SCIENCE NEWS

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MEETING OF SOVIET CHEMISTS

Two thousand chemists attended the sixth Mendeléeff Congress which opened at Kharkov, on October 25, to discuss chemical problems arising out of the second five-year-plan. The Mendeléeff Congress is held every three or four years in honor of the Russian chemist who devised the periodic table of elements.

Leading European investigators who were in attendance included: Dr. R. E. Liezegang, of Frankfurt, an authority on colloids; Dr. Erich Pitch, German specialist in catalysis; Professor Kurt Hess and Dr. C. Neuberg, biochemists, of Berlin; Dr. A. Windhaus, director of the general chemistry laboratory in the University of Göttingen; Professor Jean Perrin, of Paris, and others.

During the meetings, which continued until November 2, Professor Hess read a paper on the latest achievements in the field of high molecular compounds, particularly the living cell. Dr. Pitch reported on the structure of catalysing agents.

About 500 reports were made to the congress. The main reports by Soviet investigators were "Socialist Construction and Chemistry," by Professor Zatonsky; "The Second Five-Year-Plan and Planning of Chemical Scientific Research Work," by Dr. Pyatakov; "New Principles of Research and Utilization of Mineral Raw Material," by A. E. Fersman; "Theory of Adsorption," by A. N. Frumkin; "Modern Theory of Chemical Kinetics," by N. N. Semenov; "Chemistry of Metallurgy," by E. I. Orlov, and "Chemistry in U. S. S. R. and the Harvest Problem," by K. N. Sokolovsky.

Other contributions included an account of the application of wave mechanics to chemistry by Tamm and J. Frenkel. G. M. Krjijanowsky spoke on the general electro-chemical problems connected with the chemical and electrical industry; J. K. Sirkin on the electrostatic theory of valence; Y. A. Kazurnovsky on the structure of complex compounds; B. Roginsky on theories of catalysis, and S. E. Stchepkin on the advances made by Soviet industry for the construction of chemical equipment.

An exhibition portraying the progress in chemistry in the U. S. S. R. by means of specimens of finished products and raw materials, models and diagrams, was open during the period of the congress. Excursions took place to Dneprostroy, the new hydroelectric station, to the Kharkov tractor plant and to various chemical works in the Ukraine.

The organizing committee of the congress included Professor Zatonsky, who has taken an active part in government work in the Ukraine; Professors A. Bach and A. N. Frumkin, of the Karpov Institute; Professor Buroff, vice-president, and A. Segal, member of the organization committee; N. I. Bucharin, head of the department of heavy industry; H. A. Semashko, former commissar for public health, and many others.

POWER OF COSMIC RAYS AT HIGH ALTITUDES

FIVE miles up in the air cosmic rays are many times more plentiful than they are on the surface of the earth, but they are also much less powerful and less effective than those at ground level.

Thus may be summarized research into the character of the puzzling cosmic radiation conducted by Dr. L. M. Mott-Smith, of the Rice Institute, Texas, and the U. S. Air Corps at Wright Field, at Dayton, Ohio. Data were collected by Captain A. W. Stevens, prominent because of his achievements in long-range photography; Captain R. C. Moffatt and Lieutenants J. F. Phillips and C. D. McAllister. They used an electroscope designed especially for airplane observations by Dr. Mott-Smith and Dr. L. G. Howell.

"We find that the intensity of cosmic rays at 25,000 feet is about 21 times that at sea-level and is still increasing rapidly," Dr. Mott-Smith told *Science Service*. "Another interesting thing is that at 25,000 feet as small an amount as one inch of lead reduces the intensity by forty per cent., a surprisingly large amount."

An inch thickness of lead is an ineffective barrier in the path of cosmic rays on the surface of the earth. Though this much lead will stop practically all x-rays and other forms of radiation, a quantity sufficient to block cosmic rays must be measured in feet.

In this study measurements of cosmic rays were made at elevations of 5,000, 10,000, 15,000, 20,000 and 25,000 feet, each measurement consisting of an average of ten individual readings.

THE AGE OF THE SUN

THE age of the sun can not be much more than 7.55 million million years, according to a statement made by Dr. Ludwik Silberstein, research physicist of the Eastman Laboratories, in *Scientia*.

Dr. Silberstein bases his conclusions on a mathematical study of astronomical researches made in part by other investigators. The luminosity of a star is proportionate to the cube of its mass. That is to say, a star twice as big as our sun gives off not merely twice as much radiation, but eight times as much. The older a star grows, the smaller it gets, because it is all the time converting its matter into energy and radiating the energy away. But the smaller it gets, the more slowly it shines itself away, by that same rule of the cube. When the sun shall at last have dwindled to one half its present mass, it will be radiating only one eighth as much energy.

The mass radiated away by the sun at present is 4,200,000 tons per second; the sun's mass in tons is expressed by a 2 followed by 27 naughts, Dr. Silberstein says. The application of a suitable mathematical formula to these two figures gives 7.55 million million years as the sun's age.

