

## *The Concept of Emergence*

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SOMEWHAT over a quarter of a century ago, Professor Stephen Pepper published a paper on “Emergence” (1) which was (and still is) symptomatic of a certain way of thinking on this topic. The paper had the virtues of brevity and clarity, and, which is more important, it went to the heart of the matter. The fact that the crucial step in its argument is a simple *non sequitur* by no means detracts from its diagnostic value as a document in the controversy over emergence.

Before we examine Professor Pepper’s argument, two introductory remarks are in order.

1. Our aim is not to defend an emergentist picture of the world, but rather to criticize an argument which, if successful, would make this picture indefensible. As we see it, the question whether the world is to be conceived along emergentist lines is a scientific question which cannot be settled on a priori grounds.

2. The question “Does the world contain emergents?” requires to be answered in terms of a scientific account of observable phenomena, and although with reference to a given scientific picture of the world the question is a logical one which concerns the formal structure of this picture, taken absolutely, the question shares the inductive character, and hence corrigibility in principle, of the scientific enterprise. Indeed, since science presents us today not with one integrated interpretation of the totality of observable phenomena, but rather with a large number of partially integrated theories of more limited scope, the question inevitably takes on a *speculative* character, and becomes an attempt to anticipate the logical structure of a theoretical framework which is still in gestation. This speculative dimension must, of course, be distinguished from the previously noted corrigibility (in principle) of any answer to the question “Are there emergents?”

## I

Professor Pepper writes,

Emergence signifies a kind of change. There seem to be three important kinds of change considered possible in modern metaphysical discussion. First, there is chance occurrence, the assertion of a cosmic irregularity, an occurrence about which no law could be stated. Second, there is what we may call a "shift," a change in which one characteristic replaces another, the sort of change traditionally described as invariable succession and when more refined described as a functional relation. Thirdly, there is emergence, which is a cumulative change, a change in which certain characteristics supervene upon other characteristics, these characteristics being adequate to explain the occurrence on their level. The important points here are first, that in discussing emergence we are not discussing the possibility of cosmic chance. The emergent evolutionists admit a thoroughgoing regularity in nature. And secondly, we are not discussing the legitimacy of shifts. These also are admitted. The issue is whether in addition to shifts there are emergent changes.

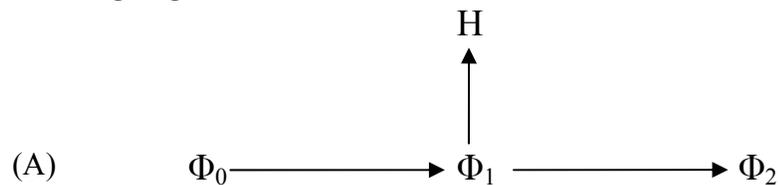
The theory of emergence involves three propositions: (1) that there are levels of existence defined in terms of degrees of integration; (2) that there are marks which distinguish these levels from one another over and above the degrees of integration; (3) that it is impossible to deduce the marks of a higher level from those of a lower level, and perhaps also (though this is not clear) impossible to deduce marks of a lower level from those of a higher. The first proposition, that there are degrees of integration in nature, is not controversial. The specific issue arises from the second and third propositions. The second states that there is cumulative change, the third that such change is not predictable.

What I wish to show is that each of these propositions is subject to a dilemma: (1) either the alleged emergent change is not cumulative or it is epiphenomenal; (2) either the alleged emergent change is predictable like any physical change, or it is epiphenomenal. I assume that a theory of wholesale epiphenomenalism 'is metaphysically unsatisfactory. I feel the more justified in making this assumption because I have been led to understand that the theory of emergent evolution has been largely developed as a corrective of mechanistic theories with their attendant psycho-physical dualisms and epiphenomenalisms. (p. 241)

The distinctions drawn in the first of these paragraphs provides the basic framework of Pepper's argument. Pointing out, quite correctly, that indeterminism is neither essential to, nor characteristic of, theories of emergent evolution, Pepper draws a distinction between two possible types of regularity: (a) "shifts"—that is to say regularities of the kind

