, the Einsteinian cosmos is a field of *always already* interconnected bodies as instantiations of this field. But "(f)or experimental science points can be fixed only with reference to objects continuing to occupy the same points

while the motion is going on" (Mead 1938\1972: 549). For experimental technoscience, we must handle objects as if they are located at particular instant points or specious presents so that we can measure\identify them with reference to other fixed points. Hence the constitution of identity is always a misidentification, a misrecognition.

Thus the cosmos is one of becoming, and this becoming is relative. We have already discussed the implications of Einstein's theories of relativity for Mead's philosophy of sociality and the act, and we will expand on these preliminary discussions in Chapter 4.

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The constitution and misidentification of the identity of an object in the experimental measuring process is also evident in quantum physics. For the ontology and epistemology of quantum mechanics and field theory is similar to Mead's ontology and epistemology of sociality. We have already discussed the implications of quantum field theory for

Mead's philosophy of sociality and vice versa, and we will elucidate on these issues further in Chapter 5.

43

Mead's philosophy of sociality is also a philosophy of chaos. For chaos philosophy and Mead's are both process philosophies wherein time is duration and not spatial extension. Time matters. And time's passages constitute cosmic novelties. in chaos and socialityphenomena, time(s) produce(s) new things which were unpredictable, undetermined, and indeterminate in identity before: "[s]omehow, nothing ever happen[s] the same way twice" (Gleick 1987: 12). This occurs, because -- following the principles of emergence -- the whole is greater than the sum of its "individual" parts. Complexity and order arise novelly out of chaos.

What is it that distinguishes the sociality of chaos and complexity from (1) the sociality of relativity physics, and (2) the sociality of quantum physics. As Gleick says in *Chaos*:

The most passionate advocates of the new science go so far as to say that twentieth-century science will be remembered for just three things: relativity, quantum mechanics, and chaos. Chaos, they contend, has become the century's third great revolution in the physical sciences. Like the first two revolutions, chaos cuts away at the tenets of Newton's physics. As one physicist put it: "Relativity eliminated the Newtonian illusion of absolute space and time; quantum theory eliminated the Newtonian dream of a controllable measurement process; and chaos eliminates the Laplacian fantasy of deterministic predictability." Of the three, the revolution in chaos applies to the universe we see and touch, to objects at human scale. Everyday experience and real pictures of the world have become legitimate targets for inquiry. There has long been a feeling, not always expressed openly, that theoretical physics has strayed far from human intuition about the world. Whether this will

prove to be fruitful heresy or just plain heresy, no one knows. But some of those who thought physics might be working its way into a corner now look to chaos as a way out (1988: 5-6).

Chaos is sociality in that it is at once both determinism and indeterminism. Mead's philosophical system is a massive struggle to reconcile determinism and indeterminism, whether these conflicting forces be at the inorganic, organic, or cultisocial levels. George Rhoads' autokinetic sculpture at the New York City Port Authority Bus Terminal, "42nd Street Ballroom," is a suitable illustration of chaos in determinism. The sculpture is a self-perpetuating assemblage (powered by an initial electrical current) of metallic tracks, levers, tunnels, bridges, and rollercoasters. Billiard balls -- an apt metaphor for a mechanical universe -- are propelled along this system by various mechanisms such as a lift, pulleys, release traps, inclines, and gravity. Usually this system works with a clockwork regularity and determinacy -- the balls rolling and tossing merrily along. Occasionally a ball collides with a xylophone, setting off musical tones. The cosmos as

a deterministic dance. But this rhythm is interrupted by a rare "error" -- a ball refuses to follow the rules of this game, to keep time and tune with the collectivity. It marches to its own drummer. It falls. You can see these revolutionaries lying at the base of the system -- cast out.

How have these social outcasts emerged? A tiny deviation occurs in a part of the system which then becomes magnified chaotically until the system is disrupted, and a ball is cast out. The mathematics of (non)linearity are relevant to the physics of chaos, because nonlinear disturbances arise from linear activity -- and vice versa. Take the swing of a pendulum. In Galilean mechanics, "a pendulum of a given length not only keeps precise time but keeps the same time no matter how wide or narrow the angle of its swing. A wide-swinging pendulum has farther to travel, but it happens to travel that much faster" (Gleick 1988: 41). The pendulum's period of oscillation is constant regardless of its amplitude. But changing angularity of the bob's motion creates a slight irregularity or nonlinearity in the equations (Gleick 1988: 41). Nonlinear equations are usually unsolvable -- representing the indeterminacy and

indeterminateness of our world. In Newtonian classical mechanics, the linear equations summarize the worldsystem, and in principle predict and determine that world. But the nonlinear equations that summarize the chaotic cosmos introduce unsolvability and indecidability into the system: sociality as a crisis of vision, imagination, representation.

44

Fractal geometry is the technoscientific visual field metaphor we needed to invent to see and constitute the cosmos of chaos -- chaosmos -- into existence.

Chaos has created special techniques of using computers and special kinds of graphic images, pictures that capture a fantastic and delicate structure underlying complexity. The new science has spawned its own language, an elegant shop talk of and *bifurcations, intermittencies and periodicities, folded-towel diffeomorphisms and smooth noodle maps*. These are the new elements of

motion, just as, in traditional physics, quarks and gluons are the new elements of matter. To some physicists chaos is a science of process rather than state, of becoming rather than being (Gleick 1988: 4-5).

The word "fractal" comes from the Latin adjective *fractus* from *frangere*, to break. "Fractal" resonates with "fracture," "fraction," "fragment" (Gleick 1988: 98).

Fractal geometry of chaos goes back to Henri Poincare, the great French mathematician who linked topological geometry, dynamical systems, and chaos theory in his 1903 *Science and Hypothesis*. As Gleick (1988: 46) says:

Both subjects, topology and dynamical systems, went back to Henri Ponicare, who saw them as two sides of one coin. Poincare, at the turn of the century, had been the last great mathematician to bring a geometric imagination to bear on the laws of motion in the physical world. He was the first to understand the possibility of chaos; his

writings hinted at a sort of unpredictability almost as severe as the sort Lorenz [who found that the weather is indeterminate because small irregularities in input develop into violent turbulences in output] discovered.

Topology studies geometrical properties that are unaffected by changes in shape. For example, a torus or "doughnut shape" has a hole in its center which structures it. Topology studies the properties of this torus which remain unchanged after the torus is twisted or contorted. Topologists ask whether a shape is connected, pierced, or knotted, and topology allows them to conceptualize\visualize four-plus dimensional space: sociality as the Hegelian development and transformation of conception (Gleick 1988: 46).

Chaos as sociality entails at once both determinism and indeterminism, regularity and irregularity, linearity and nonlinearity, periodicity and nonperiodicity, stability and turbulence, equilibrium and disruption, steady state and phase disturbance, stability and erraticism, order and disorder, Being and becoming. Consider the Lorenz

attractor. This is a metaphor created by a meteorologist Edward Lorenz at Massachusetts Institute of Technology in 1960 to see the cosmos of deterministic disorder. Lorenz simulated the weather in a computer model using twelve equations. Lorenz hoped to achieve John von Neumann's dream of a deterministic orderly mathematical world wherein weather forecasting would be an apodeictic science. But he failed gloriously, because he found that -- owing to systemic sensitivity to initial conditions -- small irregularities in input led to massive turbulences in output. Lorenz created a computer graphic picture to demonstrate this behaviour, this repetition of patterned disorder -- identity in difference (Gleick 1988: 11-26).

As Gleick (1988: 26,29) writes:

Although the Lorenz system did not fully model convection, it did turn out to have direct analogues in real systems. For example, his equations precisely describe an old-fashioned electrical dynamo, the ancestor of modern generators, where current flows through a disc that rotates through a magnetic field. Under

certain conditions the dynamo can reverse itself. And some scientists, after Lorenz's equations became better known, suggested that the behaviour of such a dynamo might provide an explanation for another peculiar reversing phenomenon: the earth's magnetic field. The "geodynamo" is known to have flipped many times during the earth's history, at intervals that seem erratic and inexplicable. Faced with such irregularity, theorists typically look for explanations outside the system, proposing such causes as meteorite strikes. Yet perhaps the geodynamo contains its own chaos.

Mapped in three-dimensional space, the Lorenz attractor resembles an owl's face or a butterfly's wings. This representation (un)covers the fine structure of the chaos. In traditional mechanics, the path of one variable is mapped in a time-series. but the continually changing relations among three variables required mapping in three-dimensional space for any instant of time. So as this system changes, the figure traces the path of the variable. The end result is a representation which demonstrates the aperiodicity of a system that never exactly repeats itself as it loops around

forever, never intersects its own pathway, and is always already novel. The representation mimes reality, but the miming is never an exact replica or mirror-picture of reality. The crossing over from one wing to the other represents a reversal of spin of the converting fluid dynamical system -- but this is only an approximation, a simulacrum. Objective identity remains elusive, mysterious (Gleick 1988: 29).

45

Speaking of the mysterious, Mead's philosophy of sociality is a (post)modern scientific cosmo-onto-theo-logy. His sociological social psychology of the self -- his social physics -- is embedded in his biosocial physics which is embedded in turn in his (meta)physics of cultinature. Consider briefly Mead's cosmology in "The Process of Mind in Nature" (1938\1972: 357-442) which "seems to have been the beginning of a systematic presentation of his views" according to the editors of his *Philosophy of the Act* (1938\1972: v).

For the purposes of logical analysis, we can distinguish three factors that have influenced our conception of mind since the revolution of modern physical science of the Renaissance: "the bifurcation of nature, the relation of the object of experience to the experiencing individual, and the location of contents in experience which have no definite place in an abstract physical environment" (Mead 1938\1972: 357).

In the European Middle Ages, the cosmic world picture was a holistic totality of religious enchantment wherein (1) a great chain of Being located each and every (id)entity of the world in a hierarchy with a Judaeo-Christian God at the top, the angels just below, with man created in the image of God following, and (2) a system of "signs" -- of resemblances miming this enchanted order. Hence science or legitimate knowledge of the Middle Ages consisted of interpreting these resemblances, and of linking them together in a sacred text. For example, a walnut resembling the human cerebral cortex might be interpreted as a cure for

headaches given its resemblance to the brain. The cosmos was thus one fecund with magic, mystery, meaning.

But this picture of the enchanted garden of nature changes with "the conception of nature which was introduced by Galileo, through his doctrine of dynamics," and which "reduced it to a statement of matter in motion" (Mead 1938\1972: 357).

"Matter was conceived of as that which effectively occupies space, i.e., resists the tendency of anything else to occupy the place which is occupied by the body in question, possesses inertia, i.e., the tendency to remain in the state of rest or motion in which it is found; has mass, i.e., has a quantity which can be measured, given equal density with other things with which it is compared, by the amount of space occupied; and has mobility, i.e., the ability to pass from one place to another provided its inertia is overcome" (Mead 1938\1972: 357).

The material thing is at a particular space, is not active unless acted upon, and has an inherent particular mass. The universe is a Cartesian-Newtonian one of *res extensa*.

Mead continues:

There were, of course, other characters of matter which had to be recognized, notably the characters of chemical substances, heat, and those of electricity. Heat was resolved into motion of the physical particles of which the objects of experience are made up. The electrodynamic theory of matter undertakes to state chemical characters in terms of the changes which result from the structure of so-called chemical substances out of the two sorts of electrical particles, positive and negative, which it assumes are the ultimate constituents of matter (1938\1972: 357).

The quality of heat is reduced in classical modern physical science to the quantity of motion of the particles of mechanistic matter. The variegated qualities of the sensuous chemical world are reduced in the electrodynamic theory of matter to quantitative changes in combination of

the ultimate constituents of matter. These "ultimate" particles were positively, neutrally, and negatively charged protons, neutrons, and electrons respectively in Mead's times. Today, the ultimate constituents of matter are leptons and quarks -- and who knows what they will be tomorrow? Indeed, there is talk now of a particle that is both a lepton and a quark -- a leptoquark -- sociality of matter at the ultimate level. The reduction of quality to quantity has proceeded apace with the movements of scientific thoughts in the twentieth century so that we speak now of two fundamental forces: (1) the gravitational force, and (2) the electromagnetic-strong-weak-force. The first represents the world of Einsteinian relativity, whereas the second represents the world of quantum field physics. Scientists are currently working to unite these two forces into one in a grand unified field theory of quantum gravity.

Mead summarizes the culmination of modern mechanistic materialism:

If nature is ultimately made up of positive and negative particles of electricity which possess

mass and inertia, the only other character which it has, apart from the aggregations of these particles and their motion, is that of the differences of the positive and negative particles, which can be stated in terms of mass, volume, and motion (1938\1972: 357-358).

But there is an attempt in (post)modern theology of nature, anticipated by Mead, to re-enchant this sterilized world, to re-create a new worldpicture inspired by the three revolutions in theory: (1) relativity physics, (2) quantum physics, and (3) chaos\complexity physics. Philosophers of the cosmological anthropic principle and the Gaia hypothesis have (re)presented the cosmos as a living self-acting holistic consciousness. Scientists speak of the God particle, while East meets West when Indian gurus discourse with quantum relativity physicist such as David Bohm. Among the most recent cultural confluences of Western and Eastern physical thought is that of Deepak Chopra's quantum-Hindu-Buddhist philosophy of mind-body healing.

And the mind-nature cosmology of Gregory Bateson is also in the tradition of Meadian pragmatist philosophy of sociality and praxis. For Bateson -- cosmologist, anthropologist, sociologist, physiologist, psychologist, linguist, semiotician continues Mead's project of (re)locating mind\consciousness in a (re)enchanted nature. "Within the world of the American behavioural sciences, Gregory Bateson has always had the scout's ambiguous status" (Toulmin 1985: 201). As Stephen Toulmin says:

In the literature and movies of the American Frontier the scout is usually depicted as a roughly clad eccentric who leaves the safety of the settlement and reappears unpredictably, bring a mixture of firsthand reports, rumors, and warnings about the wilderness ahead -- together with a tantalizing collection of plant specimens, animal skins, and rock samples, not all of which are fool's gold. At first the settlers find the scout's help indispensable: but once their community begins to consolidate he becomes a figure of fun; and finally after respectability has set in, he is a positive embarrassment. Yet

their premature respectability is vulnerable. When the settlement is struck by drought, the scout's nature lore leads the settlers to hidden springs of underground water, but once the crisis is past, respectability reemerges, and the scout is ridden out to the town line (1985: 201).

Bateson, as post-Meadian scout holds three Meadian views: (1) "the necessity for "multiple descriptions" of all natural processes, (2) a circular conception of casual interconnections, and the role of "stochastic processes" such as natural selection in generating new modes of adaptation" (Toulmin 1985: 207).

Bateson's "multiple descriptions" correspond to Mead's multiple perspectives and multiple identities; his conception of causal interconnectedness corresponds to Mead's holistic dialectics; and his examination of stochastic synergistic processes corresponds to Mead's inquiry into the unpredictable indeterminable emergence of novelty from an old order of things.

* * *

EXCURSUS ON JAMES JEROME GIBSON

Mead's critique of mechanistic Watsonian behaviorism, his contact theory of perception, and his objective perspectivism may be compared with the ecological information-based approach to visual perception of J.J. Gibson, born 1904 (1979). For Gibson, as for Mead, the organism is not a passive recipient of external environmental stimuli but actively seeks out those properties of its ecological surroundings that are functionally relevant to its life in the world. Perception is not reducible to atomistic sensations, but functions holistically as a fieldsystem comprising the organism-being-there-in-its-world. Cartesian subject-object dualism is thereby avoided: the self knows itself as it knows its world (Reed 1988: 274-295). Gibson's perspectival realist theory of perception is centered on his concept of affordances. "An affordance cuts across the dichotomy of subjective-objective and helps us to understand its inadequacies. It is equally a fact of the environment and a fact of behavior. It is both physical and psychological, yet neither" (Gibson 1979: 129). An affordance is a property of the environment which -- in Meadian terms -- can call forth a response from an

organism. Against Kantian idealism, this property is objectively there in a world common to all observers. Hence there may be a field of grass common to both a cow and a person. Against naive realism, this field of grass may afford different responses\perspectives for different organisms. Hence the field may call forth the act of eating by the cow, whereas it may call forth the act of mowing by a person (Reed 1988: 293-294).

CHAPTER 4. THE MATTER OF IDENTITY AND THE IDENTITY OF MATTER: RELATIVITY PHYSICS

46

Mead's philosophy of the becoming of sociality is at once a philosophy of the multiplicity and indeterminacy of identity of matter physical, biophysical, and sociophysical.

Let us consider Mead's critique of a substantial essential identity in his reading of Einstein's theories of relativity. For Mead transposes or translates Einsteinian relativity of physical identity into relativity of biophysical and socialphysical identity. The relevant texts here are his "Fragments on Relativity" in *The Philosophy of the Act* (1938\1972: 549-605), and his last writings in *The Philosophy of the Present* (1932\1980).

As we said in Chapter 2, Mead's philosophy of sociality is a deconstruction of the classical Greek notions of "substance," "essence," and "form."

Mead's editors observe that:

The epistemological view of Plato's earlier writings that the changeless alone is real and knowable, coupled with the historical development of the Aristotelian axiom of the immutability of essences or essential forms upon which the traditional subject-predicate logic is based, left little room for the recognition of the epigenesis of new forms, or for the place of novelty in metaphysics. This type of Greek thought found its way into the scientific thought of the seventeenth century. It was expressed by the phrase, "there is nothing new under the sun," and was more precisely formulated by the conservation of doctrines, such as Descartes' doctrine of the conservation of momentum and Leibniz' doctrine of the conservation of force. That is, for the early

modern scientific thinkers, in so far as the physical world is knowable it is eternal (1938\1972: xlvii-xlviii).

The goal of the Pre-Socratic Greek philosophers was to find the underlying order of the cosmos. "In early Greek speculation interest gathered about the character of contact experience - the wet and the dry, the hot and the cold, the heavy and light" (Mead 1938\1972: 385-386). These Pre-Socratic - among them Thales of Miletus, Anaximander of Miletus, his pupil Anaximenes of Miletus, Anaxogoras of Asia Minor, Heraclitus, and Empedocles - sought to explain their cosmos in terms of sensuous experience: fire, water, earth, air.

The profounder analysis of the Eleatics come back to the resistant solid extension, incapable of change, i.e., timeless by its very nature" (Mead 1938\1972: 385-386). Another tradition of the pre-Socratic Greek physical thinking sought to explain the cosmos in terms of mathematics. This group included Pythagoras who related mathematics to music, Parmenides the Eleatic philosopher of

Being who inspired much of Heidegger's inquiry into Being's meaning, and Parmenides' pupil Zeno of Elea. These philosophers of Being viewed the cosmos as one of changeless harmonic geometry. The true was that which had an absolute spatial extension, atemporal duration, and external characters such as mass and volume.

Speusippus and Democritus rescued change by insisting on the distance, or visual, character of space, and by confining change to motion of particles, and the effects of this motion to contacts of the atomic particles of matter" (Mead 1938\1972: 386). But Democritus' atomism was ultimately deterministic, because the motion of the particles was itself determined.

Mead continues:

The discovery of Socrates and his followers that all the characters of things, which conflict has analyzed out, can be referred to by significant symbols, lifted them into the realm of dialectic, or conversation -- into the agora, or into the

inner agora of thought. The fact that these significant symbols referred to universal constants in things and that these characters of things appeared as inner attitudes of response in the self, presented what seemed to be a realm of being into which idealistic philosophies transferred the ultimate reality of the environment from the world of perception. The effect of this was to transfer the reference on experience from the stimulus in the act to its promised result, over from the perceptual world as an appearance to a world of logical forms, or natures, or ideas. The perceptual world, that of appearance, was characterized by its particular instances, which only shared the universals or only imperfectly expressed them, and by its change, in which particular things decayed and perished and so lost their forms or universal characters. The forms or ideas were universal, permanent, and changeless. Thus the ancient world, blurring the distinction sharply presented by Democritus, abstracted the world of immediate

experience from that which the significant symbol indicated in social converse (1938\1972: 386).

