

HEIDEGGER ON THE LIMITS OF SCIENCE

I

In his essay "The Thing" Heidegger discusses the physicist's description of a wine-jug and concludes

These statements of physics are correct. By means of them science represents something real, towards which it directs itself objectively. But--is this reality the jug? No. Science always encounters what its kind of representing has admitted beforehand as an object possible for it. (VA II 42/PLT 170)

I want to ask how science is a limited disclosure of what is.<sup>1</sup>

Science talks about objects we don't seem to encounter as such in our daily life, such as electrons and space-time manifolds.<sup>2</sup>

<sup>1</sup>References to Heidegger's works will be supplied in the text according to straightforward abbreviations. Page numbers after a "/" indicate the pages in the English translation. Quotations are from the published English translations, with occasional revisions. A list of works cited can be found at the end of the essay. The "scientific realism" I discuss owes much to Wilfrid Sellars and Hilary Putnam. It is because much of what they say seems right and so does much of what Heidegger says that this paper exists as a first attempt to bring them into contact. I have profited from reactions to earlier drafts from William Richardson, Tom Sheehan, and especially Mark Okrent.

<sup>2</sup>I take "science" in this essay to mean physical science, especially physics, since that has been the center of the analytic debates. It is not self-evident that the issues remain the same if biological or social sciences are taken as the paradigm cases of sciences. Nor is it clear that a Heideggerean point of view does not question deeply the "unity of science" reductionism which the realist case tends to lead to. These issues are important but follow upon the ones discussed in the essay. It is also worth noting that Heidegger sometimes uses "Wissenschaft" in a sense wider than the English "science" to include activities such as theology and scholarship.

These strange objects do not have the properties of the objects we ordinarily encounter, and when the world is described in terms of scientific objects it seems to lack some of the reality of the world we live in. Scientific objects also compete with ordinary ones. Is John one object or a host of small particles? What qualities belong to the wine-jug itself and what to our interaction with it, and how is that interaction to be described? These familiar problems, and others equally familiar concerning freedom, have been discussed since the modern age began.<sup>3</sup>

Contemporary analytic philosophers ask such questions in usefully precise ways. We have both scientific and ordinary assertions which we take to be true; what objects possessing what qualities must scientific assertions refer to in order to account for the truth of science? How do these objects relate to those of ordinary assertions?

In analytic philosophy, the word "ontology" has come to mean a list of the types of objects which are referred to in a given area of discourse or in language generally. Usually such lists are accompanied by a commentary on the basic logic of the terms designating each type of object. By studying examples and attempting paraphrases which refer to fewer types of objects the analytic 'ontologist' attempts to answer questions such as:

<sup>3</sup> Heidegger summarizes such problems in FD A 4, including a mention of Eddington's famous two tables. I refer to scientific objects; in the course of the essay I will employ the distinction between things and objects made in "The Thing." Both these words will carry a restricted meaning; neither will mean "things in general" or be synonymous with "being."



are there universals or only particulars? do we have to refer to events or only to particular things? do minds exist or only bodies? can the same property be denoted by different and seemingly inconsistent descriptions? Throughout the remainder of this essay I will use the word 'ontology' in single quotes with this analytic meaning. To advocate an 'ontology' would be to propose a list of the basic types of objects and their basic properties. When used without quotes the word will have Heidegger's meaning.

We can now ask what 'ontology' is adequate to the way we talk. One extreme answer claims that only the objects of our ordinary experiences are real. Scientific objects are useful instrumental fictions which we describe mathematically in order to derive laws for predicting and controlling real objects. One of the premises for this paper is that Heidegger is not such an instrumentalist.<sup>4</sup>

At the other extreme stands reductive scientific realism which claims that only scientific objects exist. "Science is the

<sup>4</sup>The logic of instrumentalism usually carries one to full positivism, the doctrine that even ordinary entities are fictions to help us deal with a flow of sense-data. Support for the view that Heidegger is an instrumentalist can be derived from parallels with Husserl, who seems to many to hold instrumentalism. In fact Husserl's position is more complicated and the parallels with Heidegger not close enough. For an example of a polemical treatment of both philosophers as instrumentalists, cf. G. Gutting, "Phenomenology and Scientific Realism," New Scholasticism 48 (1974) 253-266. This article is a review of Kockelmans and Kisiel, Phenomenology and the Natural Sciences, in which scattered passages do give such an impression through the work as a whole does not.

measure of all things, of what is that it is, and of what is not that it is not" (SPR 173). Ordinary objects are the result of a kind of proto-science now being outmoded. Strictly the universe does not contain people or chairs; sentences referring to them will ultimately be translatable into sentences mentioning only the fundamental objects of physics, and this will be a better description. The behavior of ordinary objects will be explained by construing them as complexes of scientific objects. Though we might never carry out this change in practice because of its inconvenience, we would know that it is possible, and our technological manipulations would express this awareness.

