SCIENCE NEWS

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THE COMPOSITION OF THE "GREAT RED SPOT" ON JUPITER

A GREAT island of solid, frozen ammonia floating on a sea of liquid hydrocarbons, like ethane, ethylene and acetylene, is suggested as the structure of the long-known, mysterious "great red spot" observed on the surface of the planet Jupiter. The hydrocarbon ocean may be as large as the planet itself, which is 34,800 miles in diameter. This postulate is presented by Dr. Arthur Adel, of the University of Michigan, and Dr. V. M. Slipher, of Lowell Observatory, in a report to the *Physical Review* describing research which provides indications of the nature of the atmosphere on the major planets Jupiter, Saturn, Neptune and Uranus.

The largest constituent of the "air" of these distant planets of the solar system is methane, each molecule of which is composed of an atom of carbon and four atoms of hydrogen. Ammonia has previously been detected on Jupiter and Saturn. The ammonia island suggested by Drs. Adel and Slipher could be created by the extremely low temperatures of the distant planets because they are so far removed from the source of the earth's and their own heat—the sun. Of the major planets, Jupiter is nearest to the sun, but is still 483,300,000 miles away, over five times as far removed as the earth. Neptune, most distant of all major planets, is 2,791,600,000 miles away from the sun. The presence of methane in the atmosphere of the large planets indicates the temperature is not lower than 265 degrees Fahrenheit below zero, which is the boiling point of methane. Yet this is low enough to freeze and liquefy such gases as ethane, thylene and acetylene.

A search for other gases, according to Drs. Adel and Slipher, "leads to the conclusion that the other hydrocarbons, if they are present at all in the atmospheres of the giant planets, must exist only in traces relative to the amount of methane present. Presumably, these hydrocarbons as well as many others exist below the atmospheres of the giant planets. The unanchored motion of Jupiter's Great Red Spot suggests that it is an island of solid hydrocarbon or ammonia floating in a vast hydrocarbon ocean as extensive as the planet's surface itself."

THE POURING OF THE SECOND 200-INCH MIRROR

BLINDED by light from white-hot glass at a temperature of 2,800 degrees Fahrenheit, scientific men and reporters watched, for almost seven hours, great ladles transport 40,000 pounds of glass from the melting furnace to the mold for the new 200-inch telescope mirror which eventually will be placed in the new observatory of the California Institute of Technology on Mount Palomar. Dr. F. G. Pease was present to represent the Mount Wilson Observatory.

As samples of the glass being poured were shown by officials of the Corning Glass Works it was learned that the secret formula used has been changed slightly since the first attempt last March. When the disk poured in March was cooled for examination the glass was a deep turquoise blue. The twenty tons of glass poured in the present operation in 400-pound ladlefuls is highly transparent and crystal clear. The pouring was termed a "complete success." The disk will take eleven months to cool to room temperature.

While the color of the glass makes little difference when used in a mirror which eventually will be coated with silver, or perhaps aluminum, the great transparency of the present type glass would be significant for lens telescopes where the stellar light must pass through the glass. The largest lens, or refractor, telescope in the world, at the Yerkes Observatory of the University of Chicago, is but forty inches in diameter.

THE VITAMIN B REQUIREMENTS OF MAN

WHAT is believed to be the first exhaustive study of any of the vitamins from the point of view of how much a human being needs has been made at Yale University by Dr. George R. Cowgill, associate professor of physiological chemistry. Dr. Cowgill has devoted his research to the vitamin B requirements of man and has established a measure by which nutritionists can determine whether an individual's diet contains enough of this important food factor. The results of Dr. Cowgill's study have been published by the Yale University Press for the Institute of Human Relations.

Deficiency of vitamin B in the diet has long been known to be the cause of beriberi, a disease which constitutes one of the most serious medical problems in the Far East. The greatest significance attaching to vitamin B for people living in North America is the fact that it may be a cause of various chronic conditions summarized under the vague term "ill-health." In these instances the shortage of the vitamin may not be great enough to result in manifest beriberi, but sufficient to produce a complication difficult to recognize and one which therefore escapes treatment. Various gastrointestinal disorders, such as gastric ulcers and colitis, can be related to vitamin B deficiency; certain heart disorders and various neurological conditions may have their beginnings in a diet lacking sufficient amounts of this vitamin.

Body weight and vigor of vital processes (metabolism) were found by Dr. Cowgill to be the most important variables determining vitamin B requirement. In approaching the problem, he made studies of diets associated with beriberi and diets not associated with disease. Among the former were those of families in Labrador, Newfoundland and Calcutta; prison diets in the Far East, notably at Manila, Selangor and Singapore, and diets of various seamen and soldiers. A study of limited diets not associated with beriberi included a variety such as those of American white and Negro families, rations allowed by the German Government for civilians

during the winter of 1916–1917 and the dietaries of workers on sugar and cacao plantations in the East and West Indies.