The Socratic turn was a turn inward, a turning towards a supersensuous world and soul. The Socratic philosophy of dialectical discursive use of significant symbols produced a supersensuous cosmic order of absolute, eternal, unchanging, universal truths -- the unity of The Good, The True, The Beautiful. The Socratics transferred the sensuous contents of the sensible world to contingent instantiations of a more real supersensible world: the mathemization and reification of social life, and its conversion into an ahistorical acultural Realm of Being.

Conversely, Mead -- like Marx and Lukacs -- locates the metaphysical problematics of thought in the social field context of existing Greek Athenian life: "The grounds for the shift of reference can be found, I think, in the character of the problems that occupied ancient reflection. These problems were almost all entirely social problems, at first those of politics and then those of individual conduct -- those of morals" (1938: 387). Hence unresolved political conflicts and struggles, and moral dilemmas were played out

in the realm of dialectical thought: reification of consciousness, abstraction of sensuality, hypostatization of everyday life, alienation of human being from human being -- and from nature (Lukacs 1971). "The first effect of this was enormously to emphasize the social technique of reflection, in other words, dialectic and logic, and to hypostatize those universal characters to which the significant symbols refer" (Mead 1938\1972: 387). The particulars of a specific cultisocial field are dehistoricized, desocialized, and decontextualized -- the universalization and naturalization of what is merely contingent and context-determined. "The second effect was to place the universal characters of things outside experience because ancient reflection was frankly unable to find solutions for their social problems either in politics or in morals" (Mead 1938\1972: 387). Here Mead makes the startling claim that the antinomies of Socratic thought (re)presented the impossibility of achieving social justice in a community wherein master and slave, citizen and helot, man and woman faced each other in a struggle for mutual recognition. As Mead says:

They could devise neither an order of society nor a manner of life for the common man which within immediate experience could meet the social problems that confronted him. Social justice, and the union of social solidarity with individual initiative and responsibility, remained practically unattainable, and therefore as fixed conditions of the solution of the social problem were idealized as existences transcending immediate experience. The same transcendent existence was logically assigned to other universal characters of things which were arrived at by the same process of analysis and indication (1938\1972: 387).

Recall the discourse of Platonic-Socratic dialogues. Each dialogue is centered around defining a concept, whether it be The Good, Love, or Beauty. Socrates plays one particular conception of the universal metaconcept off another particular conception in a dialectical narrative comprising communicative interaction among speakers. The product of this narrative process is a universal Form which cannot be

physically seen or heard or smelt or touched. It can only be grasped by the mind contemplatively and theoretically -- the triumph of the Appolonian over the Dionysian.

48

The Greek soul is therefore split, fragmented, divided against itself: *theoria* is separated from *praxis*, contemplation from action, science from technology, minding from being. "The effect of this [process of splitting the subject] was to divide the individual on the [bio]logical level, leaving the relatively uninteresting processes of sense perception in the world of sensuous appearance, and to identify mind with the so-called supersensuous reason, the power of indicating the universals and relating them to one another. While this was a process, it did not take place in a time, i.e., in a measured duration. The unitary soul that passed over into modern thought by way of Augustine's writings was an artifact of Christian metaphysics, not the outcome of epistemological reflection" (Mead 1938\1972: 387-388). The class structure of Athenian society is at once the structure of the Greek personal identity. Recall that the so-called birthplace of democracy was a slave society.

The glory that was Greece -- the "progress" of civilization -- entailed disenchanting the cosmos, hating the body, and killing nature. As D. H. Lawrence would say, the deep dark blood gods of the unconscious were exiled, banished, cast out. The master thinkers looked with contempt at the slave doers -- the soul as Good and the body as Evil. The leisure of a Socrates, a Plato, an Aristotle was based on the labor of the slave classes. Why should society be ruled by a Philosopher-King? Because he is smarter -- and hence better -- than his (six) underlings. And he alone was capable of knowing The Good\The True\The Real\The Beautiful -- the Academic as dictator. Hence not the dictatorship of the proletariat, but the dictatorship of the Academic.

49

The birth of the soul was at once a death of soul -- a (de)animation.

50

This process of the death of animism was a process by category or concept only. It was not truly temporal or

durational, for the very concept of Time was dehistoricized, eternalized, naturalized by the Platonic scientific theory of Forms: the detemporalization and formalization of "the self."

51

The fragmentation of the self was instantiated at the cultisocial level with the decline and fall of the Roman Empire. St. Augustine, Bishop of Hippo, wrote *The City of God* in 411 A.D. after the capture and sack of Rome in 410 A.D. by Alaric, King of the pagan Barbarian Visigoths. Therein Augustine papered over the cracks in classical society and the chasm of the ancient self by projecting a utopian unity of God with Man and Man with Man in a shining city of God on a supersensuous hill: utopia as a necessary and useful metaphor (Mead 1938\1972 :388). For how can you have a dream come true if you do not have a dream? If the problematic of human society -- of the beloved community of the saints, of agape love among Christian brothers and sisters under the Fatherhood of God -- is unresolvable in *this* world, then it is unresolvable in the next. It was pragmatistically necessary to produce a unitary soul under

these field conditions. Christian metaphysics manufactured this unitary soul -- the self as both technoscientific artifact or product and process of lifethought.

Again, consider the ambiguous class position of the early Christian Church contesting for ideological hegemony with paganism. The early Christians were predominantly urbanities engaged in nonagricultural labor -- trades(wo)men, artisans, cloth merchants (e.g. Lydia the dyer of purple cloth). The class consciousness of these Christians urbanities was one of (1) cognitive dissonance, and (2) class ambiguity. For on the one hand, they were relatively successful economically, whereas, on the other hand, they were Jews in a pagan world, and subjected state-legitimated anti-Semitism. Hence Christianity appealed to them as a utopianism of eschatological bliss and heavenly reward. Secondly, they lived their lives with the perpetual expectation that the Apocalypse and the Second Coming of Christ was upon them. The failure of the Millennium to arrive produced cognitive dissonance. How were they to live their lives in this context? How were they to relate with one another? Christ had lived as a primitive communist,

condemned the religious Establishment, denounced the hypocrisy of the Scribes and the Pharisees, whipped the money-lenders in the Temple, excoriated the rich and powerful, prophesied that the meek shall inherit the earth, and made a preferential option for the poor, hanging out with whores, slaves, lepers, tax collectors, fishermen, and women -- especially the fallen ones! Christ was a revolutionary who commanded the rich man to sell all his possessions and follow him. "For what doth it profit a man to gain the whole world and loseth his own soul?" Was not Christ a homeless vagrant wandering among the lilies of the field, toiling not (He was profoundly anti-work, and expoused the right to be idle.), a Son of man who knew not where his head rested? Did not Christ beg for food in the streets and in the fields? Enter the pre-millennarium Church commanded to live as Christ did. There are rich and poor, freedmen and slaves, men and women. Notwithstanding the egalitarian division of property among *some* of these early Christian congregations, they are in fact rent by class, gender, sexual, racial, and national divisions. Enter St. Paul with his utopianly pragmatic fiction of a unitary soul. It was necessary to believe in a unitary immortal soul to hold self and society together. St. Paul

produced such a soul -- as opium-ideology for the contending classes.

52

And yet consider St. Paul's soul itself. What a queer thing it is indeed! He is the most naively cynical of confessional narrators. For what does he tell us about himself? Says our dear Paul: "If I commit sin, it is not I who commit sin, but sin that lives within me." The "I" is put under erasure -- (de)construction of the unitary ego by the constructor of the unitary ego. It is not the conscious I-ego that sins, but some other agency -- an agency of the letter of the unconscious. Like a good Foucaultian, Paul declares: "The law produces the transgression." Paul's members are always at war with themselves -- writing as a displacement, a sublimation, of "internal" struggles. Writing as discursive will to power is war by other means: the pen is really the sword.

53

In the ancient Pre-Socratic cosmos, the self and society were more at one with the cosmos -- or is this my own romantic longing for a mythical Eden? In the ancient Socratic cosmos, self and society were divided, split, fragmented. In the cosmos of Christian paganism, this division continued -- but this time under a monotheism. In the cosmos of the Middle Ages, with a (p)regnant Christianity, self, society, and cosmos were united under an omnipotent, omniscient Catholic God whose representative on Earth was the church headed by the Pope. In the flight to objectivity that was the Renaissance; the Protestant Reformation; The Catholic Counter-Reformation; seventeenth century rationalism of Descartes, Hobbes, Leibniz, Locke, and Spinoza, and the Enlightenment of the eighteenth century, self, society, and cosmos were mechanized -- and again divided dualistically between mind and matter. In the nineteenth century Romantic reaction to Enlightenment Reason, self, society, and cosmos emerged as selves, societies, and cosmologies, for there were as many philosophies as there were philosophers: the relativization of that great Romantic Rationalist Hegel. Marx revolted against Hegel: "Long ago in London town, Marx turned Hegel upside down." The last great Hebrew prophet materialized

Hegel's idealistic dialectics of History, and further relativized the (id)entities of matter. Kierkegaard revolted against both the systems of Hegel and Marx in favor of a theistic existentialist individualism wherein the metacategory representing The Good was "The Individual," and The Crowd was evil -- an individualistic social constructionism. Nietzsche Darwinized Kierkegaard, revolting against his theism, and carried onto-theo-logical relativism to its apogee. The positivist reaction to Nietzschean relativism -- the philosophies of Mach, Carnap, and Russell -- culminated in the positivistic relativism of Einstein.

54

Mead writes of relativity:

The actual field of objects whose motions with reference to one another can be ignored. Such a field is found in vision, within which no changes of position appear within the minimum visible, and whose period falls within that of visual discrimination, something like an eighth of a second (1938\1972: 549).

Again, identity entails a *field* of objects -- never a single individual. This field is really in continual motion, but the eye can discriminate only in a limited degree of change: the eye must be blinded to attain insight.

55

In addition to spatial fieldidentity, Mead constitutes temporal fieldidentity:

Any measurement of velocity involves time as well as space, that is, we must know the relative dates at which the body leaves a point and at which it arrives at another point. If this measurement is to be accurate, the dates in perception of the objects that determine these points must be identical with those of the time of departure and the time of arrival. As long as the size of the objects measured and the rate of motion lie within the range of vision, this is the case. Where this is not the case, e.g., when we are measuring the velocity of light and are dealing with the bodies and the changes which are

the conditions of vision, these dates are not identical (1938\1972: 550).

Note well that temporal identity of a moving object is also relative (to the time of departure from one space and time of arrival at another). If the rate of the object's motion and its size lie within the visual range of the eye, then the perceiving of these events occurs at the times of departure and arrival. But at velocities at or approaching the speed of light, the sizes of the objects change, and the rate of motion is in excess of the everyday visual range.

Again Mead writes:

This relation of the event to its situation, of the organism to its environment, with their mutual dependence, brings us to relativity, and to the perspectives in which this appears in experience. The nature of environment answers to the habits and selective attitudes of organisms, and the qualities that belong to the objects of the environment can only be expressed in terms of sensitivities of these organisms (1932\1980: 24).

Objective matter is not thinglike, but eventual. An event and its surrounding situation or environmental field are dialectically mutually constitutive of each other: the insurgent organizing of relative perspectives is selectively attuned to the stimuli in the environment which will enable this organism to continue its lifeactivity. The sensitivities of an organizing event are dialectically interrelated with the sensuous qualities of environmental experience.

This dialectical biophysics is also evident in the space of ideas:

And the same is true of ideas. The organism, through habits and anticipatory attitudes, finds itself related to what extends beyond its immediate present. Those characters of things which in the activity of the organism refer to what lies beyond the present take on the value of that to which they refer (Mead 1932\1980: 24-25).

"The field of mind, then, is the larger environment which the activity of the organism calls for but which transcends the present" (Mead 1932\1980: 25). The fieldspace of mental experience is at once a timespace, for the organism temporalizes its lifespace through its anticipatory expectational resoluteness towards living. An eventual object is not merely acted upon, but itself acts purposively and with intentionality on its environment. Think of an organizing perspectivizing event in its lifespace. This lifespace may be viewed as centered on an immediate present -- a present in direct body contact with the event -- with concentric circles radiating outwards towards distant and future experiences and horizons. The qualities of sense of events-which-are-to-come, or values of ethics and production, or signs of language refer to\ (re)present\ take the placevalue of things future. Referentiality is at once relativity, because the meaning or significance of an identity is not centered in one space -- but attains relevance only in and through a multiplicity of decentered relative perspectives. As Gayatri Spivak once remarked at a Socialist Scholars Conference in New York City, identity is overdetermined, meaning that it is determined some place else -- a Freudian model of identity. Sociality of identity

and identity of sociality entails relativity of identity and identity of relativity. For social identity is constituted not from a single centered timespace perspectival standpoint, but elsewhere from the mutual communicative constitution of multiple timespace eventual identities (Mead 1932\1980: xxviii, 25).

57

The self is never identical with itself if we take time seriously. "What is present in the organism, have is its own nascent activity, and that in itself and in the environment which sustains it, and there is present also its movement from the past and beyond the present" (Mead 1932\1980: 25). The organizing emerging eventing is a projecting forward from the past in and through the present and on towards the future. "It belongs to the so-called conscious organism to complete this larger temporal environment by the use of characters found in the present" (Mead 1932\1980: 25). The selfevent is never whole or wholly complete: there is a hole in it. The property of the selfevent is to complete itself socially by transcending its immediate presenting representing, and fulfilling its

tending via meaning and defining of this presenting. Hence "the field of mind is the temporal extension of the environment of the organism, and "an idea resides in the organism because the organism is using that in itself which moves beyond its present to take the place of that toward which its own activity is tending" (Mead 1932\1980: 25).

58

Thus the field of mind is at once the field of vision. "The date of all visual objects in a field of vision is that of the incidence of the wave on the retina of the eye, or on the photographic plate of a camera" (Mead 1938\1972: 550). we date the (id)entity of an event by the impact of its light upon the eye's retina -- or by technoscientific extension -- on camera. The genesis of (id)entity is at once the genesis of light. Did not the Almighty God create Light "at" Genesis? As Mead tells us, the identification of a thing is extremely elusive, because of the will o' the wisp ephemeral lightness of being and time:

We may correct this date if we know the position of the object and that of the velocity of light, as we do in the case of the vision of stars; but if we have to determine experimentally an unknown velocity of such an order, the determination must be undertaken with reference to objects occupying points in a visual space, and the points of departure and arrival will have the dates of the incidence of the wave of light upon the retina or the photographic plate, while the occupation of these points by the moving object will depend upon its velocity; and, if the size and velocity of the object excludes it from the field of vision, there will be no means of dating it as it leaves or as it arrives (1938\ : 550).

Hence the beingthere of matter is determined as light and time -- a holy trinity of being, light, and time -- and the identity of an event or therebeing is determined as terminal virtual identity: The letter sent is never the letter received. You can never tell whether the body of an itinerant lover is coming or going!

"There would seem, therefore, to be an experimental error that attaches to all experimental determination of velocities of a high order" (Mead 1938\1972: 550). The determination of (the identity) velocities at or approaching the speed of light is experimentally constituted. This "error" in measuring the occurrence of an event is not an epistemological one, or a technological difficulty which could be improved with progress, but it is an ontological matter. "This error is, however, a function of the velocity of light, for the difference between the dates of the terminal objects and of the moving objects depends upon the time that it takes light to reach the retina or the photographic plate" (Mead 1938\1972: 550). Light, time, and becoming entail one another, because the temporal identity of an event is experimentally established by the passing of the light of the event from its genesis to its arrival on the horizons of our human lifespace: light takes time. The question then becomes whether we can experimentally correct for this lag time by a constant coefficient: "Could, then, the velocity of the object be affected by a coefficient containing some expression of this velocity of light which would correct this error?" (Mead 1938\1972: 550).

Enter the decline and fall of the Absolute Aether, the prolegomena to a future relativity (meta)physics. The Eternal Aether was to Newton the sensorium of God, God's Body. It was God in that it was omnipresent, mysterious, intangible, elusive, undetectable, and heavenly. The Aether held all things together: it was the equivalent of the eternal substance of the Classical Greeks. As Mead tells us:

The assumption naturally was, then, that there was something in motion, something answering to these so-called "waves" of light. It was called "ether." The term is one which goes back to old Greek speculation, though it had a different meaning there. This [Newtonian] ether did not exhibit itself in any other phenomenon so far as known at that time. It was a substance that science set up ad hoc for a particular purpose. The waves were not discovered in the moving ether, but the mathematics of wave motion was one which best answered to the phenomenon of light. So

ether was set up as something within which the waves might occur (1936: 254).

Thus, the Aether was God in that (1) human beings believed in it on faith without evidence, (2) it had effects\signs and wonders but could not be found materially anywhere, (3) human beings created it as a useful fiction, a regulative metaphor, and (4) science wrote the language of God as the Mathematics of Nature.

Mead tells us further:

When it was set up, however, it had to be fitted into the physical doctrine of the time. If it was a substance, it itself presumably moved. If all the planetary bodies were moving through it and the stars as well, it ought to respond to their motion. If you set up a body moving through water, you not only cause waves but effect the motion of the body itself. This is true of all known liquids and gases. But no measurements made have ever indicated any retardation of the motion of the heavenly bodies on account of the friction of the ether. There was no evidence which could

be found of this ether being dragged along except, perhaps, in one instance. In studying the velocity of light passing through a moving liquid, it was found that its velocity was somewhat reduced: and at that time the first assumption that could be made for the reduction was that the ether was being swept along with the moving water to some degree. But apart from that, no evidence was found that ether was carried along with the earth which was supposed to be passing through it....[s]o it was very difficult to place ether in the mechanical theory of the universe.... Thus it is seen that ether presented a very serious difficulty in the field of the physical sciences (1936\1972: 254-255).

60

Thus the failure of Western science to identify ether drag and drift constituted an anomalous crisis in the mechanical paradigm of the universe. This anomaly in prevailing hegemonic physical theory was a perpetual thorn in the flesh

of scientists. The mystical ether had to be found, or prevailing physics would come crashing down -- and no amount of ex post facto ad hoc fiddling with experimental data would put Humpty Dumpty together again.

61

So those mighty men of physical science Albert Michelson, inventor of the interferometer, and Edward Morley set out to measure and hence identify the ether.

Michelson invented in 1881 the interferometer (after "interference"), a device for measuring distances by observing interference patterns of a light beam split in two and returned to a common point. A light source emits a beam of light towards a half-silvered mirror. The mirror splits this beam of light into two parts. One part travels *against* the supposed ether, while the other travels at a right angle to the first *across* the direction of the supposed ether wind. The distance traveled by the two beams is identical. After traveling their respective paths, the beams are reflected back by mirrors to the half-silvered mirror where

they are reunited, and where they enter a measuring device. The difference in velocity between the two beams would create interference patterns through which the measuring device would be able to identify the velocities and distances of the two beams. The theory behind this technological device was relatively simple. Think of the ether as an ocean. A boat or beam of light travelling against the current would be expected to encounter resistance or ether drag, whereas a boat or beam of light travelling across the ocean current would be expected to have a greater velocity than the first. A mobile Earth moving through an immobile unchanging ether would produce a breeze in the ether sea. A beam of light projected across this ether breeze or current would presumably encounter less resistance\friction and hence move faster than a beam of light projected against the ether breeze (Zukav 1980: 131-132). As Mead observes, "the interferometer enables us to enter the minimum visible of the source light and, through the interference of waves of light, to recognize the difference of distances of the sources of light which lie beyond the range of visual discrimination" (1938\1972: 551).

Michelson and Morley performed the now famed Michelson-Morley experiment in 1887, measuring the relative velocities of the two beams of light projected at right angles to each other. The result was shocking. The velocities were identical. They rotated the interferometer 90° to reverse the experimental situation, and again the velocities of the beams of light were identical: a negative result or failure that eventually led to relativity physics via Fitzgerald and Lorentz.

