

Chapter 4: Cognition and Experience: Quine and Cassirer (The Epistemological Problem: *What do we know?*)

"The totality of our so-called knowledge or beliefs, from the most casual matters of geography and history to the profoundest laws of atomic physics or even of pure mathematics and logic, is a man-made fabric which impinges on experience only along the edges. Or, to change the figure, total 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. Truth values have to be redistributed over some of our statements. Reevaluation of some statements entails reevaluation 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. Having reevaluated one statement we must reevaluate some others, which may be statements logically connected with the first or may be the statements of logical connections themselves. But the total field is so underdetermined by its boundary conditions, experience, that there is much latitude of choice as to what statements to reevaluate in the light of any single contrary experience. No particular experiences are linked with any particular statements in the interior of the field, except indirectly through considerations of equilibrium affecting the field as a whole..... Furthermore it becomes folly to see a boundary between synthetic statements.. and analytic statements...Any statement can be held true come what may, if we make drastic enough adjustments elsewhere in the system... Conversely.. no statement is immune to revision.. even the logical law of the excluded middle... and what difference is there in principle between such a shift and the shift whereby Kepler superseded Ptolemy, or Einstein Newton, or Darwin Aristotle?"¹

"Experience"! I have argued it as an axiom of sanity, and a minimal realist assumption. But *what* is it and what does it mean? Is it the same as "sensuous impressions"? Does the posit of absolute experience demand an immediate further commitment to reference? In this chapter I will examine these questions in the light of Quine's and Cassirer's ideas and conclude that the answer to each is "no". I will propose an answer of rigorous and scientific epistemological relativism, (an

¹ Quine, 1953, pps.42-43

extension of Cassirer's), which preserves both the phenomena and the validity of the whole dialogue of Naturalism, (including, therefore, that of my first two theses), *as organization*. It will preserve them without a commitment to metaphysical reference however. "Experience", I will argue, is *exactly that* which remains (relativistically) invariant under all consistent and comprehensive worldviews. Experience is the phenomena we must preserve and account for, but it is not the specific *organization* by which we do so. The primitives of a given organization are not legitimized, therefore, on the basis of reference, but on a (relativistic) basis of empirical adequacy.

In the previous chapter, I began a discussion of cognitive closure and asserted an "Axiom of Externality". In this chapter I will continue with the issue of closure and confirm the other necessary, (apodictic), prerequisite of cognition, i.e. the "Axiom of Experience". Quine's epigram illuminates both. It validates an absolute and ineradicable *multiplicity* of interpretations for experiment and experience.

To start, let me propose a fantasy, which I think, clarifies the relationship between knowledge, cognition generally, and "experience". It will suggest a viable working definition of the latter.

A fantasy:

The remote and newly discovered atoll of Petrolia, deep in the south pacific islands and never before touched by modern civilization, was visited by a geological survey party. It was found to lie above enormous undersea oil reserves. Its king and high priest, a primitive but highly intelligent man, asked to see *our* "magic".¹ Seeking to humor him, (and, I am ashamed to tell, selfishly induce him to assign drilling rights to an American company at a ridiculously low price), he was given a "red carpet" tour of the Supercollider Accelerator, our greatest scientific marvel.² The king was mightily impressed. He saw "magical worms", (traces on oscilloscopes), "dancing arrows", (pointers on analog gauges), and tiny "animal tracks", (particle tracks under a microscope), in this "cavern of the gods". He was convinced that the whim of *our* gods provided the "magic", (the "physical laws"), of his experience there, as it, (they), seemed quite different from his own! He subsequently engaged in a long and heated debate with one of the technicians over the *significance* of it all, ending, sad to say, with his casting a set of boar's knuckles

¹ He was awed when watching reruns of "Gilligan's Island" on the exploratory party's television.

² cf heading above!

and a shrunken head, (hidden in a bag under his robe), onto the cable-strewn floor with *disastrous* consequences!

Though whimsical, this fable helps to clarify the purest, (weakest), and the minimum, (necessary), assumption of "experience". There are clearly aspects of the situation that the king may have considered significant, (i.e. explanatory), that the scientist did not, (and conversely). The color or shape of an instrument, or the way the technician cleaned his glasses before initiating the experiment, for instance, are things that the king might have considered as ritual, (or physical), necessities, essential to the result. Even the number of floors of the facility, the time of day, or the route by which he entered might be relevant. The technician, of course, considered the king's multicolored ritual headdress, and his pouch of magic bones, (he was doing *his* best to be of help), totally irrelevant. What I will call the "abstract frame" of the experiment he witnessed, however, was the same for him as for the scientist conducting it. The abstract frame, (the total data and the "boundary condition"), for both the scientist and for the King of Petrolia was identical with the *abstract*, (from interpretation),¹ of the *whole* of the actual experiment itself, (i.e. the whole of the experimental situation).²

The "abstract frame" *must include* the "background situation" however, i.e. *all* the details -to include the observers! We do not know, a priori, *which* of these or *what* of these is relevant. This is one reason why, (other than the issues of personal integrity or error), experiments must be reproducible. It is to eliminate unique factors deriving from the particular experimental context³ and to isolate the essentials through a multiplicitous duplication, hopefully random regarding what is (unknowably) extraneous. We are never on certain ground in that process however. We are never sure that our historically dictated -and contextually limited- design of an experiment does not implicitly incorporate such factors, or that there are not *broader*, (or different), frames, isolating, (or incorporating), *other* factors as incidental and irrelevant, (or pertinent and important), in which it could be implemented.⁴ Following Quine, we are in a process of dynamic reorientation only *bounded* by the abstract frame! *Any* theoretical description really compatible with

¹ alternatively, the *experiential invariant*

² "Experiment" is clearly an extension, albeit a refined and defined one, of "experience" itself.

³ e.g. a magnetic field from the coffee-maker, a power surge from the factory down the block, the crumb from an assistant's lunch contaminating a culture

⁴ The lack of free ferrous iron in ordinary differential bacteriology plates when looking for Legionnaire's Disease was an example of a too limited context and was the reason for its long mystery.

the overall experimental situation¹, however, is clearly a *legitimate*, (i.e. logical), interpretation in Quine's sense!

Consider: was the King of Petrolia's interpretation of the data of the experiment into *his* theoretical scheme, (worldview), *patently* false? Not necessarily, according to Quine. Was the scientist's translation into "laws of physics", "particles of matter" -or as an expression of the "primitive building blocks of reality" *inherently*, (i.e. logically), better? *Also* not necessarily!

Each could use the data to integrate, reinforce or modify his theoretical basis -his world-view.²

The fable, (in concert with Quine I maintain), helps us to see that "experience" *as such* is not, (a priori *or* a posteriori), identifiable with any of its organizations or orientations. Rather, it must be identified with the *invariant relationality* -i.e. with that which remains fixed- under *all* global, comprehensive and consistent orientations. "Experience", (TENTATIVE WORKING DEFINITION), is that for which both the king and the technician *must account* in some manner!³ It is not *itself* an orientation, however. It is, rather, *that* ("thing") *which must remain fixed*, and I argue that it is a *primitive* of reason. Scientific experiment extends, (generates), experience and thereby bounds (and shapes) the scope of such consistent theories. It adds new invariant relationality to the abstract

¹ including one which might dissolve -i.e. redistribute- but exhaustively account for- the apparent relationality of our primitives. Virtual systems clearly suggest a new logical possibility.

² Even the cumulative body of scientific experiment can be accounted for by the King. Given an unending stream of counterexamples, he can, via Quine, incrementally account for each. The presumption that this *cumulative* body rules out any other consistent world-view, that eventually he will be backed into a contradiction is not justified.

This is *not* to say that any consistent theory is just as good as any other consistent theory. The king's theory, spirits and witchcraft, let us say, while it may very well be consistent and capable of accounting for any given fact, clearly falls far short in many aspects, perhaps the most important of which is predictability. The scientist will make strong

and definite projections into the future which, by and large, will be clearly and precisely confirmed. He will be able to predict wide ranges of phenomena correctly and efficiently. There are other criteria of good theories as well. Roger Penrose, in his "Emperor's New Mind" has outlined a reasonable standard very concisely. (See Appendix D)

The issue, which I will postpone for a little, is whether there cannot be, under the thesis of epistemological relativism which I will assert, *multiple*, equipotent and comprehensive "SUPERB", (using Penrose's classification), theories of reality. The proven equivalence, for example, between Heisenberg's and Schroedinger's (widely divergent) theories of quantum mechanics seems to imply that this may be the case.

³ This identifies, I propose, a viable and legitimate -and theory independent- working definition of experience.

frame, (and the history of abstract frames). Following Quine however, it never *determines* them.

