SCIENCE NEWS

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MECHANICAL MODELS OF MOLECULES

VIBRATIONS of steel balls and spiral springs now give science exact information on the motions occurring in actual molecules far too small to be seen. Dr. C. F. Kettering, general director of General Motors Research Laboratories; Professor D. H. Andrews, now at the Johns Hopkins University, and L. W. Shutts, also of the General Motors Research Laboratories, have agreeably surprised physicists all over the world by constructing mechanical models in which the various kinds of atomic vibrations occurring in, for instance, a molecule of benzene can be visually observed. These models reproduce with exactness the light radiations or spectra from liquid benzene.

The models are constructed of steel balls connected by spiral springs. The balls are the same relative weights as the carbon, hydrogen or oxygen atoms they represent. The web of balls and springs is freely suspended and connected to a vibrating rod whose speed can be varied by an electric motor. At definite frequencies of vibration, which are recorded on a counter, the model takes up a characteristic motion.

Those rates at which the model resonates are found to agree remarkably with the frequencies observed in light scattered by the substance.

The investigators postulated that the forces connecting the atoms in a molecule are the same as if the atoms are connected by spiral springs. These forces were imagined to lie in the chemical bonds which elementary students of chemistry represent when they write chemical formulae.

A spring can either stretch or bend. Specific heat measurements previously made by Professor Andrews showed that probably the same is true of the chemical bond. Equally surprising was the further result that the elasticity or springiness of all bonds is the same no matter what atoms are joined by them.

The first model made was of benzene, a molecule consisting of six atoms of carbon and six of hydrogen, and was made rather diffidently. Definite numerical results were not expected. In constructing the model, the springs had to be strong enough so that the stretching and bending forces on the balls would be large in comparison with gravitational forces. Also the balls and springs had to be so related that the vibrations would be of a speed that could be observed by the flickering light of a stroboscope. The models were suspended by thin rubber bands, much weaker than the springs.

A stroboscope permits the observation of more rapid vibrations than can be seen with the naked eye if the frequency of the flicker is brought close to the frequency of the oscillations.

A chart of the rates of vibrations was made. It was immediately recognized that the arrangement of lines was practically identical with those in the so-called Raman spectrum of benzene, which is also due to vibrations within the molecule. A simple calculation then enabled the investigators to convert the model's rates of vibrations into Raman frequencies.

The Raman spectrum is obtained by observing through a prism spectroscope the light scattered by a liquid or solid from a beam of light. Mercury arc light containing only single wave-lengths was used. The original lines of the mercury spectrum are accompanied in the scattered radiation by subsidiary frequencies which are found, on examination, to be due to vibrations of parts within the molecule. These are also shown by the heat radiated by the substance. The 1930 Nobel prize winner in physics, Sir Chandrasekhar Venkataram Raman, of the University of Calcutta, discovered the effect that bears his name.

The benzene model vibrated in several ways. The two halves sometimes vibrated like a bird flapping its wings, or three atoms went up while the alternate three went down, or all six atoms went in and out from the center.

Models of toluene, carbon tetrachloride, chloroform, ethane, ethylene, acetylene, ethyl and methyl alcohol were also made and found to give good agreement with their Raman radiations.

By watching the motion of the parts of these models, the chemist gets a real moving picture of the way the atoms are behaving in a chemical compound and this enables him to understand many obscure points of chemical behavior.

PRESERVATION OF FOODS BY ULTRA-VIOLET RADIATION

NEW ways of preserving food, enhancing its bone-building vitamin content and retaining fresh flavor and odor through the use of invisible light have been discovered. The discovery and its development to the point of commercial application is due to Professor George Sperti and his associates of the basic science research laboratory of the University of Cincinnati.

Narrow bands in the "rainbow" of invisible light or ultra-violet radiation were found to produce these beneficial effects upon food products. By exposing milk and other foods to these special wave-lengths of ultra-violet radiation, it was found possible to produce the artificial antirachitic vitamin D without an offensive taste and smell in the food. In this respect the new discovery, which will be commercialized by the General Foods Corporation of New York City, is claimed to be an improvement on the previous methods of activating foods that have been in use commercially for several years.

Foods treated with ultra-violet light act in all ways as if they contain vitamin D, which prevents rickets. By using only a part of the total ultra-violet band of light waves, Professor Sperti, the director of the laboratory, has been able to produce much larger quantities of the vitamin. He avoided also the simultaneous destruction of the active substances by other constituents of the ultra-violet region, which occurs with the older method.

Filtered ultra-violet radiation promises to be effective in preserving food products as well as in increasing the vitamin D content. Professor Sperti and his associates found it possible to sterilize milk, orange juice and other food products by exposing them to narrow spectral limits of the invisible ultra-violet light.

