

SCIENCE NEWS

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THE THIN FILM METHOD

ONE of the newest tools for detecting the presence of metals in solutions of water in amounts as small as one part in 500,000,000 was described by Dr. Irving Langmuir, of the General Electric Company, at the meetings of the American Chemical Society, at Chapel Hill, N. C. He discussed the details of his thin film method as well as its use in determining the size and some of the properties of the protein molecules that cause the plant virus disease known as tobacco mosaic.

While studies on the tobacco virus are, of course, of major importance to the tobacco industry, this plant disease has a far broader significance to science and medicine. Researches on this virus give indications of being useful in the search for the control of virus diseases which attack man. Human diseases believed caused by viruses include: infantile paralysis, influenza, rabies and small-pox.

The thin films which Dr. Langmuir and his colleagues are studying are generally similar to the familiar oil films which spread on pools of water and show iridescent colors. The really thin films may be invisible to the unaided eye and may only be about one ten-millionth of an inch thick. It is possible to transfer films from water surfaces to glass or other solid objects and to build up thicker films by several dippings. Films of certain substances, such as stearic acid, are extremely sensitive in their properties to the presence of the salts of metals in the solution. One part of aluminum by weight, when added to 500,000,000 parts of water, produces changes in a film that can be detected in several ways.

Copper, silver, gold, magnesium, tin, lead, iron and other bivalent and trivalent metals all create specific differences which, in turn, make it possible to detect the presence of these metals in most minute amounts. For example, water distilled in a condenser of copper, tinned copper, quartz, glass or platinum can be differentiated.

Dr. Wendell M. Stanley, of the Rockefeller Institute for Medical Research at Princeton, N. J., has recently shown that the giant protein molecules which make up the virus of the tobacco mosaic disease are large spherical molecules of a molecular weight of about 17,000,000 and the diameter of molecules of this kind is about 150 times as great as that of ordinary molecules. Dr. Langmuir continued: "This protein can be spread on water and the layers can be transferred to glass where their thickness can be measured. It is interesting to find that the thickness of the film is only about 1/15 of the diameter of the molecules from which it is formed. Evidently, therefore, these giant molecules unfold themselves in a remarkable way when merely allowed to spread on the surface of water. The thickness of the films obtained from these giant molecules seems to be the same as that obtained from other protein molecules which are only about 1/500 as large. This lends support to a theory which has been recently advanced that all proteins tend to spread

out on surfaces and when they do so they all have a similar lace-like pattern."

ROBERT D. POTTER

THE STUDY OF COMPLEX CARBOHYDRATE COMPOUNDS

IN an invited lecture before the recent meetings of the American Chemical Society, Professor Claude S. Hudson, chief of the Division of Chemistry, National Institute of Health, Washington, D. C., described his new experiments on breaking up complex carbohydrate compounds, with their long chains of carbon atoms, into simpler component parts whose structure can be determined. This knowledge of the parts gives a more quantitative idea of the original complex compound. These experiments are analogous to the study of a foreign language where one takes a complex sentence and finds the meaning of the component words and thus arrives at a better knowledge of the original sentence.

A practical aspect of Dr. Hudson's research is the fact that the changed chemical structures of the carbohydrates form a starting point from which the organic chemist can build up new products. New medicinal products and materials with industrial uses yet unrealized are only two logical possibilities.

Of significance is the fact that in the splitting of the long chain of carbohydrates and the addition of an oxygen atom to them, the process turns them from inert chemicals with little combining characteristics into products that combine readily with other things.

Significant, too, in the research on the carbohydrates is the fact that it is basic, long-range work on the chemistry of the future. The carbohydrates of plants—the sugars, cellulose, starches and so on—are the raw materials of the annual crops; renewed with each year's growth. With the passing of decades and centuries and the gradual decrease in the world's mineral resources, man—through the chemist—will necessarily have to turn more and more to the utilization of the products of the plants.

ROBERT D. POTTER

RADIOACTIVE POTASSIUM

AT the meeting of the American Chemical Society, Dr. A. Keith Brewer, of the U. S. Bureau of Chemistry and Soils, described new research on the atomic weight of potassium in animal tissue, which is another step forward in determining potassium's rôle in life. Dr. Brewer has determined the ratio of the two forms of potassium called K 39 and K 41 in plants, minerals and a large number of animals; also in fast-growing embryonic tissue, in bone marrow and other body tissues.

The fundamental importance of studying the rôle of potassium in living things can better be appreciated by recalling that Zwaardemaker found that the removal of potassium from the blood stream would stop the heart beat. Moreover, he found that if radioactive material

were substituted for potassium in the blood, the heart would again start to beat. Also he found that if the heart were merely radiated by radioactive material it would start to beat. This finding was substantiated by Dr. Jacques Loeb, of the Rockefeller Institute for Medical Research, but it was also found that the metallic element caesium would similarly start the heart to beat. This seemed to be the only exception to the general rule that radioactivity could equal the element potassium in causing heart beats.