62

The theoretical implications of the failure of the Michelson-Morley experiment to identify the ether were revolutionary. For the result eventually meant that either (a) ether and ether drift did not exist or (b) the Earth is stationary: destruction of the mechanical world picture in either option.

The experiment marked the decline and fall of the Absolute in physical science at a time when the Hegelian Absolute was under attack in philosophy: Nihilism in European culture

generally. Recall classical Galilean mechanics. "Against this position [of tempiospatial relativism] stands the classical doctrine which assumes that the process of the transmission of light, which is itself the condition of visual spaces, is one in which the succession of events is fixed independently of any object of reference" (Mead 1938\1972: 552). Galilean relativity was not a relativism at all. Galileo sought a coordinate system or field wherein the laws of physics would hold Absolutely in theory and in experiment. He recognized the fact -- after Copernicus -- that objects in the universe are in motion relative to one another. Hence the problematic of constituting an Absolute unchanging Perfect frame of reference against which all other fields would be measured -- in short, the House of God. "But, while for the observation of the astronomical observatory such co-ordinates can be fixed with sufficient definiteness to secure uniformity of results, there is no stellar body that is at rest at any point, and there is, therefore no structure of points with reference to which such a space can be presented, even by the supposition of a body at rest, alpha, which could be made the organizing center, for there is no way of locating alpha" (Mead 1938\1972: 552-553). We can no longer hold to the center,

and look to an Edenic origin and genesis -- Nihilism as a (de)genesis.

Galileo treated the Earth as an inertial field, a lifespace of nonmotion relative to the motion of the other bodies of the universe. Subsequently, the search for the "still point of the turning world" -- the Parmendian center amidst Heraclitean flux -- found the so-called "fixed stars." "For the purpose of visual observation the fixed star does not move relatively to other fixed stars" (Mead 1938\1972: 553). But, once again, the center will not hold: "refinement of reference to the observations of long periods of time has elicited their actual movements, and the spectroscope reveals them indirectly as in present movement -- and our astrophysics demands that we take account of this movement" (Mead 1938\1972: 553).

63

With the universe rapidly flying off-center and moving towards X, George Francis FitzGerald tried desperately to save the data and to put Humpty Dumpty together again with

his Contraction. FitzGerald introduced his Contraction in 1892 to account for the constancy of the velocity of light constituted in the Michelson-Morley experiment. Borrowing metaphorically from the foreshortening of an object in the direction of its motion through water, he claimed that the ether compressed the arm of the interferometer in the direction of its motion into the ether. On the other hand, the interferometer arm that travelled across the ether experiment no such distance contraction\foreshortening. hence the light beam travelling up the former would have less distance to cover than the latter's light beam. The reason that the end result of the experiment was constant velocity of the speed of light -- argued Fitzgerald -- was that the distance\time contraction was exactly the precise coefficient to render the two light beams' simultaneous arrival at the measuring device. Absolute space and absolute time were thus saved by the ethereal disappearance of space and time (Zukav 1980: 130-132).

Again Mead writes of the Fitzgerald Contraction:

Thus, in the Michelson-Morley experiment it was so expected that this same difference [in the

velocity of the light beams] would be found, but it was not, and this negative result disturbed people. Fitzgerald [sic] made the suggestion that this result would be met if we could conceive of the earth as shortened in the diameter which was in the same direction as that of the motion. That is, if the Earth is moving in a certain direction, we can conceive of the diameter of the earth which lies in the direction of this motion as being foreshortened. If we found the diameter was eight inches shorter in that direction, then this Michelson-Morley experiment would be exactly accounted for (1936\1972: 257).

Mead was well aware of this revolution in electromagnetic physical theory, because he conversed with Michelson and Morley at the University of Chicago where he arrived in 1893.

Fitzgerald temporarily saved the existence of the ether, but -- dialectically -- sowed the seeds of further decentralization of the cosmos. For the FitzGerald contraction meant that spatiotemporal identity was not

static but dynamic. If the earth contracts in the direction of its motion through the ether, then the interferometer arm also contracts, and a measuring rod in turn contracts -- all by the same coefficient. Thus spatial constancy is preserved at the price of relativity of measurement: sociality as both constancy and relativity.

64

"Then came the discovery that the mathematical statement which had been given to these so-called "measurements" of space and time fitted exactly into this shortening of the body in the direction of its motion" (Mead 1936: 257-258). Here Mead refers to the mathematical formalization of electromagnetic theory in the Fitzgerald-Lorentz transformation formulae developed by Hendrik Lorentz in 1893.

Lorentz seemed to have at least demonstrated conclusively that the ether existed. After all, his mathematics were formidable, and they fit the experimental data perfectly.

There was one small problem -- he was wrong about the existence of the ether.

65

Lorentz explained the constancy of the speed of light in terms of the ether, but it is precisely this constancy that led to the downfall of the absolute ether, space, and time.

66

The constancy of the speed of light in all spacetime fields, and the universality and invariance of the laws of physics in all of these fields of reference entails the nonpresence of absolute (non)motion, of absolute space, of absolute time, and of absolute matter. Conversely, constancy of the speed of light in all spacetime reference field entails relative motion, space, time, and matter -- (id)entities relative to their field context.

As Mead says, the "failure of the Michelson-Morley experiment exhibit evidence of the movement of light in a

space-time independent of the bodies that move through it seems to indicate that, if we were able so to place ourselves in the process of the transmission of light that we could be at rest there while objects moved by us with the velocity of light, there would be no one succession of events which would be the same in every space, but that there would be in each space-time a succession which answers to the structure of that space-time" (1938\1972: 554). In other words, there is relativity of simultaneity of events; there is not one simultaneous specious present for the entire cosmos, but there are innumerable Now times for the multiplicity of field comprising the world -- because light travels at a constant speed.

Mead comments on the use of the FitzGerald-Lorentz transformation formulae in comparing the relative identities of space, time, matter, and motion in one field with those of another:

If we assume that the velocity of light remains the same in all space-time while the events that succeed one another in two space-times differ, it would follow that this difference

between the events must exhibit itself in different spatial and temporal values when we undertake to transform that which is taking place from one space-time to another. If the velocity of light remains the same on earth as in stellar space, and yet the distance travelled on earth between the sets of mirrors remains the same, while in stellar space the distance travelled is different, then from the standpoint of the earth the corresponding distance must be shorter and the time longer if we would transform them from one system to the other (1938\1972; 554-555).

Thus the Lorentz formulae allow us to translate the identities or characters of one timespace field into those of another timespace field: sociality as the emerging becoming of events in multiple timespace fields (Mead 1932\1980: 40, 45, 54, 55, 58, 104, 109, 155; Mead 1938\1972: 173, 245, 525, 526, 575, 602, 603).

67

Now in "the case of the FitzGerald foreshortening, there was no such assumption of being in both systems at once, but in

this case there was no reference to difference in simultaneities" (Mead 1932\1980: 54). FitzGerald held on to the ether metaphor, and absolute simultaneity.

68

Lorentz also held on to the ether, but his transformation formulae rejected absolute simultaneity, time, space, and matter. Thus Lorentz' work in squaring the existence of a hypothetical ether with the invariance of James Clerk Maxwell's laws of electromagnetism laid the groundwork for Einstein's special theory of relativity.

Whereas two spacetimefields in the standpoint of Newtonian relativity are alternatives which cannot be applied to the same situation socially at the same time, two spacetime fields in Lorentzian and Einsteinian relativity can be instances of sociality. Mead writes on this point:

But when we use the Lorentz transformation formula, we are giving the body the characteristics which belong to another space-time system and using the result in our own.... we are

told, however, that if an aeroplane were passing us at 161,000 miles a second we should see the foreshortening and the slowing down of the temporal extension of processes, that is, we should see in our own space-time system the effects of being in the other space-time system. that is, the two frames of reference cease to be alternatives (1932\1980: 53-54).

Mead transposes the concept of sociality or social relation to spacetime field relativity, and, concomitantly, the metaphorical linkage of physical relativity and self-other relations.

69

For Mead, the sociality of the self consists in the self's capacity to be (in) multiple relational positions\field systems, to enter into the roles\perspectives of multiple others. The identity of the Median mediating self does not exist absolutely in and of itself, but only relatively or relationally with other social selves. The self as a social

process does not experience itself directly but only *indirectly* from the particular perspectival standpoints of others (Mead 1934: 138-140, 164). The self does not know itself in the immediate moment of sense-certainty but only mediately through a multiplicity of event object relations. This "social and psychological process is but an instance of what takes place in nature "(Mead 1932\1980: 173-174).

70

Einsteinian physical relativity of space, time, matter, energy, and motion entails (1) constancy of the speed of light, (2) the invariance of electromagnetic laws specifically and physical laws generally, (3) spatial contraction, (4) temporal dilation, (5) transformation formulae, and (6) sociality of spacetime fields -- but no ether. Einstein dispensed with the Absolute Aether. He substituted four-dimensional spacetime geometry and motion of physical bodies as the cause of the relativistic effects. For Einstein, the relative motion of bodies in four-dimensional spacetime fields approaching the speed of light produced the relativity of space, time, matter, energy ($E = mc^2$), and motion. The end of Newtonian absolutist physics

came with Einstein's formulation of the special theory of relativity in 1905.

71

"The determinancy factor in this difference in the succession of events" in different spacetime fields -- the relativity and sociality of simultaneity -- "is the velocity with which one system moves with reference to one another" (Mead 1938\1972: 555). For Einstein, there is no point of absolute nonmotion; motion is always motion relative to another motion. The special theory of relativity, for example, deals with spacetime fields in uniform unaccelerating motion relative to one another, whereas the general theory of relativity encompasses accelerating fields.

72

"This velocity [of one field relative to another] is not one that is determined by an outside observer who regards both,

but one which is conceived of as recognized by each" (Mead 1938\1972: 555). Identity is not constituted by an impartial valuefree observer in a view from nowhere, but by an acting insurging agent participating or intervening in the field. Each perspecting sees itself as the other perspecting sees it , and the other views itself reciprocally as the first views it. Identity is mutually relationally socially constituted.

73

"If we assume an outside observer, he would be in another system which must be assumed to be in motion with reference to the other two, and the same problem would arise with reference to the comparative velocities of all three systems" (Mead 1938\1972: 555). Since the whole cosmos is in perpetual motion with bodies moving in multiple relative motions, we cannot locate any space wherein one fieldbody is not in relative motion with another.

74

"To say that one system is moving with reference to another is to say that an event -- every event by implication lying in all systems -- is succeeded in one system by a different event from that by which it is succeeded in the other" (Mead 1938\1972: 555). This statement of the relativity of simultaneity has caused many positivist scientists to reject Einstein's special theory of relativity on the grounds that the theory destroys causal relations between antecedent events and subsequent events.

We shall expand on this debate in Chapter 6, "The Spatialization of Time or the Temporalization of Space?" Suffice it to say here that Einstein's special theory of relativity need not necessarily contradict physical causality.

75

"When the objects within the systems lie within the range of vision, the velocities can be calculated, and with opposite directions the velocity is the same in both systems, e.g., in the case of the landscape moving by the passenger in the

train while the train moves by the observer at a station" (Mead 1938\1972: 555). Einstein's distinction between "proper" and "relative" spacetime is relevant here. Our vision of a measuring rod or a train and of a clock when these are in our relatively stationary field is that of proper identities. When we are observing our own field, we notice nothing unusual, and everything is normal -- ethnocentrism in ethnography. Our measuring rods retain normal lengths, and our clocks keep normal time. But the spacetime identity of our situation viewed from an *other's* fieldperspective is very different. "What we see if we are stationary and observe a rod and a clock travelling very fast relative to us is the *relative* length of the moving rod and the *relative* time of the moving clock. The relative length is always shorter than the proper length, and the relative time is always slower than the proper time" (Zukav 1980: 139).

"To determine velocities, it is necessary to determine simultaneities between the moving objects at points which are occupied by objects at rest" (Mead 1938\1972: 555). The only theoretically valid method of measuring experimentally

the velocity of light in multiple fields is to pick a spacetime field and to view it as being at relative rest with respect to other fields. The velocities of these other fields can then be calculated in terms of this field velocity using the FitzGerald-Lorentz Contraction formulae. The choice of inertial field of reference is pragmatistically dependent on the nature of the problem to be solved and on the standpoint of the solver.

76

"This [determinate constitution of simultaneity] takes place in vision, in which, as we have seen, all objects at the points seen have the identical date of the incidence of the light wave at the retina or the photographic plate. From our human perspective\standpoint here on Earth, we judge data events in the experimental situations of everyday life, and of laboratory life. Either you consider yourself and your field to be at relative rest and other fields to be relatively moving, or you may consider other fields to be at relative rest and yourself and field to be relatively moving.

Consider the thought experiment of the twin Paradox in special relativity as an instantiation of this. Take a pair of twins. Send one on a trip into outer space. The other stays at home on Earth. The spacecraft of the first twin is travelling at a speed approaching that of light. This twin observes the passage of time on a clock which slows his proper time. With increasing velocity of his spacecraft, the astronaut twin experiences time dilation. Time passes relatively slower for this twin, and she ages at a relatively slower rate. Meanwhile, the twin back on Earth does not experience time dilation, and ages at what is a normal proper rate for her. The two twins are at rest in different spacetime field systems. The astronaut twin will return to earth after a proper duration of several years to find that her twin has long since been dead, and that several centuries have passed on earth in its proper time (Zukav 1980: 139-140).

77

This paradox arises, because of (1) our vision of events, and (2) the velocity of the speed of light. Spacetime identities are visual identities. "The crucial importance

of the velocity of light arises from the fact that in the perceptual field of experimental science the distant object that is at rest, or is simultaneous with other objects and the observer, is a visual object" (Mead 1938: 562). The optical effects of relativity are constitutive of the spatial, temporal, and material identities of eventobjects. Appearances do matter: there is no difference between the phenomenal appearing of an event and the identity of that event -- sociality as appearance and reality, semblance and objectivity, representation and the physical thing itself.

78

Frederic Jameson has said that a character of (post)modern painting is that there is a lack of depth between the representation and the objects represented -- the collapsing of the signified into the signifier. There is no difference between the signifier and signified -- the truth of painting as a simulacrum. Thus in the same way that relativity theory shows us the collapse of objective reality into appearance, (post)modern representation evidences the collapse of the signified into the signifier.

Mead writes of perspectival relative identity:

I wish to call attention to two unconnected movements which seem to me to be approaching a strategic position of great importance -- which may be called the objectivity of perspectives. These two movements are, first, that phase of behavioristic psychology which is planting communication, thinking, and substantive meanings as inextricably within nature as biological psychology has placed general animal and human intelligence; and secondly, an aspect of the philosophy of relativism which Professor Whitehead has presented (1927/1964: 307).

Mead, following Einstein, rejects the absolute unchanging space and time of Newtonian physics. For Mead and Einstein, there is therefore no privileged spacetime field\reference frame from which we can ascertain the absolute physical identities of events. Properties formerly held to be intrinsic to a physical (id)entity -- spatial extension, temporal duration, and mass -- are relative to (changes of) its perspectival field locations. For example, mass

increases with the field's increase in velocity. Changes in the physical identity of an object are not determinable *directly* from within the objects relatively moving\changing perspectives, but only *indirectly* from the standpoint of another perspective. Physical eventobjects -- like social ones -- exist as multiple identities in multiple spacetime fields. In the same way that the self exists only relative to its multiple changing role positions, the physical (id)entities of space, time, and matter are constituted only relative to their positions in a plurality of changing perspectives. Moreover, these physical and social (id)entities are contingent as that field change is indeterministic and open to novelty. Again, the self is contingent in that it is not socialized into a fixed cultural system of universal values. Both self and cultural systems are continually changing fields. Thus, Mead appropriates relativity theory to demonstrate the field relational constitution of all identity -- natural, cultisocial, and self (Mead 1932\1980; Einstein 1954b: 9-55; Miller 1973: 188-217; Zukav 1980: 129-37).

CHAPTER 5. THE MATTER OF IDENTITY AND THE IDENTITY OF MATTER: QUANTUM PHYSICS

80

Here I will discuss (1) the determination of quantum identity by sociality, (2) suggest a model of the mind resembling the Schrödinger wave function, and (3) speculate on the possibilities of the human mind being a quantum computer in Hilbert space. Following from the argument in Chapter 3, the identity of an entity is always social, multiple, heterogeneous. The same is true for the identity of quantum phenomena. The quantum concepts of superposition and supervenience (after Schrödinger) that I shall introduce in this chapter are analogous to Mead's concept of sociality as the capacity of being several things at the same time. Moreover, I shall extend my discussion of Mead's contact

theory of knowledge to knowledge of quantum phenomena. For knowledge of the identities of quantum phenomena is always within the social context of an experimenter interacting with such phenomena in the production of scientific facts. Conjectures concerning the quantum nature of the mind are in keeping with Mead's project to develop a grand unified field theory of sociality.

81

Mead's *The Philosophy of the Present* (1932\1980) is the work where Mead handles the quantum revolution in physical theory. It is the only book written by Mead himself, the others being (re)constructions of his lectures. Chapters One through Four were read as the Paul Carus Lectures at the American Philosophical Association Meeting, Berkeley, California, December 1930. Mead wrote these lectures largely on the train ride from the University of Chicago to Berkeley. It is indeed fitting that a work concerning the relativistic motion of trains, the social emergence of indeterministic novel events, and the sociality and indeterminacy of quantum identity should have been written on a moving train heading West. Mead died in 1931 a few

weeks after delivering the lectures, and was never able to revise them. As always, his work was a work in perpetual progress, since he continually (re)constructed previous writing in view of subsequent emerging eventual material -- as is fitting for his philosophy: the matching of form and content of thought. On his deathbed, he was working on Henri Bergson's *Duration and Simultaneity* (1955) which critiqued Einstein's special theory of relativity for spatializing and mathematizing time. (We will discuss Mead's critique of Bergson's *Duration and Simultaneity* in the following Chapter.)

82

Mead viewed the quantum revolution as quintessentially an instantiation of the emerging of novel events in an open cosmos:

The world is continually changing in ways in which we cannot predict. Of course, we may be able to predict that it will change, but we cannot tell what sort of world it is going to become. For example, it would have been impossible, on the basis of the Newtonian theory, to have predicted

the doctrine of Einstein. It would have been impossible, on the basis of the old biologies, to have predicted the Darwinian hypothesis. No one could have predicted the Copernican universe on the basis of the system set up by Ptolemy. The world is continually blossoming out into a new universe, and in this generation we have had fundamental conceptions brought forward that entirely change the character of the physical universe. Take such experiences as those represented in the quantum theory... (1936\1972: 117).

Mead lived at a time when the revolutionary genesis of quantum physics in 1900 -- with Max Planck's view that black-body radiation was emitted in discrete discontinuous packets or quanta -- was followed in 1905 with yet another paradigm revolution in Einstein's special theory of relativity. Revolutionary change was in the air in both thought and life. And Mead, like the other pragmatists of America -- especially William James -- looked expectantly in the Progressive Era towards an open indeterminate and

indeterministic cosmos which had not yet been already written as a footnote to Plato's Ideal Forms.

83

And the real rub of the matter is that the discontinuous quantum physics proceeded apace with continuous relativity physics: sociality as a hybrid of discontinuity and continuity. "Certain phases of light, brought out by the quantum theory, are dealt with from the standpoint of ultimate [particulate] elements; others from the point of view of the wave theory": sociality as wave-particle duality and complementarity (Mead 1936\1972: 256).

