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NEWS 12·7·26

TALKS FOR TEACHERS

Opportunity for Improvement

More than 1,000 metropolitan teachers and college students will be afforded an opportunity to improve their educational status as a result of the night lectures in arts, which will be inaugurated by the Council of the Adelaide University next year.

The University Council has been considering the project for some time, and a deputation recently waited on the Hon. J. Gunn (Premier) requesting that an additional grant of money should be made to provide for these lectures.

The University, however, has received from the Premier an announcement that the request has been granted. It is anticipated that night lectures will be initiated in 1927. Lectures may be given in any of the following subjects, provided that no fewer than 10 qualified students make the necessary application:—

Latin, 1 and 2; English, 1 and 2; Logic, Pure Mathematics, 1 and 2; Chemistry, Philology; History, 1 and 2; Ethics; Geology; French, 1 and 2; Psychology; Education; Physics and Botany.

Most of the evening lectures, excepting third-year subjects, such as English, Latin, mathematics, history, and so on at present given between 4 and 6 o'clock, will probably be discontinued.

The University Council advanced the proposal and the Government promised financial support in the interests of teachers and students desirous of improving their educational status, said a member of the council today. It had long been recognised that teachers attended late afternoon lectures tired and jaded by the work of the day, and that night lectures would afford them better opportunities and better conditions.

NEWS 10·7·26

ROYAL SOCIETY MEETS

Paper on Aborigines

Members of the Royal Society of South Australia at the monthly meeting were keenly interested in a paper given by Drs. T. D. Campbell and Aubrey J. Lewis on the aborogines of South Australia.

It was explained that the idea of the recent trip to Ooldea was to continue the systematic research in anthropology undertaken by members of the University staff.

Measurements were taken of 26 natives and observations made regarding character, and color of hair, skin, and eyes, as well as notes on ear formation, eyebrow ridges, and other characteristics.

Interesting moving pictures were shown of native scenes and customs. During the stay at Ooldea phonograph records were taken of corroboree songs. Implements were collected, vocabulary noted, and the psychology of the natives observed.

It was stressed that it was impossible to perform valuable work among the natives by hurried expeditions. Workers needed special training in research and must settle near the habitations of the aborigines and be patient and painstaking.

Other papers read were "Revision of the Sweet Collection of Triassic Plants from South Australia," by Frederick Chapman, A.L.S., and Miss Isabel C. Cookson, B.Sc., and "Varve Shales Associated with Permo-Carboniferous Glacial Sediments of South Australia" by Sir Douglas Mawson, D.Sc., F.R.S.

Dr. C. Stanton Hicks (Marks Lecturer in Applied Physiology and Sheridan Research Fellow, University of Adelaide), Dr. H. A. McCoy (Radiologist, Adelaide), and Mr. C. S. Piper, B.Sc. (Agricultural Chemist, Waite Agricultural Research Institute) were nominated as members.

REG. 13·7·26

TRAINING RESEARCH STUDENTS.

The Vice-President of the Executive Council (Senator Pearce) stated on Monday that the Executive Committee of the Council for Scientific and Industrial Research had made several appointments under the scheme that had been embodied in th rent Seince and Industry Endowment Act for sending young Australian research workers abroad for special training. Arrangements were being made to send Mr. J. R. Duggan, B.Sc., B.E. (Sydney) and Mr. L. J. Rogers, B.E. (Perth) to the British Fuel Research Station at Greenwich. Both these graduates had already had distinguished academic careers, and both had been highly recommended by their respective universities. It is intended that they shall remain two years at Greenwich to undergo special training in fuel research, especially in regard to processes for the low temperature distillation of coal and the production of liquid fuels by such processes. As regards the cold storage of foodstuffs arrangement were being made to send Mr. J. R. Vickery, M.Sc (Melbourne) to the British Food Investigation Board's station at Cambridge. Mr. Vickery has also had a distinguished career at Melbourne University, and has already carried out a considerable amount of research work in regard to the freezing and storage of beef.

ADV. 13·7·26

UNIVERSITY NIGHT LECTURES.

Night lectures in arts will be inaugurated by the University of Adelaide next year, and it is expected that over a thousand metropolitan teachers and college students will be able to improve their educational status as a result. A deputation from the University Council recently asked the Premier (Hon. J. Gunn) that an additional grant should be made to enable the lectures to be given, and this request has now been complied with. Lectures will be delivered in any of the following subjects, provided that no fewer than 10 qualified students make the necessary application:—Latin, 1 and 2; English, 1 and 2; Logic, Pure Mathematics, 1 and 2; Chemistry, Philology; History, 1 and 2; Ethics; Geology; French, 1 and 2; Psychology; Education; Physics and Botany.

REG. 13·7·26

Mr. W. A. K. McKee has been appointed assistant secretary of the Economic Society. He is a University student nearing the completion of his academic studies.

ADV. 14·7·26

THE BIRTH OF WORLDS.

UNIVERSITY EXTENSION LECTURE.

TIME SCALE OF THE UNIVERSE.

