

## THE UNIVERSE ACCORDING TO SIR JAMES JEANS

*For the invisible things of him, from the creation of the world, are clearly seen, being understood by the things that are made.*—ROMANS I, 20.

THERE is a Roman road going from Cambridge towards the south-west; six miles out of Cambridge it passes between the villages of Harlton and Little Eversden, climbs a hill and drops down on the other side to the Ermine Street. A hill, a little over two hundred feet high, is usually an insignificant feature, but in Cambridgeshire, with its great expanses of open fields, things appear different; and one has only to ascend a mere few feet up the slope to command the whole of the plain towards Cambridge, with the chapels of King's and St. John's Colleges on the horizon. The view is of great charm; its predominant features are breadth, serenity, quietness and repose; there is just the plain of large fields, broken by the clumps of trees surrounding a few villages, with church towers rising from their midst, and the road stretching out between low hedges. There are many times when the view is not only charming but beautiful; one such time is on an autumn evening when it is growing dark, with a clear sky overhead and a white-grey mist creeping over the fields. Such an evening was Tuesday November the fourth, of last year. I remember it vividly, for I was out on the low hillside until five o'clock.

Perhaps I should not have remembered the day so exactly but for the fact that Sir James Jeans was to deliver the Rede Lecture at half-past five. The scientists and the younger mathematicians of Cambridge had been alive with expectancy for some time,

## *Blackfriars*

but it was the expectancy with which one expects an astronomical sensation-monger rather than a distinguished scientist. No doubt the title of the lecture was partly responsible for this attitude; it was certainly not wholly unjustified when the lecture was delivered. Sir James, it was rumoured, feared that the attendance would not be a large one, and it is certain that bills were posted in the Cavendish Laboratory to advertise the lecture—a most unusual procedure. We in Cambridge, however, had no doubt as to what would happen, and we knew that the Senate House would be crowded. It is a matter of half an hour to cycle from Little Eversden into Cambridge, and as I passed through the few streets between the Backs and college they were thronged by gowned figures hastening to the Senate House. I preferred tea by the fireside, but those who went to the lecture were not disappointed. The Vice-Chancellor presided and Sir James spoke without notes for an hour, his delivery being of remarkable fluency. Those who knew of Sir James's competency when he held office in some of the learned societies expected it to be so. I happened to overhear a distinguished scientist speaking of the lecture some days afterwards; after paying tribute to the mastery of Sir James over his subject, he proceeded to speak of the subject-matter itself. 'He began by saying what puny, insignificant folks we are; the rest was just a bit of a song, "Nearer, my God, to Thee."'

When the audience proceeded to leave the Senate House it saw a book by Sir James offered for sale; the book is small enough to go into an overcoat pocket and costs 3/6, its title being *The Mysterious Universe*—the title of the lecture. It contains five chapters and is an expansion of the lecture and, with the exception of the fifth chapter, it is a very fine book. The first four chapters are an exposition of the parts of physics and astronomy, so far as our present knowledge of

## *The Universe according to Sir James Jeans*

them goes, which deal with the structure and behaviour of the universe. It is an exposition of remarkable clarity, and Sir James deserves our gratitude and our congratulations. It is one of the main objects of the scientist to bring the results of his observations under as few general propositions as possible, and it is in this way that science grows. We find examples of this in Sir James's book, as, for instance, when we are told that matter and radiation are different forms of the same thing, or that all types of radiation are forms of energy. We meet a large number of things in a small number of pages—atoms, electrons, quanta, radio-activity, cosmic radiation, light, mass, energy, nebulae, relativity, gravitation, the curvature of space and so forth. When conversing with others one can usually contrive, at any rate by suitably preparing the ground, to mention these things without hurting anybody's feelings—except the curvature of space. Why are people so disdainful when the curvature of space is mentioned? It is of no use assuming the air of a Grand Inquisitor and asserting dogmatically that space is straight—there is not a shred of evidence for it, any more than there is for the earth being flat.

Technicalities would be out of place here, but one might refer in passing to the interesting discussion of the age of the universe in the third chapter. A star loses weight as it grows older, and we can calculate how heavy many of the stars are and deduce that the universe is at least a certain age. Other reasoning, based on the motions of the stars, confirms this. But when we turn to the more distant nebulae, observations seem to point to a different conclusion and appear to make the universe much younger. The light emitted by a luminous body which is receding from us is redder than it would be if the body were stationary; by observing the light emitted by these nebulae we can deduce, from the amount by which it is reddened, the

## *Blackfriars*

speeds with which the nebulae are moving away from us. If the universe is actually as old as was surmised, these speeds cannot possibly have such large values; the only way of reconciling the two results is to suppose that the speeds are not so great and that the reddening of the light is due to other causes as well as recession. There is certainly evidence for this supposition, but the question is by no means settled.

