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THE MODERN DENIAL OF LATENCY

I

It is a fact, startling but none the less true, that a man's entire philosophy of life hangs upon his views concerning a very out-of-the-way and apparently academic puzzle. Put in its most general form the puzzle is this. It often happens that an "entity"—a physical object or anything else supposed to have real existence—disappears so completely that no amount of investigation can detect its presence at all. Then, maybe, it will as suddenly turn up again as if from nowhere and leave us baffled as to what could have happened in the meantime. And the question is, What *did* happen?

Now it is obvious that such a puzzle admits of two kinds of solutions—either the "entity" is present all the time, but cannot be detected for lack of suitable apparatus, or else it actually disappears in the interval. And some people tend to choose one solution and others the other, although it is not everyone who observes that one of the profoundest issues of life may be summed up in the form of a riddle so apparently divorced from reality.

The memory of thought affords a good example of the difference in attitude. Suppose a thought to be forgotten and then remembered—is it believable that the thought did not exist somewhere in the interval?

"Our memory faileth us in our sleep [wrote Richard Baxter, in his *Immortality of Man's Soul*, 1682] and yet when we wake, we find that there remains the same knowledge of Arts and Sciences. They did not end at night and were not all new made the next morning."

But there are others who can tolerate no such "mysticism". If an entity defies all powers of observation, who has a right to claim that it exists at all? The other side of the moon is invisible from the earth, but what should we think of one who boldly maintained that purple elephants roamed its mountains? "An idea persisting between its successive appearances in consciousness", wrote William James, "is as mythical an entity as a jack of spades." Or, to quote Rignano, such an idea "is neither conscious nor unconscious; it does not exist".

Here are two antagonistic ways of thinking. And history seems to show that the second is comparatively modern—or rather that it has only comparatively recently achieved any degree of respectability. In no small measure this change has come about through the philosophy of positivism sponsored by Auguste Comte. Comte urged repeatedly that nothing should be postulated unless it could be discovered. He saw that many of the greatest scientific and philosophical difficulties arose because men insisted on asking too many questions. They observed a definite event and, determined to find some explanation, they endowed nature with invisible entities which “caused” the event. Thus the physicist observed a stone falling and, instead of confining himself to the fact of the motion, he felt drawn into hypostatizing an imaginary “force”—undetectable and unknowable by any direct means—which was supposed to “pull” the stone downwards. Now Comte urged that all such “explanations” were the bane of knowledge—they usually caused contradictions before long and the best thing to do was to eliminate them ruthlessly.

II

Contemporary writers soon pointed out that such a solution was no solution at all. Complete positivism was a funeral of the reasoning powers, for unless hypothetical entities at the back of phenomena were postulated, science could offer no problems, since observed events could never be related. Moreover, it soon ended in absurdity. A straight tube half immersed in water appeared bent but might yet appear straight at the same time if an object was viewed through its centre. Thus a perfectly straightforward observation was inconsistent with itself and, so physicists urged, the only possible way out of the difficulty was the orthodox one of inventing invisible “entities”. The water possessed a power of refracting rays of light, but this “refraction” was not itself observable.

In face of such objections pure positivism was never able to flourish, yet it was clear that it contained an element of truth. The time came when the physicists, true to their principles, had been forced to postulate a dozen ethers all with different and inconsistent properties. It seemed obvious that something was wrong, but it was not for a long time that any solution was found.

Then it dawned upon the founders of modern physics that perhaps further progress could only be made by adopting a species of positivism in physics itself. They decided to see what could be done if no statement were allowed to pass in physics unless its truth could be tested by experiment. Accordingly, the material ether of space was abandoned. Einstein rejected the universally held notion that two events in different places could take place simultaneously (for there was no conceivable physical means of detecting whether they did or did not) and many strange consequences followed. Ten years ago the subject entered yet a new phase. Heisenberg realized that there was no way of testing whether the movements of small particles such as electrons were dependent on their previous motions or not—no way of finding out whether causality was real or no. Accordingly the famous principle of “indeterminacy” came to find a place in physics, and it has remained to the present time.

