SCIENCE NEWS

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THE STRUCTURE OF MATTER IN THE SOLID STATE

CHANGE in color, or wavelength, of light when, for example, it falls on a diamond, and is scattered by it, is proving "a gateway to fundamental knowledge of the highest value," regarding the structure of matter in the solid state. So stated Sir Chandrasekhara Venkata Raman, leading Indian physicist, director of the Indian Institute of Science at Bangalore, Mysore, who was awarded the Franklin Medal of the Franklin Institute of Philadelphia on May 21.

Since he was unable because of war conditions to come from India, the medal was received on his behalf by Sir Gerald Campbell, British minister to the United States. In a paper sent by Sir Chandrasekhara, which was read at the meeting, a summary was given of some of his important researches.

"A transparent crystal traversed by a beam of light exhibits an opalescence due to diffusion of the light by the ultimate structure of the solid. The phenomenon is strikingly evident when a beam of sunlight traverses a block of transparent ice. It is often possible to find extensive portions in a clear block of ice which are quite free from inclusions, and the track of the sunbeam through such regions appears of a sky-blue color, the intensity of the opalescence being about thirty times greater than the intensity of a similar track in dust-free air, but only a fraction of its intensity in dust-free water. The finest specimens of transparent quartz exhibit a similar effect, the opalescence, however, being less intense than in ice."

Early in 1928, Sir Chandrasekhara continued, he found that when a crystal or a liquid or solid was illuminated by light of but a single wavelength, as from a mercury lamp, the light which was scattered included other wavelengths. These were revealed by the spectroscope. The difference in wavelength, or color, was found to be characteristic of the substance studied. This, of course, is quite different from the colors which one sees in a crystal such as a diamond, when white light shines on it. In that case, all the colors visible are contained in the original illumination.

"On the principles of the wave-theory of light," he stated, "an ideal homogeneous crystal can not scatter light." However, he proposed that a pulsation of the network of atoms which make up a crystal might cause such scattering if it took place in a certain relation to the light falling on it.

The wavelength shift in a diamond was studied as its temperature was raised. There was a change in amount of the shift, because the diamond expanded, and the light had a greater thickness to penetrate. However, there was no increase in the brightness of the altered color, as there would had it been due primarily to the effect of heat. Consequently, Sir Chandrasekhara concludes that the pulsations in the crystal which cause the scattering of light are caused by the light itself. From these researches, he stated, it is possible to obtain important information about the way matter is put together in the solid form.

AUTOMOBILES AND STATIC ELECTRICITY

PROFESSOR ROBIN BEACH, electrical engineer of the Polytechnic Institute of Brooklyn, has found by actual measurements in his own car, equipped as a traveling laboratory, that charges of static electricity amounting to 12,000 volts or more are formed on automobiles driving along a dry road.

Possible danger from this source, in starting a fire of gasoline vapor if a spark is discharged, is indicated by his finding that, even with a stop of twenty minutes, there was sometimes no apparent decrease, indicating that many hours might be required before the charge was completely dissipated. He also found that a "drag" chain, like that which dangles from the rear of a gasoline truck and supposedly prevents a dangerous charge from accumulating, had no noticeable effect. In a report to *Electrical Engineering* he states that "since the pavement was not grounded but rather comprised a most excellent insulator, the drag chains, obviously, could not be expected to discharge the car."

The charge comes, apparently, from the transfer of electrons in two materials that are in "contact," but really separated by a hundred millionth of an inch or less. This occurs between the tires and the road surface, as well as between one's shoes and a heavy carpet, when one's body can accumulate a charge sufficient to make a sizable spark when a finger is brought near a grounded metal object. In the latter instance, he says, a charge of as much as 10,000 volts may be accumulated. Voltages up to 75,000 have been recorded, he says, in the case of gasoline and other liquids passing through pipelines, making a potential source of great danger.

The friction of rubbing does not produce the charge, Professor Beach states, but merely establishes more extensive contact between the two materials.—JAMES STOKLEY.

CORROSION

How electric currents can counteract the process by which submerged pipes act as parts of an electric battery and are corroded was described by N. A. Miller, of Universal Oil Products, Inc., at the recent meeting at Tulsa, Okla., of the American Petroleum Institute.

Mr. Miller declared that all corrosion of metals in contact with water or moist earth takes place by just one means, that of electrolytic action. In this process, the metal pipe or other structure forms one pole of a battery. The other pole may be formed by another metal, or spots of impurity or mill scale on the first. Current flows from the anode to the cathode, and the former is gradually consumed.

To counteract this process, the current must be made to flow the other way. Sometimes pieces of other metal are

placed near by, which will become anodes more easily than the metal to be protected. Then, the latter becomes the cathode, and is not corroded. But still better is the application of a direct electric current to flow in the proper direction.

