

## CHEMISTRY

# New Solvents May Bring Revolution in Paint Industry

## Nitroparaffins Are Made By Treating Constituent Of Natural Gas With Nitric Acid; Have Little Odor

**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 before the meeting of the American Chemical Society in Memphis by Dr. Charles Bogin and Dr. H. L. Wampner of Commercial Solvents Corp., 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.

*Science News Letter, April 25, 1942*

## Riboflavin Concentrated

**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 byproducts was reported to the meeting by Dr. A. Leviton of the Bureau of Dairy Industry, U. S. Department of Agriculture.

Dr. Leviton 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, the speaker stated.

*Science News Letter, April 25, 1942*

## "Dated" Vitamins

**"D**ATED" 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 at 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.

*Science News Letter, April 25, 1942*

## Oilless Axis

**T**HE ENEMY Axis, sadly lacking in oil, manages to creak along on its destructive path despite its oilless state, Dr. Gustav Egloff and P. M. Van Arsdell of the Universal Oil Products Company Research Laboratories told the meeting.

"At the end of 1941," they stated, "it was estimated that there were a total of 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 when human ingenuity can rise to the occasion, even these too will be used."

*Science News Letter, April 25, 1942*

## PHYSIOLOGY

## Fluorine Accumulates Like Lead in Human Body

**F**LUORINE accumulates like lead in the human body when too much is absorbed, according to Dr. Willard Machle and E. J. Largent of the University of Cincinnati.

This report was made to the meeting of the American Association of Industrial Physicians and Surgeons and the American Industrial Hygiene Association in Cincinnati.

When increased quantities of various fluorides were added to the diet there was increased absorption and retention. In every case about half the amount of fluorine was absorbed and stored, regardless of how much was taken in. Normally about one milligram of fluorides is absorbed by a person on normal diet. This amount is passed off, but if more than two milligrams are taken in per day, the chemical begins to accumulate, particularly in the bones.

Commonest form of fluorine poisoning is mottled enamel of the teeth which occurs where the element is present in drinking water.

*Science News Letter, April 25, 1942*

## ENGINEERING

## Curious Behavior of "Galloping Gerty" Studied

**"G**ALLOPING GERTIE," bridge over the Tacoma Narrows in Washington State, bounced up and down to the extent of making some people seasick and finally collapsed. The bridge bounced up and down even though the wind was steady and horizontal.

This curious behavior has at last been brought to leash under the most severe mathematical formulae and probably won't happen again. The restraining formulae have been supplied by Prof. Norman Levinson of Massachusetts Institute of Technology and were reported to the American Mathematical Society

at Columbia University, New York City.

This perversely vertical vibration, at right angles to a steadily blowing wind, is but one instance of many other examples of the same sort which until now have defied mathematical analysis. Other instances, Dr. Levinson mentioned, are the flapping of a flag in a breeze, the vibration of a violin string when bowed, the singing of wires in the wind, the sound issuing from a bottle when one blows across the mouth. They are called "relaxation oscillations."

They occur also in electrical systems containing radio tubes, and this case was investigated mathematically some 20 years ago by the Dutch engineer

Van der Pol, and again in 1927 by a French engineer, Lienard. But this is a very restricted field.

Much more general equations have now been developed by Dr. Levinson, applicable to a great variety of mechanical and other situations. In particular, he has found the conditions under which these relaxation oscillations will be kept within narrow safe limits. Also he has found the conditions under which only one of several possible modes of oscillation will occur.

Such a system will never be at rest, he declared, but the engineer can so design the structure that the oscillations can never become very great.

*Science News Letter, April 25, 1942*

#### RESOURCES

## Germany Well Supplied With Necessary Minerals

### Enemy Does Lack Copper, Tin, Tungsten, Nickel And Petroleum But Shortage Won't Cause Collapse

**H**ITLER'S troops are "surprisingly well supplied" with necessary minerals, metals and fuels, despite war losses, a report made public by the Department of the Interior states.

