SCIENCE NEWS

Science Service, Washington, D. C.

SOME PAPERS READ AT THE ST. LOUIS MEETING OF THE AMERICAN ASSOCIATION AND ASSOCIATED SOCIETIES

THE new super-penetrating eye of science that pierces palls of haze and smoke, which was demonstrated before the American Association for the Advancement of Science by Dr. V. K. Zworykin, of the Radio Corporation of America, will have its first use in the quiet confines of a biological laboratory, searching out new facts about life processes. The new device, which looks like a telescope from the outside, does its seeing by the infra-red rays that the unaided eye can not see. The heart of the new infra-red "eye" is a thin film of caesiated oxidized silver, deposited on a metal plate. This substance is specially sensitive to infra-red light, from the lower limit of visibility, at about 800 Ångstrom units, down to about 10,000 Ångstrom units. When the infra-red image of some object, either giving off infra-red rays itself or reflecting them from an infra-red searchlight, is focused on this special film, it gives off a stream of electrons from all the lighted parts of the image. These shoot up a tube, passing through a series of electrically charged rings, which bends them as a lens bends light. This part of the apparatus Dr. Zworykin calls an "electron lens." The focused stream of electrons, now arranged in image form again, though still invisible, strikes on a second screen, this one covered with a fluorescent substance, working on the same principle as the ordinary fluoroscopes used in hospital x-ray rooms. This turns the invisible electron image into a visible light image, very clear and distinct. The process is thus summed up in three steps: first, the infra-red rays from the object itself; then, the translation into electrons; finally, the second translation of electrons into an image shown in visible light. The uses of the new infra-red "eye," in both peace and war, are manifold, though the usefulness of the device is limited to conditions under which infra-red rays will travel through the atmosphere. Infra-red will easily penetrate haze and smoke, but fog stops it because the water-particles in fog are too big to let the rays pass. They might get through very thin fog, but the real fog menaces to air and sea navigation are still baffling.

COSMIC rays promise to measure immense movements of astronomical masses in the universe and also to test a new and needed Einstein-like extension of electrodynamics to high energies and powerful electric fields, above 70,000,000 electron-volts, which cosmic rays themselves have revealed. These two new future uses of the rays were predicted by Dr. Arthur H. Compton, University of Chicago, in an address before the association and the American Physical Society. "Studies of the latitude effect and of the variation of cosmic rays with time of day confirm our belief that the rays come from very remote distances," Dr. Compton said. "There is some evidence that the motion of the earth with the rotation of the Milky Way affects the rays. If this preliminary indication proves correct, it will mean that the rays come from very remote distances indeed, and they will serve as a useful source of information regarding astronomical motions." Dr. Compton explained the need of new physical theory and how the cosmic rays may help. "One of the most important recent developments in the study of these rays is the fact that electrons with such high energies do not excite as much radiation as is required by present electrical theory. The experiments are in reasonably good accord with the theoretical predictions up to about seventy million electron volts, at which the wave-length of the electron as calculated on quantum theory becomes about equal to its radius as calculated from classical electron theory. At higher energies the action of the electron departs rapidly from the predictions. This means that an extension of present theory of electrodynamics is needed for the regions of strong electric fields, which will be comparable with the extension of Maxwell's electrodynamics introduced by Lorentz and Einstein for the condition of high velocities. If and when such an improved theory is developed, cosmic rays afford one of our very few possibilities for giving it an adequate test."

THE atoms of the air are exploding one by one and filling the room where you sit with showers of their fragments. The projectiles causing those atom explosions have traveled millions upon millions of miles across interstellar space. These facts, almost taxing one's credulity, were established in the latest cosmic ray research in a mountain top laboratory on the summit of Pike's Peak. Dr. Carl Anderson and Dr. Seth Neddermeyer, of the California Institute of Technology, reported their findings before the meeting of the American Physical Society. To study the effect of cosmic rays having greater disintegrative power than those found at sea level, Drs. Anderson and Neddermeyer took, by truck, several tons of apparatus from Pasadena to Pike's Peak. Working night and day they packed a year of experimental measurements into a few months' work. Using Dr. Anderson's Wilson Cloud Chamber apparatus, already famous as the equipment wherein the positron was first discovered, they made over ten thousand photographs of the atom explosion tracks caused by cosmic rays. Evidence was found indicating that many of the tracks were caused by a heavy type particle. The terrific speed with which the atomic fragments were ejected in some cases represented more energy than could come from the nucleus of the struck atom alone. The fragments must, therefore, take up some of the energy of the incoming cosmic ray.