The last of three extension lectures on "The New Physics and the New Astronomy" was delivered at the Prince of Wales Theatre, University of Adelaide, on Tuesday evening by Professor Kerr Grant, who dealt in an interesting way with the cosmogonical problem, the source of solar and stellar radiation, and the time scale of the universe. The lecture was illustrated by a number of slides. Professor Darnley Naylor presided.

Professor Kerr Grant said mankind had always been profoundly interested in the great mysteries of the beginning and the end of the world, but the limited conception of the world which the primitive races had, their erroneous conceptions of the nature of the sky and its luminaries, the absence of any systematic view concerning natural causation, and their substitution of supernatural agency as it now existed, rendered those early conceptions, however interesting to the anthropologist, devoid of any trace of scientific value. The nebular hypothesis of the origin of the solar systems advanced independently by Kant and Laplace might be regarded as the first attempt at rational explanation of the origin and development of the solar system. That theory assumed that the sun and planets were orginally combined in one vast diffuse mass extending beyond the bounds of the outermost member of the solar system (Neptune), that in virtue of cooling due to radiation, the gravitational attraction between its parts the mass contracted, and as it did so its rotational velocity, in accordance with a well-known dynamical principle, steadily increased until the centrifugal force on its outer layers became sufficient to detach them in the form of successive rings which, by breaking up and aggregating, formed the various planets and their satellites. Though the first part of the hypothesis which assumed a vast distension of the original body, would probably receive universal assent, and the supposition of a primitive rotation, which explained the fact that almost all motions of rotation or revolution of the bodies comprising the solar system, were in the same sense, would probably also be accepted, the ascription of the separation of the planets from the mother-body by action of centrifugal force only, was rejected by the most competent authorities in dynamical cosmogony (Jeans, D.C., p. 10). Of other theories the most in favor to-day was that first put forward by the American astronomers, Chamberlain and Moulton, and strongly supported by Jeans—that tidal forces due to a passing star, caused disruption of the original diffuse sun and that the planets were the products of that disruption. It was little wonder that until recently the majority of astronomers ruled tidal action out as a general factor in solar or stellar evolution, though it might be allowed as the cause of one system in thousands. Jeans himself until recently held the view that our own solar system was one of these exceptional cases.

The lecturer proceeded to outline the present situation in regard to knowledge of stellar evolution. When they attempted to form an opinion of the nature and sequence of the changes, they found themselves confronted with the difficulty that the lifetime of a star the life of a human being, or for that matter, of the human race, was but a transient moment. They were in much the same situation as would be some intelligent but ephemeral insect which, from observations made upon mankind in its one-day of life, should try to draw conclusions as to the whole course of changes in the life of a human being. If, however, that insect had, during its brief space of existence, the opportunity to observe an assemblage of human beings of all races, and all ages, it might then be possible for it at least to theorise on the succession of changes which occurred in the life of the individual, though not, with any high degree of certitude, unless the insect possessed powers of observation far superior to those possessed by men. The stars differed from one another in every characteristic that lay within their powers of observation in quantity and quality of their radiation, in bulk, mass, and motion. But, with a comparatively small number of exceptions they could be ranged in a linear sequence with no breaks in it. Prior to 1912 the accepted sequence was—first, the hottest, or blue-white stars, then white, yellow, and orange red. The life of an individual star was assumed to follow the same sequence of changes, and the basic cause of the changes was assumed to be a continuous cooling of the star due to loss of heat by radiation. The one man who opposed that view among English-speaking astronomers at least, was Norman Lockyer, who insisted that the career of a star must be divided into two stages, in the first of which it steadily rose in temperature, and in the second, it steadily fell. Lockyer's views apparently got little support during his lifetime, but proof of the existence of two distinct classes of stars—giants and dwarfs—led Russell, of Princeton, in 1912, to views regarding the course of stellar evolution essentially identical with those promulgated by Lockyer. Russell pointed out that the current view of a star's life-history which made it begin at the hottest and steadily pass to the coldest stage would necessitate, in the case of giant red stars, a transition from an initial state of high density to a final one of extremely low density.

Plausible as that view was, it was not without its difficulties. Dr. W. W. Campbell, in an address to the American Association for the Advancement of Science in 1917, laid particular stress on the probability that stars had in some way or other developed from nebulae, and most probably from those of the irregular type such as the Orion nebula. Powerfully urged arguments had constituted a formidable difficulty to the acceptance of Russell's scheme of evolution. Nevertheless that scheme received support from the theories of internal stellar equilibrium and constitution advanced by Eddington, and it was practically the only one to-day seriously considered. Answering the question whether there was any means of ascertaining even in the roughest way the time required for a star to pass through the various stages of its life, the professor said they had reason to believe that the life of the universe must be measured in thousands of millions of years at least. He recalled the remark of Professor Shapley, about the globular star clusters, of "no change at all in 200,000 years," and said there were other arguments, for example, the separation of binary stars and the measure distribution of star velocities which pointed similarly to the necessity for a time scale of that or a larger order of magnitude. It was almost too much to hope that any way should be found of estimating such vast intervals of time more accurately. Yet such a way had been found.

