SCIENCE NEWS

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SOME PAPERS READ AT THE COLUMBUS MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE AND ASSOCIATED SOCIETIES

A NEW low-cost "atom-sifter" that sorts out atoms by weight, which will aid investigations of human, animal and plant physiology and in organic chemistry, was described by Dr. Alfred O. Nier, of the University of Minnesota. Speaking before a symposium on isotopes, Dr. Nier told of a small mass spectrograph by which it is readily possible to determine the abundance of isotopes in a given sample. Isotopes are varieties of an element which have the same chemical properties but slightly different atomic weights. For example, in normal carbon 99 out of every 100 atoms have an atomic weight of 12 and one atom has an atomic weight of 13. If sufficient quantities of these heavy carbon atoms can be obtained, they can serve as "tracers" to study how plants transform the atoms of carbon dioxide of the air into their body substance, how organic compounds containing carbon are created, or how the human body utilizes so many of the carbon compounds of which it is composed. The apparatus, a small spectrograph, bombards a gas or vapor of the element (it may be carbon, oxygen, nitrogen or hydrogen) with a stream of electrons. The neutral gas atoms are thus turned into ions with electric charges, which make them susceptible to electric and magnetic fields.

IN other reports in the symposium on isotopes, Dr. Hugh S. Taylor, of Princeton University, showed how light and heavy nitrogen isotopes are being used to study the chemical reactions which produce ammonia synthetically in the presence of isotopes. Dr. Lloyd P. Smith, of Cornell University, told of a new kind of electric ion source which makes available large numbers of ions for use in mass spectrographs. Dr. W. W. Watson, of Yale University, described the construction and operation of a multi-stage thermal diffusion apparatus for the concentration of heavy carbon of mass 13. Other speakers were: Professor Harold C. Urey, of Columbia University; Professor A. J. Dempster, of the University of Chicago; Professor Kenneth Bainbridge, of Harvard University, and Dr. A. Keith Brewer, of the U. S. Bureau of Chemistry and Soils.

A FORECAST of eighty new and yet undiscovered radioactive isotopes of chemical elements was made at a meeting of the American Physical Society by Drs. D. Dickson, P. W. McDaniel and E. J. Konopinski, of Indiana University. The new forecasting method, which should enable nuclear physicists to learn new facts of how atoms are put together, is made by considering the nuclear hearts of atoms which differ in mass by four units (an alpha particle) as analogous. Using the method, a new radioactivity of chromium with a half-life of 2.27 hours was predicted. Experiments proved the existence of this previously unknown isotope.

RADIUM has been produced by transmutation of the common element, bismuth, with the University of Michigan cyclotron, according to a report to the American Physical Society by Drs. J. M. Cork, J. Halpern and H. Tatel. Deuteron particles, that is, ions of heavy hydrogen of atomic mass 2, were driven at high energy by the cyclotron against the heavy element bismuth. Out of the bombardment came Radium E and Radium F, the latter discovered by Madame Marie Curie and known as polonium. Radium E and Radium F occur in nature, are radioactive and emit alpha particles. The transmutation of bismuth into Radium E appeared to be more easily accomplished than the transmutation into polonium. Four atoms of Radium E were created for every one of the polonium, Radium F.

ATOMS can act like little radio transmitters broadcasting on ultra-short waves between 40 centimeters and 1.5 meters in length, according to the report of Professor I. I. Rabi, of Columbia University, who spoke before the American Physical Society. The atom "broadcasts" are being used to detect the energy difference within the atom for different atomic states. Not only does an atom transmit such waves, but it can absorb them. By applying these short radio waves to atoms passing down his apparatus, specific energies are absorbed which make the atoms go from one atomic state to another; states in which they possess detectable differences in magnetic properties. The transition point is sharp and very exact. It provides knowledge of the spins of the atom nucleus and its associated electrons with an exactness a hundred times greater than ever before. Radio-frequency spectrum analysis also gives indication of the magnetic moments of atoms, for it is known that the nuclei of atoms behave like tiny magnets. Professor Rabi, with Drs. P. Kusch and S. Millman, also described studies on the radio-frequency spectrum of the two varieties of lithium having mass six and seven.

