PHYSICS

Sunshine and Atoms May Be Power Sources of the Future

Goal of Scientists Now Is To Tap Atomic Power And To Learn How Sun Energy Can Be Stored

By WATSON DAVIS

POWER from within the atom, or from the sunshine, may revolutionize the world in which we live. If scientists can wrest practically from the atom its internal energy or solve the secret of how the green leaf stores up the energy of the sun's rays, there may come a superpower age when usable energy will be almost as free as the air we breathe and the water we drink.

As we rely upon oil and gas, good for at least tens of years in the future, and coal, good for at least hundreds of years in the future, research is being conducted quietly upon the possibility of tapping new power sources before oil and coal become scarcer or are exhausted.

Should fortunately fruitful research give us access to the internal energy of the atom, a very efficient way of storing the sun's vast radiant energy, or some other low cost power source, there might be economic repercussions of major consequence.

The sun is fundamentally almost our sole source of available energy. Heat and electric power is derived from the sun whether it is generated hydro-electrically or by use of coal and oil. All food is manufactured by green plants through the use of sunshine. For ages men have fought for literally their places in the sun. The war in Europe is in part a struggle for the fossil sunshine of past ages, the oil and coal necessary to modern industry and living.

The problem of solar energy is a very large one. According to Dr. O. L. Inman, director of the C. F. Kettering Foundation for the Study of Chlorophyl and Photosynthesis at Antioch College, Yellow Springs, Ohio, the best estimates are that the energy reaching the earth from solar radiation each year is equivalent to that received from burning four hundred sextillion (400,000,000,000,000,000,000,000) tons of anthracite coal. From this source mankind could draw plenty of available energy for all its needs.

The green plant is the principal converter of solar energy into useful material for mankind. The process by which it does this is called photosynthesis although just how the plant does this is still unknown. Obviously, this is one of the major problems of our civilization.

Yet, a rough estimate by Dr. Inman of the amount of money budgeted in 1940 for this work in the United States is only about $250,000 to $300,000.

Dr. Inman sees two ways of approaching this problem so important to the long-time provision of power to our civilization.

First, we could learn more about plant growth and grow several hundred times the amount of vegetation we now grow, transforming much of this into more condensed charcoal from which gas, oil, etc., may be made.

Second, through fundamental research we could solve the mechanism of how to fix with the tools we now have available the carbon of carbon dioxide and the hydrogen of water into chemical compounds similar to methane or marsh gas and gasoline; or, by the addition of oxygen, to get sugar, woods, or fats; and, by the further addition of nitrogen, to get proteins and so on to thousands of possible compounds or molecules with energy stores ready for use.

When man solves the problem of photosynthesis and sets up his own method of storing radiant energy from the sun, it may very well not be an exact duplicate of the method used by the green plant. It may even be more efficient.

Man has been taking for granted that he can in some way keep on depending on capital stores of coal, oil and gas for energy. Dr. Inman feels that the solution of the problem of photosynthesis in a practical way is a long-time research program. If it is not started sufficiently early on a large scale, mankind may find that it was too late beginning the research. Serious shortage of power and energy supplies may be visited upon the earth by our failure to begin research even though we knew the job had to be done.

Within the atom there are as yet untapped stores of energy which if released would furnish almost unlimited amounts of power, enough to take care of all the energy needs of mankind.

A mere two years ago the probability of the release of atomic power of any kind seemed fantastic. Early in 1939, the splitting of the heavy chemical element uranium with the release of an enormous amount of interatomic energy was demonstrated. Laboratories throughout the world that had "atom smashing" apparatus have been exploring as rapidly as possible with relatively limited resources this very exciting possibility.

The best opinion at the present time seems to be that while it may be possible to obtain energy from uranium on a scale of commercial importance for special uses, this type of reaction if made practical will at best tap only an infinitesimal fraction of the total atomic energy around us.

The hope of tapping large amounts of atomic energy seems to lie in the possibility of discovering in the future a mechanism for atomic annihilation, in the opinion of Dr. M. A. Tuve of the Carnegie Institution of Washington's Department of Terrestrial Magnetism, one of the leading investigators in this field.

Leaders in research were optimistic when they were questioned about atomic energy.

Dr. William D. Coolidge, director of research laboratories of the General Electric Company, states:

"It has been shown that in the case of the element uranium an enormous amount of interatomic energy may be set free, so much, in fact, that if further research shows how the process once started may be made self-propagating, we may be able to get as much energy from a pound of uranium as from millions of pounds of coal. This might prove to be a cheaper source of power than any other. Even if it were more expensive it might be revolutionary in those applications where weight and bulk are all important. It also seems possible that further nuclear research may show how the interatomic energy of some of the more common elements may be economically set free."

