# SCIENCE NEWS

*Science Service, Washington, D. C.*

## SOME PAPERS READ BEFORE THE MEMPHIS MEETING OF THE AMERICAN CHEMICAL SOCIETY

MORE than 3,000 of the nation's leading chemists gathered at Memphis, Tennessee, for the annual meeting of the American Chemical Society. Reports of the latest progress were embodied in well over 300 papers, covering all phases from the newest things in plastics to the most potent of recently developed sulfa drugs.

The meeting, like those of practically all other scientific organizations this year, was frankly incomplete because of the war. Many chemists had been unable to attend because research connected with the war effort would not permit them to be absent from their laboratories for even a few days, and many of those who were able to be present were anxious to get back to their jobs as soon as possible.

Some of the most important chemical discoveries made in recent months can not be disclosed even to professional colleagues because their military value imposes the necessity of strictest secrecy. Obviously nothing that has to do with explosives or chemical warfare methods can be given publicity at this time, and there are many things in the fields of metallurgy, plastics, fuels, etc., that must be left unsaid. This secrecy is uncongenial to scientific men, who by tradition are accustomed to frank disclosure of their discoveries as soon as they are properly checked and confirmed; "mais, c'est la guerre."

There are, however, even some wartime phases of chemistry that can properly be brought into the open. One leading paper in the opening session on Monday afternoon was entitled "The Chemist's Place in Civilian Defense," presented by Col. A. Gibson, of the Chemical Warfare Service. The paper was followed by a film showing how incendiary bombs should be fought, issued by the Office of Civilian Defense. Another paper, "Cotton—Yesterday, To-day and To-morrow," by Dr. Henry G. Knight, of the U. S. Department of Agriculture, pointed out cotton's contributions to the war effort, all the way from soldiers' clothes and tents to the making of guncotton and smokeless powder.

To supply eventually industrial alcohol demands now running 300 per cent. above normal because of the war, chemists are offering three research achievements:

1. Discovery of how to break down non-fermentable sugars in corn, wood and paper mill waste liquors by means of enzymes produced by fungi, may lead to a new industry producing needed alcohol from hitherto unused materials. Professor Frederick F. Nord and John C. Wirth, of Fordham University, reported the production for the first time of pyruvic acid, a heavy syrupy substance, from pentose, which is an intermediate step in the production of alcohol. 2. Demonstration that the common bread molds can be used in converting grain into alcohol, with greater speed, economy, and efficiency than the customary malt from sprouting barley. Drs. L. A. Underkofler, Lu Chen Hao, and Ellis I. Fulmer, of Iowa State College, stated that this "mold-bran," used to substitute for malt in saccharifying corn and other mash, promises to eliminate any bottleneck in the expanded grain alcohol industry. Use of the molds in alcoholic fermentation of 100,000,000 bushels of corn or wheat would give about 25,000,000 more gallons of alcohol than would be obtained with malt. 3. Development of a continuous fermentation process for molasses that makes one apparatus do the work of ten. H. R. Bilford, R. E. Scalf, W. H. Stark and Paul J. Kolachov, of the Seagram laboratories, Louisville, Ky., have succeeded in speeding the fermentation cycle from 50 hours to 5 hours, by making the process continuous instead of in batches. The first two of these new developments are expected to have an effect upon the sugar shortage, because they produce alcohol in larger quantity from grain instead of sugar or molasses. The importance of the Fordham discovery is that yeast, used to break down fermentable sugars, chief current source of industrial alcohol, attacks non-fermentable sugars without effect. As a result the non-fermentable sugars, which exist side by side in corn, wood, or paper mill waste liquors with the fermentable sugars, have been ignored in alcohol manufacture for want of an attacking agent. Sugar is an energy supplier and by utilizing the $C_5$ chain—a compound of five carbon atoms present in non-fermentable sugars—a new source of energy could be obtained. Dr. Nord and Mr. Wirth utilized certain mineral foodstuffs in cultivating the fungi that successfully attack the non-fermentable sugars, or pentose. Through this agent it was possible to isolate pyruvic acid in large amounts as an intermediate, or go-between, in the formation of alcohol from pentose. The isolation of pyruvic acid provides the clue concerning the sequences of the phases of conversion of pentose to alcohol.

