SCIENCE NEWS

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ADVANCES IN THE APPLICATIONS OF CHEMISTRY

CHEMICAL curiosities that have recently become useful in scores of jobs from speeding up the aging of wine to protecting life from poison gas, a method of warding off colds and strengthening the body against other ailments, new resins that make textiles non-creasable and are strong enough to be moulded into chairs and window frames: these developments were among the advances reported to the Chicago meeting of the American Chemical Society.

Describing as "utopian and distinctly American achievements" the working out of processes by which ordinary air is made to combine with benzene and naphthalene to produce cheaply and in abundance maleic acid, a laboratory rarity a short time ago, Dr. Charles R. Downs, chemical engineer, of New York City, pictured some of the many uses to which this new industrial substance is already being put.

"It usually requires several years of aging for the precipitation of the excess tartar in wine," Dr. Downs said. "If the wine is bottled before the precipitation of tartrates is completed, it will lose commercial value because some tartrates will precipitate as undesirable. If, however, calcium malate is added to wine, even when young, any proportion of tartaric acid can be removed in a very short time. The acid is also used as a gas mask ingredient for absorbing ammonia vapors."

Maleic acid and related compounds have also been found to prevent the development of rancidity in stored fats and oils, serve successfully as new resins for lacquers and varnishes, aid the dyeing of textiles, replace advantageously acids commonly used in tanning, become a baking powder ingredient, aid the substitution of a chemically known salt for ordinary table salt for those who can not tolerate table salt, and in the form of little tablets conveniently disinfect small quantities of water for drinking purposes through the release of free chlorine.

Carotene, the vitamin A carrying yellow coloring matter of carrot, butter, whole milk and other fruits and vegetables, is much more valuable than nutritionists now believe and its use in the diet should be increased, according to Dr. A. F. O. Germann, of Cleveland. He said that prehistoric man was able to resist many diseases that afflict civilized men because he ate quantities of this substance.

Citing recent recognized research, Dr. Germann said that "a carotene supplement to the normal diet is the best known preventive of upper respiratory infections; brings about improvement in vision in human cataract; gives promise of relief in certain allergic conditions such as house dust allergy and hay fever; causes more rapid healing of wounds, and gives promise of greatly improving the general health and well-being."

Dr. Carleton Ellis, of Montclair, New Jersey, described unusual uses for the newest syntheic resins, the molded products which first replaced celluloid and hard rubber articles, but are now finding a much wider field of application. Tanks nine feet in diameter have been made from one new material of the phenol-aldehyde class. It is now possible to mold articles as large as chair backs and legs, table tops and radio cabinets.

Moldings made from urea and formaldehyde, Dr. Ellis continued, are strong, light in color and very resistant to darkening under influence of light. Articles can be made from them in a great variety of bright colors. When textiles impregnated with these resins are heated, the resins set and the cloth becomes non-creasable.

"PANTOTHENIC" ACID AS STIMULUS TO GROWTH

ALL life may involve the presence of a powerful growth-stimulating acid which has been found in many different kinds of plants and animals and has been concentrated by Dr. Roger J. Williams and Carl M. Lyman, of Oregon State College, to a potency one thousand times stronger than any previously reached.

Because of the wide-spread occurrence of this little-known substance Dr. Williams, who reported his latest researches to the American Chemical Society, has tentatively named it "pantothenic" acid from the Greek for "from everywhere." The name is justified by tests which show that pantothenic acid was obtained from all sources examined so far which include: cattle, human and chicken liver, milk, crab eggs, sea-urchin eggs, planarian worms, earthworms, oysters, bacteria, molds, yeast, mushrooms, potatoes, apples, grains, algae and soil.

Dr. Williams stated that "It is probably safe to say that this acid is more widely distributed in nature than any other physiologically potent substance. The evidence shows that it is contained in all living substances from the highest mammalian form down to the lowliest worm and from the highly developed green plant down to the tiniest yeast, mold or bacteria. The acid was discovered because of its effect on yeast growth. When placed in a solution in which yeast is growing it may increase the rate of multiplication from ten to twenty thousand fold in eighteen hours. The fact that it is apparently present in all living cells suggests that it may act as a growth regulator in all cells. It is interesting to observe that yeast and mushrooms, which proverbially grow rapidly, are comparatively very rich sources of the acid."

As recently concentrated by Dr. Williams and his associate, pantothenic acid is so potent in speeding up the growth of yeast that a quantity much smaller than the head of a pin has a detectable effect when placed in 250 gallons of solution in which yeast is growing. The presence of one part of the preparation in one billion parts of yeast culture medium is noticed by the resulting growth increase. Dr. Williams points out that while the origin of this acid in nature is obscure, except for the fact that it is produced by certain molds in soils, for

example, we are led to suspect that it is one of the unidentified water-soluble vitamins. In fact, several of its properties at first suggested a close relationship to vitamin G; yet, unlike the widely known vitamins, it appears to be a substance that even plants can not make for themselves, but must obtain directly from the soil.

