

Essays on Biological Epistemology

Karl Anthony Campbell

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Co-Chair: Lynn Miller, Professor of Biology

Co-Chair: Herbert Bernstein, Professor of Physics

Preface

Ask anyone whether human history shows steady progress, the gradual erosion of mythical baggage, an ever closer proximity to truth and one is likely to get an agreeable nod. Some perhaps will even be confused by the question for it presupposes the possibility of an alternative to human improvement through time. Everything about us in this swirling world of gadget and gizmo speaks to our single-minded belief in our own progress, improvement, sophistication and the like. The sheer awe instilled by variation through time has somehow come to be the synonymous with progress. And progress, it is assumed, means the reigning in of the truth.

One reading this might well argue that our era alone opposes my claims with its resurgence of conservative religious factions whose attacks on scientific theory have had very real socio-political ramifications. I think, however, that such phenomena represent a kind of meta-cultural flailing; the desperate struggle of one who has already accepted their shackles. Is it not tenable, obvious even, that one's way of life can have no relation whatsoever to the causes invoked as explanation? The reemergence of open-ended, irrational doctrines, and the willingness of so many to incorporate them into their lives, indicates an imbalance. It is against this that people rebel, though they do so out of subconscious necessity.

An existential mode inhospitable to life creates in every person an inexplicable sense of deficiency. But, just as one tends to loose awareness of invariant stimuli, one cannot easily gain an awareness of the epistemic structures that dictate the way in which we, as a species, exist in the world. The structure of our epistemic language came on gradually, slowly wresting control of our minds from older, more passive dialectics. And in the end it played the greatest trick of all: we willingly gave up the real power of our existence for the more immediate, illusory power of control. It is to this faceless oppressor that we must present ourselves. We must learn of its history and its nature. We must extricate it from our minds and see what, if anything, remains.

"Cogito ergo sum," concluded Rene Descartes thus etching in the firmament of mankind's cognitive legacy the sense, turned dogma in the hands of post-Renaissance sciences, that human awareness sits apart from the external. The unit of selfhood, "I", now synonymous with the mental act, and the baseline of existence limited to the thinking self, we have the seed of modern man: washed of ecology, meandering through a world inhospitable to belief, certain only of selfhood but left paralyzed in the face of a world that is forever the "other". What is the use of a clearly distinguishable sense of personhood when the underpinning epistemological reasoning effectively negates the environment in which personhood is realized?

Fundamentally, what Descartes introduced to the world was an explicit break between observer and observed, part and whole. Similar understandings had certainly existed long before Descartes, but his

work attributed the division to man alone while it had previously been the will of God. A faith-based sense of privilege leaves absolute truth hidden under the cloak of omnipotence and, while the world may be perceived as a resource to exploit, it is immune to the ultimate exploitation of total knowledge. God presented to men the world but he did not give them full access to its workings. Now Descartes paid lip-service to God, but the role of the divine was ad hoc, no longer fundamentally integrated into the epistemological lattice-work. The thinking mind, by its very action, extracted itself from its environment. That of which we had been a part became that of which we could not possibly be a part, home became wilderness.

But Descartes' proclamations were impotent without some methodological means. Luckily Francis Bacon had already suggested that understanding of the external might be best had by vexing it; that's to say that one could potentially gain knowledge of natural truths by exposing the world to mild torture. These two approaches having interbred, the world found itself in the grips of an entirely new dynamic. Participation gave way to control, the wild simultaneously became wilder and more inexplicable, humankind's emersion in the external abated and left only the husk that is controlled experimentation to anchor the human being.

Between the 'skeptic' and the 'empiricist', the Cartesian and Baconian, I can see little difference; at least no difference so substantial as to render them mutually incompatible. The skeptic worries of mischievous demons clouding, misdirecting and reconfiguring his perceptions. He lives in constant contradiction; at once doubting the validity of his reading of an environment while simultaneously showing an implicit trust in his perceptions through the act of living. A popular argument against the skeptic has been to stamp one's foot, but this misses the point. The empiricist issues the same trust even as he relegates skeptical doubt to the cellar of his mind. His living-trust he takes hold of and molds, making the world, with proper coaxing, the fountainhead of knowledge. This knowledge, just as for the skeptic, is true insofar as it is approached with trust.

What is it that we mean, what exactly do we speak of, when talking about science? For most, I suspect, the term brings to mind images of lab coats and test tubes, a sense of meticulousness and extreme precision; the adornments of the empirical-rationalist tradition manifest in the modern. But science as it is understood and practiced today is a means of construing the external world. Numerous methods exist which provide the practitioner with equivalent results though they may lack the same degree of correspondence with the perceived physical world. Heidegger's claim that scientific theory no longer illuminates nature but rather our knowledge of nature is given weight by the numerous coexistent epistemological lifestyles adopted today. Truth and the subsequent development of fact are, for science at least, the result of perceptive consistency through time. This consistency characterizes interaction, the developmental process undergone by each individual mind within the environment that sustains it. Thus

we cannot meaningfully speak of scientific absolutes.

At no point in history has the human species been privy to such a wealth of information, insight, and functional knowledge. Never before have we occupied a seat of such profound power; the book of Nature is in our hands. Granted, it is a contradictory book, legible here and indecipherable there. But we as a species are firmly in control, for control does not necessitate understanding. Yet we exist also in an era of pronounced psychic discord. Why? Is there a single reason, one motivating factor, that catalyzes such a profound desire to escape from life? A society in which mental fissure is often preferable to normative demands is not a healthy society. Predictably, there is also a strong movement towards irrational pursuits—the New Age movement for instance. Everywhere dissatisfaction is evident. What is it in our way of life that is so objectionable? What are we trying to get away from?

Academic institutions are certainly not blind to this phenomenon, nor have they failed to take it under consideration. My limited reading leads me to the observation that much of the academic work being produced on issues relevant to the ideas presented in this essay are single-minded, burdened by the weight of their aspirations and the minimal breadth of their means, fixated upon singular issues which invariably fail to develop broad relevancy, the work of one-time thinkers reduced to an intellectual chain-gang. The creative capacity is not diminished, the willingness to venture out, to seek enlightenment, to somehow grasp what has never been touched; these qualities exist just as ‘humanness’ exists within the enslaved. But a master, fierce and mysterious, resides over every hour spent within the walls of the institution. What can be done? What rebellion can be had? Against what can one take up arms?

It is often said that one cannot ‘see the forest for the trees’. I would add that there is an equal failure to see the trees for the seed or the seed for the decay which provides nourishment. The string of interdependency could go on without end for, of course, it would return to the point at which it began. In that light let me say that I have failed to mention much of what will appear as we continue, but a full summary was not my aim. Instead you have read of the single seed towards which the piece will seek to move and it is my hope that by reaching that point as nearly as possible, we will have ready access to the whole network and, as Eliot wrote, “know it for the first time”. There is no clearly defined issue to be dealt with, no particular idea or set of ideas which I hope to ‘unpack’ and make lucid. It is the whole of things with which this essay is concerned. Wholeness does not result from some re-pasting of the atomistic worldview but relies on relation and process; the footprints between things, not the things themselves. We can only move forward, never certain where our destination sits and never certain quite where we are going. The little that shall serve as introduction is complete. Let’s allow Jose Ortega y Gasset lead us in. It’s doubtful that I can do him justice, but I’m content to try anyhow. He writes,

[that] we will go moving...in concentric circles, their radius growing shorter and developing a greater degree of tension each time we swing around, slipping along

from the outside of the spiral, cold, abstract, and indifferent, toward a center which is frighteningly intimate, even pathetic in itself, although not in our way of handling it (Ortega, 17).

Introduction

When it is one's intention to surmise the extent and nature of the whole of the modern scientific enterprise the real trial, as perhaps with many other endeavors, lays in finding an appropriate point of entry. So much has been said, so much offered up for thought, as insight, indeed even as the final word on what is and can be done via this thing we call science. But here I must make a two-fold point: that any history loaded with a succession of final statements cannot be legitimately taken as solved, and that the primary fallacy latent in the work of all such epistemic solutions is born of a lethal confusion, attributable in different respects and varying degrees to the considerable influence of the Cartesian, Baconian, and Kantian dissections of knowing, between fact and potentiality, pattern and imposed classificatory schema, the *ding an sich* and the subjective observer inherent in any empirical act. In the course of this essay we shall consider the influence of each model in its turn giving time not only to its role in contemporary science but also to the role it plays in shaping the existential dialogue between this curious human race and the world of which it is a part.

Thomas Kuhn's work occupies an awkward and somewhat inexplicable position in the contemporary intellectual environment. Kuhn's thinking—and here I refer specifically and exclusively to the thoughts put forth in *The Structure of Scientific Revolutions* (SSR)—while conceptually worthwhile, erodes quickly under scrutiny. This essay will cover the primary points expounded in SSR along with relevant criticisms. I will not attempt to develop an alternative theory of scientific development. Rather, taking heuristic inspiration from the offerings of Kuhn, Ludwik Fleck and W.V. Quine, I will argue for a broadly evolutionary and ecological approach to the understanding of scientific development in particular, and epistemology in general. Such an argument obviously implies a degree of philosophic holism; a position which I will argue permits the revaluation of modern science as well as the realization of a novel morality.

I

The Structure of Scientific Revolutions may seem at first glance to be an essay concerned exclusively with rare and uncharacteristic instances of massive discord within the history of science. At its core, however, is a set of claims aiming to explain the development of scientific knowledge. Kuhn's claims arise from a close inspection of science past. He writes that "history, if viewed as a repository for more than anecdote or chronology, could produce a decisive transformation in the image of science by which we are now possessed" (Kuhn, 1a). Reading the historical record of scientific ideas, thinks Kuhn, sheds light on trends otherwise obscured by point-specific analysis. We are "possessed", he claims, by a picture of science as a sure-footed, gradual enterprise accumulating knowledge at a constant rate. But if historical inference must be our guide we cannot readily differentiate between the culture and the product of science. If nothing else, the book's title subtly betrays Kuhn's position. For he looks back and sees *structured* change; predictable series of socio-cultural states that parallel and often bleed into the evolution of scientific knowledge. The structure Kuhn perceives is exemplified by the paradigm concept which he defined as "universally recognized scientific achievements that for a time provide model problems and solutions to a community of practitioners" (p. x). Note that the paradigm encompasses both the axioms of the research community, the processes of individual inculcation, as well as the ends to which the axioms are employed. As Dudley Shapere observes "the theory is not the paradigm, and we might assume that Kuhn discusses the theory because it is as near as he can get in words to the inexpressible paradigm" (Shapere, 387). Indeed the difficulty of articulating the communal aspect leads Kuhn to rely heavily on discussion of theory in his attempts to characterize paradigms.

