ROBERT M. ANDERSON, JR.

Paradoxes of Cosmological Self-Reference

Ken-O and his disciple Menzan (1683–1769, Soto)
were eating a melon together. Suddenly the master
asked, "Tell me, where does all this sweetness
come from?"
"Why," Menzan quickly swallowed and answered,
"it's a product of cause and effect."
"Bah! That's cold logic!"
"Well," Menzan said, "from where then?"
"From the very 'where' itself, that's where."
A Zen Anecdote[1]

When I first considered writing this paper, I thought that perhaps one way to do it would be to have one page contain the title and then devote a few blank pages to what I want to say. Instead I have decided to put some marks on the pages. I will relate some parables and poems of science, some tales of science fiction-fact, which will (like the koans of the Zen master) lead you into paradoxes. In this way I will show you the paradoxes rather than tell them to you. Sometimes I will try to tell you them. But then:

My propositions serve as elucidations in the following way: anyone who understands me eventually recognizes them as nonsensical, when he has used them — as steps — to climb up beyond them. (He must, so to speak, throw away the ladder after he has climbed up it.)

AUTHOR'S NOTE: The ideas for this paper came into my head while I was being supported by a grant from the Carnegie Corporation as a research assistant at the Minnesota Center for the Philosophy of Science. It has been written while receiving support as a biological sciences training fellow on a grant from the National Institute of Mental Health: MH8304-09. I have profited from discussions with Professor Grover Maxwell and many others, but they are not in the least responsible for the absurdities that follow.

[1] L. Stryk and T. Ikemoto, eds., *Zen: Poems, Prayers, Sermons, Anecdotes, Interviews* (Garden City, N.Y.: Doubleday, 1963), p. 107.

He must transcend these propositions, and then he will see the world right.[2]

I begin with an innocent looking criticism of the use of meaning by contemporary philosophers of science in their analyses of theories. Although meaning has been used by philosophers for many years as an analytical tool in their accounts of theories, I am concerned here more particularly with it as it has been used by the "new wave" of philosophers of science: Norwood Russell Hanson, Stephen Toulmin, Thomas Kuhn, and Paul K. Feyerabend. All of these philosophers have attacked the more traditional ideas on the meaning of terms in theories. According to more traditional philosophers of science (logical empiricists), there are two importantly different kinds of terms in a theory — observation terms and theoretical terms. Observation terms refer directly to experience (or to middle-sized physical objects). Their meaning does not vary according to the theory with which they are associated by way of correspondence rules. Theoretical terms are interpreted by reference to observation terms and derive their meaning, at least in part, from such terms. As Feigl puts it, "There is an 'upward seepage' of meaning from the observational terms to the theoretical concepts."[3]

The "new wave" of philosophers of science (or "radical meaning variance theorists"[4] as they have been called) reject in its entirety this account of scientific theories. In particular, for theories of general scope (i.e., theories that say something about everything) they deny the possibility of theory neutral observation terms. When you have such theories, they claim, even the observations cannot escape the theories' nomological nets. Observations cannot be described in language that is not theoretically contaminated. The observation terms of any theory are theory laden — they obtain part of their meaning from the theoretical context in which they are embedded.

Paul K. Feyerabend makes this point in the course of his more general attacks on logical empiricist philosophy of science.[5] He rejects the

[2] L. Wittgenstein, *Tractatus Logico-Philosophicus* (London: Routledge & Kegan Paul, 1961), 6.54.

[3] H. Feigl, "The 'Orthodox' View of Theories: Remarks in Defense as Well as Critique," in M. Radner and S. Winokur, eds., *Minnesota Studies in the Philosophy of Science*, vol. 4 (Minneapolis: University of Minnesota Press, 1970), p. 7.

[4] C. R. Kordig, *The Justification of Scientific Change* (Dordrecht: Reidel, 1971).