The Epistemological Problem:

At the conclusion of Chapter 2, I asserted the definition: The mind is the "bio-logical", (i.e. materially reduced), "concept" of the brain. (Alternatively, mind is the *rule* of the brain.) This scientific conclusion, (and the schematic model), of my first two chapters, however, raises *profound* philosophical and epistemological difficulties, seemingly contradicting itself. It raises questions, moreover, which offend the very foundations of our rational sensibilities. This, however, is not so unusual a circumstance but has *always* been the case, historically, at the major turning points of science. Deep progress has *always* necessitated radical, (and often distasteful), reorientations, (rather than mere polishings), of our fundamental worldview -often with the loss of cherished convictions. Most recently, this is seen very clearly at the invocations of Relativity and Quantum Mechanics in modern physics which, incidentally, raise much the same sorts of questions as does my thesis, i.e. "realism vs. empiricism/algorithmic" questions. I urge that the problems raised by my thesis are not inherently more difficult -or of a radically new and different type- than have been raised, (and answered), before in the cause of science.¹ The real issue is *productivity* -to whose ultimate judgement I hereby submit my thesis. It is to legitimize and justify my conclusion, however, that I am

¹ Though admittedly painful, how are the epistemological implications of my thesis so much more difficult than those of modern physics, for instance? At the scale of the very small and at the scale of the very large, physics says that our physical world is *profoundly* strange and, at the small scale at least, that the picture of science is essentially algorithmic. My thesis proposes that our human scale world is very much the same -but that it is itself a *biological* and organic algorithm. It is a "tactile" algorithm wherein the "data" we receive and the instrument we manipulate to control it are one and the same. (See Chapter 1). Its elements, however, are purely and abstractly *logical*, (alternatively "operational"), elements! This is a very different and radical way to look at our "objects", (to include perceptual objects), to be sure. It is, I believe, however, far more compatible with the outlook of modern physics than is ordinary Naturalism. I maintain that our "tactile", "spatial", "extensive" et al. objects are *logical*, (alternatively "operational"), rather than *representative*. (cf. conclusion to Chapter 2) But the "logical" here is a (Kantian) "constitutive logic" rather than an "ordinary logic".

I will argue a necessary detachment of knowledge from reference -a necessary relinquishment of our ordinary assumption of the independence of our (cognitive) "instrument" from what it measures. This does *not* require a denial of reality, however, but of our *absolute knowledge* of reality. But physical science has already reached this conclusion, hasn't it?

forced to philosophy and a study of the metaphysical and epistemological presumptions of science -and there *are* such.

There are really two problems involved with the mind-brain problem. There is a scientific and empirical one, and there is a philosophical and metaphysical one. The combination of my first two theses solves the scientific problem, and my third thesis will explicate the metaphysical problem. This chapter will resolve the apparent paradox created by the first two hypotheses, i.e. the epistemological problem.

I shall now propose a specific answer to the problems which I have raised. This is *not* the only answer possible. I might as easily have adopted the empiricist, "anti-realist" stance common amongst physicists, for instance. My philosophic answer has something in common with that stance, but I think it is a positive advance on it, as it leads, (in Chapter 5), to a plausible and pointed answer to the question of the *substance* of mind. Let me emphasize, however, that my real and central claim remains the scientific one, i.e. the result of the combination of my first two theses; my philosophic answer is solely its rationale.

If my scientific conclusion is true, (and I believe the concordance of my first two theses, amongst numerous other reasons, strongly suggests it is), then there seems to be an inherent paradox in knowledge itself, -and my (Naturalist) premises! If both our perceptual and intellectual objects are solely artifacts of *biological coordination*, then on what ground can knowledge, (and my own argument), stand? If the *very language*, (to include the very "biological coordination" and "evolution" of my argument), in which I describe the problem, (being *part* of that self-same human reality), is only internally organizational and not referential, then *what* is it that am I describing. How can I even discuss the problem itself? Doesn't my theory actually eat itself? *How, then, could there be science at all?* Notwithstanding the apparent paradox, (which is not unique to my thesis¹ and to which I will here propose a solution), I maintain that mine is a very strong and a very pure Naturalist argument and that its conclusion, *as such*, is valid.

Chapters 1 & 2 might be considered as a constructive reductio ad absurdum of the Naturalist premise. (Chapter 3 is a direct argument to the same effect, building on Kant and Maturana.) Less kindly, they might be considered as constituting a "straw man". Combined, however, they are much more powerful than

¹ This problem is inherent in pretty much the same terms in the whole of Kantian and Neo-Kantian philosophy of science, and in the philosophical dilemmas of modern physics as well. I urge that my solution, in a form very close to that offered by Cassirer, fits with the whole of modern science in a way that none other does.

that as they actually do resolve the whole of the Naturalist dilemma, (other than the epistemological one I just raised), and explicate the actual mind-brain problem in absolutely legitimate, (and empirically promising), Naturalist terms. Clearly, there might be something wrong with the Naturalist program, but need it be *fatal*?

My argument turns now then, not to argue against the whole sense of Naturalism, but against the *part* of it I believe is flawed. I base those arguments in an extension of Kant's,¹ and, ultimately, of Cassirer's Neo-Kantian position, i.e. his "Theory of Symbolic Forms". The thrust is to split Naturalism from its over-strong metaphysical presumptions.

Cassirer Revisited:

My prior arguments do not, however, reduce the system of Naturalist *organization*, (i.e. its predictive schema), to absurdity, (nor, therefore, the corresponding organizational, i.e. Naturalist, validity of my own first two theses which are framed within it), but only its claim of absolute, (i.e. metaphysical), *reference*.² Nor do they question the profound *effectiveness* of Naturalist science.³ Cassirer suggests a way to preserve that overwhelmingly successful relationality, (i.e. the predictive efficacy), of Naturalism in a *relativized* sense, not as reference, but *as organization*, i.e. his thesis of rigorous and scientific epistemological relativism.⁴ He proposes Naturalism, (and materialism),⁵ as just one (among several) of the possible -and equipotent- "Symbolic Forms" comprehensively *organizing*

¹ Kant's work was concerned *primarily* with the problem of cognition and therefore has a special relevance here.

"This is an advantage no other science", [than epistemology], "has or can have, because there is none so fully isolated and independent of others *and so exclusively concerned with the faculty of cognition pure and simple*." Prolegomena, P.131

² again, at *whatever* level of sophistication the latter is postulated

³ The Naturalist *organization* can be taken *within* contemporary anti-realism, (i.e. anti "scientific-realism" -the position that scientific theories do not directly describe ultimate, metaphysical reality). I am making a distinction between *naturalist organization* and *naturalist metaphysics*. Cassirer I believe, like Van Fraassen, is essentially an antirealist. This is not so surprising, given the fact that they both have Kantian roots, (cf., for instance, Van Fraassen's "Laws and Symmetry".) I will most definitely *not* argue in favor of Naturalism, (i.e. metaphysical naturalism ==scientific realism), but will argue for the (relative and equipotent) naturalist organization. I will argue, therefore, for the structure, but not the reference of that organization.

⁴ Cassirer's is clearly a mathematical perspective, with its roots in modern algebra.

⁵ as embodied in mathematical physics

experience. It is only *experience itself*,¹ (the phenomena), that is preserved as a known metaphysical absolute and to which (relativized) reference can be made. "Experience", (Naturalist connotations notwithstanding), must not be confused and identified with its characterization under any *particular* one of the possible symbolic forms however.

It is the confusion of a *particular* "frame of reference", i.e. form, (and the assumption that there is only one comprehensive frame possible²), with the *invariant relationality of experience* in the abstract, (i.e. under all consistent frames), that is the heart of the issue. It results in a confusion of a *specific organization* (of experience) with the experience itself,³ which is organized. It results in an (improper) assignment of (unique) metaphysical reference rather than a (legitimate) judgement of empirical, (i.e. experiential), adequacy for the primitives of the theory. Cassirer's reformulation of the formal logical concept allows a new logical possibility and an escape from the dilemma.

Just as Einstein relativized measurement and disembodied the ether, so did Cassirer argue for a relativization of knowledge, and a disembodiment of direct reference. But Cassirer's is not a frivolous, laissez-faire relativism, (nor is it solipsism); it is an explicit and technical *epistemological* relativity rigorously grounded in the phenomenology of science.⁴

What, exactly, is the length of a rod to a physicist? It depends on the measurements, the frames of reference and the (absolute) equations of the theory of relativity relating them. What is the relevance of a theory, (including a scientific one)? It depends on the experience, the "form", (e.g. physics/Naturalist science), and the (absolute/invariant) relations, ("equations" -i.e. the web of implication), which must be preserved in it. What is constant, under all frames, are the invariants, (in a mathematical sense), which must be preserved in them, i.e. "experience". I

¹ Experience is not necessarily, therefore, the same as its Naturalist interpretation, (organization), as "sense impressions". Nor, under my thesis, does experience *refer to* externality. It is an expression of process.