When we turn to the fifth chapter we find material of a different kind; indeed this chapter is deplorable, for it spoils the book. Sir James is a mathematician, and he must know that in order to attain to competence in that science one must undergo a training notable both for its length and its severity. So it will be with philosophy, and when a 'stranger in the realms of philosophical thought' ventures to philosophise, he is liable to do some silly things. Sir James is undoubtedly aware of this danger, and apologises in advance in his preface when he pleads that 'everyone may claim the right to draw his own conclusions from the facts presented by modern science.' It is a disputable claim. In order to draw conclusions one must reason, and when one reasons, one must obey the laws of thought; it will not do to reason in a spirit of anarchy which ignores these laws, and the right to draw conclusions only belongs to those who obey the laws. It may be questioned whether it is compatible with the laws of thought to place life in the same category as magnetism and radio-activity; if chemistry does so, that merely testifies to the limitations of chemistry. Again, what of the argument from probability in the first chapter? It is perfectly true that if six monkeys sit down at typewriters, one of them may type a Shakespeare sonnet; the chance of this happening can be calculated mathematically with great ease. But to proceed, as Huxley and Sir James do, to argue that the six monkeys would be *certain*, given unlimited

## *The Universe according to Sir James Jeans*

time, to type a Shakespeare sonnet is surely unwarrantable.

I once heard a well-known ecclesiastic explaining that events happened according to prescribed laws, and that the Creator who imposed those laws must be an intelligent being. 'For example: the planets are attracted to the sun by a force varying inversely as the square of the distance—or else the square root, I forget which.' The remark is food for laughter, but it makes its point. It is hardly necessary to understand the intricate mathematics of modern physics and astronomy in order to be able to argue that (to use Sir James's phrase) the Great Architect of the Universe is a pure mathematician. The non-scientific reader cannot fail to be impressed and almost awe-struck by the imposing procession of scientific wonders of the first four chapters; and yet, if this is all they can tell us about the Great Architect, we seem to be using a steam-hammer to crack a nut. It is a strange thing, this science: so majestic, so grand and so triumphant in its progress and yet, as regards the things that really matter, so impotent, so futile and—how the blow strikes home!—so *useless* in its results.

It is difficult to understand what Sir James really means in the last chapter, and it is with something of an effort that we plough through its vagueness after leaping along with his expert guidance through the earlier part of the book. What is all this about the universe being a universe of thought? Nevertheless we find, in the vagueness of the last chapter, talk of an Eternal Spirit and of a creation; and there is something like predestination on page 119.

Sir James writes, in comparing the universe to a picture:

At present science can tell us very little as to the way in which our consciousness apprehends the picture; it is concerned mainly with the nature of the picture.

## *Blackfriars*

There is something strangely familiar in this idea; speaking of physics in 1855 Newman said :

With matter it began, with matter it will end; it will never trespass into the province of mind.

Sir James writes :

Many would hold that, from the broad philosophical standpoint, the outstanding achievement of twentieth century physics is not the theory of relativity with its welding together of space and time, or the theory of quanta with its present apparent negation of the laws of causation, or the dissection of the atom with the resultant discovery that things are not what they seem ; it is the general recognition that we are not yet in contact with ultimate reality. To speak in terms of Plato's well-known simile, we are still imprisoned in our cave with our backs to the light, and can only watch the shadows on the wall. At present the only task before science is to study those shadows, to classify them and explain them in the simplest possible way.

Why, it may be asked, did physicists suppose they could ever get into contact with ultimate reality? Again a citation from Newman is most apposite :

The physical philosopher has nothing whatever to do with final causes, and will get into inextricable confusion if he introduces them into his investigations. He has to look in one definite direction, not in any other. It is said that in some countries, when a stranger asks his way, he is at once questioned in turn where he came from : something like this would be the unseasonableness of a physicist who inquired how the phenomena and laws of the material world primarily came to be when his simple task is that of ascertaining what they are.

Time works many changes ; it may bring the scientists some day to play the *rôle* of Christian apologists. Will this science, which was to shatter revealed truth and banish the study of theology from our universities, eventually lead us back to the spiritual realities of things? For anything may do so, if it goes but far enough.

W. L. EDGE.