SCIENCE NEWS

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REFUELLING OF THE SUN

EVERY second the sun sweeps up something like 110,000,000 tons of hydrogen from the space through which it is passing, if a new astronomical theory is correct!

Other stars pick up similar amounts of the interstellar gas, and thus keep refueled. This is the suggestion of Dr. R. A. Lyttleton and F. Hoyle, Cambridge University astronomers. A summary of their theory, answering certain objections that had been made to it, is given in the latest issue of the Monthly Notices of the Royal Astronomical Society.

During the last few years astronomers have generally accepted the idea that the stars keep going by a transmutation process in which hydrogen turns into helium, giving off energy as it does so. However, it is stated that "the available astronomical evidence, particularly from double stars, led us to the view that a further potential source of energy must be introduced from outside the stars, either continually or intermittently replenishing the hydrogen in the star."

As it is now known that space between the stars is not the perfectly empty void it was once thought to be, but contains about as much matter as the stars themselves, in the form of diffuse clouds, they concluded that the stars might sweep up hydrogen from these clouds as they went through them. Though these clouds consist largely of calcium and sodium, which would not add to the stars' lives, as little as 10 per cent. of their mass in hydrogen in the form of molecules would suffice to keep the stars going. Recent observations have shown that molecules containing hydrogen actually are present in the cosmic clouds.

They also suppose that the cloud is irregular, and is concentrated towards the central plane of the Milky Way. Here, they calculate, the density would be such that a gram of matter (which is about a twenty-eighth of an ounce) would be contained in a cube some 1,300 miles on a side. Studies of other systems like the Milky Way have shown that they are about as dense as this in their centers. Dr. Lyttleton and Mr. Hoyle regard as supporting evidence for this idea the fact that the brightest and most massive stars are in the plane of the Milky Way. Evidently these pick up more matter and fuel than stars in thinner regions.

"The real need at present in this problem," they conclude, "is for trustworthy observations leading to information of the density distributions and velocities of the stars relative to the cloud." These might confirm the theory, disprove it, or require it to be modified. "At present," it is stated, "in regard to stellar evolution, the choice is between the consistent theory based on the idea of accretion and no theory at all."—JAMES STOKLEY.

PHOTOSYNTHESIS

TEXT-BOOK theories of photosynthesis have been upset by the use of radioactive carbon, a product of the atom-smashing cyclotron, in tracer studies at the University of California. This product was used by Dr. S. Ruben, of the department of chemistry, and Dr. M. D. Kamen, of the Radiation Laboratory, to test former theories of plant chemistry.

A new and as yet unidentified compound that does what formaldehyde was supposed to do has been discovered. All animal life depends on the ability of plants to convert inorganic elements into organic forms that can be assimilated by animal organisms. Any animal, from man to microbe, would starve if soil, water and air, primary storehouses of nature's supplies, were his only source of food. But plants can use elements in the raw and by a mysterious chemical process involving chlorophyll, a green coloring matter, change basic elements into sugars, starches, proteins, vitamins and other organic foods according to their kind. This process is known as photosynthesis.

The mystery of photosynthesis has long baffled scientific men, and though theories on the process have been offered, none could be proved because chemical methods of proof were inadequate. The most widely accepted theory of photosynthesis was that plants take carbon dioxide, light and water and produce formaldehyde. This process, common to all plants, was supposed to be an intermediary step, preceding the chlorophyll action that produces carbohydrates and other nutritive substances.

Dr. Ruben and Dr. Kamen placed algae plants in chambers containing radioactive carbon in a carbon dioxide compound. Leaves of the plants literally pulled the charged element from the air and its course through the plant could then be followed. If the old theory were true, the tagged carbon should appear in the formaldehyde formed by the plants, but this substance extracted from the test plants contained none of the active carbon. An unsuspected compound was discovered, however, that contained most of the charged carbon the plant "breathed"—the true intermediary step in photosynthesis. The chemical formula of this important compound has not yet been determined, but scientists are hard at work on this problem.

Dr. Ruben, Dr. Kamen and their associates also disprove the theory that photosynthesis is a process carried on exclusively in the light. They found that some phases of the process may be independent of light, for plants continued to assimilate charged carbon dioxide in total darkness.

INDEPENDENCE OF FOREIGN IMPORTS

THANKS to research, Americans in this World War era are remarkably independent of foreign-made goods compared with "the deplorable condition of this country in 1914," according to Dr. James K. Hunt, of E. I. du Pont de Nemours and Company, who spoke before the Twenty-Eighth Annual National Business Conference.

In World War I the United States depended on a

Japanese monopoly for camphor, important in medicine, plastics, and photographic film. Now, American chemical industry makes about 80 per cent. of our camphor.

