The Unseen World Behind

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When a physicist glibly speaks of submicroscopic bodies, atoms, molecules, electrons, protons and others, we take him at his words and try to visualize these minute inhabitants of a subterranean world—subterranean indeed, for the microphysical world is at the bottom of the apparent one, the macrophysical. We are told that these infinitesimal particles are the primordial stuff of this world and as such they are more real than the world of actuality given to our senses. The objects we see and touch are said to be 'gross', they are made out of the fine elementary grains of matter. The physicist tells us further that these grains can never be seen by us because they are much smaller than the smallest wavelength of visible light and they cannot be felt by touch because they are much smaller than the nerve-cells in our tactile mechanism. Yet he believes them to be existing, and one most eminent amongst them, Einstein, hopes that one day we may develop finer perceptive faculties to observe these minute particles. This hope implies a very strong belief in the real existence of the submicroscopic bodies.

Light is regarded as made of waves in a hypothetical medium called 'ether'. A wavelength is but the distance between two adjacent crests in a wave. The smallest wavelength to visible light is that of the extreme violet light and this is $\frac{4}{100000}$ or .00004 centimetre. An atom has a diameter of $\frac{1}{100,000,000}$ or .00000001 centimetre. A molecule is about twice as big. An electron, proton or a positron is 100,000 times smaller than an atom. The non-perception of these fine bodies is believed to be due to the limitation of our perceptive powers and not to any lack of reality in the bodies themselves. Thus if we could see very short waves of light, for instance, Gamma-rays and X-rays, we might have seen these fine bodies and if our tactile nerve cells were finer than these particles we might have felt them by touch.

But this faith in the unobservables has been questioned by a school of scientist-philosophers who call themselves logical positivists. They are positivists inasmuch as they believe in the observed only, they accept the physical and reject anything metaphysical. They are logical since they subject all our ideas to logical analysis and find out their physical basis, that is to say, they enquire how we have arrived at these ideas from our actual experience and how to verify them. If it is found after such an enquiry that an idea cannot be verified by actual experience, that is, either by observation or by experiment, the idea is rejected as a mere figment of our mind, it is called a pseudo-concept. Thus, according to this school of scientific philosophers, atoms, molecules, electrons, etc., have no real existence, they are our creations, mental constructs to describe the observed

phenomena in a short and simple manner. They are, therefore, characterised as 'mental summaries of experience' or 'routine of perceptions'. 'Atoms and molecules are intellectual conceptions by the aid of which physicists classify phenomena and formulate the relationships of their succession'. (Karl Pearson: *Grammar of Science*, p. 95). Again, 'To no concept, however valuable it may be as a means of describing the routine of perceptions, ought phenomenal existence to be ascribed until its perceptual equivalent has been actually disclosed'. (ibid., p. 277).

The older school of positivism was represented by such scientists as Mach, Poincare and Pearson. The modern school of logical positivism is much more radical and it is represented by the scientists of the Vienna Circle, Wittgenstein, Schilk, Neurath Cornap and others. We can contrast these statements with one from a realist. 'Atoms are just as real things as cannon balls or grains of sand, as waves on water or mountains'. (B. Bevink: *The Natural Sciences*, p. 29).

So we are puzzled. Should we believe the realists in science or the positivists? Should we regard atoms, molecules and others as realities or as fictions?

To come to an answer to this very important question in scientific philosophy, we have to look into the method of theoretical physics and see how it arrived at these invisible submicroscopic bodies. We shall here follow the advice given to us by Einstein himself. 'If you wish to learn from the theoretical physicist anything about the methods which he uses, I would give you the following piece of advice: Don't listen to his words, examine his achievements. For to the discoverer in that field, the constructions of his imagination appear so necessary and so natural that he is apt to treat them not as the creations of our thoughts but as given realities'. (*On the Method of Theoretical Physics*, p. 5). Incidentally we note that Einstein, though he is a realist and a believer in the real existence of the microbodies, is, nevertheless, aware of the fact that our mental constructs come into play in our scientific research work and that the physicists mistake these mental creations for physical discoveries. So he advises us to examine the physicists' work and not to rely upon their words.