Dr. Lee de Forest, famous engineer, whose inventions have been so important in radio, motion pictures, etc., states:

"The cyclotron as developed by Prof. E. O. Lawrence, of the University of California, has already justified man's hope that eventually he will be able to derive by elemental fission cheap, universally obtainable power in unlimited

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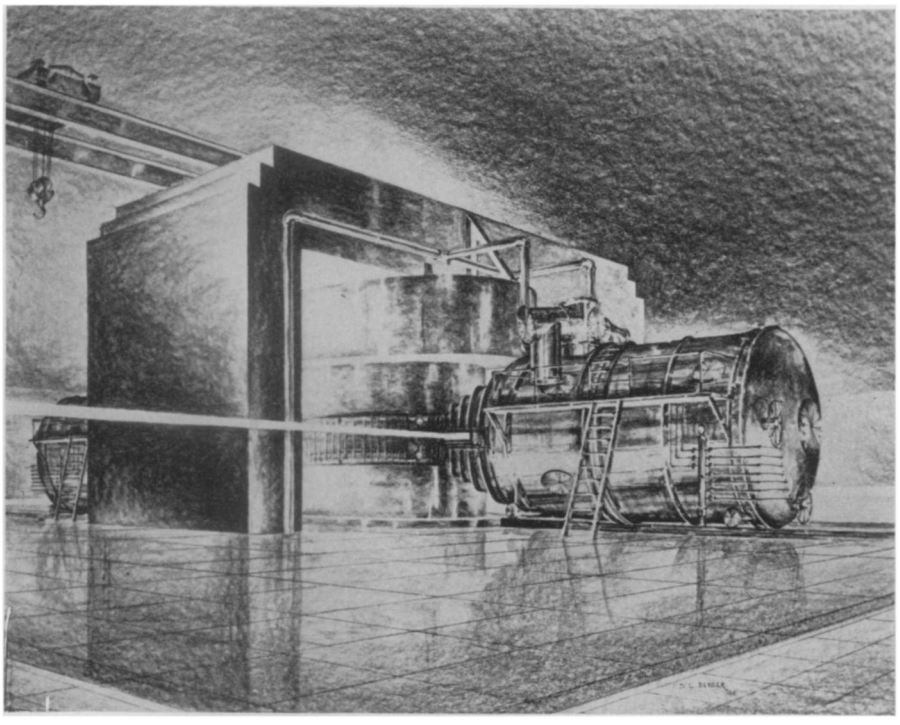

MAY RELEASE ATOMIC POWER

This is the artist's drawing of how the projected new 4,900-ton cyclotron will look when it is built for the University of California. The Rockefeller Foundation recently made this possible by a gift of $1,150,000.

quantities. Our oil and coal resources must otherwise be exhausted within a few centuries. These must be conserved for more essential services than mere power supply."

The amount of research being conducted upon the problem of atomic power is extraordinarily small compared with the large winnings to mankind if success should be achieved. Most of the research is being undertaken in university and scientific institutional laboratories without any commercial objectives. On account of the extreme importance of adequate power to national economy and military defense, as well as to industry, adequate support of investigations of atomic power would seem to be a highly justifiable gamble.

The Rockefeller Foundation has just demonstrated faith in the possibilities of this research by giving $1,150,000 toward a new 4,900-ton cyclotron (See *SNL*, April 20).

In connection with the possible obtaining of practical power from uranium, the use of a few tons of the gold stored at Fort Knox, serving no useful industrial or scientific purpose, would be helpful. Such use of the gold would not involve its loss. The most practical methods that have been suggested of concentrating uranium is through thermal diffusion or through centrifuging. The uranium would be in the form of a complex gaseous fluoride which is highly corrosive to ordinary material but which is resisted by gold.

If sufficient gold to construct the necessary apparatus could be loaned by the government to research laboratories, this particular investigation would be very much speeded. The gold after the experiment could be returned to storage and even while in practical use would not lose its value as an asset in the United States Treasury. Perhaps some of the same gold that was prized by the Egyptian pharaohs could be used in this experiment since gold is one of the most imperishable materials on earth.

There has been some fear that the sudden production of a new energy source of large magnitude would be economically disturbing. The experience has been that any development of this sort from a practical standpoint can be introduced only over a period of years even when it is once perfected. The benefits to the community at large from cheaper power would be so large that if and when atomic power or other power of low cost is achieved it would be well worth while to make the necessary economic adjustments.

Science News Letter, May 4, 1940

BIOCHEMISTRY

New Blood Test Depends On Permeability Rates

A NEW test determining whether a given sample of blood came from a man or another animal and if so, which animal species, was announced by Dr. M. H. Jacobs of the University of Pennsylvania to the National Academy of Sciences.

This test can be used only with fresh normal blood. It would be useless with blood stains, Dr. Jacobs explained. The test is based on the striking and apparently constant way in which certain substances penetrate the walls of red blood cells of different species of vertebrates when the acidity or alkalinity of the solution is systematically varied. Glycerol is a useful substance for detecting species difference in this way, but tests with this chemical take rather a long time. The tests can be made much faster, Dr. Jacobs discovered, with ethylene glycol, generally known to the layman as the basis of a popular antifreeze preparation.

"In the examination of approximately 100 samples of blood distributed among these species (common laboratory animals and man) no case has so far been encountered in which the origin of the blood could not be correctly determined by this test alone," Dr. Jacobs reported.

"Even such closely related species as the albino rat and the albino mouse are readily distinguishable, as are the dog and the cat, the rabbit and the guinea pig, the ox and the sheep, etc."

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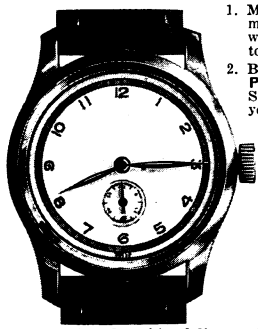

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