

WHOLE EARTH MEASUREMENTS

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I. HOW MANY PHENOMENOLOGISTS DOES IT TAKE TO DETECT A "GREENHOUSE EFFECT"?

Let us take a very commonplace, often discussed and critical topic within our conversations regarding critical environmental issues: Are we detecting a Greenhouse Effect, and related to this, is it exacerbated by "homogenic factors," i.e., human actions? At this occasion I suspect that most would be inclined to give a positive answer to both of these questions. But, if pushed philosophically, what would be the evidence, and how well grounded would it be for such affirmations?

Within scientific communities and associated scientifically informed circles, the answers have to be somewhat more ambiguous, particularly when rigorous questions concerning evidence are raised. Were scientific truth to be a matter of consensus—and some contemporary philosophers of science argue that scientific truth often turns out to be just that—then it is clear that there is beginning to be a kind of majoritarian consensus among many earth science practitioners that the temperature of the Earth, particularly of the oceans, is indeed rising and that this is a crucial indicator for a possible Greenhouse Effect.

Most of these scientists admit that the mean oceanic temperature has risen globally in the last several decades. But this generalization depends upon (a) how accurate measurements may be, not just for samples, but for *the whole Earth*. Hot spots, for example the now four year old hot spot near New Guinea which is part of the El Nino cycle, does not count by itself because it might be balanced by cold spots elsewhere. And the fact of the matter is that "whole earth measurements" are still rare and primitive in the simple sense that we simply do not have enough thermometers out. (b) Secondly, even if we have enough thermometers, a simply *synchronic* whole earth measurement over three decades is but a blip in the *diachronic* history of Ice Age cycles over the last tens of thousands of years. (c) Thirdly, even if we know that the Earth is now heating up, has an ever increasing Ozone Hole, and from this computer modelled strange

weather effects can be predicted, how much of this is due to homogenic factors, such as CFCs, CO₂ increases, hydrocarbon burning, and the like? Is it the case, as *Science* magazine claimed in 1990, that "24% of greenhouse encouraging gases are of homogenic origin" ?

As I have described the current debate it does not sound on the surface to be very philosophical; instead it seems empirical and thus within the domain of scientific discourse. However, in the way in which the story was cast, there lurk some deep epistemological issues which relate to my ironic first subtitle, "How many phenomenologists does it take to detect a greenhouse effect?"

What I wish to do in this paper is to look both at "classical" phenomenology (Husserl in particular) and at Heideggerian hermeneutics regarding the theme, "environmental phenomenology," and show that both approaches are to be found wanting with respect to the Greenhouse Effect phenomenon. Then I wish to show how a rather radically modified hermeneutic and phenomenological epistemology can address this problem. This modification entails two positive concepts, both of which, I will argue, are necessary for a phenomenological approach to environmental issues: namely, *Technoscience* as a thoroughly technologically embodied science as a necessary concept to get at presumed sub-perceptual entities, and *Earth-as-Planet* as a necessary presupposition for dealing with whole earth measurements.

Classical phenomenology, I argue, lacks the first of these concepts, and Heideggerian romanticism rejects the latter. Let us begin with a very simple phenomenological question: from what standpoint or perspective can the issue of whole earth measurements be made? If, at base, our very knowledge is constituted by way of our *bodies* and through *perception* as both Husserl and Merleau-Ponty seem to contend, then what is claimed about whole earth measurements becomes problematical in two senses.

First, how do we get a sufficiently encompassing perspective to talk about a whole earth? And, second, given that the greenhouse producing gases are, in fact, not *perceived* at least in Husserl's primordial dator sense or at the level of primary lifeworld perception, how do we constitute these?