Let us then peep into a physical laboratory where microbodies are said to be *discovered*. We learn at the very start that the physicist does not discover an atom or a molecule as an astronomer discovers a new planet or a chemist discovers a new element. The physicist postulates (i.e. supposes) the existence of atoms and molecules just as his colleagues in sister sciences do, but when the latter are busy in verifying *directly* their postulates by observation or experiment, our physicist is busy in verifying his postulates *indirectly* through looking for some consequences which should follow from them. An example or two will make it clear. The astronomer observed certain deviations from the normal in the movement of the planet Uranus and sought an explanation of this. He postulated the existence of some planet nearabout Uranus, which by its attraction might cause this deviation. On this supposition the position and motion of this postulated planet were calculated. But then the postulate had to be verified directly. So high-power telescopes were focussed in the region where the new planet was expected, and it was actually observed to be there. Thus the postulate of a new planet became a tested truth and the planet became a reality; it was named Neptune. Another example from chemistry may be given. Oxygen got from air was found a little heavier than that got from other substances. This led to the

postulation of a new element in the atmosphere which, it was supposed, might be mixed with oxygen got from air. This was directly verified by an experiment. The new element was isolated from oxygen of the atmosphere and its properties determined. Thus the postulate of a new element became a verified truth, the element became a reality and it was called argon.

But in case of the submicroscopic entities of physics direct verification is impossible. For, as we mentioned before, these particles are much smaller than the smallest wavelength of visible light. So they are indirectly verified, that is, the consequences from them are deducted and compared with facts. Thus in an ultra-microscope, a strong beam of light passes through a liquid solution and the molecules of the dissolved substance scatter the light. This scattered light is seen through the microscopic lenses, there appear in the field of the microscope brilliant specks of light dancing like light upon the rippled surface of a swift-running stream. Again when some gelatinous substance is dissolved in water, the particles of this substance, on examination through a microscope, are found to move hither and thither and to be never at rest. This behaviour (known as Brownian movement, after the name of its discoverer) is explained by supposing it to be a consequence of the movements of the molecules of water which hit the particles of the dissolved substance. So the molecules are but *inferred* from the phenomena of scattered light and Brownian movement, they themselves are never seen. Similarly, the atoms, electrons and other microbodies of physics are but inferred from certain other phenomena which they explain just as the molecules explain the phenomenon of scattered light. Thus the postulates in physics with regard to the unobservable entities are suggested by certain phenomena and their laws of recurrence, and these postulates are then indirectly verified by certain other phenomena.

When thus indirectly verified, these imperceptible entities are said to be inferred from their perceived consequences. But the mode of inference used here is a little different from the ordinary mode. Ordinarily we infer an observable thing from its observed consequence, for example, a fire from its smoke. In fact our inference is valid because we have previously seen on several occasions fire to be succeeded by smoke and we can also verify it by seeing it on the present occasion. But in the case of inference used in microphysics, the agent which produces an effect, the antecedent of a consequence, is never seen before nor is it seen afterwards, it is only guessed or imagined. This is why it is called a postulate (or a hypothesis), and even when we indirectly verify it by inferring the entities from their observed effects, our inference is not a proper and valid one, the postulate remains a postulate and is never raised to the status of a truth, either tested or inferred.

