CHEMISTRY

ACS Reports Marvels

Chemists tell of research that resulted in the "discovery" of fluorine during the war, the speeding up of penicillin production and the dehydration of garbage.

➤ A NEW CHEMICAL element, not one of the excessively rare fissionable metals of atomic bomb fame, but a light non-metal, as common as carbon, nitrogen or chlorine, has in effect been discovered during the war years and is the subject of a number of papers given at the meeting of the American Chemical Society in Chicago. The element is fluorine, actually known as a curiosity for nearly 200 years, but so corrosive, dangerous and difficult to handle that until now chemists have let it alone as much as possible.

Separation of the uranium isotopes was accomplished by using uranium fluoride, the only gaseous compound of that heavy metal. For its production, quantities of the element fluorine had to be made and stored ready for use. Since the only common use for fluorine up to that time, the etching of glass, depends upon fluorine's ability to eat glass and make it disappear in the form of a gas, the first problem was to find materials which would make satisfactory containers for this extremely active element.

Carbon Steel Containers

Chemists from university laboratories and industrial plants who took part in the cooperative researches which solved the most immediate problems on handling fluorine on a large scale reported to the American Chemical Society meeting that tanks and pipes of carbon steel were found practical, with electrodes of carbon to lead the electric current into the solution from which the fluorine is to be extracted and nickel electrodes at the poles where the corrosive gas is drawn off. The employment of modern automatic gas-handling machinery using high pressures and low temperatures, sometimes as low as that of liquid nitrogen, made possible the production of this new chemical. One of the subjects of research had to be methods for disposal of waste fluorine.

Out of the new interest in this active element have come new lubricants for airplanes and automobiles which are much less sensitive to temperature changes than the natural oils and greases formerly available. Many other new compounds are available whose properties will fit them for uses not satisfactorily filled by present-day materials. To the chemist, these offer an exciting field for new experiment, for they nearly double the already enormous array of compounds, both organic and inorganic, with which he works.

To the chemist, fluorine belongs to the family of halogens, or salt-formers. Other members of the family are chlorine, familiar as antiseptic and bleach; bromine, now mined from sea-water for use in making anti-knock compounds for gasoline; and iodine, heaviest and most metallic of the group, which is dissolved in alcohol to make the familiar antiseptic tincture. Besides etching glass, fluorine commonly appears as sodium fluoride, a household insecticide.

Penicillin Production

Penicillin production by molds can be speeded in essentially the same way shipbuilding by men was speeded during the war—the subassembly method. Subassembly in shipbuilding meant bringing to the shipyard a whole bow, a whole stern, a whole cabin, already put together elsewhere and letting the workers weld them into place. Subassembly in penicillin production means putting into the molds' culture solution chemical compounds containing groups of atoms already arranged in patterns known to exist in penicillin.

Success with this method was reported before the meeting of the American Chemical Society by Dr. F. G. Jarvis and Dr. M. J. Johnson of the University of Wisconsin. They were able to increase the production of penicillin G by adding phenylacetic acid, which contains a ring of atoms characteristic of this particular penicillin variety. For a different penicillin, designated as X, the best subassembly molecule was that of p-hydroxyphenylacetic acid.

Two other University of Wisconsin scientists, Dr. Kiyoshi Higuchi and Dr. W. H. Peterson, reported on a bacterial assay for the various kinds of penicillin. Three bacterial species respond differently to each of three different penicillins, so that their behavior in the presence of a mixture of penicillin "unknowns" gives an index to what is in it.

Coming Up: Dehydrated Garbage

Dehydrated foods we all heard plenty about during the war. New, however, is the idea of dehydrated garbage, presented before the chemists by Dr. W. A. Bush of the California Flaxseed Products Company of Los Angeles.