Shapere's concluding take on paradigms—"anything that allows science to accomplish anything can be a part of (or somehow involved in) a paradigm" (Shapere, 385)—is harsh but generally reflective of the idea's reception in the philosophic community. For the sake of further discussion, however, let us adopt a less dismissive characterization of the Kuhnian paradigm. John Zammito writes:

A paradigm is a specific achievement of insight into natural process. Second, it is recognized (soon or late, but only upon such recognition can it be a paradigm). Finally it is recognized precisely as exemplary, or capable of emulation. Its status as paradigmatic only follows from its inauguration of a subsequent, ongoing, and fruitful practice; hence, it is a historical concept, accessible only retrospectively (56).

A paradigm constitutes a portion of the developmental course of scientific work. It characterizes a period of large-scale agreement within the relevant community. In the course of this "normal science" researchers are left to flesh out and articulate the paradigm's claims. Kuhn's description reads, tellingly perhaps, as though normal science were in a desperate and frightful struggle, for it "does and must

continually strive to bring theory and fact into closer agreement [...] Its object is to solve a puzzle for whose very existence the validity of the paradigm must be assumed" (80c). In normal, puzzle-solving science we can plainly see the shift to thinking about scientific work as human product rather than as an intermediary to the real, external world. For instance "puzzles are [...] that special category of problems that can serve to test ingenuity or skill in solution"(36c). The scientific community is drawn to the challenge posed by problems to which the assumed paradigm gives clear articulation. The particular qualities and deficiencies of each researcher impact not only the problems which with they align themselves, but also the methods they employ in the course of subsequent research. The paradigm is a source of challenge and satisfaction. It provides an effective basis for structuring the external world. Bounded on all sides by chaos, the Kuhnian paradigm stands as a shelter for the curious and capable. They in turn are the paradigm's lifeblood, pushing always to extend and inflict the framework upon the unknown.

Isabella Stengers' reading provides an interesting point of entry. She writes,

Already, the accumulation of sophisticated instrumental data requires a specific social experiment, one that is not capable of creating itself, for this experiment is constructed on the belief in a model of unique progress: all science would begin in an empirical manner; then, through "maturation," it would acquire the mode of production proper to its forebears. The epistemological image guarantees, here, that one day intelligibility will give birth to data; a paradigm or a theory will come along to recompense the empirical effort. When the data itself is relative to an apparatus that unilaterally "creates" the possibility to subject anything and anyone at all to quantitative measurements, the very meaning of the operation presupposes another definition, which is that of science: what it permits, what it forbids, what it authorizes to mutilate. Finally, when "in the name of science" an experimenter reproduces the conditions under which humans have obeyed the orders that have created executioners, he or she demonstrates the existence of a social experiment in which, in the name of science, the different significations of the terms to obey and to be submitted to can be confused (Stengers, 22.3).

She distills her point, claiming that "Normal science less explains what preexists it than it creates what it explains" (Stengers. 50). The Kuhnian hypothesis from which Stengers works, in its strong form, contains numerous difficulties as we shall see. More importantly, Stengers misattributes the creative product of science. What science generates is not the object of its explanations but rather the conditions under which such explanations possess relevance. To attribute discrete creative capacities to a group (those constituting normal science) whose existence as a theoretically unified force cannot be shown accomplishes very little in the way of illuminating the socio-historic circumstances of scientific development. The only significant point Kuhn made throughout his work was in showing that knowledge construction cannot be separated from those who actually do the building. The claims of relativism leveled against him, most forcefully by Dudley Shapere, fail to see that Kuhn simply inverted or reversed

the long accepted objectivity of the positivists. Rather than science bringing us meaningfully closer to the truth contained in the external world, Kuhn shows that our growing sense of having achieved a largely comprehensive and accurate theoretical understanding of the natural world is backwards; what knowledge we have is knowledge of self.

Because paradigmatic theory under-girds the perceptual and methodological course of the community, normal research is characterized by a consistent accumulation of compatible theory very much in agreement with the logical positivist take on scientific activity. The cumulative nature of normal science leads invariably to increased specialization on the part of workers within the paradigm. Such specialization, “while it segments intellectual life, allows for a deepening of inquiry which is not otherwise imaginable and which is precisely what has given science its historically distinctive record of efficacy” (Zammito, 56). In other words specialization benefits understanding of the particular but undermines critical approaches to more fundamental structures. Members of a community can narrow their focus, according to Kuhn, because “the individual scientist can take a paradigm for granted, he need no longer, in his major works, attempt to build his field anew, starting from first principles and justifying the use of each concept introduced [instead concentrating] exclusively upon the subtlest and most esoteric aspects of the natural phenomena that concern his group” (19-20). The acceptance of some given conceptual dogma saddles researchers with the task of elaboration and extension which takes two forms: a commitment to fleshing out the obscure, and the production of paradigm-specific novelty.

But the specialization of practice must be preceded by specialization of perception. According to Kuhn the greater the complexity with which a researcher interacts with an object of study the greater their sensitivity to abnormalities, the greater the opportunity for the recognition of theoretical shortcomings. As an anomaly first appears it will be excused as experimental noise or error. Only if the aberration appears consistently through multiple experimental trials will it be recognized as something worthy of attention. Attempts will be made to bring the oddity under the explanatory awning of the theoretical framework. Often this can be done sufficiently well to please all involved and the anomaly will be taken as another example of the paradigm’s viability. On rare occasions, however, the paradigm cannot be employed to proffer an explanation. Says Kuhn, “discovery commences with the awareness of anomaly, i.e., with the recognition that nature has somehow violated the paradigm-induced expectations that govern normal science. It then continues with a more or less extended exploration of the area of anomaly [concluding] only when the anomalous has become the expected” (52-53c). Within the community there is only a gradual rejection operating in conjunction with a gradual reorientation. Most researchers will be unlikely to abandon the framework to which they have committed themselves so long as the incidence of anomaly remains sufficiently low and no alternative explanatory program is introduced. Devotion to the paradigm, however, does not undermine the pursuit of already recognized anomaly. Such pursuit yields further

anomaly and the community quickly goes from quiet agitation to full-on panic. The paradigm thus enters a crisis stage which can only be resolved by revolution.

The period of crisis which follows the recognition of serious experimental contradictions does not abate until the community pragmatically closets the issue for future generations or a new theoretic explanation is offered. By Kuhn's understanding a revolution is not constituted of the new explanatory medium in itself. Rather, it describes the reception of the novelty. Some will vow their allegiance immediately, while others will resist for a time finding it difficult to conceptually digest the new way, and still others will reject it outright and continue to do so until death quiets them. A revolution is thus a stratified community happening, a sort of carnival for anxious scientists. The violence which "revolution" implies lays in the intense debate that arises from different conceptual camps. The term can also be taken in a second light. Paradigm alignment for Kuhn is not a conscious choice. From earliest education to mature research the individual scientist's perception of the world is guided by paradigm assumptions. Its guiding theories tell him what things are "supposed" to be like and, with time, readily grasping alternatives becomes difficult. When faced with a potentially paradigmatic theory the individuals of the community will differ in the speed with which they grasp the new understanding. A simple example of this kind of shift involves an illustration which is initially seen by some as a rabbit and by others as a duck. Most will initially observe only one interpretation of the image while perception of the second requires time. Though Kuhn later reworked his theories so as to omit the idea of major conceptual shifts, much of SSR is built around them.

Such conceptual shifts form the basis of the last of Kuhn's major ideas: incommensurability. Thesis asserts the inability of a given paradigmatic community to engage alternative, or foreign, paradigms in a cognitively equivalent manner. Such conceptual disjunction permits paradigm autonomy. One's paradigm serves simultaneously to quell basic theoretic issues and shape the mode and manner of research. The acceptance of a guiding theoretical framework provides the research community with "a criterion for choosing problems that, while the paradigm is taken for granted, can be assumed to have solutions" (Kuhn, 37c). While the adoption of a paradigm requires rational choice, the concurrent rewriting of the guidelines for theory choice is often unrecognized. The conceptual shift entailed by paradigm change effectively reorients the analytic field of vision such that paradigm-specific problems "are the only problems that the community will admit as scientific or encourage its members to undertake" (Kuhn, 37c) because, quite literally, they are the only problems which the community can perceive.

At this point we can consider the extent to which Kuhn's claims antagonize each other. As stated above, the paradigm is characterized by application and specification, not large scale novelty. Certainly the strange and unexpected appear in the course of normal work, but acceptance of the paradigm

generally inhibits meaningful recognition; the unusual result is seen as error not legitimate cause for sweeping theoretical renovation. When anomalies, previously thought of as erroneous, come to be seen as significant concerns the paradigm has taken a step on the road to revolution. Here's the problem: anomaly typically arises only after significant specialization within a paradigm yet the greater the degree of specialization the greater the conceptual incompatibility between specialties. Kuhn's incommensurability hypothesis, as stated, is concerned only with perceptual disjunction between paradigms, but how can we reasonably accept that a paradigm-generated specialty be commensurable with other specialties? The beginning of research segmentation is also the beginning of conceptual segregation. If we accept Kuhn's paradigms as the base of all further work in the field (that is, up to the next revolution), we would have to assume identical interpretations of the paradigm's claims by all members of the community in order to deny the possibility of incommensurability within the paradigm itself. If a paradigm is not conceptually consistent then, by definition it is not a paradigm at all.

And what reason does one follow in choosing between paradigms? What makes one paradigm better than another? Shapere attacks the very relevance of the idea on the grounds that Kuhn's incommensurability thesis fundamentally undermines the possibility of rational choice between competing paradigms, writing that "if [paradigms] disagree as to what the facts are, and even as to the real problems to be faced and the standards which a successful theory must meet—then what are the two paradigms disagreeing about" (Shapere, 391)? But where is it stated that a science aiming at rational ends must be rational in itself?

Following Shapere, a number of critics have taken Kuhn's incommensurability thesis to imply the ultimate and inevitable failure of all scientific understanding since any theory will be underdetermined by evidence, every data set will be explainable by at least two incompatible approaches, at the end of the day different basic explanatory frameworks will be unable to communicate. "But how can it be", they ask, "that this science, whose truth value is no greater than that of literature, dance, history and the like, has yielded such profound explanatory power and practical benefit. Still, it would be difficult indeed to reject outright that communication between scientists with different theoretical affiliations often communicates nothing at all or conveys mutually unintended concepts. The incommensurability thesis, in a weak form at least, has claim to historical accuracy but "what created consternation in the minds of philosophers...was the implication that scientists would therefore not be able rationally to resolve their differences" (Zamitto, 60). In a more radical form, Kuhn describes the semantic gap between paradigms as "different worlds" (Kuhn, 110a). One critic likened Kuhn's hypothesis to a caricature which, upon consideration of the original, one finds to be accurate so long as one can agree to "the addition of a number of qualifications [which] render the original inconsistent, and the author's subsequent denials that he had said anything so radical increase further the number of inconsistencies" (Franklin, Thomas Kuhn's

Irrationalism). It should be added that a caricature is by definition the inflation of a handful of dominant traits present in the subject. Even if Franklin is correct in his characterization we cannot then say that Kuhn's hypothesis is wrong merely because it is overstated in some regards and incomplete in others.