[5] In what follows I wish to concentrate on Feyerabend's philosophy of science. I hope to unravel a coherent strand from the seemingly inconsistent tangle of Feyer-

logical empiricist principle that the meanings of the terms of theories must be invariant with respect to scientific progress; "that is, all future theories will have to be formed in such a manner that their use in explanations does not affect what is said by theories, or factual reports to be explained"[6] (condition of meaning invariance). According to Feyerabend, science does not and should not follow this principle. Knowledge grows by changes taking place that are more akin to the metamorphosis of a caterpillar into a butterfly than to the development of a chick into a hen. When this sort of change takes place, the meanings of the terms of our theory of the world undergo a radical transformation. A common example of this is the Newtonian world view compared with the Einsteinian. Length, according to each of these theories, is something quite different. According to the Newtonian world view length is independent of the frame of reference of the observer. In the Einsteinian view, it is dependent. Since observation terms acquire part of their meaning from their theoretical context, it follows that they also differ radically in their meanings from theory to theory. According to Feyerabend, "Each theory will have its own experience."[7] It is important to note here that the controversy about whether a scientist's belief in a particular theory affects how he sees the world or brings about phenomenological differences in his experience is irrelevant to this point. The point is not that theories change experience (e.g., make the interferometer bands appear to dance, whereas before they just floated by), but that theories characterize experience, tell us how it fits in with everything else. "Experience is one of the processes occurring in the world. It is up to detailed research to tell us what its nature is, for surely we cannot be allowed to decide about the most fundamental thing without careful research."[8]

For Feyerabend, each theory has its own set of facts. It is this consequence of Feyerabend's account of scientific theories (and of those of the other "radical meaning variance theorists") that has prompted the question, "How is it possible to compare theories if they have no

abend's philosophy. For some of Feyerabend's inconsistencies, see D. Shapere, "Meaning and Scientific Change," in R. G. Colodny, ed., *Mind and Cosmos* (Pittsburgh: University of Pittsburgh Press, 1966).

[6] P. K. Feyerabend, "Problems of Empiricism," in R. G. Colodny, ed., *Beyond the Edge of Certainty* (Englewood Cliffs, N.J.: Prentice-Hall, 1965), p. 164.

[7] *Ibid.*, p. 214.

[8] *Ibid.*, p. 151.

domain of overlap?" A critical experiment that would simultaneously refute one of two competing theories and confirm the other is clearly impossible. For example, an experiment that would decide between Newtonian and Einsteinian theory is impossible (among other reasons) because the instruments and other entities involved in the crucial observations are, in the Newtonian theory, three-dimensional spatial solids which endure through time, whereas in the Einsteinian account, they are four-dimensional invariants in space-time.

Although I am in agreement generally with Feyerabend's approach to the philosophy of science, it seems that in his presentation of his account of theories, he has made an important error. This is his use of "meaning" as a metatheoretical term. He is not alone in making this mistake, however, since the other "radical meaning variance theorists" also make it. And it is further magnified by the critics[9] of the view fastening on the arguments which turn on how meaning is construed. This is no surprise, considering present-day fashion of assimilating philosophy to linguistic analysis and the philosophy of language.

The point I wish to make is that meaning is as much a process occurring in the world as is experience. Meaning has to do with the operation of living brains in their biological and extrabiological environments. A highly simplified kind of meaning is present in coding operations. For example, some general purpose computers must be programmed through a set of twelve binary switches which may be in either the up or the down position.[10] This makes it necessary to communicate with the computer with sequences of

DUUDDDUDUDDU
UUDDDUDDDUDD

To avoid having to memorize long lists of binary numbers, programmers developed a code. They divided the twelve switches into sets of three and labeled the up position with an integer in the order 4-2-1. When two or three switches are up, the sum is represented. Thus

0 means DDD
1 means DDU

[9] The critics I have specifically in mind are Shapere, Kordig, and P. Achinstein, "On the Meaning of Scientific Terms," *Journal of Philosophy*, 61 (1964), 497–509.

[10] K. H. Pribram, *Languages of the Brain* (Englewood Cliffs, N.J.: Prentice-Hall, 1971), p. 67.

2 means DUD
3 means DUU
etc.

and any twelve-number binary sequence can be represented by four numbers. This code can be instantiated as an electronic circuit. It is plausible that similar codes are "wired in" to our brains and are important for memory and meaning. I must add, however, that almost nothing is known about memory and even less is understood about meaning (this example is misleading since it ignores the core problem of meaning — context).[11]

Whether or not you accept a biological approach to the problem of meaning, if you grant that meaning is part of the world, then Feyerabend must draw the same conclusions about meaning that he draws about experience. That is, that every theory will have its own meaning. Just as experience is characterized independently by each theory, so is meaning. What meaning is, is dependent on the particular theory being entertained. Observation is not theory neutral and neither is meaning. Comparison of theories in terms of meaning must be rejected for the same reasons that comparison of theories in terms of experience is. Neither realm of existence is safe from the infinitely thorough purge of the universe that accompanies a new theory. Neither can bridge the gap of indefiniteness that separates two theories.

