SCIENCE NEWS

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MODELS OF MOLECULES

A WATCH designer, in order to facilitate his work, may construct a model several times as large as the finished time-piece will be.

How convenient it would be for the organic chemist if he, likewise, could enlarge the molecules with which he deals to a size of several inches. Instead, then, of vainly attempting for months to prepare a certain compound, he could have seen at the outset that the method he was using could not possibly lead to the desired result.

The organic chemist is always anxious to know just how closely atoms or groups of atoms, appearing in the molecules of a compound, approach each other in space. With this knowledge he could foresee whether or not certain phenomena would take place.

To represent organic molecules correctly, models should be composed of spheres made to the scale of the atoms with a properly chosen magnification. Moreover, the spheres should not be separated by rods as are those in the old-type models.

This has been fully realized by Dr. Robert E. Steiger, of Swarthmore College. His "Organospheres" are 172,410,000 times the actual size of the non-metallic atoms one is most likely to find in organic substances. Made of solid aluminum, they can be connected to each other, at specific points ("valence points") on their surfaces, by means of pins which are no longer visible once the connection has been effected.

To speed up construction of the desired models, complete sets of organospheres contain assemblages of two or more spheres corresponding to the groups of atoms most frequently occurring in organic compounds.

George A. Bourdelais, of the engineering division of Swarthmore College, deserves great credit for having successfully solved the serious technical difficulties encountered in the making of the organospheres, thus having provided organic chemists and teachers with an effective tool for research and demonstration work.

But how, one may ask, can it be known how large the atoms are? This is accomplished with x-rays by examining the reflected pattern produced when a beam of x-rays is shot into a crystal of the substance in question. In addition, the models themselves may furnish considerable information as to the sizes of real atoms. For, if certain molecules are known to exist and to behave in a certain way, the models may show that this behavior is only possible when the sizes of some of the atoms lie within narrow limits.

In this way, Dr. Steiger was able to assign to the hydrogen atom attached to an aromatic ring a radius of 0.00000000173 inches (0.44 Ångstrom units). Several months later, Dr. P. L. F. Jones, of England, obtained exactly the same value by a more direct method.

Dr. Steiger is now engaged in research to prove that several rather simple compounds must be mixtures of optically active modifications because they are not at all symmetrical in structure as is generally believed.

W. E. DANFORTH

DEVELOPMENT OF AIRCRAFT ENGINES

BY 1940 aircraft engines will develop at least 1,600 horsepower in a single engine unit, according to a prediction made by the British aeronautical engineer, H. Wood, of Rolls-Royce, Ltd., before the meeting of the Society of Automotive Engineers, meeting at White Sulphur Springs, W. Va. By special invitation of the society, Mr. Wood came from England to present recent advances in the art of cooling airplane engines with liquids—either water or the newer glycerine compounds.

Wherever modern airplanes are flown, cooling is a major problem, for in many cases airplane engines already overheat if operated on the ground for any length of time. Only at the high velocities of cruising flight is sufficient air drawn over the engine to give proper cooling. Liquid cooling used in the best English airplanes is in sharp contrast to the common American practice of using air-cooled engines. The engine of high horsepower in the future, Mr. Wood intimated, will probably consist of many small cylinders to take advantage of the relative increased cooling surface thus attained. British aircraft engines—at least the major part controlled by Rolls-Royce—will continue to be liquid cooled in the future. His invitation to speak, he said, had been accepted in the spirit of a friendly challenge.

It has only been since the adoption by air-cooled engine manufacturers of the special engine cowling devised by the U. S. Government's National Advisory Committee for Aeronautics that British airplane engine producers had had to worry greatly about the development of liquid-cooled engines. Previously the small front area of "in-line" liquid-cooled engines gave a smaller air drag than the much larger radial air-cooled engines. With the cowling, however, air drag has become essentially comparable for the two contrasting engine types. Thus the liquid cooling advocates have had to revise their concepts.

Progress in English liquid-cooled engines, Mr. Wood admitted, has not been as spectacular as the American developments in air-cooled aircraft engines. The rapid development of civil aviation in America has been instrumental in this fast development. By contrast, he pointed out, civil aviation in England is comparatively small and most engines have been built for the British Air Ministry for military purposes. The Air Ministry has maintained a balance between air-cooled and liquid-cooled engines resulting in the keeping of technical advantage to both.

TESTING LIGHTING SYSTEMS BEFORE INSTALLATION

A MODEL room for the accurate testing of lighting adequacy under any given conditions is now available to architects or builders in the illumination laboratory of the University of Michigan. This apparatus, the only one of its kind in the world, according to Professor H. H. Higbie, department of electrical engineering, will make it possible for architects to determine in advance

the exact performance of any lighting system which they may design.