DR. W. W. COBLENTZ, of the National Bureau of Standards in Washington, speaking before the American Astronomical Society, stated that rhodium metal, deposited on glass by evaporation, makes rugged reflecting surfaces for telescope mirrors which withstand chemical corrosion. The rhodium mirror surfaces seem especially desirable for small mirrors used by amateur astronomers in their instruments. The rhodium, evaporated to a vapor in a vacuum and then condensed on the glass surface, avoids the chemical corrosive destruction which occurs on some aluminum-coated mirrors in telescopes. Aluminization, developed and applied in observatories on the West Coast, works well in that climate. But since first introduced a few years ago it has been discovered that elsewhere the mirror surfaces corrode and must be replaced. Dr. Coblentz has found that rhodium applied by evaporation has better reflecting properties than the same metal applied by electrolysis.

"SUPER-SHELL" stars, a class of celestial objects long observed but hitherto neglected by astronomers, were de-

scribed by Dr. Ernest Cherrington, of the Ohio Wesleyan University. Their distinguishing character is an outer gaseous envelope or atmospheric shell that speeds away from the star itself with explosive velocities up to 70 kilometers (43.5) miles a second. Spectrum photographs of these stars, technically known as the B and Be types, have been almost in the class of nuisances to astronomers, because some of their lines are fuzzy rather than clear and sharp. These faint and fuzzy lines proved, upon analysis, to be indicators of the existence and recessional speeds of the stars' "super shells."

STUDIES of the rate of earth's meteoritic accretion show that the world is gaining a minimum weight of about 100,000 long tons (10^8 grams) yearly from this cause, according to Dr. Fletcher G. Watson, Jr., of the Harvard College Observatory. The meteorite material, most of it microscopic dust, which strikes the earth yearly may amount to as much as 10,000,000 long tons. The accretion amounts to an average of 50 grams per square mile of the earth's surface each year. Although the rate of accretion can not be extrapolated far into the past, at the present rate of increase Dr. Watson estimates that a layer of meteorite dust only one centimeter thick has been deposited, on the average, since the origin of the earth as a separate body in space.

PROFESSOR HARRY N. HOLMES, of Oberlin College, spoke of his work with Ruth E. Corbet and W. B. Geiger, in concentrating crystalline substances from the bone marrow of cows after the high fatty fraction (85 per cent.) has been extracted by saponification. Among these nearly pure crystalline substances, it is believed, is the mother substance which creates the white blood cells, the granulocytes.

DR. WILLY LANGE, of the University of Cincinnati, reported methods of producing fatty acids—from which can be made edible fats and soaps—from paraffin wax, a petroleum product. Large-scale production of what corresponds to a synthetic lard is now operating in Germany.

X-RAYS were used to check up the size of the invisible particles of virus that cause mosaic disease in plants, in experiments reported to the zoologists by Professor John W. Gowen, of the Iowa State College. The size of the virus molecules, or at least of that portion of it necessary for reproduction, was gauged by the wave-length of the x-rays necessary to render them inactive. It worked out as a molecular weight of approximately 15 million, which is in fairly close agreement with the size determined by other means. These virus particles are the largest molecules thus far known; molecules of ordinary organic substances have molecular weights of only a few hundreds, or at most a few thousands.

VIRUSES thrive particularly well on a high nitrogen diet, according to Dr. Ernest L. Spencer, of the Rockefeller Institute for Medical Research, who spoke at the meeting of the American Phytopathological Society. He grew tobacco plants in washed quartz sand, giving some of them a standard nitrogen nutrient solution and others ten times as great a concentration of that element. Measurements of the virus strength in the sap, after suitable periods of growth, showed much more of the disease-causing entity in the high-nitrogen than in the low-nitrogen plants. Professor Vernon L. Frampton, of Cornell University, told of the discovery that the tobacco mosaic virus belongs to that peculiar group of substances that are liquid as water when stirred or shaken, but "set" like a firm jelly when permitted to stand undisturbed. Such substances are technically known as "thixotropic sols."

BEHAVIOR of tobacco plants ofter recovering from the virus disease known as curly top was described by Dr. James M. Wallace, of the U. S. Department of Agriculture. The plants were immune to further attacks of the same and closely related viruses, just as a human being who has had smallpox once is immune to that disease. Unlike the human convalescent, however, the recovered plants continue to harbor the virus, and healthy plants can be made sick by transfer-inoculation from them. It was also found that tomato plants could be protected against the virus, to some extent at least, by grafting upon them shoots from recovered tobacco plants.

