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FIFTY years ago, in the year 1905 to be exact, a series of papers appeared in the *Annalen Der Physik* within a few months of each other which profoundly influenced the subsequent development of physical science and indeed created a revolution in our conception of nature and its workings. The author of those epoch-making contributions to science was a young man then 26 years of age who held a position as an examiner of patents and designs in the Federal Patent Office at Berne, in Switzerland. It was not long before the immense importance of the ideas set out in those papers received general recognition and it became evident that a star of the first magnitude had arisen in the firmament of science.

The main facts of Einstein's life may be briefly summarised here. He was born on the 14th March 1879, at Ulm in South Germany but spent his childhood at Munich. In 1894, when his parents migrated to Milan in Italy, Einstein moved to Switzerland where he continued his further studies, firstly at Aurau and later at Zurich. Following graduation in 1900, he was obliged to seek employment for maintaining himself. In the autumn of 1902, he obtained a position at Berne in Switzerland in the Federal Patent Office where he remained till 1909 While thus employed, he also worked as a candidate for the doctor's degree which he obtained from Zurich in 1905. The recognition gained by his work led to his being called to a professorship at Zurich; for a short period he migrated to Prague and returned again at Zurich in 1912. Finally in 1914, Einstein moved to Berlin as Professor in the Prussian Academy of Sciences and Director of the Institute of Theoretical Physics. In the year 1933 as a consequence of the activities of the Hitler regime, he found himself obliged to resign these positions and accepted a call to a professorship at the Institute for Advanced Study at Princeton, New Jersey, in the United States of America. In the year 1945 he retired from

the latter position but continued to live at Princeton in quiet seclusion till his death on the 18th April of this year.

Einstein's record of scientific research and publication extends over half a century. The period from 1905 to 1915 however witnessed the emergence from his creative brain of those fundamental ideas which transformed the whole complexion of physical science. It is not possible to contemplate the results, at once so profound and so powerfully original, achieved by Einstein in this short period without a feeling of astonishment and admiration. We may permit ourselves to quote here the opening words of the admirable summary of Einstein's scientific work written by Louis de Broglie for the special volume dedicated to Einstein in the "Library of Living Philosophers" published in the year 1949. "For any educated man, whether or not a professional scientist, the name of Albert Einstein calls to mind the intellectual effort and genius which overturned the most traditional notions of physics and culminated in the establishment of the relativity of the notions of space and time, the inertia of energy, and an interpretation of gravitational forces which is in some sort purely geometrical. Therein lies a magnificent achievement comparable to the greatest that may be found in the history of the sciences; comparable, for example, to the achievements of Newton This alone would have sufficed to assure its author imperishable fame. But, great as it was, this achievement must not cause us to forget that Albert Einstein also rendered decisive contributions to other important advances in contemporary physics. Even if we were to overlook his no less remarkable work on the Brownian movement, statistical thermodynamics, and equilibrium fluctuations, we could not fail to take note of the tremendous import of his research upon a developing quantum theory and, in particular, his conception of "light quanta" which, reintroducing the corpuscular notion into optics, was to send physicists in search of some kind of synthesis of Fresnel's wave theory of light and the corpuscular theory....."

Within the limits of this article it is not possible to attempt a general survey of the scientific work of Einstein or to review the influence exercised by it on his contemporaries and on the progress of physics which has been enormous. Many impressive tributes have been paid to the greatness of Einstein and his work by illustrious contemporaries. I need therefore add here only a brief acknowledgement of my own personal indebtedness to the inspiration that I have derived from time to time from a study of Einstein's fundamental papers on thermodynamics, light-scattering and quantum theory. I have returned to them again and again in the course of my work and benefited thereby.

C. V. RAMAN.

THE BUBBLE CHAMBER

THE 'bubble chamber', a new device that combines the experimental possibilities of the Wilson cloud chamber with the high mass density available in photographic emulsion techniques, was described at the recent meeting of the American Physical Society in New York. The feasibility of using the bubble formation in a liquid to make the path of ionizing particles visible was first demonstrated by D. A. Glaser of the University of Michigan, and the instrument was further developed by experimentalists at the University of Chicago and at the Radiation Laboratory in Berkeley. At present the device is being used in several laboratories to study high energy nuclear events.

The bubble chamber makes use of the unstable system of a superheated liquid—that is, liquid hydrogen at a temperature above its boiling point. As soon as ionizing radiation enters the system, gas bubbles are formed and the liquid starts to boil almost immediately. If, however, a picture of the bubble formation is taken a few microseconds after the ionizing event takes place, then the bubbles formed along the path of the ionizing radiation give rise to a visible track. The high density of the liquid, the almost complete absence of undesired tracks owing to the shortness of the time interval during which the chamber is sensitive to ionizing radiation, and the possibility of taking picture in rapid sequence make the bubble chamber an extremely versatile instrument for the study of high energy events.