By changing the ways in which light is admitted, and by varying the kinds of paint on the ceiling, floor and walls of the model room, any lighting conditions may be reproduced to solve specific problems of illumination. The accuracy of the apparatus is insured by a complete check before each test is made. Numerous tests in full-size rooms have verified the applicability of the data obtained with this device.

A photo-electric cell, mounted on a carriage, moves back and forth, so that an accurate survey of the whole room may be made. The current generated in this "electric eye" is amplified, then recorded by means of an oscillograph. A beam of light, developed in the oscillograph, falls on a moving strip of photographic paper, thus making a graphic record of the trip of the "electric eye" about the room.

If it were not for reflections, this complicated apparatus would be unnecessary, since illumination could be calculated by mathematical means. The troublesome reflection difficulty, however, is solved by covering the "electric eye" with a diffusing glass, which catches light from all angles and transmits it to the photo-electric cell.

Most of the present tests are conducted with the luminous panel type of lighting, which is now coming into vogue. Permitting almost unlimited variations, as well as efficient illumination, it may readily be incorporated into the decorative scheme.

GROWTH OF HUMAN MARROW IN THE LABORATORY

HUMAN bone marrow has been grown in the laboratory for the first time in quantities sufficient to permit studies of the blood and metabolism. The complicated apparatus for growing this important human tissue outside the body is described by Dr. Edwin E. Osgood and Alfred N. Muscovitz, of the University of Oregon Medical School, Portland, in the *Journal* of the Americal Medical Association. The report of their work recalls the fact that it is not quite a year since Dr. Alexis Carrel and Colonel Charles A. Lindbergh reported their experiments at the Rockefeller Institute, New York, in which they devised a glass apparatus for growing living glands outside the body.

The apparatus for growing bone marrow gives promise of solving important problems concerning changes in the blood and bodily tissues. The red marrow of bones produces the red blood cells, so it is likely that the new apparatus may aid in the study of anemia in which there is a breakdown in red blood cell production.

Construction of the marrow-growing apparatus is complicated; the parts are chiefly of glass. Most important of the features is a semi-permeable membrane separating the culture from the main volume of medium. This membrane permits nourishment from the surrounding medium to reach the culture and allows waste products to diffuse out as they accumulate. Because of this equilibrium, analysis of the outflowing medium gives a good indication of conditions in the culture. Investigation of eighteen distinct problems by means of the new apparatus is under way at the medical school in Portland, and many other problems suitable for investigation await later attention.

Dr. Osgood and Mr. Muscovitz believe that the method appears to offer sufficient promise to justify preliminary publication with the hope that other investigators may aid in realizing as rapidly as possible its full potentialities. A grant from Eli Lilly and Company, Indianapolis, made possible the construction of the apparatus.

POISON IVY

POISON IVY just now has the unenviable distinction of being Public Pest No. 1. You can't go out on a picnic yourself, you can't send your children to camp, without the risk of having your household quiet upset for a week by an attack of the blistered, itching, red-skinned affliction known to the medical profession as rhus dermatitis, but to the laity as just plain ornery ivy poisoning.

Hardly a corner of the land escapes. Poison ivy grows all over the United States and Canada east of the Rockies. Its evil twin, poison oak, takes charge of the Pacific Coast region. And in eastern boglands a third member of this criminal fraternity, poison sumac, holds its sway.

Eastern poison ivy and western poison oak look so much alike that it takes an expert to tell them apart. They are either low shrubs on the ground, or vines climbing trees and stone walls by means of thousands of short, clinging aerial roots. Each leaf is divided into three leaflets; whence the ancient doggerel warning, "Leaves three, let it be!" This distinguishes them from the American woodbine or Virginia creeper, which has five leaflets to a leaf: "Five fingers may handle five leaves." Both prefer open, moist woodlands—exactly where you like to picnic or camp.

Poison sumac is found only in the East, and only on the borders of acid bogs—in the same kind of soggy land where grow tamarack trees, skunk cabbage and the purple pitcher-plant. It is more vicious than either poison ivy or poison oak, but attacks fewer people. It looks very much like common sumac, but differs in having drooping clusters of pallid, waxy berries, and a pale gray bark. Moreover, common sumac grows mostly on uplands, never in bogs.

All three of these plants are strictly American products. The first person ever to take notice of poison ivy in print was Captain John Smith. His description of the symptoms is so conservative and accurate that it casts some doubt on his eligibility for membership in the Ananias Club, in which tradition has always voted him a charter membership. Noting that it differed little in appearance from English "yvie," the redoubtable captain went on to state that it "causeth rednesse, itchynge, and finally blysters," but that if let alone the ailment presently went away of itself. Captain John Smith must have had a good tough hide.

Or he may have been one of the fortunate half-immune

people. The three poison weeds affect different persons very differently. Some seem to be totally immune—though this immunity can never be depended on to last indefinitely. And immunity once lost is seldom recovered.