Feyerabend doesn't always make the mistake of using "meaning" as a metatheoretical term for stating his view of theories. He sometimes, instead, puts it in terms of the complete replacement of the ontology of one theory with that of another, a complete ontological housecleaning.[12] In fact, when Feyerabend is pressed about what he means by two theories being radically different, he explicates himself by saying that they are different if they postulate different *kinds* of entities.[13] In the same

[11] For an interesting paper on the problem of context, see J. D. Bransford and N. S. McCarrell, "Some Thoughts about Understanding What It Means to Comprehend," in W. B. Weimer and D. S. Palermo, eds., *Cognition and the Symbolic Processes*, in press.

[12] P. K. Feyerabend, "Explanation, Reduction, and Empiricism," in H. Feigl and G. Maxwell, eds., *Minnesota Studies in the Philosophy of Science*, vol. 3 (Minneapolis: University of Minnesota Press, 1962), p. 29.

[13] P. K. Feyerabend, "On the 'Meaning' of Scientific Terms," *Journal of Philosophy*, 62 (1965), 267.

paper where he admit this, he also says that meaning isn't very important.[14]

The "radical meaning variance theorists," and especially Feyerabend, have been taken to task by some philosophers because of the broad meaning they have given to the word "theory." Consider the following definition given by Feyerabend: "The term 'theory' will be used in a wide sense, including ordinary beliefs (e.g., the belief in the existence of material objects), myths (e.g., the myth of eternal recurrence), religious beliefs, etc. In short, any sufficiently general point of view concerning matters of fact will be termed a 'theory.' "[15] Rather than hassle endless debates about semantics, I will follow Kuhn and use a word different from "theory." A cosmology will be pretty much what for Feyerabend is a theory. (Feyerabend, at times, talks about cosmologies instead of theories.) Cosmologies are attempts to give an accounting of what there is in the world and of the relations (if any) that these things bear to one another. Examples of cosmologies are the Elizabethan world view (which ordered the things in the world — God, angels, people, animals, the elements — into a chain of being),[16] the scientific world view as expressed in general relativity theory, and even the washed-out world picture of the suburban "nowhere man."

The task of first importance for the philosopher is the construction of a cosmology. This is one of the lessons that is to be found in Feyerabend's (and Russell's) philosophy of science. Since Descartes, philosophy has often been done backward. Philosophers have asked the question, "How can I know anything?" and have tried to answer their question ex nihilo without reference to any theoretical frame. They tried to do this by developing a logic that would certify inferences from an incorrigible factual core of experience. The hopelessness of trying to develop such a logic has been shown by many philosophers.[17] (It appears, however, that some of the contributors to this volume have not yet given up this quest.) Feyerabend's philosophy of science shows that experience itself is open to theoretical interpretation. What experience is depends on the cosmology that one adopts.

The general lesson to be learned is that cosmology precedes episte-

[14] *Ibid.*, p. 273.
[15] Feyerabend, "Problems of Empiricism," p. 219.
[16] E. M. W. Tillyard, *The Elizabethan World Picture* (New York: Random House, 1944).
[17] See numerous articles by Popper and his students.

mology rather than the other way around. If one wishes to understand what we can know about the world and how we can know it, one must (as Russell did) first have a cosmology (for Russell it was the description of the world given by the physics of his day).[18] Given your account of the world, you can then ask and answer the questions that interest you. If you are interested in problems of perception and knowledge, the knower-known relation is worked out in terms of the cosmology. For example, your cosmology might be that of a Newtonian materialist. You believe that there are atoms and the void and that the atoms obey Newton's laws. You might, given this cosmology, try to make out the knower-known relationship in terms of the relation of the neural activity of brains (interpreted as movements of atoms) and clusters of atoms outside these brains. Intentionality and meaning might be made out in terms of brain states. Truth could be the existence of a structural similarity between the configuration of atoms in the brain and the clusters of atoms outside.