² i.e. Naturalism

³ to include scientific experiment as an extension of ordinary experience

⁴ Why is Einstein not saying that *any* measurements, (at all!), are valid? Why is Einstein's *itself* not a laissez-faire *physical* relativism? It is because there is a rigid structure at the core of his assertion -i.e. the specific, (and precise), invariant equations of relativity. It is the rigid and invariant "equations", (alternatively "the topology"), of experience that structure valid theories. These "equations", this "topology", must be retained as invariant(s) under all viable theories. This is why neither mine, nor Cassirer's, is an irenic relativism.

have argued a working (and non-referential) definition of "experience" as *that* which must be maintained under all comprehensive worldviews.¹

But what exactly could a relativized *substance* be then? What could Naturalism's *material* be under such a conception? It would be an implicitly defined *term*, (alternatively "symbol"), under a particular interpretation -i.e. it would itself be an "object" implicitly defined by the "generating relations" of the science which specifies it. Even materialism need not, therefore, *necessarily* carry a metaphysical commitment. It is an organization of experience using the (implicitly defined) terms of "substance".

Cassirer's Theory of Symbolic Forms:

Cassirer suggests a new way to look at the relation between theory and experience. He proposes a rigorous *epistemological relativism* innate in the phenomenology of modern science.

"Mathematicians and physicists were first to gain a clear awareness of this [the] symbolic character of their basic implements. The new ideal of knowledge, to which this whole development points, was brilliantly formulated by Heinrich Hertz in the introduction to his 'Principles of Mechanics'. He declares that the most pressing and important function of our natural science is [simply] to enable us to foresee future experience"²

It is the *method* by which it derives the future from the past which is significant, however. We make "inner fictions or symbols" of outward objects, and these symbols are "so constituted that the necessary *logical consequences*, [my emphasis], of the images are always images of the necessary natural consequences of the imaged objects".³ But this analysis -and "image"- must be interpreted carefully:

"...[though] still couched in the *language* of the copy theory of knowledge -... the concept of the 'image' [itself] had undergone an inner change. In place of

¹ Though this is clearly somewhat circular, it is perfectly consistent with my assertion that "experience" is, in fact, an epistemic primitive.

² Cassirer, 1953, p. 75

³ *ibid*, p.75

the vague demand for a similarity of content between image and thing, we now find expressed a highly complex *logical* relation, [my emphasis], a general intellectual *condition*, which the basic concepts of physical knowledge must satisfy."¹

Its value lies "*not in the reflection of a given existence, but in what it accomplishes as an instrument of knowledge,*"² [my emphasis], "in a unity of phenomena, which the phenomena must produce out of themselves." Hertz formulated the distinction very succinctly:

"The images of which we are speaking are our ideas of things; they have with things the one essential agreement which lies in the fulfillment of the stated requirement, [of successful consequences], but further agreement with things is not necessary to their purpose. *Actually we do not know and have no means of finding out whether our ideas of things accord with them in any other respect than in this one fundamental relation.*"³

A system of physical concepts must reflect the relations between objective things and their mutual dependency, but, Cassirer argues, this is only possible "in so far as these concepts pertain *from the very outset* to a definite, homogeneous intellectual orientation",⁴ [my emphasis]. It is only within a distinct logical framework that these "images" are significant at all.⁵ The object cannot be regarded as a "naked thing in itself", *independent* of the essential categories, (and framework), of natural science: "for only within these categories which are required to constitute its form can it be described at all."

This change of perspective, (a genuine "Copernican Revolution" in Kant's sense), necessitates and validates Cassirer's conclusion of the innate symmetry and *a relativity of interpretations* for phenomena. "With this critical insight ... *science*

¹ ibid

² ibid

³ H. Hertz, "Die Prinzipien der Mechanik", p.1 ff, my emphasis

⁴ Cassirer, op cit p.76

⁵ Please note the similarity of this situation, as formulated by Hertz and Cassirer, with that I laid out in Chapter one for the training seminar. The objects, ("images"), in a very real sense, are a function of the calculus. Insofar as they are justified, it is on the conjoint basis of utility.

renounces its aspiration and its claim to an 'immediate' grasp and communication of reality."¹

It realizes that the only objectivization of which it is capable is, and must remain, *mediation*, [my emphasis]. And in this insight, another highly significant [critical]² idealistic consequence is implicit. If the object of knowledge can be defined only through the medium of a particular logical and conceptual structure, we are forced to conclude that a *variety of media*, [my emphasis], will correspond to various structures of the object, to various meanings for 'objective' relations.³

This is the assertion of symmetry and the foundation for his thesis of "Symbolic Forms".

Even in 'nature',⁴ [my emphasis], the physical object will not coincide absolutely with the chemical object, nor the chemical with the biological - because physical, chemical, biological knowledge *frame their questions* each from its own particular standpoint and, in accordance with this standpoint, subject the phenomena to a special interpretation and formation.⁵ It might also seem that this consequence in the development of [critical] idealistic thought had conclusively frustrated the expectation in which it began. The end of this development seems to negate its beginning -the unity of being, for which it strove, threatens once more to disintegrate into a mere diversity of existing

¹ *ibid*

² *Everywhere*, where Cassirer uses "idealism", it must be understood as "critical idealism" in the sense that Kant used it. This is very different from ordinary idealism, and, as I discussed in Chapter 3, is a real misnomer. I have suggested "ontic indeterminism" as a more modern alternative, and one I think both Kant and Cassirer would have been happy with. Also compare the "mere X", (below), with my discussion in Chapter 3.

³ Cassirer, 1954, p.76

⁴ i.e., "science" as opposed to the "cultural forms" -see discussion later.

⁵ But even within Cassirer's primary "natural forms" -in physics, for instance, I argue -beyond Cassirer- that the exact parallel obtains. There are arguably alternative Hertzian formulations of the problem. Alternative objects and alternative calculi are possible. Fine suggests that Relativity and Quantum Mechanics may represent such alternatives, and certainly Schroedinger's and Heisenberg's conceptions of quantum theory illustrate the plausibility.

things. The One Being, to which thought holds fast and which it seems unable to relinquish without destroying its own form, eludes *cognition*.¹

It is the *phenomena*, (experience), *not reference*, however, that is the fulcrum of, (and reunifies), this relativity of perspectives. The forms do not *refer to* (metaphysical) reality, (their objects are not *images* of reality), they *organize experience*. Metaphysical reality becomes "a mere X"² "The more its metaphysical unity as a 'thing in itself' is asserted, the more it evades all possibility of knowledge, until at last it is relegated entirely to the sphere of the *unknowable and becomes a³ mere 'X'", [my emphasis].⁴ It is the realm of *phenomena*, "the true sphere of the knowable with its enduring multiplicity, finiteness and relativity", on which we stand. It is the (multiplicitous and relativized) *organization* of phenomena, *not reference* to a metaphysical origin, which lies at the basis of knowledge.*

"And to this rigid metaphysical absolute is juxtaposed the realm of phenomena, the true sphere of the knowable⁵ with its enduring multiplicity, finiteness and relativity.⁶

But this reorientation does not destroy the either the unity or the coherence of knowledge.

"But upon closer scrutiny the fundamental postulate of unity is not discredited by this *irreducible diversity*, [my emphasis], of the methods and objects of knowledge; it merely assumes a new form. True, *the unity of knowledge can no longer be made certain and secure by referring knowledge in all its forms to a 'simple' common object which is related to all these forms as the transcendent prototype to the empirical copies.*" [my emphasis]⁷

¹ ibid

² compare this with the discussion of Chapter 3

³ (Kantian)

⁴ ibid

⁵ see Chapter 3

⁶ ibid

⁷ ibid

(This latter demand is, of course, the rationale of the Naturalist claim of reference.)

"But instead, a new task arises: to gather the various branches of science with their diverse methodologies - with all their recognized specificity and independence - into one system, whose separate parts precisely through their necessary diversity will complement and further one another. This postulate of a purely functional unity *replaces the postulate of a unity of substance and origin, which lay at the core of the ancient concept of being.*"¹

Cassirer conceives his "symbolic forms" *functionally*, (and serially), i.e. in terms of the "mathematical concept of function".

"And this creates a new task for the philosophical critique of knowledge. It must follow the special sciences and survey them as a whole. It must ask whether the intellectual symbols by means of which the specialized disciplines reflect on and describe reality exist merely side by side *or whether they are not diverse manifestations of the same basic human function.* And if the latter hypothesis should be confirmed, a philosophical critique must formulate the universal conditions of this function and define *the principle* underlying it."²

Instead of dogmatic metaphysics, "*which seeks absolute unity in a substance to which all the particulars of existence are reducible*", he seeks after "*a rule governing the concrete diversity of the functions of cognition, a rule which, without negating and destroying them, will gather them into a unity of deed, the unity of a self-contained human endeavor.*"³ [my emphasis]⁴

¹ ibid

² ibid p.77, my emphasis

³ ibid

⁴ Cassirer extends his theory of symbolic forms *beyond "nature"*, (i.e. beyond the sciences), into the "cultural forms": art, myth, religion, etc. -i.e. beyond cognition itself. I will deal with this aspect of his thesis presently, taking a neutral perspective, but first I would like to extend and modify this, his core and scientifically grounded position somewhat.

Perhaps the most succinct overall statement of Cassirer's thesis is found in his "Einstein's Theory of Relativity".¹ Each of the perspectives of scientific knowledge: physics, chemistry, biology, ... (the "cognitive forms"), - and ultimately myth, religion and art, ... (the "cultural forms"),² are taken as alternative and equipotent (organizational) perspectives on the phenomena.