Dr. Williams' present work grew out of studies of the many practically unknown substances that stimulate yeast growth and carries on a detailed examination of one of the more simple of these materials. It is the acid constituent, he found, of the previously widely heralded "bios," a hypothetical substance thought necessary to life. Though the chemical formula of pantothenic acid has not been determined, something is known concerning the structure of its molecule. Its molecular weight has been found to be about 150.

WATER FILMS STUDIED BY ELECTRIC "FEELER"

SEEKING from the infinitesimal building blocks of matter themselves the secret of why atoms and molecules cling together, to compose the living and lifeless substances of the world, Dr. William D. Harkins and E. K. Fischer, of the University of Chicago, reported to the American Chemical Society that they are now able to reveal the presence of thin layers of organic material five hundred times too small to be seen through the most powerful microscope.

Though we can not see them, such films are on all surfaces, Dr. Harkins explained, and knowledge of them will lead to a better understanding of why all things hold together. He pointed out that since the human body is made up largely of surfaces in contact with surfaces, this research may eventually explain body processes now little understood.

Films of water have been studied. Such films, only one ten millionth of an inch in thickness, are divided up into islands and continents, and the study of the geography of the surface of almost any body of water reveals an interesting topography. The continents and islands, too small to be seen, are located by measuring with very delicate and sensitive instruments changes in electrical potential caused by the film.

Dr. Harkins has found that the outer part or top of an organic film is, in general, electrically positive with respect to the underlying liquid. Although the change of potential, usually about three tenths of a volt, seems small, such potentials are related to important features of the surface. Paradoxically, films composed of extremely large molecules, with weights of about 17,000, set up the same potentials caused by films of smaller molecules. What is even more strange, very large molecules gave much thinner films than those made up of molecules sixty times smaller.

ELECTRIC CURRENT FROM ELECTROSTATIC MACHINES

ENORMOUS disks, spinning at high speed in an almost perfect vacuum, will replace the familiar generators and motors of modern electrical plants, according to Dr. R. J. Van de Graaff, physicist of the Massachusetts Institute of Technology, who spoke before the Leicester meeting of the British Association for the Advancement of Science.

These disks would be great electrostatic machines, producing direct current electricity at tremendously high voltage. The vacuum would be necessary in order to prevent the production of tremendous sparks that might wreck the whole machine and would in any case prevent the electricity from being led out on wires to be usefully employed. Dr. Van de Graaff believes that vacua sufficiently high to insulate the machines against such electrical breakdown can be produced, even in the large housings that would be required for the industrial production of current by electrostatic machines. He exhibited designs for such machinery.

If Dr. Van de Graaff's prophecy is realized, it will be, in a sense, progress made by setting the clock back. For the electrical machines that were used by the eighteenth-century school of "natural philosophers," of which our own Dr. Benjamin Franklin was a brilliant member, were all of the electrostatic type. They generated electricity by friction on large disks. Instruments of the same kind are still used for special purposes in laboratories.

The trouble with such machines has always been that the air was not a sufficient insulator to prevent sparks after a certain potential had been built up. For this reason the development of the electric age had to await the discovery that electricity could be generated in another way, by the moving of a conductor in the field of a magnet. All our present generators are elaborate arrangements of magnets, past which systems of wire coils are rapidly moved, with arrangements for capturing and leading off the current thus produced. They are the best we have; but their working efficiency is admittedly not as high as could be attained, at least in theory, by properly arranged and insulated electrostatic machines. Dr. Van de Graaff believes that such theoretically possible machines can actually be built.

Dr. Van de Graaff has attracted much attention among physicists by the simple but tremendously powerful electrostatic machines he has already built, first at Princeton and latterly at the Massachusetts Institute of Technology. These have produced "artificial lightning" measured in hundreds of thousands of volts, used in atom-smashing experiments.

ANTARCTIC METEOROLOGY

AT the airport weather station at South Washington, Virginia, a veteran weather man of the first Byrd Antarctic Expedition is making ready to join Admiral Byrd again for a renewed investigation of South Polar weather.

While he talks to aviators of such matters as ordinary United States weather, William C. Haines is looking ahead to September 25 when he will sail from Boston on Admiral Byrd's ship to study the icy, blizzardy weather of the world's coldest continent.

The whole Antarctic, as big as the United States and Mexico put together, turns out just one commodity that the world takes and uses. That is weather. South Amer-

ica and lands farther from the South Pole get some of their waves of chill, drought, heat and rain from the busy South Pole weather factory. But the rules of production and distribution that run the factory are almost unknown.