This is the view I want to bring into contrast with Heidegger's ideas. In the quote from "The Thing" cited above Heidegger seems to be a realist (in the sense "realist" has in this controversy). His general terminology of revelation and disclosure supports this interpretation. But he would never admit that one language could disclose beings totally. How is it possible to be a limited scientific realist?<sup>5</sup>

<sup>5</sup>The "realism" involved here should not be confused with the "realism" criticized in section 43 of SZ, though the two are related. All the positions on the status of science accept "the existence of the external world"; they start from the truth of our language and go on to ask what objects must exist to account for that truth. The question is not whether external objects exist but which ones. Of course an individual scientific realist could still be a realist in the sense that he demands a proof of the reality of the external world, but he need not be; he could view the question as nonsensical. On the other hand scientific realists of an unlimited sort definitely espouse another aspect of the realism criticized by Heidegger; they attempt to explain everything by the interaction of objects present-at-hand.

A middle position would hold that the correct 'ontology' includes both scientific and ordinary objects. Since these objects seem to compete, some account must be given of their relation. One way of doing this would be to situate both within some overarching scheme of more basic objects, as does Whitehead.

Heidegger accepts none of these positions. He is closest to the last, but would reject it along with the others because they are all tied to truth as accuracy of representation and beings as objects with properties. He wants to situate these presuppositions within a larger context which undermines the ultimacy of any 'ontology.' It is this road to a limited scientific realism which we must now examine.<sup>6</sup>

<sup>6</sup>There are other roads which lie close to Heidegger's own:  
(a) A version of pragmatism makes no attempt to rank descriptions by faithfulness to "reality." Descriptions are useful for life. Questions about the primacy of one set of objects over another are either answered according to the current criteria with no attempt at absolute justification, or are diagnosed away. A subtle position of this kind has been developed by Richard Rorty (cf. "The World Well Lost," Journal of Philosophy (1972) and "Overcoming the Tradition: Heidegger and Dewey" (unpublished manuscript available from Professor Rorty)). He attributes similar views to Wittgenstein, Dewey, and Quine, and finds Heidegger to be a pragmatist manqué, one who has taken the hard step of dispensing with the notion of truth as correctness of representations and who needs only to renounce a lingering Platonism of Being to be welcomed into historicist pragmatism. Rorty is fully aware that for Heidegger this would be to step into nihilism, but sees this as the correct outcome of Heidegger's views on representation. Heidegger seems to me a realist of sorts who would object that Rorty's pragmatism solves the problems by a denial which remains the absence of what it negates and comes to no new understanding of language and truth. This way of overcoming the problems of science blocks the way to overcoming the problems of technicity. Rorty would probably accept these points but dispute whether they constitute criticisms. (b) Hans Seigfried has argued that SZ should be seen as a treatise on the foundations of the new philosophy of science of Kuhn and others. (Cf. Hans Seigfried, "Heidegger's Longest Day," delivered before the APA Eastern meeting, 1975, and "Descriptive Phenomenology and Constructivism," Philosophy and Phenomenological Research, forthcoming.) Seigfried rightly points out that Heidegger's project of fundamental ontology was aimed at grounding the regional ontologies of the special sciences, and that the explanations of key concepts in SZ clarify (Footnote continued on p. 6)

## II

Heidegger discusses many levels of difference. How deeply are the opposing sides in the controversy over scientific realism divided? The most profound differences Heidegger considers are those between the history of Being up until now and a future for whose advent we can only prepare ourselves. Since the controversy over scientific realism concerns rival 'ontologies' it clearly remains within the history of metaphysics. Does it represent a transition between two epochs in that history comparable to the medieval and modern eras? The modern age began when beings were no longer comprehended as stemming from a creative intention and will. They became simply present, resources for the will to transform. Scientific realism clearly belongs to this modern epoch. But so also do its rivals in the controversy. Instrumentalism declares that only ordinary objects exist while science offers convenient fictions; the ordinary objects are simply present and the fictions aid manipulation and control. The entire controversy goes on within the Cartesian-empiricist tradition; it represents a quarrel about what beings exist but not a disagreement over the comprehension of their Being. All candidates for the role of adequate 'ontology' stand as objects to the subject proposing representations in search of certainty.

<sup>6</sup> related notions used by the new philosophy of science. (It is not sure they would accept the cost of these clarifications!) But Seigfried is forced to detach SZ from the rest of Heidegger's work where the Being-question has been freed from lingering Neo-Kantian overtones and from the Husserlian project of radical grounding. The later essays seek not to ground science but to locate it.

