SCIENCE NEWS

Science Service, Washington, D. C.

MAGNETO-OPTIC CHEMICAL ANALYSIS

"A POWERFUL new tool for research, one thousand times more sensitive than the most delicate methods of analysis now used," is the report Dr. B. S. Hopkins and Dr. Gordon Hughes, of the University of Illinois, gave the American Chemical Society on March 29, following a study of the magneto-optic method of analysis developed by Dr. Fred Allison, of the Alabama Polytechnic Institute, and used in the discovery of the last two of the 92 chemical elements.

Investigators at Illinois are devising improvements to Dr. Allison's method which they expect will make it a dependable tool for routine use in the laboratory—one with which the limits of human knowledge can be extended to present "unknowns" where infinitesimals of one millionth of one per cent. are matters of importance.

While other investigators have worked with the magneto-optic method to check Dr. Allison's reported discovery of the last two elements of the periodic table, which he named virginium and alabamine, the sole object of the present investigation is to develop the Allison method into a dependable laboratory operation. Dr. Hopkins and Dr. Hughes found that the magneto-optic method surpasses a thousand times analysis by arc spectra, its nearest rival in sensitivity. The limit of accuracy of the x-ray spectra method is one tenth of one per cent., the arc spectra will analyze to one thousandth of one per cent., depending on the substance under examination, and the magneto-optic method easily extends this limit to one millionth of one per cent. This accuracy is achieved in analysis of rare earths, that part of the periodic table where analysis is most difficult because the elements are so closely "jammed together" there.

The Allison method uses simple apparatus, which costs much less than that required in other forms of analysis. Two hundred dollars would cover the cost of that employed in the University of Illinois investigations. Dr. Hopkins and Dr. Hughes also reported that the Allison analysis requires much less of a "sample" than other methods and that the substance is not destroyed as is the case with the chief forms of analysis now used. But their investigations have led them to agree with other scientists who have found that the Allison method in its present form is not dependable.

"Results are obtained from the instrument by noting faint light flickers with the eye," Dr. Hopkins told Science Service. "Dr. Allison and his workers have trained themselves to make these observations and they have become very efficient, but others have tried reading with the eye and they have found that they can not depend on it. Dr. Allison, himself, admits that some eyes can never be trained to read the so-called "minima" and that others will always be of little value.

"Our work has been directed at eliminating this fault," he continued. "Dr. Hughes has already improved the light source, a spark which has been unsteady. He is now developing a photographic method of reading the 'minima.' The faintly varying light makes a record on a very sensitive moving photographic plate and this is examined under a microphotometer, which is much more accurate than the eye in locating the spot of slight light variation."

RESEARCH ON VITAMINS

VITAMINS are losing their mystery. Spectacular attacks on these complex diet essentials during recent months by investigators in different parts of the world have yielded valuable knowledge about the way they are made, their structure, and their effects on other substances.

Acquisition of new knowledge has been so rapid that it would appear that text-books and teaching will have to be completely revised, Dr. R. Adams Dutcher, of the department of agricultural and biological chemistry of Pennsylvania State College, said in a report to the American Chemical Society meeting at New Orleans. Dr. Dutcher summarized this advance in his report.

Important facts have been learned about the relation between vitamin A and carotene, the yellow coloring matter of carrots, it appears from Dr. Dutcher's report. The carotene molecule is apparently split in the liver to form vitamin A, and some chemists believe this change is caused by a potent organic catalyst, or enzyme, which they have named "carotenase." Others claim to have found in fish liver a substance even more potent than carotene. The structure of the vitamin A molecule has been almost completely worked out.

Vitamin B seems likely to be made up of five different vitamins, or fractions. One fraction, which prevents beri-beri, has been definitely established, and a second form, which is known in this country as anti-pellagra vitamin G, has been recognized. Some chemists believe that a third fraction is necessary for growth in pigeons; work has been done which shows that a fourth fraction is responsible for growth in rats; and evidence has also been obtained for the existence of a fifth fraction necessary for rat growth, which is different from the fourth in stability.

Formulas have been ascribed to vitamins A and B and it appears that this step is near at hand for the anti-scurvy vitamin C, Dr. Dutcher reports. Narcotine, a by-product in the manufacture of morphine from opium, may be the parent substance of vitamin C, in much the same way that inactivated ergosterol is the parent of the anti-rachitic vitamin D, the report states.

The most outstanding recent development concerning vitamin D is its preparation in crystalline form which has been accomplished by a number of scientists in different countries.

OPIATES AND VITAMINS

CHEMISTS are building a bridge over the seemingly impassable gap between destructive, habit-forming drugs and essential, building elements of diet, it appears from a report made to closing sessions of the American Chemical Society. From an alkaloid derived from the age-

old drug, opium, there may come, after a series of chemical changes, a substance bringing the benefits of the anti-scurvy vitamin C, possibly the vitamin itself.