HONORS were conferred on a tiny insect ally used by man in his ceaseless war against crop and orchard pests, when J. E. Webb., Jr., and C. H. Alden, of the Georgia State Department of Entomology, told how effective has been the aid of a gnat-sized wasplet known as *Trichogramma minutum* in abating the ravages of codling moth and fruit moth in Georgia's famous peach and apple orchards. During the past ten years armies of these midget warriors of more than 300 millions have been raised and turned loose to range the orchards. They lay their microscopic eggs within the eggs of the moths, and the minute but hungry larvae destroy the pests by literally boring from within.

MALARIA mosquitoes in the Tennessee Valley spend the winter in caves like bats, living on the accumulated fat stored in their bodies, according to Drs. E. Harold Hinman and H. S. Hurlbut, of the Tennessee Valley Authority. The specimens they found in their searchings were all adult females that had been mated, so that they were ready to develop and lay their eggs as soon as warm weather came again. "Hibernating females in caves have survived as long as 69 days without food." The temperature ranged from 51.5 to 59 degrees Fahrenheit between December 16 and January 27 in one cave where continuous record was kept. A renewal of reproductive activity occurs early in February and the overwintering females leave the caves at this time.

GREEN leaves, even the thinnest, are exceedingly effective sponges for soaking up sunlight, according to Professor W. E. Loomis, of the Iowa State College, before an audience of chemists. They absorb from 85 to 90 per cent. of the sun's visible radiation, from high violet to well into the red part of the spectrum. But of the ultra-violet, from 7,000 to 30,000 Angstroms wave-length, they absorb almost nothing. So far as visible light is concerned, Professor Loomis stated that leaves are "so selective that only the high percentage of green in sunlight and the sensitivity of the eye to this color makes them appear green." Artificial light, even the cheapest,

can not compete economically with sunlight as a source of energy for plants, was emphasized by Dr. John M. Arthur, of the Boyce Thompson Institute for Plant Research. "Basement greenhouses" are not practicable if the electric current has to be paid for. "The most practical arrangement at present," he said, "is to use sunlight in a greenhouse while it lasts and to supplement for a period of three to six hours each night with artificial light." The 500-watt lamps used for the purpose supply heat as well as light, and are thermostatically controlled.

BUDS were induced to grow where there had been none before through the use of vaporized growth-promoting substances, in experiments described before the Botanical Society of America by Drs. P. W. Zimmerman and A. E. Hitchcock, of the Boyce Thompson Institute for Plant Research. Cuttings of the Hibiscus species commonly known as Rose of Sharon were used. All the normal buds were cut away, and the cuttings then exposed to the vapors of the growth chemicals. Large numbers of buds were formed in irregular positions—the kind botanists call adventitious buds. As many as 75 of these buds were formed on one six-inch cutting. Most of the buds appeared on the upper portions of the cuttings.

CUTTINGS of woody plants that ordinarily do not readily sprout roots, like apple, pear and plum, can be induced to do so by treatment with one of the growth-promoting substances. Where they do not respond readily to simple soaking in a growth-promoting solution, the process can be speeded up by subjecting them to a vacuum treatment, was reported by N. W. Butterfield, of Purdue University.

TREE rings are not infallible records of the weather in the years when they were formed. It depends partly on the species of the tree. Such would seem to be the inference from records set before the meeting of the Ecological Society of America by Professor Charles J. Lyon, of Dartmouth College. Professor Lyon's studies were made on a number of trees, of six different species, that had grown for years in the near neighborhood of a regularly maintained set of weather-recording instruments. The 1938 hurricane blew them all down, which gave occasion for the study of correlation between their growth rings and past weather records. Closest correlation between spring rainfall and ring growth was shown by white pine, Scotch pine and red oak, but Austrian pine, Norway spruce and European larch showed no consistent agreement with precipitation records of any period. Temperature studies showed almost no correlation whatever when the growing season itself was concerned, but all the coniferous trees gave significant correlations between growth rate and the temperatures in March and April, before the growth starts.

PRODUCTION of a new potato variety, resistant to the deadly blight disease that caused the Great Famine in Ireland in the mid-nineteenth century and that still robs potato growers of their profits all over the world, was announced by Professor Donald Reddick, of Cornell University. The new variety, not yet in commercial production, was bred by crossing desirable commercial potato varieties with a wild potato species from tropical America which had been found highly resistant to the destructive blight fungus. Professor Reddick stated that if the potato exhibited holds its record for one year more, it will be released to seed producers for increase. It will be named Desert. It produces a good crop under extremely dry conditions.