The report, which summarizes Germany's war materials acquired during the past eight years through purchase, aggression and internal effort, was prepared by Charles Will Wright, foreign minerals specialist of the Bureau of Mines.

"In the case of aluminum and magnesium, the metals so essential to the manufacture of airplanes and incendiary bombs, Germany was out-producing the United States, Great Britain and Canada up to 1941," according to Mr. Wright.

"By the end of 1941, it was expected that the combined aluminum output of the three allied countries would pull ahead of the German-dominated nations, and that the Allies' 1941 figures would be nearly doubled by the end of 1942. In the case of magnesium, it is believed that American and British output is now equal to German production, while American output alone by 1943 will be more than four times Germany's expanded 1941 production."

Mr. Wright warns, however, that mineral production for non-defense purposes in the United States still goes on, even since Dec. 7.

He asserts that "Just when the United States and Great Britain will be able to exceed the German production of these war machines (tanks, submarines and munitions) depends largely on their ability to increase and maintain mineral production and the extent to which civilian consumption is curtailed to permit more rapid advances in the manufacture of required war materials."

The report admits Germany lacks "copper, tin, tungsten, nickel and petroleum."

"But," it continues, "there is no immediate prospect of a collapse of the military machine because of shortages of any of these materials."

According to Mr. Wright, German possession of the Near Eastern oil fields would assure ample petroleum oil for all essential needs if transport and reconstruction problems were solved.

Mr. Wright notes that despite purchase and tremendous internal effort, "Germany's greatest increase in mineral supply . . . has been through the occupation first of Poland, then Norway, then France, the Balkans, and later of the Ukraine and Donetz Basin."

"Reports indicate that no time is being lost by the Germans in these occupied countries in organizing mineral production in order to get the utmost benefit out of these new sources of supply."

*Science News Letter, April 25, 1942*

## ● RADIO

*Saturday, May 2, 1:30 p.m., EWT*

"Adventures in Science," with Watson Davis, director of Science, over Columbia Broadcasting System.

Miss Katharine F. Lenroot, chief of the Children's Bureau, U. S. Department of Labor, will discuss the Pan American Child Congress for which she is chairman of the organizing committee.

*Tuesday, April 28, 7:30 p.m., EWT*

Science Clubs of America programs over WRUL, Boston, on 6.04, 9.70 and 11.73 megacycles.

One in a series of regular periods over this short wave station to serve science clubs, particularly in the high schools, throughout the Americas. Have your science group listen in at this time.

#### CHEMISTRY

### Liquids and Gases Not Entirely Formless

"**G**HOSTS" of ice lurk in water, and all liquids have some slight residual structure which is like a memory of a former crystalline solid state. This latest finding of science was told at the University of Minnesota by Dr. John G. Kirkwood, professor of chemistry at Cornell University. Dr. Kirkwood spoke under the auspices of the Society of the Sigma Xi, the national fraternity for promotion of scientific research.

When a solid melts, the long-range crystalline order, that extended throughout the mass of the solid, disappears completely, but some trace of the short-range local organization persists, he explained. Each molecule in the liquid tends to retain some of its former neighbors.

That liquids are mobile and solids are rigid, does not adequately describe the distinction, Dr. Kirkwood declared. For glass is to be regarded as an undercooled liquid that failed to crystallize on solidifying. Yet it has great rigidity while crystalline solids may show plastic flow.

The real distinction, he said, is the degree of orderliness in the arrangement and distribution of their molecules. In the crystalline solid, the degree of order is high and extends over wide domains. In the liquid, it is slight and confined to local groups. Nevertheless some remains, both in liquids and gases.

This residual orderliness in liquids is revealed by X-ray scattering, the same technic that has so precisely determined the crystal structure of solids.

Dr. Kirkwood has reduced "degree of local order" to a mathematical expression, the "radial distribution function." X-rays determine the value of this function, and conversely, if the function is known, some of the properties of the liquid can be predicted.

*Science News Letter, April 25, 1942*