SCIENCE NEWS

Science Service, Washington, D. C.

SOME PAPERS READ BEFORE THE MEETING OF THE PACIFIC DIVISION OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Do the still mysterious cosmic rays cause the light of the sky at night? Science is gradually accumulating evidence which rules out scattered sunlight as the source of this "night light." Night light is the faint but distinguishable radiation which comes from the space between stars. It is separate and distinct from the aurora borealis, although its colors resemble the latter. Dr. Joseph Kaplan, of the University of California, at the meeting at Los Angeles of the Pacific Division of the American Association for the Advancement of Science, stated that new studies on the midnight maximum of "night light" removes the sun as a possible cause of this nocturnal glow. It was formerly believed that the sun's radiation striking atoms high up in the region above the stratosphere excited them during the daytime, and that after sundown they gradually released this stored-up energy in the form of light. Dr. Kaplan believes, however, that cosmic rays cause the "night light." Most of the cosmic ray energy, as is known by the extensive researches of Dr. Robert A. Millikan, Dr. A. H. Compton and other investigators, is absorbed high in the upper atmosphere where the light of the night sky originates. In his laboratory, Dr. Kaplan has been able to produce a glow discharge in evacuated tubes whose light is the duplicate of the aurora borealis and is now studying means of duplicating, on earth, the much weaker "night light." If Dr. Kaplan's theory that cosmic rays cause the light of nocturnal sky is correct, a new means may be found for studying the very penetrating cosmic radiation. But if "night light" may turn out to be an aid to the cosmic ray studies, it is and has ever been a nuisance to astronomers, for it limits the length of time that photographic plates can be exposed to study very faint stellar objects. The "night light" forms a continous background which gradually fogs the astronomical plates.—

ARE the distant nebulae redder than the nearer ones because they are receding with enormous speed or, as many would like to believe, is there some other explanation such as attributing the red shift to the action of electrons in free space? Professor Roy Kennedy and Walter Barkas, of the University of Washington, announced that they had tested the matter experimentally and found that electrons could not be held responsible because there are not enough of them. They used an interferometer, designed by Professor Kennedy, that is capable of detecting a change of a billionth of an inch in a foot. Still no effect of electrons could be seen even with millions of millions present. Professor R. C. Tolman, the new president of the Pacific Division, announced that he and Dr. Edwin P. Hubble, who was recently awarded the Barnard medal for his work on the red shift, were practically convinced that no known effect other than recession of the nebulae was competent to account for the observations of the red shift.

A NEW discovery promising to revolutionize the whole costly and lengthy procedure of finishing large and accurate mirrors for giant telescopes was announced by Dr. John Strong and Professor Enrique Gaviola, of the California Institute of Technology. Instead of rubbing and grinding a spherical mirror for months or even years until it attains the desired parabolic shape, the new Strong-Gaviola method is to deposit just enough aluminum on the mirror in just the right places to change the sphere to a parabola. The amount to be deposited can be calculated in advance instead of using the tedious cut-and-try methods of grinding of the old opticians. If something goes wrong, instead of reworking the whole mirror, it is only necessary to remove the aluminum and repeat the process. The method is an outgrowth of Dr. Strong's technique for evaporating aluminum on large glass mirrors in a vacuum to attain better light-gathering power through all of the spectrum. Dr. Gaviola, who is visiting professor from Buenos Aires, has been assisting him in this work. The first attempt to turn a spherical mirror into a parabolic one by evaporation has now been completed with complete success. Drs. Strong and Gaviola used a mirror twelve inches in diameter for the test. There are great technical difficulties in handling very large mirrors, but the limit has not nearly been reached in the present case. The evaporation technique may change the practice of the design of optical instruments. Other shapes of telescope mirror surfaces can be made besides parabolas. Hyperbolas, for example, can be constructed. At present mirrors of this shape present enormous constructional difficulties, especially when they are off center, and are avoided at all costs. Yet they have their uses in astronomical research.

Now that large astronomical mirrors have been coated with aluminum and tried out, a group of astronomers and physicists got together at the meeting and compared notes. Dr. Strong, who has aluminized all the big astronomical mirrors so far, described some of the processes involved. The main thing is to get a good vacuum and an absolutely clean surface for the aluminum to stick to. Then just the right amount of aluminum has to be melted on the right size of tungsten wire and the wire heated until the aluminum has boiled off in all directions. Professor Hiram Edwards, of the University of California at Los Angeles, told how he happened to find a most favorable alloy of magnesium and aluminum to deposit by evaporation in a vacuum. He found the reflecting power of the alloy to be remarkably constant and equal, for visible light, to the unheard-of value of 94 per cent. This is 4 per cent. higher than aluminum. Astronomers from various observatories pointed out newly found advantages for aluminum. No mirrors have deteriorated so far. They have proved easy to clean of dust and they per-

mitted longer exposures because of the cleanness of the pictures photographed. One mirror on a sun telescope had to be treated with optical rouge every week while it had a silver surface, but during the last year and a half since it was aluminized it required no attention. The full investigation of all the benefits of aluminum will probably not be completed for years.

