SCIENCE NEWS

Science Service, Washington, D. C.

SOME PAPERS READ BEFORE THE AMERICAN PHILOSOPHICAL SOCIETY

COSMIC rays strike the outermost parts of the earth's atmospheric envelope at the terrifically high energy level of six billion electron volts, Dr. Robert A. Millikan, of the California Institute of Technology reported. This figure is based on records of instruments sent aloft in small, unmanned balloons that penetrated the stratosphere and went on up until only one or two per cent. of the atmosphere remained above them. "This maximum corresponds closely to the energy to be expected if there is a possibility of transforming into cosmic-ray energy the whole of the rest-mass of the carbon atom," Dr. Millikan explained. "This is the most abundant element save hydrogen and helium which the spectroscope, in Dr. Bowen's hands, has revealed in the nebulae."

MESOTRONS, recently discovered welterweight atomic particles which are intermediate in mass between heavyweight protons and lightweight electrons, are abundant in nature, but in a part of the outdoors that few of us ever get to—the upper air above 25,000 feet, Professor Arthur H. Compton, of the University of Chicago, reported this morning before the meeting here of the American Philosophical Society. Instruments for detecting and counting these particles were exposed at sea level, on mountain heights and in a high-flying airplane by several of Professor Compton's associates. At sea level and up to 14,000 feet, he said, mesotron production is almost non-existent. At 20,000 feet it is readily observable, and at 25,000 feet it is abundant.

Calculations based on observations at accessible altitudes indicate that greatest mesotron production goes on close to the very top of the atmosphere. At this level, the mesotrons are produced by bombardment of atmospheric molecules by incoming cosmic rays. At lower altitudes, Professor Compton stated, photons (particles of light) and secondary cosmic rays are responsible. The mesotrons thus produced in the upper levels of the atmosphere disintegrate into smaller particles by the time they reach the levels at which men live. Among those associated with Professor Compton in these researches were Drs. Volney Wilson, Marcel Schein, D. S. Hsiung, F. R. Shonka and P. S. Gill.

MEASUREMENTS of the rotation of the sky's most famous giant pinwheel, the great spiral nebula in the constellation Andromeda, were reported by Dr. Horace W. Babcock, of the Lick Observatory, University of California. This object is really a vast mass of stars and star-stuff on the order of 50,000 light-years in diameter, so that it makes a really massive wheel. In its spinning, Dr. Babcock said, the parts near the center and the parts near the rim move at nearly the same angular rate, just as a point on the hub and one on the tire of a wheel always keep opposite each other. This means of course that the linear velocity, the speed in miles per hour, is vastly higher in the outer parts of the nebula than it is near the center. The "arms" of the nebula are spirally curved, and Dr. Babcock found that movement is in the direction of the convex curvature. Dr. Babcock also made an approximate calculation of the amount of material in this nebula. It amounts to 10^{11} or 100,000,000,000 times the mass of the sun.

DR. CHARLES B. DAVENPORT, of Cold Spring Harbor, N. Y., called attention to the fact that we change the shapes of our own skulls, giving our heads different forms as we grow up, according to the predominating activities of the various "ages of man" through which we pass. Dr. Davenport has spent many years in the application of the principles of genetical science to problems in human eugenics. The process begins even before birth, when the skull becomes longer and narrower just before it must make its crucial journey through the birth canal. In early infancy, while it is still only a series of slightly bony plates embedded in flexible cartilage, it shapes itself more broadly as it lies in the crib. Yet children born invalids and condemned to lie in bed all their lives do not keep this crib-influenced skull shape, but eventually acquire nearly standard head proportions. "As soon as the infant begins to walk," Dr. Davenport continued, "the head height diminishes or increases only slowly under the pull of gravity, but after one and one-half years the vertical dimension increases rapidly as though to compensate for the earlier loss. During the period of great activity in jumping and romping the vertical dimension of the head grows very slowly. The length of the skull grows relatively faster in adolescent boys than in girls."

"BLOOD relationship" is no mere figure of speech; it really means something. This has been indicated in researches reported by Professor Merkel H. Jacobs, of the University of Pennsylvania. Professor Jacobs has devised a simple and quick method for testing the ability of blood corpuscles of widely different species of animals to absorb various kinds of chemicals, requiring no apparatus other than test-tube and stop-watch. He finds that corpuscles of related species resemble each other more in their characteristic absorbing powers than do red cells from animals more widely separated in their kinship. He has worked out a "key" for their identification, similar to that used by systematic botanists and zoologists.

COLCHICINE, old-fashioned rheumatism remedy that has recently been used with spectacular results to speed up evolutionary changes in flowering plants, met its Waterloo at the bottom of the vegetable life ladder, Dr. Albert F. Blakeslee, of the Carnegie Institution of Washington, reported here this afternoon before the meeting of the American Philosophical Society.