ADOPTION of the combine as the predominant wheat harvesting machine in the United States has created some entirely new insect pest problems, according to Professor T. H. Parks, of Ohio State University. Wheat harvested with a combine has a higher moisture content than wheat harvested with older types of machinery, and in the east central states at least, this has resulted in increased losses from weevils attacking the stored grain.

PROGRESS toward the production of a wheat variety able to fight off a number of the crop's most formidable insect and fungus foes was announced by Dr. R. H. Painter, of the U. S. Department of Agriculture. Effort has been made to combine the resistance to Hessian fly found in Marquillo spring wheat with resistance to stem rust, wheat rust and bunt found in various winter wheats, with the goal of producing the best possible new strain of winter wheat. Associated with Dr. Painter in his researches are Elmer T. Jones, C. O. Johnston and John H. Parker.

PRODUCTION of normal bolls of cotton from unpollinated flowers was described by Dr. J. C. Ireland, of the Oklahoma Agricultural and Mechanical College. Using the same growth-promoting substances that have been employed to induce formation of seedless fruits, all the way from holly berries to watermelons, Dr. Ireland treated the pistils of cotton flowers after the stamens had been removed. Both fiber and seed developed normally; the only differences observed were in the embryo plants within the seeds. Dr. F. G. Gustafson, of the University of Michigan, pioneer worker in this "fatherless" fruit production, told how he had grown side-by-side crops of ordinary and unpollinated tomatoes. There was no observable difference between the two products, in either proportion of fruits set by the flowers or in size of the tomatoes when ripe.

AN instrument that might be called an electrical drought-meter was described before an audience of agronomists by Byron Shaw and Dr. L. D. Baver, of the Ohio State University. It consists of a coil of copper wire wound on a glass tube, which is placed in the soil. Electric current is forced through it, and the resistance measured with a suitable instrumental setup. The drier the soil the greater the resistance. Progress of droughty conditions, from normally moist to extremely dry, can be measured quickly and accurately.

RADIO-PHOSPHORUS, made active so that it gives off detectable particles and radiation in atom-smashing experiments, is a new means of studying how plants absorb fertilizers from the soil, Drs. S. S. Ballard and L. A. Dean, of the University of Hawaii, reported to the American

Physical Society. Radioactive phosphorus is one of the longest lived of the many elements which have now been created artificially by bombardment. Its half life is 14.5 days—which means that its initial strength of radioactivity diminishes to half in that length of time.

THE dizziness, swaying or airsickness that is caused when the semicircular canals of the ears are seriously disturbed can also be produced through training by the simple ringing of a bell, according to Drs. W. Horsley Gantt and H. Loewenbach, of the Johns Hopkins University. A mild electric shock passed through the ears will cause dizziness and loss of balance just as the rapid descent of an airplane might. The adjustment of the nervous system "is so delicate that the animal could be caused to fall in one direction by one bell and in the opposite direction by another bell, depending upon the direction of the passage of the current through the ears.

THAT intelligence is not confined to any single area of the brain's cortex, but is a function of the entire brain, is indicated by experimental findings presented by Professor H. M. Hildreth, of Syracuse University. Indirect methods must ordinarily be used to study the work done by different parts of man's brain, because it is not possible to take out one area after another to measure what functions remain and what are lost. Dr. Hildreth's study was made on those unfortunate persons who through the brain condition known as cerebral arteriosclerosis have had destroyed small areas of tissue throughout the brain. Comparing the achievement of 201 such brain-injured persons on several mental tests with that of an equal number of "control" subjects matched with them on initial intelligence, Dr. Hildreth found that the deterioration of the brain-injured patients ranged all the way from zero to 90 per cent., according to the difficulty of the particular test. If the ability to pass a given test were dependent upon one particular area in the brain, the scattering of the brain injuries throughout the brain would have resulted in a corresponding scattering deterioration in test performance. Such scatter, Dr. Hildreth did not find.