The poison of poison ivy and its kin-criminals is an oily substance related to carbolic acid. The leaves must be contacted to give you a "dose." Stories of ivy poison "caught" from just going near the plant most probably have some unknown or ignored element in them. Either the victim had previously rubbed against poison ivy somewhere else, without noticing it, or had handled some object that in turn had been in contact with poison ivy—garden tools, for example, or a picnic basket. It is even possible for an extremely susceptible person to be poisoned by shaking hands with an immune person who has been recklessly plucking poison-ivy leaves.

Fortunately, most poison ivy victims can get rid of their affliction in relatively short time, and it is even possible to prevent yourself from being poisoned at all. Something over 300 remedies have been proposed for ivy poisoning. Most of them of course are worthless, but there are several that really work. A very good remedy, not as well known as it deserves to be, is a five per cent. solution of potassium permanganate in water. You can mix this up yourself, or get your druggist to do it for you. Puncture all blisters, and swab up their watery contents with absorbent cotton or sterile gauze. Then thoroughly moisten all poisoned skin areas with the solution. It will turn the skin brown, but this can be cleaned up after a time with lemon juice.

A highly successful preventive treatment is a five per cent. solution of ferrous sulphate in a half-and-half mixture of water and alcohol, with a little glycerin added. Wash this solution on all exposed parts of the skin, before going into the woods. Do not rinse or dry the skin; let the solution dry in place. The iron in the compound unites with the poison and renders it insoluble and harmless. This "iron treatment" has been used by thousands of persons, and has given complete protection to all except a very few unlucky extreme-susceptibles.

FRANK THONE

ITEMS

RIVERS and streams of America are being polluted by a third of the nation's population and by reviving industries, despite a quarter century struggle by health and conservation experts to keep water supplies clean and safe. This warning is being carried to President Roosevelt from a conference of governors, senators and technical authorities held in Washington. Abel Wolman, Maryland Health Department chief engineer and water resources specialist, revealed the present extent of the threat to clean, drinkable water. Dr. Thomas Parran, U. S. Public Health Service Surgeon-General, spotted as regions of acute pollution: "Ohio River, the Niagara frontier, Hudson and Connecticut rivers and the upper reaches of the Potomac. Water poisoned by sewage and wastes from factories can be made drinkable by purification treatment, but there is a limit to the pollution that can be counteracted by engineering methods. The limit is now being exceeded at several points along the Ohio. The conference went on record urging President Roosevelt to sponsor the passage of a Congressional bill allowing the U. S. Public Health Service to tackle the problem of stream pollution.

THE *Journal* of the American Medical Association, official spokesman of the medical profession, says of the federal food and drug bill in the forthcoming issue: "The first bill introduced has been subjected to a sort of plastic surgery which has resulted in a specimen not even resembling the original model and utterly deficient in many particulars. Formulas under this bill are secret and filed with the Department of Agriculture. Violations must be carried from the department into the Federal Trade Commission. The procedure is so long and wearisome and the penalties so inadequate that the forces of quackdom may ravage the sick and ailing and retire with their booty long before the processes of investigation and prosecution catch up with them." The bill is so far from ideal that it had better be scrapped, the *Journal* states, and a new beginning made when a more favorable opportunity offers. Perhaps the best procedure would still be to amend and strengthen the original, thirty-year-old pure food and drug law by taking account of the need for control over advertising, the great development of the cosmetic industry, and the newer social viewpoint which demands adequate protection for the uninformed consumer.

NEED for evolution of a new specialty, that of medical sociology, was pointed out by Dr. R. R. Spencer, U. S. Public Health Service, at the Atlantic City meeting of the National Conference of Social Work. Physicians, social workers and public health nurses would meet in this field which Dr. Spencer termed a "borderland science." They would study the relation of social conditions to health and disease, and work out measures, both medical and social, for improving health. He compared this new specialty with such established ones as radiation-genetics and economic entomology. Dr. Spencer is chief of the newly organized office of public health education in the scientific research division of the U. S. Public Health Service.

BOTANIZING over a gap of a century and a half, on preserved plant specimens that have crossed the ocean twice, is to be the unique task of Paul C. Standley, of the Field Museum Herbarium. Approximately 7,000 plants, collected in Mexico while that country was still a Spanish colony, have lain untouched in the vaults of the Botanical Garden of Madrid, while wars and revolutions swept the earth above them. Through all Spain's turbulent modern history, no adequate examination of these rare specimens has been possible. Now, because Mr. Standley has made a special study of the botany of Mexico and the Middle Americas, the Spanish authorities have entrusted to him the task of identifying and describing the specimens. The main collection will eventually be returned to Madrid, but the Field Museum will be permitted to retain some of the plants.