To investigate, to get at some of the reasons, this is the task confronting Mr. Haines and the other meteorological staff member of the expedition, George Grimminger. It is Mr. Grimminger's first venture into the Antarctic. Both men are from the U. S. Weather Bureau.

It is expected that one base for observations may be established in the interior, at an advanced position, perhaps not far distant from the Pole. Some of the weather records noted by Mr. Haines on his previous year in the Antarctic may be far eclipsed. His coldest weather record was 72 degrees below zero, and the warmest summer day was just three degrees above freezing. In the midwinter blizzard, in July, his instruments recorded a drop to 58 below zero and just when the cold was most intense the wind blew 43 miles an hour. And that, Mr. Haines thinks, may be a record for blizzards anywhere.

"We expect to lay stress this year on upper air observations," Mr. Haines reported to Science Service. "We can generalize more accurately about the wind direction and velocity as we find it high in the air. At ground level, weather records are more complicated by influences of local geography."

Winds are especially important in the Antarctic weather, Mr. Haines explained, for winds, even more than icebergs, are carriers of cold there. Swiftly changing temperatures and changes in air density raise the wind, and the wind carries cold across the icy continent and out toward warmer latitudes.

Instruments packed for the expedition's use will include standard equipment, furnished by the U. S. Weather Bureau, for measuring temperature, barometric pressure, wind direction and velocity, and humidity. The clocks have to be adjusted for low temperature, but not much trouble is expected in handling equipment. On the previous expedition, the non-freezing ink in the pens of self-recording instruments froze at 60 below zero, until alcohol and glycerine were added.

Mr. Haines believes that the possibility of establishing permanent weather stations in the Antarctic, to keep the world informed and warned of weather brewing there, seems very remote these days. So expensive is such a proposition that it can only be carried out if the leading countries of the world cooperate in the financing. Meanwhile, the data that will be needed are being gathered by the weather explorers, and it is hoped that even without Antarctic weather bureaus the world may profit by greater knowledge of Antarctic weather.

ITEMS

A SABER-TOOTH cat species, much smaller than the great tiger-sized animals made famous by the California tar-pit finds, is represented by a jaw fragment from Idaho described in the current *Journal of Mammalogy* by Dr. C. Lewis Gazin, of the U. S. National Museum. Another new species of extinct cat found in the same region resembles the modern puma or mountain lion. These fossils were found among a mass of bones of extinct species of horses collected by paleontologists of the museum. The stratum in which the find was made is of Pliocene Age, perhaps two or three million years old, and dating before the coming of the great glaciers that once covered most of this continent.

PETRIFIED FOREST NATIONAL MONUMENT, in eastern Arizona, one day may be the great show place for antelope in this country, if plans now being considered by the Office of National Parks, Buildings and Reservations of the Department of the Interior are carried out. The Petrified Forest is a natural range for these plains animals. At present about 38 antelope range immediately south of the monument and along the approach road, while another band of 30 ranges immediately southeast of the monument and still a third, numbering about 200, ranges to the west. With this nucleus in the vicinity of the monument, there is sufficient stock available for further development.

STARCHED clothes wash more easily than unstarched clothes. Chemists have devised a machine that will tell how much dirt is left in a piece of cloth after washing. Exact measurements on washed cotton fabrics with various kinds of starch are described by Professor Lawrence E. Stout, of Washington University. Professor Stout's measurements gave a scientific proof of the correctness of the old saying that every woman knows, "Starched clothes wash easier."

CYSTINE, a sulfur-containing organic compound, is deficient in the fingernails of persons suffering from arthritis, often known as "rheumatism of the joints," according to a paper by Dr. M. X. Sullivan and Dr. W. C. Hess, of Georgetown University. The two research men tried injecting colloidal sulfur into the blood-stream of six arthritis patients. They found that the cystine in their subjects' fingernails returned to normal, and at the same time the symptoms of arthritis abated. Drs. Sullivan and Hess are now working on the problem of the relation of certain microorganisms to arthritis. They state that the lowering of the cystine content of body tissues implies the presence of injurious substances resulting from the activity of such microbes.

HYDROCYANIC acid, deadliest of all simple chemical compounds, is formed in the caps of two species of mushroom, it has been discovered by M. Mirande. The poison was found in the gills of a small mushroom belonging to the genus Marasmius; it is extractable in cold water from both fresh and dried material, though neither the spores nor the underground root-like threads of the mushroom contain it. The second hydrocyanic-acid yielding mushroom belongs to the genus Clitocybe; the poisonous night-shining American species known as the "jack-o'-lantern mushroom" is also a member of this group. This mushroom, unlike the Marasmius species, gives up its poison only when heated.