The trouble with incommensurability is that it washes back upon the other elements of Kuhn's claim of there being an oscillation between revolutionary and normal science. For instance, "paradigm theory if it is to be consistent [with the incommensurability thesis], must itself presumably also be incommensurable with other explanatory theories or models of science, in which case there can be no means of comparison, evaluation or adjudication of those theories as a whole" (von Dietze, 61). In other words one either accepts incommensurability and all it entails or one denies it entirely. Its explanatory value must be swallowed whole or rejected absolutely.

Any active thought or attempt at articulation carries with it the baggage of theory alignment and value judgment. The incommensurability hypothesis, in my estimation, is stricken with the same affliction that infects much of Kuhn's work: it is so broadly applied that it cannot be assigned any distinct meaning. If taken to mean only that major conceptual differences create significant meaning variance within the same language which turn limits, or altogether undermines, the possibility of "measuring-up" theories between conceptual camps then incommensurability is a bottomless well. Quine showed nicely that the utility of language is not granted or intrinsic but must be learned. Some forms of meaning are always hypothetical, educated guesses made on experiential grounds. Even a lexicon, as the product of one or many people, is an interpretation of meaning. All Kuhn has done then is to grossly inflate a pervasive character of language which manifests at all levels of communication. The meaning of the abstract, esoteric talk of scientists is indeed fluid but it is not uniquely so. When is an utterance not hypothetical? To sum up then, Kuhn's incommensurability thesis is indeed true on a basic level, but it is a truth void of functional insight.

As the reader has no doubt recognized, Kuhn's thesis holds considerable implications regarding the way in which we understand scientific work to operate on the level of the individual. It is fairly easy to lose sight of the fact that it is the single researcher, the individual scientist, who propels Science. Kuhn himself seems to lose sight of this in his conflation of singular cognitive shifts with wholesale communal redirection. He starts off simply enough, but his historicist agenda encroaches: "since any description must be partial, the typical natural history often omits from its immensely circumstantial accounts just those details that later scientists will find sources of important illumination" (Kuhn, 16c). It is obvious that any account of natural phenomena will be partial, consisting of areas of greater and lesser articulation. For most, this trait would appear as merely the expected byproduct of a field of inquiry pursued by a finite number of investigators, with the gaps or shallow regions left by one generation serving as the obvious beginnings for the next. But Kuhn is possessed by paradigms and he understands

the areas of 'omission' within a field to be symptoms of perceptive inability due to belief in a particular, paradigm-determined, artificial framework. Thus, for Kuhn, the 'important illumination' derived from the pursuit of omitted or partially articulated cases indicates a cognitive shift (gestalt shift) within the community.

Further, Kuhn claims that observation and inference are both fueled by value assumptions (conscience or not), that "no natural history can be interpreted in the absence of at least some implicit body of intertwined theoretical and methodological belief that permits selection, evaluation and criticism". In short, the researcher is a sieve for the research. Kuhn has positioned us such that our humanity makes the acquisition of "unburdened" facts impossible: "If that body of belief is not already implicit in the collection of facts—in which case more than "mere facts" are at hand—it must be externally supplied, perhaps by a current metaphysic, by another science, or by personal and historical accident" (16-17c).

It is not actual success but the promise of success which guides paradigm choice: "To be accepted as a paradigm, a theory must seem better than its competitors, but it need not, and in fact never does, explain all the facts with which it can be confronted" (17-18c). What indicates such promise to the individual researcher or the community as a whole? Some theories, says Kuhn, become paradigms simply because "they are more successful than their competitors in solving a few problems that the group of practitioners has come to recognize as acute ... The success of a paradigm ... is at the start largely a promise of success discoverable in selected and still incomplete examples" (23-24c). Recognition of potential implies a prior recognition of inadequacy, an awareness of theoretical insufficiency. There is then a rejection, at least in part, before there is a replacement, conversion, revolution or what have you.

The major difficulty arising out of Kuhn's paradigmatic reading of scientific history lay, not in some far reaching inaccuracy, but in its rigid, oppositional take on scientific practice. Some of this can perhaps be attributed to the sociopolitical climate in which Kuhn was writing, but the majority must be attributed to Kuhn's near total failure to consider the broader philosophic issues underlying the pursuit of knowledge. We will discuss this point in detail later. For now, suffice it to say that Kuhn's reading is hampered by the limits of his focus much as if one were to infer the ethology of an organism based entirely upon a mounted specimen.

Kuhn's claims have not weathered the criticisms of the philosophic community all that well. In their strong form, his ideas carry little weight in the contemporary intellectual environment. This is, of course, not to downplay the considerable influence of his work, nor the lasting receptivity of various disciplines to weaker formulations of his thesis. It is this author's opinion that less stringent formulations of Kuhn's thesis are well worth further development and preservation. His work, even if historically biased and lacking in broad applicability, holds considerable heuristic value. An excellent place to begin

lay with Kuhn's intellectual ancestor, Ludwik Fleck.

Fleck, a Polish microbiologist, philosopher and historian of science from whom Kuhn undeniably took significant inspiration (and possibly a good deal more), offers us a similarly sociological take on the workings of science. But whereas Kuhn was mostly content to limit himself to socio-historic phenomena, Fleck took such phenomena as a launching point for more abstract and probing forays into the epistemological tenets of science. Central to Fleck's formulation is the idea of the "thought collective" which, though loosely analogous to Kuhn's paradigm, entails considerably more focus upon the intellectual development of the individual. The thought collective is not characterized by its member's unanimous acceptance of some theoretic foundation, though this is likely entailed. Instead, the collective exists as the mutually reinforcing work of researchers working from similar epistemological assumptions. Large-scale theoretic assumption no doubt figure largely in binding the community, but Fleck sees scientific development as more fundamentally attributable to a loosely conceived epistemological naturalism: literally, the perceptive constraints imposed by human biology dictate the dimensions and, to some extent, the direction, of knowledge. This last idea — that biology and epistemic form share some connection — bares notable resemblance to ideas put forth by Friedrich Nietzsche during the latter part of the nineteenth century. In a more developed form the idea has considerable moral resonance. Unfortunately, Fleck never saw fit to elaborate upon the point. Later, this same issue will take a prominent position in our discussion and, hopefully, we will be able to flesh out what Fleck only eluded too. For the moment, let's cover the pillars of Fleck's position.

Fleck's contribution to the philosophy of science is largely contained in a single slim volume, *The Genesis and Development of Scientific Fact*. The work was motivated, in part, by Fleck's observation that the scientific community suffered from an epistemological tunnel-vision in regard to the nature of its own work. Those accepting traditional formalisms, writes Fleck, "pay far too little, if any, attention to the cultural-historical dependence of such an alleged epistemological choice--the alleged convention...A stylistic bond exists between many, if not all, concepts of a period, based on their mutual influence" (Fleck, 9). The work represents the confluence of Fleck's engagement with a number of disciplines, most importantly philosophy of science, history of medicine, immunology and microbiology. As such, the work sometimes makes demands of the reader--detailed familiarity across several fields--which at times obscures his thesis. Nevertheless, at its heart *Genesis* is a discussion of the history of syphilis, tracing the evolution of socio-cultural understanding of the disease in order to show that the "scientific" diagnostic tool known as the Wassermann Reaction cannot be attributed to any objective methodological approach. Fleck writes that

Historically, [the Wassermann Reaction] appears as the only possible junction of the various trains of thought. The old idea about the blood and the new idea of

complement fixation merge in a convergent development with chemical ideas and with the habits they induce to create a fixed point. This in turn is the starting point for new lines everywhere developing and again joining up with others. Nor do the old lines remain unchanged. New junctions are produced time and again and old ones displace each other. This network in continuous fluctuation is called reality or truth (Fleck, 79).

No doubt the excerpt above gives some sense as to Fleck's approach to understanding scientific work. Rather than the simple application of a predetermined 'scientific method' which, by design, digests the problem at hand, reducing it to conclusive understanding, the work of science rests instead upon a network of conceptual "habits" or styles. Already mentioned was the central importance of the 'thought style' to Fleck's reading of fact development. For Fleck it is the readiness or preparation for "directed perception, with corresponding mental and objective assimilation of what has been so perceived [*italics his*]" (Fleck, 99) that define thought style. The thought style resides within the collective and is strengthened by the social structure while effectively limiting the cognitive variability of the individual: "It constrains the individual by determining "what can be thought in no other way"" (Fleck, 99). The resemblance between such 'styles' and Kuhn's paradigms is obvious and would be easy to accept in full but for one pivotal difference: 'thought style' is of a psychological domain while paradigms encompass mostly sociological phenomena. This is not a clear division as mental and social existence feed into one another, but the distinctive locus of their respective interpretations is plain. For Fleck, constraints of the individual mind secondarily flow into the communal sphere. This 'collective' represents the hybridization of unique constituent styles.

The primacy of the individual thought style does not imply relativism in the damning sense often invoked by critics. "Styles" represent only a relativism of perception. As Fleck notes,

[truth] is not 'relative' and certainly not 'subjective' in the popular sense of the word. It is always, or almost always, completely determined within a thought style. One can never say that the same thought is true for A and false for B. If A and B belong to the same thought collective, the thought will be either true or false for both. But if they belong to different thought collectives, it will just not be the same thought! It must either be unclear to, or be understood differently by, one of them. Truth is not a convention, but rather (1) in historical perspective, an event in the history of thought, (2) in its contemporary context, stylized thought constraint (Fleck, 100).

We can see that the veracity of a scientific claim, for Fleck, is relative only to the community that interprets it, and does not indicate a spectrum of equally true realities. Fleck makes a clear division between fact and truth. The former being communally realized and therefore shaped by historic and cognitive forces. The latter is really nothing more than a conceptual trapdoor. Barbara Herrnstein Smith nicely summarizes the gap between actively shaped knowledge and the potential for knowledge of

immutable truth: “The mutual shaping and coordination of perceptual, conceptual and behavioral practices; a stable and effective congruence among ideas, observations and manipulations; a consonance among beliefs, perceptions and actions: none of these comes down to the matching of beliefs or statements to an independent external reality--that is, to a classic or commonsense idea of truth” (Smith, 51). She avoids the temptation, though I cannot, to push such thinking into the arena of moral philosophy. Problems arise when the context-based fact is taken to be synonymous with some absolute, external truth. The ability to generate fact is the source of science’s value, the foundation of the enterprise’s proliferation and enduring success. The failure, either by choice or happenstance, to acknowledge the space which exists between scientific fact and external truth marks the point at which scientific utility became scientific power. The misguided association of scientific practice with external truth manifests an oppositional epistemic environment in which knowledge acquisition requires willful imposition and control. The world becomes an object of resentment diffusible only by way of quantification. The whole of life comes under the tension of class conflict, and moralization becomes the only means of those who think themselves subjugated. Moral thought, quite apart from issues of good and bad, takes the form of a weapon. This is a point that Nietzsche dealt with at considerable length, and one to which we will return later.