"Each of the original directions of knowledge, each interpretation, which it makes of phenomena to combine them into the unity of a theoretical connection or into a definite unity of meaning, *involves a special understanding and formulation of the concept of reality.*"³

Ordinary Naturalism confuses a *particular* organization, (mathematical physics), with the phenomena which are organized. That is the basis of its assertion of reference -and "scientific realism"⁴. "The "objects", (the organizational primitives -i.e. "images"), of one *particular* form are assumed, (incorrectly), to *reference* ontology -to relate to "an ultimate metaphysical unity".

"Where there exist such diversities in fundamental *direction* of consideration, the *results* of consideration cannot be directly compared and measured with each other. The naive realism of the ordinary view of the world, like the realism of dogmatic metaphysics, falls into this error, ever again. It separates out of the totality of possible concepts of reality a single one and sets it up as a norm and pattern for all the others. *Thus certain necessary formal points of view, from which we seek to judge and understand the world of phenomena, are made into things, into absolute beings.*[my emphasis]"^{5 6}

What these "formal points of view" do, instead, is *organize* phenomena. What is consistent under *all* forms, however, are the phenomena themselves. Naturalism confuses a *particular* "frame of reference", i.e. form, (and assumes that there is only one comprehensive frame possible⁷), with the *invariant relationality of experience*

¹ Cassirer 1953

² I will question the eventual scope of his vision presently

³ *ibid*, P.446, my emphasis

⁴ another misnomer

⁵ *ibid*, p.447

⁶ Naturalism, at *whatever* level of sophistication, clearly falls under this injunction.

⁷ i.e. Naturalism

in the abstract, (i.e. under all consistent frames)¹ It confuses a *specific organization*, (and a specific characterization), of experience with the experience itself² which is organized. It results, (and I repeat myself), in an (improper) assignment of (unique) metaphysical reference rather than a (legitimate) judgement of empirical, (i.e. experiential), adequacy for the primitives of its theories.

"Only when we resist the temptation to compress the totality of forms, which here result, into an ultimate metaphysical unity, into the unity and simplicity of an absolute 'world ground' and to deduce it from the latter, do we grasp its true concrete import and fullness. No individual form can indeed claim to grasp absolute 'reality' as such and to give it complete and adequate expression.[my emphasis]"³

Cassirer's denial of "completeness" and "adequacy", however, is not the same as denying that any individual form can grasp the whole of the phenomena *comprehensively*! Nor does it speak definitively on the issue of reduction! I will address both of these issues shortly.⁴

"It is the task of systematic philosophy, which extends far beyond the theory of knowledge, to free the idea of the world from this one-sidedness. It has to grasp the *whole system* of symbolic forms, the application of which produces for us the concept of an ordered reality, and by virtue of which subject and object, ego and world are separated and opposed to each other in definite form, and it must refer each individual in this totality to its fixed place. If we assume this problem solved, then the rights would be assured, and the limits fixed, of each of the particular forms of the concept and of knowledge as well of the general forms of the theoretical, ethical, aesthetic and religious understanding of the world. *Each particular form would be 'relativized' with regard to the others, but since this 'relativization' is throughout reciprocal*

¹ compare Van Fraassen's "co-ordinate-free descriptions". "Quantum Mechanics: an Empiricist's View"

² to include scientific experiment as an extension of ordinary experience

³ *ibid*, p.446

⁴ If a given form were, in fact, capable of reducing all other theories, and no other could, it would obviously cut against equipotency and "relativization" -i.e. against the whole sense of his thesis! This is the current rationale for dogmatic Naturalism as grounded, (problematically, I believe), in mathematical physics.)

and since no single form but only the systematic totality can serve as the expression of 'truth' and 'reality', [my emphasis], the limit that results appears as a thoroughly immanent limit, as one that is removed as soon as we again relate the individual to the system of the whole." ¹

Cassirer's is not a *capricious* relativism; it is a relativism as rigorous in concept as is Einstein's. Just as Einstein characterized his theory as having removed "the last remainder of physical objectivity from space and time", Cassirer's conclusion removes the last remainder of metaphysical, (i.e. absolute), *reference* from knowledge. It is based in the essential methodology of science: in its (Hertzian) theorizing *function!* It is the nature of science to construct a form, complete and interdependent between symbols, ("images"), and calculus which acts as a whole.²

Under all the forms, (of "nature", at least), Cassirer maintains that what must be maintained are the "invariants" -i.e. that which must be preserved under any consistent form. These are not "things" or "images", but rather, (mathematically), that which remains constant under all legitimate forms. In the sense which I will expand the notion, I argue that it corresponds to my prior (relativized) definition of "experience".

"But above all it is the general form of natural law which we have to recognize as the real invariant and thus as the real logical framework of nature in general.....No sort of *things* are truly invariant, but always only certain fundamental relations and functional dependencies retained in the symbolic language of our mathematics and physics, in certain equations." ³

I will postpone my critique of Cassirer's thesis for a little. Though I think there are problems and questions which need to be resolved, I would like to make the connection to my own thesis before going into those. In its essence, i.e. the essential relativism of knowledge, and his case against reference, I think the argument is very strong and very fundamental. There are very strong questions and delimitations that I will raise when I return to Cassirer's broader thesis later. They will not, however, question this, his core position.

¹ *ibid*, p.447

² cf. the "training seminar" of Chapter 1

³ Cassirer, 1923, pps. 374-379, my emphasis

The solution to the dilemma:

Nowhere does Cassirer question the profound *effectiveness* of modern science, however. His orientation is wholly and profoundly scientific. Rather, he preserves the various sciences as *perspectives*, as organizations of phenomena. He has, moreover, provided the tools necessary to resolve the epistemological dilemma created by the combination of my first and second theses.

I therefore propose a fundamental, (and final), "Copernican Revolution" -a profound change in perspective- contrary to that, (i.e. the Naturalist perspective), which I conditionally adopted¹ at the end of Chapter 2, (and *to* the stance I now ultimately proclaim), which "reduces" the materialist position itself to organization and *not* to reference. I argue against ordinary Naturalism, and *for* a more sophisticated realism, (essentially a Kantian -and Cassirerian- one),² consistent with the results of the first two theses. By this, (once again), I do not mean to say that the *relationality* of Naturalism, (or Naturalist science), is faulty, but that its metaphysical reference *as reference* is faulty. My thesis, though built with Naturalist "bricks", does *not* therefore entail the (further and unnecessary) Naturalist "foundation" of reference. Though it assumes the validity of the Naturalist organization, (at least on the human scale), it does not assume the metaphysical reality of Naturalism's primitives. In questioning our actual, (referential), cognition of metaphysical reality, it is not, therefore, innately self-contradictory! Though stated in Naturalist terms, my thesis can legitimately question the actual (metaphysical) existence, (or even the *possibility of knowledge*), of the referents of those terms.

Ordinary Naturalism, though it will not say so, is through and through grounded in a specifically metaphysical dogma, i.e. absolute reference, (however sophisticated), to absolute, (rather than relativized), "material" == "substance". This is the "material" in "materialism",³ and was the specific target of Kant's and Cassirer's profound arguments.

¹ but with perfect legitimacy, I now maintain -as a *relative* stance

² Kant's thesis is profoundly difficult to accept admittedly, both intellectually and intuitively - but so was Einstein's. Where Einstein relativized the physical world, Kant sought to relativize the epistemological one. His lapses can be assigned to his deprivation of the examples of modern mathematics and modern science -which subjects were always his primary focus -and which could have corrected him. That he was two hundred years before his time is surely not an argument against his credibility.

³ as usually conceived -i.e. not in a Cassirerian sense

As realists, contrariwise, (and I speak to no one else), we *must* posit the existence of an absolute, external reality. It is, I have argued, an axiom of realist reason. But, I further argue based on Kant, on Cassirer, on the advances of modern physics, on Maturana's penetrating analysis and on the results, (and natural concordance), of my first two theses, that human cognition does not know, and *can not know* that absolute reality. I argue we cannot know that *metaphysical* world in itself, even in "sophisticated" reference! I propose that we stand, *even at the human scale*,¹ in the same relation to ontology that current physics does, (at least as I understand, let's say, Bohr's or Heisenberg's position to be.) I propose that our human scale cognitive world is as much -and as solely- a pure algorithm as is the worldview of quantum physics. It is utilitarian and not referential. But it is an organic, "tactile" algorithm, (a "GUI"), that evolution constructed.² This sentence, however, is no longer paradoxical. It must itself now be understood in my larger context, as the very "evolution" in it is *itself* relativized, (i.e. it is a relative assertion *within* the (particular) Naturalist form).