84

Relativity physics rendered approximate the Newtonian paradigm of the mechanical universe, but it was still a classical theory: Einstein's conception was that God does not play dice with the universe. Relativity replaced absolute and independent space, time, matter, and energy with relative interdependent space, time, matter, and energy. Separately conceived space and time were now joined

together in a four-dimensional spacetime continuum (three dimensions of space and one of time). $E = mc^2$ (E = energy; m = mass; c = the constant speed of light) translated energy into matter and matter into energy. The general theory of relativity went even further and linked space with matter and gravitational force. Newton had conceived these as separate individuals which then came together in interaction. But for Einstein, the three identities were always already socially constitutive of one another. Gravity was now the curvature of the spacetime continuum in the presence of matter. But this revolution in physical theory still entailed determinism in that Newton's mathematics were subsumed as a subset of the new relativistic mathematical worldpicture: Newton's laws were a particular instantiation of a more general ensemble of physical laws.

85

Following are the differences in kind between Newtonian and Einsteinian classical physics, on the one hand, and quantum physics on the other:

1. classical physics is easily pictured, whereas quantum physics is not;
2. classical physics is based on the perceptions of everyday life, whereas quantum physics requires a leap of imaginative faith, and is based on behavior of subatomic particles and systems not directly observable;
3. classical physics describes individual objective things in space and their changes through time, whereas quantum physics describes the statistical probabilistic behavior of fieldsystems;
4. classical physics predicts events, whereas quantum physics predicts probabilities of events;
5. classical physics assumes an objective reality standing against the subject, whereas quantum physics assumes subject-object holism, and participatory intervention between the knowing and known;
6. in classical physics we can observe something without changing it, whereas in quantum physics we cannot;
7. classical physics claims to be based on absolute Truth or God's Mind, whereas quantum physics claims only to

correlate our limited human experience probabilistically (Zukav 1980: 41).

86

This quantum revolution began in December 1900 -- on the eve of a new century -- with Max Planck's "discovery" that the basic structure of matter is particulate, discrete, discontinuous, disruptive.

87

Planck was interested in black-body radiation that comes from a nonreflecting, perfectly absorbing, flat, nonglossy body. Black represents the absence of light and color. So black bodies do not emit color by themselves unless they are heated and receive energy. In 1900 the planetary model of the atom did not exist. Physicists pictured the atom as a nucleus with springy spokes radiating outward at the end of which are electrons, one electron for every spoke. On this view, the energy received from heating the atoms of a black-body causes the electrons to oscillate on the ends of their springs. The oscillating electrons then gives out radiant

energy which appears as the hot glow of a heated body. This radiant energy emitted from a glowing hot black-body is electromagnetic, because the oscillating negatively charged electron is accelerated, and produces an electromagnetic current. The energy absorbed by a heated body is radiated outward as light: law of the conservation of energy. This theory also held that energy absorbed by an atom is distributed evenly to its oscillating electrons. Those electrons which oscillated faster at higher frequencies emitted their radiation more efficiently. This prequantum theory predicted that (1) all heated bodies emit more high-frequency (blue, violet) than low-frequency (red) light, and (2) highly heated bodies radiate infinite amounts of high-frequency light. This theory was invalid, because (1) only superheated bodies emit blue white light, whereas medium heated bodies emit red low frequency light and (2) heated bodies emit finite amounts of high-frequency light. Thus the common sense model\metaphor of the atom had to go.

Prequantum physicists believed that the oscillating electrons emitted their radiation continuously until they ran out of energy. But Planck found that energy was

absorbed and radiated in discontinuous explosive spurts as quanta\photons (in the case of light radiation). The oscillating electrons emit their energy in discrete packets or quanta, and drop to a lower energy level with each explosion until they reach ground state. As Planck said "the hypothesis of quanta has led to the idea that they are changes in nature which do not occur continuously but in an explosive manner" (Zukav 1980: 48-51).

88

Planck created Planck's constant which is used to calculate the size of the energy packets\quanta of each light frequency\color ($h = 6.63 \times 10^{27}$ erg-sec). The quantum of energy of each particular frequency of the electromagnetic spectrum is the frequency of the light\color times Planck's constant. There is the same amount of energymatter in each quantum of violet light. And the higher frequencies of light have progressively greater quanta so that, going from red to violet, we experience increasingly larger quanta. Thus time, light, color, electromagnetic frequency, energymatter, and quanta are different manifestations of one holistic field: sociality as identity in difference

(Identität und Differenz) -- Hegel's ghost gaily laughs (Zukav 1980: 51). (For has not Foucault said that perhaps we shall meet at the end of the poststructuralist highway the looming figure of Hegel?)

89

We now have all the elements to solve Planck's puzzle of black-body radiation. When low heat is applied to the body, it first glows red, and then progressively becomes higher frequency colors as the heat energy and hence quanta increases. In our macroscopic everyday world of common-sense perception, we cannot see with our human eyes the quantum leaps in color so that the heated body appears to change color in a continuous way. But at the microscopic subatomic level, the cosmos is revolutionary and disruptive: sociality as at once both deterministic, macroscopic, continuous, wavy -- on the one hand -- and as indeterministic, microscopic, discontinuous, and particulate on the other.

90

Mead sought a grand unified field theory of everything which could accommodate relativistic determinism and quantum indeterminism in both physical and cultisocial domains:

It is the task of the philosophy of today to bring into congruence with each other this universality of determination which is the text of modern science, and the emergence of the novel which belongs not only to the experience of human social organisms, but is found also in a nature which science and the philosophy that has followed it have separated from human nature (1932\1980: 14).

This is Mead at his most Marxist historical materialist.

91

The sociality of determinism and indeterminism was epitomized by Einstein's papers in 1905 on (1) the quantum nature of light with the photon as this quantum (Planck's constant h), (2) Brownian motion (Boltzmann's constant k), and (3) the special theory of relativity, a wave theory (c as the constant velocity of light). (Einstein won the Nobel

Prize in 1921 for the first paper and not for the special theory of relativity, because of the bias against grand theoretical "speculation" in the scientific community.)

92

Einstein's quantum theory of light holds that light is particulate or corpuscular, although he also knew that it was wavelike (interference phenomena). This was a resurrection of Newton's theory of light which had been superseded by the wave theory of light\electromagnetism in the nineteenth century, first proposed by Huygens in 1678. Einstein proposed that light is composed of tiny particles called photons. This is similar to Planck's quantization of energy absorption and emission. But Einstein went a further. Planck quantized the *processes* of electromagnetism, whereas Einstein proposed that *lightenergy* is *itself* quantized. Einstein referred to the photoelectric effect to validate his theory. When a photon hits the electron of a metal's atom, it knocks that electron off. We can measure the rate of this photoelectric effect by measuring the rate of the electrons' displacement (Zukav 1980: 53).

Einstein based his revolution in conceptual worldview on the experimental work of Philippe Lenard constituted an experimental context wherein he created an immediate flow of electrons with the presence of an impinging light source. The wave theory of light predicts that it would take several cycles of frequency oscillation for the photoelectric emission of electrons. Einstein's particulate quantum theory of light explained this immediate emission of electrons, because we do not have to wait until the electrons vibrate quickly enough through several cycles to experience and measure the photoelectric emission of electrons (Zukav 1980: 53).

93

The Danish physicist Niels Bohr furthered this quantum revolution in physical theory. And again sociality emerges eventfully with this progression of the quantum physical revolution.

94

Bohr won the Nobel Prize in 1913 for constituting the identity of the atom. Bohr created his metaphor of the atom, using spectroscopic experimental data. Bohr speculated that electrons orbit their atomic nucleus at specific distances from it or shells. "The Bohr atom is an outstanding illustration of such a [spacetime energymatter] model, in which the content of the object is energy which is spatiotemporally defined" (Mead 1938\1972: 208). Each of these shells has a finite number of electrons\energy that can be contained within it. The atom's electrons therefore fill up the first shell's quota first, and progressively the others if there are other electrons to be carried like:

Shell number	1	2	3	4	5...
Number of electrons	2	8	18	32	50...

Bohr's calculations were based on the hydrogen atom, the simplest atom. Bohr held that the sole electron of the hydrogen atom stays as close to the nucleus as it can in the first shell, the lowest or ground energy state. The electron of the hydrogen atom absorbs energy when the atom is heated, and jumps outward from its ground state to outer shells according to the amount of energy absorbed. The electron jumps back inward as heat decreases until it

reaches ground state with the absence of heat. It emits light as it returns to ground state, and the light energy emitted is exactly the same quantum as the energy absorbed. Bohr's metaphorical model of the atom (re)presented all the possible quantum leaps that the electron can make on its journey back to ground state as the number of lines in the hydrogen spectrum (Zukav 1980: 13).

The hydrogen spectrum is experimentally created by exciting hydrogen and shining its emitted light energy through a spectroscope. We can also produce a negative image of the hydrogen spectrum by shining white light through hydrogen vapor to see the parts of the white light the hydrogen absorbs. The white light passing through the hydrogen and spectroscope produces\presents the rainbow of colors minus the lines emitted by incandescent hydrogen. In both cases, the hydrogen spectrum always present the same distinct pattern -- whether it is a representation of black lines on an otherwise complete spectrum, or colored lines without the rest of the spectrum. The absorption spectrum representation is an element's fingerprint. And the

fingerprint of hydrogen contains over one hundred lines (Zukav 1980: 10-12).

95

Thus Bohr deepened further the crisis in physical theory by contradicting Einstein's wave theory of special theory with his particle theory of the structure of the atom -- and the paradox is intensified by the fact that Einstein himself had contributed to Bohr's work with his theory of the photoelectric effect: again, sociality as both relativity and quantum physics; and wave-particle duality.

96

So waves of matterenergy were now particles. Then Prince Louis de Broglie constituted particles as waves in 1924. His metaphorical model of matter presented it as (re)presented by matter waves: matterwaves "correspond" to matterparticles. He imaginatively speculated philosophically and mathematically -- he could not prove it -- on the nature of this "correspondence" between particles and waves. Two entities appeared to constitute the cosmos. The cosmos

is one. Ergo these two (id)entities must indeed be one and the same -- holistically speaking. De Broglie used the equations of Planck ($E = hv$) and Einstein ($E = mc^2$) to formulate one of his own ($\lambda = h/mv$; $\lambda = c^2/v$, where λ = wavelength, c = speed of light, h = Planck's constant quantum of energy, m = mass, and v = frequency). Thus the greater the momentum of a particle, the shorter its wavelength. And, vice versa, the lesser the momentum of a particle is the longer its corresponding wavelength ($v = c/\lambda$). De Broglie's matterwaves are not found in the perceptual world of everyday macroscopic experience. For the wave associated with even the smallest object that we can see is so incredibly small compared to it that they have a negligible effect. But the size of the wave is bigger than its electron at the subatomic level, and matter exhibits wave behavior: the wavicle of sociality and the sociality of the wavicle (Zukav 1980: 96).

97

In 1924 Bohr, Kramers, and Slater proposed that the waves in question were probability waves. This was the supernova of the classical mechanical worldpictures, a last valiant

heroic effort "to describe the atomic system along the quasi-classical lines he had employed earlier" (Folse 1985: 36). The revolution of the quantum revolution -- for do not revolutions devour their children? -- was simultaneously a revolution of metaphor. As the center will not hold, the old metaphor will not hold.

98

Mead writes of this quantum revolution of the metaphorical atomic worldview -- a crisis of vision:

It is, however, practically impossible to place ourselves inside an electron in a Bohr atom and present the rest of the universe as moving with [relative] reference to it, if it be regarded as at rest. It is difficult enough to present a Bohr atom. It is hopeless to undertake to present a system of the universe whose elements are so moving that the electron in question may be regarded as at rest. We are forced to abandon rest and motion, which are experimental, and approach the scientific fiction of the world at an instant, but including in the conception of the

physical particle its temporal dimension
(1938\1972: 235).

Here Mead refers to the near impossibility of imag(in)ing the Bohr atom from a relativistic perspectival point of view. The metaphor of relativity itself breaks down\self-deconstructs itself: the chaotic cosmos cannot be contained even in this picture of a universe of relatively moving flux -- the death of the specious present instance (Instanz), and the triumph of the passing moment (Moment). The relativity metaphor try to fix\pin down the things of the world as you pin butterflies to a board so as to observe, study, and explain them better. But the things of the New World rebel -- nay, revolt against the tyranny of outdated signifiers. Does not Marx tell us prophetically that the memories of the historical past weigh like a nightmare upon the shoulders of the acting (re)presenting revolting organizing novel agencies of the historicalizing temporalizing present? After all truth is nothing but a mobile army of metaphors, and reality nothing but a useful technoscientific fiction -- a romance novel, if you will -- for living. Thus we arrive dialectically at the end of a long Hegelian highway to the

twilight of the idols: sociality as Apocalypse. The owl of Minerva rises only at dusk -- but the owl is X.

99

Thus the immanent selfcritique of moving material thoughts and things (Foucault's *Les Mots et Les Choses*) from Max Planck's quantum year of 1900 to the probability waves of Bohr, Kramers, and Slater of 1924 produced the chaotic cosmos we living live in today.

100

Matter is thus not a thing or even an event happening -- not an event itself, but the wave of *probability* of an event happening.

101

In 1924, Kramers mathematically formulated a theory for the dispersion of light by atoms (Folse 1985: 36).

In the summer of 1925, Heisenberg used Kramers' work to develop his matrix mathematical formulation of quantum mechanical fieldsystems. Heisenberg, Born, and Jordan extended this metaphor throughout 1925-6 to produce matrix mechanics (Folse 1985: 36). This new metaphor replaced many of the Newtonian equations of mechanical motion with equations between matrices, e.g. the law of the conservation of energy: mathematical metaphoricity as sociality.

But later Born, Jordan, and Dirac demonstrated that the "matrices representing position and momentum of the electron do not commute. This latter fact demonstrated clearly the essential difference between quantum mechanics and classical mechanics" (Heisenberg 1962: 39).

102

The other strand of the mathematical metaphorical representation of quantum mechanics was developed independently by Schrödinger in the spring of 1926. Schrödinger revolutionized de Broglie's concept of matter waves to constitute a "wave mechanics" representation of

quantum physics. He established a wave equation to represent the stationary de Broglie waves around the nucleus. For Schrödinger, it made more sense to represent atomic phenomena in terms of probability wave equations instead of Bohr's planetary metaphor of hard, spherical, thinglike electrons revolving around a nucleus at specific levels. Bohr's model did not explain (1) the number of electrons in each atomic shell, and (2) the behavior of electrons between shells. Schrödinger transformed physical atomic things into patterns of probability waves: electrons were now probabilities of stationary de Broglie waves (Zukav 1980: 99).

103

But how can a physical thing be the probability of that thing occurring? : sociality as both the physical thing itself and the patterns of the probabilities of waveevents.

Standing waves are familiar events in everyday life. Consider a rope attached to a pole at one end with someone holding the other end. When a person oscillates the rope up

and down, a standing or stationary wave is produced as a hump appears in the rope and travels down it to its other end where it returns to the person's hand traveling upside down. This single hump is a travelling wave, and it is the simplest waveevent we could produce under these circumstances. We can produce a more complicated pattern of these traveling waves depending on the superpositioning of these waves. Now it is the traveling waves\rope that moves, whereas the pattern produced remains stationary or standing. The widest point of a standing wave, and its two end points (nodes) are stationary. There can only be a whole number of standing waves on the rope whether it is one, or two, or three. The rope cannot be divided into fractions of a whole wave: we cannot produce one and a half standing waves, for example. Thus the only way we can produce an increase or decrease in the number of standing waves is discontinuously or by quantum leaps (Zukav 1980: 100).

104

Atomic phenomena are quantized wave (id)entities in Schrödingers metaphorical revolution of quantum physics. Schrödinger "succeeded in deriving the energy values of the

stationary states of the hydrogen atom as "Eigenvalues" of his wave equation and could give a more general prescription for transforming a given set of classical equations of motion into a corresponding wave equation in a space of many dimensions" (Heisenberg 1962: 39). The particulate electron now emerged as a probability waveevent. The orbiting electron comprises a wave path of a certain length as it orbits around its nucleus. This wavelength corresponds to and (re)presents the length of the rope in our experiment. Schrödinger constituted the identity of the electron as a production and process of patterns of probability standing waves. Each standing wave represented the identity of the electron in a particular state, and varying (patterns of) standing waves represent varying identities of the electron. Hence the electron comprises multiple identities, and the total identity of the electron comprises all the probable patterns of standing waves it creates in its particular orbit around the nucleus of an atom. Identity is always multiple and other-determined, and not homogenous, intrinsic, and essentialist: sociality as atomic phenomena (Zukav 1980: 101).

Again, an electron's identity is constituted as the standard waves between the nodes. Schrödinger studied the path of an hydrogen atom's sole electron, and found that "the energy levels of the hydrogen atom in his theory seemed to be simply the eigenfrequencies of the stationary matterwaves" constituting the electron's identity (Heisenberg 1962: 41). While all of the standing waves of our rope are identical, all the probable standard waves of the electron are different, with some shaped like concentric circles, or butterflies, or mandalas (Zukav 1980: 103). Schrödinger's wave equation is a representation of the varying spatiotemporal identities of the waveelectron. It is the mathematical metaphor which represents the order of the emergent progression of varying waveelectron (id)entities over spacetime. Given an initial particular experimental or environmental context of atom, state, and technoscientific apparatus, this wave equation predicts the deterministic developmental sequential order of these multiple (id)entities until the moment distance experience becomes contact experience and the identity on trial quantum leaps indeterministically and indeterminantly to its ultimate most fully real(ized) identity: sociality as the determinism and

indeterminism of Schrödinger's wave equation of quantum fieldsystems (Zukav 1980: 105).

The Schrödinger wave equation also correlates the size and energy state of the hydrogen atom with experience. "[T]he wave pattern of a system with one electron and one proton, which is what we call a hydrogen atom, in its lowest energy state, has an appreciable magnitude only within a sphere which is just the diameter of the smallest Bohr orbit. In other words, such a wave pattern turns out to be the same size as the ground state of a hydrogen atom" (Zukav 1980: 105). The wave function is also termed the eigenfunction. Each eigenfunction has a fixed energy value -- its eigenvalue -- for the system. Thus the Schrödinger wave equation for the three dimensions of the hydrogen atom's electron (6 dimensions for two electrons, 9 dimensions for three electrons, and so on) enables us to constitute the energy identity of the hydrogen atom as an ensemble of multiple eigenvalues.

The Pauli exclusion principle of 1925 in yet another way of representing the quantum mechanics of subatomic phenomena. The principle states that no two electrons in an atom are identical in their properties or have the same set of four quantum values. This means that the value of one electron excludes another electron from having the identical set of quantum numbers. Pauli's exclusion principle entails that the development of a particular pattern of Schrödinger's standing waves in an atom excludes the existence of other patterns in that atom. Schrödinger's wave equation shows that there are only two possible standing wave patterns in the lowest atomic energy state or in the first shell, and therefore the first shell can have a maximum of only two electrons. The second shell can have eight standing wave patterns, and therefore can have a maximum of eight electrons in it (Zukav 1980: 103-104).

In 1926, Schrödinger equated Heisenberg's matrix quantum mechanics with his own wave mechanics:

Later he was able to prove that his formalism of wave mechanics was mathematically equivalent to the earlier formalism of quantum mechanics.

Thus one finally had a consistent mathematical formalism, which could be defined in two equivalent ways starting either from relations between matrices or from wave equations. This formalism gave the correct energy values for the hydrogen atom; it took less than one year to show that it was also successful for the helium atom and the more complicated problems of the heavier atoms. But in what sense did the new formalism describe the new atom? The paradoxes of the dualism between wave picture and particle picture were not solved; they were hidden somehow in the mathematical scheme (Heisenberg 1962: 39-40).

Thus wave-particle duality or complementarity is yet another instantiation of sociality.