One approach might be to recognize that the scientific discourse

concerning greenhouse gases seems itself to be constructed in terms consistent with "modern" as opposed to phenomenological epistemology. Indeed, all the entities to be measured, ozone, CFCs, CO₂, are sub-perceptual in any direct perceptual sense. One cannot directly *sense* them. In early modern (Cartesian) terms these entities are "inferred." And, indeed, these constructs, even in Husserl's version of Galilean science, are thought to be distant from the primary perceptions of the lifeworld and are, instead, results of a *mathematization* process.

I cannot take the time here to walk through the whole of Husserl's version of mathematization and Galilean science, but the elements which are of importance for this argument revolve around the virtually exclusive interpretation of science through mathematization. (a) At the heart of Husserl's version is a strong distinction between primary perceived *plena* which are directly sensorily perceived, and mathematized objects (the pure shapes of geometrization) which are both *abstract* or idealized, and only *indirectly* available. "[Science in] . . . all this *pure* mathematics has to do with bodies and the bodily world only through an abstraction, i.e., it has to do only with *abstract shapes* within space-time, and with these, furthermore, as purely 'ideal' limit-shapes. *Concretely*, however, the actual and possible empirical shapes are given, at first, in empirical sense-intuition, merely as 'forms' of a 'matter' of a sensible plenum; thus they are given together with what shows itself, with its own gradations, in the so-called 'specific' sense qualities: color, sound, smell, and the like."¹¹ Husserl's mathematized science thus presupposes this strong distinction between the fully perceived *plena* and the merely idealized abstractions of pure shapes. (b) Thus, to incorporate the perceived world into and under the scientific world, there must be an *indirect* process. "Now with regard to the 'indirect' mathematization of that aspect of the world which in itself has no mathematizable world-form: such mathematization is thinkable only in the sense that the specifically sensible qualities (*plena*) that can be experienced in the intuited bodies are closely related in a quite peculiar and *regulated* way with the shapes that belong essentially to them."¹² In short, there is needed some form of association between the idealized abstracta and the *plena*, a relation which Husserl terms *indirect*.

If we now return to our environmental problem, the measured changes occurring with greenhouse gases, were Husserl right then the gases are themselves constituted through *mathematization* with its abstractive process and indirect or inferential geometrization. But there is something radically wrong with this approach because it implicitly leaves out the very *materiality* of the gases

themselves and with it any possible realism which drives the earth sciences as well as any other late modern science.

The flaw, however, lies not with the description or the presumed indirect constitution of the gases; it rather lies with Husserl's *flawed concept of science*. And while Husserl is not alone—he in fact remains close in his interpretation to many other "Cartesian" or theory-weighted interpreters of science, including the positivists of his time and Descartes himself—it is his concept of science which has undergone the *abstraction*. Of course science requires *measurement*, *quantification*, and the processes of *analysis* which occur in mathematization—but it equally requires a *material* relation with the "things themselves" and this occurs in actually embodied science. That embodiment is the *technological extension of primary perception* through *instrumentation*. Husserl's Galileo is a Galileo without the telescope. And the relation between Galileo's satellites of Jupiter and rings of Saturn and early modern science is not mathematical or indirect; it is rather *mediated* and *instrumentally real* through this technological extension of bodily perception. This technologically *mediated* perceivability reduces and transforms the presumed strong distinction between Husserl's plenary perception and the equally presumed indirect and abstract reduction to merely pure shapes. CFCs, CO₂, and ozone are not pure shapes, but are instrumentally presentable, material entities through science's increasingly sophisticated technological embodiments. They, too, are plena, albeit micro-plena instrumentally presentable. Simply put, science's mathematization does not fit the Husserlian version of it, and, moreover, a purely or only mathematized science is itself a disembodied science. Contrarily, a technologically embodied science is a science which may operate through an *instrumental realism* which allows a *mediated* bodily perception of micro-entities rather than of abstract, pure shapes. I am here arguing that only such a *technoscience* can allow for the realism needed to take a greenhouse effect seriously.