The results of my first two theses are therefore consistent under this epistemological rationale. The resolution lies in the scientifically and mathematically, (but most certainly *not arbitrarily*), conceived relativization of knowledge itself. Relational implications, predictive systems, (to include scientific theories), are not, (with Quine), epistemologically determinate. Rather, their essence, (which is their predictivity), can be isolated, (following Cassirer), as relational invariants, (in a mathematical sense), over the field of consistent hypotheses in a sense parallel to that in which Einstein's equations of special relativity were isolated as invariants from the "ether" in which they were originally grounded by Lorentz. Or, rather, relational implications are invariant, but predictive organizations, (i.e. theories), even comprehensive ones, are not! They are the (better or worse), "SUPERB" or "MISGUIDED"³ "forms" which organize those implications.

¹ more properly "domain" than "scale", as I do not think this is a *size* issue. I will expand this momentarily.

² This is the implication of my footnote early in Chapter 1. Let me repeat it here: Ideally instrumentation and control would unify in the *same* "object". We would manipulate "the object" of the display itself and *it* would be the control device. Think about this in relation to our ordinary "objects of perception" -in relation to the sensory-motor coordination of the brain and the problem of naive realism! We do not *use* our biological algorithm, we *live* in it!

³ cf Penrose "The Emperor's New Mind" (his CAPS!). cf Appendix D

Whence Cassirer's Thesis:

There is, interestingly, a very real similarity of intent at least, (if not in scope or rationale), between Bas Van Fraassen's "co-ordinate free" and "semantic" approach to modern physics and Cassirer's "symbolic forms".

"To formulate a view on the aim of science, I gave a partial answer to the question of what a scientific theory is. ... It does not follow that a theory is something essentially linguistic. That we cannot convey information, or say what a theory entails, without using language does not imply that -after all, we cannot say what anything is without using language. We are here at another parting of the ways in philosophy of science. Again I shall advocate one particular view, the *semantic view* of theories. Despite its name, it is the view which de-emphasizes language."¹

"Words are like coordinates. If I present a theory in English, there is a transformation which produces an equivalent description in German. There are also transformations which produce distinct but equivalent English descriptions. This would be easiest to see if I were so conscientious as to present the theory in axiomatic form; for then it could be rewritten so that the body of theorems remains the same, but a different subset of those theorems is designated as the axioms, from which all the rest follow. Translation is thus analogous to coordinate transformation -is there *a coordinate-free*", [*invariant?*] "*format as well?*" [my emphasis] The answer is *yes* (though the banal point that I can describe it only in words obviously remains)."²

Though Van Fraassen ultimately rejects axiomatics, and confines himself to the domain of physical science, his position has a very definite resemblance to that of Cassirer, at least insofar as the latter is confined to "nature". Each is epistemologically relativistic,³ and each is grounded in invariants. Van Fraassen rejects

¹ Van Fraassen, 1991, pps.4-5

² *ibid*

³ "There are a number of reasons why I advocate an alternative to scientific realism ... One concerns the difference between acceptance and belief; reasons for acceptance include many which *ceteris paribus*, detract from the likelihood of truth. This point was made very graphically by William James; it is part of the legacy of pragmatism. The reason is that, in constructing and evaluating theories, we follow our desires for information as well as our desire for truth. We

axiomatics, (which I believe is the most cogent formulation of the problem), however, on the basis of a *need for meaning and interpretation*, i.e. reference. He goes on:

"To show this, we should look back a little for contrast. Around the turn of the century, foundations of mathematics progressed by increased formalization. Hilbert found many gaps in Euclid's axiomatization of geometry because he rewrote the proofs in a way that did not rely at all on the *meaning* of the terms (point, line, plane,...). This presented philosophers with the ideal: a pure theory is written in a language devoid of meaning (a pure *syntax*) *plus* something that imparts meaning and so connects it with our real concerns."¹

My thesis of the "schematic object", however is directed *precisely* to that point. It is precisely my point that "meaning" be taken in its *mathematical* sense for such a system. A mathematician understands the meaning of a term to be *precisely* that which is implied by the syntax, i.e. it is a virtual term "ordering" the system in which it is defined. If the mind and perception specifically, (the phenomena), is taken in this sense, ordering process- if it is taken as an organization, and its terms as metaphors of process then there is no longer the *metaphysical* question of meaning or of reference. The terms mean precisely what the syntax implies -i.e. they are virtual terms *only!* I maintain these *are* our real concerns! The real problem is the one that Cassirer defined: that of "experience" itself and how theoretical science relates to it,² -and *that* involves a total reevaluation of the problem of reference.

want theories with great powers of empirical prediction. For belief itself, however, all but the desire for truth must be 'ulterior motives'." (ibid p.3) Please note the connection to the essential Hertzian perspective. "Information" is concerned with predicting future events; "truth" is something else altogether.

¹ ibid

² Theory, (seen as a Hertzian, free construct -as developed in this chapter), must match, (in *some* sense), the "topology" of temporal and spatial consequence in experience. As stated thus far, this idea is, of course, Kantian. Russell however, (in his "Foundations of Geometry"), argued to extend the Kantian frame to projective geometry. I feel it must be broadened again past that - past even topology and into the mathematics of abstract transformations. What is required is that the predicted results of the theoretical system (*through some transformation!*) must match the results of naive (?) experience, -*and conversely!* I.e. that the results of naive experience -through *some* (mathematical) transformation - should match the retrodictive predictions of the theory. But

Cassirer's epistemology, of course, is firmly grounded in axiomatics. Discussing Hilbert, Cassirer says:

"The procedure of mathematics here", (implicit definition), "points to the analogous procedure of theoretical natural science, for which it contains the key and justification."¹

Contra Cassirer: (What are the real parameters?)

Though I accept, (and argue), Cassirer's core position of epistemological relativism, (I believe it is absolutely warranted on the very pure and very strong phenomenological grounds wherein he evolved it), I will now question its scope and its applicability. What *are* the legitimate forms?

Cassirer's thesis goes beyond "cognition" and science, ("nature") into a symmetry of cultural forms, (to include science as a special case), as well. Van Fraassen does not, nor did Kant, (who remained entirely within "nature"), but this is a question of scope. There is also a question of the identification of the legitimate (primitive) forms -even within "nature" itself.

Before addressing these questions, however, let me first complete my examination of the broadest formulation of Cassirer's thesis. Going beyond the "natural forms", (physics, biology, chemistry, etc), he extends his thesis into ground which I must at least question. He proposes that the forms of "nature", of "cognition", are only part of the innate symmetry of perspectives across the phenomena. They, (the natural forms), represent those forms which relate phenomena directly to a metaphysical, (cognitive), framework. Phenomena can however, (he asserts), be organized on *other* grounds: art, myth, religion, etc., *but they achieve this universal validity by methods entirely different from the logical concept and logical law.*

But again our perspectives widen, [i.e. beyond "nature" and into the purely cultural forms], if we consider that cognition, [itself], however universally and comprehensively we may define it, is only one of the many

this transformation, (since it is *past* topology), need not preserve objects, and therefore, *not reference!* What it *must* preserve is the web of relationality in its most abstract sense.

¹ *ibid* p.94

forms in which the mind can apprehend and interpret being. In giving form to multiplicity it is governed by a specific, hence sharply delimited principle. All cognition, much as it may vary in method and orientation, aims ultimately to subject the multiplicity of phenomena *to the unity of a 'fundamental proposition.'* The particular must not be left to stand alone, but must be made to take its place in a context, where it appears as part of a *logical structure*, whether of a teleological, logical, or causal character. Essentially cognition is always oriented toward this essential aim, the articulation of the particular into a universal law and order.¹

(I disagree with his distinction -so too do the "cultural forms" embody law. The difference, I believe, is in the *orientation* -i.e. to *cognition* -to "externality" as world-ground. Any form, even the "cultural forms", will have, (by definition), its own sense of law and logical structure. It is a question of the meaning of "logical structure".)

"But beside this intellectual synthesis, which operates and expresses itself within a system of scientific concepts, the life of the human spirit as a *whole knows other forms*. They too can be designated as modes of 'objectivization': i.e., as means of raising the particular to the level of the universally valid; *but they achieve this universal validity by methods entirely different from the logical concept and logical law. Every authentic function of the human spirit has this decisive characteristic in common with cognition: it does not merely copy but rather embodies an original, formative power.* It does not express passively the mere fact that something is present but contains an independent energy of the human spirit *through which the simple presence of the phenomenon assumes a definite 'meaning', a particular ideational content.*"²

But please note carefully that *all* of Cassirer's "functions of the human spirit" -even his "cultural forms" specifically articulate *phenomena* -i.e. they are not free, "idealistic" constructs! ("...an independent energy of the human spirit through which the simple presence of the phenomenon assumes a definite 'meaning', a particular ideational content.")

¹ Cassirer, 1953, p.77

² *ibid.* pps. 77-78, my emphasis

"This is as true of art as it is of cognition; it is as true of myth as of religion. All live in particular image-worlds, which do not merely reflect the empirically given, but which rather produce it in accordance with an independent principle. Each of these functions creates its own symbolic forms which, if not similar to the intellectual symbols, enjoy equal rank as products of the human spirit. *None of these forms can simply be reduced to, or derived from, the others*; each of them designates a particular approach, in which and through which it constitutes its own aspect of 'reality'. They are not different modes in which an independent reality manifests itself to the human spirit, but roads by which the spirit proceeds towards its objectivization, i.e. its self-revelation."¹

(That "none of these forms can simply be reduced to, or derived from, the others" seems to provide an essential argument to dogmatic Naturalism. Conversely, I will argue that it suggests and delimits a more correct extension of Cassirer's solution to the overall problem. I will address these very large problems shortly. His meaning must be examined very closely.)

