SCIENCE NEWS

Science Service, Washington, D. C.

THE UNIVERSAL VITAMIN

ONE vitamin out of the whole alphabet of them is probably essential for the growth of all living things, from bacteria, fungi, seed plants and similar lowly forms to the higher animals and possibly man himself. Two new discoveries which indicate that there probably is such a universal vitamin appear in reports to the *Journal* of the American Chemical Society. At the same time partial synthesis of the vitamin is reported.

The vitamin is part of the large group of B vitamins, which include the anti-beriberi vitamin, thiamin, the anti-pellagra vitamin, nicotinic acid, and riboflavin. The universal vitamin is called pantothenic acid, its Greek name indicating that it is found everywhere. This vitamin was first discovered by Professor R. J. Williams (brother of Dr. R. R. Williams, who synthesized another vitamin, B_1 or thiamin) and associates at the University of Oregon, who found that it stimulates the growth of yeast.

The latest discoveries, indicating that this vitamin promotes growth of chicks, are reported by two groups of experimenters, Dr. Thomas H. Jukes, of the University of California, and Drs. D. W. Woolley, Harry A. Waisman and C. A. Elvehjem, of the University of Wisconsin. Dr. Elvehjem is the chemist whose studies of nicotinic acid led to its becoming the cure for pellagra.

Dr. Jukes reports that a preparation of pantothenic acid (calcium pantothenate) protected chicks from a dermatitis which develops when they are on a diet lacking in part of the vitamin B group called the filtrate factor. Dr. Elvehjem and associates report partial synthesis of this filtrate factor which their chemical studies show is very similar to pantothenic acid. "Final proof of the identity of the two," they state, "must await crystallization of the pure compound."

Professor Williams, discoverer of pantothenic acid, from his new post as professor of chemistry at the University of Texas, points out in a statement to Science Service:

"Since its discovery it (pantothenic acid) has been found to be not only present in widely different tissues and organisms but to function as a potent physiological substance stimulating the growth of yeasts, molds, lactic acid bacteria, diphtheria bacillus, protozoa, young alfalfa seedlings and liverworts, and to stimulate the respiration of various tissues.

"The present discovery of Jukes and of Woolley, Waisman and Elvehjem is the first one linking it up definitely as a 'growth-promoting substance' for higher animals, though it has been recognized as a constituent of all types of animal tissue and to be stored in the livers of all animals.

"Too great significance should not be placed upon the fact that chicks are the experimental animals used in these first experiments. There is evidence that the same substance is required by pigs and dogs and the inference is not a wild one that it is necessary for the nutrition of all the higher forms of animal life and that it makes up an essential part of every living cell.

"One of the interesting features regarding this discovery is that it demonstrates anew the kinship of the whole organic world, since the lowly microscopic yeast cell requires for its nutrition the same substance as is required by higher animals. Pantothenic acid is produced by various molds and microorganisms in the soil and elsewhere and by green plants after they develop their photosynthetic apparatus.

"Not all of the vitamins seem to be as universal in their function as pantothenic acid. Yeast which is typical of the lower plant life apparently does not contain vitamin A, vitamin D, vitamin E or vitamin C, unless especial means are taken (such as irradiation with ultra-violet light) to place them there. It seems probable that these vitamins may not be essential to all forms of life. Vitamin B_1 and nicotinamide, on the other hand, like pantothenic acid, are probably universally present in living matter."

THE FEMALE SEX HORMONE EQUILENIN

THE total synthesis of the female sex hormone equilenin —an important new advance in the chemistry of sexual activity in women—is announced by chemists of the University of Michigan. Reporting to the *Journal* of the American Chemical Society, Professor W. E. Bachmann, Wayne Cole and A. L. Wilds state:

"Although certain sex hormones such as estrone have been prepared from other naturally occurring compounds possessing similarities in structure, the total synthesis of none of them has yet been reported. We have now succeeded in accomplishing the total synthesis of the sex hormone equilenin."

Following closely the discoveries of Professor Russell E. Marker, of Pennsylvania State College, that equilenin can be converted to estrone by reduction, the new research means that the total synthesis of these highly important sex hormones has now been accomplished.

Equilenin, chemically related to the sex hormone theelin found by Professor Edward A. Doisy, of St. Louis University School of Medicine, was reported by Drs. André Girard and Georges Sandulesco, of the Roussel Research Laboratories, Paris, in 1932. Its name was given because it was first found in the urine of pregnant mares. Several tons of this material had to be used, in these early experiments, to extract about three grains of the hormone.

EFFECT OF PARENTAL DIET ON THE SEX OF OFFSPRING

THE discovery that the sex of offspring can be determined by the diet of the parents, at least in rats, may explain why more boy babies are born after wars.

Dr. Frederick Hoelzel, of the University of Chicago, pointed this out in commenting on sex determination findings just announced by himself and two other University of Chicago scientists, Dr. Esther Da Costa and Professor A. J. Carlson.