Colchicine works on the higher plants because it is poisonous to them. It causes a doubling of their chromosome numbers by partially paralyzing the cell-division

process. The only higher plant found to be immune to this poisoning effect is the plant from which the drug is derived, Colchicum, the autumn-flowering crocus.

Dr. Blakeslee, with Drs. Sophia Satina and Marie E. Conklin, used colchicine on several kinds of molds and bacteria, as well as on some of the liverworts or lower mosses, and on certain algae or pond-scum plants. It apparently had effect on the latter two groups, which are green or chlorophyll-bearing plants. But the molds and bacteria would not change their way of life for it. Indeed, two species of mold and one strain of bacteria apparently found it good for food.

DEGREE of dryness in soil, as expressed in its ability to take up offered water and transmit it for short distances, is automatically measured by apparatus described before the meeting by Professor Burton E. Livingston and Stuart B. LeCompte, Jr., of the Johns Hopkins University. The instrument consists primarily of an inverted cone of porous porcelain, permanently buried, and supplied with water from a reservoir at the top. As long as the soil is not saturated, it keeps drawing water away from the cone, the rate depending on the degree of dryness. As soon as saturation sets in, the instrument stops working, to resume operation when the soil once more begins to dry out.

Dr. Livingston also described two instruments, one of them his own invention, that give expressions of the total intensity of sunlight.—FRANK THONE.

PLANT TISSUE GROWN IN TEST TUBES

PLANT tissue that is neither root, stem nor leaf, but "just plant," is kept growing in test tubes at the Rockefeller Institute for Medical Research laboratories in Princeton, N. J., by Dr. Philip R. White. Potentially immortal, these masses of plant cells can be made to develop and differentiate into small plants at the will of the experimenter. At a recent meeting of the Torrey Botanical Club Dr. White described his technique and its results.

The principles would apply to any of the higher plants; the actual species used by Dr. White are tobacco and tomato. The outer layers of the stem are peeled away, and a conical piece broken out of the growing tip. All the work is done under aseptic conditions, for the presence of bacteria or fungi would quickly cause decay and destroy the cultures.

The bits of stem-tip tissue are placed on a mixture of mineral and organic nutrients solidified into a jelly with agar. They develop outgrowths of cell masses, that can be cut off and re-propagated in the same way, indefinitely.

So long as these cell-mass cultures are kept on the nutrient agar jelly they continue to grow as undifferentiated tissue—stuff that is "just plant." But if they are taken off the jelled substratum and dropped into a liquid solution containing the same food substances they sink to the bottom and presently produce first stems, then leaves and roots—complete plantlets.

Why these masses of generalized plant cells should be induced to turn into differentiated and specialized stem, leaf and root tissues by being thus immersed, Dr. White said that he was unprepared to state positively. He conjectured, however, that the difference between the oxygen supply at the top and at the bottom of the solution may have something to do with it.

These masses of plant tissue have been kept growing for eighteen months, divorced from the original parent plants. The next step in the research is to see whether plant cells can be grown as separate individuals, instead of in the tissue masses as at present.

A by-product of the root researches was an experiment in which he demonstrated that these isolated tomato roots develop pressures that could easily carry a column of sap higher than the Washington Monument. For the paper in which he described this experiment, Dr. White received the $1,000 prize of the American Association for the Advancement of Science.

THE HASSEL COMET

THE most brilliant comet to sweep the skies in several years is now flaming low in the northwestern heavens in the early evening. Easily visible to the eye, it is nearly as bright as the familiar North Star and has a tail greater in length than the apparent diameter of the full moon.

The new comet of the third magnitude (the North Star is of second magnitude) was discovered at the University Observatory, Oslo, Norway, on April 16 by the astronomer Hassel, according to cabled reports from Professor S. Rosseland, director of the Norwegian Observatory, to Harvard Observatory, the American clearing center for astronomical discoveries.

The most recent check on the comet's position comes from the observatory of the University of Copenhagen. Its position on the evening of April 18 was right ascension two hours, seven minutes and 58 seconds and its declination was plus 43 degrees, 15 minutes and 53 seconds, according to reports from Miss J. M. Vinter-Hansen, astronomer at Copenhagen, and her associate, J. P. Möller.

This places the comet in the constellation of Andromeda near the bright star Almak. Andromeda is low in the northwest sky in the very early evening and disappears below the horizon about 7 P.M. local time in latitudes comparable with Washington. Only swift observing between sunset and the disappearance of the comet below the horizon will spot it. However, once found it can be seen easily because of its brilliance.

The Hassel comet, while at present in a rather unfavorable position for night-time observation, is so bright that it should be possible to observe it with large telescopes during the day-time. The right ascension of the star is so nearly the same as that of the sun that it sets and rises at very nearly the same time. It is thus possible to see it at sunset and probably, also, just before sunrise in the southeast.

The comet was nearest to the sun—and hence brightest—on April 10. It is now moving away from the sun and earth and will rapidly become fainter. On April 19 it was of the third magnitude, easily visible to the unaided eye, and can be found in the constellation of Perseus in the northwest. It is moving rapidly southeast and soon will enter the constellation of Auriga.