A chocolate-flavored syrup of germs that, according to preliminary tests, enables human beings to eat grass, leaves and wood if other food supplies fail was announced by Dr. Gustav J. Martin, of the Warner Institute for Therapeutic Research, New York City. The germ syrup, which would accomplish the desired result for a lifetime at a cost of $2 per person, is considered particularly suitable for paratroops and other army units. It seems to be the American research scientist's answer to reports that the Germans have developed a similar procedure for enabling their soldiers to live on wood, leaves or grass. For civilians as well as soldiers, a germ syrup to supply vitamins for a lifetime is also on its way, if Dr. Martin's experiments prove successful. Certain bacteria, or germs, of a type that do not cause disease, are known to manufacture various of the B vitamins. The cow does not have to eat B vitamins in food because her rumen contains the bacteria that manufacture them. Dr. Martin's experiments are designed to develop similar germ vitamin factories in man's intestines. Dr. Martin's work on developing germ vitamin factories and the chocolate-flavored germ syrup for digesting grass, leaves and wood has been done on laboratory animals. Preliminary tests on humans have been started in New York hospitals, but have not gone long enough for conclusive results to be reported.

The idea of creating germ vitamin factories in man's body to make him independent of food sources of vitamins or even of vitamin pills resulted from the discovery that one of the B vitamins, pantothenic acid, can stimulate the growth of those intestinal tract germs which synthesize another B vitamin, inositol. In past experiments when pantothenic acid was left out of the diet, the symptoms that resulted, such as hair graying and hemorrhage of the adrenal glands and so on, were attributed to the lack of pantothenic acid. But because there was no pantothenic acid in the diet, there was also an unsuspected deficiency of inositol. It was this unsuspected lack of inositol that was responsible for some of the symptoms attributed to lack of pantothenic acid. Graying of the hair, Dr. Martin reported, is actually due to pantothenic acid deficiency and inositol will not cure the condition. The adrenal hemorrhages, however, are due to the inositol deficiency. Lack of pantothenic acid, Dr. Martin pointed out, is not the only dietary lack which will produce gray hair. Restoring hair color lost through lack of pantothenic acid may be accomplished by restoring pantothenic acid to the diet. Hair color may also be restored, as has previously been reported, by doses of another vitamin para-aminobenzoic acid. This vitamin acts to "cure" gray hair, Dr. Martin is now convinced, through its action on bacteria in the intestinal tract.

A revolution in paints, varnishes and lacquers is in the making, comparable with the great and rapid changes wrought a few years ago by the introduction of cellulose lacquers, which made the world a decidedly brighter place to live in. The new revolution in protective coatings is being brought about by a new class of solvents, known as the nitroparaffins, which were described by Dr. Charles Bogin and Dr. H. L. Wampner, of Commercial Solvents Corporation, Terre Haute, Ind. The nitroparaffins are made by treating one constituent of natural gas, propane, with nitric acid. There are four of them, known, respectively, as nitromethane, nitroethane, 1-nitropropane and 2-nitropropane. They are all excellent solvents for a number of coating materials, including the cellulose compounds, the rubber-like vinyl compounds, rubber itself, and natural shellac. From the user's point of view they recommend themselves in several ways. They have only a little odor, and that not disagreeable, contrasting favorably with some of the solvents in present use. They are less inflammable than many of the present solvents, and are relatively non-toxic. They dry out at a moderate rate, permitting ready spreading, but not staying wet too long after application. Finally, they permit less complex mixing formulas, so that costs of production should be lower.

A discovery that should have the doubly desirable effect of reducing the cost of one of the most important vitamins and at the same time finding a use for what is now one of the most nearly useless of dairy by-products was reported by Dr. A. Leviton, of the Bureau of Dairy Industry, U. S. Department of Agriculture. He has found that when whey is being condensed to the point where crystals of milk sugar begin to form, the vitamin riboflavin is strongly adsorbed on them. A concentration of as much as 300 micrograms of riboflavin per gram of milk sugar has been prepared in the laboratory.

