CHEMISTRY

Tires from Trees

Waste from spruce wood may be the material from which tomorrow's synthetic rubber will be made. This rubber may be superior to the synthetic rubber now in use.

➤ RAW material for tomorrow's synthetic rubber can be obtained from waste from the manufacture of paper from spruce wood, the American Chemical Society was told in Chicago.

This new rubber-making chemical is called PADMS, which is short for para alpha dimethyl styrene. It can replace the usual styrene that combines with butadiene to make GR-S synthetic rubber, the sort now in largest production. Dr. K. A. Kobe and Dr. R. T. Romans of the University of Texas made the report to the chemists.

Now styrene is in very short supply because of the expanded synthetic rubber program and because it is widely used in new synthetic chemical processes. It is made from benzene, obtained from oil or natural gas, and this is the mother material of so many other essential chemical products.

From the by-product of sulfite paper pulp, which is not only waste but a nuisance, chemists can obtain para-cymene which is then converted into PADMS by a process known as catalytic dehydrogenation.

The synthetic rubber made with the kind of styrene from paper manufacture may even produce better synthetic rubber than the styrene now used. A few experimental batches of synthetic rubber were made with PADMS produced from terpenes by the turpentine or naval stores industry. In the few tires tested, there was a hint that the rubber might be superior to the kind now manufactured, but much larger pilot plant manufacture and extensive road tests of the tires made will be necessary before the scientists can be sure. There is confidence that the new rubber will be just as good as the present synthetic sort.

The paper pulp industry is expected to be willing to install the necessary recovery equipment for the cymene by-product if it would be utilized in large amount by the synthetic rubber industry. And the synthetic rubber plants would be reluctant to convert to the paper pulp raw material unless large supplies were assured.

Synthetic rubber production of the GR-S variety is now above the 400,000-ton-per-year mark due to the war situation and it is expected to increase in coming months.

Science News Letter, September 9, 1950

MATHEMATICS

From Now On: Math

Mathematics will continue to be vital in the sciences while new application of it in industrial production is expected.

By WATSON DAVIS

Twenty-fourth in a series of glances forward into science.

➤ MATHEMATICS is called both the queen of the sciences and the handmaiden of technology. Repeatedly in the long upward march of scientific progress, mathematical formulations and theories have led the way to great physical and biological developments.

The atomic bomb—both the A and H varieties—were first built in the formulas of the mathematical physicists. From the standpoint of engineering and technology, mathematics in its various ramifications is a very necessary tool, often creative of new ideas and new applications.

Mathematics as a science is still young and growing. It is by no means static. In fact, several hundred periodicals are published throughout the world, devoted in whole or in part to mathematical research.

The scientists who work with paper and pencil have new and challenging problems and applications.

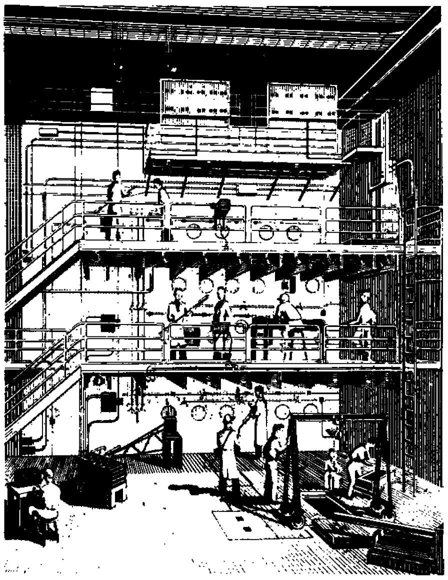
One of the plagues in mathematics, as in ordinary life, is in the fact that many problems do not seem to have a solution; that is, they are indeterminant. It used to be thought that everything could be resolved in some way or other if one were only ingenious enough, but it is now known that this is not true, because problems have been found which can be shown to be undecidable.

One thing that the mathematicians have been doing is to tackle analysis which is concerned with infinite processes, and turn it into algebra, which is concerned with finite processes. The new methods drop the infinite out by treating some of these problems in an algebraic way. The algebraic approach provides simpler methods of solution for many practical problems ranging from the design of electrical circuits to gun sights.

Probability, which is basic not alone to gambling but to all human activity, is being put upon a firm mathematical basis and not left to plausible conjectures and paradoxes.

In the control of quality, so important to manufacturing production, mathematics has made recent and important contributions. Statistics are being used to tell manufacturers how often to pick a sample in connection with routine machine production.

For example, if a screw part is being made by an automatic machine it is wasteful to test each part produced to see whether it meets specifications. The trick is to make a test at infrequent intervals while the output is running true to specifications, but to increase the frequency of tests as soon as any divergence from specifications is noted. In this way it is quickly determined whether the divergence is a random fluctuation or whether the machine is really getting out of adjustment.



SCIENTISTS AT WORK—Artist's conception of how scientific experiments will be conducted on the west face of the Brookhaven reactor. Substances are introduced through the round ports or openings in the concrete shield for bombardment by neutrons inside the reactor. The bombardment makes the atoms of most elements radioactive. Beams of neutrons may also be let out of the reactor for studies of neutrons themselves, or for irradiation of various substances including plant and animal cells.

Mathematics tells how frequently tests should be made so as, on the one hand, to avoid unnecessary testing when things are running smoothly, while on the other hand, to avoid making many defective parts by quickly sensing when things start to go wrong.