107

In 1926, Born further developed the metaphor of "standing wave." Schrödinger attempted to visualize "electrons as actually being spread out over their wave patterns in the form of a tenuous cloud" (Zukav 1980: 105). It may have been possible to imagine the hydrogen atom's electron in three dimensions, but six dimensions were not visualizable in terms of ordinary everyday perception. A new metaphor was necessary to represent the new atomic structure of quantum physics. Born came along and said, "why bother to picture electrons as real at all?" In 1926, Born proposed that it was unnecessary and impossible to imagine standing waves, because they are not real (id)entities but probability waves -- the probabilities or tendencies of an (id)entity to become. The probability of a given state is obtained by squaring the amplituded of its matter wave (Zukav 1980: 105-106). Heisenberg writes of Born's contribution to the revolution in quantum physical theory and metaphor:

...Born took up this idea of the probability wave
and gave a clear definition of the mathematical

quantity in the formalism, which was to be interpreted as the probability wave. It was not a three-dimensional wave like elastic or radio waves, but a wave in the many-dimensional configuration space, and therefore a rather abstract mathematical quantity (1962: 41).

Thus we move further away from the sensibilities of everyday life towards the mysteries of mathematical metaphorism.

108

Schrödinger tried valiantly in the summer of 1926 to convert all discontinuous quantum phenomena into continuous wave phenomena:

When Schrödinger in that summer had shown that his mathematical formalism of wave mechanics was mathematically equivalent to quantum mechanics he tried for some time to abandon the idea of quanta and "quantum jumps" altogether and to replace the electrons in the atoms simply by his three-dimensional matter waves (Heisenberg 1962: 41).

But Schrödinger was ultimately unable to reduce the complexity, diversity, and heterogeneity of quantum phenomena to a singular picture of the cosmos in terms of continuous wave phenomena. But in the discussions which took place in the autumn of 1926 in Copenhagen between Bohr and Schrödinger and the Copenhagen group of physicists it soon became apparent that such an interpretation would not even be sufficient to explain Planck's formula of heat radiation (Heisenberg 1962: 41-42). Thus Schrödinger's attempt to (re)present a homogeneous identity picture of the cosmos in terms of the wave metaphor failed: the cosmos was irreducibly heterogeneous.

109

So we are at the autumn of 1926 in Copenhagen. Heisenberg returned to the University of Copenhagen in 1926-1927 to discuss the two dichotomous pictures of quantum physics: waves and particles. Erwin Schrödinger also came in the fall of 1926 to discuss the physical experimental basis of the novel quantum theories. While Bohr and Heisenberg pictured the cosmos in terms of mechanical particles, Schrödinger's worldpicture was one of wave phenomena (Folse

1985: 37). Heisenberg describes this period of the genesis of the complementary Copenhagen interpretation of quantum physics thus:

During the months following these discussions an intensive study of all questions concerning the interpretation of quantum theory in Copenhagen finally led to a complete and, as many physicists believe, satisfactory clarification of the situation. But it was not a solution which one could easily accept. I remember discussions with Bohr which went through many hours till very late at night and ended almost in despair; and when at the end of the discussion I went alone for a walk in the neighbouring park I repeated to myself again and again the question: can nature possibly be as absurd as it seemed to us in these atomic experiments (1962: 42)?

Thus closure was not closure at all in quantum physics -- merely the opening towards novel emerging possibilities of quantum theory. As the quantum physicist who abandoned quantum physics for magical entertainment in an episode of the television series *Northern Exposure* says: "I had to give

up quantum physics. Magic makes more sense to me. I have more control over it."

110

The quantum revolution continued to revolutionize itself ever devouring its theoretical children in its wake. Enter Heisenberg and his (in)famous indeterminacy principle formulated in February 1927 in Copenhagen (Folse 1985: 37).

"The "final solution" [my quotation marks] was approached in two different ways" (Heisenberg 1962: 42). Quantum physics always has at least two different perspectival standpoints of the same solution.

111

"The one was a turning around of the question" (Heisenberg 1962: 42) -- a revolutionary changing of the rules of the preceding language game by reversing the question.

112

"Instead of asking: How can one in the known mathematical scheme express a given experimental situation? The other question was put: Is it true, perhaps, that only such experimental situations can arise in nature as can be expressed in the mathematical formalism?" (Heisenberg 1962: 42). The first question represents the pre-Kantian correspondence theory of truth, the language game of "the mirror of nature": the world exists as object outside of our consciousness; how then do we accurately represent it? In this language game, the experimental natural situation is viewed as given -- not humanly-naturally, constituted -- and the task of the philosopher scientist is to match his (six) mathematical representations -- themselves viewed as naturalized objects -- to the given. Hence philosophizing in bad faith (Rorty 1979).

113

And a queer Spinozism: both subjectivity and objectivity are at once Nature-given and God-given.

114

The second question represents Kant's Copernican Revolution. The world does exist as stuff out there, but the only world we can know is the world that we constitute through our categories of consciousness. We see the world in terms of the mathematical representations we create. Thus matter is mind-dependent.

115

"The assumption that this was actually true led to limitations in the use of those concepts that had been the basis of classical physics since Newton" (Heisenberg 1962: 42). Quantum physicists pragmatistically made the assumption as if the cosmos were written in the Kantian language -- disrupting the old classical Newtonian metaphors.

116

One could speak of the position and of the velocity of an electron as in Newtonian mechanics and one could observe and measure these quantities. But one could not fix both quantities simultaneously with an arbitrarily high accuracy"

(Heisenberg 1962: 42). We may still speak of the classical electron, and we can still identify its position and velocity experimentally -- but we cannot identify with Laplacean accuracy its position and velocity at once, simultaneously. Quantum sociality calls for a profoundly novel kind of sociality.

117

This quantum situation is not an epistemological but an ontological field. It is humanly natural and naturally human that the greater (the accuracy of) the identification of the electron's position, the lesser its identity as velocity.

118

This is sociality as the humanization of nature and the naturalization of humanity in the quantum field experimental laboratory -- a site of nature selftransacting with itself.

119

The reason? Because the gamma\photon beam of the electron microscope operated by the scientist transacts with the electron and intervenes in its identity (Zukav 1980: 111-112).

120

Thus identity is indeterministic.

121

"Actually the product of these two inaccuracies turned out to be not less than Planck's constant divided by the mass of the particle" (Heisenberg 1962: 42).

122

"Similar relations could be formulated for other experimental situations" (Heisenberg 1962: 42). Thus was replaced the punctilious, individualistic, classical mechanical Newtonian universe. Enter the cultisocial cosmos of quantum implicate relations.

123

"They are usually called relations of uncertainty or principle of indeterminacy. One had learned that the old concepts fit nature only inaccurately" (Heisenberg 1962: 42-43).

124

"The other way of approach (to the two parallel developments in quantum physical theory) was Bohr's concept of complementarity" (Heisenberg 1962: 43). Bohr was profoundly disturbed at the physical implications of de Broglie's and Schrödingers wave interpretation of quantum theory versus Heisenberg's matrix method:

These two different approaches convinced Bohr that mathematically their theory was on the right track, but at the same time they intensified his deep concern with the physical interpretation of the mathematical formalism. On the one hand Bohr joyfully welcomed the new theories as furthering the progress of atomic physics in its ability to

predict confirmed results for an increasing range of experimental phenomena. But on the other hand he was made even more aware of that tension which he had felt since 1912 created by the fact that quantum theory had thrown out the classical framework but still had need of a framework of its own to stipulate what could be expected of a quantum mechanical description of atomic systems (Folse 1985: 36).

So Bohr worked on his interpretation of complementarity on a skiing holiday at the same time as Heisenberg created his indeterminacy principle in February 1927 (Folse 1985: 37).

125

Bohr initially was skeptical about Heisenberg's relations, but discussions between Bohr and Heisenberg mediated by Klein produced a consensus complementarity interpretation by the late spring of 1927 (Folse 1985: 37).

126

Heisenberg describes this situation:

Schrödinger had described the atom as a system not of a nucleus and electrons but of a nucleus and matter waves. This picture of the matter waves certainly also contained an element of truth. Bohr considered the two pictures -- particle picture and wave picture -- as two complementary descriptions of the same reality. Any of these descriptions can be partially true, there must be limitations to the use of the particle concept as well as of the wave concept, else one could not avoid contradictions. If one takes into account those limitations which can be explained by the uncertainty relations, the contradictions disappear (1962: 43).

Hence a situation wherein you're damned if you do and damned if you don't: if uncontradictory knowledge, then limited\imperfect knowledge: if expanded conception of the cosmos, then contradictions shatter our old worldpicture.

127

"In this way since the spring of 1927 one has had a consistent interpretation of quantum theory, which is frequently called the "Copenhagen interpretation" (Heisenberg 1962: 43). Bohr presented this consistently revolutionary picture of quantum theory first at a congress at Como, Italy in September 1927, but the new metaphors fell on deaf ears or, should we say, blind eyes?

128

"This [complementarity] interpretation received its crucial test" in October 1927 at the Solvay Congress, Brussels (Heisenberg 1962: 43; Folse 1985: 37). The greats of Western science were there, including Einstein, and Bohr was deeply disappointed at Einstein's skepticism (Folse 1985:). "Those experiments which had always led to the worst paradoxes were again and again discussed in all details, especially by Einstein. New ideal experiments were invented to trace any possible inconsistency of the theory, but the theory was shown to be consistent and seemed to fit the experiments as far as one could see" (Heisenberg 1962: 43). Despite the interchanges between Einstein ("God does not

play dice with the universe.") and Bohr ("Stop telling God what to do."), the novel metaphor of complementarity of wave-particle quantum duality prevailed: sociality as complementarity.

129

How does Mead incorporate complementarity into his distance-contact interpretation of scientific objects? The probability wave of Bohr, Kramers, Slaters "meant a tendency for something. It was a quantitative version of the old concept of "potentia" in Aristotelian philosophy. It introduced something standing in the middle between the idea of an event and the actual event, a strange kind of physical reality just in the middle between possibility and reality" (Heisenberg 1962: 41). In terms of Mead's social distant and contact experience, we may say that distance experience is just such a queer reality. The distance experience is an indeterminate X -- a tendency to become actualized as a particular event -- which emerges as a fully realized actualized identity with body contact with a human becoming or its technoscientific representation.

130

An (id)entity is not an already completed thing but a propensity to become something.

131

"The Copenhagen interpretation of quantum theory starts from a paradox....The concepts of classical physics form the language by which we describe the arrangement of our experiments and state the results. We cannot and should not replace these concepts by any others. Still the application of these concepts is limited by the relations of uncertainty" (Heisenberg 1962: 44). Heisenberg looks back towards the old shore as he sails forwards to uncharted seas.

132

Heisenberg explains the difference between the classical Newtonian paradigm and the quantum paradigm in terms of the quantum revolution in our conception of probability.

Newtonian probability is epistemological: classical "[p]robability in mathematics or in statistical mechanics means a statement about our degree of knowledge of the actual situation. In throwing dice we do not know the fine details of the motion of our hands which determine the fall of the dice and therefore we say that the probability for throwing a special number is just one in six" (Heisenberg 1962: 40-41). But quantum probability is ontological: "[t]his concept of the probability wave was something entirely new in theoretical physics since Newton" (Heisenberg 1962: 40).

133

Consider the differential experimental interpretations of the classical and the quantum paradigms. We can begin by studying the position and velocity of a moving planet in Newtonian mechanics. Observational results are mathematically translated into coordinates and momenta figures. Then Newton's equations of motion are used to project\predict these positional coordinates and momenta from one time to another. The astronomer can predict the exact time of a lunar eclipse (Heisenberg 1962: 44-45).

134

But in "quantum theory the procedure is slightly different" (Heisenberg 1962: 45). We can identify the initial position and velocity of a *moving* electron, but we will not be able to predict with apodeictic accuracy its path through a cloud chamber, because this experimental identification "will at least contain the inaccuracies following from the uncertainty relations and will probably contain still larger errors due to the difficulty of the experiment" (Heisenberg 1962: 45).

135

"It is the first of these inaccuracies which allows us to translate the result of the observation into the mathematical scheme of quantum theory" (Heisenberg 1962: 45). Hence again the rationalization, reification, and mathemathization of sensuous stuff of the world for the living of that world.

136

"A probability function is written down which represents the experimental situation at the time of the measurement, including even the possible errors of the measurement" (Heisenberg 1962: 45). The probability function is a mathematical (re)presentation of the biocultisocial field of the laboratory at a particular moment of spacetime. The probability function represents the future potentialities of the unfolding developing of the originary technoscientific throwing of the phenomena towards the ultimate self-identifying of measuring\determinancy: in my end is my beginning - sociality.

137

"This probability function represents a mixture of two things, partly a fact and partly our knowledge of a fact" (Heisenberg 1962: 45). Thus this probability function of the Copenhagen Interpretation of Quantum Theory is an instantiation of sociality as the capacity of being several things at once, at the same time, simultaneously.

138

The cosmos is to all eternity hybridity.

139

"It represents a fact in so far as it assigns at the initial time the probability unity (i.e., complete certainty) to the initial situation: the electron moving with the observed velocity at the observed position...." (Heisenberg 1962: 45). The quantum revolution in physical theory translates all facts, values, and interpretations of facts and values into quantum probabilities. Hence we represent a certain event of known positional and velocity identity at a known spacetime a probability of 1.

140

" '[O]bseved' means observed within the accuracy of the experiment" (Heisenberg 1962: 45). We cannot have a God's eye view of the cosmos -- a view from everywhere and hence nowhere -- because our knowledge is always already experimental, contingent, contextual, cultisocial, and historical.

141

"It represents our knowledge in so far as another observer could perhaps know the position of the electron more accurately" (Heisenberg 1962: 45). The probability function of the experimenting situation represents a recognition of scientific humility and limitation -- the possibility of always becoming proven wrong, and the moral courage to accept this. Another scientist may predict the electron's position better than you can, and he may well win the Nobel Prize in Physics for his achievement, while you do not. And you have to live with that -- if science is to be radically democratic.

142

"The error in the experiment does -- at least to some extent -- not represent a property of the electron but a deficiency in our knowledge of the electron. Also this deficiency of knowledge is expressed in the probability function" (Heisenberg 1962: 45). Here Heisenberg is in a state of categorical confusion -- caught between the metaphors of the classical old on one hand and the metaphors of the quantum new on the other. He does not quite know what to do with

this insurgent electron, how to make it fit into *his* preconceived picture of an electron.

143

But we know -- after Kant, Hegel, and Heidegger -- that quantum phenomena are things showing themselves to us in the only way we can see them revealing themselves to us. Thus there is no chasm or dichotomy between *our knowledge of* acting showing quanta and the quanta acting showing *themselves*.

144

"Therefore, the theoretical interpretation of an experiment requires three distinct steps: (1) the translation of the initial experimental situation into a probability function; (2) the following up of this function in the course of time; (3) the statement of a new measurement to be made of the system, the result of which can then be calculated from the probability function" (Heisenberg 1962: 46). Thus we have an initial quantum probability state of a culturally constituted fieldsystem. Then comes the tendential

development of these probabilistic potentialities over time. Then finally comes the ultimate (id)entification, determination, and constitution of the (id)entity in question through human technoscientific measuring.

145

The quantum identity in question chooses and wears its ensemble of social relations with the speed and dexterity of a fashion model changing clothes for a runway show -- faddish, fickle, flauntingly faithless as they come.

146

"For the first step the fulfillment of the uncertainty relations is a necessary condition" (Heisenberg 1962: 46-47). The lady in question is from the outset a person of dubious social character.

147

"The second step cannot be described in terms of the classical concepts" (Heisenberg 1962: 47). Though the lady wears Dior, it is evident to all observers in our fashion

audience -- the scientific cognoscenti -- that she is a (post)modern (post)structuralist hussy under her wrap.

148

"[T]here is no description of what happens to the system between the initial observation and the next measurement" (Heisenberg 1962: 47). Suddenly off comes the Dior wrap and our quantum model reveals the latest from Jean-Paul Gaultier. The fashion show continues, and our model never fails to surprise us -- seduce us -- with her malleability: now Lagerfeld, then de la Renta, then Versace, next Donna Karran, then Dolce e Gabbano, Miyaki, Calvin Klein, and so on and so forth.

149

"It is only in the third step that we change over again from the "possible" to the "actual" " (Heisenberg 1962: 47). Naomi Cambell shatters her untouchable iconic image when she falls flat on her bony buttocks on the French catwalk, her skirts all helter skelter -- the observed of all observed quite undone. She bursts out laughing uproariously. The

cognoscenti are at first aghast at this quantum revelation, this twilight of their idol. Then one observer and then another and then yet another unfreeze their gazes and bodies, and rush to help her up, to make body contact with their inimitable unflappable icon. And Naomi Campbell's true identity is finally revealed\conceived. She is born -- a woman, a mere woman.

150

The stage is now set to receive Dirac's constitution of anti matter in 1928. Dirac tried to square the circle and circle the square in proposing quantum field theory: sociality as both quantumparticle and fieldwave. Quantum particles are actually transacting fieldwaves in quantum-field theory: when two transacting fields transact socially with each other, their point of communication is singular\local and instantaneous. Thus quanta are transactions of transacting fields of matterwaves (Zukav 1980: 199).

151

Dirac theorized that there was a separate field for each of the three known particles of matter. (Since 1928, there have been numerous particles, and equally numerous fields in quantum-field theory to explain them.) Dirac predicted the existence of a positively charged particle from his mathematical marriage of quantum physics and Einstein's relativistic principle of the invariance of physical laws across all spacetime fields. The prevailing physical theoretical pundits claimed that this mathematical positively charged (id)entity was the positively charged proton. They chided Dirac for getting the mass of his particle wrong (Zukav 1980: 199-210).

152

But the pundits erred. Dirac had constituted not the proton but a new particle of anti-matter, positively charged, with some properties like the negatively charged electron -- but antinomially opposite to the electron in other ways. Sociality instantiated itself yet again in this "positron" (Zukav 1980: 210).

153

Thus Mead's philosophy of the act, present, mind, self, society, movements of 19th century thoughts, and sociality constituted and was constituted by quantum and relativity physical theory of the first third of the 20th century.

154

Mead writes of quantum indeterministic causality:

In the analysis which I have undertaken we come then, first, to passage within which what is taking place conditions that which is arising. Everything that is taking place takes place under necessary conditions. Second, these conditions while necessary do not determine in its full reality that which emerges (1932\1980: 16).

Mead first observes the deterministic side of an event emerging: the event arises out of causal determinations; causes do produce effects. But they do not produce these effects with Laplacean determinism -- causes determine effects indeterministically. There is therefore both a deterministic and an indeterministic character acting to

causality in the quantum relativity cosmos: sociality as both classical Newtonian Laplacean Einsteinian determinism, and quantum (in)determinism of the Copenhagen Interpretation of quantum physics.

155

"We are getting interesting reflections of this situation [of indeterminacy] from the scientist's criticism of his own methods of researching exact determination of position and velocity and from the implications of quanta" (Mead 1932\1980: 16). It is through scientists' critique of their own measuring procedures that we have come to recognize the indeterminacy of the cosmos -- a reevaluation of scientific values via scientific values.

156

"What appears in this criticism is that while the scientist never abandons the conditioning of that which takes place by that which has gone on, expressed in probability, he finds himself quite able to think as emergent even those events which are subject to the most exact determination" (Mead

1932\1980: 16-17). Consider a photon in a double-slit experiment. The region of preparation is a light source and a screen with two slits while the region of measurement is a photographic plate which records the impact of photons striking it. The observed system is the photon, while the observing system consists of scientists conducting the experiment and the apparatuses of the photon's environment. This experimental situation is a simplified abstracted instantiation of causal determination, because things are not so isolated in the world at large. Yet our experimenting physicists cannot predict where a particular photon will strike the photographic plate after passing through the double-slit screen. What determines the ultimate contact identity of the photon is a matter of chance and emergent novelty. On the deterministic side, our scientists can predict the probabilities of the photon striking a particular region of the photographic plate, because the photon propagates according to Schrödinger's wave equation\function (Zukav 1980: 68-70).

