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RCA ELECTRON MICROSCOPE
SOME PAPERS READ BEFORE THE PITTSBURGH MEETING OF THE AMERICAN CHEMICAL SOCIETY

Dr. Per K. Frolich, of the Standard Oil Development Company, in his presidential address before the American Chemical Society, stated that the danger of oil famine is not immediate. Taking a temperately optimistic view, and not trying to dodge present or anticipated difficulties, he still accepted an estimate of 300 years before the earth runs out of oil. This is assuming consumption at present rate, discovery of new reserves where they can reasonably be expected, and unhindered production and distribution.

The United States is especially favored as an oil-producing country, Dr. Frolich pointed out. While its boundaries enclose only 5 per cent. of the land area of the earth, it contains 15 per cent. of the area of the structures most favorable for the occurrence of oil fields. He estimated that the forty-six billion barrels thus far discovered and partly extracted in this country represent less than half of the oil we shall eventually contribute before the last American pool has been pumped out. A round hundred billion barrels was his estimate of America’s share of the ultimate 600 billion barrels that all the world’s oil fields, existing and yet to be found, should produce. Back of our oil reserves stand our coal beds, which contain an estimated three trillion tons. Coal accounts for more than 98 per cent. of our country’s known energy resources, exclusive of water power. Methods for converting solid coal into liquid oil are already known and in use, and we can turn to them as our supplies of oil and natural gas run low and the cost of gasoline rises accordingly. Such gasoline from coal is not likely to be cheap, however. As compared with a cost of eight and a half cents a gallon from crude oil at two dollars a barrel, gasoline from coal has a cost ranging around twenty cents a gallon. Whether new processes could cut that cost is in the realm of prophecy rather than that of scientific estimate. The better part of wisdom would seem to be not to expect too much until you see it.

CHEMICAL research laboratories, often thought of as a luxury that only big businesses can afford, will operate for the benefit of small and middle-sized businesses as well, in the post-war era. At a symposium on this subject, the speakers told how the needs for research will be met by privately managed consulting laboratories and by government research workers as well as by laboratories owned and operated by the corporations themselves. Small businessmen were promised a share in the rapidly developing field of industries based on farm products, in the address of Dr. O. E. May, research coordinator of the U. S. Agricultural Research Administration. “These include,” he said, “the dry and wet milling of cereal grains, processing of fruits and vegetables, production and processing of vegetable oils, meat packing, dairy products, feeds, fertilizers, insecticides and fungicides, pharmaceuticals, naval stores, fermentation products, rubber, leather, fibers and textiles.” On all these materials, and many besides, the U. S. Department of Agriculture was conducting very active research in its four great regional laboratories when the war interrupted all programs. The laboratories are concentrating on war problems now, but as soon as victory has been won they will return to their normal activities. Conversion, Dr. May stated, will not be a difficult or lengthy process for most parts of the program. Small businesses will of course not be dependent entirely on what government scientists do for them. Charles H. Egan, of the Dewey and Almy Chemical Company, outlined some of the other research resources of the manager of a small business. Even a modestly financed plant can often afford to hire two or three research men, he pointed out, and it can also obtain more information by small research grants to be used in college and university laboratories. The resources and scope of activity of a professional consulting firm with a large laboratory were described by Raymond Stevens and Earl P. Stevenson, of Arthur D. Little, Inc. They pointed out that research is sometimes needed in the most surprising spots: for instance, anthropologists had to be called in when transport planes for paratroopers were being designed, to make sure the seats would fit the anatomies destined to sit in them.

ULTRASONIC waves, which are sound waves far too high pitched for any ears to hear, have strange effects on mixtures and solutions, and may some day become a useful chemical tool, was stated by Professor Karl Solliner, of the University of Minnesota. Audible sound waves come at rates of a few hundreds or thousands per second; ultrasounds, which are started by crystals set into rapid pulsation by high-frequency electric currents, have rates up to a million or more per second. Their effects were first studied some years ago by Professor R. W. Wood, of the Johns Hopkins University, and Dr. A. L. Loomis, in the latter’s private laboratory at Tuxedo Park, N. Y.; since then also by a number of other workers. The waves have been used to make permanent emulsions of such “unmixable” things as oil and water and even water and mercury. Acting on this hint, one investigator used them to homogenize milk so that the cream will not separate out. This use has not yet been commercialized. The waves also disperse exceedingly fine metallic particles through a suspending medium; Professor Solliner suggested their use in this way to produce special, ultra-fine-grained photographic emulsions.

