

REITH LECTURES 1950: Doubt and Certainty in Science

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Lecture 8: Made in What Image?

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In these lectures I have been trying to show that it is a great advantage to talk about ourselves by describing what goes on in our brains. However, this is still a rather unfamiliar way of speaking. It is not easy to use yet because we have not had much practice with it. We have not enough detailed facts about how the brain works. However, I have tried to give you an idea of the different sorts of information that are available and to show you how much we can do with them. We can talk conveniently about many of the more interesting things that men do by speaking of the rules that become established in their brains. Admittedly we know as yet only very little about these rules. The aim of my lectures has been to show how much we might be able to do if we took the trouble to find out more. This study of the brain is certainly one of the most challenging of all scientific problems. At present we spend much of our mathematical and physical genius on study of the world around us. Why not apply more of it to ourselves and especially to our brains?

The very idea may seem absurd to many scientists. That is because the poverty of our current language about the brain gives little hint of the richness of the problems to be solved. In order to show that this poverty might be overcome I have tried to speak about even the most complicated human behaviour in terms of the actions of the brain cells. In order to give at least a primitive way of talking about these actions I have tried to show how the brain rules sort out the input coming from the sense organs. The rules act, as we might say, as models as standards of comparison. Speaking of rules and of models must be at best only a crude way of presenting the nature of brain action. The point is that we need some way that will stimulate us to make investigations and to find out more. One of the results that have emerged so far is that use of our knowledge about the brain alters considerably the way we speak about ourselves. In the last lecture I suggested that the practice has been growing up of using, for this purpose, a new basic standard model. We are getting the habit of speaking more and more about populations, with all their variety. I shall now try to show how the use of this model alters the way we speak about many things, including our own selves. It provides a new system that unifies many fields of activity from physics, through biology, to sociology. In fact, it is not too much to say that it is the basic model for the functioning of modern societies.

Each human society usually has some central model as the canon of its system, a symbol that provides, if you like, something that everyone agrees is important, so that conversation and writing can proceed. In the Middle Ages the symbols of religion provided such a model; statements were true if they abounded to the glory of God. Then, as time went on, men adopted various other ways of speaking and found that they could say more. The central model or reference point now became the individual person. Descartes might be said to have founded modern philosophy and habits of language with his famous 'I think, therefore I am'. The new basic unit that we have

used has therefore been what we might call the experiencing I or ego. We cast all our speech into the form that it takes place between two units, you and I. We picture, as the physicists put it, a world of observers. The basic canon of the system is that it deals with verifiable observation. Probably most scientists would say that a true statement is one that can potentially be verified by anyone who takes the trouble to learn the necessary skill.

This is where the biologist steps in, for his business is the description of living organisms, such as these observers—the physicists. He insists that he finds that they are not all alike. They differ, for example, in their brains and the rules that are in them. Therefore, it is not adequate to define truth as that which can be observed and verified by anyone. So the biologist goes on to suggest that we are mistaken in this emphasis on individual observers. They are not the basic unit of life. Each individual is part of a much larger system which continues over millions of years, changing slowly by the process of evolution. This maintenance of continuity is the most fundamental feature that the biologist can see and he suggests that all human action should be spoken about relative to it.

‘Not One Man Only’

This way of speaking in terms of continuity means changing a good deal our apparatus of words. In any system of talk or language the basic fact is that of communication—the transfer of information. This certainly presupposes agents, persons, egos, whatever you like, that do the interchanging. But our way of speaking has magnified these egos to such an extent as to obscure the reason for which we originally postulated them, namely to speak about their communication. We learn very early in life to talk like this about ourselves, so that it becomes the obvious thing to do. It may seem absurd to doubt the primacy of oneself. Probably most of us tend to say, ‘One must begin somewhere and the one thing I cannot doubt is the existence of myself and my experience’. But biology has shown us to what an extraordinary extent our ways of observing and speaking are not our own, but, like our whole organisation, are inherited and learned. We are in fact already coming to speak of ourselves in quite a different way—not as one thing but as a great variety of them. Marcel Proust expresses this when, speaking of his own personality, he says, ‘I was not one man only, but the steady parade hour after hour of an army in close formation, in which there appeared according to the moment impassioned men, indifferent men, jealous men—jealous men no two of whom were jealous of the same woman’.