Conceived this way the controversy becomes less urgent. All the contestants embody the modern comprehension of Being which is for Heidegger the root of our problems with science. They may express different developmental stages--reductive scientific realism could even be its culminating moment--but all this fails to grasp the real issue.<sup>7</sup>

Heidegger does argue in many places against taking the objects of science for the full disclosure of what is. Yet in doing so he is not arguing for a rival scheme of objects. He has no interest in defending some 'ontology' of ordinary objects with irreducible substantial form, emergent properties, non-physical entities, and the like. Nor is he concerned to deny these. He will defend the uniqueness of various modes of Being, but these are not sets of objects (cf. section III, below). His aim is to show that beyond any objectivization, that of G. E. Moore as much as that of Sellars, there is the primal experience of the thing as gathering a world and the advent of unconcealedness. The texts which seem to defend ordinary objects actually stress the differences between things and objects, or between the ready-to-hand and the present-at-hand. The wine-jug discussed in "The Thing" stands as remote

<sup>7</sup>Heidegger is suggesting that the current controversies over conceptual change in science and other fields stay on too parochial a level. While different comprehensions of Being will be expressed, among other ways, in different conceptual schemes, not every difference of conceptual scheme will be so radical, and the current controversies envision only the less radical differences.

from the 'ontology' of ordinary language as it does from the objects of science.<sup>8</sup>

We do encounter both things and objects. But this is neither encountering two sets of objects nor encountering the same objects in two ways, as by naked eye and by microscope. We must avoid construing what is as a set of objects. Sets of objects are one way what is can be disclosed. (The problems involved in thinking this will be the main theme of sections III-IV.)

Thus things cannot be assigned to classes within an 'ontology.' Or rather when we do assign them as referents to words (conceived themselves as objects linked to their referent objects by some function or relation of reference) we level the world and create an 'ontology' for the first time.<sup>9</sup>

<sup>8</sup>The distinction of things from objects does not divide the beings we experience into two sets, as does the distinction of living from non-living. When I encounter the wine-jug as a thing the other beings in that world do not appear as objects. (In the earlier terminology: the world as the network of the ready-to-hand is not a subset of the universe of the present-at-hand.) Similarly, exploring the horizon of an object gives only more objects. When Heidegger writes "things are also compliant and modest in number compared with the countless objects everywhere of equal value" (VA II 55/PLT 182), he does not mean we experience the world as a domain of objects containing a small subset of things. He is discussing the varying structures of the world gathered by things and of the universe of objects.

<sup>9</sup>If we refuse to make things a subset of objects then we will have to give up the notion that language is only a mechanism of reference and information-transfer. Cf. Heidegger's remark in US that a dictionary does not contain any words (US 192/87) and his distinction between designation and showing (US 245/115).



Heidegger is not defending "common sense." His problem with scientific realism consists in defending the distinctiveness of the thinging of the wine-jug against the challenge that such talk merely describes an experience which subjects have of objects, an experience which is merely subjective and ultimately derived from the interactions of scientific objects.<sup>10</sup>

The remainder of this section will consider how Heidegger limits science in his own way. The next sections will look at certain aspects and problems in more detail.

In his view the limits of science are bound up with the larger problem of technicity, under whose call science is both done and interpreted. The power of technicity includes not only its important feats of control and transformation but also its power to form our encounter with ourselves. We can be led to project our possibilities wholly within the realm of calculative thinking and the will to will. This obscures our relation to Being and our possibilities for a wider 'dwelling building thinking.' Unlimited scientific realism could become a weapon for enforcing such constraints by announcing the description of beings as objects and the absorption of all modes of contact with what is

<sup>10</sup>In this sense Heidegger's problem is to make room for his version of the transcendental. Though he later dropped this word, his thinking remains within the transcendental tradition in the sense that he claims some kind of condition of possibility of the objective use of language, conditions that cannot be described in objective terms. One reason Heidegger needs to limit science is to forbid it the power to redescribe his conditions in the psychologized way mentioned above.

into the correctness of scientific representations.<sup>11</sup>

In his 1966 Spiegel interview Heidegger responded

Spiegel: And in just this place where the technical world arose it must also, you think...

Heidegger: ...be aufgehoben in the Hegelian sense. Not laid aside, but aufgehoben, though not through men alone.

What is aufgehoben is preserved, but its claims to independence and absoluteness are rejected. It no longer exclusively dominates our context of thought or action; it becomes an element in a wider context. Thus even its internal structure may now be seen more clearly. Heidegger most obviously intends this Hegelian transformation to be applied to technological practice itself.