The next step was the speculation—and admittedly it still is such—that perhaps it was the radioactive kind of potassium, the K 41 form, which was the crucial factor. Moreover, experiments at Prague had shown that seed germination was markedly speeded by the presence of K 41. In seeds where perhaps 20 out of a hundred would germinate naturally, the number was increased clearly beyond any experimental error in the presence of radioactive potassium.

Dr. Brewer's report indicates that a high proportion of the radioactive kind of potassium appears to be associated in animals with embryonic tissue. Bone marrow, for example, is rich in K 41 compared with other tissues of the body, and the concentration grows less with the maturity of the animal. Interesting, too, is the fact that a mature animal which had developed cancer and therefore had a more than normal abundance of embryonic tissue in its body showed an increase in the K 41 content of its tissues. The heart, he reported, is relatively low in its K 41 content and has relatively more of the non-radioactive K 39 kind of potassium present.

Dr. Brewer's studies were made with the aid of a large atom "scale" known as a mass spectrograph which determines the weights of the atoms in an element. His present studies on animal tissues are the culmination of a similar line of research on potassium which has included the analysis of sea-water for this element, down to a depth of two and one half miles; a study of the ratio of the two kinds of potassium in minerals from all over the world and an investigation of the same thing in plants.

The ratio of the two varieties, and hence the average atomic weight, is sensibly constant in sea-water and in minerals; in plants, with the exception of kelp, which seems to have the ability to concentrate the radioactive form, and in potato vines where the older vines show more of K 41 than do the younger ones.

ROBERT D. POTTER

NEW INTERSTELLAR GASES

THE discovery of several new interstellar gases, two of which have been identified as neutral potassium and calcium, has been made by Dr. Theodore Dunham, Jr., astronomer at the Mount Wilson Observatory. Space between stars is filled with atoms of various elements, and Dr. Dunham's research brings the total identified to four, one of which, calcium, appears in two forms.

Ionized calcium was the first interstellar gas to be discovered, and the discovery of neutral calcium by Dr. Dunham is considered remarkable because it is estimated that each cubic yard of space contains but one atom. Detection of this element was made possible by the de-

velopment of delicate apparatus and an improvement in photographic plates.

Using light from the stars Chi Orionis and 55 Cygni and new ultra-sensitive infra-red photographic plates at the Coude focus of the 100-inch telescope, evidence was obtained for the existence of neutral potassium. Previous interstellar elements detected include ionized calcium, sodium and titanium. Dr. Dunham and Dr. Walter S. Adams, director of Mount Wilson, announced their discovery of titanium last fall, the first new interstellar gas detected since about 1915. Because the intensity of the lines in the spectrum produced by the newly discovered interstellar elements varies from star to star, Dr. Dunham suggests that the distribution of gas throughout interstellar space is far from uniform.

THE CAMBRIDGE MEETING OF THE AMERICAN ASSOCIATION OF PHYSICAL ANTHROPOLOGISTS

PAPERS presented at the Cambridge meeting of the American Association of Physical Anthropologists, of which the following are brief abstracts, include:

New evidence that close inbreeding of human beings has no ill effects if the original stocks were biologically sound was presented by Dr. H. L. Shapiro, of the American Museum of Natural History. The present population of Pitcairn Island, 202 persons, are descended from six of the mutineers of the famous ship *Bounty*, who settled on the island in 1790, with a dozen Tahitian women. "Inbreeding has been common to such an extent that practically every one is related to all the other members of the community. Despite this inbreeding the islanders are healthy, vigorous and are free from the stigmata of degeneracy. This finding confirms the inbreeding experiments of the laboratory which demonstrate that inbreeding as a process does not lead to disaster. The evil consequences which occur in some inbred stocks may more correctly be attributed to latent defects which are intensified and brought to the surface by inbreeding."

Blood group tests, such as sometimes figure in cases of disputed parentage brought before the court, can be performed on the long-time dead as well as on the living. A report of such tests carried out on 300 mummies, including Egyptian, Peruvian, Basketmaker and ancient Aleutian Indians of Alaska, was presented by Drs. William C. Boyd and Lyle G. Boyd, of Boston University.

Brains of the lower members of the primates are remarkably symmetrical, in contrast to the usually somewhat unevenly balanced brains of the higher primates, including man, according to Dr. C. J. Connolly, of the Catholic University of America. Dr. Connolly worked on the large collection of primate brains in the U. S. National Museum. In all, he studied 210 brains, representing 40 different species. The symmetry which he discovered was expressed not only in the evenly matched sizes and shapes of the opposite halves of the brains, but also in their principal furrows or sulci. Brain forms changed, and the position of the furrows also, with advancing age. This indicates the existence in the brain of centers of more active growth. This shift is carried much further in the higher apes and in man.