Is this another way of describing the situation which I have expressed by saying that modern man has learned to use in his brain a whole variety of models? You remember I suggested that in the Middle Ages all talk was unified around one central set of symbols and this made for great compactness in society. After the Middle Ages men broke away from this way of speaking and their brains became filled with a number of lesser rules, of models of machines and so on, each suitable for conveying some sorts of information. But we have continued up to now to use the old sorts of speech in describing ourselves. We each probably still say if pressed something like, ‘The central thing I know is my mind, my experience, my consciousness and so on’. That is to say we refer to ourselves as if we were a body occupied by one person—the old model of a circle with something inside it. Is it possible that we should convey more information if we tried to do without this whole apparatus of the words of

conventional psychology? We can say everything we want to say quite well without speaking all the time as if we were inhabited by this spirit called the mind.

Consciousness as an Occult Quality

One of the principles of science since the seventeenth century has been to try to speak only of that which was observable—to be direct. In an earlier lecture I tried to show how in a sense the extraordinary discoveries of relativity flow from directness of description. We must not say that a rod has such and such a length, but must describe exactly what we have done to measure it. We must not interpose the ‘occult quality’, as Newton might have called it, of length into our description. May it be that the terminology of psychology consists of a series of occult qualities interposed in this way? They are models, if you like, used for convenience of description; we can do without them when we get better ones. Take the case of consciousness. In order to talk we postulate this entity as a kind of something within ourselves. ‘But how can I doubt’, you may say, ‘that I have something called consciousness. I have consciousness and I may lose it, when I bang my head’. But what is it that you really mean to tell me—that you lose it in the sense you lose a penny when it rolls under the sideboard? Of course not—what you meant to tell me was that following some particular blow on the back of your head you were unable to act as an observer or transmitter for ten minutes. ‘Of course’, you may reply, ‘you can put it like that if you wish and I agree it tells you a little more detail, but what else is gained by your new method? Is it not much easier and less clumsy to say “I lost consciousness”?’ Surely the danger is that if we use these old methods we shall be misled into all the fallacies that would follow if we supposed consciousness to be a single thing which could exist independently of the rest of ourselves. If it is a thing in the ordinary sense it could be observable directly like any object. No one claims to be able to observe consciousness in that way. We may, therefore, be pretty sure that it is one of these occult qualities.

Let us try to describe ourselves exactly to each other. We shall find that we can do better than by trying to speak of ourselves as inhabited by a number of pseudo-things such as consciousness, mind, experience and the rest of them. Of course, I am making the situation out at its worst. Few people speak of the mind as if it were a simple thing. It is a truism that our powers are compounded from many sources. My suggestion is that we should now fully recognise this, face the multiplicity of ourselves and speak less as if we were inhabited by a semi-thing—the mind.

We now have enough facts to enable us to picture quite fully the inheritance of our system from our parents. We can follow how, by education, most elaborate rules of action grow up in our brains. We each have there, as we might say, a whole population of models. Some of us have more, some less, according to our abilities and experience. What we now have to do is to try to put all this information together to give a new model of ourselves. I suggest that we can do it if we can imagine the way the cells of our brains are arranged and organised. This organisation is so vast that to speak adequately about it we must compare it with the action of a very large population, say that of the whole human race. We have to try to find ways of speaking about all the groupings and actions and conflicts of the thousands of millions of cells there. Only when study has proceeded much further shall we acquire a really satisfactory picture of ourselves as part of a continuous organisation. Probably we

shall need for this an elaborate statistical and mathematical terminology. But already we can see that it provides a better way of speaking for many purposes than is obtained by emphasis on a compact entity, the individual ego. Some such way of speaking can do much to unify the separate parts of science. It is an idiom that arises naturally out of the recent developments of a number of branches of science, such as behaviourist psychology, physics and sociology. It arises from the biologist's thesis that from the study of the evolution of living things we acquire a new model or standard with which to make comparisons.

A New Science of Behaviour

The early scientists organised their talk by finding laws, that is to say by comparison with human society. They also compared the universe and the human body with machines—that is to say with our tools. Now we are learning to speak by comparison with the human and animal populations that present the widest expression of continuity that we know. What will be the results of this change? There are already distinct signs that in future there will be less sharp separation between physical, biological and sociological science than there is now. All of these report the behaviour of the same populations of observers. Their business is to describe these in all their variety, and particularly the variety of brains and their rules. **The aim of this new science might be said to be to define the relations between people which enable them to communicate information and so to maintain life.** This is the way of speaking that can unify all our scientific activities. That, of course, does not mean that we may not be able to doubt it in the future. One may expect that further and better models will be developed, just as this one is now arising out of previous systems.