We can use technical devices, and yet with proper use keep ourselves free of them, so that we may let go of them any time. We can use technical devices as they ought to be used, and also let them alone as something which does not affect our inner and real core. We can affirm the unavoidable use of technical devices, and also deny them the right to dominate us, and so to warp, confuse, and lay waste our nature.... We let technical devices enter our daily life, and at the same time leave them outside, that is, let them alone, as things which are nothing absolute but remain dependent upon something higher. (G /54). (cf. also ID 104/40)

Such a new context for technology can only be prepared for by meditative thinking. The "higher" must be let come. But even this anticipative waiting already frees our "inner core" from projecting its possibilities solely within technicity.

We free ourselves from the constraints of technicity by ex-

<sup>11</sup>A fully positivist instrumentalism would be an even more ideal tool for technicity.

periencing fully the origin and meaning of those constraints, the call of Being. Thus the wider context opens up in the experience of technicity itself. Could something parallel happen with science? Would scientific realism then be aufgehoben--preserved with its absoluteness denied--or is scientific realism just the absoluteness of science which must be left behind? If we can experience scientific realism in the wider context of its relation to Being it will be preserved.

How is scientific realism to be limited by its residence in this wider context? This question concerns not just the historical state of science, its mistakes and revolutions, but above all its ideal of the one total description and explanation. Heidegger's general strategy seems clear. Science's disclosure of what is remains limited not because of some peculiar feature of its objects or methods but because of its origin. Any disclosure of beings will be limited because it stems from the finite coming-to-pass of truth. This is not proven by analyzing science but by Heidegger's continuing meditations on truth and Being.

We can trace this limitation through a series of deepening levels. The disclosure of any particular being always takes place within a horizon of undisclosed beings. This limitation can be compensated for by efforts to disclose the others. But while no being is in principle unavailable, the necessity of having a horizon means that it is impossible to disclose all beings at once. More important than this piecemeal limitation,

the totality of beings as such remains undisclosed. Because this totality cannot be surveyed it is less obvious that beings-in-totally have already been encompassed in a pre-comprehension of their Being. This in turn conceals the finitude of such a pre-comprehension. "Science always encounters only what its kind of representation has admitted beforehand as an object possible for science " (VA II 42/PLT 170). While this quote can be applied to the sciences severally, it directs our attention to the unified pre-comprehension of Being underlying all the sciences: Being as constant presence such that it can be grasped in its Being by mathematics. This remains hidden and unquestioned. Yet it is limited. As scientific-mathematical it contrasts with other non-mathematical modes of objectification. (Heidegger does not speak at length about this contrast but it is implicit in his SZ discussion of science as one of several varieties of presence-at-hand). As an objectifying pre-comprehension it contrasts with the more primal encounter with things, or the world of the ready-to-hand. As a pre-comprehension of the Being of beings it contrasts with other possible past and future epochs in the history of Being. Despite these limits the ideal of a total description is born from this relation to Being because of the leveling nature of scientific objectification and, more originally, because of the withdrawing of Being implicit in the coming-to-pass of truth.

These limitations keep us from absolutizing any disclosure of what is, including science. They are applications of Heidegger's central affirmations and situate science within the finitude of

our relation to Being. We can glimpse what it would mean to live an approach to science in this spirit. We would be attentive to the larger context of Being and its relation to us (cf. SG 208). Just as we would continue to use technological devices without letting them restrict our inmost possibilities to those of calculative thought and manipulation, so we would use science to reveal what is without letting it shape entirely our world. This would not be because we had placed science within some other (metaphysical) total picture of what is. We would give up the ideal of the total description. We would have learned that all disclosures are limited without being a part of some hidden total revelation. They are not even like different spatial perspectives on the same mountain, but more like different experiences from the walk around the mountain on different days which cannot be combined into one master list of qualities 'it' possesses.

### III

We can approach issues which must be thought more fully by comparing Heidegger's way to another method of limiting science. This is to set up an 'ontology' in which certain logical subjects or properties are put out of its reach.<sup>12</sup>

<sup>12</sup>In what follows we will need a term to designate any bearer of properties and relations. Since I have already employed "thing" and "object" in other technical uses, I have chosen "logical subject": "subject" in the old sense of subiectum, that which underlies, and "logical" to distinguish it from the "subject-object relation" and to emphasize the connection with predication. We cannot use "being" or "entity" since the issue at stake is whether beings should be thought as logical subjects.