"If we consider art and language, myth and cognition in this light, they present a common problem which opens up new access to a universal philosophy of the cultural sciences."²

"The 'revolution in method' which Kant brought to theoretical philosophy rests on the fundamental idea that the relation between cognition and its object, generally accepted until then, must be radically modified. Instead of starting from *the object*", [my emphasis]," as the known and given, we must begin with the law of cognition, which alone is truly accessible and certain in a primary sense; instead of defining the universal qualities of *being*, like ontological metaphysics, we must, by an analysis of reason, ascertain the fundamental form of *judgement* and define it in all its numerous ramifications; only if this is done, can objectivity become conceivable. According to Kant, only such an analysis can disclose the conditions on which all *knowledge* of being and the pure concept of being depend. But the object which transcendental analytics thus places before us is the correlate of the synthetic unity of the understanding, an object determined by purely logical attributes.² Hence it does not characterize all objectivity as such, but only that form of

¹ *ibid*, my emphasis

² *ibid*

objective necessity which can be apprehended by the basic concepts of science, particularly the concepts and principles of mathematical physics. ..."¹

Cassirer asserts an absolute "*spiritual*" relativism, (but *always* articulating the phenomena), -i.e. an absolute symmetry across the whole of the "cultural forms", (the "spirit"), of man.

"There result here not only the characteristic differences of meaning in the objects of science, the distinction of the 'mathematical' object from the 'physical' object, the 'physical' from the 'chemical', the 'chemical' from the 'biological', but there occur also, over against the whole of *theoretical* scientific knowledge, other forms and meanings of independent type and laws, such as the ethical, the aesthetic 'form'. It appears as the task of a truly universal criticism of knowledge not to level this manifold, this wealth and variety of forms of knowledge and understanding of the world and compress them into a purely abstract unity, but to leave them standing as such."²

Though starting from very stable ground, I think that Cassirer ended up in a somewhat ambiguous position. He, like Kant, used words with great precision,³ so he must be read very carefully -even technically. "Nature", and "the forms of nature", for Cassirer, are *technical words*.

He defines the "forms of nature" for us -e.g. physics, biology, chemistry. These are some of the "values" of his specific *function*, (his "purely functional unity"), of the human spirit, (here specifically the cognitive forms). A philosophical critique "must formulate the universal conditions of this function and define the principle underlying it."

We must place this passage in the context of Cassirer's *redefinition* of the formal concept however. We must see it in the context of "the mathematical concept of function" to understand it. The various forms are functional "values" -in a technical mathematical sense -of a definite, and, for Cassirer, *serial* ordering, (and principle). They are the alternative orderings of the phenomena, (defined by a serial function), -and constitute a series of series. The phenomena, however, remain always the orientation -the focus -of *all* the forms, (even the "cultural forms").

¹ ibid

² Cassirer, 1923, p.446

³ I think it is a necessary concomitant of the very abstract nature of their ideas

There is in this no assertion of comprehensiveness, (and even a seeming denial of it), for any given form however. He seems to argue against reduction,¹ (and therefore comprehensiveness), as well -but against "reduction" and "comprehensiveness" in *what senses?*

Compare: (1) "none of these forms can simply be reduced to, or derived from, the others",² (2) "no individual form can indeed claim to grasp absolute 'reality' as such and to give it complete and adequate expression."³, and (3) "each particular form would be 'relativized' with regard to the others, but since this 'relativization' is throughout reciprocal and since no single form but only the systematic totality can serve as the expression of 'truth' and 'reality', the limit that results appears as a thoroughly immanent limit, as one that is removed as soon as we again relate the individual to the system of the whole."⁴

What is the sense of Cassirer's "*cannot be simply reduced to or derived from*"? That no individual form can give "complete and adequate expression to reality" and that no form can be "simply reduced" does not necessarily imply that reduction, (i.e. translation), in a *non-simple* sense, or that *comprehensiveness*, (as a complete accounting for phenomena), is impossible. (3), moreover, seems to contradict (1) and (2).

Consider, moreover, his "*invariants of nature*": though "no sort of *things* [his emphasis] are truly invariant, but [it is the]..fundamental relations and functional dependencies retained ... in certain equations..[which are truly invariant]" He proposes these, (the functional invariants), as "the real logical framework of nature *in general*" [my emphasis]. But "nature" is a *pluralistic* word for Cassirer -the "natural forms" are *all the forms of science*!

We have, therefore, an assertion of invariance⁵ across *all* the forms of science -and cross-reduction across the invariants. Indeed, this is the only sense in which "invariance" makes any sense at all, (it is a "coordinate-free" perspective). "Invariance", therefore, means invariance across different, (*all the different*), perspectives of nature -and epistemologic relativity. For what *other* interpretation of the "relativization" of (3) is there except as alternative orientations of the same phenomena?

¹ "None of these forms can simply be reduced to, or derived from, the others"

² *ibid*, my emphasis

³ *ibid*, p.446

⁴ *ibid*, p.447

⁵ of functional dependency but not of "things"

Consider also his seeming denial of comprehensiveness. "The 'relativization' [of forms] is throughout reciprocal". "No single form but only the systematic totality can serve as the expression of 'truth' and 'reality'." What he is actually asserting, I argue, is that although multiple forms are legitimate, no single one of them can describe the structure *as abstracted from an orientation!* What Cassirer is portraying here is exactly a "*coordinate free*" perspective! It is not, therefore, a denial of *comprehensiveness*¹ that he is arguing, but a denial of the (metaphysical) adequacy of any *particular orientation*. It is only in their multiplicity that he believes that they express "'truth' and 'reality'". "The limit that results appears as a thoroughly immanent limit, as one that is removed as soon as we again relate the individual to the system of the whole."²

If these are "the real logical framework of nature", and they are invariant across *all* the forms of nature, then all the forms of nature are, by implication, *cross reductive and comprehensive!* That these forms cannot be "*simply...reduced to, or*

¹ Comprehensiveness is, of course, a highly pertinent issue because of the very definite, (and very powerful), claim by ordinary Naturalism for just such an (ultimate) comprehensiveness for mathematical physics . (I will address this issue presently). This is a very strong claim, and one I think we all actually do accept -at least in principle. However, if one particular form, (e.g. Naturalism), *is* actually capable of such comprehensiveness, (even in principle), *and no other is*, then this would constitute a very definite objection to his thesis.

Cassirer believed that the only salvation for the symmetry and relativism he envisaged lay in his extension across the cultural forms:

"As long as philosophical thought limits itself to analysis of *pure cognition*, [his emphasis], the naive-realistic view of the world cannot be wholly discredited, [I will disagree with this],. The object of cognition is no doubt determined and formed in some way by cognition and through its original law -but it must nevertheless, so it would seem, also be present and given as something independent outside of this relation to the fundamental categories of knowledge.** If, however, we take as our starting point not the general concept of the world, but rather the general concept of culture, the question assumes a different form. For the content of the concept of culture cannot be detached from the fundamental forms and directions of human activity: here 'being can be apprehended only in 'action'."

I believe the *actual* salvation of his thesis and the guide to its extension lies in the idea of *converse* -i.e. mutual reduction. If his basic conception is right, and I think it is, (on phenomenological grounds), then multiple *cross-reductions* and a true relativism will be possible. The possibility is founded in the conception of alternative axiom systems, (and orientations), in formal mathematics and in my extension of Cassirer's reformulation of the formal logical concept.

² *ibid*, p.447

derived from the others", does *not* mean, therefore, that they cannot be reduced or derived *at all!*

It is *cross-reduction* and relativistic invariance which tie the forms together and it is only in their totality that they express reality -and experience. The mathematical axiom system will serve to illustrate the case again. That any (adequate) axiom system for a given discipline will be comprehensive is, of course, clear by definition. But to confuse the discipline itself with one particular, (of many possible), adequate axiom systems, is incorrect. Peano's system is not the same as the positive integers. (A more specific and perhaps a more elegant tool for illustrating this conception lies the mathematical notion of "ideals" in abstract algebra. I have discussed this in detail in the Lakoff/Edelman appendix. cf: Afterward: Lakoff – Edelman)

Cassirer is asserting alternative functional orientations across the phenomena in his thesis of "Symbolic Forms". Each draws different functional, (and serial), perspectives, "diverse

manifestations of the same basic human function".¹ This is an explicit invocation of his "mathematical concept of function". I suggest, instead, an extension of it: that the objects of knowledge are constituted in different, (and alternative), "axiom systems"² which "crystallize" the phenomena, (under the "concept of implicit definition"). (This is certainly consistent with the Hertzian perspective, more so, I believe, than even Cassirer's interpretation.) I suggest that it is the phenomena *themselves* which are the actual invariants!³ It is a solution based, not in the mathematics of functions but, as Cassirer suggested often as the true focus of modern thought, -in that of the manifold itself. What results is a *true* epistemological relativity, (in a mathematical sense), and the possibility of multiple, each-truly-comprehensive and cross-reductive independent perspectives.⁴

I will leave the problem of the definition of the *actual* (valid) forms without reaching a definite conclusion. Cassirer's solution is seductive, to be sure -and may very well be correct, but it is outside of the needs for my thesis. What is unquestionable, I think, is his "coordinate-free" orientation to phenomena. Such a perspective on physics alone would stand sufficient to my requirements and my

¹ Also: "A philosophical critique must formulate the universal conditions of *this function* and define the principle underlying it."