EXPERIMENTAL evidence for the existence of the "neutrino"—postulated but never-found new atomic particle—was presented by Dr. Kenneth T. Bainbridge, of Harvard University, before the American Physical Society.

For years investigators have known that the cores, or nuclei, of atoms contained the electrons, the negatively charged particles of small mass, and the protons, which are positively charged particles of the same mass as the hydrogen. In 1932 Professor James Chadwick, of Cavendish Laboratory, England, discovered that atom nuclei also contained the neutron, which, as the name suggests, is neutrally charged in the electrical sense. Professor Chadwick won the 1935 Nobel Prize in physics for this discovery. More recently a number of theoretical scientists have postulated the existence of the neutrino, or little neutron, in order to explain certain products produced in artificial radioactive transmutation of the elements. Working from known facts and with known theories it can be shown, for example, that certain isotopes can exist only if the neutrino is a fact instead of a mathematical abstraction. The search for such isotopes would, then, constitute a test for the existence of the neutrino. Dr. Bainbridge's report concerned the discovery of what might be called the "neutrino" isotopes. Using his new mass spectrograph—which might be likened to a super scale for weighing individual atoms—isotopes of cadmium and indium of atomic weight 113, indium and tin of atomic weight 115 and antimony and tellurium of atomic weight 123 were detected. These isotopes can exist only if the neutrino exists.

EXPERIMENTAL rocket flight to altitudes of 7,500 feet, with speeds up to 700 miles an hour, were reported by Professor Robert Goddard, of Clark University. Motion pictures of his rockets in actual flight were shown and some of the tests which Colonel Charles A. Lindbergh and Harry F. Guggenheim saw last September at Roswell, N. M., were shown on the screen. The experimental flights, based on five years of research, are designed to provide science with a mechanism for probing the stratosphere beyond the reach of balloons, either manned or without human pilots. Flights to the moon and other astronomical objects have never been considered by Professor Goddard as a goal in his experiments. Three needs for rocket research were cited: (1) A suitable combustion chamber which can withstand the high temperatures and pressures encountered when the rocket fuel is burned; (2) a means of keeping the rocket in vertical flight; (3) construction of very light-weight rockets. The first two goals have been achieved, Professor Goddard pointed out. A rocket "motor" has been perfected which yields 209 horsepower per pound of combustion chamber. A good airplane engine for comparison will give slightly less than one horsepower per pound of weight. Stabilization in flight, according to Professor Goddard, is accomplished with a gyroscope which serves to move vanes placed in the flaming blast of the rocket.

TWO chemical conquests, one the isolation of an alcohol which is the essence of the anti-sterility vitamin E and the other the identification of the cause of one of the puzzling virus diseases as a non-living crystalline protein material, are of special interest. Dr. Herbert M. Evans, of the Institute of Experimental Biology of the University of California, announced that from the oil of the germ of the wheat kernel he and his co-workers, Drs. Oliver H. Emerson and Gladys A. Emerson, have isolated an alcohol, called tocopherol, which has the properties of vitamin E. Since Dr. Evans was the discoverer of the anti-sterility vitamin E in 1922, his latest achievement completes a cycle of research giving the world of science a very complete record of this food factor that is essential to reproduction along with vitamin A. Vitamin E occurs in wheat and lettuce most abundantly and its lack causes sterility through interference with development of the baby in the female and the degeneration of sex glands in the male. By demonstrating that the infective material in the typical virus disease, tobacco mosaic, consists of non-living crystals, Dr. W. M. Stanley, of the Rockefeller Institute for Medical Research, at Princeton, N. J., has probably opened a new field of medical research. While Dr. Stanley has obtained his results on a plant disease instead of a human ill, his colleagues expect that some of the important diseases of mankind caused by what are called "viruses" will prove to have a chemical, inanimate cause. Dr. Stanley described just how he concentrated the infective virus material of a disease that hampers tobacco production and obtained from it crystals of a protein which had the power of causing the disease. Proteins consist of a class of substances that occur most abundantly in meat, cheese, etc., among foods. The fact that the material obtained is crystalline indicates it is a pure chemical.

