SCIENCE NEWS

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PAPERS READ BEFORE THE WASHINGTON MEETING OF THE AMERICAN PHYSICAL SOCIETY

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NEW and more accurate knowledge about the two essential building blocks of the hearts of atoms—the protons and neutrons—was reported by Professor E. O. Salant, of Washington Square College, New York University, and Dr. Norman Ramsey, fellow of the Carnegie Institution of Washington. Working with the 1,000,000-volt electrostatic atom-smasher at the Department of Terrestrial Magnetism of the Carnegie Institution, the collision cross-sections of protons when bombarded with neutrons were measured. All nuclei of all atoms, except hydrogen, are made up of combinations of neutrons and protons, so that the binding energies of these nuclear pairs is fundamental knowledge essential to an understanding of how the elements—and hence all matter—are composed. By the use of a "wall" of potential which appears to exist in atoms of copper the collision cross-sections of protons for "fast," or high energy, neutrons which poured off a lithium target in the atom-smasher as it was bombarded with ionized particles of the heavy-weight kind of hydrogen known as deuterium were studied. These ions, called deuterons, struck the lithium target and by artificial radioactivity liberated from the lithium "fast" neutrons having energies up to 15,000,000 electron volts. Advantage was taken of the fact that copper is insensitive to neutrons weaker than 12,000,000 electron volts. This "threshold" permitted them to be sure that their experiments were carried out only with the "fast" neutrons of energies greater than 12,000,000 electron volts. By an "in and out" method the scientists measured the transmission of pieces of paraffin and carbon for the fast neutrons. Chemically the only difference in paraffin and carbon is that the former has two extra atoms of hydrogen in its molecule. As a result Professor Salant and Dr. Ramsey, after they had determined the collision cross-section for carbon, were able to insert this value in the collision cross-section for paraffin and—by simple subtraction—were able to determine the cross-section of fast neutrons on hydrogen atoms alone. Hydrogen atoms and protons have essentially similar collision properties, for they differ only by a single electron.

SOME of the difficulty which lies behind dreams of releasing atomic energy from the nucleus of the uranium atom was discussed in the report of K. H. Kingdon and H. C. Pollock, of the General Electric Company. Using a large mass spectrograph for separating uranium isotopes a mere speck of uranium of mass 238 was obtained after running the machine for three hours. One and eight tenths of a microgram of uranium concentrate was obtained. At this rate it would take some 70,000 days (over 191 years) to produce a gram of the uranium concentrate. The key step in the possible production of atomic power by the continuous release of energy from uranium atoms has been the attempt to concentrate uranium from its ores so that a chain reaction can be produced. There has been some evidence of this chain reaction, but the final test will come only when science is able to concentrate sufficient samples of uranium in pure form. While nothing was said about uranium fission and the release of atomic energy, the results have an important bearing on the problem if only to point out to others the complexity and difficulty of uranium concentration.

THE new invisible films on glass which now reduce lost light by reflections from camera lenses and other optical parts can be made as durable as glass itself, according to Dr. C. Hawley Cartwright, of the Massachusetts Institute of Technology. Evaporated films of magnesium fluoride on glass can be greatly hardened by heat treatment. The effective hardness can be further increased by the application of oil or soap, which serves as a lubricant and makes the film waterproof.

SUGGESTIONS that long invisible infra-red radiation could be used to pierce fog were refuted by experiments reported by J. A. Sanderson, of the U. S. Naval Research Laboratory, Washington, D. C. The infra-red absorption of clear natural fog in the infra-red region out to wavelengths of 12 mu, or 120,000 Ångstroms, was measured. The limit of ordinary vision is in the deep red near 7,500 Ångstroms. Mr. Sanderson found that the transmission of the long infra-red rays was fairly uniform throughout the entire region studied, which leads "to the result, in accordance with previous measurements and theory, that there is no important advantage in employing long wavelength infra-red light in seeing through fog." It was also found that falling snow scatters all wave-lengths equally so that in a snowstorm there would be no special advantage in infra-red radiations.

HOSPITALS using the new high-powered 1,000,000-volt x-ray tubes in the treatment of cancer must change their procedure in using the erythema reddening of the skin as an index of dosage, according to Dr. G. Failla and Mrs. Edith Quimby, of Memorial Hospital, New York City. A frequent method of collimating the 1,000,000-volt x-rays is to pass them through a lead opening whose open end is covered with a piece of bakelite. This bakelite, it has been found, creates large numbers of so-called secondary electrons which are highly effective in producing skin reddening. Dr. Failla and Mrs. Quimby reported experiments in which they set out to demonstrate clearly the creation of these unwanted secondary electrons in the x-ray beam. To do this they radiated a patient with a beam of 1,000,000-volt x-rays which passed through nothing except air for the last 10 inches of its path before reaching the skin. They covered half the exposed area with a piece of rubber sheeting. It was found that after a given treatment the skin under the rubber sheeting was strongly reddened, while the uncovered area still showed no erythema reddening. They showed that the reddening of

the skin as an index of x-ray dosage in cancer treatment may be permissible for 200,000-volt x-ray tubes widely used, but that it is not a proper gage of dosage for the new 1,000,000-volt x-rays. They claim that with 1,000,000-volt x-rays there should be nothing in the x-ray beam as it comes to the patient that will create secondary electrons.—ROBERT D. POTTER.