II. ONLY BY BEING PROFOUND CAN HEIDEGGER BE PROFOUNDLY WRONG:

Husserl has not often been invoked for discussion of environmental issues. But Heidegger has; indeed, he is often termed "green" and he has been invoked particularly by "deep ecologists." There are two surface reasons why this is the case. (a) In the example here, a Greenhouse Effect, if it is the case that

there are homogenically originated causes arising from escaped CFCs, hydrocarbon burning processes, and increased CO₂ accumulations, it is largely because of industrial processes or Technology with the capital T Heidegger gives to it. Technology is thus culpable in the environmental crisis. (b) The second reason for the invocation of Heidegger is a "romantic" one and lies in his honorific use of the term, "Earth." (Has anyone noted that the Heideggerian concept of Earth as groundedness actually fits a still geocentric universe?) (c) I find, however, that there is a deeper reason why Heidegger is thought to be relevant to the environmental crisis. It lies in his much more material realism concerning the artifactual, which I contended was lacking in Husserl.

This realism was very early applied to the role of artifacts in his concept of the *Zuhanden*. Tools or instruments were ways in which human actions were *mediated* into the world. The hammer "withdraws" into the sense of bodily action which produces the project in its materiality. Much later, in the context of an emergent philosophy of technology, Heidegger included science itself as a kind of institutionalized *Zuhanden* process. One must also remember that the tools which Heidegger analyzes in *Being and Time* play a special role there—they are the indicators of the "Worldhood of the World." The covered railway platform "takes account of the weather," and Nature itself is shown via these artifacts. But, later, technology, now elevated to a metaphysical mode of seeing, makes science itself "technological": "It is said that modern technology is something incomparably different from all earlier technologies because it is based on modern physics. . . . Meanwhile we have come to understand more clearly that the reverse holds true as well: modern physics, as experimental, is dependent upon technical apparatus and upon progress in the building of apparatus" (*The Question Concerning Technology*, p.30). Science is technologically embodied. This is the origin of its instrumental realism and although Heidegger did not follow through on this concept, he may be said to have thereby corrected the Husserlian abstract view of science.

In Heidegger's view, however, science is doubly instrumental. If, in its actions, it is through its instruments or artifacts that it can act upon nature, it itself is an instrument of a certain metaphysical way of seeing Technology—namely, with the capital. It is the means by which Nature is challenged and taken as "standing reserve" or a "resource well" [*Bestand*]. In short, it is through the artifactual or material instrumentality of science that this can occur. By

extension, then, there can be a homogenically related Greenhouse Effect, through the very challenging process.

Normatively, this is part of the danger found in Technology: by being materially efficient it can pose a threat to the preservation of *Earth*, another of Heidegger's central concepts. Technology, now become materially efficient through the artifactual, reveals nature as a resource well which can be acted upon. Or, to put it another way, nature in the *modern* sense becomes what it is through the possibilities of material instrumental realism.

Now I want to turn to another, subterraneanly-close look at Heidegger's materially efficient or realist uses of the artifactual. Tools are not the only artifacts—Greek temples are also artifactual. And, like earlier *Zuhanden* uses of tools, they *reveal a world*. "Standing there, the building rests on the rocky ground. This resting of the work draws up out of the rock the mystery of that rock's clumsy yet spontaneous support. Standing there, the building holds its ground against the storm raging above it and so first makes the storm manifest in its violence."³ This artifact carries lots of freight—it reveals, or even "makes" the storm reveal itself as storm, the very sun its grace, the light its light, the invisible space of the air . . . tree, grass, eagle, bull, snake, cricket "come to appear as what they are."⁴ The temple-work (artifact) "opens up a world and at the same time sets this world back again on earth, which itself only thus emerges as native ground."⁵

But while this Wagnerian, Nietzschean romantic tone rings much louder than the accounting for the weather of *Being and Time's Zuhanden*, it plays a similar role. It is through the artifact (work) that the world is revealed and now, settled, upon the Earth. The temple is a kind of "nice" technology. "To be a work means to set up a world. . . . [but this ultimately also] lets the earth be an earth."⁶ Heidegger then goes on to create a dialectic between "world" and "earth." Other than to reiterate that the dialectic itself is revealed through the work or artifact, I shall now leave the commentary and turn to what I think to be profoundly wrong with this view.