A FLAMING piece of cotton can be held in the hand, provided it is first immersed in a mixture of two parts carbon tetrachloride and one part of carbon bisulphide. But drop the cotton as soon as the chemicals have burned off. This magician-like stunt was part of the lecture given by Professor R. W. Wood, of the Johns Hopkins University, Baltimore, who described the eccentricities of high explosives. He also demonstrated an explosion which occurs at the relatively low temperature of boiling water, at 212 degrees Fahrenheit. Particularly violent among explosions is the outburst of fulminate detonators. When such firing devices blow up, their cap is shot off at three times the speed of a rifle bullet. By photography Professor Wood has proved that when explosives are set off they first send out weak light of extremely short duration and then remain dark for a period of less than a ten thousandth of a second. Finally they burst forth with a blaze and a bang. This second burning progresses along the explosive sometimes as fast as four miles a second.

THE meeting, sponsored jointly by the American Physical Society and the Astronomical Society of the Pacific, discussed the different ways of determining the approximate "birthday of the earth" over a thousand million years ago. One technique is called the "hour glass" method since it is based on the amount and rate of sedimentation laid down by erosion over millions of years. It is comparable to measuring time by using the flow of sand through an hour glass. The difficulty is that no one can be sure that the rate of sedimentation was anywhere near constant through the long periods of time involved, according to Dr. George D. Louderback, of the University of California. Much more accurate is the radioactive "time clock" method described by Dr. Robley Evans, of the Massachusetts Institute of Technology. Certain rocks of the earth contain the elements thorium and uranium, which continually disintegrate and finally form lead. The rate of doing that is unchanged by any natural phenomena yet found by science. Thus, the ratio of the lead to the thorium or uranium present is a measure of how old the rock is. It is still more accurate to measure the amount of the gas helium present in the sample. This gas is formed as the radioactive elements break down and shoot off alpha particles which are really the cores of helium atoms. Finally, the impact of the alpha particles on the surrounding material forms, over long periods of time, very small haloes or rings. Some specimens of mica show these rings very well. The age of the sample can be determined by studying the size and fineness of these haloes. All these methods, as well as others based on astronomical considerations, indicate that the age of the earth is between 1,850,000,000 and 3,500,000,000 years.

PROFESSOR VERN KNUDSEN, of the University of California at Los Angeles, spoke of the most recent developments in the study of sound. A peculiarity of sound is the minute energy required for audibility. When the volume of sound changes, its pitch seems to change and this is difficult to explain by the otherwise satisfactory theory of hearing now worked out. This theory envisages the ear as a string instrument. Each separate string or fiber responds best to a separate note and its agitation is transmitted by nerves to the brain. The fibers can not vibrate continuously but must have rest of one thousandth of a second between spasms of agitation. The apparent loudness of a sound depends not only on the energy of the source and the sensitivity of the listener, but also on the medium in between. Professor Knudsen described some of his own pioneering research on this question which he said depends on some theoretical results of Einstein over ten years ago. The usual medium through which we hear sound is air and the amount absorbed by the air depends largely on the small percentages of water it contains. Moist air absorbs much less than dry air. This means that the humidity of large auditoriums must be limited to diminish reverberation which is so important. It also explains the majestic quiet of the desert the dry air of which may absorb an ordinary sound so that it is almost a million times as weak at a distance an eighth of a mile as it would have been without the absorption. Carbon dioxide is still worse and reduces high notes ten thousand-fold in a distance of ten feet. This is the most absorbing gas so far found by Professor Knudsen.

THE mechanism of heredity is explained according to the most modern ideas of the biologists in terms of little blobs strung along on fibers which exist within each living cell like beads on a string. The blobs are called genes and the string of them is a chromosome. Professor Th. Dobzhansky, of the California Institute of Technology, summarized recent research in this field. The genes, he stated, are as fundamental for the geneticist as atoms for the physicist or chemist; just as definite conclusions can be drawn as to their separate existence as is possible in these other fields about atoms. Moreover, conclusions of the biologists from indirect experiments and reasoning can be verified by a direct view of giant chromosomes recently discovered in the salivary glands of the fruit fly. This is more than the chemist can ever hope to do with his atoms. The biologists found that their reasoning had been quite correct as to the order of the genes in the chromosomes but that the distances between them sometimes were off a little. These distances are not so important but the order is. The chromosome is more than an aggregate of genes because the same genes arranged differently will give different species which may be sterile when bred together. Evolutionary changes in the order of the genes is constantly going on. Professor Dobzhansky emphasized that the matter of order or relative position is an important factor hitherto disregarded.