Basic patent protection for the principle of selective irradiation has been claimed by the investigators. The method depends on the existence of a critical wave-length at which biological reactions begin and applies to all kinds of radiations. A given effect occurs with shorter wave-lengths, that contain larger quanta of energy, but longer wave-lengths than the critical one are inactive.

If yeast used in making bread is irradiated with a narrow frequency band of x-rays, unwanted mold cells that would spoil the bread after baking are killed, while the yeast cells are unharmed.

The success of these researches has led the General Foods Corporation to sponsor at Cincinnati the inauguration of a new General Development Laboratories whose business it will be to conduct further investigations along similar lines.

THE USE OF CORN SUGAR

ACCORDING to a decision announced by Secretary Arthur M. Hyde, pure, refined corn sugar may be used to sweeten prepared foods without so stating on the label. Corn sugar sold in package or bulk must be labeled as such.

However, dextrose, which is the sugar obtained from corn, is not as sweet as sucrose, the sugar obtained from sugar cane. Consequently more corn sugar will have to be used to achieve the same flavoring effect in foods. Increasing the sugar, whether in the form of dextrose or of sucrose, increases the calories. Herein lies the danger to the unsuspecting.

The general public may be affected, as well as the obese, by an increased use of corn sugar which is expected to result from the new ruling. "The American dietary will probably be still further excessive in carbohydrates unless the people continue to learn to eat more intelligently," the American Medical Association pointed out with reference to the extra amount of sugar that must be used for flavoring when corn sugar is substituted for cane sugar. The American diet has been severely criticized because it contains too much sugar in proportion to other foods. Sugar is an energy food, but lacks vitamins and other important food elements.

Aside from the potential danger of increasing the carbohydrate consumption of the country, the ruling, as it affects sugar alone, will not have any harmful effect on the health of the country. "It is generally admitted," according to the American Medical Association, "that the use of corn sugar in the place of cane sugar in packaged foods of all varieties does not raise, in any sense of the words, a public health problem." The ruling places an added responsibility on the Department of Agriculture to prevent any undermining of the Food and Drug Act. "The decision may make necessary, at least temporarily, a larger service for inspection and a more rigid control over labels and even over advertising."

LIBERIA SUFFERS UNDER HOST OF DISEASES

A HOST of tropical diseases and many non-tropical ones are rife in the Republic of Liberia. Among them are malaria, blackwater fever, leprosy, elephantiasis, yaws, syphilis, smallpox, chicken pox, sleeping sickness, pneumonia, yellow fever, tuberculosis, rheumatism, dysentery, beriberi and nutritional diseases. About the only ones missing are bubonic plague and relapsing fever.

Public health and sanitation are absolutely lacking. There is no public water supply. Even in the capital city, Monrovia, wells and cisterns are the only sources of water. There is also no sewage system, and the wells are dug in the extremely porous soil of the back yards where the outhouses are found. Three or four physicians and "one building called a hospital" represent the extent of medical facilities for the entire country of 43,000 square miles with a population of about 2,012,000.

In spite of extremely fertile soil and equable climate, the governing class of Americo-Liberians and all the visiting foreigners must get their fruits and vegetables out of cans. Such is the picture of the country painted by the Harvard African Expedition and by Dr. Howard F. Smith, of the U. S. Public Health Service.

While the country is bankrupt, lack of funds is not the only hindrance to sanitation and health work, Dr. Smith found. He was sent to Liberia shortly after the last American Minister to the country, Charles B. Francis, died there of yellow fever. Dr. Smith expected to assist the Liberian Government organize its sanitary and public health activities, particularly with reference to the eradication of yellow fever, in accordance with an agreement between the American and Liberian governments. He is returning now, since complete lack of cooperation from the Liberian Government made his mission a failure.

The more favored of the population—socially, economically, politically—take the attitude that God will take care of them and the devil will take care of the rest. Consequently they can not be made to take an interest in public health activities. They do not believe that they themselves will benefit from proper drainage, sewage and water systems, from screening houses and destroying mosquito-breeding places, and they do not care that these measures will benefit others. Besides lack of interest, Dr. Smith encountered actual opposition in his efforts to start sanitary and public health activities.

Liberia's diseases and her lack of public health work are not without importance to the rest of the world. The country has been called "one of the festering spots of West Africa." Liberia's immediate neighbors, Sierra Leone, Nigeria and the Gold Coast Colony, all have active departments of public health, and all are concerned over the situation in Liberia. These other countries have tried to stamp out yellow fever within their own borders. Yet they can never feel safe because

the disease is always present in Liberia, and may at any time be brought over the border.