The first error lies in the romantic amplification of the deeper insight from the *Zuhanden* period. If it is through the artifactual in its praxical context that a "world" is revealed, then the later Heideggerian selective romanticization of

this in his ontological aesthetic is one which fails to *fully* reveal the world which gives rise to the artwork, but which instead in its romantic selectivity *covers over* precisely the full set of involvements which the artwork potentially reveals.

It was the historian, J. Donald Hughes, who first drew my attention to this problem. Although I doubt he knew of Heidegger's work, he opens his *Ecology in Ancient Civilizations* with the following remark: "Those who look at the Parthenon, that incomparable symbol of the achievements of an ancient civilization, often do not see its wider setting. Behind the Acropolis, the bare dry mountains of Attica show their rocky bones against the blue Mediterranean sky, and the ruin of the finest temple built by the ancient Greeks is surrounded by the far vaster ruins of an environment which they desolated at the same time."

As I read this passage, a new revealing suggested itself—instead of storm, snake and bull, I began to see rock surpassing forest, species-counts changing or disappearing, and soil irreversibly eroding into sea around Heidegger's temple. But there is worse: were one to look closely, much more closely, at the temple itself, one would find in its very stone testimony to the Greek destruction of an environment. The first temples were made of wood—which became increasingly scarce as deforestation continued, not under chainsaws but under mere bronze axes, probably well crafted in a *techne* way—and the temple on the hill evidences this past: "The Greeks persisted in using the architectural forms that they were accustomed to from the days of wood. All the details of the entablature, with its cornices, friezes, . . . were copies in stone of wooden structural elements. Greek builders even imitated the pegs that held the ancestral wooden structure together by adding little stone knobs called 'drops.'¹⁸ In short, even the temple itself, read closely, evidences the process of earlier deforestation, and all of this before modern machine technology.

The temple as *art work*, at least in Heidegger's description of it, does not, will not, perhaps cannot reveal its wider and more negative context. The reason, I contend, is the choice of a romanticized version of such works. But, deeper, the art work is simply the other side, the obverse of a *technology* or a technological artifact. Both are material; both are focal entities which reveal fields of involvements and references; and both thus "gather the fourfold" to use a Heideggerian overstatement.

There is, in the Heideggerian context, good artifactuality—the artwork—which reveals the romanticized interplay of the gods and mortals, earth and sky, and bad artifactuality—technologies—which rush us across rivers (the steel bridge), or dam the same river (hydroelectric dams), or reduce the Holocaust to modern agriculture (both of which treat humans as standing reserve). While I argue that there is something profoundly wrong with such romantic reductionism, I want now to make one more post-Heidegger move before returning to the Greenhouse Effect.

Good artifactuality—the temple—reveals Earth as ground, that upon which a world can rest. Bad artifactuality—in this case I shall introduce the now familiar *global imaging* made possible by such technologies as earth shots from the Moon—makes of the world a "world as picture." "Hence world picture, when understood essentially, does not mean a picture of the world, but the world conceived and grasped as picture."⁹ This, presumably, is bad. What makes it bad is the reduction of the world to picture, whereas world (itself) cannot be so reduced.

Behind this critique, of course, lies a lot of ancient and still modern garbage, which beginning with Plato's copy-epistemology and its transformation into modern representationalist-epistemology, needs weeding out. Heidegger's insight that world is revealed as picture is better than that, but it still misses the point. I wish to argue, contrarily, that to see by means of imaging technologies, is not to look at a picture, it is rather to *look through the image*. That, at least, is how imaging—including whole earth measurements—is used in scientific praxis.