"I am not attempting to pre-empt what later interpretation will be put upon the speculations of de Broglie, Schrödinger [Mead says "Schroeder."], and Planck" (Mead 1932\1980: 17). Here Mead uses the mathematical physics of quantum mechanics to prove his point about the emergence of historical novelty from a conditioning past and a passing present. "The event that has taken place and the direction of the process going on form the basis for the rational determination of the future" (Mead 1932\1980: 13-14). Novelty emerges in all the levels of nature because its processes are not mechanically but probabilistically determined. "Probability is found in the character of the process which is going on in experience" (Mead 1932\1980: 14).

158

"I am simply indicating that even within the field of mathematical physics rigorous thinking does not necessarily imply that conditioning of the present by the past carries with it the complete determination of the present by the past" (Mead 1932\1980: 17). Mead invokes the mathematical rigor of quantum physics to substantiate his claim that events are deterministically indeterministic, contingent,

and relative to a frame of reference. If historical determination is "soft," then so is quantum physics.

159

"*Third*, in passage the conditioning of that which is taking place by that which has taken place, of the present by the past, is *there*" (Mead 1932\1980: 17). The cosmos becomes a passing happening emerging from novelty to novelty -- and therefore it does not move through the rationalized sequence of specious presents of physical thought. The past could not stretch into the passing present without genuine temporal passage or duration. "The past in that sense is in the present" (Mead 1932\1980: 17). Thus our cosmos becomes at once passing past, (re)presenting presenting, and anticipatory future.

160

The past is "in what we call conscious experience" (Mead 1932\1980: 17). Here Mead gestures to his audience his speculative doubt in the traditional conception of

consciousness, his doubt over the separation between the inorganic and the organic cosmos.

161

"[I]ts presence is exhibited in memory" (Mead 1932\1980: 17). Present consciousness is in part composed of memories of past events -- events which we can relatively reevaluate in the light of present events.

162

The past is also present "in the historical apparatus which extends memory, as that part of the conditioning nature of passage which reflects itself into the experience of the organic individual" (Mead 1932\1980: 17). The historical apparatus of history as a field of knowledge functions as an extension of consciousness. We are self-reflexive becomings precisely because we are able to grasp the past in the present through consciousness, memory, and history. We are not robotic automatons, because we can reflect on our past, constitute it anew in view of the present, and adjust our

present conduct to produce a novel emergent future -- Nietzschean perspectivalism and pragmatist standpoint theory.

163

Mead applies and appropriates quantum physics in his relativistic indeterministic philosophy of natural history:

...If all objects in a present are conditioned by the same characters in passage, their pasts are implicitly the same, but if, to follow out a suggestion taken from the speculations about quanta, one electron out of two thousand sets energy free, when there are no determining conditions for the selection of this electron over against the other nineteen hundred and ninety nine, it is evident that the past as exhibited in the conduct of this electron will be of a sort that will not even implicitly be the same as that of the others in that group, though its jump will be conditioned by all that has gone before (1932\1980:17).

Mead attempts to reconcile the deterministic history of the group of electrons with the indeterministic creative agency of the individual electron: the link between the two orders of history is quantum probability. Again, the Schrödinger wave equation\function is relevant to our understanding of sociality as both determinism and indeterminism. This probability function predicts the probabilistic development of our two thousand electrons as a whole, but it cannot predict the behaviour of a single electron. It is a matter of pure chance which electron releases energy. All the electrons have a common spatiotemporal history and environment, because they are all subjected to the same scientific observers, the same region of preparation, the same technoscientific apparatus, and the same region of measurement. In the Laplacean-Newtonian cosmos these conditions meant that we could predict in principle the future of the electron. But quantum physics teaches us that we cannot predict in principle the future of our electron.

164

Mead applies quantum indeterminacy to human social history next:

...If of two thousand individuals under disintegrating social conditions one commits suicide where, so far as can be seen, one was as likely to succumb as another, his past has a peculiarly poignant nature which is absent from that of the others, though his committing of suicide is an expression of the past (1932\1980: 17).

All have a common shared past, and yet the historical past of the particular person who committed suicide takes on a special singularity of its own. We read backwards her text from future to past and (re)construct\ (re)constitute her biography. The identity of the suicide is not really ultimately real until her identity becomes a terminal identity. In other words, the meaning and interpretation of her textual identity is not intrinsic\inherent to her, but depends on the spatiotemporal cultisocial contexts wherein she is thrown.

165

Mead's philosophy of history and the present is linked substantively to Nietzsche's relativistic perspectival

philosophy of history -- particularly the Nietzsche of "The Uses and Abuses of History for Life," *Untimely Meditations* (1983). Hence sociality as American pragmatism, physical relativism, and Lebensphilosophie. Nietzsche argued in his essay that there is no essentially real account of our historical past. Our past is relative to the service for life -- the lifeservice -- which we give to it. It is most definitely not the telling of things as they really are, value free, and objective as von Ranke vainly attempted to do. The purpose of history is to serve our lifeinterests. We write different kinds of history according to the particular lifeinterest we have chosen to serve: hence monumental history to serve as edification of a nation's mythic glorious past.

166

"The past is there conditioning the present and its passage into the future, but in the organization of tendencies embodied in one individual there may be an emergent which gives to these tendencies a structure which belongs only to the situation of that individual" (Mead 1932\1980: 17-18). Schödinger's wave function and de Broglie's matterwaves are

relevant to our understanding here in terms of (1) the person as a whole, (2) Mead's constitution of the human self as "I" and "me", and (3) the psychophysical functioning of human minding.

167

Consider the human personality metaphorically in terms of the Schrödinger wave function. This function describes the various probabilistic tendencies comprising the person. It organizes the multiple potentialities -- the-those-which-the-person-may-become -- of the person. A person is capable of becoming and doing multiple things. What the person ultimately becomes is a product of the person's contact with a (measuring) other. You become more fully yourself not in hermetic monastic isolation but in the experience of a past presenting other. You see yourself as others see you. This situation of identity constitution entails the person's multiple identities. For these will vary according to the kind of other the person connects with. "The tendencies coming from past passage, and from the conditioning that is inherent in passage, become different influences when they have taken on this organized structure of tendencies" (Mead

1932\1980: 18). A person's identity is a relative wild card -- plastic -- until the person makes contact and socializes with significant others. But the process of socialization is a lifelong one, and it is finished only with death. So there is always the probability that an old dog can learn new tricks, that something novel emerges.

168

"This would be as true of the balance of processes of disruption and agglomeration in a star as in the adjustment to each other of a living form and its environment" (Mead 1932\1980: 18). Mead extends the metaphor of quantum sociality of the self to the birth and death of stars, and to the dialectical transaction of form living and living environment.

169

Again, the "structural relationship in their reciprocal balance or adjustment arranges those passing processes which

reflect backward and lead us to an account of the history of the star" (Mead 1932\1980: 18).

170

Mead paraphrases chapters three and seven of Dewey's *Experience and Nature* (1929):

...As Dewey has maintained, events appear as histories which have a *dénouement*, and when an historical process is taking place the organization of the conditioning phases of the process is the novel element which is not predictable from the separate phases themselves, and which at once sets the scene for a past that leads to this outcome (1932\1980: 18).

Natural processes as natural eventual histories are composed of several analytically separable elements, but the process of an historical movement as a whole cannot be rationalized and reduced to any of these elements. Event histories derive their significance from the cultisocial values we bring to the situation. Cultisocial, natural, historical events occur, and it is the new organization of their

elements that produces emergent novelty: a novelty which cannot be predicted on the basis of knowledge of the mathematical sum of elements. We can understand the import of an event by looking backwards from the occurrence of the event towards its pasts: we live life forwards but understand it backwards.

171

Mead continues this discourse of identity and difference:

The organization of any individual thing carries with it the relation of this thing to processes that occurred before this organization set in. In this sense the past of that thing is "given" in the passing present of the thing, and our histories of things are elaborations of what is implicit in this situation. This "given" in passage is there and is the starting point for a cognitive structure of a past (1932\1980: 18).

The individual is not individual after all, but an organized relation with its given past. The past is given in that the individual is thrown\projected into an always already

existing system of relations -- stressing the deterministic aspect of casual relation. Our human dasein -- our becoming-there -- emerges in dialectical relation with its "given" field. This "given" world we are thrown into is the ontological basis for an epistemological quest for the past.

172

"Fourth, this emergent character, being responsible for a relationship of passing processes, sets up a given past that is, so to speak, a perspective of the object within which this character appears" (Mead 1932\1980: 18). The emergent character modeled on the Schrödinger wave function entails organizing processual tendencies as probabilistic relations . This emergent novelty establishes the perspectival past of the event: we (re)view the past from the vantage point of the passing present.

173

On the other hand, "[w]e can conceive of an object such as, say, some atom of hydrogen, which has remained what it is through immeasurable periods in complete adjustment to its

surroundings, which has remained real in the slipping of one present into another, or, better, in one unbroken, uneventful passage" (Mead 1932\1980: .18-19). Here Mead seems to be heading in a humanistic philosophical direction in that he makes a distinction between organic pasts and inorganic temporal existences. But even the inorganic level of nature is past filled. Paul Dirac tells us that "even a single subatomic particle" interferes with itself, subtends itself, intervenes with itself (Zukav 1980: 93n). Thus there is a continuity between our organic and inorganic pasts.

174

"For such an object there would have been unbroken existence but no past, unless we should revert to the occasion on which it emerged as an atom of hydrogen" (Mead 1932\1980: 19). It is quality not quantity of life that is significant. You may meet a centenarian without a past -- and a ten year old with an intensely rich meaningful past. The old man follows all social rules slavishly, whereas the young girl breaks them with a regularity that appalls her elders. Maturity is not a matter of rationalized

chronological age but a question of significance of life lived.

175

"This amounts to saying that where being is existence but not becoming there is no past, and that the determination involved in passage is a condition of a past but not its realization" (Mead 1932\1980: 19). Becoming not being is really and truly real. Only the passing presenting is fully realized. What matters most now? What is to be done now?

176

"The relationship of passage involves [ontologically] distinguishable natures in events before past, present and future can arise, as extension is a relationship which involves distinguishable physical things before structurable space can arise" (Mead 1932\1980: 19). Here Mead revolts against the rationalization, reification, and mathematization of the scientific world. Mead, like Husserl, viewed the scientific knowledge, scientists, and scientific worldview of his times as a crisis of

European\Western science. Both philosophers attempted to save the phenomena: Mead by pragmatism, Husserl by phenomenology. Mead's point in the quote above is a Wittgensteinian one of counting. Counting temporal relations *entails* counting things passing through time in the same way that counting spatial relations in four-dimensional Minkowski space-time entails counting spatial things. Mead opposes Western science's abstraction and anti-democratic move away from everyday life towards a Platonic paradise.

177

"What renders one event distinguishable from another is a becoming which affects the inner nature of the event" (Mead 1932\1980: 19). In terms of Schrödinger's wave function, genuine space-time becoming implicitly signifies that one of the multiple potential (id)entities described by this representation has emerged into a fully actualized becoming.

178

Mead critiques his contemporary physical science's attempt to abstract nature, spatialize time, and deny difference:

... It seems to me that the extreme mathematization of recent science in which the reality of motion is reduced to equations in which change disappears in an identity, and in which space and time disappear in a four-dimensional continuum of indistinguishable events which is neither space nor time is a reflection of the treatment of time as passage without becoming (1932\1980: 19).

Thus passage is a necessary but insufficient element in identifying the presenting passing becoming.

179

We shall address this issue of the mathematization of nature in greater depth in Chapter Six. Suffice it to say here that Mead uses one metaphorical mathematical representation to deconstruct another. Is he being (in)consistent?

180

Let us consider Mead's constitution of the (human?) self in the texts of quantum physics and Schrödinger's wave function.

181

Mead constitutes the self as a double-consciousness of deterministic "me" and indeterministic "I" (Mead 1934). The self is a double-agent.

182

The me-agency is at war with the I-agency. For the me-agency represents the voices and texts of socially significant others -- negatively, the crowd -- whereas the I-agency represents the free spontaneous creative aspect of the self. The me-agency acts as superego to the I-agency as ego. The me commands with the letter of the Law, whereas the I seeks to avoid its strict exacting. The me hails, interpolates, and objectifies the I as subject. The me seeks social control -- the I, deviance.

183

Now for a gayer tale. The me and the I collaborate with each other in that the me represents spontaneous receptivity while the I represents receptive spontaneity. Thus these hybrid metaphors enable us to bridge the supposed Kantian, subject-object, indeterminism-determinism dichotomy: sociality as metaphorical hybridity.

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Consider these two hybrid metaphors in terms of the Schrödinger wave function. The isolated wave function represents the me as spontaneous-receptivity, the totality of the probabilistic potentialities\tendencies that the subject I may become. In a sense, Schrödinger's wave function may be said to summarize the degrees of freedom of the subject. A self suffering the injustices of classism, racism, sexism, and heterosexism has fewer degrees of freedom than a self not suffering from these hierarchical oppressions. Thus each personal self has a particular wave function.

185

The event of measurement of this propagating personal system precipitates the self, personal and particular -- the abject ejection of the subjected subject. The singular measuring event represents mathematically the agential insurgent I.

186

Moreover, sociality is instantiated in Mead's mediating self as self-consciousness. The self knows itself only in so far as this self's others know it. We view ourselves -- are conscious of ourselves -- as others view us. Thus consciousness of self, and of others.

187

There is therefore no socialization without individuation, and no individuation without socialization. Thus sociality is at once both socialization and individuation.

Incidentally, a recent discovery in the field of subatomic elementary particles may well be -- on replication -- yet another instantiation of Mead's principle of sociality. I refer to the possible identification of a hybrid particle: a leptoquark. The existence of such a particle would signify that we rethink our understanding of elementary particle physics. A leptoquark is a strange species. All matter is composed of two fundamental kinds of particles: [1] leptons (neutrinos, muons, tauons, and electrons) which interact via the electromagnetic weak force, and [2] hadrons (including protons, neutrons, pions) which also interact via the strong force. Leptons do not have an internal structure. So they are elementary particles. Hadrons, on the other hand, do have internal structures, and so they are not really ultimately elementary particles. Hadrons may be either baryons or mesons, and these are in turn composed of elementary quarks: 3 quarks in the case of baryons, and 2 quarks for mesons. Therefore the most elementary constituents of matter are leptons and quarks. Now if a

leptoquark were to exist, this would mean that we would have reduced matter to a single elementary constituent. Moreover, our knowledge of elementary subatomic interactions would be revolutionized (Uvarov and Isaacs 1993: 141).

We are now in a position to consider the human mind and self in the metaphorical terms of quantum mechanical Hilbert state space -- the extension and elaboration of Mead's ontology of sociality (Hodgson 1993; Lockwood 1992).

189

This extension of Mead's naturalism and materialism via quantum physics is both [1] in accord with his program in behavioristic psychology of "planting communication, thinking, and substantive meanings as inextricably within nature as biological psychology has placed general animal and human intelligence" (Mead 1927\1964: 307), and [2] counter his project to save objective scientific phenomena from mathematical formalism: sociality, again, as at once the old order and the new. Thus Mead's work is itself novelized and revolutionized

190

In *Mind, Brain, and the Quantum: The Compound "I"* (1992), Lockwood conjectures that the human mind is a compound computer of quantum states\Hilbert spaces which function as a Bose condensate: sociality as the identity of mental and physical events.

191

Here again we need a new metaphor to describe the human mind-brain relations -- sociality as supervenience or superposition. Supervenience or superposition means that a quantum state (or states) is imposed upon another. Quantum superpositions are holistic compounds in that they are coherent: a coherent superposition is a thing which is as distinct from its component parts as they are from one another -- sociality as emergence again (Zukav 1980: 270).

Coherent superpositions are central to quantum mathematics in that they are (represented by) wave functions. A quantum mechanical experiment -- living, minding -- has an observed

system (organizing of perspectives) with its associated wave function (Zukav 1980: 270). The wave function of a particular observed system -- a photon or a person -- is the superpositioning of all the potentialities of the probabilities of interactions between identified and identifying\measuring system (photographic plate, human personal lifespace). Schrödinger's wave equation represents the development over time of this compound of heterogeneous potential identities. We can use Schrödinger's wave equation to calculate the form of this coherent superposition of potentialities -- this queer thing-in-itself -- for a particular point in time. Then we can calculate the probability of each potentiality of the wave function at this time, yielding the probability function of an event -- for example, the location of an electron or photon (Zukav 1980: 270).

In terms of vector mathematics, a Hilbert space vector represents the state of the quantum to-be-identified-system (Lockwood 1992: 337). A Hilbert space is an infinite dimensional complex vector space where [1] the inner product of two vectors of the space is generally a complex number,

and [2] reversing the order of vectors in an inner product replaces the original value with its complex conjugate (Lockwood 1992: 330-331). A complex number is expressed in the form $x + yi$; where x and y are real quantities, and i is the square root of -1 (Uvarov and Isaacs 1993: 88). The complex conjugate of a complex number is therefore given by $x - y I$; and the square modulus or product of complex number and conjugate is given by $x^2 + y^2$.

We may represent the location of a particle by these Hilbert state vectors and coordinates; and we can also do the same for the particle's momentum. State vector mathematics therefore represent wave functions for every possible energy level: sociality as supervenience and superposition. Using this metaphorical picture of quantum state space vectors, we may represent and constitute the identities of energy levels or eigenstates as product vectors of the basis vectors of x a position and y as momentum (Lockwood 1992: 179-195).

Let us consider the position wave function or state vector. There is a corresponding wave function for every energy level. Let P be the position of a quantum identity, defined

by a value on the x coordinate of the configuration space. Then the wave function yields a corresponding complex number for any given P . Then the square modulus of this complex number is proportional to the probability that we can locate the quantum identity in its immediate environment or lifespace of P . Thus the wave function defines a probability density over the position coordinate x (Lockwood 1992: 184).

192

Again, the Hilbert space metaphor picture enables us to carry on a conversation about our cosmos and selves that we could not before with the normal nonrevolutionary Euclidean space. Euclidean space differs from Hilbertian space in that [1] product vectors are not complex numbers, and [2] reversal of order of inner product vectors does not make a difference in identities. Hence sociality as pathology, abnormality, deviance -- revolution. (Hence a family resemblance between sociality and the aberrant practices in *Psychopathia Sexualis*.)

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It is these mathematical metaphoric characters of Hilbert space vectors that enable us pragmatically to represent the queer world of quantum superposition of vectors\states. "Given a set of physical states in quantum mechanics, it is possible to multiply each state, or rather the corresponding **state vector**, by any number one likes, add the various products together, and get a new physical state, which is then known as a superposition of the state one started with" (Lockwood 1992: 337). Here sociality as thing-in-itself emerges. For the Hilbert vectors allow us to calculate the probable position of an observed quantum identity. And the probable position of this, say, electron will be the holistic totality of its quantum probable positions: the electron is an (id)entity who is at once more than one thing. Thus the electron is social: socially human and humanly social -- and by macroscopic extension so are human becomings (Lockwood 1992: 337-338).

194

And human identities are socialities in that they and quantum *microscopic* characters are perspectival. For each

personal quantum (sub)systems will transact with that person's lifespace depending on its perspectival identifyings of situations.

195

Consider Lockwood's conjectures that the mind or brain may be a quantum computer of Bose condensation (1992: 240-260).

196

There are some who argue that the brain has evolved particularly to take advantage of quantum physical effects, and that consciousness may be a quantum mechanical phenomenon. Two questions emerge here. First, are there any advantages from the exploitation of quantum physical effects? Second, could quantum physical events be happening in the mindbrain? (1992: 240).

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The evolutionary advantage of quantum brain effects may be that they enable the brain to expand its computational powers by functioning as a quantum computer. We have not

yet been able to construct a quantum computer, and the field is still in its theoretical phase. But the theory of quantum computing has already provided significant results through generalization from the concept of a Turing machine (Lockwood 1992: 241).