Spurred by the recent discoveries which indicate that the effects of vitamin C can be obtained from a substance easily made from narcotine, a by-product in the manufacture of morphine from opium and which is now of little value, chemists throughout the world are racing to learn more about narcotine and its compounds. Progress of an American laboratory was described by Dr. Carl R. Addinall, research chemist with Merck and Co., at Rahway, New Jersey. He told how he has made from narcotine, by methods simpler and more general than those used in the past, a number of compounds, the proportions and transformations of which may become valuable allies in the investigation of citrus fruit juices and other foods well supplied with vitamin C.

"Chemists already knew how to make narcotine into the more rare narceine," Dr. Addinall told Science Service. "We have found that this transformation can be extended to include the changing of narcotine quaternary salts into the acid salts of narceine esters, narceineamide and of narceine itself."

Although there now is no important use for these more easily made substances, they may become of value at any time, it was pointed out. It depends on whether Dr. Otto Rygh, Norwegian chemist, fulfills his recent claim that he can make from narcotine a substance that will prevent scurvy and which may be vitamin C. When these claims are verified by experiments of other chemists, every little bit of knowledge about the chemistry of narcotine will become very important.

Substantiation of the work will also be of great benefit to far northern and far southern countries where fruit juices with their vitamin C are scarce and scurvy is common. It will then be possible to combat this disease with a substance which can be cheaply made from a product that is now wasted.

Dr. Rygh announced the first of the year that by heating narcotine with hydrochloric acid he had obtained a substance very much like vitamin C, possibly the vitamin itself. He admitted, however, that it is likely to be a mixture of the potent substance with impurities. When he fed it to guinea-pigs suffering from scurvy, the pigs were cured of the vitamin C deficiency disease.

The claims of Dr. Rygh are contested by a prominent English biochemist, Dr. Silva, who reports that the substance he prepared from narcotine by the method adopted by Dr. Rygh did not cure guinea-pigs of scurvy. The work of the Norwegian chemist is now being examined in other laboratories throughout the world.

RADIOACTIVE MEDICINES

A WARNING against the unwise use of "radioactive" waters has been reissued by the Food, Drug and Insecticide Administration of the U. S. Department of Agriculture. While this warning was too late to save Eben M. Byers, whose death from radium poisoning, resulting from drinking a radioactive water, has been reported, it is only the latest of many such warnings which this branch of the federal government has repeatedly issued since 1926.

The Food and Drug Administration can not prohibit the sale or transportation of radioactive substances within the United States, even though they may be highly dangerous, any more than it can prohibit the sale or transportation of any poison, such as arsenic, Dr. P. B. Dunbar, assistant chief of the administration, explained. It can only prohibit incorrect labelling of drugs. Radithor, the product used by the late Mr. Byers, was correctly labeled. It claimed to be radioactive and it is, highly so.

Advertising claims do not come under the jurisdiction of the Food and Drug Administration but under the Federal Trade Commission. This body on January 17 of this year ordered the makers of Radithor to "cease and desist" from advertising that their product was harmless and that it would improve a long list of ailments.

Most of the radioactive waters on the market contain very little radioactive substances, only 2 or 3 units in a little over a quart of water. Their use is probably harmless unless it keeps people from some more beneficial form of treatment. Radithor, however, is a powerfully radioactive substance, and should therefore not be used except under the direction of a qualified physician.

When radium is used in medical treatment proper precautions are taken to safeguard the patient and attendants from this substance which is potent for harm as well as for good.

If radium or radioactive substances had been included in the federal caustic poison law, the Food and Drug Administration could have required it to carry the word "Poison" in half-inch high letters on the label. Under this law certain caustic acids and other poisonous products must bear such marking and also the antidote for the poison on the label, Dr. Dunbar explained. No antidote for radium poisoning is known, however.

The Food and Drug Administration can prohibit the sale of radioactive foods, since this comes under the head of adulteration of foods, which is prohibited by the Food and Drug Law. The administration has stopped the importation of a number of foreign food products, such as chocolate, claiming to be radioactive.

SEX HORMONES

THE male hormone, or gland secretion that is responsible for typically masculine physiology in men and male animals, has been prepared for the first time in full purified, crystalline form by Dr. Adolf Butenandt, of the University of Göttingen. Dr. Butenandt has also analyzed it and determined the proportions of carbon, hydrogen and oxygen that enter into its make-up. They are expressed by the formula $C_{16}H_{26}O_2$.

Although other physiologists have been at work on the same problem, the final crystallization of the hormone is regarded as of the greatest importance. When any preparation can be made in crytalline form, that signifies a high state of purity, which makes possible really accurate comparative physiological tests, and may even lead the way to synthetic preparation.