"If we know the present mass of a star," Dr. Silberstein continues, "the equation enables us to predict what

its mass will be at any future time and, reaching back into the past, to tell how much time has elapsed since the star had a mass so or so many times greater than now. Thus, for example, if we ask what time has elapsed since our sun had twice its present mass (if such ever was the case), the answer is 5.66 million million years. Similarly, for the time since the sun had 4 times and 10 times its present mass (again if this was ever the case) we find 7.08 and 7.47 million million years, respectively.

We see, incidentally, that these figures differ less and less from each other and approach very rapidly indeed the original time-coefficient, *viz.*, 7.55 million million years, and the remarkable thing is that even if we asked about a hundredfold, a thousandfold mass, and so on, we should never exceed that length of time (T) which thus is the upper limit of the sun's age, if we are yet to keep to our concrete example. In plain English, the sun as such can not be older than 7.55 million million years. If we asked what mass the sun had before that time, say 8 billion years ago, the equation would give us an absurd answer, an imaginary mass, as a mathematician would put it.''

TERTIARY BUTYL ALCOHOL

FOLLOWING the post-war practice of cracking heavy petroleum to yield gasoline, certain leading oil refiners discovered that several kinds of alcohol could be made economically from the more volatile parts of the cracked oil. These alcohols have proved to be of great value, especially in the lacquer industry.

Unfortunately the oil refiner has to take what Nature gives him when he demolishes the large molecules of cheap, heavy petroleum. An appreciable fraction of one peculiar alcohol, the so-called tertiary butyl variety, turns up regularly by the thousands of gallons, and the present customers do not welcome it. It has eccentric chemical habits which do not fit the solvent industry.

Tertiary butyl alcohol is normally regarded by chemists as an academic curiosity. Its full industrial virtues have undoubtedly not been tested. Like grain alcohol, but unlike most of the newer alcohols, it mixes freely with water. It is readily frozen, more easily than water itself. It evaporates almost as freely as grain alcohol. The partial likeness of tertiary butyl alcohol to the ordinary alcohol suggests that it might be substituted for the latter in some of the host of industries using the older product. Such substitution would be a godsend to manufacturers who at present regard grain alcohol as indispensable, but are seriously hampered by the government prohibition restrictions.

For more than half a century chemists have known the structure of the molecule of the tertiary alcohol to be like a compact bunch of grapes rather than the more slender chains characteristic of its alcoholic brethren. The bunch-like molecular structure has suggested value as an anti-knock motor fuel. It is known that the more compact molecules in petroleum treat high-powered motors more kindly than do the snake-like type of gasoline particles. Tertiary butyl alcohol seems to follow the rule.

THE BREATHING OF INSECTS

BREATH in an insect is not pumped in and out at the same opening, but circulates through the body, going in at one point and coming out at another. This is indicated by an ingenious experiment performed at the Hebrew University of Jerusalem by Dr. Gottfried Fraenkel, who is now at the Zoological Institute in Frankfurt-am-Main, Germany.

The mechanism of insect respiration has always been a more or less disputed matter. It has long been well known that insects do not breathe through a single opening, as man and all air-breathing vertebrates do. An insect has a row of holes along each side of its body, and from these openings many fine-walled branching tubes run into all parts of the interior, bearing oxygen directly to the tissues requiring it. Insects do not need and do not have anything resembling the oxygen-carrying blood corpuscles found in vertebrates.

The pumping or breathing motions of an insect's body, especially of its abdomen, have long been a matter of common observation. The question was whether this pumping drew air in and then pushed it out again at the same hole, or whether the air passed along to an exit elsewhere.

Earlier observers noticed that when certain insects swelled their abdomens certain of the breathing-holes were open and others shut. Then when the insects ''breathed out,'' contracting their abdomens, the previously closed holes opened and the opened ones shut. This was taken to indicate a circulation of air, but did not prove it.

Dr. Fraenkel got more conclusive evidence in a most ingenious way. He slipped a locust's abdomen through a hole in a bit of thin rubber sheeting, and made the joint air-tight with collodion. Then he put the forepart of the insect's body into a glass cylinder, and the abdomen into a second cylinder; the rubber sheeting dividing the two like a diaphragm. Each glass cylinder was attached to a fine capillary tube at its outer end, and in this tube was a drop of liquid acting as a pointer. The movement of this drop of water indicated that under normal conditions the insect pulled air in through the openings of its thorax and expelled it through the openings of its abdomen.

Another disputed point which Dr. Fraenkel settled was the question whether insects keep up the pumping motions of their abdomens when they are flying. Obviously it is quite impossible to watch for this on an insect actually in the air. But Dr. Fraenkel found a way around this difficulty.