“traditionally described as invariable succession”; (b) regularities “in which certain characteristics supervene upon other characteristics.” Notice, however, that to his description of the second kind of regularity he adds the phrase “these [latter] characteristics being adequate to explain the occurrences on their level.” By adding this phrase, Pepper implies that there could be no such thing as a regularity in which certain characteristics supervene upon other characteristics but in which the lower level characteristics were not adequate to explain the occurrences on their level. In other words, he implies that “supervening” or emergent characteristics are, merely by virtue of being such, unnecessary to the explanation of occurrences at the lower level—that is to say, of occurrences insofar as they exemplify nonemergent characteristics. And, indeed, he implies that this is such a well-known and generally accepted fact that its use requires no justification in this day and age. We are not surprised, then, to find him claiming, without further ado, in the fifth paragraph, that “a theory of emergent qualities is palpably a theory of epiphenomena” (p. 242).

Now the claim that emergent qualities are (“palpably”) epiphenomenal can scarcely be just the claim that emergent qualities have necessary-and-sufficient conditions. “Epiphenomenal” carries, and is intended by Pepper to carry, the connotation “making no difference.” Obviously “having a necessary-and-sufficient condition” is not identical in sense with “making no difference.” Yet the idea that emergent qualities must be epiphenomenal is clearly tied up with the idea that a certain context specified in terms of lower level characteristics is the necessary-and-sufficient condition for the appearance of the emergent quality. A glance at the conventional diagram will show what is going on.



This diagram is designed to be a representation of the following propositions: (1)  $\Phi_0$  is a sufficient condition of  $\Phi_1$ ; (2)  $\Phi_1$  is a sufficient condition of  $\Phi_2$ ; (3)  $\Phi_1$  is also the necessary and sufficient condition of H. But while this is all that the diagram is *intended* to represent, it strongly suggests that H is, in the proper sense of the term, an epiphenomenon. That this suggestion is unwarranted, that the information

summed up in the diagram leaves open the question as to whether H is an epiphenomenon, will be established at a later stage in our argument. For the moment we shall limit ourselves to some reflection on the phrase “making no difference.”

It is obvious that if H is to “make a difference” there must be a difference between situations in which it is present and situations in which it is not. That there is one such difference is clear; H-situations differ from non-H-situations in that the former are also  $\Phi_1$  situations and the latter not. But this difference, far from being a difference that would keep H from being epiphenomenal, is at least part of what is meant by calling H an epiphenomenon. And, indeed, if there were no other difference between H-situations and non-H-situations, H *would* be epiphenomenal. But what other difference could there be? Clearly it is a mistake to look for this new difference in the form of another characteristic that is present when H is present and absent when H is absent. There remains only the possibility that H-situations are governed by different laws than non-H-situations. And this not in the trivial sense that H-situations conform to the law “H if and only if  $\Phi_1$ ” whereas non-H-situations do not (save vacuously), but in the important sense that the lower level characteristics themselves exhibit a different lawfulness in H-situations. In other words, for emergent qualities to make a difference which removes them from the category of the epiphenomenal, in any significant sense of this term, there must be “emergent laws.” We hasten to add that the last few remarks are informal in character, and are intended to be hints and signposts of what is coming, rather than definitive clarifications.

## II

Pepper’s “first dilemma,” designed to prove that “either the alleged emergent change is not cumulative or it is epiphenomenal” begins with a distinction between those theories of emergence according to which what emerges are *qualities* and those according to which what emerges are *laws*. He points out that in Alexander’s system it is new qualities which emerge; but he expresses the conviction that “most emergent evolutionists have theories of emergent laws” (p. 242). As we have already noted, he claims that “a theory of emergent qualities is palpably a theory of epiphenomena.” On the other hand “it is not so obvious that a theory of emergent laws must also be such—or else cease to be

a theory of emergence” (p. 242). But though he finds the latter claim “not so obvious,” it is, as he sees it, equally true, and it is to the task of showing it to be true that he now turns.