Fleck’s approach did not stop simply with the assertion that cognition is stylized. It is easy to forget that the stylization of mind--that of one scientist, say--entails the respective developmental trajectories of *every* thought, not a single contextually dependent network, but, literally, a network of networks, a “metapattern”—the pattern of patterns—in Gregory Bateson’s words. The stylized nature of mental processes has significant implications regarding our understanding of perception and its relation to an externally occurring world. As Smith observes, “The central ontological/epistemological implication of Fleck’s work and of constructivist thought more generally is not that there is nothing ‘out there’. It is, rather, that the specific features of what we interact with *as* reality are not prior to and independent of those interactions but emerge and acquire their specificity *through* them [italics hers]” (Smith, 51). Here Smith touches upon an interesting and somewhat counterintuitive aspect of historicist and constructivist thinking. She duly notes that for Fleck, as well as his intellectual progeny, there is no denial of the existence of a world independent of perception. Fleck’s argument is, at its simplest, that perception or observation entail interaction and interaction catalyzes change. Thus there can be a fixed external world of which our knowledge shall at all times be relative. Importantly, Fleck’s position is not full “relativism” in the philosophical sense, but rather a form of perspectivism. Realizing this alone is sufficient to undermine many of the criticisms made of Fleck’s work and, to somewhat lesser extent, that of Kuhn. Perspectivism would be philosophic relativism if it did not entail the additional movement of denying the worth of anything apart from human knowledge. It is worthless to assert the existence of

noumenal world in the Kantian sense--that is, a world true in itself apart from perceptive involvement. Rather the world blooms only under the eye an observer. One can certainly hold belief in Kant's noumenal world, but it is a world of which nothing can be meaningfully said.

Fleck's perspectivism makes no explicit, cogent denial of Kant's noumenal realm, but such a denial necessarily follows from the major claims of his work. It seems to this author that Fleck was aware of, and receptive to, this outcome though he did not pay it specific attention. This is best evidenced by his discussion of the "harmony of illusions" which exists as the aggregate of cognitive stylization and provides a cohesive, consistent worldview. The stability of the perceptive network makes for a functional mental process while necessitating no correspondence to noumenal truth. "The notion of truth, facts or reality as the product of a 'harmony of illusions'," writes Smith, "is one of Fleck's most important ideas, but also perhaps the most scandalous one, especially in the context of classic dualisms of truth and error, reality and appearance, and correspondence and disparity" (Smith, 55-56). It should be noted that any hint of constructivist thinking counts as "scandalous" for Smith, but she is correct in asserting the radical nature of his argument. The network of stylizations that constitute a single individual, and the meta-network that defines a professional community make it exceedingly difficult to discern causative elements in the history of any practice, especially one as innately complex as science. If not an explicit rejection, Fleck's work certainly stands as a denial of objective truth having any currency.

Scientific fact, says Fleck, appears in retrospect as a historical imperative, but the generative process is, in actuality, far more fluid: "The old idea...and the new idea...merge in a convergent development with [related] ideas and with the habits they induce to create a fixed point. This in turn is the starting point for new lines everywhere developing and again joining up with others" (Fleck, 79). By a kind of call and response between numerous disciplinary camps the various fields converge with the interaction yielding novel theory. But the "old lines" do not come away entirely unaffected. "New junctions are produced time and again and old ones displace one another" (Fleck, 79). Only through historical lenses can one impose a theoretic-developmental linearity which, in fact, was never the case. Fleck sees our understanding of truth and reality as originating in this variable 'cybernetic' system. This last bit is probably the most vexing. The network process by which fact is generated is, of course, not itself what we take as true or real. As Fleck makes clear throughout *Genesis*, the multivariate dialectical process of fact-building is typically lost to history. Does he mean to imply then that our conceptions of truth and reality are misattributed; that we recognize only the climactic, singular yield of what are considerably larger and vastly more complex underlying interactions?

Fleck summarizes his conceptualization of scientific fact as "*a thought-stylized conceptual relation which can be investigated from the point of view of history and from that of psychology, both individual and collective, but which cannot be substantively reconstructed in toto simply from these points*

of view [italics his]” (Fleck, 83). His phrase is more an explication of method than it is a succinct and focused definition. As such, critics may claim that the ambiguity of his terms betrays the insufficiency of the larger argument. But really what he has offered is a microcosm of his position. The point is precisely that the nature of scientific fact must be “investigated from [a] point of view, that the facts of science are not the same when approached from multiple angles. The absoluteness implied by the act of defining is unattainable when the phenomenon rests upon an “inseparable relation between active and passive parts of knowledge” (Fleck, 83).

In its strong empirical form, the scientific community purports to employ experimental methods which bypass the inherent subjectivity of the human researcher. Adherence to such methods, it is thought, leaves no room for interpretation or misreading. Such results speak of the world and we are left to bend ourselves to the truth. However, belief in such thinking constitutes a contradiction. Truth in itself, if anything at all, must still be interpreted in order to be known, in order to *be* knowledge. The experiment, as Fleck says, can be easily interpreted but has no meaning without experience, without incorporation into the stylized network of the observer:

Whereas an experiment can be interpreted in terms of a simple question and answer, experience must be understood as a complex state of intellectual training based upon the interaction involving the knower, that which he already knows, and that which he has yet to learn. The acquisition of physical and psychological skills, the amassing of a certain number of observations and experiments, the ability to mold concepts, however, introduce all kinds of factors that cannot be regulated by formal logic. Indeed, such interactions as those mentioned prohibit any systematic treatment of the cognitive process (Fleck, 10-11).

Thus whatever it is that scientific experimentation yields, objective truth or not, perception recasts the results in the mold of the interpreter’s unique stylization. It is only self-knowledge that stands to be gained from experimentation; the results that the singular constitution of the practitioner brings forth from the data. Yet at the base of our “training” as living entities, is the functionally necessary assumption that perception and interpretation are reflective of the world as it is. This epistemic assumption is so basic that it makes possible the second movement of believing systematization, method-building and the like to be appropriate, essentially correct ways of knowing: “Whatever is known has always seemed systematic, proven, applicable, and evident to the knower....May not the time have come to assume a less egocentric, more general point of view and to speak of comparative epistemology?” (Fleck, 22).

But what is the value, what advantage is conferred, in accepting science, as both a process and an avenue of knowledge, to be of objective privilege, an essentially inhuman act? Fleck seems to understand the whole of the scientific act as being chiefly an imposition of human will. He writes,

The first, chaotically styled observation resembles a chaos of feeling: amazement, a searching for similarities, trial by experiment, retraction as well as hope and

disappointment. Feeling, will, and intellect all function together as an indivisible unit. The research worker gropes but everything recedes, and nowhere is there a firm support. Everything seems to be an artificial effect inspired by his own personal will. Every formulation melts away at the next test. He looks for that resistance and thought constraint in the face of which he could feel passive. Aids appear in the form of memory and education. *At the moment of scientific genesis, the research worker personifies the totality of his physical and intellectual ancestors and of all his friends and enemies. They both promote and inhibit his search* [italics mine]. The work of the research scientist means that in the complex confusion and chaos which he faces, he must distinguish that which obeys his will from that which arises spontaneously and opposes it....The general aim of intellectual work is therefore maximum *thought constraint with minimum thought caprice* [italics his] (Fleck, 94-5).

Again, we see that it is the make-up of the observer, not the nature of the observed, that dictates not only what course the act of research adopts, but also, and more importantly, the truths that such research will present and the valences attached to them. Science is the measuring of men, an act of self-examination, and the world “out there” is the looking glass. The scientific act is not so much a matter of choice. It is not simply adopted to satiate a particular kind of curiosity. It is, both the cause of and desperate solution to an overriding sense of pointlessness and absurdity characteristic of any creature misfortunate enough to realize that it cannot fully explain itself. In this sense, science and history have a great deal in common for both are justificatory in their intended ends. Jose Ortega Gasset makes a similar assertion:

History is the second look which manages to find the reason for what appears to be unreason...[it is] bound to justify all periods, and this is the opposite of what it was first threatening to be; on showing us the variability of human opinions it seems to condemn us to relativism, but as it gives full meaning to each relative position that man takes, and reveals to us the eternal truth which every period has lived, it overcomes whatever there is in relativism that is incompatible with faith in man's extra-relative and, as it were, eternal destiny (Ortega, 27).

Relativism is a symptom of the present, expunged as the moment of experience slips into the past. History, like scientific knowledge, is always increasing in size. Unlike historical perspectives, however, science is not grounded in fatalism; science is the abandonment of traditional metaphysics in favor of a naturalism which reduces questions of “why” to questions of “how”. Misguided as it may be, the scientific act is life affirming, indicative of the desire for understanding but, far more importantly, obsessed with discerning the place and purpose of human existence.

II

The broadly developmental conceptualization of scientific practice advocated in different forms by Kuhn and Fleck naturally leads the reader to draw tentative parallels with biological evolution. Both entail, it seems, nonlinear and non-progressive modification through time. But how far can the likeness be elaborated? To use biological terms, are we entertaining a case of true homology or misleading analogy? Starting off with W.V. Quine, he says that

recognition of a body is not a simple matter of responding similarly to similar stimulations; not a simple matter of similar causes having similar effects. The various visual shapes that a given body presents are related to one another less by similarity than by continuity in time; the body presents them in continuous succession (Quine, 44d).

The concrete elements of a perceptible state provide an appealing but misleading simplicity in our attempts to fully grasp a system: “the...parts [are] insufficient to explain the properties of the whole, but the whole can be explained without any knowledge of the...parts” (Wilson, 271b). Our sensory abilities are discrete capacities which, while serving to put us in touch with the external world, also limit the extent of our experience with it. Our sensory capacities do not allow for infinitely detailed experiencing of the world. Science then, as a directed act, grounded in human perception, may be an adaptive reorganization of our individually limited abilities to perceive the external. The biological mechanisms that make sensory organization and cohesive, consistent perceptive narratives possible are not well understood. Even less is known of the relation between biological perception and socio-cultural forces. In an interesting paper on dream sleep and its relation to the unique neuronal structure of the cortex, Crick and Mitchison note that a major drawback of neuronal networks (nets) when artificially modeled is a tendency to overload “if an attempt is made to store simultaneously too many different patterns or associations of patterns, or if the stored patterns have too large an overlap” (Crick and Mitchison, 1983). They observed that when overloaded, behavior will depend on the particular structure of the network, but there do emerge definite patterns:

- (1) Fantastical associations
- (2) Repeated production of the same state no matter the stimuli
- (3) Hallucinatory responses, relating especially to feed-back
nets, in which signals normally ignored evoke responses
(Crick and Mitchison, 1983).