HEATING plastic objects all the way through at the same time, by the same radio-wave treatment used in producing artificial fever in modern medicine, is the newest device to speed up the production of airplane instrument panels and steering wheels, radio housings and knobs, and all the ten thousand other plastic gadgets used in present-day war equipment. It has been given the convenience-name of “heatronic molding.” It was described by V. E. Meharg, of the Bakelite Corporation. Use of high-frequency waves to produce heat in metal objects is not new, but it
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PRINCIPLES OF HUMAN GEOGRAPHY
By ELLSWORTH HUNTINGTON, Research Associate in Geography, Yale University; Fifth Edition, largely rewritten, based on original work in collaboration with the late S. W. CUSHING.

In this book man's physical environment is clearly shown to influence human culture throughout the world. This result is achieved, first, by a logical development from geographic factors to culture traits rather than vice versa; second, by describing the minimum essentials of the background sciences such as geology, meteorology, and physiography in simple terms with an abundance of familiar illustrations; third, by a generous use of diagrams, maps, and pictures, appropriately inserted and effectively utilized in textual discussion; and fourth, by a style of writing which arouses and sustains interest.

Fifth Edition (1940). 594 pages; 6 by 9; $3.50

COLLEGE GEOGRAPHY
By E. C. CASE, Professor of Geography, and D. R. BERGSMARK, Associate Professor of Geography; both at the University of Cincinnati.

"Case and Bergsmark" offers a general discussion of the all-important geographic factor of location and space relationship, chapters on human relationships to climate, soils and land forms, extensive discussions of the regional geography of the several climatic realms, chapters on mineral resources and industries, transportation and world trade, and an ample selection of charts, maps, and illustrations.

Second Edition (1940). 767 pages; 6 by 9; $4.00

PRINCIPLES OF ECONOMIC GEOGRAPHY
By ELLSWORTH HUNTINGTON, assisted by FRANK E. WILLIAMS, Professor of Geography, University of Pennsylvania, SAMUEL VAN VALKENBURG, Professor of Geography, Clark University, and STEPHEN S. VISHER, Professor of Geography, Indiana University.

This book progresses from the simplest to the most complex elements of the subject. Special features are its analysis of principles governing the use of occupancy of the land, the discussion of food crops as a part of a scheme of diet, and the study of environmental factors and their effort on the industries of the region and the energy and living standards of human beings. One part of the book covers cities, manufacturing, trade, and transportation.

(1940). 715 pages; 6 by 9; $4.00

EUROPE
By SAMUEL VAN VALKENBURG and ELLSWORTH HUNTINGTON.

One-third of this book is given over to a study of Europe as a whole, and the remainder to the separate countries. It gives a balanced analysis of historical, social and political aspects of European development in their relation to geographical features. It leaves the student with a sense of the quality of European life. Ideally suited to the course offered in the Area and Language Program.

(1935). 651 pages; 6 by 9; $4.50

JOHN WILEY & SONS, Inc., 440-4th Ave., New York 16, N. Y.
has not been practical until lately to heat up non-conduc-
tors of electricity in this way. Now that means have been
devised to make it work, it is being used to produce a
more uniform, even heat throughout plastic objects of the
thermosetting variety, in which one heating forms and
hardens the plastic, which will not soften or change for
any number of subsequent heatings. Hitherto it has been
the practice to heat the die, which has meant that the
heat flowed from the outside inward, and was not uni-
formly applied throughout the mass at the same time.

Steel for war, with many of the properties of expen-
sive alloy steels, can be made without the necessity of
adding such hard-to-get elements as chromium and van-
dium, according to Dr. Merle Randall, of the University
of California. It is made by a special heat treatment of
ordinary low-carbon steel. The process, which was or-
iginated by Dr. Randall's colleague, George F. Nelson, of
Berkeley, Calif., consists in heating the steel very hot—
up to 1,700 degrees Fahrenheit, and then suddenly
quenching it in a 35 per cent. solution of either caustic
potash or caustic soda. The metal can then be cold-rolled
into sheets or bars without difficulty. Tests show it to
possess an extraordinarily high strength.