After the 82% or so of water is removed, the speaker stated, the remaining dry matter contains materials that can be used to advantage as fertilizers. And if the garbage can be collected in sufficiently fresh condition, as would be the case at hotels, hospitals, etc., it can be made to yield greases suitable for soap-making and other technical uses,

AAF photograph

MAN-MADE ANTENNA — The Army Air Forces uses radar antenna such as this to measure the height of thunderstorms. This antenna rocks back and forth, recording on a scope the echoes returned by the thunderstorm and giving valuable data on the storm's structure. Part of the equipment is being used in the joint AAF-Navy-Weather Bureau at Orlando, Fla.

and a meal suitable for livestock feeding produced from the residue.

Soil Chemistry

Botanists can give chemists some useful pointers when it comes to finding out what's wrong with a given area of soil, Prof. Walter S. Eisenmenger of Massachusetts State College indicated in an address before the meeting. A man with a well-trained eye for plants can tell, by the presence or absence of certain species, a good deal about the chemical state of affairs down at root level.

In general, wild plants are more sensitive indicators of soil chemistry than cultivated plants, Prof. Eisenmenger stated, and he attributed this to the long centuries since he first tamed them. Among the wild plants, the species farthest down on the ladder of evolution are the most responsive.

Fissionable Matter

A preview of what plenty of fissionable materials can do towards revolutionizing everyday life was provided by a paper presented at the meeting by Dr. C. L. Comar and Dr. George K. Davis of the University of Florida. They demonstrated by means of "tagged" atoms of artificially radioactive cobalt that this element, needed in minute amounts to keep animals healthy, must be supplied to cattle constantly because they have no way of storing reserve supplies of it in their bodies.

The cobalt used in these experiments was made radioactive in a cyclotron, but larger supplies at much lower cost should soon be made available as the country's U235 and plutonium production facilities become available for turning out radioactive elements for scientific research purposes. Not only the relatively minor element cobalt but also such elements as phosphorus, calcium, potassium and sodium, all of major importance in animal and plant physiology, should soon be available cheaply and in quantity for use in experiments designed to answer old riddles in life processes, and to make the answers significant in increased food production and better health.

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INVENTION

Optical Canes to Aid Blind

➤ A BLIND MAN, using a seeing-eye optical cane, may soon be as familiar a sight on crowded city sidewalks as the uncertain tapping of a blind man's stick or the gentle tugging of a seeing-eye dog.

An experimental sensory aid for the blind that uses a beam of light to accurately detect the distance and direction of all obstacles within 20 feet is being perfeced by the Signal Corps Engineering Laboratories, Bradley Beach, N. J. It cannot be called radar, but it is like radar in which visible light is used instead of short radio waves.

The size of a loaf of bread, a nine-pound case carried in one hand is connected by a short wire to a single earphone. Trees, people, steps, and other obstacles in the path of the blind user are heard, instead of seen, as coded "dots" and "dashes".

In scanning his surroundings, the blind person turns the case slowly from side to side so that the beam of light projected from the front of the case can reflect any obstacle it meets. The reflected beam of light is changed by a photoelectric cell into coded tone signals in the blind user's earphone.

With a little practice a person could easily determine the exact distance, to within one foot, of obstacles on a city street or in a room strewn with furniture. His sense of hearing allows him to learn to recognize the code signals. While a reflection from an object 11 feet distant produces a tone signal of one "dash", and a reflection from eight feet distant produces a signal of two "dots", a reflection from an object 10 feet distant produces a strong "dash" and two weaker" "dots", and a reflection from nine feet produces a weak "dash" and two stronger "dots". The time of travel of the reflected light determines the sound code.

Although the Signal Corps is already producing a few test models for continued experiments, optical canes for the blind cannot be produced commercially until the present apparatus is perfected.

As yet, the device would be of little help to a blind person in crossing streets, since a speeding vehicle would not be detected until it was within 20 feet of him. Before the seeing-eye device is introduced to the public, it will be made lighter and equipped to detect small objects, such as narrow posts and hanging wires.

The problem of filtering out signals from sunlight and ordinary electric light used for illumination has been solved by making the optical cane sensitive only to pulsed light, and then pulsing the beam of light emitted by the case to that exact frequency.

Research is continuing under the direction of Lawrence Cranberg, a civilian Army physicist, who designed the first model.

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