Turing conceived the Turing machine in the 1930s as a means of giving precise meaning to the mathematical concept of an algorithm, a mechanical procedure. Turing worked on Hilbert's 23rd mathematical problem, "finding a mechanical way of testing whether an arbitrarily chosen formula of *first-order predicate logic* was a theorem" (Lockwood 1992: 241). An example of first-order predicate logic is: "For every x , if x is F , then x is G ." A mechanical algorithmic test of theoremhood is a decision procedure (Lockwood 1992: 241).

The Turing machine was conceptually capable of performing all algorithmic procedures, e.g. addition and subtraction (Lockwood 1992: 241). Turing's machine is a mathematical representation rather than hardware. Metaphorically, imagine a typewriter with an endless papertape, only a

portion of which is ever used at one time, divided into squares. We can think that there is either a 1 or a 0 on each square. The machine scans one square at a time in a certain state. The conjunction of symbol and state causes three things to happen: [1] the machine prints a 1 or a 0 where printing means leaving a 1 if it is already there, or substituting a 1 for an 0 if an 0 is already there; [2] the machine either halts, or shifts the tape to scan the square on the left or the right. The machine's operations is described sequentially by a machine table which lists for each internal state the operation for each square. This system of combining 0s and 1s can be easily adapted to mathematical operations such as addition and subtraction.

The Turing machine is the theoretical foundation for the modern digital computer. The random access memory corresponds to the tape, and the machine table is a computer program.

Now the Turing machine and the computer operate *linearly*, whereas a quantum computer would overcome the speed limitations of ordinary computers by operating

superpositionally. This means that a quantum computer can be at once in a number of states, and that each square can have indeterminately a linear combination of both a 0 and a 1, and that the contents of a set of squares are also superimposed. Thus a quantum computer is capable of quantum parallel processing which does not restrict the number of operations that can be simultaneously performed: computer technoscience as sociality. Perhaps the human brain operates as a quantum Turing machine.

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In addition to the metaphors of Hilbert space and Turing machine, we may think, perhaps, of theoretically using as metaphors 1. and 2. machines wherein each atom would act as a quantum computer chip. SQUIDS are superconducting quantum interference devices. These are rings of superconducting material forming a neck where they are constricted at a certain point. Superconducting materials are those wherein electrical resistance is zero, and hence its current does not become attenuated with the conversion of electrical energy into heat. Superconductivity occurs in some materials when their temperature falls below a certain

value. A SQUID functions as a macroscopic analogue of the microscopic fieldsystems of quantum physics. The flow of current around the superconducting ring creates a magnetic flux. This flux and the electrical charge of the pinched neck function as noncommuting quantum-mechanical observables in an indeterminacy relation analogous to that of the position and momentum of an electron. Thus in the same way that an electron emerges as an identity of superposed position eigenstates a SQUID emerges as a superposition of position eigenstates of the macroscopic magnetic flux observable (Lockwood 1992: 251).

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Recently quantum theorists proved that by manipulating subatomic particles like abacus beads we can solve problems that would take an inhumanly long time quicker. In a normal digital computer, bits - the 0s and 1s - are manipulated by logic gates or switches. A NOT gate inverts its input signal. When a 1 arrives at the gate, it outputs a 0, and vice versa. Some gates have two inputs: an AND gate returns a 1 only if both its inputs X and Y are 1. An OR gate will say 1 if either of its inputs X or Y is 1. Present

technology has shrunk hardware to such an extent that millions of logic gates are on a single computer chip. But the gate in a quantum computer would each be the size of a single atom. Three different kinds of atoms (A, B, C) can be strung together in a polymer chain: ABCABCABCABCABC. Each of these atoms' electrons could be manipulated to perform a computation. Let the normal lowest energy state of the electron represent a 0. A laser striking the electron causes it to rise to a higher energy level, and this represents 1. A second laser pulse resets the electron to 0. Different atoms are activated by differently colored lasers, so that we can command particular atoms to perform particular computations, shuffling binary digits as in a normal digital computer. But the electrons in a quantum computer would theoretically be in superpositioned states of 0 and 1 at once, simultaneously, and at the same time: sociality (New York Times, Tuesday, February 18, 1997, C1, C6).

So much for the evolutionary computational advantages of quantum computer parallel processing. But has the brain in fact evolved as a quantum computer?

There is evidence that the brain functions as quantum Bose condensation. A boson is a quantum particle that obeys Bose-Einstein statistics. "Given two identical bosons, A and B, and two states 1 and 2, there are three, rather than four, distinct possible configurations: both particles in state 1, both particles in state 2, and one particle in state one and the other in state 2. No distinction can be made between the configuration in which A is in state 1, while B is in state 2, and the configuration in which B is in state 1, while A is in state 2" (Lockwood 1992: 327).

Consider a system wherein metal balls are fired toward a partition established so that any given ball is equally likely to land on the left hand side as on the right side. Let us fire two balls in succession, a and b. What is the probability that we will find both balls on the left side? Evidently, it is $1/4$ because there are four possible distinct equally probable states: both balls on the left,

both balls on the right, ball a on the right and ball b on the left, and ball a on the left and ball b on the right.

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Classical physics identifies the two balls as two distinct separate identities. But this is not the case in quantum physics. If the balls were bosons - photons, or helium atoms, or electron pairs in a superconducted current -- then the probability that two of them would end up on the left would be greater than $1/4$. This is because the probabilities of photon a on the left and photon b on the right, and photon a on the right and photon b on the left are not two distinguishable separate distinct (id)entities. In quantum physics these are two aspects or perspectives of the same state. Thus there are only three possibilities in our quantum situation: both particles on the left, both on the right, and one on either side: the probability therefore of both landing on the left side is one third (Lockwood 1992: 252-253).

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Thus there is the tendency of bosons to crowd together in the same state. Bose condensed states are states in which almost all the bosons are in the same state. This state may come about through thermal equilibrium. Suppose that the bosons are in a continual state of interaction with a heat bath as an energy source. Energy is exchanged among the bosons, and between the system of bosons and the heat bath in such a way that there is zero energy transfer between the two systems over an interval of time. When this equilibrium state has been reached, the bosons become distributed in different energy states according to Planck's 1900 distribution formula.

This energy state distribution is a function of temperature. At a sufficiently low temperature of the heat bath almost all the bosons crowd into the lowest energy state. Hence the easiest way to achieve superconductivity is at low temperatures. Thus one way of achieving Bose condensation is through cooling(Lockwood 1992: 254).

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But Bose condensation is also achievable by other means. Bose condensation is also possible through maintaining the boson system in a nonequilibrium state via a pumping processor (Lockwood 1992: 254).

204

Any vibrating system has normal modes of vibration. Normal modes of vibration are states of vibration in which every element of the system is vibrating about its equilibrium system at the same frequency. We can represent any arbitrary vibrational system state as a superposition of the normal modes. Each mode can be viewed as a harmonic oscillator in its own right. Each node will then have a discrete spectrum of energy levels which we can number 0, 1, 2, 3, 4. An energy eigenstate of the whole system is specified exhaustively when we represent the level up the energy spectrum for each node. In quantum field theory, photons are viewed as nothing but notches up the normal

energy states for the electromagnetic field: photons are quanta of the electromagnetic field (Lockwood 1992: 254).

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This correspondence between photon particles and quanta of the electromagnetic field is merely one instance of a more general correspondence between particles and quanta of the normal modes of a field. Particles may be represented as quanta, and quanta of ordinary vibrational systems may also be represented as particles, e.g. sound vibrations. Matter vibrations are electrical in that these oscillations involve forces which involve electrical attraction and repulsion between atoms. Phonons are as to vibrations of mechanical fields as photons are to vibrations of electromagnetic fields (Lockwood 1992: 255).

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Now there are a number of biological entities that are systems that function as electrical dipole oscillations -- having both positive and negative electrical poles.

Dielectric protein molecules are dipole oscillations in themselves, and molecules in cell membranes are excellent candidates. For the voltage difference across these membranes are often very steep, particularly in nerve cells. Another possibility of dipole oscillation involves nonlocalized electrons -- those whose position wave function is spread over a wide area.

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Thus Bose condensation is in principle achievable in such biological dipole oscillating systems at ordinary temperatures. We can have a biological dipole oscillating system immersed in a heat bath -- at a *constant* temperature and not cooled as in superconductivity. Each dipole oscillator in the system vibrates according to two forces: [1] short-range electrical forces between its positive and negative poles, and [2] long range Coulomb forces between one oscillator and another mediating kinetic energy transmission between oscillators. Then the stronger these long range forces are, is the greater the tendency for the oscillators to vibrate in unison (Lockwood 1992: 256).

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Now we have seen that bosons are the quanta of the collective normal vibrational modes of the oscillators. But in Bose condensation at ordinary temperatures the oscillators and the heat bath do not reach a thermal equilibrium of a low temperature. The oscillators are pumped with a constant supply of heat, and this prevents them from attaining thermal equilibrium with the heat bath. This pumping energy could be conveyed to dielectric molecules in cell membranes through a cellular structure known as the cytoskeleton. In Bose condensation through cooling, heat energy is withdrawn from the heat bath so that the system settles into a state of thermal equilibrium at a low temperature. But in Bose condensation at ordinary temperatures, condensation can be achieved by supplying the oscillators with a source of heat, while keeping the temperature of the heat bath constant. When the rate of heat energy supplied to the oscillators is sufficiently high, energy is stored in the phonon system by being channelled into the lowest collective frequency mode. New phonons are therefore created in this mode. And the result is a long-range spatiotemporally coherent state in which

different points in the fieldsystem oscillate at the same frequency and vary in phase and amplitude by a fixed amount -- like clocks in a different time zones. An incoherent state is like the surface of a pond on a windy day: turbulent without any discernible pattern. But a coherent state is like a pond surface on a calm day -- not flat but with standing waves moving together in a coordinated way at every point (Lockwood 1992: 256).

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These Bose condensed states could have great evolutionary biological utility in that they could be used to amplify a weak incoming trigger into a more powerful coordinated output -- as in a laser.

210

Moreover, Bose condensed states may be used to encode immense amounts of information into a very small space. These Bose condensed phonon pumped states may be the basis of mental states and processes. This has first been postulated by Ian Marshall. Indeed, Marshall has argued

that their collective holistic character may be the basis for the unity of the consciousness. His calculations suggest that these states would be capable within the space of a cubic centimeter or less of carrying as many bits of information as are contained in a single maximal experimental phenomenal perspective. Information might be encoded within the lowest collective frequency mode by adjusting the amplitudes and phase relations between dipole oscillations. Amplitude and relative phase may be the physical basis of the intensity and quality respectively of our sensations (lockwood 1992: 257-258).

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There is some evidence that these phonon pumping Bose condensed states may exist in biological systems. One bit of evidence is that one can cause marked changes in the behaviour of cells through exposing them to microwave radiation. There are sharply defined resonance frequencies at which this phenomenon is observed. There is also the Raman effect in living cells which concerns the way that a system scatters laser light. Both cases are difficult to

explain by processes that are not coordinated and holistic similarly to Bose condensed ones (Lockwood 1992: 257).

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Marshall thinks that the action of general anesthesia may be an example of these states. How is it that a heterogeneous mixture of chemicals produce a holistic effect? It may well be that the loss of consciousness is constituted by the disabling of certain cells in molecular dipole oscillation. General anesthetics may work well by leveling the voltage gradient across the cell membranes of neurons, and thereby preventing them from firing. For neurons function under specific patterns of exchange of positive and negative ions across the walls of the axon (Lockwood 1992: 258).

CHAPTER 6. THE SPATIALIZATION OF TIME OR THE TEMPORALIZATION OF SPACE?

213

In this Chapter, I shall address the conflicting interpretations of Einsteinian relativity of two major schools or trends of physical thought: [1] the philosopher-scientists of Being, and [2] the philosopher-scientists of

becoming. Mead, of course, belongs to the second trend -- along with Bergson, Meyerson, Capek, Griffin, and other (post)modern process theologians. These theorists critique Einstein's relativity for spatializing and freezing time. On the other side are Einstein himself, Minkowski, Godel, and de Beauregard, who argue for the spatialization of time - and against the temporalization of space. Whitehead plays a pivotal role in this debate in physical and social theory, because [1] he belongs both to the Heracliteans and the Parmenideans, [2] his account of relativity theory differs from Mead's and [3] Mead studied Whitehead's philosophical system extensively to situate his own work.

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I will provide a genealogy of this discursive debate over relativity theory hereafter.

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We begin -- of course -- with Einstein himself. Einstein's special theory of relativity demonstrates that we should no longer think of space and time as separate (id)entities but

as connected in a spacetime continuum. We can represent an event by the coordinates X , Y , Z , and t where X , Y , Z stand for spatial dimensions and t for time. Our problematic turns on the question whether time is spatialized in this connection and can be treated like another spatial dimension, or whether time temporalizes the other spatial dimensions (Einstein et alia 1952: 38-39, 43).

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In his 1908 address "Space and Time," Minkowski provided the geometrical formulas for the four dimensional spacetime of the special theory of relativity, and declared that "[h]enceforth space by itself, and time by itself, are doomed to fade away into mere shadows, and only a kind of union of the two will preserve an independent reality" (Einstein et alia 1952: 75).

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"We will try to visualize the state of things by the graphic method. Let x , y , z be rectangular co-ordinates for space, and let t denote time" (Minkowski in Einstein et alia 1952:

76). As with Einstein we can represent a four-dimensional spacetime manifold graphically with three coordinates of space and one for time.

"A point of space at a point of time, that is, a system of values x, y, z, t , I will call a *world-point*. The multiplicity of all thinkable x, y, z, t systems of values we will christen the *world*" (Minkowski in Einstein et alia 1952: 76).

"Not to leave a yawning void anywhere, we will imagine that everywhere and everywhen there is something perceptible. To avoid saying "matter" or "electricity" I will use for this something the word "substance" (Minkowski in Einstein et alia 1952: 76). This is akin to the medieval view that nature abhors a vacuum. And the old concept of substance returns, but this spacetime manifold or continuum is a very queer substance indeed.

"We fix our attention on the substantial point which is at the world-point x, y, z, t , and imagine that we are able to

recognize this substantial point at any other time" (Minkowski in Einstein et alia 1952: 76). Now it seems that Minkowski recognizes that it is an imaginary abstraction to think of a world-point as being unchanged at any other time. For this would not hold true for a Heraclitean cosmos wherein you cannot step into the same river twice.

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"Let the variations dx , dy , dz of the space co-ordinates of this substantial point correspond to a time element dt . Then we obtain, as an image, so to speak, of the everlasting career of the substantial point, a curve in the world, a world-line, the points of which can be referred unequivocally to the parameter t from $-\infty$ to $+\infty$ " (Minkowski in Einstein et alia 1952: 76).

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"The whole universe is seen to resolve itself into similar world-lines, and I would fain anticipate myself by saying that in my opinion physical laws might find their most perfect expression as reciprocal relations between these

world-lines" (Minkowski in Einstein et alia 1952: 76). Here is the crux of the matter. We may represent the entire cosmos by these mathematical world-lines, but do these mathematical representations have physical significance? Now Einstein has demonstrated that the velocity of light c is constant, that time takes time to travel, and that superluminality (barring tachyons) is not possible. Can there be nonlocal relations between Minkowski's mathematical world-lines? In other words, can any light signal traversing any world-line causally relate with any other world-line.

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" The concepts, space and time, cause the x, y, z - manifold $t = 0$ and its two sides $t > 0$ and $t < 0$ to fall asunder" (Minkowski in Einstein et alia 1952: 76). Hence we have a double cone with the time dimensions vertical, and the spatial dimensions horizontal to it. This cone is generated by light signals traveling inwards to a world-point $t = 0$, and light signals traveling outward from this point. Thus the cone defined by $t = 0$ divides the directions of spacetime into three classes: [1] the exterior of the cone

($t > 0$), [2] the interior of the upper cone ($t < 0$), and [3] the interior of the lower cone ($t < 0$). These dimensions are respectively [1] spacelike or elsewhere, [2] future timelike, and [3] past timelike (de Beauregard in Fraser 1966: 428-429). "Because the numbers x , y , z , and t are always real, it follows that the axes of x , y , and z are space-like while the t -axis is time-like" (de Beauregard in Fraser 1966: 429).

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Thus this vertical-horizontal timelike-spacelike distinction suggests that time is not subsumed under space, and therefore cannot be treated as just another spatial dimension.

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But Minkowski writes:

We should then have in the world no longer space, but an infinite number of spaces, analogously as there are in three-dimensional space an infinite number of planes. Three dimensional geometry

becomes a chapter in four-dimensional physics. Now you know why I said at the outset that space and time are to fade away into shadows, and only a world in itself will subsist (In Einstein et alia 1952: 79-80).

Note well that he does not say "an infinite number of spacetimes" -- but merely "spaces." Again, he says, "The world-postulate [of the absolute world] permits identical treatment of the four co-ordinates x, y, z, t " (Minkowski in Einstein et alia 1952: 83).

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Henceforth, a number of commentators, including de Beauregard, have tended to treat time as another spatial dimension, as a fourth dimension of space and not of spacetime. If time is treated in spatial terms, then one enters the future as something already existing, as one would walk into a room which is already there before one's entry. If this is the case, the future may be already determined and self-agency thereby negated. The spatialization of time implies that the distinctions between past, present, and future are elided. Hence de Beauregard

states in "Time in Relativity theory: A Philosophy of Being" that "relativity is a theory in which everything is "written" and where change is only relative to the perceptual mode of living beings" (in Fraser 1966: 432).

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De Beauregard writes:

We can, of course, easily imagine the past experience of an individual as being diagrammed in space-time along a time-axis extending backwards into the past. In our view, the future is to be adjoined to the diagram in a corresponding fashion. There are writers who affirm that the future contains elements which are undetermined by the past and the present, and that the future light cone in the diagram must therefore be left blank. The answer is that there is a future. Nature "will take" one of the alternatives open to her, and it is this that we must imagine inscribed, even though we do not know what it "will be" (in Fraser 1966: 432).

Now Mead, Bergson, Meyerson, and Capek are among those process philosophers who hold that the future is not mechanistically determined by the past and the present, and that the cosmos is open to novelty. Here de Beauregard insists that there is a future stretching before us. Intuitively, this begs the question, "What if the cosmos has already come to its end ahead of us?"

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Moreover, the twin paradox of general relativity demonstrates that time cannot be simply reduced to space. Now length contraction of a body in uniform relative motion occurs in the direction of the body's movement. Take two yardsticks in two spacetime systems in uniform relative motion, and an observer in each system. To each observer the yardstick of the other is shorter than their own. But there is no analogue of reciprocal length contraction in the time dilation of the twin paradox, signifying that there are temporal relations which cannot be explained in terms of spatial ones. Take twin sisters, one of whom goes into outer space as an astronaut, while the other stays on Earth. Now the astronaut sister is in an accelerating rocket, her

time contracts or passes slower, and her clock runs slower. Thus she ages slower than the twin at home, and returns home to find her twin long dead. But since relativity is reciprocal, we may regard the rocket as stationary relative to the moving twin on Earth. Hence the twin on Earth would also age slower than the twin in outer space, and both twins would each be younger than the other. The solution to this paradox is that the returning astronaut twin is younger, because reciprocal relative relations apply only to uniform motion -- as in the special theory of relativity -- and not to the accelerating motion of the general theory (de Beauregard in Fraser 1966: 422-423).

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De Beauregard's discussion of the problematic of determinism and free will in the special theory of relativity raises interesting issues concerning the static versus dynamic interpretations of Minkowski spacetime.

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Beauregard writes:

The subject concerns relativity because if a conscious being is able to make free decisions, these decisions influence the future and not the past and once again a dissymmetry exists. Further, it seems to be urgently implied that the future half of the Minkowski diagram cannot be filled in, even in principle, because decisions upon which it depends have not yet been made. To this we have answered above that something is going to happen and that is what is written down. This does not answer the question of determinism, however, and we must proceed to make a basic distinction (In Fraser 1966: 434).