Naturally our faith in these entities is a little shaken after this scrutiny of a physicist's method of arriving at his infinitesimal particles, atoms, molecules and all the rest of them. Even if we accept the logical procedure he adopts as valid, (that is to say, even if we believe that an indirectly verified postulate yields truth), we feel some difficulty in regarding these microbodies as fully real, 'as real things as cannon balls or grains of sand', so that we cannot be complete realists like B. Bevink (whom we quoted before). The difficulty arises because we find that these atoms, molecules, etc., have only a few primary qualities, mass, size and motion, and they have no secondary qualities like temperature, colour, hardness

or softness, etc. For, to take one quality, temperature, it is a consequence of motion of a large number of molecules in a gross body; no single factory labourer when observed can give us any idea of a factory strike which is a consequence of a mass agitation. Thus those atoms, molecules and the rest cannot themselves possess the characters which they explain. They are the primordial stuff of the concrete world of qualities and as such they possess only a few primary qualities. 'The general principle involved is this, an entity which is postulated to explain a general property of observable entities must necessarily lack that property', says H. Dingle, an eminent astronomer-philosopher in his book *Through Science to Philosophy* (p. 285). So we have to imagine these microbodies residing in a subsensuous world where no quality is to be ever sensed by us and only a few primary ones, not all, can be supposed to be there. It is hard to believe in the reality of this world after all this analytical examination of the form and content of our knowledge about it. How can we grant existence to the queer infinitesimal bodies without qualities, ghosts of a dark sub-world, when we fail even to imagine them fully? Surely, it is a ticklish business, to make up our mind about these little imps, these microbodies of physics. We ask ourselves, 'Do they really exist?' and it seems we shall never get a clear answer. Perplexed to the extreme, we sometimes declare them to be but riddles produced by clever sophists of our day to fool us to the top of our bent.

One thing emerges from the above discussion: a thorough-going realism with regard to these particles is a matter of sheer 'will to believe' and very difficult to maintain on purely rational ground. But should we then turn to positivism and regard these particles as mere 'mental summaries' of experience and as having no existence, therefore, outside our mind? That they are ghost-like without many perceptible qualities is, we have to consider, not enough of an argument against their existence, for 'there are more things in heaven and earth than are dreamt of in our philosophy'. The positivists, when they reject the possibility of these unverifiable entities, commit one mistake—they thereby imply that what is unverifiable is non-existent, which goes against our common sense. The realists point out (and this agrees with our common sense) that there may exist entities that are beyond the reach of our senses. Our knowledge or the lack of it does not in the least manner affect the existence of things. Knowledge must be of the nature of a discovery, the thing must be there no matter whether we know it or not.

Again, we cannot definitely speak of anything as unverifiable, for the history of science tells us that what seemed to be unverifiable once was verified later. In fact, the positivists mean by 'unverifiable' what has not been verified and *not* what cannot be verified. And the fact is that the positivists cannot speak of anything as unverifiable for he has not verified this statement, he has to rely, according to his own principle, only on what has been verified by experience. No philosophy can lay down the limits of our perceptive powers; we may have direct extrasensory perception as mentioned in Indian philosophy.

So it is not inconceivable, though difficult to visualize, that there may exist entities which are at present unperceived and apparently unperceivable. Rather we would like to conceive a world of unseen reality beneath the obvious one. If we believe only in our immediate experiences and content ourselves with describing them as the positivists want us to do, we cannot be

exactly sure that there will be no inter-subjective intercourse and so, science would lose objective validity.

Positivism carried to its logical extreme leads us to subjective idealism or solipsism. This is also called 'egocentric predicament', a dangerous situation where one is shut inside his own world of experience and cannot communicate with others. Because there is nothing for him which is not purely his own experience, he does not believe in any metaphysical object. To escape this predicament we have to believe not only in the immediate and concrete data of our experience but also in some objective and universal reality behind this, in entities, for instance, which being observed by none can be described independently of any actual observer. That is, they will enjoy the status of objectivity and universality. In this sense the submicroscopic entities of physics are more real than the sensuous or gross reality. For that which has no definite form and which changes with time and observer cannot be more real than that which is the same for all time and all observers. Thus we can conclude that though these atoms, molecules, etc., are not given in our experience, and so lack some concrete reality, they are in a way more real than the experienced reality which is but a passing show having its objective ground not in themselves but in the unseen microworld.