Since Descartes many philosophers have tried to show there are some logical subjects which have essential properties that scientific objects can neither possess nor explain through their interactions.<sup>13</sup>

For convenience we can choose an example Heidegger discusses. In section 21 of SZ he disputes the reduction of hardness (Härte) to the relative motion of two bodies. Heidegger claims that the Being of sensations and that of the beings they reveal are simply diverse from that of the present-at-hand motion of bodies. If we were to continue in the fashion of traditional and analytic philosophy of mind we might proceed as follows: granted the two descriptions cannot be made identical or synonymous, must they designate different properties? Granted that they must, in what subjects do these properties reside? In the external thing? Granted that it is proved impossible for both properties to belong to the same logical subject and granted some degree of scientific realism, where is the hardness? Suppose it is proven to be a property of the perceiver's sensations or a mental object of these sensations. Further arguments might try to show that these must be properties of immaterial subjects.

If successful such an argument would limit science by showing that at least one group of logical subjects was immune to being

<sup>13</sup>Such discussions rest on a jungle of epistemological and metaphysical issues concerning essentialism. While Husserl grapples with these issues, Heidegger does not engage his thought in solving them. Indeed the doctrine of the hermeneutic circle should make us wary of attributing essentialism to Heidegger (cf. SZ 139) at least in any form which concerns classes of logical subjects.

redescribed in scientific terms. Heidegger does not make this argument, although passages from his works could be used to bolster it. He does not make it because the entire argument remains within the sphere of the representation of logical subjects. Furthermore, mind-body dualism resembles its fraternal enemy materialism in reducing everything to beings present-at-hand. Even if successful this argument would not limit science in a way which touches Heidegger's interests.

Nevertheless he does say things which look very much like the claim that certain types of objects are immune from scientific description. Speaking of Realität, the kind of presence-at-hand which belongs to mere things of Nature, he remarks

All the modes of Being of beings within the world are founded ontologically upon the worldhood of the world, and so upon the phenomenon of Being-in-the-world. From this there arises the insight that within the world Realität has no priority, and that Realität is a kind of Being which cannot even characterize anything like the world or Dasein in a way which is ontologically appropriate. (SZ 211) Beings with Dasein's kind of Being cannot be conceived in terms of Realität and substantiality. (SZ 212)

Similar remarks can be found in SZ (section 43) concerning living things, Nature as a whole, and other modes of worldly Being.

What is crucial is to recognize that what Heidegger is doing here differs from building an 'ontology.' The various modes he speaks of do not segregate objects into neatly separate classes. "The world" is not one being over against other beings, nor is Nature. Living things can be both ready-to-hand and present-at-hand. The modes of Being are not divisions of a realm of logical subjects.

Heidegger argues that all the modes of worldly Being have a common derivative status, hence none is primary. But he has distinguished the motion of atoms from the experienced hardness. Where does he put the hardness? If he is not proposing a new 'ontological' scheme, where is the hardness? In the Open.

A being is disclosed in the Open. Its mode of Being is not a property inhering in it. Heidegger's long struggle to purify his language of metaphysics has to be refought here.<sup>14</sup> This space stands prior to 'ontological' schemas. Yet it is finite and historical; beings are disclosed because we correspond with Being by projecting a pre-comprehension of their Being-structure which allows them to be revealed. This pre-comprehension is not a conceptual scheme; it is a structure of relatedness and a mode of temporal presence which might be the basis for a variety of 'ontologies'.

From this vantage point we can say science has neither the first nor the last word. Not the first, because there is an advent of truth as the disclosedness of the thing, which can be uttered in language. Not the last, because science never tells all that is involved in itself and remains based on an historical comprehension of Being.

This gives us a sense of the depth of Heidegger's rejection

<sup>14</sup>In particular we must avoid the temptation to read "in the Open" as "in experience" and thus turn Heidegger into a positivist talking of sense-data, and so into an instrumentalist about science.

of the schema of logical subjects with properties. The schema cannot be used to think the disclosedness of a being and its mode of Being. But this raises an issue which calls for further thought. If we are not to think of logical subjects, how are we to think "the same being" which can be disclosed in the Open in various ways?

Science and ordinary language both speak of the table. The hammer can be ready-to-hand and then present-at-hand. The wine-jug is now a thing, now an object. The Greek temple is disclosed differently in different epochs. Dasein itself can be disclosed in different ways. How are we to think the identity of these beings in the face of multiple disclosures?

If we think a being as a subject whose properties are only partly disclosed at any one time we open the door to the ideal of the total description of those properties. Science will lay its claim and we return to debates over 'ontology' and essential properties within the realm of the present-at-hand.

If we think a being as the sum of its disclosures rather than as a logical subject, we seem to embrace a phenomenological idealism where the in-itself-ness of a being is interpreted as the transcendence of the series of appearances over one of its members. But Heidegger makes no claims to any such idealism.