De Beauregard does not allow for the possibility of causal signals travelling backwards into the past as is envisaged in time travel. Hence we may influence the future but not the past physically. It is puzzling what the indeterminate something that is written in the future could be. What does de Beauregard mean by "written" ? Might future somethings be possible worlds in the many worlds interpretation of quantum physics, or potentialities in the Copenhagen interpretation?

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There are at least two ways we can represent events in a Minkowski diagram: [1] a Heisenberg picture of quantum field theory wherein the Psi-function of the entire cosmos propagates independently, deterministically, and time-independently, and [2] as a record of the thoughts of an intervener. We may think of these two worldpictures as complementary to each other -- sociality again.

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When Bergson responded to Einstein and Minkowski in his 1922 *Duration and Simultaneity* (1955), he had already constructed a philosophical system which critiqued science and mathematics for spatializing time, and for substituting abstractions from the durational flux of reality for reality itself. I affirm Bergson's critique of philosophical and scientific negations of time, I disagree with his rejection of relative simultaneity, and of time passing slower\faster in the "twin/clock paradox" (Bergson 1955: 67-113). Bergson is inconsistent when he rejects an absolute reference frame,

but still upholds absolute simultaneity. The rejection of an absolute spacetime perspective entails that there is no universal "now," that each field has its own "now-time," and therefore that events simultaneous in one field may not be such in another.

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Also, Bergson incorrectly situates the twin paradox in the special theory of relativity which deals with fields in uniform unaccelerating relative motion instead of the general theory which deals with accelerating fields. The physical effect of acceleration hence gravity in slowing time accounts for the paradox in which a twin projected from earth in an accelerating rocket returns to find her earth-bound twin dead for two hundred years while she has aged only two years (Capek 1971: 238-256).

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Following in Bergson's footsteps, Meyerson's 1925 *The Relativistic Deduction* (1985) critiques the spatialization of time. Zahar writes:

According to Meyerson, all explanations, whether scientific or common-sensical, spring from one basic tendency of the human mind; namely the tendency to deny diversity and change; or to assert the existence of constants behind the fleeting appearances; or to explain the Many in terms of the one; or to subsume the flux of becoming under the immutability of Being. The best formulation, in my opinion, is that the human mind inevitably tends to deny diversity and assert sameness or identity both in space and in time (1987: 95).

Meyerson instantiates this tendency to deny temporal change in mathematical equations wherein the right hand side is identical to the left hand side. Meyerson maintains that "in order to yield knowledge, the statement $A = A$ had to be non-tautological in the sense that the A on the right hand side of the equation was not identical with the A on the left side" (Zahar 1987: 99). Moreover, he claimed that the "equality $a^2 - b^2 = (a - b)(a + b)$ is not an identity. Although both sides of the equation yield the same result when numbers are substituted for a and b , the operations

performed on the two sides remain different" (Zahar 1987: 99). In other words, the processual operations on either side are different in kind. Let the left hand side represent natural processes before an event, the equal sign these processes in and through this event, and the right side the outcome of this event. Then the equation represents not an equation of identities but a novel transformation. Thus Meyerson is similar to Mead in his distrust of mathematical rationalizations.

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Why should the cosmos be a Raphael and not a Jackson Pollock?

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In terms of relativity physics, both Einstein and Meyerson correctly point out that since the signature of $(g_{\mu\nu})$ is $(1, -1, -1, -1)$, relativity physics does not treat time on a par with space (Zahar 1987: 105). Weyl expressed this state of affairs by saying that the spatio-temporal manifold is

(3+1)-dimensional rather than 4-dimensional" (Zahar 1987: 105).

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On this issue of the mathematical rationalization of relativity physics, it must be said that the basis of the formulae are sensory qualities of sight, color, and sound. Thus there is no intrinsic contradiction between the mathematics of relativity physics and phenomenal sensuous characters.

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Whitehead, influenced by Bergson, also affirms that reality is temporal process, and criticizes the spatializing of time in relativity theory (1978). While Whitehead is a leading exponent of relativity theory (1922), he too suffers from the epistemic habit of absolute simultaneity (1964: 53,56). Whitehead reintroduces an absolute temporality underlying different spacetime systems, the temporal sequence of the ingression of eternal Platonic forms into relativistic spacetime.

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Mead comments on Whiteheads's relativity physics:

Whitehead, taking the position of objective relativism, accepts the different time systems as reality and asks what is common between them, and finds it in the levels, rects, and puncts. The puncts are found in all systems, the rects and levels in at least two or three and, in fact, in indefinitely many more. He seems to assume that the presence of these identical elements in different time systems is responsible for the common Euclidean structure of the different spaces, which become the permanent spaces of different time systems. So far as these perspectives are practically only spatial, i.e., where the velocities do not approach that of light, we can continue to operate in the same sort of a common world as that referred to above (1938\1972: 524-525).

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Two questions then come to mind here:

... How far is Whitehead justified in assuming that logical entities such as levels, rects, and punts can have a constitutive character in determining the perspectives or spaces and times of the different time systems, and, second, how far has he setup a metaphysical event which is the ultimate reality in independence of the independence of the time systems, and thus has surrendered his objective relativism? Has he avoided bifurcation (Mead 1938\1972: 525)? How can Platonic essences causally interact with the material world of the relativistic spacetime systems? Whitehead appears to have reconstructed a mind-body bifurcation and dualism of nature.

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Thus Mead critiques Whitehead for reintroducing a static version of Minkowski spacetime into his relativity physics:

...This view of reality as an infinite scroll unrolling in snatches before our intermittent vision receives another variant in the picture of reality as a four-dimensional continuum of space-time, of events and intervals, forever determined by its own geometry, and into which we venture with our own subjective frames of reference,

receiving momentary impressions whose present character is a function of our minds and not of any section of the ordered events in the universe (1932\1980: 43).

"Whitehead thus seems to have set up a world of events as an absolute and a passage which admits of alternate [relativistic] time systems" (Mead 1938\1972: 527). Whitehead's world of events is the infinite scroll of absolute events unfolding as we perspectivally glimpse pieces of this absolute reality through different relativistic spacetime systems. Now Mead's reading of Minkowski is that his spacetime four-dimensional continuum is yet another version of a block universe wherein events are already inscribed, and our subjective reference frames merely pick out events that are already absolutely there.

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But as we saw in de Beauregard's quantum mechanical version of Minkowski's space-time, we need not necessarily accept Minkowski's theory as a static spatialization of time. The perspectival "observer" in a spacetime reference frame does not merely (re)present the events of that frame and of other

frames, but intervenes in those very events -- thereby constituting them. Knowledge is not contemplative but transactive. Mead needed to expand his understanding of quantum physics to relate it to the problematic of temporality in spacetime relativity.

CHAPTER 7. IMPLICATIONS AND APPLICATIONS: INCONCLUDING UNSCIENTIFIC POSTSCRIPT

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This dissertation has applications and implications for [1] social psychological symbolic interactionist research, [2] debates within symbolic interactionist theory, [3] relations between pragmatist philosophy and classical and contemporary

cultisocial theory, [4] relations among the physical, biological, and biosocial fields and [5] relations between science and religion, particularly Eastern religion.

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SYMBOLIC INTERACTIONIST RESEARCH

The validity of the standard Twenty Statements Test is problematic in view of the theoretical concerns of this dissertation. The test was developed by Kuhn's structural school as a measurement of the self. The TST consists of a list of twenty open-ended self-reported answers to the question, "Who am I?" The researcher content analyzes the responses, codes them, and processes them statistically in order to predict a core hierarchy of self-identities that will be carried from one situation to another (Spitzer et alia 1970).

But if one takes seriously the field-dependence of identity, one should vary the test contexts to determine response changes in different situations. The meaning of responses in the test is constituted only in the perspective(s) of the

observer who codes them, and not in genuine symbolic interaction of the perspectives of observed and observer.

Moreover, the self must be situated and constituted not only in her perspective of herself, but also in her perspective of others' views of herself, and *their* perspectives of her identity (Tucker 1966). In terms of relativity physics, the self is mutually constituted and constituting in relations with others in a diversity of fieldsystems.

Most important, the TST captures the self at a spatial instant of time and not its temporal processual character -- a defect which might be mitigated by an extensive series of tests in a longitudinal study. But at this point my skepticism mounts as to whether we could not obtain a better understanding of the subject in question through an ethnographic case study of the self in its social field. Or through a reconstructive reading of signifying texts produced by the self.

SYMBOLIC INTERACTIONIST THEORY

In terms of the positivist dispute in symbolic interaction, we find that Mead attempts to reconcile the humanistic indeterministic school of Blumer with the more structural deterministic school of Kuhn by metaphorically reconstituting the debate in terms of quantum versus relativity physics. Thus this reconciliation in cultisocial theory is in the same inconclusive state as it is in physical theory.

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CLASSICAL SOCIAL THEORY

In terms of Marxist theory, we find that Mead's philosophy of sociality supports Marx's indeterministic Epicurean metaphor of the cosmos. Mead's reading of quantum physics supports the interpretive hermeneutics of Dilthey and Weber: sociality as complementarity entails multiple interpretability and polyvalent perspectivalism.

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CONTEMPORARY SOCIAL THEORY

Mead's philosophy of sociality anticipates contemporary developments in poststructuralism, postmodernism, and postmetaphysical thinking: [1] the death of the individual Cartesian subject, [2] standpoint theory, [3] textuality. [4] the importance of cultisocial practices in identity constitution, and [5] discourses of the body. On Mead's view, the Cartesian subject which stands over and against the body exists no longer: personal identity is inextricably a fieldidentity. The subject no longer views the cosmos from an Absolute God's eye view of the universe -- but perspectivally, from various standpoints. Hence feminist, racial\ethnic, national, queer, and class standpoints. Mead's view of the self of sociality accords with contemporary theories of social signification in that [1] the self is constituted as individualized and socialized via textuality, and [2] polyvalent textualities in a diversity of fieldsystems. In terms of the relation between cultisocial and quantum theory, identity is not essentialist and relatively stable but constituted by intervening practices novelistically. This is particularly relevant to technoscientific theory and laboratory life research which demonstrate the constitution of scientific object identities. The most surprising theoretical conclusion for

me is that Mead is a theorist of the body. For identity reality is constituted ultimately through contact experience of body with body, and the constituting mind-brain-body-self is a quantum field system.

Further, Mead's philosophy of sociality and its appropriation of indeterministic quantum physics has implications for the positivistic passion for prediction in much contemporary social thought. For "the breakdown of causality in modern physics" (Greenberger 1992: 22-27) should impel all scientists, physical and cultural, to reconsider profoundly the very nature of causality. This is even more true of events in physics which occurred after Mead's death.

Consider the EPR argument to rebut the breakdown of causality in quantum physics named after Einstein, Boris Podolsky, and Nathan Rosen. Einstein and his collaborators argued that quantum physics, though internally selfconsistent, must be incomplete, since it violated classical notions of reality and locality. They argued that the theory failed to penetrate to a deeper level of nature

at which reality and locality hold. On the other hand, Bohr and other proponents of quantum theory held that nature violated at least one of these principles (Greenberger 1992: 23). By "reality," we mean we mean that there exists an objective natural order prior to and independent of our experimental observation of it. "If it were possible to perform an experiment on one system that determined the value of some parameter for a different system, without in any way interacting with that other system, then the value of that parameter would be an element of reality" (Greenberger 1992: 25). By "locality," we mean that causal influences between one entity and another must operate at a local level in that, according to relativity physics, forces cannot travel and have effects faster than the constant speed of light (Greenberger 1992: 25).

The English physicist David Bohm subsequently contributed to the issues of non(reality) and non(locality) by considering the property of electron spin (Greenberger 1992: 25). An electron can spin only at a single rate in one of two possible states: 1. counterclockwise or "spin up," and 2. clockwise or "spin down" (Greenberger 1992: 24). The Bohm

example considers an original system which subsequently decays into two electrons or any two particles with electron-like spins. With the original system at rest, the two particles fly apart in opposite directions (conservation of momentum). The original spin of the system is also conserved in that the spin of each electron is opposite in direction to that of the other: one is "spin up" whereas the other is "spin down." Now we can measure the spin of electron 1 along any direction when the two electrons are separated by a distance too far for one to have a causal effect on the other. If we measure electron 1 as having spin up, then we know that electron 2 has spin down. From an EPR perspective, this means that the conditions of reality and locality have been satisfied. The spin property of electron 2 is an objectively real property, without touching this electron. Also, the spin of the second electron could not have been locally affected by the spin of the first subsequent to decay, because the two particles were too causally far apart at the time of measurement of the first. The spin direction of the second electron must have been an objectively real property of this electron prior to its separation in system decay (Greenberger 1992: 25).

But quantum theory denies the reality and locality assumptions. One could have measured the spin of electron 1 along any one of a number of arbitrary directional axes. How could electron 2 have "known in advance to have its spin in exactly the correct direction? The spin of electron A is totally correlated with that of electron B, but neither of them is determined until the measurement is made" (Greenberger 1992: 25).

In 1964, John Stewart Bell demonstrated that there was an experimental way of deciding between Einstein's and Bohr's perspectives, based on the classical notion of causality that there is a set of instructions in the decay which informs each particle how to behave upon detection (Greenberger 1992: 26). Bell's theorem demonstrated that, for three axes of measurement of particle spin, particle spins were more correlated on average than could be expected under conditions of reality and locality (Greenberger 1992: 27).

Had Mead been alive at the time of Bell's theorem, he would have affirmed its conclusions. The lack of an instruction set which determines the behavior of particles subsequent to decay in a quantum system is fully in accord with Mead's notion of a universe perpetually open to novelty and indeterminacy.

What are the implications of Bell's theorem for social scientists? Quantum theory is not confined to the microscopic world, but explains phenomena in the everyday macroscopic world, e.g. the behavior of solids at room temperature, and the structure of neutron stars. Scientists seeking to explain phenomena at the cultisocial level should be cognizant of the breakdown of causality in modern physics lest they be tempted to emulate an overly deterministic conception of science which no longer exists.

Even when scientists attempt a critique of naive Humean empiricism -- as does Mead -- their projects falter if they fail to consider the radical implications of quantum theory for science. Consider Roy Bhaskar's project in *A Realist Theory of Science* (1978). Bhaskar attempts to construct a

transcendental realist ontology which avoids Humean empiricism and Kantian idealism:

It regards the objects of knowledge as the structures and mechanisms that generate phenomena; and the knowledge as produced in the social activity of science. These objects are neither phenomena (empiricism) nor human constructs imposed upon the phenomena (idealism), but real structures which endure and operate independently of our knowledge, our experience and the conditions which allow us to access them (1978: 25).

Now Mead would not object to the contention that there is a nature out there that exists independently of human scientific endeavor, but he would find this position besides the point from a quantum perspective. The problem arises in our *knowledge* of this nature. In quantum physics, the interpretation of experimental events is inseparable from social construction of phenomena as "waves" or "particles." Bhaskar makes an ontological distinction between deep underlying structures explained by causal laws and events produced in experiments: There is a fundamental structural

order beneath sequences of experimental events (1978: 33).

But this distinction is elided in quantum physics:

This accent on probability [of particle events] is very important, but it is not based on the classical notion of probability as representing our ignorance of what is actually going on at a deeper level. Rather, it is a mathematical representation of the fact that nothing can be happening at a deeper level. There is no deeper level (Greenberger 1992: 22).

Thus Bhaskar's realist theory of science is based on an EPR notion of reality, one not endorsed by quantum and Meadian theory.

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UNIFIED FIELD THEORIES

Mead was a forerunner of contemporary theoretical attempts to construct unified field theories -- "theories of everything" -- within the physical, biological, and cultural sciences, and transdisciplinary field theories across these sciences.

RELIGIONS AND SCIENCES

Mead was also a forerunner of contemporary attempts to link religious and sciences via holistic process cosmologies. Throughout this dissertation, Zukav's *The Dancing Wu Li Masters* (1980) has acted as a kind of spirit guide. The Chinese conception of the cosmos as Wu Li or patterns of organic energy is an apt metaphor for a world of continual flux, novelty, and ultimately -- mystery. For the Eastern mystics of our past and present have imaged the cosmos in ways metaphorically resonant with quantum relativity physics.

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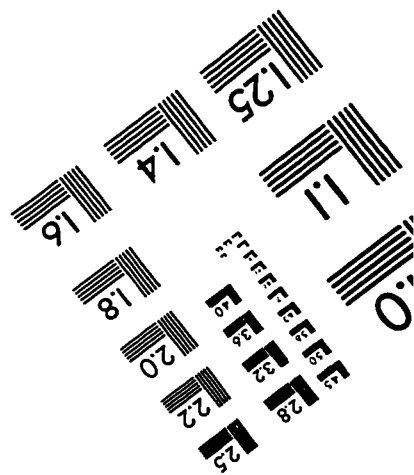
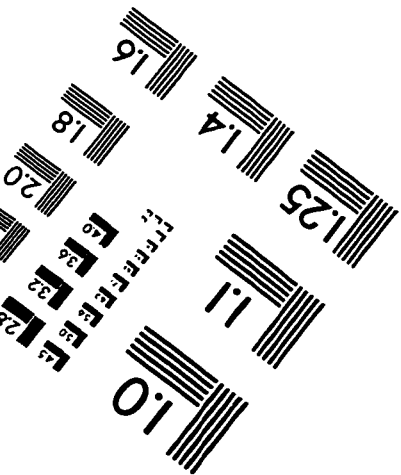
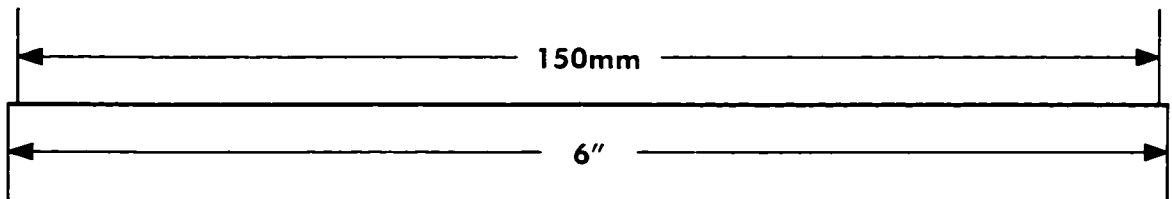
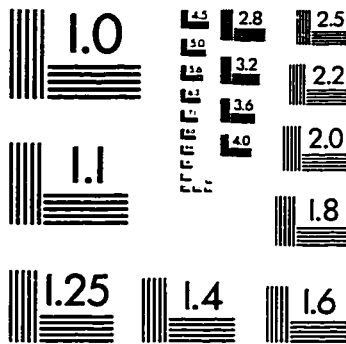
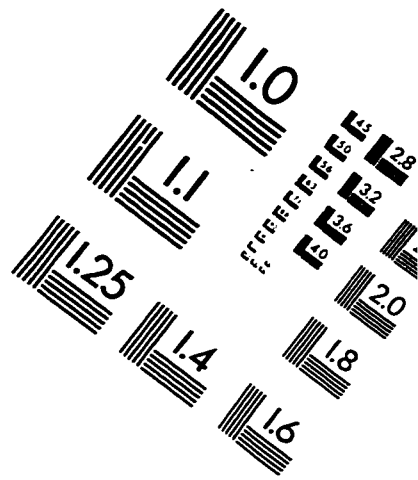
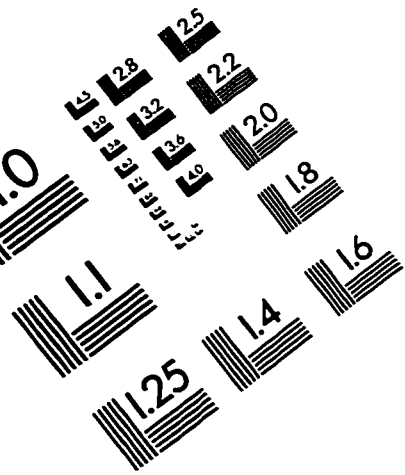
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IMAGE EVALUATION TEST TARGET (QA-3)



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