SCIENCE NEWS

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PAPERS BEFORE THE MINNEAPOLIS MEETING OF THE AMERICAN CHEMICAL SOCIETY

RICKETS is fundamentally a bacterial disease, caused by the poisonous products of bacteria in the digestive tract. Vitamin D prevents this distressing ill of childhood primarily by killing off a large proportion of these harmful microorganisms. These claims, differing radically from the concepts now orthodox in physiology, were advanced at the meeting of the American Chemical Society by Lester Yoder, chemist at the Iowa Experiment Station, Ames. He was led to his conclusions by a study of the bacterial population of the intestinal contents before, during and after the administration of vitamin D. While his experimental animals were receiving the vitamin the bacterial count fell off markedly, but increased again when the vitamin was discontinued. For this reason the Iowa chemist suggests the possibility of using vitamin D as a means for the general control of the bacterial growths within us, as well as for the specific cure or prevention of rickets. Studies on vitamin D in the test-tube as well as on its physiological effects have confirmed Mr. Yoder in his opinion that it exerts its principal effects without leaving the digestive tract. Pure ergosterol, which is the stuff that becomes vitamin D when ultra-violet light has shone upon it, is almost insoluble in water. After exposure to ultra-violet radiation it becomes even more insoluble. In this condition it would be extremely difficult, if not impossible, for it to pass through the intestinal wall and be absorbed into the circulating blood. For this reason it exerts its chief influence during its passage through the digestive tube, and not in the circulatory system.

THE basal metabolism, or general level of physiological processes, is raised in women as the result of the presence in their blood of the hormone or internal secretion of the sex glands. Results of researches indicating this were presented by Professor J. F. McClendon, of the University of Minnesota. Working with human volunteers, he found that a large injection of the ovarian hormone into the blood-stream where none was present would raise the basal metabolism so high that it remained seven per cent. above normal 24 hours after the injection. Smaller injections raised it for a few hours only.

A REGULAR regimen of cod-liver oil is helpful to underweight school children suspected of being incipient or arrested tuberculosis cases, according to Dr. Arthur D. Holmes, of Stoneham, Mass. With Miss Hanna L. Ackerman and Miss Madeleine G. Pigott, he conducted tests on a group of school children from tuberculous surroundings. At the end of the investigations, the records showed a definite increase in body weight and a lowering of abnormal temperatures. There was also an improvement in general health and in quality of school work.

MAKING germs step up and get killed by new disinfectants and antiseptics, to get an idea of the strength the latter substances will have when used in active service, is one of the tricks of the trade in modern bacteriology. One of the most evil of germs, the gonococcus, the cause of one of the so-called social diseases, is employed in this way by Herbert C. Hamilton, of Detroit. He described his technique for using this dangerous organism in standardizing germicidal chemicals.

A FLAME so intense as to melt its way through any known solid substance is produced by a new type of blowpipe, employing finely powdered aluminum instead of the more familiar hydrogen or acetylene gases. The new invention was described by Dr. Frank M. Strong, of Syracuse University. Dr. Strong described his device as follows: "A screw conveyer carries a slow stream of aluminum dust from the bottom of a hopper out through the open end of a brass pipe. The dust is here met by a swift cross-stream of oxygen, with which it forms a fine and uniform suspension. From this point the mixture is passed forward through a larger tube, which farther along is divided up into eight smaller tubes. The latter diverge from the central tube for a short distance, and are then curved back inward so as to come to a sharp focus. The aluminum-oxygen flame can be lighted at this focus point with a match or Bunsen burner." Dr. Strong's blowpipe combines the principles of the familiar oxyhydrogen or oxyacetylene blowpipes with that of thermite, a powder used for the generation of intense heat on a limited area, such as the ends of rails in welding. Thermite consists of aluminum powder mixed with another chemical which on heating yields free oxygen at a rapid rate. In the new blowpipe the oxygen is supplied directly in the form of a gas instead of being generated on the spot from a chemical.

ETHYLENE, the gas now used extensively to bring stored fruits to a ripe color, to blanch celery, and for other purposes, appears to be harmless to animal life if there is not much of it in the atmosphere. Furthermore, it has no effect on most of the processes of digestion, and may even facilitate the digestion of starch. These conclusions appear to be justified on the basis of a report made by Dr. Arthur D. Hirschfelder and Elmer T. Ceder, of the University of Minnesota. They report that young rats given water saturated with ethylene did not have their growth checked by it, nor did other rats suffer slowing down of growth when they lived in an atmosphere containing a low concentration of the gas. An atmosphere containing one per cent. of ethylene, however, did inhibit growth. Pepsin, trypsin and lipase, digestive juices that act on proteins and fats, were neither helped nor harmed by being saturated with ethylene, but amylase, the principal digester of starch, had its action augmented by similar treatment. Ethylene alone did not convert starch into sugar, the chemists stated.

