ENGINEERING

Liquid Fuels from Coal

We can be made self-sufficient for centuries by converting domestic coal, of which there is an ample supply, to oil.

See Front Cover

➤ LIQUID FUELS from coal, for automobiles, airplanes, powerplants and heating, can meet American needs for centuries, the nation was assured by Dr. W. C. Schroeder, chief of the Office of Synthetic Liquid Fuels of the U. S. Bureau of Mines. They will be made from domestic coal, of which the United States has ample supply, and will make the country self-sufficient in this respect whatever the future holds.

Dr. Schroeder discussed synthetic liquid fuel production in St. Louis as a guest of Watson Davis, director of Science Service, Washington, D. C., on Adventures in Science, heard over the Columbia network. Dr. Schroeder is en route to Louisiana, Mo., to the dedication of the new government Coal-to-Oil Demonstration plants. The train on which he and party will travel the 90 miles between St. Louis and Louisiana will have a diesel engine powered with synthetic oil produced at the new plant. This makes railroad history. Diesel locomotives are plentiful, but this is the first to operate on synthetic oil.

The new coal-to-oil plants at Louisiana can produce a full range of liquid products from coal, he said. First of their kind in this country, they can make aviation gasoline, motor gasoline, diesel oil, heating oil and fuel oil—all from coal. These products can be used in present-day motor cars, airplanes, tractors, oil burners, and all other such equipment without change or modification of the equipment itself. In addition, these plants will produce phenol, alcohol, and other valuable byproducts.

Two plants to produce liquid fuels from coal are to be used at Louisiana. They will demonstrate for private industry the respective merits of two basic processes for converting American coal to oil. These are the so-called hydrogenation process and the gas synthesis process.

These two processes are complementary rather than competitive, he stated, and each is best adapted to produce different products. For example, the hydrogenation process excels in the production of high-octane aviation gasoline and heavy fuel oils, whereas the gas synthesis process is the better of the two if motor gasoline is desired. One of these demonstration plants is now in use; the other will be before the end of the year.

The hydrogenation demonstration plant is shown on this week's cover of SCIENCE NEWS LETTER, with stalls of heavy reinforced concrete enclosing on three sides the giant chrome steel converter vessels in which coal is transformed into oil. These compartments are for the protection of operators in the event of fire or explosion.

Getting demonstration plants in operation is only the beginning of the job, he continued. A vast fund of information now must be collected from plant operations and from the laboratories of the oil and coal industries for the sound engineering of the very much larger commercial plants.

Then, before we can have synthetic oil and gasoline for furnaces and cars, these commercial plants must be built. Legislation has been introduced in Congress to encourage private industry to build the initial commercial-scale plants. After the construction of these initial plants, we can depend upon our great petroleum, coal and engineering industries to develop the new enterprise without using taxpayers' dollars, Dr. Schroeder concluded.

Science News Letter, May 7, 1949

PHYSICS

Soft X-Rays from the Sun

➤ DISCOVERY of X-rays in the upper reaches of the atmosphere probed by high-flying V-2 rockets was reported to the American Physical Society in Washington by a team of scientists from the Naval Research Laboratory.

Believed to come from the sun, these soft X-rays, actually gentler than those used by a dentist, are responsible for the ionosphere or electrified air layers in the atmosphere that reflect the radio waves and enable them to travel long distances.

Extremely short wavelength ultraviolet radiation was also detected by the rocket flights of last Nov. 18 and Feb. 17 from White Sands, N. Mex. These radiations, shorter than 1300 Angstrom units, are stopped by ordinary air and have been observed heretofore on earth only when they were generated in a vacuum.

Theories have hitherto credited the sun with giving forth radiations like those now observed to cause the radio-reflecting layers but they have never been discovered before.

HIGHEST LABORATORY?—To study the cosmic rays which bombard the earth from outer space, University of Chicago scientists parachuted equipment to a saddle of Mount McKinley in Alaska and climbed up to their new base, 18,000 feet above sea level. The Chicago physicists, Albert B. Weaver and Marcel Schein, may hold the honor of having set up the world's highest land-based laboratory. Other, more permanent high altitude laboratories are at Morococha, Peru (14,900 feet) and Mount Evans, Colo. (14,156 feet).

The scientists who did the research are Dr. T. R. Burnight, J. D. Purcell, Dr. R. Tousey, and Dr. K. Watanake, all with the Naval Research Laboratory, Anacostia, D. C.

In one set of experiments X-rays were detected by their effect upon photographic films covered by thin aluminum and beryllium windows. The ultraviolet radiation was demonstrated by exposing to the sun's radiation a phosphor strip that gave off light when heated after return to earth, thus demonstrating the presence of the invisible radiation from the sun at the high altitudes.

Science News Letter, May 7, 1949

ASTRONOMY

Stars Planetary Parents?

➤ PAIRS of yellowish lemon-shaped stars which waltz through space may be the ancestors from which come planetary systems such as the one in which our earth is located.

How one type of double star might be the parents of planetary systems like our own was suggested to the meeting of the National Academy of Sciences in Washington by Dr. Otto Struve of the University of Chicago's Yerkes Observatory, Williams Bay, Wis.