THE MIGRATIONS OF BODY PROTEIN MOLECULES IN SOLUTIONS

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THE way protein molecules of the human body migrate in solutions under the influence of electric current may make possible a rapid and accurate diagnosis of disease.

Dr. D. A. MacInnes, of the Rockefeller Institute for Medical Research, New York City, told of the new method in a lecture at Western Reserve University sponsored by the Society of Sigma Xi.

Dr. MacInnes, now completing a two weeks' lecture tour across the continent addressing Sigma Xi chapters at eight universities, described the new robot "moving boundary apparatus" which makes it possible to get patterns created by normal blood plasma, and the plasma and serum patterns in different diseases.

The black and white diagnostic outlines are called schlieren patterns and consist of a series of peaks. In normal blood one peak, the largest, is caused by albumin A found in the blood plasma. Other and smaller peaks are caused by other proteins in the blood, three globulins—alpha, beta and gamma—and by the fibrinogen. The heights of these peaks and their relationships to one another appear characteristic of different conditions of the blood. Normal blood, for example, gives a standard schlieren pattern.

It is found in many diseases which have the common characteristic of fever—pneumonia, peritonitis, rheumatic fever and lymphatic leukemia—that in every case the peak representing alpha globulin was greatly enlarged. It may be possible that when scientists have extended the new method they will be able to "read" schlieren patterns of blood plasma as readily as a spectroscopist can look at spectrum plates and distinguish the bands and lines of molecules and atoms.

Dr. MacInnes credited Arne Tiselius, of Sweden, with improvement in the moving boundary apparatus which has made possible the new advance. For the development of the automatic recording apparatus to obtain the schlieren patterns he praised the work of Dr. Lewis G. Longsworth, also of the Rockefeller Institute.

The schlieren patterns of blood are obtained by passing a beam of light through a composite solution of blood proteins. This beam, eventually, falls on a photographic plate. As an electric current is applied to the protein solutions they start to move—some faster than others—so that soon a series of boundaries between the different proteins originate. The light, shining through these boundaries, encounters materials with different refractive indices (light-bending power).

By optical means these boundaries show up at the peaks of the schlieren patterns.

THE VIRGIN FORESTS OF THE CANADIAN NORTHWEST

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WORLD WAR II is taking a heavy toll of the Pacific Northwest's famous but almost irreplaceable tall timber, one of the last stands of big trees in the world.

Cutting of Sitka spruce, the 250-foot forest monarch whose best cuts go into military training planes, is up about 50 per cent. since the declaration of war, according to the British Columbia Forest Service. The available supply of virgin spruce will last less than 40 years at the present rate of cutting, instead of the 50 years the pre-war cutting rate would have allowed.

The take of Douglas fir, best Pacific coast lumber tree and one of the finest in the world, is such that virgin stands of this species of fir will not last more than fifteen years. Production is temporarily off because of a shipping shortage, but once the shipping difficulties are solved (and they will be), the rate of cutting will exceed that of 1939, which exceeded 1938.

In not too many years the familiar barge loads of Douglas fir "peeler logs" from the Pacific coast islands will be a sight of the past. The 12-foot-long, stout "peeler logs," cut from the butt of the tree, are top-grade lumber.

Tragedy of both Sitka spruce and Douglas fir is that neither achieves its outstanding qualities of strength in much less than 250 years. This slow period of growth, combined with a peculiar system of timberland holding in effect in British Columbia, makes forest "harvesting"—in which the annual cut is limited to the annual growth—appear an impractical dream for these two trees.

Timberlands are not owned outright, but revert to the government when the timber has been cut. The right-holder must pay an annual tax of $140 a square mile as long as the land is not cut and he holds it. He would need rights on simply immense areas to get any harvest at all from such slow-maturing trees. At $140 per section per year, this is not economically feasible. Instead, the timber baron "cuts out and gets out."—LEONARD H. ENGEL.

PROPOSED EXCHANGE PROFESSORSHIPS BETWEEN INDUSTRIES AND UNIVERSITIES

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EXCHANGE professorships between major industries and great universities, for beneficial mutual interchange of practical and scientific ideas, were proposed at the conference of the Industrial Research Institute meeting in Cincinnati.

Dean E. L. Moreland, of the Massachusetts Institute of Technology, suggested that one of the most effective ways of increasing the cooperation between university and industrial research might be to have scientific men engaged in industrial research to teach courses for a year at a university, giving the students their background of experience in research in industry. At the same time a professor, expert in some field of research, would go into an industry and bring to its research problems a fresh approach.