A MEASURING stick for resistance to colds and possibly pneumonia seems to have been found in the capacity of the body to work. Experiments indicating this were reported by Dr. Arthur Locke, of the Western Pennsylvania Hospital Institute of Pathology, Pittsburgh. This does not mean that hard workers are necessarily the most resistant to colds and pneumonia, Dr. Locke explained. It is the body's ability to do work, rather than the person's inclination to work, that is important. Dr. Locke sees resistance or defense against invading disease "germs" as an activity that involves work. "Every phase of the activity which is necessary for the support of life requires an eventual expenditure of work," he said. Rabbits able to perform quickly the simple task of warming up after chilling are also able quickly to get invading pneumonia germs out of their blood, he found. This warming-up time is a good index of the rabbit's resistance, but it is not a practical measure of man's resistance. Instead, Dr. Locke uses for the measuring stick on man the amount of oxygen consumed in a minute while the man is riding a bicycle as hard as he can. The work on men has only just begun. Already, however, Dr. Locke found that persons who use about two quarts of oxygen—2,000 CC—in a minute during hard work have fewer and less severe colds than those who use less than this amount of oxygen. Because he has been able to study only 39 people during two months, Dr. Locke hesitates to draw any definite conclusions.

ONE of the problems of childbirth has been solved by discovery that two of the female sex hormones act as the

trigger that sets in motion the process of labor. Dr. G. F. Marrion, of the University of Toronto, reported the solution of a riddle puzzling medical scientists, by finding that just before, during and after labor great quantities of active sex hormones flood the mother's body. The hormones are known as oestrone and oestriol. During the time that the baby is growing before its birth, the hormones are produced continuously but in ineffective forms. Dr. Marrion found that in the inactive form the hormones are bound up with a kind of sugar, glucuronic acid. When the time for birth comes this combination is broken.

TWO poisons that cause many deaths each year, through suicide or accident, can now be combatted by physicians through new treatments. The two poisons are the extremely deadly cyanide and the less deadly barbiturate sleeping powders, such as luminal and veronal, which nevertheless cost hundreds of lives when taken accidentally or wilfully. Picrotoxin is the drug that fights overdoses of the sleeping powders. Dr. Theodore Koppanyi, Georgetown University Medical School professor who developed the treatment, assisted Washington physicians in recalling from otherwise certain death persons who had taken overdoses of the powders with suicidal intent. Cyanide poisoning is combatted in a new way by Dr. K. K. Chen, of Indianapolis. He uses a mixture of amyl nitrate, sodium nitrite and sodium thiosulphate and this trio of drugs rapidly counteracts the deadly poisonous effects of the cyanide when administered by injection into the veins.

CHEMICALS that produce cancer in man and animals also cause abnormal tissue growths when applied to plants, Dr. Michael Levine, of Montefiore Hospital, New York City, told the meeting of the American Botanical Society. Dr. Levine used a number of substances, including the well-known cancer-provoking coal tar and compounds containing the "sulfhydril" group, claimed by some physiologists to be especially liable to cause abnormal cell formation. He applied them to the growing tips of a considerable variety of plants, both annuals and perennials. Young sunflower plants thus treated grew crooked stems, the spaces between the leaves were shortened, many small branches were formed producing a "witch's broom" effect. Injured or injected stems painted with chemicals or treated with powdered forms of these agents produced swellings with small tumor-like growths. Under the microscope, these abnormal growths displayed certain cancer-like appearances, but of the simplest type. The plant tissues did not remain permanently cancerous, but developed the characteristics of mature tissue and stopped their wild undirected growth.

TAKE the figure 2 and add 55 ciphers after it and you will have the mass of the universe expressed in grams! That is the report of the Viennese physicist, Professor Arthur Haas. He did not weigh the universe to find its mass, as might seem necessary to the layman. His result was based on theoretical calculations, the interest of which lies in the fact that they were made without the use of customary helps like the relativity theory, the concept of an expanding universe, the curvature of space or astronomical data. From the same calculations Professor Haas derived the number of particles in the universe and the radius of a spherical volume of space over which astronomical objects are distributed. The number of particles amounts to the figure 12 with 78 ciphers after it. And the radius in centimeters of the volume of space is expressed as 93 with 25 ciphers following.

WARNING of a new explosion menace was given by Dr. R. W. Wood, of the Johns Hopkins University. The detonator caps used to set off dynamite blasts are causing damaged fingers and blinded eyes and occasionally deaths when they are found in quarries by children or lost in coal during mining. Dr. Wood recently investigated the mysterious death of a Baltimore woman which occurred while she was stoking the furnace. A cap left in the coal had exploded and a small pellet of copper no bigger than the head of a pin was blasted through her breastbone, severing a large artery and causing death. Experiments made by Dr. Wood showed that the minute projectiles are driven by the explosion through even the thickness of a couple of telephone directories.