It is certainly important to keep in mind that this is a paper using primitive networking models to explain the function of dream sleep. The considerable subjectivity involved in determining what counts as “fantastical” or “hallucinatory” for an artificial neural network should also be noted. That said, the process which they illustrate is a striking intermediary between Kuhn’s socio-cultural approach and the cognitive-ontological “webs” of Quine. Whether or not Crick and Mitchison’s “virtues” of neural network overload serve to explain why we dream, they may have application to our understanding of theory construction and development. What is a neural network but an action-potential secondarily subjected to buffering mechanisms? It consists of functional sensory units, the nature of whose large number of interactions is largely determined by a nearly constant influx of sense data. A community, whether it be made up of honey bees or paleontologists, is fundamentally the same system of interacting functional agents. A research community is literally an intermingling pool of individual neural networks. With this approach it is much easier to account for the relationship between the research community and the theories they develop. Take the active, day-to-day work of a research community to be its waking state. The experiments conducted, the data collected are all stimuli acting upon isolated units. These units interact with one another with varied periodicity depending on proximity. The nature and frequency of associations leaves all units involved altered to a greater or lesser degree.

What’s more, systemic stability can only be maintained by regulation of interaction. Quite literally, it is what is *not* involved in cognition, what is ignored, excluded, or beyond perception, that shields the network from the tail-spin of associative overload. Extending this idea even further, Quine writes that “science is like a field of force whose boundary conditions are experience. A conflict with experience at the periphery occasions readjustments in the interior of the field [...] Re-evaluation of some statements entails re-evaluation of others, because of their logical interconnections---the logical laws being in turn simply certain further statements of the system, certain further elements of the field” (Quine, 460c). No perception, no datum has substance in isolation. Things and properties gain form only when contextualized, when they are related in the mind.

Returning to the communal level, we see that the recognition of marked anomaly (over-stimulation of the network) would certainly constitute a “conflict with experience” and the community may first make futile attempts to integrate the problem into preexisting explanatory structures (fantastical associations). It may find itself incapable of resolving the problem and return to more clearly defined avenues of research (repetition) or it may indeed recognize the anomaly as unique and settle upon explanatory methods that are internally coherent but incompatible with the remainder of the field (fantasy). In this way the anomaly can be both resolved and denied without disturbing the web of belief upon which the science functions.

Kuhn, I think, moved in the general direction of these ideas but was set off course by his stubborn

insistence upon a close reading of history. A scientific community seen as a point along a historical trajectory requires an external stabilizing concept, something to explicitly impose the coherence of belief through time. The paradigm was this mechanism for Kuhn. Within his controlled reading, the paradigm serves its one role rather well, but the order it imparts is an artificial one necessitated by his unfortunate choice to see through historic lenses. Shapere recognizes the error of historicism:

Yet the feasibility of a historical inquiry concerning paradigms is exactly what is brought into question by the scope of the term “paradigm” and the inaccessibility of particular paradigms to verbal formulation. For on the one hand, as we have seen, it is too easy to identify a paradigm; and on the other hand, it is not easy to determine, in particular cases treated by Kuhn, what the paradigm is supposed to have been in that case (Shapere, 386).

He also recognizes the artificiality of the paradigm:

For his view is made to appear convincing only by inflating the definition of “paradigm” until that term becomes so vague and ambiguous that it cannot easily be withheld, so general that it cannot easily be applied, so mysterious that it cannot help explain, and so misleading that it is a positive hindrance to the understanding of some central aspects of science; and then, finally, these excesses must be counterbalanced by qualifications that simply contradict them (Shapere, 393).

In such a context, theory development can be seen as the reorganization of network associations within the community. For a time the network of researchers flounders about in the face of nature’s defiance. The conceptual forces reduce consistency within the field creating areas of greater and lesser density. The theoretical pathways available to the researchers are not autonomously determined; not mere products of individual function. With a reorganization of the “ways” of thinking available to community members, their conceptual positions will be a matter of individual function and external conceptual interaction. The presentation of a new theoretical framework which resolves anomaly will stabilize both the network’s and the individual’s conceptual field and increase the efficiency of associations allowing for fuller exploitation of a given theories explanatory potential.

The work of the stable period, which is loosely similar to Kuhn’s “normal science” minus the historicist paradigm, serves to elaborate upon its interaction with the new theory. The theory, in this network context, does not require the conceptual shifts of Kuhn nor does it necessitate any deep-seated belief. It is not something that is bought into so much as something imposed upon researchers. The streamlining of network associations under pressure from the new theory may prove well suited to the kinds of problems concerning the community. If consistently beneficial in the face of such problems, the theory may become a fixed pattern of association within the research community as individuals accept and utilize it.

Let me just add that for the network that constitutes a single researcher, the single stylized mind, theory might be understood as a species of thought, a way of navigating an environment, a construction of ideas allowing for the exploitation of aspects of a cognitive mosaic arising from patterns of sense data. The explanatory dimensions of a theory are the product of effort exerted in competition with other topically-related explanations. The dimensions will be greater or lesser based upon the extent of the theories explanatory capacity.

Indeed, such adaptive or evolutionary approaches to understanding scientific development have significant currency in modern philosophy of science. The work of those calling themselves evolutionary epistemologists has, thus far, exclusively followed the dictums of the modern evolutionary synthesis. The appeal of their approach is that it promises to reduce knowledge to a handful of simple operational rules. Stronger versions of this method explicitly take ideas (or statements, mental states) to be the epistemological equivalents of genetic material. As Michael Bradie puts it, “evolutionary epistemologies are broadly naturalistic approaches to the theory of knowledge which draw heavily upon evolutionary considerations to formulate models of conceptual growth”(245). The field is divided into two methodological approaches which Bradie labels the Evolution of Epistemic Mechanisms (EEM) and the Evolution of Epistemic Theories (EET). EEM is concerned with the evolutionary pathways by which the biological capacity for knowledge acquisition comes to be. EET, on the other hand, attempts to explain the course of human knowledge in terms of evolutionary theory (Bradie, 246). EEM, it seems, assumes the basic “knowability” of the external world, the objective relevance of our perceptions. EET, on the other hand, takes a position much closer to those of Kuhn and Fleck. However, while the latter two were dependent almost entirely upon sociological causative mechanisms, EET is a form of methodological naturalism which takes biological evolution to be the basis of conceptual change. These two sub-fields, EEM and EET, are fairly modern developments and as such are not fully developed, defined or differentiated schools. Their immaturity aside, it is the coming together of human epistemology and evolutionary theory which is real importance.

The degree of relation between evolutionary epistemology and biological evolutionary theory varies significantly depending upon the particular researcher. David Hull, for instance, takes from the latter only a general sense of selective action and sets it loose in the community of ideas (Hull, 275), while Stephen Toulmin stops just short of claiming complete likeness of kind between epistemic and organismic evolution within a Darwinian framework. Critics, of Toulmin in particular, have claimed that EET invariably reduces epistemology to sociology (Law, 327) and harbors a relativism not far removed from that of Kuhn (Briskman, 166).

David Stump argues with some success that naturalist philosophers of science must apply a plurality of scientific methods in seeking to understand science. Under the broad umbrella of science,

research practices are diverse and disjointed with no one methodology encapsulating all others (Stump, 1990). The naturalist approach to the philosophy of science, used here to mean “an application of the methods of science to the methodology of science itself”, suffers from conflicting demands for a “unified method [while also requiring] that the philosophy of science be true to science as practiced and...science itself has been shown not to be unified in its method” (Stump, 457). The varied methodological approaches utilized by different scientific fields makes the application of a single interpretative method to the whole of science “a reduction [that] distorts the philosophy of science just as badly as traditional philosophy of science distorted science” (Stump, 456). Stump’s approach has an intuitive appeal that erodes quickly under scrutiny. Let us grant that different fields utilize different methodologies, each possessing a unique suite of attributes and deficiencies, which in turn hold the potential for novel insights when applied to the whole of science itself. Such an application hardly offers utile insights let alone methodological unity. I suspect that Stump takes naturalism to be internally worthwhile without crediting the approach with much claim to objective truth. His recommendation that science be understood from multiple methodological angles is reminiscent of Nietzsche’s perspectivism. We will address this idea more fully later.

G.G. Simpson provides us with an interesting alternative form of epistemological naturalism:

Still another consideration seems to me the most interesting of all, and yet I have never seen it clearly expressed elsewhere. It is, in a sense a validation of the ‘animal faith’ given by Russell (after Santayana) ...as sole basis for assuming that we really can obtain knowledge of the outer world. The fact is that man originated by a slow process of evolution guided by natural selection. At every stage in this long progression our ancestors necessarily had adaptive reactions to the world around them. As behavior and sense organs became more complex, perception of sensations from those organs obviously maintained a realistic relationship to the environment. To put it crudely but graphically, the monkey who did not have a realistic perception of the tree branch he jumped for was soon a dead monkey—and therefore did not become one of our ancestors. Our perceptions do give true, even though not complete, representations of the outer world because that was and is a biological necessity (84-85).

The actuality of a fixed external world, Simpson says, is proven by the adaptive coherence of the organisms populating it. That I have persisted long enough to write this essay is evidence enough that my perception of the world, though fragmentary, is accurate and true. An obvious argument posits that the correspondence between reality and individual perceptions would be shattered if one found themselves in an environment to which they were not adapted. This argument misses what I think is Simpson’s underlying point: that it is *reality* to which organisms are fundamentally adapted. The idea has some intuitive appeal but ultimately falls short.

The first point that comes to mind revolves around the question of there being other “knowing

creatures”. I observe, accepting that I am a knowing sort, that organisms may confirm the world by successfully enduring in its crevices. But, in all cases, can they be said to have awareness of their condition? Lacking awareness, can they be said to possess knowledge? Lacking knowledge can they be said to confirm anything? The difficulty is in finding an irreducible state or element whose being is beyond doubt. If we accept Descartes, we are left knowing only ourselves. In which case the correspondence between *other* organisms and reality confirms nothing. This is a worthy point but is too far removed from my aim. I am concerned with the reciprocal issue: that knowledge requires adaptation.

By way of getting to that point, let’s review. Ludwik Fleck was a practicing scientist whose self-reflexivity held off the generally palatable dogma of scientific objectivity, progress and privilege to allow conceptual space for the workings of community. Thomas Kuhn was the physicist turned philosopher-historian whose work incorporated much of Fleck’s while preserving the yearnings of his scientific training for an all-encompassing theoretical platform. W.V. Quine, the final member of my heuristic post-positivist triumvirate, was the half-rebel analytic philosopher who grounded Kuhn’s, and by default Fleck’s, work in the linguistic realm thus giving philosophic relevancy to thinking that may otherwise have found only a meager living in the backwaters of sociology. But this trio offered only descriptive accounts void of any claims regarding the risks and ramifications inherent in the systems they were offering. Undoubtedly, their work calls up a host of problems that had been unapparent under the “one world/one scientific knowledge” cloud cover dating to the renaissance. And yet these fresh problems went unaddressed. To a great extent these thinkers, for all their novelty, continued to operate under larger intellectual and academic assumptions that undermined whatever propensity they might have had to turn theoretical musings into a call for change. After a flourish of potential in the early 1960’s, the promising tension they had amassed was largely lost: Fleck, long since dead, remained in obscurity; sociologists co-opted Kuhn while philosophers unsheathed their carving knives; and Quine did his best to put distance between himself and the melee. What they had started was for a time left to be meaningfully directed. Among numerous others, it was the work of scientific polymath Gregory Bateson that took the necessary next step.