BREAKING up a low-grade fertilizer and pushing its essential elements more compactly into another combination, as one might unpack three loosely-filled trunks and cram their contents into a single tightly-filled one, is a feat that is occupying much attention on the part of industrial chemists now-a-days. E. L. Larison and R. J. Caro, of the Anaconda Copper Mining Company, are carrying on this process, in the interest of saving bulk and economizing on freight and truckage charges. Among the most widely used classes of fertilizers are the phosphates. A peculiarity of phosphates is that they can exist in three forms—three degrees of chemical packing. The basic metal—calcium, usually—can carry either one, two or three units of phosphoric acid. Since the phosphoric acid is what the farmer especially wants on his field, the triple phosphate is the most desirable form, from the point of view of economy in handling. In nature, however, phosphate rock usually occurs in the single, or monophosphate form. The trick of the manufacture is to break off the phosphate portion of part of this rock, and tack two units of it on to a calcium atom already carrying one unit, thus converting the monophosphate into the more concentrated triphosphate. Another trick of double packing in fertilizer manufacture carried on by the Anaconda firm is the combination of ammonia with phosphate. Crops want nitrogen as well as phosphorus, and ammonia contains nitrogen. Therefore a fertilizer combining the two satisfies two needs of plants at one application, again resulting in an economy in handling.

PUMPING a nitrogenous gas through crushed and moistened phosphate rock is expected to yield an improved commercial fertilizer according to Edward J. Fox and Dr. J. W. Turrentine. Their researches were the result of a desire to find a wider use for the products of manufacturing plants that capture nitrogen from the air and combine it with other elements to form fertilizer material and other chemicals. The three mineral nutrients needed in largest quantity by most crop plants are nitrogen, phosphorus and potassium. This country has great deposits of phosphorus-bearing rocks of various kinds, and if the same mineral can be made to carry nitrogen as well as phosphorus, there will be that much less dead weight to transport to the field. The two government chemists found that by passing nitrogen, in the form of nitrogen peroxide, through slightly moistened masses of phosphate rock, they could secure the combination of a considerable proportion of this valuable element with the phosphates, at the sacrifice of a fraction of the phosphorus. This makes a double fertilizer out of the rock, leaving only the potash to be added. The work so far has been on an experimental basis, and the problems of factory-scale production have yet to be solved. But Mr. Fox and Dr. Turrentine are confident that this end can be successfully attained.

THE potash production from American mineral beds is increasing rapidly, but not as rapidly as the national demand for this important fertilizer, according to Dr. J. W. Turrentine, of the U. S. Department of Agriculture. The world production in 1928 may be conservatively estimated at something over 1,900,000 tons of actual potash. In the United States production amounted to 104,000 tons of potash salts, equivalent to 60,000 tons of actual potash, valued at over $3,000,000. This represents an increase of 38 per cent. over the previous year's tonnage. During the same period, however, 976,000 tons of potash salts, representing a total value of $22,500,000, were imported for domestic consumption. This represents an increase of 33 per cent. in American importations.

THE creosoted wood conduits in which lead-coated telephone cables are sometimes cased for protection may, under some circumstances, become a menace instead of a means of preservation, according to R. M. Burns and B. L. Clarke, of the Bell Telephone Company. They told of discovering in the air contained in such conduits appreciable quantities of volatile acids capable of corroding the lead sheathing. They have devised a method of estimating the quantity of such acids present, and told of their findings on a number of different kinds of lumber.

ARTIFICIAL diamonds were predicted by Professor J. Willard Hershey, of McPherson College, Kansas. The most promising modern attempts at achieving this much-sought-for end were made about thirty years ago by a French scientist named Moissan. Taking up the work where Moissan left off, Professor Hershey has made some improvements in his technique and is hopeful of eventually producing good diamonds in the laboratory. His process consists of melting pure carbon with filings of various metals in an electric furnace, and then plunging the white-hot mass into an ice-cold saturated salt solution. The cooled mass is subjected to further chemical treatment, and then tested for diamond particles. "I have not yet succeeded in all that I hope to accomplish," said Professor Hershey, "but the largest diamonds produced at McPherson College are the largest genuine synthetic diamonds on record. It is no longer an unattainable goal to produce artificial diamonds in the laboratory, and it is believed that the difficulties that prevent the preparation of large and beautiful diamonds are only technical."

INDICATIONS of a possible future use for the sawdust that now makes useless and troublesome mountains around sawmills were contained in a paper presented by Professor W. H. Peterson, R. J. Allgeier and Professor E. B. Fred, of the University of Wisconsin. In a co-operative chemical-bacteriological research program, they have discovered how to make the powdery wood waste into acetic acid, the active principle of vinegar, and lactic acid, which is what makes sour milk sour. Both these acids have industrial uses that render their domestic significance an entirely secondary matter. Three steps were involved in turning wood into acid. The first was turning it into sugar, which was done by the old familiar method of treating it with a strong chemical, such as sulphuric or hydrochloric acid. Then the pulp was further treated with a carbohydrate-converting enzyme, contained in malt

sprouts. Finally, the process was completed by the addition of a microoragnism that has the power to ferment both hexose and pentose sugars into acid. From 80 to 90 per cent. of the sugar present was fermented, the resulting mixture of acids consisting of ten parts of lactic to one of acetic. Wood sugar produced by the Bergius process in Germany fermented equally well and gave the same yield and ratio of products.