THE 23-year period of solar activities, which is the dominant one of twelve solar cycles, not only exists at present but has existed in at least two past geologic ages. Dr. Charles G. Abbot, secretary of the Smithsonian Institution, reported that evidence has been uncovered by paleontologists and geologists that the same slow tides in the sun's energy flowed and ebbed in Pleistocene and Eocene times that are moving to-day. Pleistocene time was the Great Ice Age; Eocene time was the dawn of the Age of Mammals, about 55,000,000 years ago. All the twelve lesser solar cycles are aliquot parts of the 23-year period. In addition, there is a double cycle of forty-six years.

POORER radio reception in the broadcast region of the radio dials is forecast by Dr. Harlan T. Stetson, Harvard scientist, thanks to the increasing spottedness of the sun that will occur in the next two years. Because the sun is becoming increasingly active as measured by the great solar storms, seen as sunspots, there is every indication that the sun will reach a peak of maximum spottedness earlier than the usual length of the familiar cycle that astronomers have been carefully measuring for over a hundred years. Dr. Stetson finds that the next greatest time of sun spottedness will be reached in the early part of 1938, only ten years since the last maximum. Solar activity now is well on towards the half-way mark between the last minimum in 1933 and the next maximum.

ENGINEERS now have a new weapon with which to combat one of their most powerful enemies—the earthquake. A machine devised at the Massachusetts Institute of Technology, and described by Arthur C. Ruge, of the institute staff, makes it possible for them to reproduce at will, on a small scale, all the wracking movements of any earthquake that has been recorded on a seismograph.

Models of buildings, set on this machine, are given a chance to display points of strength and weakness, and the engineers can turn the knowledge they thus obtain to account in perfecting the resistance of their structures to the thrusts and pulls of an unruly earth. Machines constructed for this purpose in the past have not been able to follow the actual movements of an earthquake at all accurately, due largely to imperfect control mechanisms. Mr. Ruge's device consists essentially of an electromagnetic control over a valve, that in turn determines the rate and amplitude of motion of an oil-driven piston moving the shaking table. The current that operates the control is increased and diminished by a photoelectric cell, or "electric eye," in response to a controlling cam cut out of paper, in the exact shape of the earthquake's record curves. A spot of light constantly "watches" the irregular edge of the cam.

BELIEF that man lived in America hundreds of thousands of years ago was challenged by Dr. Ernst Antevs. Man could not have lived in America more than 20,000 years ago, he said, because ice sheets would have blocked his passage. Only one chance in a million exists that human beings came to this continent at about 40,000 years ago, but no scientific evidence, truly verified, has been found to show that he did. This estimate of Dr. Antevs, based on geological studies of climate of past ages, is much higher, however, than would have been accepted a few years ago. But it discounts the idea that because stone tools of ancient man found in America resemble paleolithic artifacts thought to be 500,000 to 250,000 years old found in Europe, man may have existed in America at such an early time.

FOSSIL remains of the world's largest insect, a prehistoric dragon-fly nearly two and one half feet long that was king of the air about 150,000,000 years ago, have been found near Elmo, Kansas, by Dr. Frank M. Carpenter, of the Harvard Museum of Comparative Zoology. Although only a part of one wing was discovered, the fact that many other smaller insects of a similar type have been found in excellently preserved condition, has enabled scientists to gauge accurately the size of this entire specimen. The insect was a member of the protodonato group which lived in the Permian Age, about 150,000,000 years ago, when there were no birds or mammals on earth, but only fish, amphibia, reptiles and invertebrates. With long thin bodies and good-sized wings, these insects were the most powerful that ever lived and were undoubtedly supreme in the air in their time. They were exceptionally speedy and were so strong that they could cover great distances in one continuous flight. Their diet consisted mainly of smaller insects, probably cockroaches to a great extent, since these were very plentiful at that time.

PLANTS, complete with leaves and roots, have been grown from almost microscopic bits of plant-embryonic tissue from which such plant parts have not previously been known to develop, says Dr. Carl D. LaRue, of the University of Michigan. The bits of tissue were all cut out carefully, usually from sprouting seeds, sometimes from buds on stems, and planted in a sterile nutrient medium, with a very little of the growth-promoting substance known as hetero-auxin—a concentration of one part in twenty million. From wild lettuce seeds, bits of the primary stem, bearing no trace of roots or leaves, grew successfully in Dr. LaRue's glass containers and produced complete plants with both roots and leaves, which are still living. Corn and oat embryos, removed from their natural source of food in the seed and transplanted to the nutrient medium, have grown and produced roots and green shoots.