Feeding a high protein diet to male rats and a low protein diet to the females led to a ratio of 145 males to 100 females in the offspring. Reversing the diet reversed the sex ratio to 92 males to 100 females. Protein appears in the human diet in the form of meat, cheese and eggs.

"It is too early to say whether diet could be used to practical advantage to control sex in animal breeding," Dr. Hoelzel replied to a Science Service inquiry. "Our results, however, may mean that the greater number of boy babies, particularly after some wars, are due to the fathers obtaining a higher proportion of protein in the diet than the mothers. The most significant suggestion from our results seems to be that the 30 to 40 per cent. of abortions or resorptions of fetuses that are known to occur in domestic animals and humans may be serving an important rôle in evolution by eliminating the least fit at this early stage of life."

The effect of diet on the sex of offspring is explained on the grounds that the state of protein metabolism induced in the parent by high or low protein diet evidently also affects the germ cells and tends to determine the survival value of the same sex among the embryos.

THE ROTATION OF MOLECULES INSIDE SOLIDS

USING the electrical property as the dielectric constant, it can be determined whether molecules inside solids are rotating, according to a report made to the New York Academy of Sciences by Professor Charles P. Smyth and Dr. William O. Baker, of Princeton University. "It had previously been known that molecules in solids vibrate in very short paths about points in a rigid lattice and measurements on specific heats had indicated, in a few solids, that the molecules begin to rotate as the temperature rises. The dielectric constant measurements provide a means of reaching into the material, taking hold of any positive and negative electricity on opposite sides of the molecule, and learning whether it can turn. A number of molecules have been found to turn as easily in the solid as in the liquid until falling temperature reduces their energy so far that they rather suddenly cease to turn."

Professor Smyth pointed out that whether molecules in a solid rotate or not depends on their ability to overcome orienting forces by their heat energy. These inner molecular forces play a part in determining at what temperatures a substance will boil or melt, and may cause a liquid to form a glass on cooling while another almost similar compound solidifies directly into a crystalline form.

Measurements of the dielectric constant——an index of a material's ability to withstand electric strain as in electrical glass insulators—are used to calculate the energies necessary for the rotation of molecules in the glasses. Substances whose molecules will rotate in the solid crystalline state are found to have higher melting points and exist as liquids over a shorter range of temperatures than do similar substances with non-rotating molecules.

PAN AMERICAN AIRWAYS TRANS-ATLANTIC SERVICE

PAN AMERICAN AIRWAYS' application to the Civil Aeronautics Authority for mail payments for the trans-atlantic air service it will inaugurate shortly will probably be cut by the authority to three fourths or even only three fifths of the requested amount. Payments which will cost the U. S. Government a net ranging from about $10,000 per round trip for four return crossings a week, or a gross from about $24,000 up, are asked by the airline in a hearing before a three-man board of the authority.

A gross annual payment of $5,000,000 to $5,750,000 is asked by the line if four services a week are authorized. But this sum, which PAA insists is necessary to enable a return on the $1,500,000 spent thus far in Atlantic development work, is regarded by informed people in the government aviation body as excessive. At twenty-five cents a half ounce, users of transatlantic airmail would repay the government $3,320,000, leaving a net annual payment out of Treasury funds of $2,455,000 if four services a week are operated and the line's request for funds is granted in full. Not only will the annual payment by the government probably be held below this total, but the subsidy per trip will, in all likelihood, be reduced as well.

Eventual operation of four services a week may be authorized at the conclusion of the present hearing, but it is unlikely that they will be maintained at any time during the first year of service. But because overhead cost is constant and passenger, cargo and mail revenue decreases faster than the number of trips, it is possible that fewer trips will cost the government more per year. In any event, the scale will in all cases be lower than that filed by the airline.

Estimates of passenger traffic filed by the Pan American are believed to be too low—barring a European war, of course, in which case almost any passenger traffic estimate is too high, unless the United States is a participant. The financial schedules of the line include this allegedly low estimate.

In the case of the airline's application a month ago for an increase of its postal subsidy on the transpacific route, Pan American was criticized for high-engine overhaul costs and a number of other expenditures. The authority is likely to look closely into similar estimates prepared for maintenance of its transatlantic planes and ground facilities.

THE HYDROGENATION PROCESS OF TREATING PETROLEUM

THE chemical process of high pressure hydrogenation—by which Germany to-day makes nearly half of her gasoline—has been applied in the United States to petroleum with yields of one and one fifth gallons of gasoline for each gallon of oil.

This yield, the highest ever attained by any process of treating petroleum, was reported to the meeting of the American Section of the Society of Chemical Industry and the New York Section of the American Chemical Society by Dr. W. J. Sweeney, of the Esso Laboratories of the Standard Oil Development Company. Hydrogenation will become extremely important, Dr. Sweeney stated, when estimated United States supplies of crude oil reserves show signs of shrinkage. At present the method is not used

commercially. A hundred octane gasolines, high-powered low-knocking fuels for military and transoceanic airplanes, are now available commercially.

