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On the subject of ontology, again

As we have indicated so far, in reflections upon the material I have covered in this series and in other writings published earlier, the crucial issue of science, of knowledge in general, and of policy-shaping, therefore, is the issue of the notion of *ontology*, of being in the sense of substance: What is substantial?

In general, I have cautioned people that causality is the key to being. That which efficiently causes something to occur, and which is the subject of causation in a reciprocal manner, is essentially what we should mean by *being*. As to how being elaborates itself, that is something for us to discover. But in starting out, we must reject simple perception, sense perception, as a definition of being, and must have a more general notion of being which covers all cases, that is, which is of universal applicability.

I shall indicate some of that now, and go through an



Old man in contemplation; experiments in varying the velocity of water—two pen and ink studies on a single sheet, by Leonardo da Vinci (1452-1519). All being is associated with motion, or more generally, with becoming, with change. And change has two aspects: that which is representable in a linear way, and that which is a qualitative change.

exercise, essentially Socratic in its character, though not necessarily always Socratic in its form. I tend, in summation of the argument, more to the didactic, and leave the Socratic to the pedagogy of the classroom, or similar circumstances.

Let us start with being.

All being is associated with *motion*. This motion occurs in two primary ways: Either we perceive the being, the entity in question, to move with respect to the physical space-time in which it is situated, or, we see it not to move, but, that is, relatively to move with respect to the motion occurring about it. So in both cases, the notion of being is associated with motion.

It is associated more generally with *becoming*, with *change*. And change has two aspects: the linear aspect of change, or that which is representable in a linear way; and that which is not representable in a linear way, i.e., a *qualitative* change, we tend to say.

In this vein, on the simplest level, the preconditions for defining simple existence are, in order, first of all, motion, which signifies, generally, matter-motion, as a most common reading of that. And secondly, the motion of change of quality of motion, accompanying a simple matter-motion. This relationship of the two, as qualified in the second observation, is very important to bear in mind.

There is another consideration of universality which comes in in a different way here, negatively. Suppose we were to reject either of these two conditions, or to qualify them. Then we would have a real problem. Because our definition of substance, of being, implicitly, is that it is substantial in respect to all possible conditions of the universe.

Now how would we observe all possible conditions? What would we mean by "all possible conditions"? Or, reciprocally, what would we mean by failing to meet the standard of all possible conditions? In other words, all we would have to do, according to this line of argument, is to prove that in one case the entity responded to the universe in a manner as if the universe did not exist.

For example, if you imagine a great explosion, a couple of kilotons or megatons of dynamite goes off next to a fellow, who is walking. Everything around him is blasted, tattered, ruined, except he continues to walk through blithely, as if nothing had happened. We would say, well, this fellow cannot possibly exist. This must be a phantasm. It cannot be a real person.

Therefore, something that fails to respond appropriately to action of the universe more generally, even in one case, puts upon itself a question mark as to its existence.

This may involve, in some exceptional cases, all kinds of subtleties, which might be explained away, as in the kind of case I just used for illustration. But, nonetheless, if we cannot explain it away in a consistent manner, then it does not meet the criteria of being.

Therefore, that is our crucial, negative test: It must be efficient in its action upon the universe, and the universe

must be efficient in its action upon it. And that must be universal. A single exception tends to call that being into question. Therefore, universality of substance implies universality of response, as well as universality of its causal efficiency as an existence. It must respond as an efficient existence, in all possible motions and states, i.e., qualities of motion, in the universe. There may be, according to the rules, reasons why it should not appear to react in certain cases, though it actually must react in all cases, whether it appears to or not.

This sort of notion leads us to the question of *transfinite being*. Transfinite being, as a notion, starts out as a very simple kind of Socratic idea.

Let us take, for example, numbers. We have all kinds of numbers. Let us take the numbers in the proper fashion, not arbitrarily. Let us take them without fooling anybody; let us take them geometrically. Well, the number *one* has a very simple significance. And so does *zero*. *One* and *zero* have a very simple significance in geometry. Well, we make constructions. And as we make constructions, the simplest plane figure we can make is the triangle and so forth. We can make quadrilaterals and so forth, and so on, plane figures. Out of this we get notions of construction, which are generating plane areas and their roots by products of linear magnitudes. A very simple kind of case. One can try to generate the field of integers, so far, in that way, and other numbers that fill in between integers. We find out that we have rational numbers, which can be constructed that way. Then we have a number of irrational numbers. Then we have various orders above the irrational. We have the transcendental numbers, and we have much higher orders than simple transcendental numbers, which can be generated in the manner which Gauss has indicated, and as Cantor has indicated this problem.

We get into larger geometric numbers, as Gauss does. We get into the so-called imaginary and complex numbers, which are not really imaginary, and which are quite clearly classes of geometric numbers. They tend to fill up the gaps in between, leftover in-betweennesses not filled in by all inferior sorts of numbers.

So, a general notion of number arises, not from particular experience, but by trying to approach universality by the method of successive transfinite orderings. So, hard proofs and strong proofs all involve universality. They involve universality positively, and they involve it negatively. We have referred to the negative above. We have referred to the single crucial experiment, which is a negative demonstration, tending to jeopardize the claims to being of something. And we have the more profound sort of negative inquiry, which may cause us either to abandon the definition of being for something, or to redefine it in a qualitatively new way.