Before we take up his argument, some remarks on his classification of theories of emergence are in order. Once again we find fewer alternatives presented than are abstractly possible. Postponing (with Pepper) the question as to what could be meant by “emergent law,” the dichotomy “emergent quality”–“emergent law” yields a trichotomy of emergentist theories: (a) theories of emergent qualities without emergent laws; (b) theories of emergent qualities with emergent laws; (c) theories of emergent laws without emergent qualities. Now we have already suggested that of these three only the first is “palpably” committed to epiphenomenalism (unless, that is, a theory of emergent qualities is “epiphenomenalistic” merely by virtue of the fact that it recognizes that emergent qualities have necessary-and-sufficient conditions). We now notice that to make this first alternative consistent with determinism (which is not in question in this paper) we must either refuse to call the regularities between emergent qualities and the contexts in which they emerge “laws,” or, calling them “laws,” we must deny that they are “emergent.” Pepper, in effect, by drawing his distinction between “shifts” and “superveniences” takes the former alternative. In these terms, the regularities in diagram (A) between  $\Phi_0$  and  $\Phi_1$ , and between  $\Phi_1$  and  $\Phi_2$  would be shifts, whereas that between  $\Phi_1$  and H would be a regularity of supervenience. And in these terms, the three alternatives above become (a’) theories of emergent qualities without emergent shifts; (b’) theories of emergent qualities with emergent shifts; (c’) theories of emergent shifts without emergent qualities. But from the standpoint of one whose concern is with the question “Does emergence involve epiphenomenalism?” and who is convinced that emergent qualities must as such be epiphenomenal, this trichotomy reduces to this dichotomy: theories without emergent shifts–theories with emergent shifts. And from this standpoint, and in these terms, the issue would be “Do emergent shifts involve epiphenomenalism?”

But this is not how Pepper sets up his problem. In his first formulation, as we have seen, he makes use of the general notion of *law*, and sees his purpose as that of showing that “a theory of emergent laws...must be [a theory of epiphenomena] or else cease to be a theory of emergence.” Then, after drawing a distinction between *laws* and the

regularities they describe, he reformulates his task as that of showing that “all natural regularities are shifts.” At first sight this is puzzling indeed, for as the term “shift” was introduced, it amounts to the task of showing that no natural regularities are regularities in which “certain characteristics supervene upon other characteristics.” And since the understood context is “under pain of epiphenomenalism,” this amounts, in turn, to the task of showing that supervening characteristics must be epiphenomena. But at first sight this is only verbally different from the task of showing that emergent qualities are epiphenomena—and this, for Pepper, is no task, since the *demonstrandum* is “palpably” true.

Now the key to the resolution of this difficulty is the philosophical virtuosity of the term “characteristic.” Often used in the sense of *property*, frequently used to cover both *properties* and *relations*, it is here being used in so broad a sense that even *regularities* become characteristics. Pepper, indeed, is thinking of an emergent law as a *supervening regularity*—as, so to speak, a regularity which rides piggy-back on a lower level regularity. It is little wonder that, approaching it with this mental set, he finds the notion of an emergent law absurd. As he sees it, the emergentist who speaks of emergent laws is able to swallow this absurdity because he mistakes a “whole hierarchy of different laws”—each of which, according to Pepper, describes “the same natural regularities”—for a “ladder of cosmic regularities.” Pepper does not develop this point. However, in terms of contemporary controversy, the initial mistake of the emergentist, according to Pepper, is to be so fascinated by the difference between one framework of concepts and laws (e.g., biology) and the proximate lower level framework of concepts and laws (e.g., organic chemistry) that he finds it difficult to believe that the one could be reducible to the other. What is not clear is whether Pepper believes that the denial (in principle) of reducibility involves the absurdities he finds in the notion of emergent laws.

### III

Be this as it may, the fact remains that Pepper does find the emergentist view absurd, and offers an argument to prove it. He seeks, as we have seen, to show that “all natural regularities are shifts.” Now this thesis is equivalent to “there are no emergent (supervening) regularities” only if “shift” is being used in such a way that it connotes absence of

supervenience. Given this connotation, Pepper's formulation of his task is equivalent to our formulation at the end of the preceding section, namely, "Do emergent shifts involve epiphenomenalism?" Indeed, in the terminology of that section, it becomes "Is the notion of an emergent shift absurd?" Here is his argument:

Let us suppose a shift at level B is described as a function of four variables  $q$ ,  $r$ ,  $s$ , and  $t$ . Let us then suppose that  $r$  and  $s$  constitute an integration giving rise to level C at which level a new cosmic regularity emerges that can be described as a function of four variables  $r$ ,  $s$ ,  $a$ , and  $b$ .  $r$  and  $s$  must necessarily be variables in this emergent law' even though they are variables of level B, because they constitute part of the conditions under which the emergent law is possible. Theoretically, to be sure, the emergent law may be thought of either as a function of new variables or as a new function of C-level variables. But actually only the former is possible. For if the new law were not  $f_1(q,r,s,t)$ , but were  $f_2(q,r,s,t)$ , then, of course, it would never be  $f_1(q,r,s,t)$ , unless the event were a chance occurrence in which case no regularity could be described anyway. The point is, either  $f_1$  adequately describes the interrelationships of  $(q,r,s,t)$  or  $f_2$  does; or if neither adequately describes the interrelationships there is some  $f_3$  that does, but there cannot be two adequate descriptions of the same interrelationships among the same variables.

An emergent law must, therefore, involve the emergence of new variables. But these new variables either have some functional relationship with the rest of the lower level variables or they haven't. If they haven't, they are sheer epiphenomena, and the view resolves itself into a theory of qualitative emergence. If they have, they have to be included among the total set of variables described by the lower level functional relation; they have to drop down and take their places among the lower level variables as elements in a lower level shift.

Such being the case, our dilemma is established so far as concerns cumulative change—either there is no such thing or it is epiphenomenal ... (pp.242-43)

Before embarking upon a more general discussion, we shall examine the argument in Pepper's form. It can be restated as follows:

1. If a function  $f_1(q,r,s,t)$  "adequately describes the interrelationships" among four variables  $q$ ,  $r$ ,  $s$  and  $t$ , then no other function  $f_2$ , nonequivalent to  $f_1$ , of these variables can do so. "There cannot be two adequate descriptions of the same interrelationships among the same variables."

2. If  $f_2$  "adequately describes the interrelationships" among

these variables *after* the ‘integration’ (and putative emergence) then, since sheer difference of time has no material consequence,  $f_2$  must also be the adequate description of these interrelationships before the integration. Consequently  $f_1$  could only be the adequate description of these interrelationships before the integration if it were equivalent to  $f_2$ , which, *ex hypothesi*, it is not.

3. Hence, if  $f_2$  “adequately describes the interrelationships” after the integration,  $f_1$  cannot adequately describe the relationships which obtain before the integration. “The point is, either  $f_1$  adequately describes the interrelationships of  $(q,r,s,t)$  or  $f_2$  does; or if neither adequately describes the interrelationships, there is some  $f_3$  which does...”

But surely this is too strong—a veritable *ignoratio elenchi*. What the emergentist says is that there is a region in the fourspace  $qrst$  within which  $f_1(q,r,s,t) = 0$  holds. This region is the “lower level of integration”—e.g., physicochemical processes which are not occurring in protoplasm. On the other hand, there is another region—the “emergent” region—in which  $f_2(q,r,s,t) = 0$  holds,  $f_1 \neq f_2$ . And a claim of *this* kind is mathematically unexceptionable, since it amounts to no more than the claim that a function may graduate the empirical data in restricted regions but break down when extrapolated. Such a “breakdown” does not mean, however, that the fit attained in either the subregion fitted by  $f_1$  or that fitted by  $f_2$  is a “chance occurrence.” The fit may be excellent, and the demarcation of the regions precise (or, if gradual, thoroughly lawful) so that the “chance occurrence” interpretation is as definitely excludable as it ever can be by inductive methods. It should be noted that phenomena in describing which scientists speak of “laws of composition” belong to this category.