POSSIBILITY of assaying maleness on the basis of female sex hormone production by the male body is suggested by the description of various glands and their hormones given by Professor B. M. Allen, of the University of California at Los Angeles. Professor Allen reviewed the entire field of hormones, dwelling particularly on those produced by the pituitary, thyroid and sex glands. The sex glands are associated with hormones characteristic of the male and the female, but recent research indicates that it is not only the sex glands which produce the hormone. A man may produce both male and female sex hormones and so may a woman. This corresponds to the observation that a certain degree of effeminacy is found in men and masculinity in women. Some men produce female hormones almost exclusively and this seems to match other aspects of their behavior. From these observations arises the suggestion that in the relative amount of female sex hormone produced in a man's body is to be found the measure of his masculinity. Professor Allen warned that these studies are very new and much more work will have to be done along this line before final conclusions can be drawn. X-rays and nicotine also influence production of hormones and tend to diminish it. The effect of injection of hormones varies in surprising ways. A small dose of hormone might produce a big change in certain tissues of experimental animals whereas ten thousand times the dose might produce no effect at all. Pituitary is a misnomer for the small but important gland in the head which exercises control over the other ductless glands and over body growth in general. Pituitary is a word of Latin origin meaning cold in the head.

DR. KARL MEYER, of the Hooper Foundation, University of California, stated that California and other western states must continue their drive against wild rodents, especially the ground squirrel, in order to protect themselves and the rest of the country against plague which is always present among these animals. Plague is nature's way of regulating the population of rodents which otherwise multiply with extreme rapidity. Domestic rats may share nests with squirrels and so become infected through the fleas of which the average squirrel harbors about twenty. It is the flea which generally carries the disease from rat to man. In the great bubonic plague of 1665, however, the infection was probably from man to man. The plague which in that pandemic killed off a quarter of Europe is, however, no longer a socially important disease. The infection in the domestic rat is on the wane but the selvatic form, which is the infection from wild rodents, is an ever-present danger. Outside of the Orient the current foci of plague are South Africa, Argentina and California. Both state and federal health departments are active in campaigning against the millions of rodents which infest the western states, and which are infected to the extent of 2 per cent. with plague, mostly in the pneumonic form.

ITEMS

RAPID CITY, S. D., has been selected as the site for another flight to the stratosphere next October, according to an announcement made by the National Geographic Society. Studies of the weather conditions at Stratobowl, in the Black Hills, for the last fifteen years disclose that October usually has periods of good weather long enough to make the flight a fair possibility. In the decision which will send the Society-Army Air Corps balloon *Explorer II* aloft again, Rapid City won out over Scott Field, Illinois, as the take-off site. Much of the equipment is still at Rapid City, and it had been decided that if weather conditions at the two places were at all comparable for October the South Dakota site would again be used. The entire top of the *Explorer II* is being rebuilt in the Goodyear Zeppelin factories in Akron, Ohio, and will be delivered to Rapid City some time in early September.

FIRST scanty details of the design of the sixteen giant airplanes which will take the place of the ill-fated *Maxim Gorky* have been released by the Soviet Government. The new planes will be of the all-metal monoplane type powered by six engines, each of 1,200 horsepower. The *Maxim Gorky* had eight engines of 850 horsepower each. Designed to carry from 60 to 70 passengers, the new planes will have a top speed of 167 miles an hour. The wing-span of each "ship" will be 206 feet, the over-all height 36 feet, the length 111 feet and the distance between the landing wheels 34 feet. As planned the new airplanes will operate in horizontal flight, at normal load, with two of the six engines out of order. Robot pilots, blind-flight instruments and equipment for night landings will be provided.

DUTCH ELM DISEASE is still a potential menace outside the zone around New York City where the major eradication efforts have to be concentrated because of the gravity of the infestation there. Two isolated outbreaks, one of nine infected trees in Indianapolis, Ind., the other of two trees in Norfolk, Va., have been reported to the U. S. Department of Agriculture. These trees have been destroyed, and scouts are hunting in their respective neighborhoods for others that may still be bearing the disease. The scouting and eradication campaign conducted by the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, has now reached impressive proportions. In the infested area, covering parts of Connecticut, New York and New Jersey, a total of over 1,700 square miles has been scouted to date, and specimens from more than 30,000 suspected trees have been collected and sent in to the laboratories for examination. About a third of these have received positive identification and the trees have been destroyed.

SPEAKING before the British Association for the Advancement of Science, E. W. Gilbert called attention to the fact that Britain has been in possession of other Mediterranean islands besides Malta. During the stormy, war-filled eighteenth century, England took possession of the Spanish island of Menorca on three different occasions. Even yet there are surviving relics of these periods of occupation, in the use of English sash windows, and in the presence of about a hundred English words, mostly quite corrupted, in the islanders' vocabulary.