"Dated" vitamins may presently become necessary, as a result of the discovery that oxygen is an enemy of vitamin D. This discovery was reported by Dr. J. C. Fritz, Dr. J. L. Halpin, Dr. J. H. Hooper and Dr. E. H. Kramke, of Borden's Nutritional Research Laboratory, Elgin, Ill. They found that vitamin D, both natural and synthetic, deteriorated on standing, and have evidence that oxygen in the air was the cause of the mischief. They were able to protect the vitamin by applying protective coatings to the substances on which it was adsorbed, or by placing it in containers in which air had been replaced by an inert gas.

It was pointed out by Dr. Gustav Egloff and P. M. Van Arsdell, of the Universal Oil Products Company Research Laboratories, that the enemy Axis, sadly lacking in oil, manages to creak along on its destructive path despite its oilless state. "At the end of 1941," they stated, "it was estimated that there were 107,225 compressed gas vehicles which released approximately 2,553,000 barrels of liquid fuels, and a maximum of 373,143 producer gas vehicles in use in Europe, which saved about 7,780,000 barrels of oil fuel. Approximately 13,200,000 barrels of benzol and alcohol were produced on the European continent in the same period and 233,000 barrels of shale oil also had been produced. Sweden and Spain planned to produce greater quantities of shale oil from their undeveloped resources. The cataloguing of the other substitutes shows that man has availed himself of animal, vegetable, and mineral products to run his motor vehicles on all the continents of the world. The only energy givers so far untapped for direct use in a motor are sunlight and atomic power, and the chances are that when human ingenuity can rise to the occasion, even these, too, will be used."

That nicotinic acid, the vitamin that saves lives by preventing and curing the disabling "hard times disease," pellagra, can work harm as well as good, has been shown in experiments reported by Professor Jakob A. Stekol, of the Vanderbilt University School of Medicine. He fed young male rats on a synthetic diet short in casein, one of the important protein foods. At the same time he gave them enough nicotinic acid to make up one per cent. of their rations—far more of this vitamin than goes into the normal diet of either human beings or any experimental animal. The rats' growth was stunted. Curiously enough, parallel treatment of young female rats had no effect on their growth.

A literal case of poison against poison was reported by A. L. Moxon and H. D. Anderson, of the South Dakota Agricultural Experiment Station. In parts of the Northwest, selenium poisoning is a serious problem in the livestock industry. The poisonous element exists in the soil, gets into plants which the animals eat, and cripples or sometimes kills them. In careful experiments, Mr. Moxon and Mr. Anderson have found that selenium poisoning can be stopped by giving the animals very small amounts of arsenic, in their food or drinking water, or in the salt which ranch cattle eagerly seek. Concentrations as low as 12 to 25 parts per million were found effective in the treatment of dogs, chickens and cattle.

Lead is commonly rated as one of the worst poisons a person can swallow. Yet we all eat and drink lead daily and come to no harm from it, according to Dr. Robert A. Kehoe, of the Kettering Laboratory of Applied Physiology at the University of Cincinnati. The secret of this apparent paradox lies in the exceedingly small amounts we take in—on an average only about three milligrams a day. (A milligram is a thousandth of a gram, and a gram is about a thirtieth of an ounce.) Lead gets into our food and water from the common rocks and minerals of the earth's surface, many of which contain it in small quantities.

We commonly think of carbon dioxide as the gas that makes some of our favorite beverages fizz, or (in its solid form) as the exceedingly cold stuff that keeps ice cream frozen as we take it home. This versatile gas has been found useful in another connection, by Dr. Philip W. West, of Louisiana State University. It is an advantage in making artificial ice to use as low temperatures as possible in freezing the water. The trouble is, however, that sometimes ice frozen at very low temperatures has a tendency to crack or shatter. He has found that by running a small amount of carbon dioxide into the water it is possible to drop freezing temperatures by as much as five degrees Fahrenheit, resulting in an increase of the ice yield of the plant by nearly a third. The extra cost of the carbon dioxide was insignificant.