He has established that the ratio of the amount of the vitamin to the energy-yielding value of the diet correlated with the body weight and metabolism expresses the adequacy of the diet in vitamin content. Thus the diets associated with beriberi showed an average ratio of 1.74, while in diets where the disease did not occur, the ratio was 2.18. Men require more vitamin B than women. Dr. Cowgill states that "students of the beriberi problem have frequently commented on the fact that this disorder is preeminently a disease of young adult males. As an explanation of this it has been suggested that beriberi is chiefly an 'institutional disease,' that is to say, a disorder found in jails, asylums, groups of laborers and the like, and that the conditions in society which operate to form these groups affect men more than women. The results of the present study suggest another explanation. The formula derived from these quantitative studies indicates that the two most important variables determining the vitamin B requirement are the body weight and the metabolism. Now it is generally known that males have a distinctly higher rate of metabolism than females, and being usually heavier and more active, consequently consume greater quantities of food. Therefore, males have a higher total energy exchange per day. Under conditions where the vitamin B content of the ration proves to be very close to that required by the organism, there is little or no factor of safety against beriberi, and this sex difference in total metabolism may be the chief factor determining whether beriberi shall develop. Under such circumstances it is obvious that the males should be more liable to the disease."

THE ISOLATION OF A PROTEIN DERIVATIVE FROM THE TUBERCLE BACILLUS

A GREAT advance in medicine's warfare on the great white plague, the obtaining of tuberculosis test material in pure crystals, has been made by Dr. Florence Seibert, of the Henry Phipps Institute in Philadelphia.

For sixty years investigators have been endeavoring to isolate in pure form this substance of the tuberculosis bacillus. Tuberculin allows the making of a simple skin test to tell whether or not a person or animal has tuberculosis. The new purified substance will be of immediate application to human patients.

It has been known for 60 years that this substance was in the TB "germ" and it has been used in tuberculin tests on man and in vast programs of tuberculosis eradication in cattle to insure a safe milk supply. But it has never before been available in pure form.

The isolation of this new substance, called the purified protein derivative of the tubercle bacillus, may be likened to getting out of the pancreas pure crystalline insulin for treating diabetes. Using the old tuberculin would be like using a preparation of the whole pancreas to treat diabetes. The insulin would be there, but so would many other substances. Old tuberculin contained the tuberculosis detective, but it also contained many other things.

To produce this important protein substance, tubercle bacilli were grown on an inorganic medium, and by special chemical methods the pure crystalline substance was isolated. Dr. Seibert has reported technical details of the isolation in the *American Review of Tuberculosis*. Her work was done under the auspices of the medical research committee of the National Tuberculosis Association, largely supported by Christmas seal sales.

A PROPOSED SUBSTITUTE FOR MORPHINE

AFTER years of painstaking research, investigators have produced a new derivative of morphine in the course of experiments directed toward the discovery of a non-addicting form of morphine. Dihydrodesoxymorphine-D is the name of the new drug. It was made by Dr. Lyndon F. Small, research chemist at the University of Virginia. It is ten times as effective as morphine in relieving pain.

Given as a substitute for morphine to persons addicted to the latter drug, the new product satisfied the cravings of the addicts and relieved the painful abstinence symptoms that follow withdrawal of morphine. This indicated that it also might be habit-forming.

Tests with monkeys and other animals indicate that these animals develop tolerance to the new drug as they do to morphine. It is not certain, however, that experiments on monkeys are a correct index of the new drug's addiction or habit-forming property for man.

The final test of this point is now about to be made. Patients suffering from severe cancer and advanced tuberculosis are sure to become addicted to morphine, because that is the only drug which will control their pain and cough. A group of such patients will soon be given the new drug instead of morphine to relieve their suffering. If they fail to develop addiction to the new drug, dihydrodesoxymorphine-D will be hailed as the long-sought, safe substitute for morphine, and possibly as an aid in the prevention of narcotic drug addiction. If it can be used in the case of persons already addicted to narcotic drugs, it might aid in their "cure."

Since Dr. Small can produce only a limited amount of the new morphine in his laboratory, he has patented his discovery and given the patent rights to the Secretary of the Treasury. The commissioner of narcotics is now able to license manufacturing firms to produce enough of the new drug to complete the clinical trials.

The discovery of dihydrodesoxymorphine-D was the result of a concerted attack on narcotic drug addiction by several groups of scientists working under the guidance of the National Research Council. Cooperating with the National Research Council's committee have been the U. S. Public Health Service, the Narcotic Bureau of the U. S. Treasury, the University of Michigan and the University of Virginia.