Liberia does not report her health conditions to either the League of Nations or the Office International, and never has done so, although she is a member of the League and a signatory to the International Sanitary Convention of 1926.

Liberia has never recorded any communicable disease on any bill of health. These are required of each vessel that clears a foreign port for the United States. They are filled out by the American consul at the port and are supposed to give among other things the number of cases of each communicable disease occurring at or near the port for the past two weeks. This information is obtained from the government of the foreign country, and is part of our protection against the importation of disease. Liberia has failed to furnish this vital information.

CRIME NEWS IN THE PRESS

CONTRARY to popular belief, modern newspapers present news of crime much less extensively than they did a generation and a generation and a half ago.

The amount of crime material available for publication, measured by court records, has nearly tripled since 1890, and yet newspapers have decreased the percentage of their news space devoted to crime. Sensational sex crimes are not nearly as important to the city editor of the present decade as they were to his predecessor in 1905; and such stories were even more eagerly sought and published by editors of the gay 90's.

These are some of the facts learned by Dr. Frank Harris, of Elmira College. Dr. Harris based his conclusions on detailed examination and study of crime news published by three newspapers of Minneapolis during 1890, 1905 and 1921. Court records for the same years were examined so that proper allowance could be made for the increase of crime.

Even when crime increase is not allowed for, the percentage of space devoted to crime compared with the space given all other news shows a decrease. In 1890 slightly more than four per cent. of the news space was devoted to crime news, in 1905 nearly five and a half per cent. and in 1921 less than four per cent.

Because of the great labor involved in the study it was possible to work thoroughly in only one city. However, Dr. Harris believes that his results will apply generally throughout the country, as all newspapers of the United States conform largely to a standard pattern. He also thinks that the decrease in attention given crime news continues past 1921, the last year of the study, though not as rapidly as between 1905 and 1921.

When Dr. Harris took into consideration the increasing availability of crime news, determined by the number of arrests in the three courts of Minneapolis, the decrease in attention given crime by the papers is even more pronounced. In 1890 there were 15,422 arrests and 3,059 articles reporting arrests; in 1905 arrests numbered 20,714 and articles 2,624, and in 1921, 44,448 arrests and 2,737 articles.

ITEMS

THE volcanic outbreaks in northwestern Argentina, reported by refugees at San Antonio de los Cobres, seem to have occurred in a region previously known to be volcanic but quiescent. They may be taken as a pointed illustration of the adage of volcanologists, that a "quiet" or "extinct" volcano is never to be trusted. Data available show three volcanoes along the Argentina-Chile border region that have been in a more or less simmering state for many years. These are Llullaillaco, which was observed to be smoking in 1854; Lastarria, also known as Cerro de Azufre, which has been so "dead" that sulfur-mining was conducted in it, and Antofalla, which seems to have been smoking within recent years. All these mountains are very lofty, ranging up to elevations of about 20,000 feet.

MORE uses are being found for the metal, zinc, in automobiles, according to a report made by Robert M. Curts, engineer of the New Jersey Zinc Company, to the Society of Automotive Engineers meeting in Detroit. Rolled, cast and extruded alloys of zinc which show good mechanical properties and resistance to corrosion are steadily replacing more fashionable and costly metals in the manufacture of automobile parts, he declared. Hub or tank caps, and running-board molding can be made of rolled zinc plated with chromium. Die-cast alloys of zinc with copper, aluminum and other metals have been successfully used for such things as gears or windshields. Zinc plated or galvanized iron is coming back into favor for it has been found that its rival, cadmium plate, is actually less resistant to corrosion.

TULAREMIA, or rabbit fever, has been found for the first time in Canada, according to a report of the U. S. Public Health Service. The first case reported was in a miner living near Timmons, Ontario. The second was in a snowshoe rabbit near Vavenby, British Columbia. Because these localities are so widely separated and are both hundreds of miles north of the United States border, it seems likely that the rabbits and other rodents of Canada have been widely infected with tularemia for many years. Further indication of this was found in reports from Canadian observers.

A TROPICAL fungus whose reproductive bodies, or spores, are resistant to degrees of cold never encountered by Arctic plants has been studied by Anna F. Faull, of Harvard University. The material she used in her tests was found on a burnt stump in Cuba after a severe brush fire, and belongs to a species frequently found on burnt-over lands. To test its resistance to heat, Miss Faull subjected its spores to temperatures slightly higher than 50 degrees Centigrade, which is halfway to the boiling point. This had little effect, except that it delayed their sprouting a little. Then she tried the effects of low temperatures, down to the deadly cold of liquid air. But this also failed to discourage this heat-resistant fungus. Miss Faull concludes that the fungus is not especially a heat-lover, as had been supposed, but that it is equipped with high all-round resisting powers.