Mr. Miller described installations of such a system by oil refineries, especially in pipes of open tank condensers. Though the operating records are meager, he stated, "what information we do have indicates positive beneficial results." He urged further investigation of the subject, and pointed out that records available concern locations where corrosion was initially very bad. "Additional data are necessary to establish the economics involved in the border-line cases," he concluded.

Bacteria and other living organisms are responsible for some kinds of corrosion, which may affect non-metallic as well as metallic objects, according to W. J. O'Connell, Jr., of the technical division of Wallace and Tiernan Products, Inc. One kind, for example, affects concrete. The bacteria produce hydrogen sulfide gas, which reacts to produce sulfurous or sulfuric acid, either of which will attack the concrete. He pointed out that methods for controlling these organisms are well known, but that attention must be paid to physical, chemical, electrochemical, biochemical and biophysical aspects of the problem in applying them.

HEALTH OF LOW-INCOME FARM FAMILIES

ONLY five out of a thousand heads of low-income farm families are really in good health—free from physical defects, was pointed out at a meeting of the Population Association of America, at Princeton, N. J., in a report from Dr. R. C. Williams, chief medical officer of the Farm Security Administration.

The accumulation of defects and disabilities affecting these people, termed by Dr. Williams "reservoirs of America's defensive forces" because they contribute so much to the numbers of America's young manhood, was brought to light by a health survey conducted last year by the administration.

"So far," Dr. Williams said, "we have found no dramatic results which would show any great number of them dragging along with one foot in the grave. "But what we are finding is that they have an accumulation of defects and chronic conditions which are not serious enough to keep them from carrying on with their activities, but which cause progressive debilitation and, in some cases, partial or total disability." Of 1,005 heads of white families and their wives, only five were free from defects. Of 111 colored husbands and wives, not a single one was in perfect health. The average person is handicapped by between three and four physical defects, and even children have two or three apiece. Vitamin deficiencies are extremely prevalent.

In Maine, the eye specialist on the survey staff examined about 350 persons with slit lamp microscopy for evidence of past or present riboflavin (one of the B vitamins) deficiency. Every individual examined showed evidence of an old, existing, or healing deficiency. Over 80 per cent. showed both old and existing or new signs of deficiency. Blood plasma studies of 276 individuals, also in Maine, showed plasma ascorbic acid values below 0.4 milligrams per cent. in 38 per cent. of those examined. Such low values are usually found with vitamin C undernutrition which, when fully developed, is scurvy. Decayed teeth were found in 65 per cent. of white persons and 73 per cent. of colored. It is defective teeth that accounts for the largest percentage of draft rejections this year. These poor farm people never seem to have teeth filled. Their teeth get holes in them, remain untreated, and finally are pulled out.

Of 16,000 cases of serious illnesses among the families surveyed, more than half had received no medical care whatever. One out of three births had not been attended by a physician. Yet the total amount of unpaid doctors' bills was close to half a million dollars.

Among the white wives under 45 years old, 41 per cent. had been lacerated in childbirth; the figure was 66 per cent. for those over 45. Incidence of syphilis among the white people surveyed was low, only 0.6 per cent. It was ten times as high among the colored families. Hookworm is a serious problem, but varies in prevalence in different localities from 15 per cent. to 38 per cent. Among 4,333 white persons of all ages in eight states, 48 per cent. had defective tonsils.

Families are large among these farm people. More than 43 per cent. of the mothers studied had had five or more children and one wife out of every ten had given birth to ten or more children. One mother had nineteen children.—MARJORIE VAN DE WATER.

ITEMS

CHROMITE, source of chromium needed in high-grade steels and for plating metals, may be mined on the Kenai peninsula in Alaska, to replace imports from Turkey if the latter are cut off by Nazi conquest. Presence of the chromite deposits in the northern territory has been known for thirty years, and one of the ore bodies was worked in a small way during the first World War, but it was not until the summer of 1940 that a systematic survey of all deposits in sight was made by the U. S. Geological Survey. A preliminary report on the Kenai chromite bodies has been made by the Department of the Interior. Estimates of the quantities in sight total 150,000 tons. Of this about 70,000 tons is of shipping grade. Last year's chromite requirements in this country were 660,000 tons, of which less than one per cent. was produced within the continental United States. Turkey's share of our imports was 70,000 tons.

QUININE, like rubber, is coming back home to the Western Hemisphere. Paul C. Standley, herbarium curator at the Field Museum of Natural History in Chicago, recently returned from an expedition to Guatemala, reports that large plantations of cinchona trees, source of quinine, have been set out, financed by American capital. They will be able to produce a large supply of the best grade of quinine. Tea, native to the Orient, has become a naturalized Central American citizen. The only commercial tea plantations in the New World are in Guatemala, and they are capable of great expansion if need arises.