A real revolution in computing has been started by the introduction of automatic, high speed, computing devices, the so-called mechanical or electronic brains. This is opening new realms of mathematics. Not only will such computers speed up computations which are now done by slower, more tedious, methods, but they will make it possible to carry out computations which are too long to undertake by previous methods. The way in which mathematicians are trained in the future will be changed by the availability of these large computers.

The matter of mathematical tables may be vastly changed, because these machines may find it simpler and quicker to compute a particular value when needed rather than to look it up in a table. If the value can be computed in less time and at less cost whenever it is needed, the machine will obviate the necessity of elaborate and costly table of values seldom required.

For the future, there may be expected:

A. Advances in pure mathematics either in filling gaps in our present knowledge or in the exploration of new fields.

B. Mathematicians will continue to explore the factors and relationships within the hearts of atoms, the living cell, the causes of diseases and the technicalities of engineering and production, with the likelihood of penetrating some of these mysteries.

C. While a more intensive development of mathematical research in the most advanced fields will take place, a new development in the application of mathematics to problems of production in industry is expected.

D. Scientists in almost every field will need to have a basic knowledge of mathematics and its power as an aid to scientific research.

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ASTRONOMY

Eclipse Thought Bad Omen

The path of the eclipse, beginning and ending in the western hemisphere, will be in the eastern hemisphere most of the time.

➤ MOST of the people in Korea, both North and South Koreans, consider the partial eclipse of the sun that will be visible there next Tuesday, Sept. 12, a bad omen, a thing of evil.

GI's busy slugging it out with the Communist armies will have little time to watch the moon blot out part of the sun's bright disk.

Both the total and partial phases of the eclipse can be seen only from the eastern hemisphere most of the time, although the path of totality begins and ends in the western hemisphere.

The partial eclipse will be visible over most of Siberia, northern China, Korea, Japan, Alaska, the Hawaiian islands and wide reaches of the Pacific.

The path of the total eclipse, that is where the sun will be completely blacked out by the moon, is nearly north-south for most of the way. It sweeps down on mainly uninhabited areas, starting near the north pole and going down to the central north Pacific, ending at 35 degrees latitude, about on a line with San Francisco.

Attu and Agattu islands, at the tip of the Aleutian chain, lie in the path of totality. Ten government scientists have set up a radio astronomy laboratory on Attu for viewing the eclipse. Using radar antenna instead of optical instruments, they will view the sun's eclipse. At their position, astronomers calculate that totality will last one minute and 13 seconds.

This is only the second eclipse that has been studied with war-developed radar-like instruments, the other one being on May 20, 1947.

Just in case the weather is clear, however, these radio-wave specialists have taken along a 10-inch telescope with which they hope to be able to view the bright halo of the corona around a darkened sun.

Even if the sun is not visible to the naked eye, the measurements that the scientific world is awaiting can be made. For the sun gives off radiation that we can not see. Great streams of electrons, shot off from the sun, produce auroras when they strike the earth's atmospheric shell, play havoc with radio communications and appear to have an effect on the weather.

To learn more about the physics of the sun, the government scientists will train radio radiation-detecting instruments on it, using the moon as a knife edge to cut off the radiation. They will make their measurements at four different radio wavelengths.

As the moon slices in front of the sun, it will cut down on these different radiations just the way that it does on the visible ones. By accurately timing the disappearance of each of these wavelengths the physicists will be able to learn the true size of the sun, not just the size of the part that is visible.

Scientists hope also to be able to get some idea of the contribution of sunspots, great whirling turbulences seen on the sun's surface, to the total radiation of the sun. When sunspots appear on the sun, hours later radio communications on earth will be affected. There also seems to be an increase in the intensity of the bombardment of the earth by cosmic rays after sunspots appear on the sun. Further verification of the recently proved direct travel of hydrogen atoms from the sun to the earth (See story below) is expected from their observations.

Also checks will be made of the astronomical constants, such as the positions, motions and distances of the moon and sun.

Scientists will have to wait until Feb. 25, 1952, for the next total solar eclipse, then over two years for the next one, on June 30, 1954. That one starts in Nebraska just as the sun is rising and passes over Iowa, Minnesota, Wisconsin, Michigan, Ontario, Quebec, and Labrador on this continent.

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ASTRONOMY

Sun Blasts of Hydrogen Cause Aurora Display

See Front Cover

➤ THE earth has been bombarded with hydrogen—from outside the earth. No hydrogen bomb scare this, although the atomic projectiles reported by the University of Chicago do come from the sun which is past master of changing matter into energy with which to continue to shine. A great auroral display recently caused the skies to blaze with northern lights.

The spectacular northern lights of Aug. 19, photographed by astronomers at the University of Chicago's Yerkes Observatory, are shown on this week's cover of SCIENCE NEWS LETTER. The picture was taken with a wide-angled camera which covers a field of 140 degrees. The dome of the observatory and other buildings can be seen as silhouettes at the lower part of the picture. The three shadows emerging from the center are supports for the camera's plateholder.

This display allowed Yerkes Observatory astronomer, A. B. Meinel, to determine that the cause was hydrogen gas given off from sunspots. Traveling 1800 miles per second, the hydrogen struck the earth's atmosphere and made it give off light. Scientists have suspected this, but Mr. Meinel proved it by displacement of hydrogen lines in the spectrum of the borealis.

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