At the University of Virginia a research laboratory

was established under Dr. Small's direction for chemical analysis and synthesis of alkaloid substances related to or similar to morphine. Because few American chemists had worked on alkaloid chemistry in the past twenty-five years, it was necessary at the start of the work to import chemists from Europe. Dr. Small himself spent two years in narcotic research in Europe. The "imported" chemists who have worked with him are Dr. Erich Mosetting and Dr. Alfred Burger.

At the University of Michigan another research laboratory was established under the direction of Professor C. W. Edmunds and Dr. Nathan B. Eddy, for biological testing of the narcotics and their substitutes. All clinical work is being done under the direction of Dr. Walter Treadway, chief of the division of mental hygiene of the U. S. Public Health Service. Funds for the work are being provided by the Rockefeller Foundation.

THE FOSSIL EGG FROM TEXAS

THE world's oldest fossil egg, approximately 225,000,000 years old, has been found in the Permian Red Beds, an exceedingly ancient geological formation of north central Texas, by the recently returned expedition from the Harvard University Museum of Comparative Zoology.

The egg, three inches long and rusty in coloring, is more than twice the age of previously known specimens, the famed dinosaur eggs of the Gobi Desert being about 100,000,000 years old and the oldest known to science previous to the present discovery. It is one of the most primitive eggs ever laid on land. Prior to that time animal eggs had always been deposited in water, a feature retained from the fish ancestry of the amphibians. Unhatched, and preserved with but little distortion, the fossil gives an accurate conception of the egg's original shape and also of the character of the shell, which is slightly cracked in various places. A microscopic study of this shell is now under way to determine the structure of the limy covering.

The egg can not be definitely associated with any particular animal, but it is believed to be that of a large lizard-like animal known as Ophiacodon, a creature with an exceptionally large head and short limbs, measuring about six feet from snout to tip of tail. The partial skeleton of an animal of this kind was found near the egg.

ITEMS

USING super-penetrating x-rays with energies equivalent to from 1,500,000 to 2,000,000 volts, Professor F. L. Hopwood, of St. Bartholomew's Hospital in London, announces that the non-electrical particles—the neutrons—have been obtained from the element beryllium. Using these neutrons as bombarding particles, both iodine and bromine have been made radioactive by the artificial means. The half period of the radioactive iodine—its rapidity of decay—is thirty minutes. Two types of radioactive bromine were produced, one with a half period of thirty minutes and another with a half period of six hours. Professor Hopwood's announcement, describing the work that he has carried out with six collaborators in London and Berlin, appears in a recent issue of *Nature*.

STUDIES conducted by the U. S. Public Health Service show that an encephalitis outbreak of the type that occurred in St. Louis and vicinity last year may appear anywhere in the United States at any time. The virus that causes this disease is pretty well distributed throughout the country. When, where and why this low level of infection will flare up into another serious epidemic is not known. Investigations are being made to ascertain what factors determine when an outbreak takes place. A test has been devised that gives a pretty good though not an absolute indication of whether or not a person has been infected with the virus of St. Louis encephalitis, as this type of the disease has come to be known. Numerous healthy carriers of the disease have been detected by this test, according to Dr. J. G. Wooley, of the U. S. Public Health Service's National Institute of Health, who reported to the Washington Branch of the Society of American Bacteriologists. Dr. Wooley reported studies made by himself and two other officers of the service, Drs. Charles Armstrong and R. D. Lillie.

THE fight against smallpox has not yet been entirely won. Statisticians of the Metropolitan Life Insurance Company make this statement in spite of the fact that their figures show there was less of this dread disease in the United States and Canada in 1933 than ever before and that the records for the first seven months of 1934 promise a further drop in the number of smallpox cases. Significant is the fact that fully three fourths of the smallpox cases reported by American states in 1933 occurred in only twelve states whose population is only one fifth of that of the entire country. "Generally speaking, these states are the ones in which popular sentiment has been most opposed to compulsory vaccination." The twelve states are California, Colorado, Idaho, Iowa, Montana, Nevada, Oklahoma, Oregon, Texas, Utah, Washington and Wisconsin. Falling in the same class of above-average prevalence of smallpox during 1933 was the Canadian province of Saskatchewan.

GRAPES from South Africa will be on the United States market for the first time during the coming winter, thanks to a new pest-eliminating treatment and to a regulation of the U. S. Department of Agriculture permitting fruit so treated to enter. This will give vineyard owners in South Africa the market advantage inherent in the fact that the Northern Hemisphere's winter is the Southern Hemisphere's summer, enabling the shipping of "early" grapes for the American Christmas market. The embargo that has hitherto been enforced against South African grapes has been due to the danger of introducing the dreaded insect pest, a fruit fly, into the still-exempt American fruit-growing regions. The new treatment consists in exposing the packed grapes to high temperature for a brief period. This eliminates any flies that may be present but does not damage the grapes.