Chilean copper, vital for victory, is the product of tremendous natural convulsions in the earth in an age long past, was stated by Dr. Nancy Brower, of Mary Hardin-Baylor College. The place where it is produced, known as the Chuquicamata mine, is a tremendous open pit, like the great iron mines in northern Minnesota. It is claimed to be the largest open-pit copper mine in the world. It is situated on the west slope of the Andes, about 10,000 feet above sea level, approximately 150 miles northeast of the city of Antofagasta. The most plausible theory for the presence of copper ore there is that strong volcanic action in the remote past carried the copper ore in solution up into the veins where it now occurs and concentrated it there. This theory gains support, Dr. Brower pointed out, through the presence in the neighborhood of two volcanoes still active. She was able to set forth her facts with first-hand intimacy, because she lived practically on the rim of the mine all her life until three years ago.

Hundred-octane gasolines, which give great advantage in battle to American and Allied planes, are specially tailored fuels, according to Dr. Hulit Madinger, of the Rose Polytechnic Institute. He described two processes by which separate constituents are chemically stitched together. Both processes belong to the general class known as alkylation, but one is conducted with a catalyst and is known as catalytic alkylation; the other is carried out by heat alone and is known as thermal alkylation. In the catalytic alkylation, the common and cheap chemical, sulfuric acid, serves as catalyst. The two constituent carbon compounds, isobutane and butylene-1, are subjected to mild pressure and relatively low temperature over the acid, and they emerge as high-grade 100-octane fuel. In the other process, isobutane and ethylene are united by subjecting them to quite high pressures, at temperatures as high as 1,400 degrees Fahrenheit.

A series of new sulfa drugs was described by Dr. Simon L. Ruskin, of New York. His objective was to combine the sulfa group of atoms, which has such remarkable knock-out powers against certain bacteria, with atom groups occurring naturally in the body, such as the building-blocks of some of the proteins. He anticipated the result that these new compounds should be less poisonous to the patient than some sulfa drugs now in use, while at the same time they would retain their power against the enemy microorganisms. Preliminary experiments indicate that he has had a considerable degree of success. The new compounds must, however, be subjected to further testing before they can be offered to the medical profession for general use.

It seems a far cry from the modern age of chemistry to the days of Solomon in his glory; yet learned men in Bible times did possess and use a practical working knowledge of certain chemical processes, was pointed out by Professor John T. Chappell, of Marion College. Even as early as the time of Moses, about 1500 B.C., a considerable amount of chemical knowledge entered into the metallurgy of the gold, silver and copper used in constructing the Tabernacle and its fittings. Five hundred years later, when Solomon built the Temple and his great palace, and had fleets on the sea, a further development of the chemical industries had taken place.

Thermometers use the boiling point of water (100 degrees Centigrade, 212 degrees Fahrenheit) as the landmark from which they start making their scales. Another fixed point, more accurately determinable, was offered by Dr. Frank W. Schwab and Dr. Edward Wichers, of the National Bureau of Standards. It is the freezing-point of benzoic acid, a rather common chemical. This passes from liquid to solid state at 122.37 degrees Centigrade. The temperature never varies more than a thousandth of a degree, and is independent of barometric pressure, which is a troublesome variable in determining the steam-point of water.

Sugar as the basis for many chemical processes has many advantages because of its high degree of purity, according to Dr. E. Whitman Rice, of the National Sugar Refining Company. Ordinary white sugar, as it comes to the table, is purer than many chemical compounds officially rated as "chemically pure." Use of such a material in industrial operations will do away with many costly refining and purifying processes necessary with other materials, the speaker pointed out.

Satisfactory composition cork, now widely used as a gasket material for liquid-filled electrical apparatus, can be picked by one simple test, L. P. Hart, Jr., R. W. Work, L. T. Irish, and M. A. Howe, of General Electric, Pittsfield, Mass. To keep the liquid in and also prevent moisture from penetrating, it must be nonporous, and have the proper compressibility, flexibility and density. To test all these properties in composition cork from different sources takes too long. So the engineers use a simple density measurement which tests show is sufficient.

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