Heidegger's own meditations have concentrated on Being, not beings; they do not provide the clarity we need here. It is not enough to know how not to think beings; this denial does not help us in the concrete tasks of relating and limiting different

disclosures which already collide in our language and life.<sup>15</sup>

Thus if we are to carry out a Heideggerean way to limit science we must think beings, their unity, identity and in-itself-ness, without recourse to the classical schema of subjects with properties. Heidegger has begun this thought. In SZ there is the notion of in-itself-ness as it applies to the ready-to-hand--cf. SZ sections 15 and 16, especially pages 71 and 75-76 where he refuses to identify in-itself-ness and presence-at-hand. In his later writings there is the notion of the earth and its relation to the world--cf. UK and VA II especially pages 27-28 where a similar denial occurs. But these notions need to be thought more fully. In particular, if we are to deal with science we must think these notions not only in terms of history but also in relation to multiple disclosures at the same time. This would be to think different disclosures as limited without being parts of some withheld total disclosure.<sup>16</sup>

<sup>15</sup>The actuality of such collisions, as between science and ordinary experience, should warn us against a facile use of the notion of the hermeneutical circle to avoid the task of relating and limiting by assigning all competing disclosures to different circles. It is not clear that all the colliding disclosures move within different circles. Recall the difficulty of ascertaining on what level the problem of scientific realism exists. In addition, "hermeneutical circle" is a term better adapted to describe the structure within which we stand than to individuate other examples of such structures. In order to clarify the identity and relations of different circles we must think them not only with respect to Being but with respect to "the same beings" they may disclose, which returns us to the task discussed in the text.

<sup>16</sup>Such a withheld total disclosure is almost inevitably envisioned as a list of properties only parts of which are available to us. If we are to overcome this illusion we need a new notion of finitude. In ZS we find mention of an attempt to develop such a non-contrasting notion: "The finitude of Appropriation, of Being, of the fourfold hinted at during the seminar is nevertheless different from the finitude spoken of in the book on Kant, in that it is no longer thought in terms of the relation to infinity, but rather as finitude in itself: finitude, end, limit, one's own--to be secure in one's own" ("Summary of a Seminar," p. 54 of the English translation). Also there is the problem of concealment developed in WW. Heidegger is usually concerned to speak of the concealment or withdrawal of Being, but we can ask about beings: in what way are they concealed? what is concealed about them?



## IV

So far we have recognized the need to think beings more adequately. There is a further side to this need: the problem of explanation as it is raised by science.

I noted earlier that Heidegger tells us comparatively little about conflict between different objectivizations. He often speaks of the relation and conflict between objectivization and its origin in Being. He also recommends an appropriate attitude towards beings (authenticity) in view of this relation. But he seems to regard differences on the level of objectivization as less acute. Once we appreciate their origin we will be able to let them peacefully co-exist as disclosures of different regions of what is.<sup>17</sup>

But will they easily coexist? The problem of explanation suggests that objectivizations may conflict in ways no account of their origins will easily placate. Heidegger does not sufficiently investigate the claims of science on this score. The sections in SZ (34,69) often cited as accounts of the origin of science are in fact accounts of the origin of the present-at-hand. Science is treated as an extreme case of the objectivization involved in ordinary statements such as "this hammer is heavy." This presumes scientific assertions are close enough in structure to ordinary assertions that one account will serve for both.

In other places Heidegger deals with mathematics as the most

<sup>17</sup>Cf. SZ sections 33, 44, 69b; VA II 42/PLT 170; WW 26; also the remarks of Gerd Brand on pp. 92-94 of his "Husserls Lehre von der Wahrheit," Philosophische Rundschau 17.

distinctive feature of science, one which allows it to "know in advance" the Being of its objects. Other features such as experiments and the priority of method rest on the role of mathematics (cf. FD B I; HW 71-72). But instead of investigating the peculiar structural role of mathematics in science Heidegger quickly generalizes and discusses the role of "the mathematical" (that which is known in advance) in all knowledge. Thus science is assimilated to other objectivizations, all of which have their "mathematical" too. What is to distinguish science is the use of numbers and measurements linked with equations as its version of the "mathematical." This in turn relates to the modern comprehension of the Being of Nature. All of this is true as far as it goes, but it does not sufficiently illuminate what is peculiar to science's use of mathematics.