In 1914, we depended on getting natural bristles from abroad. "To-day," said Dr. Hunt, "bristles better than any hog bristles from the Orient are being made from the same nylon used in the manufacture of hosiery."

Fine optical glass, in 1914, came from Europe, for important war and peace instruments. Now "this country is producing optical glass of quality second to none in the world."

Automobile tire treads made from certain of the so-called synthetic rubbers developed by research were pronounced the equal of the best natural rubber in resisting abrasion. America has virtually inexhaustible supplies of the basic raw materials for making these rubbers.

As recently as 1931, said Dr. Hunt, 42 materials were listed as strategic, but only 14 are on the most recent list by the Army and Navy Munitions Board, and some of these are "less strategic" now because of recent scientific achievement.

HOSPITAL SERVICE IN GREAT BRITAIN

A REVOLUTIONARY step in Britain's health program, making available comprehensive hospital service to every person needing it, will soon be taken, was reported by Sir Wilson Jameson, chief medical officer of the British Ministry of Health, at the Atlantic City meeting of the American Public Health Association. By this plan, patients will pay for services if able, but the service will be available to all regardless of ability to pay. Part of the cost will be met by counties and large towns and part by the national government.

All hospitals, voluntary and tax-supported, are now unified in one national hospital system, Sir Wilson pointed out, although few realize it. This came about because the government took over some existing hospital beds and added new ones in preparation for expected war casualties and reallocated the hospital staffs for efficient service during the emergency. The new step shortly to be taken will insure that the gains from this unification of hospitals will not be lost after the war.

The health of the English people has not suffered and in some ways has improved during two years of war, Sir Wilson declared. Cases of nervous and mental disease of psychoneurotic type are actually less among the civil population than they were before the war. With the exception of meningitis, infectious diseases have not occurred. Cooperation of the public in boiling water and efficiency of sanitary engineers in repairing water mains and sewage systems have prevented typhoid fever epidemics in spite of the endless number of times water mains and sewers were bombed and water contaminated in air raids.

Sir Wilson stated that large numbers were saved from death by bombing through the evacuation of children from "target towns." This evacuation policy also helped to keep down epidemics, as those evacuated were in the age group most susceptible to many communicable diseases.

The chief lesson for America to learn from England's war health experiences, it appears, is to build up adequate maternal and child health facilities and improve housing in even the smallest towns and rural communities. The excellence of the English health facilities, built up between two World Wars, and the rehousing during the same period of millions in individual homes contributed largely to the good health which has been maintained through evacuation of cities, air raids and the accompanying disruption and destruction of the war.—JANE STAFFORD.

CONTROL OF THE IMPORTATION OF TYPHOID

DISCOVERY of typhoid fever patients and healthy carriers of the disease among more than a score of European refugees recently arrived in New York City, Newark, N. J., and Buffalo, N. Y., led the International Society of Medical Health officers, meeting in Atlantic City, to request Surgeon-General Thomas Parran, of the U. S. Public Health Service, to take steps to prevent further importation of disease from abroad.

Specifically the society requested, in a resolution introduced by Dr. Charles A. Craster, health officer of Newark, N. J., that the Surgeon-General institute at all ports of entry comprehensive laboratory tests for detection of persons who have, or are carriers of, typhoid fever so that they may be kept from introducing the disease into this country. Costs of the procedure should be borne by the shipping companies which, according to the resolution, are now charging exhorbitant fees for passage through the war zone.

At present U. S. Quarantine officers detain only those incoming passengers showing a rise in temperature and notify health officers of cities to which other refugees are bound. This is not effective, Dr. Craster charged, because when the local health officers try to locate the refugees, they are not to be found at the addresses given by shipping companies and immigration officials.

More rigid inspection of passengers at ports of embarkation and refusal of landing permits for ships with inadequate space and sanitary facilities for passengers or for ships whose captains or surgeons make false statements as to cases of disease occurring during the voyage was also requested in the resolution.—JANE STAFFORD.

VISION AND VITAMIN A

IF your diet is extremely deficient in vitamin A for just one day, night blindness may result that will increase your accident-hazard in night driving. This discovery was made by psychologists at the University of California under the direction of Dr. C. W. Brown, associate professor of psychology.

Ten students were tested and Dr. Brown divided them into two groups. One group ate foods with high vitamin A content for 12 days. The other group omitted A-containing foods from their diet. Then each group reversed the diet program for another 12 days. At the end of each 12-day period students' eyes were tested by an apparatus developed by Dr. Brown for quick testing of glare blindness. A light was flashed in front of students' eyes

for a short period, then the time for "vision recovery" was measured in a nearly dark room. Those who had been on a high vitamin A diet recovered from glare blindness in 18.03 seconds, while those with vitamin A deficiency took 22.70 seconds to adjust their eyes to dim illumination.