He noticed that many insects begin to fly instantly if their feet lose contact with a solid object. So he secured a wasp in such a way that it could buzz with its wings, but could not fly away. To the tip of the insect's abdomen he fastened a light pointer, to indicate whether movements took place. Then he lifted away the solid object against which the wasp's feet had been allowed to rest. Instantly the wings went to work, and as they did so the wasp's abdomen began to pump many times

as rapidly as it did when the insect was at rest. As soon as the foot-contact was restored the wasp ceased to "fly," and the pumping rate simultaneously fell off. The same experiment with locusts yielded similar results.

AFRICAN MARSUPIALS

MARSUPIALS, the remains of which have been discovered in Africa for the first time, seem to have originated in America. They were not in Australia, their present headquarters, until a geologic period considerably more recent than the dates of their oldest known American fossils.

The single find in Africa is of course not sufficient to serve as foundation for any reasonable inference as to the origin of a marsupial population of that continent. However, since European fossils similar to extinct American species have been found in the past, it might not be out of the way to suppose that this African form got in by way of Europe from an original homeland in America, while other marsupials made their way *via* Asia to Australia, over a land bridge that lay where the East Indian archipelago now is. This hypothesis would do away with the necessity for calling up again the often-laid ghost of the imaginary continent of "Lemuria."

The numerous opossum-like marsupials now found in South America, as well as their fossil relatives in South American rocks, represent a branch of the family that migrated southwards rather than eastwards. There is some evidence for a possible land-connection between South America and Australia, in certain Australoid fossils in South America; but this point is not out of the debating stage as yet. Marsupials with two incisor teeth to the jaw, like the recently found African specimen, were found in both South America and Australia.

North America's claim to the title of the first marsupial's homeland is based partly on the oldest known marsupial skull, an opossum-like piece of anatomy, found associated with the skull of a dinosaur in Montana not long before the war.

ITEMS

EVIDENCE that lack of vitamin A in the diet may be the cause of kidney stones has been reported by Drs. C. A. Elvehjem and V. F. Neu, of the University of Wisconsin. These investigators found that in birds the kidneys undergo definite, harmful changes when the birds are deprived of vitamin A. Other investigators, Drs. T. B. Osborn and Lafayette B. Mendel in this country, and Dr. Robert McCarrison in England, observed a similar relation between kidney stones and lack of vitamin A in laboratory animals. Recalling that kidney stones are particularly prevalent among peoples of the Far East, Dr. McCarrison fed animals on diets made up of foods common in India. More than one fifth of the animals developed kidney stones. When vitamin A was added to their East Indian diet, the animals did not have them.

IF the sun is a chemical factory in which the light element hydrogen is being turned into other and heavier elements by tight packing together of atoms, then its life time may be only a hundredth of the age now estimated by most astronomers. This new and shorter estimate of the possible age of the sun is put forth in the annual report of the Smithsonian Institution by Theodore Dunham, Jr., of the Mount Wilson Observatory. The current estimate of the sun's age is on the order of a million times a million years. It is based on the assumption that the sun shines because matter is being burst asunder into pure energy. The opposite assumption, of matter in a light form being turned into matter in a denser form, would still call for some conversion of matter into energy, but not nearly so much.

MANKIND is growing wheat much faster than it is eating it, so that much of the present distress in agriculture is due to an evil long familiar to manufacturing—simple overproduction. This was the thesis of an address by G. V. Jacks, of the staff of the Rothamsted Experimental Station, delivered before the British Association. During the last twenty years the world's wheat area has been increased by over 20 per cent., and production by over 25 per cent.; the increase in population over the same period has probably not been more than 14 per cent. The causes of this overproduction have been very complicated, and are hard to analyze; but economic, scientific and political factors have all played their parts.

THE U. S. Department of Agriculture has issued two new booklets with colored pictures of sick vegetables. These are intended for the guidance of market inspectors, dealers and all persons concerned with the handling of potatoes, tomatoes, peppers and eggplants. They show and describe the typical symptoms of the fungous and bacterial spoilages that attack these vegetables, as well as insect and other animal injuries and some of the "physiological" diseases. The authors are Dr. George K. K. Link, professor of plant pathology at the University of Chicago, and Dr. Glen B. Ramsey, senior pathologist of the Office of Horticultural Crops and Diseases, with headquarters at the university.

POSITIVE rays or canal rays, which are streams of atomic particles resembling cathode rays except that they are heavier and carry a positive instead of a negative electric charge, are being speeded up far above their normal velocities in a special apparatus built by Professor Christian Gerthsen, of the University of Tübingen, who expects to use them in atom-smashing experiments. The apparatus consists of a vacuum tube with the usual electric terminals fused into it. Through the cathode or negative terminal is a narrow opening, and when the current is turned on the positive rays from the anode pass through this. Behind the pierced cathode are accessory pierced terminals, separated by chambers filled with hydrogen at extremely low pressures. Each of the charged terminals gives the positive ray an additional electrical push as it passes through, until finally its velocity has been stepped up to the desired point. Professor Gerthsen has reported his preliminary work to the German weekly, *Die Naturwissenschaften*, and promises full details in a short time.