III

At first sight all these developments appear as if they constituted an overwhelming victory for positivism. Indeed, these ideas have already been transferred from physics to philosophy to such an extent that many a university graduate or even undergraduate will say with a shrug of his shoulders: “In matters of religion I am willing to adopt the basis of the quantum mechanics—I shall only accept statements as true if they prove to be directly susceptible of experimental proof.” Thus there can be little doubt that much of the modern stimulus to materialism—using the word in the widest sense—has come about through an analogy of this kind. Materialism in its ultimate sense must mean, not the old-fashioned doctrine that all things consist of matter, for physics, the most materialist of the sciences, deals with things other than matter—but the refusal to believe in things unseen. Put in other words, it is the denial of latency.

But is the doctrine of latency really on the decline in physics? Among the masses this is certainly supposed to be the case, and the belief is largely fostered by the writings of the rationalists. But the supposed decline of latency in physical science is largely imaginary. Both Frenkel and Silberstein have pointed out that even the indeterminacy principle is nothing new. It was adopted by Newton. His corpuscles of light had

“fits”—in modern parlance, free-wills or probabilities—which decided whether they would go through a pane of glass or rebound from its surface. This view is the very one to which science has now returned. And all through the nineteenth century it was recognized that measurements could not be made with infinite accuracy. The Victorian scientist had not yet become interested in the absolute limit to which measurements could be made, but the fact that there was always a small margin for error never made him doubt the doctrine of determinism. Even in the field of the new physical discoveries, there is no real ground for doubting latency—for doubting that although certain minute velocities and positions cannot be measured, they exist none the less. That, at any rate, appears to be the view held by many of the physical scientists who have developed these modern ideas.

Yet, whatever the truth about electrons, one fact must not be overlooked. There are still whole branches of knowledge where latency is tacitly accepted—and forgotten. In their wild enthusiasm many think that they are now able to confine themselves to observables. They can do nothing of the kind. Such a concept as latent or “potential” energy is still enthroned in physics. When a stone is lifted, energy vanishes. The stone seems to be the same stone, unchanged in every respect. The space beneath it is likewise unchanged. Energy has vanished—no attempts to find it have ever resulted in success. Yet physics still believes in the law of the conservation of energy. It is still supposed that the energy has hidden itself in some unobservable state and is not recreated anew when the stone is allowed to fall. Here the doctrine of latency remains unquestioned.

IV

Again, latency still stands at the basis of chemical science. Every schoolchild learns that two elements combine together to form a compound and that the new substance is now wholly different from its constituents. But why is it supposed that the constituents are there at all? They cannot be detected. Why should not old substances simply vanish away and new ones take their place? There is no chlorine in salt, no iron in iron pyrites. If they are there at all they must be present in a latent condition. It is as if a conjurer has some cards which he causes to vanish or

appear at will. When they have vanished, some feathers appear in their stead; but no amount of inspection can tell us where the cards have gone to. The only evidence of their existence seems to be that the conjurer does not alter in weight if he is made to perform his tricks on a weighing machine. The mysterious cards retreated into a "latent" condition from which he causes them to spring to light. It is the same with the atoms. Unless invisible and undetectable things are postulated there can be no science—science depends upon the doctrine of latency. Those who think otherwise have only reached their present position by its aid, and have failed to notice the fact. They are seeking to renounce a tool of thought on which their very thinking is founded.

That this is the correct diagnosis of the matter also appears from another consideration. We have seen that the whole object of the indeterminacy principle was to avoid latency. But if, as has been maintained, science cannot exist without latency, it would seem that those who consciously reject it in one form might easily accept it unconsciously in another. Now it so happens that, as Dr. Dingle has pointed out (e.g. *Nature*, September 14th, 1935, p. 423), this is exactly what has happened. "Probability" is itself a latent concept—except for the cases in which there is a dead certainty one way or the other no one can test whether a given probability has exactly such and such a value. Therefore, by the very principle on which modern physics is supposed to rest, probability itself ought to be eliminated. The mere fact that particles are still spoken of as if they possessed a "probability" only shows how naturally the human mind turns to latent properties in order to explain real events.

But latency has not merely failed to become redundant with time: it has led the human mind on from strength to strength. In no department of knowledge, perhaps, has this been more striking than in the study of heredity. Habits and structures often skip a generation or two, only to appear once more. Here, if anywhere, these latent characters are absolutely unobservable. But do they exist? Geneticists have shown abundantly that they do. The recessive character can be located in the chromosome map and the circumstances under which it will come to light are predictable. Yet all is done with the eye of faith—the latent character is never observable, though without it there would be no science of genetics.