But while the notion of different regions in the fourspace  $qrst$  exhibiting different functional relationships is mathematically unexceptionable, is it emergence? Here the first thing to note is that the notion, as such, involves no “supervenience.” For (a) no emergent variables have been introduced;  $f_1$  and  $f_2$  being functions of the same four variables; and (b) it is not being claimed that there are ‘piggy-back’ regularities. When a situation exhibits a constellation of values of  $q$ ,  $r$ ,  $s$ , and  $t$  falling within region<sub>1</sub> of the fourspace, it is not exhibiting a constellation falling within region<sub>2</sub>, and vice versa. When a situation conforms to  $f_2$ , it is not conforming to  $f_1$ , and vice versa. Thus, to the extent that ‘emergence’ connotes the simultaneous presence in a single situation of two

or more levels, the notion we have been analyzing is not, as such, a matter of emergence. This, however, is not to say that there is no philosophical use of “emergence”—a use, that is, to connote something of philosophical interest—according to which cases of this kind are cases of emergence. Thus, the mere fact that the highly complex organic compounds which are found in protoplasm made their appearance late in the history of the universe would *not* be a fact of emergence in any philosophically interesting sense. But if we add to this the notion that protoplasm exhibits a constellation of physicochemical variables which belongs in a region of the n-space defined by those variables that conform to a different function than do the regions to which belong constellations exhibited by less complex physicochemical situations, then the use of the term “emergence” seems not inappropriate. And, indeed, many philosophers who have made use of the concept of *levels of integration* or *levels of causality* seem to have had something like the above in mind.

But it is reasonably clear that most emergentist philosophers have had something more in mind. They have spoken of the emergence of *properties*. And while there is a usage of “property” (in the sense of *dispositional property*) in which to mention a property of an object is to mention a functional correlation exhibited by that object—so that to say, for example, that protoplasm has an emergent property would be just another way of saying what was said above in terms of different functions holding for different regions in the n-space of physicochemical variables—not all the ‘properties’ that have been said to ‘emerge’ can be given this interpretation. Thus, the qualia of feeling and sensation have been said to emerge. It must be confessed, however, that emergentists have tended to lump into one category of “emergent properties” items which require radically different treatment, e.g., *sense qualities, life, purpose, value, thought*.

#### IV

We are now in a position to make a more penetrating analysis of Pepper’s claim that theories of emergent qualities are committed to epiphenomenalism. If determinism is assumed, so that these qualities are themselves lawfully related to the lower level variables, then it must be granted that descriptive laws predicting the course of the latter can, in principle, always be formulated in terms of them alone. For suppose

the emergents to be  $a$  and  $b$ , depending for their appearance upon, say, appropriate values of  $q$ ,  $r$ ,  $s$  and  $t$ , so that, for example,

$$\begin{aligned} a &= g(q,r) \\ b &= h(s,t) \end{aligned}$$

then the function which adequately describes the interrelationships of the inclusive set of variables  $(q,r,s,t,a,b)$ , call it  $E(q,r,s,t,a,b)$ , can be written without  $a$  and  $b$ , for it can be written as  $E[q,r,s,t,g(q,r),h(s,t)]$  or  $f_3(q,r,s,t)$ .

Now Pepper at this point develops an argument which can be represented as follows:

1. Unless  $f_3(q,r,s,t)$  is equivalent to  $f_1(q,r,s,t)$ , they cannot both hold (and, of course, Pepper is quite right if both  $f_3$  and  $f_1$  are intended to cover the entire fourspace determined by these variables).

2. But for  $f_3$  to be equivalent to  $f_1$ , is for  $a$  and  $b$  to be epiphenomenal. (Again Pepper is quite right on the same condition we have pointed out in our comment on 1.)

3. Thus, if  $f_3$  holds, and  $a$  and  $b$  are *not* epiphenomenal, then  $f_1$  cannot hold. In other words, if  $f_3$  holds and  $a$  and  $b$  are not epiphenomenal, then  $f_3$  must hold both ‘before’ and ‘after’ the appearance of  $a$  and  $b$ .

4. But  $f_3(q,r,s,t)$  is just another way of writing  $E(q,r,s,t,a,b)$ . Therefore, both ‘before’ and ‘after’ integration the phenomena in question are adequately described by the function  $E(q,r,s,t,a,b)$ .

5. Thus, the supposed emergents  $a$  and  $b$  “have to be included among the total set of variables described by the lower level functional relation; they have to drop down and take their place among the lower level variables as elements in a lower level shift” (pp. 242-43).