Gregory Bateson may not appear to have an obvious connection to the topics thus far discussed. He was a practicing scientist whose work ranged from anthropology, biological evolution and psychology to philosophy of mind and epistemology. Though his writings never pick up the specific issues dealt with by Fleck and Kuhn, and he seems to have been largely unconcerned with the specifics of the analytic philosophic school, his interpretation of mind with its emphasis on what would now be called ecological holism, has its origin in the epistemological problems left latent in their socio-historical theories. Bateson’s work does not occupy itself with elaborating what *is*, but instead seeks to plot a connection between contemporary epistemological sensibilities and the concurrent downward trend in ecological

status. This in itself is not especially unique. What sets him apart is his near total abandonment of the accepted empirical infrastructure in favor of a kind of existential, dialectical narrative.

Gregory Bateson, obviously influenced by his father's thinking, puts primary emphasis on the relation between parts rather than the eternally inexplicable parts themselves. While the senior Bateson limited the use of this approach to ontogenetic studies of the invertebrates--that is, he limited himself to the accepted objects of biological inquiry--the younger Bateson recognized no such restraint. For him, biologically manifest pattern is itself an actor in larger logical types--"metapatterns"--by which all things constituting the world stand connected. In his words: "The *pattern which connects is a metapattern*. It is a pattern of patterns. It is that metapattern which defines the vast generalization that, indeed, *it is patterns which connect* [italics his]" (Bateson, 10b). Disregarding for a moment any sour spiritual associations, for which Bateson himself had considerable disdain, his point reveals itself to be both subtle and not a little confounding. It is difficult to deny his claim of an all-encompassing connection operating in the world, but the specific nature of that connection is not easily teased out. Lacking any concrete understanding of such connections leaves us with nothing more than an intriguing but useless tautology along the lines saying "All is one"; more copout than insight. It is good then that Bateson, scientist to the end, would never have allowed himself such generalizations without having first discerned a mechanism.

The 'stuff' of the meta-connected world Bateson calls the mind, but it is not any conventional sort of mind. He writes rather cryptically, that

Mind is empty; it is no-thing. It exists only in its ideas, and these again are no-things. Only the ideas are immanent, embodied in their examples. And the examples are, again, no-things. The claw...is not the *Ding an sich*; it is precisely not the "thing in itself." Rather, it is what mind makes of it, namely, an *example* of something or other (Bateson, 10b).

The contemporary notion of mind takes it to be a singular, active entity largely removed from the outside world and capable of understanding it as a sum of its parts. But, thinks Bateson, such an understanding of the mind and its functional relation to the world is merely one of many approaches and, he claims, not the most constructive one at that. The Batesonian mind encompasses the whole the world accessible to the sensory faculties. Quite literally, everything constitutes one global ecological mind. The mind of a single scientist, say, is a part of this larger ecology. But any knowledge had or gained by said scientist is contingent, not upon innate properties of the external world, but upon the information, the contextual relation between the parts: "whatever the word *context* means, it is an appropriate word, the *necessary* word, in the description of all these distantly related processes" (Bateson, 14b). The focus upon the relationships between things, rather than the things themselves, is perhaps the most valuable line of thought in the Batesonian approach. He is certainly not alone, nor was he the first to push the idea.

Bateson's father, for instance, developed and applied such an approach in studying biological form and development, though he never really made the second movement towards creating a process-oriented epistemology. Aspects of this method are also plainly apparent throughout anthropological and sociological fields. What sets Gregory Bateson apart was his attempt to expand the ideas to the point that they might constitute a total worldview.

Bateson's argument can be seen to extend from the point made by Simpson, presented earlier. In Bateson's case, however, such "fit" does not compel us to accept the Kantian assumption but, rather, forces us to acknowledge that adaptation imposes definite limitations upon the perceptive domain. The impressive correspondence between organism and environment, implies that biological "choices" have been made. Adaptively speaking, an organism will possess a perceptive capacity in keeping with the unique selective pressures which have acted upon its lineage. The *reality* experienced by one evolutionary line may bear no resemblance to that of another, even as the specific environment remains the same: "It is all very well to say that it makes a sort of adaptive sense to present only the images to consciousness without wasting psychological process on consciousness of their making" (Bateson, 34b). An awareness of perceptual differences does not manifest because there is no regular consciousness of the cognitive processes that catalyze perception itself. There is no denying the heuristic advantages of assuming that the physical world exists in itself and abides by some universal praxis. But, for Bateson, it is an advantageous assumption only insofar as it is put to work within a complementary framework: systematic, reductive, and empirical inquiry. Thus the worth of the assumption—the intrinsic value it seems to have—is reliant upon a broader set of assumptions as to the nature of knowledge and knowing. Ortega offers an abstracted version of this same point:

We must recognize variations in thinking not as changes in yesterday's truth which convert it into today's error, but as changes in man's orientation which lead him to see other truths that are different from those of yesterday. It is not truths that change, but man who changes and who, because he changes, goes on scanning the series of truths, goes on choosing from that transmundane sphere to which we earlier alluded the ones which are right for him, and blinding himself to all the rest (Gassett, 26).

A world of entities necessarily defined only by their impingement upon each other—the observed relations which mold perception—sits uncomfortably in the modern mind brought up on a world-view comprised of discrete and knowable objects. According to Morris Berman, what Bateson has offered us is a distinctly non-mystical recovery of what was lost with the dissolution of alchemy; namely, an understanding of existence that does not presuppose one's separation from the external, that maintains a kind of knowledge that understands entities and phenomena as bound to one another and recognizes that all knowledge is personal, subjective and, to the modern mind, incomplete.

The concept of “personal knowledge” used by Bateson is more complex than might first be thought. Personality, we might say, is one phenomena of an individual mind at work in the world. But for Bateson “mind is empty; it is no-thing. It exists only in its ideas, and these again are no-things,” and as we have already seen, ideas stem from interaction and involvement. The things towards which ideas are directed are illusory,

Only the ideas are immanent, embodied in their examples. And the examples are, again, no-things. The claw, *as an example*, is not the *Ding an sich*; it is precisely not the “*thing in itself*.” Rather, it is what mind makes of it, namely, an *example* of something or other [author’s italics] (Bateson, 10b).

The active mind can deal only with stimuli acting upon it. Knowledge of the world arises via the logical organization of sensory data; relations between the elements of the external world are really relations between our *ideas* of the things. A clear distinction cannot justifiably be made between, say, the scientist and the external object of inquiry. The active mind and idea-genesis arise out of the historical pattern of previous mind-states. It is the organization of all previous ideological representations of contextual state that dictate the way in which new stimuli will be positioned in regards to one another. Any individual who seeks knowledge of the world is, in actuality, navigating the world within. As Bateson puts it:

it takes at least two somethings to create a difference. To produce news of difference, i.e., information, there must be two entities (real or imagined) such that the difference between them can be immanent in their mutual relationship; and the whole affair must be such that news of their difference can be represented as a difference inside some information-processing entity, such as a brain or, perhaps, a computer....there is a profound and unanswerable question about the nature of those “at least two” things that between them generate the difference which becomes information by making a difference. Clearly each alone is-for the mind and perception-a non-entity, a non-being. Not different from being, and not different from non-being. An unknowable, a *Ding an sich*, a sound of one hand clapping (Bateson, 64).

The nature of the scientific experimental act is a product of the artificial division between our species and all the rest of the world. This division did not come to be by any one event. Indeed, it was never purposefully developed or introduced, but piggy-backed into the collective mind upon the systematization of natural science; the once nominal cost of a productive epistemology that, with time, proved to have cost nearly everything. One can hear echoes of Bateson and Fleck in Ortega’s comment that “a thought...separated from the mental road that leads toward it, a thought standing alone and abrupt as an island, is an abstraction in the worst sense of the word, and by the same token is unintelligible” (Ortega, 15). It is uncertain whether Ortega thought this approach to extend to such things as the theories and laws of modern science. His implicit cautionary point—something like “do not trust the messenger until you know where it is he comes from”—would, I think, be no different either way. For how great is

the distance between the idea born of one person's experience and the scientific maxim, experimentally produced, and held as incontrovertible by innumerable practitioners? If anything, the modern scientific complex only enhances the separation between thought and "mental road". What is now deemed meaningful work in the sciences entails specialization so elaborate that whatever conclusions the work yields can be understood, in terms of the "mental road", only by a well trained few. Their familiarity with the relevant language privileges them with entry into a rarified domain and, unconsciously perhaps, confers the responsibility of fortifying the gates against those unsatisfied with mere abstraction. Secrecy is a tremendous source of power, as Ortega duly notes, writing that "the individual sciences ... increasingly impose between the treasure of their discoveries and the curiosity of the profane the tremendous dragon of their closed terminology" (Ortega, 19). But can you slay such a dragon without slaying the whole of science? Is it foolish to think that science is worth preserving?

III

Our path thus far has been largely preparative. The accounts offered come with no claim of comprehensiveness nor are they presented to the reader as the final interpretative word. The only value in what has been offered us by other writers from other times is their intellectual reactivity. Flux is the only constant and any creation is at least partially irrelevant from the instant it is conceived, even before it is physically manifest.

What suite of explanatory maxims might best account for the non-linear, non-progressive, but increasingly complex character of the scientific way of knowing? The so-called post-positivists, of which for our purposes Ludwik Fleck is an unusual member, dealt largely with intra-communal issues and only rarely or indirectly contacted the question of epistemology as whole. Granted, it is useful to have an understanding of the community-based influences shaping a particular means of knowledge acquisition. But to limit ourselves to such an approach only maintains the half-blind Cartesian focus upon questions of

“how”. I recommend that we turn away from “how” and direct our energies towards “why”, a sort of question alive but comatose in the philosophic mind and almost entirely absent, or at least inaccessible in practice, to the mind of the scientist. Asking “why” basically forces us to abandon our current descriptivist framework. Description is localized, stable and, in this sense only, simple.