² Alternatively, "generators of an Ideal" –cf Afterword

³ Are the phenomena themselves, then, invariant *equations*? No, they are what the equations embody.

⁴ See the discussion of mathematical "ideals" in the "Afterword: Lakoff, Edelman,..." for a further elaboration of these ideas.

interests here, and Cassirer's Hertzian stance, narrowed to Van Fraassen's smaller physical perspective, will adequately serve my case. I do, nonetheless, think that the case for the "forms of nature" has definite merit as well,¹ but, as Cassirer himself explicitly states, beyond that we leave the arena of "cognition" altogether. But cognition is precisely our area of *interest* here. Our context here is precisely that of cognition and metaphysics!

If my area of *interest* were to change -if I chose to look at "the phenomena" artistically, let's say, then this would *no longer* be my orientation, and his broader case might be argued. But then, conversely, I would *no longer* be able to express it in a cognitive context!²

Cassirer's is a profoundly beautiful and elegant conception, to be sure. I am not sure that I can accept the broadest symmetry that Cassirer asserts however, a symmetry, (and a still further Copernican Revolution), that extends beyond cognition and science itself into the cultural forms: language, religion, myth.³ But I believe the symmetry within cognition and science itself is wholly justified.

The Power of Naturalism

Naturalism, however, is a profoundly *comprehensive* theory! Not only mathematical physics, but its reductive incorporation of the *other* disciplines, from biology and chemistry through (proposedly) psychology, philosophy, ethics, religion,³ presents a purportedly complete (comprehensive) theory of *all* the phenomena. Quine demonstrates, however, that there are *always* other interpretations of the phenomena, *no matter the level of detail*. Can there be *other* comprehensive forms then? I think the answer is necessarily yes! Need they be

¹ Note 6-20-1999: In reflection, I have altered my conception of this. I have concluded that an extension to biology is a necessary component of my thesis. See the footnote to the Afterward: Lakoff - Edelman discussing "embodied logic" and biology as a pure "form". ([Hyperlink to Lakoff appendix, relevant section](#))***

² An interesting and important point comes up here, however. If his broader thesis is correct, and my extension of it as well -i.e. mutual cross-reductions and comprehensiveness - then the "invariants", (if there should be such), of *those other forms* will be (reductively) retained as invariants even in the sciences! Thus, if there be absolutes, (invariants), in art, in music, in religion, then they will be *retained* as invariants even in the sciences, (in psychology, for instance). I consider this a very significant scientific conclusion, and running contrary to current social relativism. There *may be* an ultimate scientific decision possible between, let's say, John Cage and Beethoven! -Or between Zoroaster and Jesus!

³ The primitives of some of these forms are distributed and derivative under the reduction, however.

physical forms? The possibility of alternative, *and comprehensive*, physical forms, certainly seems quite believable. Heisenberg vs. Schroedinger illustrates the plausibility. Whether Cassirer's *other* "natural forms": biology, chemistry, etc. are capable of such a legitimate extension to comprehensiveness¹ is another issue, however.

Cassirer wrote in another era,² but this does not, in itself, invalidate his conclusions or their possible extension to a broader relativism. On the subject of biology, for instance, he dealt with the issues of vitalism. In modern times, however, there is a very strong case made on much more rigorous grounds which supports the same, independent case for biology. It is that of Maturana and Varela.¹ To appreciate it, it is necessary, of course, to effect the same "Copernican Revolution" which Cassirer suggested. Maturana and Varela's case is made on very pure phenomenological grounds. The biology they propound is not grounded *upon* mathematical physics. Its primitives are not those of the latter, but rather, physics, (and human knowledge) is derived as a function of linguistic coupling, (third order structural coupling) -i.e. it is contained as a (non-centralized) theoretical derivative of biology's own primitives:

"It is by languaging that the act of knowing, in the behavioral coordination which is language, brings forth a world. ...We find ourselves in this co-ontogenic coupling, *not as a preexisting reference nor in reference to an origin*, [my emphasis], but as an ongoing transformation in the becoming of the linguistic world that we build with other human beings."³

Maturana and Varela's thesis does not find its epistemological roots in substance, but drives past its materialist beginnings to find its new epistemological center in "autopoietic unities" and "structural coupling". It ends up questioning the very physical ground from which it began. In many ways it represents the "Heisenberg" case of biology. It represents an alternative theoretical perspective on experience and on science. It *works* because of the purity of its phenomenology. Can other "natural forms" be asserted in this same sense?⁴ Could chemistry, for

¹ with equivalent distributions and derivativeness of primitives

² though not *that* long ago!

³ op.cit Pps.234-244, my emphasis

⁴ Maturana and Varela reveal such an alternative orientation in "structural coupling" and "autopoietic unities". That these other "symbolic forms" *must* encompass the whole of experience, (i.e. the whole of past and future experience -to include scientific experiment), I think is

instance, be stated with the phenomenological purity with which Maturana and Varela stated biology? That is the only real issue. This is Hertz' problem, after all, pure and simple. It is also the case I made for the training seminar in Chapter 1.

I will not profess an absolute conclusion on these questions other than in the case of physics, where I conclude, (on Quinean grounds), that there must be, indeed, multiple possible comprehensive forms. The case for biology seems *more than plausible* and leads to me to accept the broader case for the "natural forms", though I will not insist on it.

But my conclusion in its essence, and beyond Cassirer's, is a *fully* relativistic one. The truly fundamental forms are (necessarily) *comprehensive* forms -i.e. they are fully functional "axiom systems"¹ capable of exhausting the phenomena. (Alternatively, "the phenomena" is that which remains constant -i.e. invariant- under all such exhaustive perspectives.) They "slice" the phenomena, (*all* the phenomena), from different perspectives. To be fully relativistic, *each* form must be complete. Though Cassirer seemed to drive towards this complete relativism, he didn't ever complete it.²

But must not a comprehensive organization *be categorical*, i.e. must there not be *only one*? (If we could achieve the Laplacean ideal, would it not be unique?)³

incontrovertible. But they need not encompass it *in the same way* as does physics, for example. They need not encompass it as the primitive and hierarchical ground of their science, but may weave and distribute its relationality into a much less central, (i.e. removed from "axiomatic" status), much less concentrated position in its theoretical structure. They need not adopt the primitives of another orientation as their own primitives -those may become "theorems"!

¹ Cf Afterword: Lakoff and Edelman on mathematical "ideals"

² I believe because of the limitation in his formal concept

³ The Laplacean ideal is not realist by definition.

"In the introduction to his "Theorie analytique des probabilites" Laplace envisages an all-embracing spirit possessing complete knowledge of the state of the universe at a given moment, for whom the whole universe in every detail of its existence and development would thus be completely determined. Such a spirit, knowing all forces operative in nature and exact positions of all the particles that make up the universe, would only have to subject these data to mathematical analysis in order to arrive at a cosmic formula that would incorporate the movements both of the largest bodies and of the lightest atoms. Nothing would be uncertain for it; future and past would lie before its gaze with the same clarity. ...Du Bois-Reymond elevated scientific knowledge far above all accidental, merely empirical bounds...If it were possible for human understanding to raise itself to the ideal of the Laplacean spirit, the universe in every single detail past and future

Or, rather, might there not be alternative yet still comprehensive predictive organizations with *different* perspectives and *different* utilities? Under the Aristotelian logic, and assuming comprehensiveness, (i.e. assuming the possibility of a single and complete accounting of all phenomena), there is a linear reduction of all true theories to a single substratum of primitives.¹

Hierarchy, (set-theoretic, type ordered inclusion), is an essential component of the existing Naturalist perspective: i.e. that there is a necessary hierarchy of spatial scale. It argues that that hierarchy is mirrored in the process of the reduction of scientific theories: e.g. biology is a subset of chemistry, and chemistry of physics. (Thus psychology and all the phenomena of experience, of knowledge, and of the "spirit" as well, are embedded in that hierarchical ordering -as biological subsets.) It presumes that our *naive world*, (or at least most of it), is hierarchically mirrored in the primitives of any true theory, (i.e. that the objects of naive realism are objects of that true theory as well). It presumes that they can be represented as legitimate and necessary groupings of those primitives. Thus our ordinary objects and the ordinary things they do are, in fact, real and necessary *metaphysical* objects and happenings. This argument is crucial to the strength of Naturalism and its metaphysical claim!