In this process, as we have done in the foregoing sections, with intermezzi and affirmation, we have defined that the change of quality of motion comes close to the proper definition of substance, that is, it covers universality. This must



The "Virgin of the Grotto" by Leonardo da Vinci (1483; Paris, Louvre Museum) shows the Virgin Mary, the Christ Child, and an angel as the infant St. John the Baptist approaches them, in an unusual grotto-like landscape. "The idea of beauty, as we associate it with great classical art, emphasizes an aspect of the creative processes of mind, which is otherwise essential to creative scientific work."

be the case, because any simple motion cannot be universal. There will be cases in which this particular motion does not exist, or in which the universe is expressing itself in a different quality of motion, in which the universe is changing the quality of motion. So we cannot have a response, unless we fill up the gap of change of quality of motion. That leads us to a further consideration: the rate of change of change of quality of motion, or rate of change of rate of change of quality of motion. That begins to bring us to a kind of universality, in which the higher ordering of the functional notion of rate of change of rate of change, does pretty much on the third level of change of quality of motion everything we need

to do in an ordinary way in representation.

Very simply, having come that far, let us look at our mathematics.

Simple, discrete matter does not exist, as in the sense of a perceptual discreteness, as an object of touch, as an object divorced from motion. That kind of substance does not exist. It cannot exist in our universe. Secondly, even simple motion cannot exist as something primary in our universe. It does not meet the qualifications of substance in any aspects of substantiality. It is not being, it is not substance. Nor is a rate of change in quality of motion adequate. We have to generalize the notion of a rate of change of rate of change of quality of motion, and then we have, at least verbally, encompassed in a general way the kind of definition of being we require.

That being the case, let us do a very simple thing. Let us look at the domain of physics. Let us not be totally naive. Let us take into account the notion of curvature of physical space-time which has been explored and pretty well refined, and which we have dealt with in various ways, in qualifying the implications of Kepler from a more advanced standpoint, say that of Gauss, Riemann, and Beltrami, and so forth. Into that space-time, let us introduce this notion of rate of change of rate of change of quality of motion, of matter-motion. And let us put that into any relativistic physics whose relativism is defined from the constructive geometric basis in terms of a curvature of physical space-time.

If that is the most primitive substance, look at what we have said earlier about the relationship between the individual monad and the universal. Let us suppose the monad is somewhere in the order of a Planck distance. Suppose we squeeze it down in there someplace. We do not simply have a little black hole there; we have something that is very busy, with more lights than the thousand points of light that George Bush has been looking for lately. Very complicated, very active substance in there, nonlinear also. But from our standpoint, the substance in there, since it is cognate with the universal in particular, the substance of universality and the substance in that monad is of this nature: It is of the nature of a function describing a rate of change of a rate of change of the quality of motion. It is not only that: The function implies the ability, a method, for increasing that function; an increase which we can measure, in the first approximation, with a notion borrowed from Georg Cantor of an increase of the enumerable density of apparent mathematical discontinuities for interval of action. The interval of action being, say, this Planck distance. There is an arbitrary choice, consistent with Cantor's definition of an arbitrary choice, for that kind of comparison.

That becomes, then, simple matter. It is simple matter, of course, in the case of an individual human being endowed with sovereign, creative reason.

But we also referred earlier to the other kinds of little monads kicking around the universe that do not have any

intelligence, that do not have any creativity—little pieces of dirt, for example. We said that these things have to *react* to the universe, which is *characterized* by the relationship between that higher monad and the universe as a whole. Therefore, the lawfulness governing that little piece of dirt there, in its motion, is determined in reference to the higher degree of motion, that is, the motion of the mind of man, of reason, with respect to the universe as a whole. Thus the laws that we adduce concerning the nature of substance, from the primary relationship, that of the individual human being to the universe as a whole, define the laws of the universe in which that little piece of dirt is functioning and having its relationships.

Thus, the simplest rigor of reason requires us to turn, so to speak, the entirety of physics on its head, in the sense that physics and simplistic physics, or accepted classroom versions of physics, attempt to reduce everything to derivation of the articulated from the simple, where in point of fact, the simple is determined by the increasingly self-articulated substance, in the sense we have defined. So, this defines another way of looking at the problem we have been discussing so far. A way which, of course, must be included in an all-sided treatment of the problem.

Finally, let us return our attention to the subject of creative reason as experienced by the human mind, as the map of physics and as the proper reflection, within itself, of the laws of the universe as a whole.

Let us look at this from a different standpoint, the standpoint of method, historically, and recognize that this is precisely the secret of what is called the Socratic dialectical method.

By recognizing that the individual creative reason, as a

sovereign capacity of the person, was essentially in unmediated relationship to the universal, that is, directly, Socrates struck upon—whatever sources he used for this discovery—the essence of all science and all knowledge. We seek universality by eliminating those underlying assumptions which fail to be universal, and whose failure is demonstrated to us, or can be demonstrated to us by the means internal to the sovereign faculty of creative reason within each person.

The limitations placed upon this are, of course, empirical. That is, the mind cannot know more than it knows as an interpretation, in a sense, of the falseness of perception. In order to understand the falseness of the misleading character of perception, we must have perception, empirical, or we must have the absence of a perception where that perception is to be expected according to some prevailing, accepted set of assumptions. That is really all there is to it.

The Socratic method rests, in fact as it does implicitly, by the very use of it, upon the evidence that the sovereign creative reason, intrinsic to the individual human mind as potential, is in an unmediated direct relationship with the universal. And that, by exploring that, we have, in a sense, the perfect mathematical physics, given to us, as it were, *a priori*, but not in Kant's sense; not a specific physics, but we have the map of mathematical physics, which enables us to exclude all formulations which we attempt to force upon that map, which do not fit the map. Otherwise, it is as I have said, that the relationship between the monad, as a monad, which we are, and the universality, particularly the unmediated aspect of that relationship, which enables us to know, and to prove, that the Socratic method is a true one, and a uniquely true one.

That completes Project A.