III. WHOLE EARTH MEASUREMENTS

I now return to the initial problem: How can one tell anything about a Greenhouse Effect, phenomenologically? I opened this venture with the assertion that two concepts are necessary as a frame for detecting a Greenhouse Effect: science as *technoscience* and a perspective, *earth-as-planet*, for making whole earth measurements.

The first is necessary if there is to be any referential realism regarding the phenomenon. Measurements must be measurements of something, and what

an instrumentally embodied science gives one is precisely the opening to micro and macrophenomena through the mediated bodily perceptions made possible by instrumentation. Instruments give access to the phenomena, and that often in mediated perceptual form. Greenhouse gases are not inferred, they are instrumentally perceived. I argued that the Husserlian science of the *Crisis* lacked this conception of science, although the praxical realism of Heidegger's earlier work saw its possibilities.

The second conception needed is *perspectival* in the sense that one must have a sense of a "whole earth" as that field which is measurable, and this is what I am calling *earth-as-planet*. The idea of earth as planet, as a finite sphere, is itself quite ancient: it is anticipated by Aristarchus, is assumed by Copernicus, and its size has been measured along with these notions, both in Greek and early modern times. But one could argue that it is not *seen* as planet until it is so embodied in the earth shots with which we are now all familiar. And it is here that I enter the last set of arguments with classical phenomenology, Husserlian and Heideggerian.

Put crassly, what might Husserl and Heidegger see when they look at a moonshot of earth-as-planet? Or, when they look at other imagings of environmental phenomena? If the answers are "pictures" or "images," then the look involved is both naive and cast in terms of modern epistemologies which remain caught with a passive theory of perception which sees only surfaces and representations. And if, in the Heideggerian case, there is more penetration, but a penetration which yields the referent phenomenon as itself a picture, then the seeing remains short of *scientific seeing* as evident in science praxis. Indeed, such a look would remain short of even the primary insights of a phenomenological epistemology claimed by both but restricted to everyday or pre-scientific lifeworld regions. Heidegger notes, "What we 'first' hear is never noises or complexes of sounds, but the creaking wagon, the motorcycle. We hear the column on the march, the north wind, the woodpecker tapping, the fire crackling."¹⁰ This auditory plenum precedes its abstract resolution into distinct *qualia*, the gestalt precedes its separable parts. "It requires a very artificial and complicated frame of mind to 'hear' a 'pure noise'" (*Being and Time*, p. 207).

Similarly, I am arguing that it likewise takes an artificial and complicated frame of mind to see a "mere picture" or an "image"—this is an effect of a

modern epistemology. Instead, in scientific seeing, a "seeing which understands" to again paraphrase Heidegger, *gestalts* are "seen through" in the processes of imaging and measuring. And no scientific seeing takes the image for the referent itself, nor confuses the world with its picture. Rather, all pictures and images are themselves instrumental and are seen or read through. I return, now, to the Greenhouse Effect.

IV. SCIENCE PRAXIS AS A PHENOMENOLOGICAL HERMENEUTIC

Contemporary *technoscience* does its work by means of its technological embodiments, its instrumentation. Its range of instruments is wide and diverse. With respect to some of these referring to whole earth measurements, attempting to discern a possible Greenhouse Effect, there are various sorts of recording thermometers such as buoys in the oceans which record both surface and depth temperatures. Similarly, thermometers are placed in the atmosphere (balloons, aircraft probes, etc.). The recorded results are then fed into computer models, mathematically analyzed and reduced to graphs and trajectories to determine overall patterns. This process falls under what I have earlier called "hermeneutic relations" whereby the referent is mediated by digital, numerical, or graphed results which are non-isomorphic with the items themselves referred to.