These yellowish double stars are called W Ursae Majoris eclipsing binaries, with the stars eclipsing one another as they move through space.

Discovery that these pairs of stars have a common envelope of gas about them has led to Dr. Struve's new theory. This gaseous envelope around the double stars is not symmetrical, varying in thickness and other properties. This indicates, the Yerkes astronomer said, that these pairs are not stable. They may either be moving apart to form more widely separated stars, or they may be moving together into a single star.

Dr. Struve's theory proposes that these yellowish, closely-mated double stars may have come from bluish, more widely spaced double stars, known as Beta Lyrae or U Cephei. This may come from the loss of streams of gases by the bluish stars. The streams are estimated to carry off a weight equal to not less than one hundred-millionth of the sun's mass each year. In addition, the streams also are believed to slow down the bluish stars.

Thus, the bluish double stars may be moving closer together, forming the yellowish star pairs. If the process continues, then the yellowish double stars may be moving together to form a single star.

The single star, resulting from the evolutionary process of this theory, might be like our sun, with planets such as the earth formed from the mass carried off by the streams from the stars.

The eclipsing double stars from which planetary systems may be formed are both slightly smaller than our own sun, but one weighs about as much as the sun and the other is only about half as heavy.

Dr. Harlow Shapley, director of the Harvard College Observatory, has discovered that this type of eclipsing double star, W Ursae Majoris, is more numerous in the heavens than all other types of eclipsing star pairs.

Science News Letter, May 7, 1949

PSYCHOLOGY

Eye's Index Point Mapped

➤ THE center of your eye has an index point that is to your eye what the sensitive tip of your forefinger is to your hand. Your most exact and finest seeing is done with this index area in the center of the eye's fovea.

Although this important center in the eye has been known to scientists since Clerk Maxwell first discovered it in 1856, it has now been mapped for the first time, Prof. Walter R. Miles, of the Yale School of Medicine reported to the National Academy of Sciences in Washington.

At the back of the eye in the center of a yellow pigmented section is a little depression which contains an area known as the fovea. At the center of the fovea, Prof. Miles located the index area, known to scientists as the visual fixation disk. When mapped out on charts by means of tests upon 20 men, using color filters, three concentric circles or ovals appeared. The visual fixation disk is a tiny, but well defined core, occupying four and one-half per cent of the entire area of the fovea.

The outer border of the disk is well-defined, contrasting markedly with the area outside it. The edge is about as sharp, Prof. Miles reported, as the edges of typed letters on a good carbon copy.

When you want to do any precise seeing you turn your eye so that this portion of the retina is turned directly on what you want to distinguish, such as the marking of a slide rule or the eye of a needle you are trying to thread.

The size of the disk, if it were projected onto a printed page held 14 inches from the eye, would be about the size of the capital letter "M". At workbench distance of 28.6 inches, the disk would cover an object a quarter-inch across. At floor distance of 57.3 inches, the projected disk would be a half-inch in diameter. When looking across a typical street 100 feet wide, it would measure nine inches.

The total retina, or light-sensitive back of the eye, is a semi-circle about 180 degrees from end to end. The visual fixation disk occupies only one-half of one degree of this semi-circle. This tiny part of the fovea contains from 1,200 to 2,000 cones, which are the bright light and color detectors for the eye. The cones in this area are longer and thinner than they are elsewhere and this difference helps to explain the importance of the area for sharp seeing.

Science News Letter, May 7, 1949

METEOROLOGY

Thunderstorms Are Made Up of Distinct "Cells"

➤ THUNDERSTORMS are made up of distinct units or "cells", each acting more or less independently of the others, Dr. Horace R. Byers of the University of Chicago told the National Academy of Sciences in Washington.

Each cell consists of a system of vertical air currents set up by marked temperature differences between ground level and higher altitudes.

Each cell goes through a three-stage life cycle, Dr. Byers explained: first the cumulus or fleecy-cloud stage, then the "mature" stage during which the air currents flow towards the earth and rain falls, and finally the dissipating stage during which the storm dies out.

Science News Letter, May 7, 1949

RADIO-MEDICINE

Cancer Under Microscope On Regular TV Channel

➤ TELEVISION fans of the nation's capital have now seen for themselves the differences between cancer cells and healthy, normal cells of the human body. They were able to do this through the twin eyes of the television camera and the microscope in a program sponsored by the U. S. National Cancer Institute and the American Cancer Society over WMAL-TV.

Slides with tissue-paper-thin slices of normal and cancer tissues were first focussed under the microscope. Then the huge television camera was swung over and down onto the microscope eyepiece. As the televiewers looked, they heard Dr. William Ober, research fellow at the National Cancer Institute, point out the orderly arrangement and shape and small nuclei of the normal cells and compare these to the irregularly arranged and sized cancer cells with their larger nuclei. These differences, he explained, are what help the pathologist diagnose cancer.

The program is the first in which microscopic scenes have been televised over a regular television channel.

Science News Letter, May 7, 1949