But scale is not a priori inherent or the only way to preserve the phenomena, i.e. it *need not* necessarily "cut reality at the joints".¹ If *other* organizations, more effective, (i.e. other schematic organizations), are found, then they are legitimate as well. Our naive objects, *as objects*, are not necessarily *metaphysical* objects.

would be completely transparent. 'For such a spirit the hairs on our head would be numbered and no sparrow would fall to the ground without his knowledge. He would be a prophet facing forward and backward for whom the universe would be a single fact, one great truth.'" Cassirer, "Determinism and Indeterminism in Modern Physics", pps.3-4

Under a functional logic, (i.e. one not based in the generic concept), there is the possibility of alternative "axiom systems", (organizational perspectives), exposing alternative utilities, (e.g. biology, psychology, etc. -or alternative physical theories). The Laplacean ideal does not, therefore, presuppose a unique theory, (Newtonian, for instance), and reference.

If we were, in fact, to achieve a science, (theory), such that "the hairs on our head would be numbered and no sparrow would fall to the ground without his [our] knowledge", i.e., comprehensiveness, I maintain that it still not need be unique. The Laplacean ideal is not tied necessarily to Newtonian or any other particular theory, but constitutes the basis of determinism and could apply to raw empiricism as well. (ibid)

¹ See Afterword: Lakoff and Edelman for a further discussion of classical logic and science

Science, until very recently has supported such a spatial, (and theoretical), hierarchy -from the macro to the human scale to the micro to the atomic, (which, of course, theoretical reduction generally supports -i.e. biology -> chemistry -> physics), -or from cosmology right down through the human scale to the atomic.

At the smallest level of scale, of course, (and at the largest scale as well - EPR), the case for hierarchy has broken down in this century. As an example, let me cite Penrose's "most optimistic" view of quantum mechanics, (most optimistic for scientific realism, that is):

"I shall follow the more positive line which attributes *objective physical reality* to the quantum description: the *quantum state*. .

"I have been taking the view that the 'objectively real' state of an individual particle is indeed described by its wavefunction ψ . It seems that many people find this a difficult position to adhere to in a serious way. One reason for this appears to be that it involves our regarding individual particles being spread out spatially, rather than always being concentrated at single points. For a momentum state, this spread is at its most extreme, *since ψ is distributed equally all over the whole of space*, (my emphasis),...It would seem that we must indeed come to terms with this picture of a particle which can be spread out over large regions of space, and which is likely to remain spread out until the next position measurement is carried out...."

The particle -this *smallest part of our "object"*- is *not* included, (spatially, reductively), *within* the spatiality of the atom or within the molecule -or even within the *human scale* object of which it is the theoretical (and supposed material) foundation. Naturalism can no longer support, therefore, a consistent hierarchy of scale! At the human level, of course, it is a very useful tool, and that is just what I propose it is -constructed by evolution! Schematism, (and "Symbolic Forms" as well), suggests *other*, non-scaled and non-hierarchical organizations -i.e. they support *any* other efficacious organization. It is a simple matter of utility.

Naturalism's primitive substratum, (the primitives of mathematical physics), is deemed unique and "true of" == "refers (isomorphically) to" ontology. It is Naturalism's epistemological basis for a claim of reference.¹ But under a functional logic, (i.e. a logic not based in the generic concept), there is the possibility of *alternative* "axiom systems", (different functional logical concepts/theories, *-not* as class abstractions from phenomena or as hierarchical spatial perspectives into the phenomena, but as lines drawn *across* phenomena - as connective functional rules), and a different sort of "reduction", (i.e. translation), exposing alternative utilities, (e.g. biology, psychology, etc. -or alternative purely physical conceptions). So may we consider the new possibility that the relationality of experience, (and experiment), can be entirely preserved under varying (comprehensive) functional perspectives, no one of which stands as the canonical revelation of ontology/experience. The assertion of comprehensiveness for a given reducing theory would not then imply that it would necessarily, therefore, be *the sole and unique* organizational primitive -i.e. that would be the only one.

This is the sense of my extension of Cassirer's "symbolic forms". I argue, with Cassirer, for a relativism of forms which organize the phenomena, but against reference. I do not argue for his particular specification, (choices), of these forms, nor do I assert my own alternatives to these forms, but I do argue for his *general* conclusion.

It is in Cassirer's sense of the organizational, rather than the referential relevance of theories that I propose that the relations of ordinary Naturalism -and my own thesis as well- can be, (must be), retained in a deeper realism. "Experience", our true primitive, (and, I have argued, the other axiom of reason), is not the same as any particular organization of it. It is not identical with its (legitimate but particular) characterization as "sense impressions" under the Naturalist form, for instance. I have argued a (broadest -and truly relativistic) definition of "experience" as that which remains invariant under all consistent and comprehensive worldviews.²

What must be preserved is the web of implication of experience in our world, but *hierarchy as such* need not be maintained. A comprehensive theory, ("form"), e.g. Naturalism, stands as an "axiom system" to generate the field of experience. But if *other* theories, (forms), and other "axiom systems" are found, (and Quine definitely implies their existence), also comprehensive, then the

¹ cf. Appendix E

² But does "experience" itself absolutely, (i.e. metaphysically), refer to *something else*? My thesis proposes that it does not. I propose, rather, that it is an organization of atomic, (and indeterminate), process. It is, therefore, real and ontic, but irreducible and non-referential.

preference is no longer epistemological but utilitarian. Each, however, must fully preserve "experience" -to include the whole body of past (and future) scientific experiment.¹

I have proposed that our ordinary perceptual world -our innate and functional organic naive realism- is such an organization itself, constructed by evolution, (as stated in *relative* -but legitimate- Naturalist terms), for efficient viability. At the human scale, Naturalism is an extension of that existing organization -i.e. of that which evolution has given us. But there is clearly no paradox remaining in these statements in light of the prior discussion. My thesis is, therefore, self-consistent and the epistemological dilemma is resolved.

My thesis is, I believe however, *more* than consistent. Even from a purely Naturalistic perspective, I maintain that it is the only complete and consistent explanation yet offered of what it is we have set out to understand -i.e. the whole of cognition! The problem of the "Cartesian theatre", (sentiency), for instance, has heretofore either been trivialized and eliminated by ordinary Naturalism, (leading to a sort of linguistic or materialistic "idealism"), or it has been referred, for instance, to epiphenomenalism or emergence. But the latter are little more than an invocation of magic, (they do not *vivify* the ghosts they summon).

On its own grounds, I believe my *scientific* thesis stands well vis a vis its competition -it is biologically, psychologically, logically and teleologically cogent. It is, moreover, far more compatible with the epistemology of modern physics than is any other alternative -it speaks the same language. It "covers the territory", (of mind and mind-brain), for the first time and assumes no "magic", (*also* for the first time).

¹ This is the point on which I question, (but do not necessarily deny), Cassirer's suggestions of the *particular* comprehensive "symbolic forms" -i.e. in that I believe that they must each embody the whole as past and future scientific experiment. In defense of his choice, however, that relationality of experiment need not necessarily be maintained as "central" to the organization of a particular form. That is, it need not lie close to its "axiomatic" base, but need only be maintained somewhere and somehow within the form as a whole. Thus biology could stand as such a "form" in Maturana's conception, for instance, wherein the experimental results of science would be maintained within third order structural coupling, for example. But how would science be retained in a *mythical* form, for instance? Or *language*? And yet he has touched something very powerful in both of these. That I am, as yet, unable to see the specific relevance of these suggestions does not convince me that they are, therefore, wrong! In the specific case of religion, for instance, however, I believe that Cassirer has misconstrued the problem. Let me make a countersuggestion: that religion, identified not with its ordinary practice, but with its incarnations in the religious mystics - exhibits an alternative *biological* form corresponding to the rational form suggested by Quine, i.e., one in which "ordinary objects" are no longer the organizing rationale. (cf. William James "Varieties of Religious Experience").

But our "ordinary objects", (the objects of naive realism), *need not* be, (and in fact, *are not*), preserved as *metaphysical* primitives -i.e. as necessary unities. Quine acknowledged the possibility:

"One could even end up, though we ourselves shall not, by finding that the smoothest and most adequate overall account of the world does not after all accord existence to ordinary physical things.....*Such* eventual departures from Johnsonian usage¹ could partake of the spirit of science and even of the evolutionary spirit of ordinary language itself."²

This is exactly the case I have made. I argue that the "smoothest and most adequate overall account of the world" does not, indeed, accord existence to ordinary physical things. My departure from Johnsonian usage does "partake of the spirit of science and the evolutionary spirit of ordinary language itself".

This concludes the epistemological argument. In the next chapter, I will complete my solution of the mind-body problem with a statement of my third thesis which will supply the "what", the "matter of mind". All the hard work has already been done, however, so the chapter will be brief. The *problem* is not so hard; it was our presuppositions which made it seem so.

¹ Johnson demonstrated the reality of a stone by kicking it!

² W. V.O. Quine 1960, pps. 3-4