SURGEONS performing muscle transposition operations to correct motor paralysis might find valuable hints in the motion pictures of reverse-action rats shown by Dr. Roger W. Sperry, of the University of Chicago. When these rats tried to rise upright on their toes, the toes swung up in the air and the animals fell back on their heels. When they lifted their legs in walking, instead of rising with the knee, the foot jerked downward and scraped on the floor. This complete reversal of all movements, both spontaneous and reflex, of the hind feet was due to an operation in which muscles operating the hind foot were transplanted so as to move the foot in reverse. Although the rats lived more than a year after operation and were subjected to training, none of them was able to readjust the reversed coordinations. The results are in accord with the views of some surgeons and physicians that re-education after muscle transposition, when possible, is extremely difficult and tedious. They indicate, Dr. Sperry said, a central nervous system organization of the motor patterns for limb coordination and the relative unplasticity of these basic central nervous processes.

INDEX TO ADVERTISEMENTS

Akatos, Inc. 35
Aloe Company, A. S. 18
American Association for the Advancement of Science 68
American Chemical Paint Co. 26
American Instrument Co. 9
American Medical Specialties Co., Inc. 24
American Telephone & Telegraph Co. 4
Badger Biological Supply Company 8
Bausch & Lomb Optical Co. 38
Biddle Co., James G. 37
Blakiston Company 2
Bureau of Publications, Teachers College, Columbia Univ. 69
Burke & James, Inc. 72
Cambridge Instrument Co., Inc. 25
Cargille, R. P. 14
Carnegie Institution of Washington 66
Carver, Fred S. 36
Central Scientific Company 10
Chicago Apparatus Company 20
Chicago Press, University of 41
Clay-Adams Co., Inc. 15, 26, 27, 47
Coleman & Bell Co. 25
Coleman Electric Co. 29
Comstock Publishing Company 58
Cornell University Press 41
Corning Glass Works 75
Eastern Engineering Company 17
Eastman Kodak Co. 73
Ednal Company, Inc. 26, 27
Edwards Brothers, Inc. 68
Electro-Medical Laboratory, Inc. 25
Eppley Laboratory, Inc. 22
Evans, Adlard & Co., Ltd. 24
Fiedler, Henry George 68
Fish-Schurman Corporation 23
Fisher Scientific Company 16
Frober-Faybor Co. 22
Gaertner Scientific Corp. 31
General Biological Supply House, Inc. 70
Graf-Apsco Co. 20
Green, Henry J. 26
Hartman-Leddon Company 23
Harvard Apparatus Company, Incorporated 45
Hengar Company 16
Hoke, Inc. 47
Holt and Company, Henry 39
International Equipment Co. 11
Kern Company 27
Kewaunee Mfg. Co. 18
LaMotte Chemical Products Co. 26
Lea & Febiger 52
Linde Air Products Company 72
Linguaphone Institute 26
Longmans, Green & Co. 69
Loring, J. Alden 27
McGraw-Hill Book Co., Inc. 48, 49
[illegible] 54, 55, 56, 57
[illegible]
[illegible]
[illegible] Co. 27
[illegible]
[illegible] tories 71
Nelson, George F. 19
New York Scientific Supply Co. 23
Nordeman Publishing Co., Inc. 66, 67
Offner Electronics 47
Paragon C. & C. Co. 34
PerfeKtum Products Co. 28
Phipps & Bird, Inc. 74
Polaroid Corporation 72
Polychrome Co. 15
Precision Scientific Co. 33
Purina Mills 70
Reinhold Publishing Corporation 50, 51
Rosenberg, L. 26
Ross, Harry 26
Ryerson Press 68
Ryker, Inc., Harrison C. 27
Saunders Company, W. B. 1, 3
Schleicher and Schüll Co., Carl 30
Science Press 69
Science Press Printing Co. 12, 13
Sharples Corporation 43
Sorvall, Ivan 21
Spencer Lens Co. 32
Spindler & Sauppe, Inc. 25
Stacey, Inc., J. W. 5
Standard Scientific Supply Corp. 74
Stanford University Press 69
Stoelting Co., C. H. 14
Stokes Machine Co., F. J. 47
Stylograph Corporation 24
[illegible] 27
[illegible] H. 7
[illegible] Bureau 69
[illegible] Instrument Co. 71
[illegible]
[illegible] Anatomical Laboratory of 23
Ward's Natural Science Estab., Inc. 73
Warren-Knight Co. 66, 72
Welch Scientific Company, W. M. 17
Wiley & Sons, Inc., John 60, 61, 62, 63, 64, 65
Will Corporation 6
Wilmot Castle Company 19
Winston Company, John C. 5
Zeiss, Inc., Carl 76

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