If this evolutionary model is so powerful it should be of practical value. Speaking by comparison is useful to mankind because it enables us to make better tools and thus aids survival. The point of the talking is to work together and to plan. The better words and other symbols that we have the better we can plan. By using each of the special sorts of scientific language we can make useful plans to help mankind—for example, building houses, making chemicals or breeding better wheat. It is often complained that while we have all these separate scientific skills yet we lack a general plan for mankind as a whole. Evolutionary theory provides that general plan. It comprehends within itself all the other sciences. It provides a general science that compounds the activities of all the others and enables us to make useful forecasts and plans for large human groups or the whole of society. This may sound grandiose, perhaps even absurd, but it is said soberly. Studies of populations and their evolution are useful because they show us how to talk about and plan all our varied affairs. It is presumably no accident that the century that has seen the growth of evolutionary biology has also produced the science of sociology with all its implications.

The picture could be made more specific by suggesting changes that the new ways of speaking may produce in fields as wide apart as technology, metaphysics, ethics and politics. For example, no doubt there will be development of many sorts of tools at present used in engineering, industry and agriculture. The special contribution of the new model should be to keep in perspective at all times the relative position of men and the tools that they use. There is already a pronounced tendency to do this. The old plan was to make the machine first and then sit the man uncomfortably in it. Now the human operator is studied at every stage. We make the machine to fit him, study how

to teach him to use the machine. Above all we learn where to find the weak links in the maintenance of the whole system. All of this sort of work is made easier by the development of tools of communication. More and more these are coming to depend not only on physical research, as our past machines have done. More and more they will be the product largely of investigation of ourselves and especially of our brains. They will probably be mainly electrical and will be such as to ensure much more nearly direct communication between brains than is possible now. It is quite likely that by scanning the electrical activities in the head we shall read each other's brains. This is not so revolutionary as it sounds. Throughout these lectures you have come precious close to scanning my brain with your electrical equipment. Do you see what has been happening? Electrical devices have made it possible for one to speak to many. So the one person's brain works very hard to find symbols that will match those in so many brains. That is a good example of how improvement in communication ensures increasing accuracy, directness and completeness of description. These are tendencies that are evident in many fields of language and literature today.

Had the Universe a Beginning?

Future methods of observation and communication will lead to people being better orientated in relation to their place in the universe than in the past. They will have a much better understanding of themselves and their relationship to the continuity of life which is our fundamental experience. Exactly how that continuity and communication may be symbolised I do not propose to forecast. No doubt old symbols will be used to a large extent. All these changes that I am suggesting are but developments of what has gone on before. No doubt we shall gradually come to know much more of the universe and our place in it, as we apply the new tools. Some of the revelations that these provide may be strange. In the past we have continued to rely for our general views essentially on medieval conceptions that the universe was created at some finite time in the past. I wonder whether we need to consider that the universe started at all. This may seem absurd until you realise how limited and arbitrary is our present view that there was a beginning. It is an unwarranted extension. When two people walk off in opposite directions it seems that they will never meet. And yet we now know that the earth is round. One of our hardest lessons is to learn that apparently obvious extensions of the use of our rules may lead us astray. We must balance certainty by doubt. In this case our short experience of time and existence does not warrant us in postulating any creation or beginning at all. To do so is our crude way of talking about things, in terms of the model that speaks of the basic reality of life as an I, with a beginning and an end. Biological discovery has shown that this assumption of a sudden beginning for each of us is not true. Our organisation, the most essential and enduring thing about us, does not begin from nothing, but is passed on continually. Perhaps we make our world picture with a beginning and an end because we have conceived too narrowly of our own beginnings and ends. If we could only look further behind and ahead we might use a different picture.

I suggest that instead of focusing on beginning as the act of creation we should do exactly the opposite and centre our speech on continuity. The sense in which we do see creation is in the building of organisation that goes on in the life of each individual, especially in the case of man in our brains. Each individual thus forms its

own way of life, its own order and rules. In our own species these are valuable to the race because each is individual and unique. Certainly our -rules are largely acquired, but it is because individuals are not all alike that our kind is so adaptable and maintains its dominance. Each individual uses the store of randomness with which he is born to build during his life rules that are useful and can be passed on. Similarly I showed in my last lecture that we can detect in the progress of evolution a decrease in randomness of all living things. The higher animals are in a sense more different from their surroundings than the lower. What I am suggesting, therefore, is that we should take as our general picture of the universe a system of continuity in which there are two elements—randomness and organisation—disorder and order if you like, alternating with each other in such a fashion as to maintain continuity. Is it possible that the data of the astronomers can also best be interpreted as showing the universe as a system of balancing, of maintaining a steady state, just as our living system does, with the characteristic that it builds up systems of order and then returns them to disorder? You may say that this is very crude anthropomorphism. Certainly it is, but no more crude than that of imagining a creation. Astronomical evidence tells us all sorts of things about how some stars heat up while others cool. New hydrogen appears and forms into more complex elements. Stars and galaxies are built out of the disorder, then recede away perhaps into randomness.

