Chapter 23 - Some of the Chief Astronomers of the World

[Beginning with Ptolemy, Evans presents brief sketches of major figures in the field of astronomy up until his own day. On page 251, he turns to a discussion of Einstein and his then quite recently proposed Theory of Relativity:]

EINSTEIN. – Albert Einstein was born in Ulm, Württemberg, in 1879, thus he is now (1923) 44 years old. His parents were Jews. He spent the days of his childhood in Munich. In 1894 his parents moved to Italy, but he remained in a school in Aarau, in Switzerland. Soon after this we find him in Zürich earning his livelihood as a teacher of mathematics. From 1900 to 1909 he dwelt in Berne. He earned his Ph.D. from Zürich, and was appointed professor there in 1909. In 1911 he was appointed professor in the University of Prague, but in 1912 he returned to Zürich. In 1914 a special position was created for him in Berlin as Professor of Physics. In 1921 he received the F.R.S. in this country, and he also has degrees from Geneva, Manchester, Rostock, and Princeton.

Einstein is generally regarded as a sort of second Newton. His world-famous theory – Relativity, and the hypothesis of the Relativity of Motion – is revolutionary. It is said that only twelve people in the world understand it. That may be true, but since I am not one of them it would be presumptuous of me to undertake the adventure of interpreting it. But perhaps I shall be forgiven for offering my service to those who know *nothing* about it, and perhaps have never even heard about it, to guide them a part of the way.

The first whisperings of it came in about the year 1905, and by 1915 the existence of the theory was perfectly well-known to the foremost intellectuals of every land. Everyone will appreciate that it is not possible to do more than merely touch upon the edges of this complex subject without higher mathematics, and without these mathematics it is not possible to give more than an indistinct sketch of the theory. I chiefly rely on Jeans, Haldane, and H. H. Turner for guidance.

The theory, according to Einstein, contains two propositions:—

(1) It is necessarily impossible to determine absolute motion by any experiment of any sort.

(2) The phenomena of Nature will be the same for two observers who are moving with any uniform velocity relative to each other.

The first question is, where is absolute rest – absolute stillness – to be found? The ether is perfectly still and fixed, and Newton said: “Absolute stillness is not to be found except only on the furthest frontiers of the fixed stars, or perhaps even further beyond them”. It is necessary that there be some fixed standard to measure time and space (Latin *spatium*). Everything is ‘relative’. Listen to Haldane: “It is one of the essential arguments of Philosophy that everything is relative to the human mind, and that our idea of our knowledge of everything contains a contribution from us ourselves. Observe how a man depicts facts as it is that they appear to him. The rainbow is colouring the brow of the hill, and its end touches the earth. It is our location that creates that. When we go there we will find the rainbow to have fled, to have withdrawn behind a further horizon! In the same way the location of the observer determines the degree to which an object moves. Even when a train is travelling at fifty miles per hour, a man *in* the train will perceive another man as walking through the corridor at two miles an hour, while to someone standing on the *platform* that man will seem to be travelling at 52 miles per hour". There are three rates of motion already. We should remind ourselves again that the Earth on which we are standing is turning rapidly on its axes. There's four. Or again, that the earth voyages around the sun. There's five rates of motion. There exists no such thing as a fixed standard. Apply this to all the worlds of Creation and it will be discovered that there is nothing absolute in relation to time and space.

Haldane again: "Where is the true centre of the station platform? In the place where two beams of light meet that had begun from opposite ends of the platform at exactly the same time. A man standing on the platform would see them meet in some particular place, while a man travelling in the train at sixty miles per hour would see them meeting in a slightly different place; and if he were travelling even faster he would see the centre of the platform as lying very close to the far end. It is the true centre despite that, but the platform would appear as if it had shrunk. We have not taken sufficient notice of the fact that things appear to us not as they are in truth, but as we see them".

Listen to Jeans again: "Consider two events taking place in the void. There is with the events themselves the interval of time which is between them specifically, but that interval of time and space is classified differently by different observers. For example, take the appearance of the nova (*Nova Persei*) in 1901, and the Great Fire of London in 1666. Perhaps one observer will measure the interval between the two events as so many years and so many millions of miles, but another observer will classify the interval entirely differently. Perhaps an observer on the earth will calculate that the explosion of Nova Persei had taken place a century *before* the Great Fire of London, while an observer at the nova would testify with the same degree of correctness that the explosion of Nova Persei had happened a century *after* the Great Fire of London; while another observer would testify that the two events had taken place at exactly the same time. Any one is fully as correct as any other, although no one of them is absolutely correct. Time and space thus become 'relative' things". Minkowski says: "Space in and of itself, and time also in and of itself, disappear into the shadows, and it is only some sort of union of the two that has an independent existence".

Prof. H. H. Turner says: "There was no doubt as to the correctness of Newton's laws until Einstein appeared". The fact is that Newton had neglected to take into account the time it takes light to travel. It is only a small effect, but it should be taken account of, especially in connection with the worlds closest to us. Einstein's predictions with regard to the bending of the light-beam of a star which is (as it appears to us) close to the sun, was confirmed by photographs that were taken at the time of the total solar eclipse in 1919. A beam of light from a distant star is bent on its journey through the gravitational field of the sun, the amount of bending varying from 1' 75" when it is close to the sun, to a smaller amount as it moves away from the sun. Each time the theory of Relativity has appeared to be in opposition to the laws of Nature as they were known or supposed, every experiment without exception has shown that the 'laws' were deceptive, and that the laws suggested by Einstein's theory were correct.

Dr. Campbell, the director of Lick Observatory, writing on 12 April 1923, says that the photos of the total solar eclipse in 1922 confirm Einstein's theory. Four plates of 17 inches each were used, and pictures were obtained of scores of stars which appeared near to the sun. The same cameras were used three months previously to take a picture of the same stars at night. Einstein said that the theory would have to withstand three tests or else fall to the floor, and this test was one of those. Dr. Campbell and Dr. Trumpler measured the plates carefully, and it was found that the stars' light-beams were bent as they passed by the sun, some 1' 59" and some 1' 86", and the average of five of them was 1' 74" (Einstein had predicted 1' 75"). This was sufficiently close to satisfy Einstein's most enthusiastic supporters.

Einstein's theory has also succeeded in clarifying for the first time one thing which astronomers had been unable to understand, that is, a certain irregularity in connection with the movements of the planet Mercury.