After one group on the excessive A diet switched to the deficient foods, their more rapid recovery time from glare blindness was lost within one day. When the other group began their deficiency diet, the glare-recovery time became longer gradually until the fifth day, then remained the same throughout the rest of the 12-day test.

The difference between the glare recovery time of the two groups was not great; 4.76 seconds, but enough to be significant. While the small number of students used in the tests does not permit any final conclusion on the exact time required for vitamin A deficiency to affect night blindness, the results are significant.

AUTOMOBILE OWNERSHIP

ACCORDING to government statisticians, the average farm, village or small-city family of good income now spends more on automobile transportation than on any other item except food and housing.

It is said that an American would rather give up his home than his car. This is an exaggeration, but the investigation shows that families are willing to give up other things to make a place for the important automobile.

Nine families in ten in American cities and towns of all sizes own a car, if they have an income above $2,500. Farm families have become so automobile-minded that relatively more such families own cars than families living in villages and small towns.

Leading items in American family budgets in villages and small cities used to be food, housing, household operation and clothing. Now, the family in good circumstances tends to spend as much or more on the car than on clothing—if the family lives in a village or small city.

Automobile ownership increases with ability to pay, but the used car market has extended car ownership, especially at lower income levels. While used cars are more commonly bought by low income families, in families as high as the $3,000 to $4,000 income class one third of farm autoists drive used cars, and one fourth to one fifth of the village and small-city drivers are used car owners.

The survey, intended to provide comprehensive facts about the income and consumption habits of American families, was made by the U. S. Department of Agriculture in cooperation with the WPA, and the results compiled form a government booklet entitled "Family Expenditures for Automobile and Other Transportation."

ITEMS

MOTION pictures of fiery gas in the atmosphere of the sun large enough to cover the entire United States and whirling at a speed of 120,000 miles per hour are described by Dr. Edison Pettit, of the Mount Wilson Observatory, in a report to the Astronomical Society of the Pacific. The photographs were taken with a new type of instrument, an interference polarizing monochromator, that had not been previously used in this work. When first seen the solar tornado was 8,000 miles wide at its base and 38,000 miles high. A smoke-like column projecting from its top reached an elevation of 68,000 miles after which it bent over and returned to the sun's surface. During the course of the observations a knot of gas broke away from the top and was ejected upward with a speed of 130,000 miles per hour. About two hours later the whole vortex started to rise, losing its spiral structure but remaining attached to the sun by two fine streamers. It finally faded from sight completely.

STREAMS of neutrons, unchanged fragments of atoms smashed in the University of California cyclotron, have produced hereditary changes in living organisms, in experiments carried out by Dr. Everett Ross Dempster. As experimental material, Dr. Dempster used the familiar fruit fly. He exposed male insects to the neutron stream, then mated them with untreated females and watched their offspring for mutations, or abrupt evolutionary changes. He found that neutrons are more effective than x-rays in producing certain types of mutations, less effective in producing others.

DEFENSE priority ratings for materials needed in the commercial manufacture of two vitamins have been obtained so that no shortage in these strategic chemicals will occur, according to an announcement made by Dr. W. H. Sebrell, of the U. S. Public Health Service, to the American Public Health Association meeting at Atlantic City. The two vitamins concerned are vitamin B_1 and riboflavin. The latter is needed for protection against an eye disorder that may destroy vision. It is difficult to obtain an adequate supply of this vitamin from the diet unless plenty of milk is taken every day. Nutrition authorities therefore believe it would be advisable to add this vitamin to enriched bread and flour as soon as an adequate supply of the synthetic vitamin is available. Synthetic vitamin factories are now working to increase production of both riboflavin and thiamin, which is the synthetic vitamin B_1. When large-scale production is under way, Dr. Sebrell said, the addition of riboflavin, thiamin and pellagra-preventing nicotinic acid to white flour and bread will cost no more than the addition of thiamin and iron does now.

FRUIT crops are being greatly benefited this year by sprays of various growth-promoting substances, notably naphthalene acetamide and naphthalene acetic acid, according to F. D. Jones, of the American Chemical Paint Company, Ambler, Pa. Apples and pears are induced to hang onto their twigs longer, assuring better crops; premature bud development in peaches is checked until danger of late frost is past; oranges are ripened two weeks earlier. In experimental sprayings in the South, cotton yields were increased by half. Under certain soil conditions, yields of corn, peas and beans have been doubled. Certain vegetables in storage, like potatoes and onions, are restrained from sprouting.