Yet, no more than simple description has been offered up. To what end does this description and its associated perspective carry us? I seriously doubt that anyone, even the harshest critic, will deny that we live in a tumultuous world fraught with serious health issues ranging from environmental degradation to the proliferation of psychological disorder. Many of the issues which we face can be pushed aside as the expected products of more sensitive diagnostic tools. By such a view it is our ever-strengthening epistemic power that “makes” problems of preexistent, unseen or poorly understood phenomena. Such arguments, however, are mere stop-gaps suffering from an unwillingness to follow the trail of symptoms back to their origin. An unwillingness of this sort is also prominent in modern science. In an external world assumed to be populated by discrete, knowable entities it is difficult to see anything besides equally discrete, solvable problems; puzzles with distinct boundaries and definite, final solutions. The work of Fleck, Kuhn and, less directly Quine, goes a good distance towards showing how empirical practice generates and fosters the functional hallucinations that literally make it make sense to develop solutions to problems using the very cause of the problem itself.

We have thus far set up a number of conceptual and epistemic divisions the destructive nature of which it has been the primary aim of this essay to illustrate. It has also become quite apparent, I think, that most if not all of these problematic divisions--divisions which make up much of what it is to be a modern human--cannot be readily cured. Whatever the possible solutions, their nature is totally outside the realm of contemporary human experience and awareness.

Increasingly, it seems, human civilization has become, not the fruition of mighty advancements and systemically healthy understanding but, rather, a padded room in which the ever-more neurotic populace might live out its corrosive fantasy without accumulating much in the way of apparent damage. It is an un-reflective civilization believing, in the words of anthropologist Hans Peter Duerr, that it is “possible to render our own horizon intelligible from inside-out, within itself” (Duerr, 42) The world as it is presently known is subject to a stratification of reality. For most it is the grocer, the township, the metropolis that hold the greatest claim to reality. The rest of the world, the second or forgotten world, exists in the shadows just beyond the perimeter of our camps. Wilderness is subjugated to a hazy and forgetful realm accessible via science in such a way that it retains its confinements, no longer understood for its monolithic life-confirming, imperative power. The implicit understanding of archaic humans recognized the interdependency of the parts of a division:

Archaic humans...still possessed the insight that one had to leave the world, that one could become ‘tame’ only if before one had been ‘wild’, that one could only

live in the true sense of the word if one had proved one's willingness to die. In order to be able to live within the order, in other words, in order to be consciously tame or domesticated, one had to have lived in the wilderness. One could know what *inside* meant only if one had once been *outside* [italics his] (Duerr, 42).

Total division is an impossibility. The pulling apart of pieces leaves vacancy, empty space that calls to be filled. Instead the suppressed portion of the division manifests itself in new ways:

The demons who had been chased into the wilderness, far away from people, then [proceeded] to return in a changed shape and in a much more threatening form. They were not content to squat on the fence anymore, they sneaked up the cellar steps at night and knocked on the doors. The witch no longer threatened from the outside, she awoke inside (Duerr, 49).

Maybe those demons "sneak[ing] up the cellar steps" can go some way towards accounting for the proliferation of mental disease in our age. To a large degree the nature of an organism is the product of its involvement with its environment. A fairly recent area of research in evolutionary biology involves the idea of "niche construction" by which the selective pressures acting upon an organism are actually determined by the activities of the organism itself. No steady state exists in which the activities of an individual hold a neutral relation to its environment. What happens then when environment becomes Duerr's "wilderness"? What results from the implementation of an artificial barrier--civilization--that permits, even encourages, virtually unchallenged belief in an objectivity of which "The generalizable triumph...depends on the possibility of setting oneself up as the other pole, indestructible and inalienable, of the human mode of existence" (Stengers, 35.6). In such a case there exists no constituency, no acknowledgement of the shaping force of existential dialectic, only mindless, unfounded, dominion and rule. Civilization represents niche construction gone mad. It is voluntary isolation, coming with all the ailments characteristic of long-term deprivation, and modern science is the language of this madness. And still there is a strange sort of promise in Duerr's thoughts. What has been lost is not lost for good; fragments persist and they harbor the seed of a new form of knowledge.

One can see in Duerr's writing traces of Joseph Campbell's historical analysis of the "hero" archetype. For both writers there is a plainly apparent rift between the internal human world, and the external, psychically separated "wild" world. For Duerr, movement from one to the other was knowledge held by archaic peoples but lost under the momentum of civilization. Campbell does not deny the loss of this knowledge in its active form but, as opposed to a psychic deficiency now filled by way of the "cellar", he sees this knowledge as preserved in narrative history, maintained within the resin of allegory and manifest in the recesses of the mind:

The unconscious sends all sorts of vapors, odd beings, terrors, and deluding images up into the mind--whether in dream, broad daylight, or insanity; for the human

kingdom, beneath the floor of the comparatively neat little dwelling that we call our consciousness, goes down into the unsuspected Aladdin caves. There not only jewels but also dangerous jinn abide....These are dangerous because they threaten the fabric of the security into which we have built ourselves and our family. But they are fiendishly fascinating too, for they carry keys that open the whole realm of the desired and feared adventure of the discovery of the self (Campbell, 8).

The hero represents the rare individual who dares to move beyond civilization, to call out to the temperamental wilds from which he came but within which he no longer has a home. In a relevant, maybe melodramatic passage, Campbell writes of the hero's developmental path and their unique potential to induce profound change upon returning to the world:

The hero...is the man or woman who has been able to battle past his personal and local historical limitations to the generally valid, normally human forms....Hence they are eloquent, not of the present, disintegrating society and psyche, but of the unquenched source through which society is reborn (Campbell, 19-20).

He elaborates:

The hero is the man of self-achieved submission. But submission to what? That precisely is the riddle that today we have to ask ourselves and that it is everywhere the primary virtue and historic deed of the hero to be solved (Campbell, 16).

Duerr's take on modern man might then rightfully be called the anti-hero; near total absence of psychic unity and pronounced inability to conceive of, let alone catalyze, change. The hero alone, in Campbell's understanding, possesses the solvent, the cure. Campbell's hero, or at least the understanding implicit in his actions, bares strong resemblance to Duerr's archaic peoples. And it is through that similarity that we can begin to answer Campbell's question: "...submission to what?". Duerr's archaic people, Campbell's hero, are characterized by a fundamental submission to knowledge itself. To say it a bit better, they possess a sort of knowledge that makes any subsequent epistemic approach irrelevant.

Campbell's position is not antithetical to Duerr's nor to that of any other who reads recent human history as a consistent distancing of "mind and nature," in Bateson's words. Campbell makes a convincing case for a reversal of the traditionally held view that mythology represents an attempt on the part of the culture which produced it to reign in the world; that myth is the imaginative necessity of pre-scientific civilizations faced with an otherwise inexplicable natural world. In this way mythology becomes secondary in value, primitive by comparison, to the avenue of true knowledge taken by the post-renaissance empirical sciences. In fact, Campbell claims, myth and civilization have always coexisted not because men require that the happenings of the world be explained, but because they feel compelled to explain themselves: "For the symbols of mythology are not manufactured; they cannot be ordered, invented, or permanently suppressed. They are spontaneous productions of the psyche, and each bears within it, undamaged, the germ power of its source" (Campbell, 4). Environment is not the enigma so much as that we persist within it. The ways and means of a culture or civilization, the underlying

conceptual and metaphysical methodology which it employs to sustain itself, are products of an internal aesthetic continuously hovering at the perimeter of chaos. Self-awareness exerts a force on the human mind, for our purposes akin to gravity, except that it does not keep one planted firmly in the world but instead draws one steadily away from epistemological certainty.

For to be aware of one's internal state is to simultaneously be aware of one's relation, one's contextual state, and ultimately the uncertainty of selfhood. Unless we are willing—and I am not—to posit some form of radical naturalism, the osmotic status of self/environment coupling leaves neither open to complete quantification. Thus we see through the course of history a host of moralizing phenomena which affix valences to the prominent operative societal forces. More often than not such morality culminates in some form of deity, whether through the fallible gods of the Greeks and Romans or the guilt-loving God of the Judeo-Christian tradition. The gods of a people are not the best gauge of a society itself but they provide by far the most penetrating insight into the mental life of the individual. We see this idea in microcosmic form when Campbell writes that

all the life-potentialities that we never managed to bring to adult realization, those other portions of ourself, are there; for such golden seeds do not die....Moreover, if we could dredge up something forgotten not only by ourselves but by our whole generation or our entire civilization, we should become indeed the boon-bringer, the culture hero of the day--a personage of not only local but world historical moment (Campbell, 17).

The “boon-bringer” is the one who harnesses the still-born aspirations and unrealized capacities of a people; one who literally betrays the notion of God, steals from it the power imparted by a people—“the herd” in Nietzsche's terminology—making the locus of this power, this will, the seat of one's own being. It should be noted that this is an interpretation of Campbell's writing that he would be unlikely to support. But Campbell's “hero” is a romantic bit of drivel; an important concept lessened by his poor treatment and philosophic tunnel-vision. He does not seem to have realized that his “hero” is precisely the one who would reject such status outright. Heroes are made, as Gods are made, to diffuse the tension that builds when an animal—humans—attempt to domesticate themselves. The animal, like Duerr's “wilderness,” becomes that which must be repressed. Repression is a chaotrope, wreaking havoc upon the psyche and leaving the infected to design outlets for their misery. For Nietzsche, the outlet for us moderns—meaning the Judeo-Christian world—is the strange idea of guilt which, he claims, is quite literally the redirection of the misery brought on by repression of the untamed/animal/wild back upon ourselves.

The hero then, is not a figure of mythical proportion, but the mythical caricature of one who sets out on an arching path that will take them away from a world which requires unceasing civil war of the mind, into the crevices of cognitive selfhood, and finally back out into the world—a world undivided, free

of dams—equipped with a new epistemic fertility. In Campbell’s words, the path entails

retreat from the world scene of secondary effects to those causal zones of the psyche where the difficulties really reside, and there to clarify the difficulties, eradicate them in his own case (ie, give battle to the nursery demons of his local culture) and break through to the undistorted, direct experience and assimilation of what C.G. Jung has called “the archetypal images” (Campbell, 17).

And from an anthropological perspective:

In this elementary sense we moderns are much more ignorant about ourselves and about our limitations than humans were earlier. The reason in that we tend to think that we can live consciously, without paying the price of the ‘little death’. Many Indians call that consciousness by a word that is generally translated to mean ‘power’. The Whites possess a lot, perhaps everything. The Menomini say, ‘Everything. Everything--except for *meskowesan*, “power” (Duerr, 75).

The hero, the bringer of change, is one who resigns themselves to confrontation of the inborn “demons” generated in the course of artificial niche development. Scientists, as high priests of the prevailing epistemic order, are in the best position to act, to play the hero, to stand as midwives for an unborn world. Yet acclimation has dulled awareness. The greatest fleet of problem-solvers ever known to the world are incapable of identifying the one problem which resides in their very minds and works through their actions. Awareness of this demon, this most fundamental of problems, requires that “the scientist...himself...be ‘demonized’Archaic humans were still fully aware of all of this. They knew that a conscious ‘experiencing of things’, a conscious life...was possible only by *dissolving* experience [italics his]” (Duerr, 69). The scientist would have to enter *into* the “knowable,” exist within in it, rather than seek some external quantification. Awareness comes with the abandonment of “Knowing” as a purposeful endeavor in favor of “knowing” as a temporally finite state of being; knowing as being, coupled to an awareness of ecological integration rather than moralized rule. Duerr writes that “Knowledge awaits the one who returns from the wilderness” (Duerr, 74) and, unfortunately, betrays the thrust of his own argument. Willing demonization is the movement into the wilderness and reunion of the two worlds. If the first movement can be made, then there is nothing to which one might return for one has surpassed the limits of the city and made himself the domain of the wild.