Directors of research saw in the Moreland plan much good for universities because many of the industrial research men have themselves been in teaching. They saw less benefit to industrial research because the incoming professor might require his entire year to attain necessary orientation for his job. They seemed willing, however, to consider the plan and explore its possibilities.

In further discussions between industry, represented by the research directors, and education, typified by deans of engineering schools present, the industrial men aired their worries over the kind of training new graduates bound for industrial research jobs are now receiving. L. W. Wallace, director of engineering and research of the Crane Company, Chicago, was the most outspoken of the research directors present. In part he said: "The college graduate of to-day is defective because he has neither the exploratory urge nor the inquiring mind so needed in industrial research. Few graduates have an appreciation of the value of the technical and patent literature and thus fail to realize that the point of departure in any industrial problem is the state of the art as disclosed by such literature. Moreover, few seem to know how to undertake a literature search. Few graduates to-day appreciate the value of making use of the processes of analysis and synthesis in their thinking which are so fundamental to successful endeavor. I would rather have a man schooled in these processes . . . than a man most skilled in the use of slide-rules, chemical balances and what not. I believe an undue amount of educational time is spent on these aspects and not nearly enough upon the intellectual and mental phases."—ROBERT D. POTTER.

ITEMS

SUCCESSFUL forecasting three months in advance of the best frequencies for use in dependable radio transmission has been achieved by the National Bureau of Standards, Dr. J. H. Dellinger and N. Smith, two of the government's radio experts, reported to the recent meeting in Washington of the International Scientific Radio Union and the Institute of Radio Engineers. The monthly predictions are published as graphs showing the maximum usable frequencies for radio waves reflected by the ionized layers, many miles high in the earth's atmosphere. To radio engineers such predictions are useful because they allow them to plan what communication channels to use. When the predictions were begun a year ago it was expected that they would be accurate within 15 per cent. and better than this fulfillment has been achieved. The predictions are based on the 11-year sun-spot cycle.

NEW evidence that water rising through plant stems is mainly pulled up by the leaves, rather than pushed up by the roots, is offered by Professor Paul J. Kramer, of Duke University. In re-attacking this old moot question of what makes water flow uphill, Professor Kramer used sets of half a dozen plants each, of several different species. He grew them in pots, with the soil covered with oilcloth to prevent evaporation from its surface. First, he weighed each plant, pot and all, at suitable intervals, to determine how much water was lost by evaporation through the leaves—transpiration. Then he cut off the stem close to the ground and as quickly as possible attached a slender graduated glass tube by means of a short piece of rubber tubing. The amount of liquid rising in the tube was a measure of the roots' ability to supply water without the leaves' pull from above. This effect was very small—only from a hundredth to a twentieth of the quantities of water handled by transpiration in the same plants before de-topping. In some cases the effect was even negative. Water was absorbed through the cut surface for two hours or more by some of the de-topped plants before the root pressure began to push water up in the tubes.

GERMS may play a part in the chemistry which causes formation of gallstones, according to experiments made by Drs. K. K. Jones and Marie Lorenz, of Northwestern University Medical School. The material of which gallstones are made may be present normally in gallbladder bile, but it does not crystallize into stones unless chemical conditions are just right. Specifically, fatty acids with long side-chains must be converted by oxygen to acids with short side-chains. If the flow of bile is stopped ferments from bacteria or from white blood cells may provide the oxygen for changing the long fatty acids into short ones with consequent formation of the stones. The work was described at the recent New Orleans meetings of biologists.

A DECADE ago, it was found that certain kinds of lubricating oils were distinctly improved by blending, but nobody knew why. Studies by Drs. W. D. Harkins, T. F. Young and George Boyd, of the University of Chicago, show that the superiority is due to the presence in the oil of certain large molecules formed by partial oxidation. In monolayers, or liquid films only one molecule thick, the individual molecule "stays put," but it may be spread out to varying thinness: as much as a ten-millionth of an inch or as little as a fifty-millionth. The more "spreadable" an oil, the better its lubricating properties.

LIQUID wood, produced by the same kind of methods by which Germany is now making much of its gasoline from coal, is the newest product of Canadian chemical science. Water-white liquids are obtained which it is expected will provide the raw materials for a future synthetic organic chemical industry. Professor Harold Hibbert, of McGill University, described the new way of processing wood at the meeting in Cincinnati of the American Chemical Society. One of the new liquid woods, Professor Hibbert explained, "is so closely related to the raw material from which the synthetic fiber nylon is made that it should readily prove possible to obtain from it a new variety of this interesting fiber, the raw material being wood instead of coal."

DR. L. E. JEWELL, Meridian, Idaho, has successfully used sulfanilamide as a scarlet fever preventive. He reports to the *Journal* of the American Medical Association that only one of 116 persons exposed to scarlet fever developed the disease when it was used as a preventive medicine. The one exception was a person who had been exposed to the disease five days before getting the sulfanilamide and developed the scarlet fever the day after treatment.