This seems to be a satisfactory solution of our problem and a fair compromise between realism and positivism. But this excites one philosophical doubt. How can a substratum that is without certain qualities generate these qualities? This is an old suspicion against bifurcating nature into two parts, one perceptible and the other an imperceptible cause or ground of it. To avoid this dualism the idealists regard the permanent substratum as the only real and its changing qualities as appearance only, while the positivists regard the qualities as the only real and its so-called substratum as only an hypostatized entity introduced by science to interpret coherently the qualities. But these are dodges, this duality between sense-object and subsensuous scientific objects like atoms, molecules, etc., must be explained and not simply avoided by denying the reality of one or the other.

We shall adopt here the explanation offered by some naturalists who also believe in the emergence of higher qualities from the lower. They point out that in nature this 'emergent' evolution is a fact; the elementary particles, say electrons, have certain properties when moving haphazardly, but when they selectively enter into the stuff of an atom they are under a new kind of substantial relatedness and acquire novel properties. Thus atoms too, when they form molecules by selective synthesis, undergo a substantial change. No mechanical explanation is sufficient with regard to this emergence of new qualities which we have to accept as a fact with a natural piety. We cannot say why at a certain critical state this new relatedness emerges.

A more mechanical combination of electrons and protons cannot fully explain the concrete reality of the world. Emergent evolutionists admit the existence of the non-perceptible microworld of physics yet they seek to bridge the gulf between this and the perceptible microworld. For them the relation between the two worlds offers no great problem, it is regarded as intimate and admitted as a general fact. The other schools of philosophy, (positivism and idealism), it seems, have simply created this duality, and failing to solve it, cut the Gordian knot by accepting only one of the world as real and condemning the other as unreal. The realists have accepted both the worlds, but their attitude towards the

imperceptible entities is crudely realistic. The positivists have done a service by criticising this bold and dogmatic realism, but, as we saw before, positivism is not a very satisfactory philosophy about the status of the microphysical entities.

The solution seems to be a fair compromise between the two opposing schools of thought. We have accepted an imperceptible substratum for the perceptible world, the substratum being the ultimate microworld constituted of microentities like electrons, protons, neutrons and others. But a doubt arose from a suspected duality between the seen and the unseen worlds. This could be somewhat corrected by adopting the view of the emergent evolutionists, that is, by accepting in the evolution of nature the fact of emergence of new qualities out of the simpler ones. This is not a very satisfactory solution, for it takes for granted what demands explanation but, it seems, we have to content ourselves with it for the present. Everything cannot be explained all at once, there remains, and always will remain, some mystery, unravelled in nature. This makes nature so absorbing a study and natural philosophy so keen and full of possibilities. ■

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your particular devotional practice by worshipping the personal god, a particular form of the Ultimate Reality, there is the possibility that you may start looking down on other people. In that case, your *bhaktiyoga* becomes a source of ego in its own right.

The way out

In the *Gospel*, somebody asks Sri Ramakrishna: What is the way out? How to avoid self-deception? He mentions two things: '*prārthanā o sat-asat bichār*'—prayer and distinguishing between the real and the unreal, the path of perfection and the path of enjoyment. These are two of the three things I want to mention. First, '*sat-asat bichār*', mindfulness, discernment. This is something that all great saints have emphasized again and again. Be self-reflective, be mindful of yourself and the attitude that you bring to bear upon your spiritual practices. Catch yourself in the act of self-deception. Secondly, remember that you are not alone. Call on God to guide, to help you. While praying to the Divine Mother, Sri Ramakrishna would say: O Mother, give me *shuddhā bhakti*, pure *bhakti*, love for Your Lotus Feet. Do not delude me with Your world bewitching *māyā*. Thirdly, try to combine the four yogas to the best of your ability instead of focusing exclusively on one. If you combine them, the dangers actually cancel out each other. For instance, if *jnānayoga* is your main path, you can combine it with *bhaktiyoga* and other paths. It would keep you grounded and humble. Being a *karmayogi*, you will be serving others; as a *bhaktiyogi* you would not look down on others and say that their religion is based on blind faith. Be more self-aware and pray to God, for prayer is the most potent means of avoiding self-deception and spiritual ego. ■