However, once we drop, as we have seen we must, the assumption that  $f_3$  and  $f_1$  are intended by the emergentist to hold for the same regions in  $qrst$ -space ( $f_3$  presumably holds for all regions,  $f_1$  only for the “lower level of integration”), the argument falls apart. For while the emergentist must indeed admit that if  $f_3$  and  $f_1$  are equivalent, then  $a$  and  $b$  make no difference, it is open to him to say that the difference made by  $a$  and  $b$  is just the fact that  $f_1(qrst)$ , which holds in regions of  $qrst$ -space which are unaccompanied by  $a$  and  $b$ , is not equivalent to the function which holds of these variables for regions in which they are accompanied by  $a$  and/or  $b$ .

## V

A survey of the literature makes it clear that ‘sense quality,’ ‘sensa,’ ‘raw feels,’ ‘(sensory) consciousness’—the terms are almost as numerous as the authors—are among the more confidently backed candidates for the role of emergent. And it may be helpful to conclude our examination of emergence on the more concrete note of a discussion of certain logical aspects of this particular claim. In doing so, however, we shall avoid, as far as possible, those labyrinthine issues concerning the sense, if any, in which sense qualities, supposing them to be emergent, can appropriately be said to be ‘in’ the brain. It should, however, be pointed out that this problem concerns the structure of a (future) *scientific* account of sensory consciousness, and it must be carefully distinguished from the problem of analyzing ordinary language to determine the relation of talk about seeing colors, feeling pain, having an itch, etc., to talk about the body and bodily behavior. Science has the task of *creating* a way of talking about the sensory activities of the central nervous system, not that of analyzing antecedent ordinary language about sense experience. After all, we were talking about seeing colors and itching long before there was such a notion as that of the C.N.S., and long before it was realized that the brain had anything to do with these matters. Our present concern is with a possible logical feature (namely emergence) of the coming scientific account of what goes on “in Jones” when common sense correctly says that Jones is seeing green or has a toothache, etc.

Now, to suppose that “raw feels” as we shall call them, will be found to be emergent—though not epiphenomenal—in this future scientific account, is to suppose that raw feels (or, better, raw feel dimensions) are the *a*’s and *b*’s in the *generalized* function

$$E(q,r,s,t,a,b) = f_3(q,r,s,t)$$

where

$$\begin{aligned} a &= g(q,r) \\ b &= h(s,t) \end{aligned}$$

That is, raw feels depend upon the variables  $q,r,s,t$  which also characterize pre-emergent situations. But raw feels do not occur in the presence of matter generally; only matter as it is in the living brain. The function  $f_1(q,r,s,t)$  which fits the behavior of matter

everywhere else, breaks down when applied to brains. This, as we have seen, is the sense in which raw feels “make a difference.”

But how will the scientist be led to introduce raw feels into his picture of the world? Will he, indeed should he, not be content with noting that one region of  $qrst$ -space conforms to  $f_1$  whereas another region (roughly brains) conforms to  $f_2$ ? Or, to put it differently, constructing the function  $E[q,r,s,t,g(q,r),h(s,t)]$  which combines these into one function holding for the entire space, what would lead him, as scientist, to speak of the part-functions  $g$  and  $h$  as correlating values of the lower level variables  $q,r,s$ , and  $t$  with values of raw-feel variables? Now one answer would be that, after all, we experience raw feels, and it is the business of science to fit them into its world picture. And even in the present primitive state of psychophysiology we can confirm certain crude functional dependencies both of the (psychophysical) kind  $g$  and  $h$ , and of the (psychopsychical kind  $f_3(q,r,s,t,g,h)$ .

But the controversy over Behaviorism has made us sensitive about the scientific standing of ‘sensations,’ ‘images,’ and ‘raw feels’ generally. Thus, it is often thought that the only concept of ‘seeing green’ that belongs in a scientifically constructed psychology is one that is defined in terms of molar behavior. And it is obvious that at best such concepts would designate correlates of raw feels, and not the latter themselves. But how could we legitimately introduce raw feels or other emergent qualities into the “psychology of the other one?” Here we have to distinguish between “descriptive” and “theoretical” aims. While it is true that prior to the examination of living brains, the function  $f_1$  was quite adequate, and though afterwards we saw that  $f_2$  was required for the case of brains, this does not force us to introduce the new variables  $a$  and  $b$ . For, as we have seen,  $a$  and  $b$  are eliminable from the descriptive laws. Nevertheless, the introduction of these new variables might be ‘forced’ upon us by theoretical necessities (insofar as we are ever forced to make theoretical sense by the postulation of hypothetical entities). For example, a brain consists of matter of special kinds in certain arrangements. Complex hydrocarbon molecules, potassium ions, free iron, and electromagnetic fields exhibit certain “exceptionless” regularities (outside of brains) which correspond to Pepper’s  $f_1$ . Many arrangements turn out to be such that we can deduce their properties, including the ways in which the components will behave *in situ*, from the  $f_1$  functions. But for living brains this turns out not to be the case.