MATHEMATICS AND MODERN LIVING

PROFESSOR GEORGE D. BIRKHOFF, dean of the Faculty of Arts and Sciences, Harvard University, in an address at Catholic University, stated that nearly one half of the circle of human thought has already become definitely mathematical in character. Already encompassing the fields of the physical and mathematical sciences, the study of mathematics is now influencing the field of economics. He continued: "I would conjecture that this tendency will extend still further into such fields as sociology and law, where mathematical analyses may introduce much clarification and simplification.

Professor Birkhoff's address on "The Role of Mathematics in Education" is one of a series of lectures being given by members of the Pontifical Academy of Sciences in celebration of the Golden Jubilee of the Catholic University of America.

A knowledge of mathematics and the sciences (using the language of mathematics) is essential for advancement and understanding of the modern world, Professor Birkhoff said. He cited a survey of the men in Who's Who to back this point, showing that between 30 and 40 per cent. of these outstanding men have a considerable scientific and mathematical background. He pointed out that mathematics of an advanced stage need not be taken by all college students. What is really essential is the fostering of the student's intellectual enthusiasm and initiative.

Professor Birkhoff predicted that within a few years an appreciation of the beauty, grandeur and basic importance of mathematical thought would become much more widespread.

ITEMS

DINOSAURS, pterodactyls and other weird extinct reptiles crowd two new halls of the American Museum of Natural History, which was shown in preview to a group of invited guests on the evening of April 17 and opened to the general public the following day. The total number of exhibits exceeds 200, and the specimens range from the size of bantam roosters to the great "thunder-lizard" that in life weighed 15 tons. A dramatic grouping shows the skeleton of a great spike-toothed carnivorous tyrannosaur stooping over the remains of a larger but herbivorous dinosaur, as if about to rend and devour its flesh. While some of the exhibits have been in the museum's collections for many years, so many new exhibits have been added that a complete rearrangement was necessary, in addition to the construction of a new and magnificent Jurassic Hall.

SOVIET Russia will take a long step toward solution of its urgent transportation problem during the third five-year plan by cutting an eight-and-a-half-foot channel in the shallow reaches of the Volga River to make possible a through waterway between Moscow and the raw materials base of the lower Volga region and the Urals, according to a report from Tass, the Soviet news agency. Now little more than a yard in depth upstream from Rybinsk, the channel will open a 2,000-mile waterway, shortest and cheapest means of transportation through the entire Volga region. Moscow is already linked to the river by a canal.

POINTING the way toward possibly finding eventually another use for their seemingly curious laboratory toy, the molecular film only a millionth of an inch thick, General Electric investigators have found that their inconceivably thin films may have insulation values comparable to the best known dielectric insulating materials in use. Already applied to the production of glareless glass in one instance, thin films of another type are having their insulating properties studied by Dr. H. H. Race with apparatus that makes a dust particle appear like a mountain. Infinitesimal quantities of materials such as barium stearate are being used in the new experiments. The films' areas are only about three thousandths of a square inch—about that of the head of a pin. "The investigation is really one of pure science, but . . . what to-day is only an interesting fact may to-morrow be applied."

SULFURIC acid pollution in the Ohio River and its branches has already been reduced 25 per cent. by the mine-sealing program carried on by the Works Progress Administration, with the cooperation of the U. S. Public Health Service. In the Monongahela River alone, the principal water source for Pittsburgh, Morgantown, W. Va., and other cities, the noxious acid content has been reduced approximately 30 per cent. Many of the streams in this great watershed are now wholly free of acid; the waters have been cleared and can be used for drinking and bathing, fish life has returned and plants have sprung up on the once bare banks. Sulfuric acid forms in mines when air and water come into contact with iron pyrites. The acid water then flows from the mines into the streams. The discharge amounts to 2,802,000 tons of sulfuric acid per year. Treatment consists in blocking all openings of abandoned mines, to prevent the entrance of air and water, and in keeping operating mines as well closed up as practicable. Thus far a grand total of nearly 116,000 mine openings have been sealed, at a cost approaching six and one half million dollars.

LIGNIN, waste wood product in paper-pulp making, has had another addition made to its growing list of possible uses by chemists of the U. S. Department of Agriculture, at the Agricultural By-Products Laboratory at Ames, Iowa. They have found it to be much more efficient than chemicals now in use for the removal of iron from water. Iron is a problem in most city and industrial water supplies. Lignin is a problem in the wood-products industries. Put the two together and they solve each other. Lignin is very cheap because of its great abundance, and the little use hitherto found for it. Yet cheap as it is, it can be used with still further economy in the iron-removal process, because it can be used over and over again, as often as ten times, with no appreciable lessening of efficiency. A compound now in use was tried out in parallel tests and found not only to remove less iron at any one time, but also to lose its efficiency after only six runs.