Imaging processes, however, are of special interest because imaging mediates perceivable patterns which often do refer isomorphically, or partially isomorphically with the referent intended. Thus satellite photography in geosatellites *depicts* earth phenomena which in more visually *gestalted* forms show the state of the whole earth. I choose this special form of instrumentation here because it displays a much more *phenomenological* morphology in its very closeness to perceivability.

In the cases of straightforward isomorphism, in which color photography remains representational with true colors, one can detect what is happening on the planet. One can "see" the deforestation process in South America, and a satellite photo this fall dramatically showed the smoke plume hundreds of miles to sea from the forest fires on my own Long Island. And, with enough satellites, one can scan the whole planet. But, scientifically, such straightforward visual isomorphism is not enough.

What I call "instrumental phenomenological variations" show more: by turning to the sophisticated varieties of false color, which varies from human vision, one may learn more. Infra-red imaging shows much more dramatically the changing ratios of organic to inorganic surfaces thereby showing where desertification is taking place. Thermal imaging shows temperature variations; magnetometry shows even that which is below the surface; and with each variation a richer and more complex set of phenomena emerge. I am suggesting in the strong sense that this deliberate variational praxis is, in science, very much akin to an embodied form of phenomenological variational praxis.

But it is also critically hermeneutic. One must learn to read the interrelations. For example, the current ability to get closer to *synchronic* whole earth measurements must also be related to *diachronic* readings of the past. These are made possible by the material "calendars" left by the earth itself. Tree rings reveal past periods of drought and wet seasons, deep glacial ice shows past temperatures, etc. I am suggesting here a "hermeneutics of things," not merely of languages and texts. (Indeed, I take the current penchant to make of everything a "text" to be analogous to the Heideggerian fear of taking the world as "picture.")

Finally, scientific praxis—even if it still sometimes self-interprets its knowledge in modern epistemological language—is no longer modern. It is, rather, *reconstructive*. Instrumental perceivability is not passive observation, it is actively constructive. To get the truest imaging, the result must be manipulated, constructed. Here two techniques may be noted in passing. First, the use of contrastive techniques is known in all types of imaging processes. False color or some other contrastive technique is used to sharpen, enhance, and bring forth features which otherwise would lie undetected. Here manipulation *away from the passively real* is needed to bring out the phenomenon. Second, computerized enhancement also may sharpen and create more true or hyperreal imaging. I contend that this technologically constructed approach is beyond the limits of modern epistemology and is more akin to a phenomenological constitution which in its classical sense did not realize its scientific potential.

Imaging, as one example of the technological embodiment of science, is not some set of pictures; it is the praxical, instrumental *Zuhanden* of that which reveals a world. Insofar as science is not merely some set of mathematized

theory, but is embodied as a *technoscience* which materially relates to a world, and insofar as the earth is a perceivable *planet*, and then, insofar as our measurements are critically reconstructed through instrumentally constitutive praxis, then phenomenologists can detect the possible Greenhouse Effect.

NOTES

1. Edmund Husserl, *The Crisis of European Sciences and Transcendental Phenomenology*, trans. David Carr (Evanston: Northwestern University Press, 1970), pp. 29-30.
2. *Ibid.*, p. 35.
3. Martin Heidegger, "The Origin of the Work of Art," in *Poetry, Language, Thought*, trans. Albert Hofstadter (New York: Harper, 1971), p. 42.
4. *Ibid.*, p. 42.
5. *Ibid.*, p. 42.
6. *Ibid.*, pp. 42, 46.
7. J. Donald Hughes, *Ecology in Ancient Civilizations* (Albuquerque: University of New Mexico Press, 1975), p. 1.
8. L. Sprague de Camp, *The Ancient Engineers* (New York: Dorset Press, 1963), p. 93.
9. Martin Heidegger, *The Question Concerning Technology*, trans. William Lovitt (New York: Harper Torchbooks, 1977), p. 129.
10. Martin Heidegger, *Being and Time*, trans. John Macquarrie and Edward Robinson (New York: Harper and Row, 1962), p. 207.