Two General Laws

I cannot pretend that the picture is complete or very satisfactory, but it seems to show at least signs of a correspondence and unity between organic and astronomical happenings. Perhaps we might say that if all this is correct there appear to us to be two general laws of the universe: first, that of association, of binding, the tendency for randomly distributed processes to become linked together to form larger units; second is the law that such unity is not permanent, but sooner or later dissolves, providing fresh randomness. This certainly seems to be a general principle in biology and we have seen how it usefully describes the progress of the growth of our brains and of the whole organisation of our species by alternation of aggregation and disaggregation. Each species remains in balance with its surroundings by alternate periods of development and death, followed by replacement by a new version of the organisation. This is the means by which life maintains, as it were, communication with the non-living world. It is perhaps not fantastic to say that a corresponding method of communication prevails throughout the universe. There is a rhythmic building by alternation of organisation and disorder, a continuous process of creation.

The wide vision we have acquired by our new systems of language and tools enables us to see continuity extending a considerable way into the past. We can follow in outline the whole evolution of life from simple organisms, more than 1,000,000,000 years ago. We cannot yet say for certain how life first arose, but we can imagine that it happened gradually, as a result of conditions obtaining at that time. We still do not know exactly how our earth took the form we now see, but the date seems to have been about 3,000,000,000 years ago or rather more. We can try to follow continuity still further backwards and to see our whole position in the universe. But here we find ourselves more baffled: We cannot properly comprehend the pattern of the stars. Our astronomers are working hard to find the rules of brain action that shall make us able to do so. In spite of their considerable discoveries I, feel sure that they would agree that they have not yet found the really significant clue. In this respect we are all like

the people born blind who on receiving their sight see only a revolving mass of lights. I do not wish to belittle the conclusions of astronomers when I say that when we look at the heavens we are as babies—we have no means of understanding the significance of what we see. It is exciting to speculate that one day we may see much more fully the meaning of the frame in which we are set.

Stability of Life upon Earth

Until we can understand the stars we shall probably be wise to continue to base our actions upon the stability of life upon the earth. By an adequate supply of variation life has managed to remain continuous for at least 1,000,000,000 years. Mammalian organisation was well established long before the Himalayas or the Alps appeared. We shall not go far wrong if we base our talk and actions upon this continuity of life, which is certainly as stable as any other basis we can see. We need some such canon for establishing our rules, and therefore the principles of education, by which these rules are taught. I have given already some reasons for believing that this continuity will be the central model or rule of our brains at least in the immediate future.

I need not urge upon you to regard these considerations as tentative. I am not sure how far they are the result of excessive preoccupation throughout these lectures with the subject of communication. They are, of course, the logical outcome of that preoccupation. My whole thesis here is that our thoughts can conveniently be organised by focusing our attention on the importance of communication. If these suggestions serve to stimulate discussion—that is, to provide a means of talking about these matters—I shall be well content. For I do beg you to remember that at best—what we are producing is a system of the universe as conceived by man, the talking animal. Our brains work like this and we cannot help it. But I should like to emphasise that to communicate is not our whole nature. It is our means of getting a living as a social animal, but it is only a means, not living itself. One great mistake of modern man is to bother too much about his means of living—his models and his comparisons. We must go on making them and we can greatly enjoy doing so. They are a chief glory in our way of life. But they are not the whole of life. A fine morning, a good meal, work well done and a pleasant sleep, these are as truly our life as is talking about them. We can enjoy life, and like the birds, we must sing about it. The octopus and the plants and the sky and the stars do not sing or talk, but are not the less real for that.

It is of our very nature to see the universe as a place that we can talk about. In particular, you will remember, the brain tends to compute by organising all of its input into certain general patterns. It is natural for us, therefore, to try to make these grand abstractions to find one formula, one model, one god, around which we can organise all our communication and the whole business of getting a living.