Problems of justification can arise with respect to local theories, but they must be solved within the cosmology. The question of justification does not arise with respect to the cosmology. The cosmology is not justified by reference to other contingent theories, nor does it stand in need of justification. All justification takes place within the cosmology.

Just as experience and meaning are part of the world, so is cosmology. Just as experience and meaning are defined by the cosmology, the cosmology must be also. The cosmology must say what itself is. "Every cosmology must have its own cosmology," to substitute new values for the variables in Feyerabend's proposition. It is clear that one cannot appeal to a metacosmology to define the cosmology. The cosmology, in giving an account of what is in the world, exhausts the field. Feyerabend seems often to not see this (if he agrees with it at all). He often calls for the proliferation of theories and for scientists to use their imaginations in the name of scientific progress. Ignoring the problem that Feyerabend has with maintaining his philosophy of science consistently and also defining scientific progress (how can two different comprehensive theories of the world be compared, and one be meaningfully labeled "better" than the other?), why does Feyerabend believe that a proliferation of theories will bring about scientific progress? One explanation might be as follows: The scientific community might be thought of as

[18] B. Russell, *Human Knowledge* (New York: Simon and Schuster, 1967).

an Ashby set of homeostats interacting with the environment.[19] Such a set of homeostats is highly adaptable not only because it is a stable system but also because random processes can take command and the entire system realign itself. Scientists should use their imaginations to keep the random element functioning so that the scientific community can realign itself. This reason for scientists using their imaginations could be put in terms of the Newtonian materialist cosmology augmented by a local theory of homeostats. But Feyerabend supplies no such underpinning for his exhortations. His maxim that one should proliferate theories has the status of a metacosmological precept independent of any particular world view.

It is because of the impossibility of a metacosmology that I said at the beginning of this paper that I could show you what I want to say but couldn't really tell it to you. To tell it to you I would have to make general statements about cosmologies, do metacosmology. But this I can't do. Nevertheless, I have written many propositions which you must transcend if you wish to attain truth.

It is also due to the impossibility of metacosmology that if an account is to be given of the cosmology, it must be done in terms of the cosmology. But is this possible? Is it possible for the cosmology to define itself?

The cosmology gives an account of the world.

Only what the cosmology says goes. (Contra Feyerabend.)

The cosmology says what meaning is.

The cosmology says what it is to communicate.

The cosmology says whether anything is contingent,
whether anything is necessary.

And what it is for anything to be
contingent or necessary.

The cosmology says how things can be known
and therefore what is known.

It therefore says how itself is known.

The cosmology says what it is for the
cosmology to say something.

The cosmology says what the cosmology is.

[19] W. R. Ashby, *Design for a Brain* (New York: John Wiley, 1960).

Is there a nest of paradoxes concealed in this aphoristic? Consider a second set of statements set more in the "material" mode.

What is, is.

What is known and what knows is part of what is.

What is, determines what is known and what knows.

When a person says what is, his saying of what is, is part of what is.

What is, determines what it is to say what is.

What is, says what is.

I am using these chants to emphasize the bizarreness of the idea of something defining its own nature.

Let's take a world view and see how these maxims work within it. For simplicity, let's take the Newtonian materialist cosmology. According to this view, there are atoms and the void and the atoms obey Newton's laws. I have already said how truth, meaning, and knowledge might be worked out within this cosmology, but what of the cosmology itself? The cosmology must be certain collections of atoms. It must consist of configurations of atoms in people's brains, of certain other configurations similar in structure on paper, and of others in the memory banks of computers. If this is the cosmology, how does it say what there is in the universe? It does so by bearing a structural resemblance to the rest of the universe.[20] It postulates structures similar to its own to exist in the universe. The cosmology is a part of the universe miming the universe. It mimes the universe by following and matching the movements of the universe. Its structure unfolds as similar to the structure of the universe. But if this is how the cosmology can say what exists in the universe, how does it say something about what itself is? How can it bear a structural resemblance to itself? (Perhaps the cosmology's macrostructure, e.g., marks on paper, can bear a structural resemblance to its microstructure, atomic composition.) How can it mime itself? It simply is itself so how can it bear a resemblance to itself or mime itself? How then can it define its own nature?