Among the newest advances is the process of "alkylation." This is a catalytic type of reaction in which a fragment of a hydrocarbon is hooked on to a gasoline molecule in place of one of its hydrogen atoms. This creates a "fishlike" molecule which burns slower than ordinary gasoline molecules and hence has a lower knocking value and higher octane rating. Experimentally such gasolines have been created with an octane number of 125, according to reports to the American Chemical Society. Fifty per cent. more power than present 100-octane aviation fuels is claimed for this new gasoline.

Modern technological advances in petroleum chemistry have greatly extended the estimated life of America's known petroleum reserves. In the early days of the automobile crude petroleum was distilled for its gasoline content and virtually all the rest of the vapors rejected and discarded.

Next it was found that crude oils could be "cracked" by heat and pressure to increase their yields of gasoline. Then, as the demand for higher octane gasolines increased, the process of polymerization came into being. Finally has come alkylation making gasoline even better and with even higher yields.

It is estimated that $100,000,000 has been invested in new refining plants for the petroleum industry and that when these are all in operation the more efficient processes will save the United States 500,000,000 barrels of oil a year, or about half the nation's present yearly consumption. In other words, modern petroleum technology effectively doubles the nation's oil reserves.

ITEMS

CONCRETE walls can be used to shield against penetrating x-rays used in hospitals for treating cancer instead of lead, with resultant economies in the cost of protecting patients and doctors, has been found by studies made at the National Bureau of Standards. The cost of protection for installations as powerful as 400,000-volts may be cut 90 per cent., and, for 200,000-volt machines, by 80 per cent. according to Lauriston S. Taylor, in charge of x-ray investigations at the bureau. The present International Recommendations for X-ray Protection are at times unnecessarily stringent, Mr. Taylor finds. Concrete walls and floors, if thick enough, provide adequate protection. The economies now possible are important because lead walls contribute a major part of the cost of installing x-ray apparatus.

BEARS seem to have disappeared from the Alps, at least from the western and central portions, where they were once abundant. A recent close search of the heights of the Vercors range in the French Alps, formerly a favorite stamping-ground of brown bears, failed to turn up a single bear or any trace of one. The last record of a bear killed in the Vercors mountains is dated 1896, and the last time a bear was seen was in 1921. Supposed traces of bears have been reported up to 1937, but these are rather uncertain.

POTATOES are being tested for quality at the New Hampshire Experiment Station at Durham. They are thrown into a series of salt brines of different densities. The poorest ones float in the thinnest brines, while the best spuds, which are firm and heavy for their size, sink to the bottom in even the thickest salt solution used. It has been found that the cooking qualities of potatoes vary directly as their specific gravity, as determined by the brine-bath tests.

IT is reported that low-grade ores containing silica, which is difficult to remove, are giving engineers in charge of building blast furnaces for the Hermann Goering Werke iron and steel combine headaches and are causing delays in a construction program vital to the success of the Four Year Plan to make the Reich independent of foreign supplies. When and if the new furnaces are completed and placed in operation, production costs will run to considerably more than double those in other large iron producing plants. A new method of removing silica from the iron as it comes from the furnaces, known as the Brassert process, may have to be abandoned in favor of other methods. The furnaces are located near the ore bodies in Brunswick they are intended to exploit. In addition to having a high silica content, contained iron is only 30 per cent. as compared with 60 per cent. for Swedish ore.

TELEVISION and aeronautical radio will be given a great impetus by the invention of the "klystron" ultra-short-wave radio apparatus at Stanford University. It sends and receives on wave-lengths as low as 10 centimeters (4 inches) at efficiencies not hitherto attained. It is hailed as "the most important advance in radio since the invention of the audion tube in 1906 by Lee de Forest." Invented by Russell H. Varian and developed by a Stanford group, including Varian, his brother, Sigurd F. Varian, Professors William W. Hansen and David L. Webster, the klystron grew out of the rhumbatron, an electric resonator intended to smash the atom. Flight-Captain Sigurd Varian was a Pan-American Airways pilot when he visualized that the rhumbatron, developed by Professor Hansen, could be applied to radio communication for airplanes. Taking leave of absence, he organized the Stanford group for the research which is now successful. Two rhumbatrons, called the "buncher" and the "catcher," form the heart of the klystron, so named from the Greek "klyzo," meaning waves breaking on a beach, which is what the apparatus does.

SIR FRANCIS DRAKE'S famous plate of brass, on which he claimed the California coast as a kingdom for England, has definitely been found, according to the result of six chemical tests given to the piece of now battered metal. The tests close a heated controversy as to whether or not a brass plate picked up on the California shore, several years ago, is a historic American document or a hoax. Professor Colin G. Fink and E. P. Polushkin, of the Electrochemical Laboratories of Columbia University, put the engraved metal object through a series of tests at request of the California Historical Society. They report, "it is our opinion that the brass plate examined by us is the genuine Drake Plate referred to in the book, 'The World Encompassed' by Sir Francis Drake, published in 1628."