In SZ section 33 Heidegger discusses the change in involvement with the ready-to-hand which allows the emergence of the present-at-hand. "Only so does the assertion obtain the possibility of exhibiting something in such a way that we just look at it." Later (in sections 44 and 69b), speaking of a picture askew on the wall which we turn to inspect after having asserted it was askew, he says "the entity itself which one has in mind shows itself just as it is in itself; that is to say, it shows that it, in its self-sameness, is just as it gets pointed out in the assertion as being." This sounds plausible when we consider the example of the picture in the light of the phenomenological theory of the coincidence of evidence and intention. (After the quote cited above Heidegger refers the reader to Husserl's Logical Investigation VI and its

discussion of the theory of judgment and truth.) But is this account applicable to science? The intentional structure of scientific assertions seems more complicated.<sup>18</sup>

The following points indicate differences between scientific and ordinary assertions. They are not meant to be an exhaustive set of necessary and sufficient conditions for science, but they seem to be the crucial differences for our purposes and common to realistic accounts of science.

<sup>18</sup> I am suggesting that in place of a two-fold division (ready-to-hand vs. present-at-hand) there may be a threefold division among:  
I (a) the ready-to-hand, beings revealed by circumspective concern (the hammer as used).

II (b) the present-at-hand as directly available objects freed into indifferent space, as just present (the hammer or picture on the wall as reported on).

(c) the present-at-hand as object of scientific assertions, indirectly available through instruments and mathematical models (the aggregate of atoms making up the hammer).

I have suggested that Heidegger fails to distinguish adequately (b) and (c), which are just the opponents in the analytic scientific realism controversy. On the other hand analytic philosophers such as Sellars miss (a); thus they read phenomenologists as defenders of an 'ordinary language ontology.' The discussion is further confused when commentators try to fit everyone's dichotomies together. Thus Husserl's life-world and Heidegger's ready-to-hand are equated with Sellars' manifest image, and so on with the other poles. (On these issues, cf. Patrick Heelan, "Horizon, Objectivity, and Reality in Physical Science," International Philosophical Quarterly 7(1967)375-412, and "Hermeneutics of Experimental Science in the Context of the Life-World," Philosophia Mathematica, 1972).

The "directly available" in (b) above is extremely questionable. Both (b) and (c) involve interpretation, though (b) does not involve instruments. This tends to bring (b) and (c) back together but by assimilating the ordinary to the scientific rather than vice versa. Whether this is done through emphasizing the interpretative elements in ordinary discourse, or through speaking of unconscious analogues of hypothesis projection, it tends to bring the results of ordinary and scientific disclosures into even greater conflict.

(1) In a scientific assertion it is frequently an entire theory which is being confirmed by evidence, not merely an intention directed to one object within an already secure horizon.

(2) This mediation by an entire theory which is itself up for confirmation is necessary because the objects revealed are seldom directly perceptible; we are given signs of their nature and activity through our interaction with other objects which show themselves more directly, such as measuring instruments.<sup>19</sup>

(3) These signs are interpreted by means of mathematical models. Such models are themselves made objects of awareness, argued over and tinkered with much more explicitly than are the interpretative structures involved in the example of the picture on the wall. These models offer an explicit 'ontology' for what-is-in-totality.

(4) Thus a science possesses an explicit vocabulary which it can use to redescribe objects. That is, ordinary objects and their properties can be redescribed in scientific terms, as with Eddington's famous two tables. In this redescription ordinary objects are replaced by systems of scientific objects; the properties and behavior of the ordinary objects are explained as results of the different properties and behavior of the scientific objects. It is important to recall that such redescrptions must be total. An assertion like "the table is composed of atoms" is not yet a redescription but only a recipe for one. A complete redescription would not use the word

<sup>19</sup>Not every science involves imperceptible objects. But it has been argued that the most fundamental scientific objects must be imperceptible because they explain the perceived qualities of ordinary objects. Cf. W. Sellars, "Philosophy and the Scientific Image of Man," in Science, Perception and Reality.

"table" at all but would speak only of aggregates of atoms and their properties. Thus "the table is hard" might be replaced by a statement to the effect that this aggregate of atoms has such and such properties which do not allow other medium-sized aggregates to pass through it. Similarly, "I see the table" would be replaced not by "I see the atoms" but by a physiological account of the interaction of my visual system and an aggregate of atoms. The claim of the reductive scientific realist, of course, is that such redescriptions offer better accounts of what is.

(5) What backs up the claim to superiority on the part of scientific redescriptions is their explanatory power. Unlike the example of the picture on the wall, a scientific assertion does not merely point out an object as it is. Because the assertion is linked to an explicit total model which includes laws and relations to other kinds of objects, the assertion involves an explanation of how and why the object is what it is. Redescribing the behavior of an ordinary object in scientific terms explains that behavior by showing how a system of more fundamental objects could come to appear red or slide down a hill. More importantly perhaps, this will also explain why in certain circumstances the red object will appear black or will not slide. The explanatory power seems to justify claiming that the scientific redescription is a better picture of what is.