War-necessary sulfur can be salvaged from choking
gas now wasted up the chimneys of factories, oil refin-
eries and smelters, and turned from an irritating nuisance
into hard cash. The process whereby this is accomplished
was described by T. F. Doumani, R. F. Deery and W. E.
Bradley, of the Union Oil Company of California. The
waste gas is sulfur dioxide, the same suffocating fumes
you smell when a sulfur candle is burned. It is an in-
evitable by-product of the refining of many types of crude
oil, the burning of certain kinds of soft coal and the roast-
ing of ores. In the new process this gas is passed over a
catalyst at moderately high temperatures with the addi-
tion of hydrogen. The hydrogen takes the oxygen away
from the sulfur dioxide to form water which comes off as
steam. The sulfur comes off in pure form ready for use
in vulcanizing rubber or for any of its other thousand-
fold industrial tasks.

Keyed to the wartime need for quicker answers to re-
search questions is a method for testing the rust-prevent-
ing properties of paints, on which a report was given by
Dr. G. D. Patterson and Dr. C. K. Sloan, of E. I. du Pont
de Nemours and Company. Instead of painting a thick
slab of steel and then waiting for the paint to begin peel-
ing, a testing method requiring a year or more, a film
only a thousandth of an inch thick is applied to small
sheets of iron foil rolled to a uniform thickness of one
two thousandth of an inch—about one eighth as thick as
common newspaper print. The foil is first cemented to
small slips of glass, then the paint is sprayed on and the
whole set-up is exposed to rust-provoking atmospheric con-
ditions. With metal so thin, it does not take long for
holes to be eaten clear through it, once rust gets started
at all. The length of time a sample holds out before
you can see through it in spots is a measure of the success
of the paint under test.

Looking to a day when gasoline will be a permanent
rarity in the United States and probably in the whole
world, Dr. Gustav Egloff and Prudence Van Arsdel, of
the Universal Oil Products Company, described progress
already made in the development of motor vehicles that
will run without gasoline. These are the producer-gas
units, mostly trucks and buses but including many motor
cars as well, that already ply the streets and roads in oil-
less lands. They convert wood chips, charcoal, and a
number of other solid fuels into gas, which is then fed
into internal combustion engines. Dr. Egloff estimated
that even now there are more than 800,000 such vehicles
in operation.

The possible existence of a new food factor necessary
for reproduction, believed to be different from the
already-known vitamin E, was suggested by H. W.
Schultz, R. E. Gray and H. E. Robinson, of Swift and
Company. The new vitamin (if that is what it is) ap-
pears to be present in meat, but is made useless by heat-
ing. Cats were used in the experiments. Some were fed
on raw meat, others exclusively on meat that had been
highly heated. Tomcats fed on the heated meat sired no
kittens during a period of three and four years. Female
cats similarly fed either had no kittens, or had very few,
and those unhealthy.

Common white sugar is the purest chemical substance
that most of us ever get to see; it is nearer absolute
chemical purity than most of the laboratory compounds
bearing the mark, "C.P." This very purity becomes a
handicap for some purposes; one of the complaints some-
times heard against refined sugar is that it supplies energy
without accompanying vitamins. That vitamins are not
lacking in the source of sugar is indicated by results of
analyses presented by William R. Jackson, of the research
laboratory of Merck and Company. He worked both on
whole cane from Cuba and Louisiana, and on raw sugar-
cane juice. His report: "Whole mature sugarcane is a
fair source of thiamin and riboflavin, rich in pantothenic
acid, and a good source of niacin."

If you want to get all the sugar in some of our common
vegetables, you'll have to eat them raw. This would seem
to be one conclusion to be drawn from studies of E.
Whitman Rice and Louis Lang, of the National Sugar
Refining Company. They found that although onions,
cabbage and carrots contain considerable percentages of
sugar, they lose them in various steps involved in pre-
paring them for the table. Carrots especially "bleed" sugar
very freely. "A preliminary experiment with fresh carrots showed that 50 per cent. of the total solids
were lost when the carrot was subjected to the common
steps of precooking (blanching) before dehydrating and
reconstituting before the final cooking. Losses in cook-
ing will be additional to these mentioned. Further ex-
periments seem to indicate that the losses of valuable
food components of vegetables in certain methods of
processing warrant a re-evaluation of some products.
This is especially true during the present food shortage."
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The book also contains a summary of the theory of dislocations and the role they play in determining plastic flow.

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COPPER AND COPPER BASE ALLOYS
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By G. Albert Hill, Wesleyan University, and Louise Kelley, Goucher College. 919 Pages. $4.00 (1943)

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