We are confronted by a dilemma. Either we try to understand the world (i.e., do philosophy) without reference to a presuppositional frame or cosmology (i.e., try to develop an epistemology without refer-

[20] G. Maxwell, "Theories, Perception, and Structural Realism," in R. G. Colodny, ed., *The Nature and Function of Scientific Theories* (Pittsburgh: University of Pittsburgh Press, 1970), p. 17.

ence to an ontology) or we adopt a cosmology and confront the paradox that the cosmology must define itself. Philosophy is either barren or paradoxical.

In one koan, the Zen master brandishes a stick over the pupil's head, and says fiercely, "If you say this stick is not real, I will strike you with it. If you say this stick is real, I will strike you with it. If you don't say anything, I will strike you with it."[21]

Can the cosmos or world as a whole say what itself is? To say something about itself it must be able to refer to itself. But how can it refer to itself if there is nothing outside itself? The famous sentence in Gödel's proof that says of itself that it can't be proved can do this because its self-reference is mediated by things (people and institutions) outside of itself. But the cosmos can't transcend itself. Neither can it compare itself relative to some other form of being and define itself relative to this other form. Within the cosmos, however, things may be able to define themselves with respect to each other. The cosmos may, on the other hand, be the most perfect theory of itself. Since it is self-identical, it bears a perfect resemblance to itself. The cosmos represents itself by being itself.

Can I say what I am? I am a collection of atoms with such and such properties. But what has been accomplished with such a phrase? Some atoms have arranged themselves in a particular pattern within me. And what has been accomplished in this answer? Some atoms have arranged themselves in a pattern within me. My atoms say that they are atoms. (I am still using the Newtonian materialist cosmology.)[22]

[21] R. E. Ornstein, *The Psychology of Consciousness* (San Francisco: W. H. Freeman, 1972), p. 156.

[22] Bertrand Russell's philosophy, especially as currently modified and augmented by Grover Maxwell, may escape this paradox. Experience is not interpreted for Russell and Maxwell but is direct. Nothing is hidden. A "person" is certain events in the universe, and in being these events he directly experiences them. He can know what these events are, know their natures. This is similar to the world's being the best theory of itself by being the same as itself. (A quotation from Schopenhauer feels appropriate here: ". . . a consciousness when directed inwardly becomes self-consciousness. Then that inner being presents itself to this self-consciousness as that which is so familiar and so mysterious, and is denoted by the word *will*." ". . . by this word nothing is further from our intention than to denote an unknown *x*; but, on the contrary, we denote that which at least on one side is infinitely better known and more intimate than anything else." R. Taylor, ed., *The Will to Live: Selected Writings of Arthur Schopenhauer* (Garden City, N.Y.: Doubleday, 1962), p. 33. Except for the implicit reference to an act-object distinction, I think this is how Maxwell and Russell feel.

When your practice is not good, you are poor Buddha. When your practice is good, you are good Buddha. And *poor* and *good* are Buddhas themselves. *Poor* is Buddha and *good* is Buddha and *you* are Buddha also. Whatever you think, say, every word becomes Buddha. I am Buddha. *I* is Buddha, and *am* is Buddha, and *Buddha* is Buddha. Buddha. Buddha. Buddha. Buddha.[23]

Perhaps when Western analysis, the scientific method, is pushed to extremes it leads to Eastern mysticism. I have taken the philosophy of science (Feyerabend's) that seems to me the strongest of all present-day contenders. And I have tried to develop it consistently with its precept that everything is to be interpreted within a presupposed cosmology. This led to cosmological self-references which seemed to be paradoxical and to our consequent puzzlement. But perhaps it also leads to enlightenment?[24]

[23] From a lecture by Shrinya Suzaki Roshi at Zen Mountain Center in 1968. C. Naranjo and R. E. Ornstein, *On the Psychology of Meditation* (New York: Viking Press, 1971), p. 84.

[24] If you have had a great deal of trouble with this essay, and especially with the last part, I suggest you indulge yourself in some wine or other intoxicant. It may be more fun the second time through. Once I was telling these ideas to some friends over wine. One of them suddenly said, "Yes, I see what the paradox is. It's . . ." She stopped in midsentence with her mouth hanging open.