I am here presuming that explanation in science proceeds as does ordinary explanation. That is, something is explained by pointing out how its parts interact (e.g., a car engine by talking of pistons, etc.).<sup>20</sup>

<sup>20</sup> Obviously if there are fundamental objects which have no parts this view of explanation will not cover their explanation by laws. But the cases we will be concerned with are all cases of redescriptive explanation.



Explanation poses more severe problems than description. Many early phenomenologists, like their positivist contemporaries, treated scientific explanation as subsumption under general laws. To explain something was more akin to deriving a mathematical theorem than to showing a friend how your car works. The general discouragement with the positivist model of explanation among current analytic philosophers poses difficulties for phenomenologists who still treat scientific explanation in the old manner. If explanation is deduction, competing explanations might be compatible as alternative axiom systems implying the same conclusions. But if explanation tells us how a being can be as it is by showing the interaction of its parts then competing explanations really compete. If I say the car moves because it has pistons and you because it has an electric motor we cannot both be correct about what is under the hood. It may be that the car has a hybrid engine such that it has both pistons and electric motors; then we are both right but only because our partial stories have been subsumed into a larger explanation. In each case there finally emerges one explanation which tells us what the parts and their interactions really are.

Thus competing explanations tend to be reduced to one. Other objectivizations which do not offer explanations also tend to be incorporated as their subjects and properties are explained. The success of such redescription and explanation suggests that the in-itself-ness of beings should be conceived as the presence-at-hand of the scientific objects. If this is done the nonobjective modes of Being become vulnerable to explanation as psychological events. The art work and the wine-jug become systems of scientific objects with

stimulate meaningful experiences which are themselves to be explained as interactions of scientific objects.

This vulnerability may extend even to Being itself. Heidegger has not isolated Being as a metaphysical Ground or a purely formal transcendental category. Being stays closely related to our historical world and to Dasein. Nor is Dasein a transcendental ego after the Husserlian manner. While ontological it remains ontic. Consider then all the verbs and verbal nouns that dot Heidegger's pages: aletheia, thinging and others which refer to the emergence of the ontological difference. If scientific explanation suggests that the in-itself-ness of beings is to be thought as the presence-at-hand of scientific objects, and if the ontological difference is correlated with Dasein whose ontic comportment is now explained as the interaction of scientific objects, how else think the emergence of the ontological difference but as a psychological event to be explained scientifically? In order to clarify this we have to think not only the ontological difference itself but also how scientific explanation relates to beings.

The threat I have invoked may seem extreme. Reductive materialism is engaged in lively debate with mind-body dualists and with defenders of emergent properties and of multiple levels of explanation. It is by no means obvious that physical science can redescribe and explain all beings.<sup>21</sup> But even if physical science were to be seen

<sup>21</sup>Phenomenologists with their more subtle descriptions of experience could contribute to these debates over 'ontology' even while contesting their problematic. Such debates play their role in attacking the ideal of total description. I have attempted such an application of phenomenological results to an analytic debate in part of my "Sellars' Intentions" (forthcoming).

as only one type of explanation among many, we would still face the problem of thinking the in-itself-ness of beings in the face of these multiple disclosures and explanations. There would also remain the task of relating the thing, the art-work, and other non-objective modes of Being to explanations in terms of the present-at-hand.

Heidegger urges that we "step back from the thinking that merely represents--that is, explains" (VA II 54/PLT 181). I have suggested that in stepping back from the ideal of language as an information-transfer device we must think beings in a way which helps locate talk of reference, explanation, and conceptual frameworks within the larger context.

\* \* \* \* \*

#### Sources Cited by Abbreviation:

- FD Die Frage nach dem Ding, Niemeyer 1962. Tr. Barton and Deutsch, Regnery 1967, as What Is a Thing?
- G Gelassenheit. Tr. Anderson and Freund, Harper 1969, as Discourse on Thinking.
- HW Holzwege, 4th ed., Klostermann 1963.
- ID Identität und Differenz. Tr. Joan Stambaugh, Harper 1974, German text included.
- PLT Poetry, Language and Thought. Selected essays tr. Albert Hofstadter, Harper 1971.
- SG Der Satz vom Grund, 3rd ed., Neske 1965.
- SPR Science, Perception and Reality, by Wilfrid Sellars, Humanities 1963.
- SZ Sein und Zeit, 10th ed., Niemeyer 1963. Tr. Macquarrie and Robinson, Harper 1962.
- US Unterwegs zur Sprache, 5th ed., Neske 1975. Tr. Peter Hartz, Harper 1971.
- VA Vorträge und Aufsätze, 3rd ed., Neske 1967, paperback edition.
- WW Vom Wesen der Wahrheit, 5th ed., Klostermann 1967.
- ZS Zeit und Sein. Tr. Joan Stambaugh, Harper 1972.