The male sex hormone seems to be very closely related

chemically to its physiological analogue, the female sex hormone. This hormone was prepared first in the United States by Professor Edward A. Doisy, of the St. Louis University School of Medicine, and was announced at the Thirteenth International Physiological Congress at Boston in August, 1929. Subsequently, Dr. Doisy was the first to announce the empirical formula of this female sex hormone, $C_{18}H_{22}O_2$. Dr. Butenandt announced the independent isolation of the female hormone some months subsequent to Dr. Doisy's announcement and the independent analysis a short time after, thus confirming Dr. Doisy's findings. The female sex hormone is already being used in medicine to a considerable extent and it may be anticipated that its male counterpart will likewise find clinical employment after further tests on animals have given more data on which to base its first applications to human cases. Dr. Butenandt, therefore, must be credited with the first isolation and analysis of the male hormone and the independent isolation and analysis of the female sex hormone.

Both the sex hormones are prepared from an ingredient that might well have gone into a witch's cauldron of old—human urine. The female sex hormone can be prepared only from that of pregnant women. However, the long and elaborate processes of condensation and precipitation through which the material must be put before the final few crystals are isolated removes any suggestion of its original repulsive source.

Dr. Butenandt's announcement of the preparation of male sex hormone in crystalline form is made in the German science weekly, *Forschungen und Fortschritte*.

ITEMS

THE ease with which three of the most widely used, yet most dangerously inflammable substances in industry, explode has been determined by G. W. Jones, E. S. Harris and W. E. Miller. They reported before the meeting of the American Chemical Society results of study at the Pittsburgh Experiment Station of the U. S. Bureau of Mines. Methane or natural gas, manufactured illuminating gas, and quickly evaporating acetone, a much-used solvent, were tested. Mixtures of these gases with air were considered inflammable if, when ignited in a closed apparatus, they produced a pressure of six or more pounds per square inch. Mixed with the right amount of air to make the greatest explosion, manufactured gas gave much higher pressures than either methane or acetone, while a mixture of acetone and air built up a pressure slightly higher than that caused by natural gas and air.

THE small gland at the base of the brain known as the pituitary gland produces a hormone which acts as a thyroid "starter" or activator, it appears from the report of Dr. Frank H. Figge and Dr. Eduard Uhlenhuth, of the University of Maryland Medical School, to the American Association of Anatomists. These investigators found that although the thyroid gland is responsible for the change from the larval to the grown-up stage in the axolotl, an animal related to the salamander, the thyroid can not bring about this change by itself. Axolotls lacking both thyroid and pituitary glands do not metamorphose into the adult stage when given thyroid hormone alone, to make up for the lack of it from their own missing thyroid gland. But when they are given thyroid hormone plus pituitary hormone, the change proceeds as usual.

JUICE of pineapples preserved by the frozen-pack method keeps its power to digest proteins. This is one of the results of a series of experiments conducted at the new frozen-pack laboratory of the Bureau of Plant Industry, U. S. Department of Agriculture at Seattle, under the direction of H. C. Diehl. It has been long known that the juice of raw fresh pineapple has in it a digestive enzym similar to pepsin in its ability to digest proteins. Pineapple preserved by the frozen-pack method, with the addition of either syrup or sugar, has an attractive flavor and a rich golden color. Although other frozen-packed fruits are now on the market, pineapple preserved in this way has not yet made its commercial debut. Other products which have been satisfactorily preserved by the frozen-pack method in the new laboratory are peaches, Japanese persimmons, apples, several kinds of berries, peas, beans, carrots, cauliflower, mushrooms and other vegetables.

A POTENT extract of normal human stomach juice which will check pernicious anemia when injected into the muscles has been prepared by Drs. Roger S. Morris and Leon Schiff, in collaboration with Drs. George Burger and James Sherman, of the department of internal medicine at the University of Cincinnati. The extract, is thought to contain a blood-forming hormone which the Cincinnati investigators have named "addisin" in honor of Thomas Addison, who first described the disease. That the normal human stomach secretes a substance which prevents the development of pernicious anemia was discovered by Dr. William B. Castle and his associates at the Boston City Hospital, who also found that feeding pernicious anemia patients beef muscle which had been digested by normal human stomach juice checked the malady. Feeding stomach juice itself was not successful, but the investigators have reported to the *Journal of Medicine* that their concentrated stomach juice when injected into the muscles produces an effect similar to that of liver extract.

IT is safe to use hot cement in paving concrete road, tests made under direction of the American Society of Testing Materials have shown. The general belief heretofore has been that hot cement would impair the appearance and strength of the finished product. Some state highway departments require that the cement when delivered on the job must not exceed a standard temperature of 125 degrees Fahrenheit. The tests, however, show that there is virtually no difference in the quality of the concrete when the cement used has a temperature of 180 degrees Fahrenheit or more. The tests were conducted, according to a report printed in the *Engineering News-Record*, on sections of a concrete road in northern Indiana.