AN AERIAL CAMERA

THE world's largest aerial camera, weighing 130 pounds, and measuring about half the height of an average man, has been tested successfully by photograph experts of the Army Air Corps at Wright Field, at Dayton, Ohio.

The camera was developed to take wide-spread ground areas from high altitudes, and is the result of five years of experimentation. The pictures taken are 9 by 18 inches and the roll of film carried is 9½ inches wide and 150 feet long.

The camera's most unique feature is that its operation is fully automatic, possessing an automatic registering device whereby the elevation of the plane, the time, date and the number of the negative are noted on one corner of the film. The device is electrically heated so that it will function at the below-zero temperatures found at altitudes exceeding 40,000 feet.

A test plane with a wasp 420-horsepower motor was especially devised for the giant camera. The ship has been carefully balanced with a minimum of vibration. It holds six passengers without the camera, but carries only two when the camera is in place.

Ordinarily the camera is suspended through a hole drilled through a section of the ship's bottom. While the picture is being taken the plane moves at a speed of about 85 miles an hour. The completion of an exposure, including the automatic setting and winding of the shutter, the rolling of the film and the "shooting" of the picture, takes only 15 seconds. During these operations the photographer has very little to do, since he has already set the automatically controlled mechanism to snap pictures at regular intervals varying from a few seconds to several minutes.

ITEMS

TWO petrified human brains have been found at Odinzowo, near Moscow, in central Russia, associated with the teeth of a woolly mammoth, and are said to be the oldest fossilized human brains ever found. It is reported that a commission of scientists has been selected to make detailed studies of these remarkable finds of man during the Ice Age when the huge mammoths and the rhinoceros were clothed with a thick coat of woolly hair. These finds are not "casts," but actually petrified human brains—somewhat shrunken, but sufficiently well preserved so that anatomists can reconstruct the form of the brains from the fossils. The Russian scientist, Hindze, who is preparing a report on the brains, is of the opinion that man in the Ice Age possessed a brain slightly smaller and less developed than recent dwellers of the same area.

THE site of a village dating back to the end of the New Stone Age has been discovered and excavated at Moedling, a picturesque town a half-hour's train ride from Vienna, and long a favorite haunt of artists. It stands on a low hill at a little distance from the town. Other relics of antiquity near by date back to the Middle Ages and to a time in the Iron Age, about 700 B. C., so that the history of human settlement here now runs more or less continuously from 4000 B. C., the date of the newly-discovered village, down to the modern times represented by the town of Moedling. Nothing much is left of the Stone Age settlement. Not even a post-hole shows where the houses were, but many blackened stones tell of hearth-fires, and fragments of pottery and broken stone and bone implements tell of housekeeping. One metal tool has been unearthed, a copper chisel. This is of a pattern similar to copper and bronze chisels that have been found in sites in lower Austria and in Saxony, indicating an early north-south trade route passing through this place.

THE problem of where birds go in winter may be solved by the assistance of radio. Professor Johannes Thienemann at a bird station at Rossitten, East Prussia, was able, by means of requests for information, *via* microphone, to get valuable check-ups on the movements of a group of storks released after number bands had been attached to their legs at the beginning of the fall migratory season last year. Band numbers sent in by interested members of his radio audience showed that five days after the storks' release on September 26, they were in the Carpathian Mountains of Czecho-Slovakia. By October 10 they were near Messini in the southwest of Greece, having flown approximately 1,250 miles in two weeks, almost due south. This checks previous experiments with stork migration made in Germany, but the use of the radio naturally speeds up considerably the process of gathering the required information. Whether the experiment will be repeated again this fall is not yet known.

DIVING animals, like ducks and muskrats, can be induced to hold their breath until they die from lack of oxygen. This strange phenomenon has been observed by Dr. Theodore Koppanyi, of Syracuse University. The nerve endings of the reflex that control holding the breath are in the nostrils, since pouring water over the nostrils induces it in both the duck and the muskrat. Besides this submergence apnea, as the feat of holding the breath is technically known, there is another respiratory adaptation in diving birds and animals by which apnea can be brought about by bending the head back on the neck while the animal is lying on its back. Dr. Koppanyi states that complete suspension of breath for ten minutes has been observed in this position. It is actually possible to kill the duck by maintaining this postural apnea until the animal dies from lack of oxygen. It is indeed a remarkable fact that inhibitory nervous influences can counteract the chemical stimulation of the respiratory center by the accumulated carbon dioxide in the blood.