Once the lives of men are permitted to bleed into the larger ecology, once that interaction and involvement takes on significance and is integrated into the very bedrock of human selfhood, a sense of responsibility is manifest: “People do not exploit a nature that speaks to them” (Duerr, 92). But the question remains as to how a people might intentionally ready themselves to hear or, conversely bring nature to speak. Anthropological work provides little hope. Cultures which appear (though this is certainly no guarantee) to maintain such a relationship do so by way of lengthy historical fortification. In these cases there is receptivity but no internalization. Is it possible to force the issue, back-peddle, to

regain what was tossed aside?

In a passage somewhat reminiscent of Simpson's adaptive justification for belief in the external world, Duerr asks,

does not reality show itself in our form of life? Does not our form of life expressly instruct us that what awaits us on the other side is nothing but what we have in some way or another always known, and what science has long ago arranged in its proper categories? And is it not...a sign of 'gullibility' if we think otherwise? Or could it be that where the confrontation of the criteria of various forms of life ends, there would be no criteria at all that would allow an unequivocal answer to such a question?... if what is real necessarily shows itself in one form of life, and if applying a set of basic criteria to various forms of life, those forms cannot be considered together, [if the experience is reality in one form of life and hallucination in another] then it follows that there is no neutral experience as such, the experience itself as it were, which could serve as an arbiter in the question of its own interpretation. The experience itself would cancel itself out in the same way as the 'thing-in-itself' of transcendental philosophy does when we want to answer the question whether we can be sure that the objects of our experience actually are the way they are in themselves, in reality. Criteria would then oppose criteria, one form of life would be pitted against other life forms, and a decision could only be brought about by paying the price of dogmatism (Duerr, 93).

His thinking takes a somewhat different route in that he does not take adaptive coherence as verification of an isolated external environment, but as verification of the self alone; life, as a set of experiences and interactions, perceptions and degrees of involvement, is the subjective product of the living agent. Science then, as the imposition of order, effectively tears perception away from subjective involvement, or least from the recognition of subjectivity as an elemental component of 'world-experience'.

Returning briefly to the mind/body split foisted upon the world by Cartesian scepticism, we can begin to discern lines of connection between an unawareness of physical context and the tendency towards mental isolation. The life of the mind, left to itself, is capable of nothing more than the critical reshuffling of perceptual input; coming increasingly under the conviction that the arbitrary imposition of order belies the nature of things, the nature of Nature. In part, this is the real risk run by scientific cultures; the pervading assumption states that application of the method makes knowable the whole of Nature. That the phenomena of nature is thought to be fundamentally reducible in a science-based society to a singular epistemic characterization has the three-fold effect of undermining the validity of non-scientific epistemological positions, extracting the scientist, and thus the society, from their ecological context, and finally conferring an artificial sense of power the utter falsity of which can be accounted for only by way of the development of justificatory moral codes. This re-moralization confirms itself on the grounds that science is truth while science, more subtly, uses its place within the new moral domain as confirmation.

The two pervasive Cartesian views, writes Bateson, "blossomed out into an emphasis upon

quantity in scientific explanation which distracted men's thought from problems of contrast, pattern, and gestalt" (Bateson and Bateson, 60a). In the realm of scientific consideration after the Cartesian dichotomy, difference was provided a secondary role. No longer was it a legitimate character of some larger functioning network but instead the residue of operations within particular elements. In many ways this transition is akin to reading literature with one's sole focus upon the frequency of certain letters, words, or phrases but coming away with concept of the overarching theme. Thus when Dubos writes that "in the distant past the concept that [science] could be disciplined and organized into a systematic body of operations applicable to all human problems," he is, knowingly or not, referring to a pre-Cartesian understanding of difference, multifaceted engagement, and spirit. It is no surprise then when he next writes that "what is really peculiar to the modern world is the belief that scientific knowledge can be used at will by man to master and exploit nature for his own ends" (Dubos, 16). Dubos, in fact, appears throughout his work to be genuinely taken aback by the exploitative capacities of modern science as well as the degree to which it contrasts with earlier practice. He has astutely identified the symptoms of an underlying epistemic condition while failing to grasp what Bateson understood: that epistemology torn from ontology can amount to nothing more than an object of cognitive brutality.

A thought: "the map is not the territory". It is such a simple statement and yet it holds a surprisingly diverse spectrum of meaning. Like anything though, the matter reduces to a choice: to take the words in relation to their author or to make of them a pedestal upon which we can prop our agenda. For the sake of balance, I think it would be best to do both. So, what have we here in these six words? The "territory" can be taken as the environment in which the perceptive act occurs, what I, following Duerr, have previously referred to as wilderness. It is the impenetrable medium of our cognitive engagement which simultaneously rebuffs our inquiries and acts as looking-glass. The map is the failed attempt at producing, in ourselves, a pitch-perfect replica of the perceived. We can meaningfully compare the map/territory idea to Gottlob Frege's distinction between the sense and reference of noun phrases. For Frege, the thing designated by a noun, the noun's reference, can remain constant between different speakers of the same language even while the sense associated with the designator can vary significantly between individuals. The referent is constant while the relationship between it and the observer fluctuates. Though Frege's concern lay primarily within the realm of language the idea is applicable to the whole of experience which, I think, is what Kuhn's phrase highlights. The map results from one's sense of the referent, the territory. Such a sense may well impart on the agent the ability to deal predictably with the referent, but it does not confer truth in any universal or absolute sense. What is gained is personal knowledge though it often goes unrecognized.

If one stops to consider the vast array of "territories" encountered over the course of a typical day, even ignoring thoughts of their interaction or logical constituency, it is easy to understand people's

readiness to assume the externality of experience; the ease with which the map comes to be taken as identical with the territory. In general such an approach is both stable and productive. The patterns of life for most individuals are sufficiently integrated into one another that individual perceptions are not notably variant. Culture effectively buffers against significant aberrations in perceptive mode which in turn minimizes the need to explicitly recognize the distinction between object and observation.

The normative effect of human culture—maintaining a conceptual separation between “us” and “it” while simultaneously catalyzing and reinforcing the assumption of identity between the “thing in itself” and perception—is not without significant long-term consequences for every member of the species as well as the global ecology. By taking for granted that what we see equates to what is true we assume the ability to entertain wholly rational interactions with our environment. Concepts of process, non-directional change, life, fate, faith, and the unknowable become, at best, secondary to a brand of knowledge built upon mechanization and control.

Works Cited

- Agassi, Joseph. “Comparability and incommensurability.” Social Epistemology 17 (2003): 93-94.
- Bar-am, Nimrod. “The dusk of incommensurability.” Social Epistemology 17 (2003): 111-114.
- Bateson, Gregory and Mary Catherine. Angels Fear: Towards and Epistemology of the Sacred. Macmillan Publishing Company, New York: 1987.
- Bateson, Gregory. Mind and Nature: A Necessary Unity. Hampton Press Inc., New Jersey: 2002.
- . Steps Towards and Ecology of Mind. The University of Chicago Press, Chicago: 1972.
- Berman, Morris. The Reenchantment of the World. Cornell University Press, Ithaca and London: 1981.
- Bradie, Michael. “The Evolution of Scientific Lineages.” PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association 2 (1990): 245-254.
- Campbell, Joseph. The Hero with a Thousand Faces.
- Crick, Francis and Graeme Mitchison. “The Function of Dream Sleep.” Nature 304 (1984): 111-114.
- Dubos, Rene. The Dreams of Reason: Science and Utopias. Columbia University Press, NY: 1961.
- Duerr, Hans Peter. Dreamtime: Concerning the Boundary between Wilderness and Civilization. Basil Blackwell Inc., New York: 1978.
- Fleck, Ludwik. The Genesis and Development of Scientific Fact.
- Foucault, Michel. The Order of Things: An Archeology of the Human Sciences. Random House Inc., New York: 1970.
- Gren, Martin. “By Our Epistemology You Shall Know Us (A Novice’s First Fumbling Steps on the Road to Human Geography).” Geografiska Annaler, Series B, Human Geography 70 (1988): 301-304.

- Kuhn, Thomas S. The Essential Tension. Chicago: University of Chicago Press, 1977.
- . The Road Since Structure. Eds. James Conant and John Haugeland. Chicago: University of Chicago Press, 2000.
- . The Structure of Scientific Revolutions. 2nd ed. Chicago: University of Chicago Press, 1970.
- Ortega y Gasset, Jose. What is Philosophy? W.W. Norton and Company, Inc. New York: 1960.
- Paz, Octavio. Alternating Current. The Viking Press, Inc., NY: 1973.
- Polanyi, Michael. Science, Faith and Society. The University of Chicago Press, Chicago: 1946.
- Quine, W.V.. "On Simple Theories of a Complex World." The Ways of Paradox. New York: Random House 1976.
- . Ontological Relativity and Other Essays. New York: Columbia UP, 1969
- . "What is it all about?" American Scholar 50 (1980-81): 43-54.
- Quine, W.V., and J.S. Ullian. The Web of Belief. New York: Random House, 1970.
- Redner, Harry. The Ends of Science. Westview Press Inc., Boulder, CO: 1987.
- Shapere, Dudley. "The Structure of Scientific Revolutions." The Philosophical Review 73 (1964): 383-394.
- Simpson, George Gaylord. "Biology and the Nature of Science." Science 139 (1963): 81-88.
- Smith, Barbara Herrnstein. Scandalous Knowledge: Science, Truth, and the Human. Duke University Press, Durham NC: 2006.
- Stengers, Isabelle. The Invention of Modern Science. University of Minnesota Press, Minneapolis MN: 2000.
- Stump, David. "Naturalized Philosophy of Science with a Plurality of Methods." Philosophy of Science 59 (1992): 456-460.
- Thagard, Paul. "Against Evolutionary Epistemology." PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association 1 (1980): 187-196.
- Von Dietze, Erich. Paradigms Explained: Rethinking Thomas Kuhn's Philosophy of Science. Connecticut: Praeger Publishers, 2001.
- Waddington, C.H.. "Canalization of Development and the inheritance of acquired characters." The Evolution of an Evolutionist. Ithaca: Cornell UP, 1975. 16-22.
- Wilson, David Sloan. "Holism and reductionism in evolutionary biology." Oikos 53 (1988): 269-273.
- Zammito, John. A Nice Derangement of Epistemes: Post-positivism in the Study of Science from Quine to Latour. Chicago: University of Chicago Press, 2004.