The greatest difficulty with which the advocates of an extensive time scale were faced, he said, was to find a satisfactory explanation of the source of solar or stellar radiation. For ages the sun had poured continuously into space an enormous flood of radiant heat and light. They could easily estimate the present value of that quantity, for the amount received on one square inch of the earth's surface had been measured, and it was a matter of simple arithmetic with a little geometry to deduce from that the quantity emitted by each square yard of the sun's surface. The result was that the energy output was at the rate of 140,000 h.p. per square yard or 580,000 trillion h.p. for the whole sun; and some of the giant stars were 10,000 times as powerful as the sun. From what enormous reservoirs of energy flowed this mighty stream. Even giving the sun a temperature of 20 million degrees centigrade, would not increase its store of heat to an amount sufficient to last more than a few thousand years. The age of the oldest rocks on the earth was probably, as the evidence from the products of radio-active change which they contained showed, at least 800,000,000 years. And the solar system must be many times older than that. Even if the sun were made of pure coal and oxygen supplied for its combustion, the heat thus obtained would suffice for only 1,000 years.

The energy of radio-active changes was the order of a millionfold that of chemical change, weight for weight; but the spectrum of the sun gave no evidence that radio-active substances were present in the sun to an extent greater than they were on earth. And that source would again give a totally inadequate supply.

He had given several illustrations of the success which had attended the application of Einstein's views of space and time to astronomical problems. There was yet another. The older mechanics was based largely upon two fundamental propositions—the invariability of mass, and the invariability of conservation of energy. It was in consequence of the modification in their views of space-measurement and time-measurement that these two laws became fused into a single one. Mass and energy were no longer to be regarded as distinct quantities but as different aspects of the same. Energy in all its forms possessed mass or inertia, and mass was potential energy. As regarded radiant energy, that conception was not entirely new, for they had seen already that a beam of light could exert pressure, that was, could deliver momentum to a material body, and it was hard to avoid attributing mass to anything that could do that. Einstein was, however, the first to calculate the mass equivalent to a given quantity of energy—the factor of conversion from the unit of mass to the unit of energy. That he had found to be the square of the velocity of light—an enormous multiplier. Thus one pound of matter of any kind was equivalent to a thousand million electrical units of energy, and its value in money as retailed by the Electric Supply Company would be something like 250 million pounds sterling. Conversely, the radiant energy pouring out of the sun carried with it four million tons of the sun's mass every second. They might well feel concern at such colossal waste, but a simple calculation showed that there was no cause for immediate alarm. Even if that rate of liminution continued undiminished, it would still be 15 billion years before the sun was completely annihilated.

Man had as yet discovered no means of converting the mass of bodies into energy, and perhaps never would, but it seemed likely that Nature had, and that therein lay the true source of the vast streams of radiation poured out by the stars. As to the precise mechanism of transformation, they could as yet only guess. Jeans and Russell favored the view that the stars contained very large quantities of elements which, under the conditions obtaining there, underwent spontaneous nuclear transformation, with the consequent evolution of energy in the form of radiation. It seemed to him that the existence of radio-active elements in the earth was compatible with such an hypothesis. The average life of uranium atoms was not more than 2,000 million years, and those were among the longest-lived of all the radio-active species. Even had the sun consisted of pure uranium a billion years ago, the quantity of uranium left to-day would not be detectable in any of the residue. For since those atoms were more unstable than those of other elements they should be the first to disappear. He supported the view that the stars, or their central parts at least, were cosmic crucibles in which matter as they knew it was created. Such a view was easier to reconcile with the older view of the course of stellar evolution, namely, continuous progression from the hottest to the coldest type of star, than with the Lockyer-Russell scheme of ascent and descent, and those who pinned their faith to that scheme were not likely to accept it.

No hypothesis that he had mentioned touched the ultimate problem of the origin of matter in the stars. Could matter even in its most primitive form of protons and electrons, arise from something which was not matter? And if so, from what, where, and in what fashion? Only two ultimate objective entities existed for physical science to-day—matter and radiation. There was reason to believe that transformation of matter into radiation occurred. Could they assert that the converse process, the conversion of light into matter, also took place? No positive answer to that question could yet be given, however probable an affirmative answer might appear on a priori grounds.

Their views, however, as to the nature of light, which was certainly an electrical phenomenon, and its relation to electricity in its localised and concentrated forms of proton and electron were at present undergoing a radical revision.

Whatever the final solution of the mystery of the birth of worlds might be, there was little doubt that it could only come, as the solution of so many other astronomical difficulties had come, from a deeper understanding of the physics of light and of matter. The riddle would be read not only in the depths of the stellar spaces, but in the laboratory of the experimenter, or in the study of the theorist. He hoped the brief recital had told them sufficient of triumphs of theory and of observation of ancient fallacies removed, of new knowledge gained, and of that vast enlargement of rational speculation which must ever precede a further advance into the unknown, to outweigh any [illegible] failure and of defeat. History [illegible]