The flow of electrons at the synaptic interface “breaks the laws.” But it is not lawless, since the more general function  $f_3$  takes care of it. However, we were able to derive  $f_1$  from other laws, those of the microtheory, involving only variables  $q, r, s, t$ . When we have succeeded in working up a theory which will enable us to derive  $f_3$ , the theoretical primitives include other terms than those which were sufficient for an explanation of pre-emergent phenomena. These other terms— $a_1, a_2, a_3$ , etc.—are the items to which the variables  $a$  and  $b$  pertain; and while we can write  $a$  and  $b$  as functions ( $g$  and  $h$ ) of  $q, r, s$ , and  $t$ , it should not be supposed that the  $a$ 's have thereby been shown to be analyzable into the entities for which  $q, r, s$ , and  $t$  in turn suffice as descriptive functors. If this seems odd, one should remember that whenever a theory is “correct” it means that we have succeeded (among other things) in formulating a lawful relation between a value,  $x$ , appertaining to the theoretical entity and a value,  $y$ , taken on by the observed. Hence, in the present case we can write an equation explicitly relating these *values*,

$$x = f(y)$$

But the fact that we can write this equation obviously does not mean that the entity to which the value  $x$  appertains is being equated with the situation to which the value  $y$  appertains, any more than the discovery of a functional relation between a person's height and weight would require us to suppose that somehow a person's height is the same thing as his weight.

Now an argument offered by Pepper in the closing section of his paper hinges partly on a failure to make this last distinction.

It is a natural ideal of science to derive all laws from a certain limited number of primitive laws or principles—not necessarily from one single law—and so to convert science into a mathematics. If it could be assumed that there are no chance occurrences such a system of laws should be obtainable, though it might look very different from the traditional mechanics. The assumption of science appears to be that such a system is obtainable. I do not know what else the dissatisfaction of science with inconsistencies could mean.

Now, there seems to be no intention on the part of emergent evolutionists to deny that such a system is possible or to assert that there are chance occurrences. If that is so, they seem to be faced with the following dilemma: either the emergent laws they are arguing for are ineffectual and epiphenomenal, or they are effectual and capable of

being absorbed into the physical system. But apparently they want their laws to be both effectual and at the same time no part of the physical system...(pp. 243-44)

First a terminological point. Among the various meanings of the word *physical* let us distinguish the following for present purposes:

*Physical*<sub>1</sub>: an event or entity is *physical*<sub>1</sub> if it belongs in the space-time network.

*Physical*<sub>2</sub>: an event or entity is *physical*<sub>2</sub> if it is definable in terms of theoretical primitives adequate to describe completely the actual states though not necessarily the potentialities of the universe before the appearance of life.

Now, an emergentist account (of the kind we have been constructing) of raw feels denies that the latter are *physical*<sub>2</sub>. But this in no way involves the denial that they are *physical*<sub>1</sub>. And indeed this emergentist account definitely gives them a *physical*<sub>1</sub> status. And if the equations

$$\begin{aligned}a &= g(q,r) \\ b &= h(s,t)\end{aligned}$$

permit the elimination of *a* and *b* from the descriptive function relating the *physical*<sub>2</sub> variables *q,r,s*, and *t*, this fact, as we have just seen, by no means involves that the emergent entities with which the variables *a* and *b* are associated must also be *physical*<sub>2</sub>.

Whether or not there are any emergents in the sense we have sought to clarify is an empirical question. Our only aim has been to show that Pepper's "formal" demonstration of the impossibility of nonepiphenomenal emergents is invalid.

#### REFERENCE

1. Pepper, Stephen C. "Emergence," *Journal of Philosophy*, 23:241-45 (1926).