Iraq is a small kingdom, with only 3,000,000 inhabitants, but it contains a large mixture of races. Studies of these were reported by Henry Field, of the Field Museum of Natural History, Chicago. For 5,000 years and more, the land now called Iraq has been a crossing of folk migration routes. Mr. Field distinguished four principal racial elements: the Proto-Mediterranean stock, the nomadic Bedouins of the desert, the settled Arabs of the towns, and the Kurds. But besides these there are many interesting small groups, such as the Assyrians, Yezidis, Turkomans, Subba and Marsh Arabs.

BIRD STUDY

AIRPLANES and sound-films are among the means and methods used by modern science in investigating the lives of birds. The evolution of up-to-date study methods from elementary beginnings was described in a lecture by Dr. A. A. Allen, professor of ornithology at Cornell University, delivered in Washington on April 8.

With airplanes, migrating birds have been intercepted at various heights up to 12,000 feet and their speed of flying recorded. This varies from 20 to as much as 75 miles per hour, with greater speeds open to question. Numbered aluminum bands up to nearly two million have been placed on wild birds so as to trace their travels, determine their longevity and aid in the solution of other problems.

Laboratory experiments with controlled lighting have been performed on a number of species. These indicate conclusively that the migratory instinct is closely associated with the enlarging of the reproductive organs, and that this process is dependent upon the lengthening days. By merely artificially lengthening the bird's day, it can be brought into breeding condition in the middle of winter. This helps to explain not only the cause of migration but also the regularity of bird arrivals in the spring.

The meaning of song and how birds recognize one another are likewise coming under the scrutiny of ornithologists in a series of well-planned experiments. The songs and calls of birds are being recorded accurately on film where they can be studied and compared, as are other scientific data.

Wildlife management methods, some of which were used in the thirteenth century but have lain dormant ever since, are being revived, improved upon, and put into practice in this country not only for game species but for song birds as well. Nine state universities have recently started research projects along these lines, cooperating with the U. S. Biological Survey and the American Game Institute. Other universities are carrying on research and instruction in this field and a new Wildlife Society has recently been formed. The study of individual birds by marking with brightly colored feathers or colored celluloid bands so they can be recognized at a distance is greatly facilitating many ornithological studies.

ITEMS

A DRIFTING bottle crossed the Pacific Ocean in a little less than two years, traveling more than 8,000 miles, the Hydrographic Office of the U. S. Navy has been notified. The bottle, with an identifying paper sealed inside, was dropped overboard the American steamer *Birmingham* by

Second Officer J. J. Parrilla on January 19, 1935. The ship was then in latitude 14 degrees, 19 minutes north, southwest of Mexico. On January 14, 1937, it was found on the island of Antau Su, near Taiwan (Formosa), in approximately latitude 22 degrees north, 121 degrees 30 minutes east.

BLACK WIDOW spiders were known to the Aztecs of pre-Columbian Mexico. The Aztecs knew, too, that the spiders were poisonous, yet they were not afraid of them. For they knew another thing, which few present-day white men are willing to believe—that the black widow's bite is rarely fatal, even though it may make the victim uncomfortably ill for several days. Dr. C. H. Curran, of the American Museum of Natural History, has dug up out of old Spanish records the notes about the black widow set down by the scholarly missionary Sahagun, to whose encyclopedic writings about Mexico the modern world owes the larger part of its knowledge of Aztec life. Sahagun estimated the black widow briefly, but correctly: "There are some poisonous spiders in this country, they are black and have a reddish tail. The stings cause great fatigue for three or four days, although they do not kill with their sting." Aztec doctors treated black widow bites with compresses soaked in an alkaline solution, and also gave the patient an alkaline drink. Complete rest for several days was a necessary part of the cure.

IN the last six years the number of fast trains in the United States has increased more than thirteen times. According to a report in *Mechanical Engineering*, there are more than 400 trains in the nation which now operate at scheduled speeds of 60 miles an hour or better, while in 1930 there were but thirty such trains. This trend to higher railroad speeds is not wholly confined to the United States. In France, the Riviera express from Paris averages 59 miles an hour over 318 miles of curved, difficult route through hilly country. In Austria electric trains through the mountains operate at nearly the maximum speeds which the curves will permit. Even Switzerland, where distances are short and the urge for speed might seem less, is building three trains with top speeds of 93 miles an hour. The trend to higher speeds is not solely an effort to catch and hold the public's imagination and patronage. The German State Railways, for example, estimate that their increase of speed, of 11 per cent., between 1932 and 1935, has resulted in economies of 9 million dollars, due to more intensive use of rolling stock and personnel, in spite of rising repair and traction costs.

THE State Institute of Testing Materials, in Berlin, where the strength of concrete, girders and beams is usually tested, has recently turned to a study of the mechanical strength of human bones. Knowledge of value in osteopathic surgery has resulted for it has been shown that the same laws of physics governing ordinary materials can be applied to bone fractures. It was also found that at the moment of fracture there is a local rise of temperature of over eight degrees which may result in fever symptoms.