rected by Colonel Mason J. Young, of the Army Engineers, is of particular interest in that it looks down stream for relief and not to the hills, as is usual.

Due to the work of glaciers in the region of Middletown the Connecticut River has left its former channel and now follows for a distance another course never intended for its use. This results in three bad features: (1) A lengthened course; (2) an impeding curve; (3) the constricted channel, the "Narrows." These act as a veritable dam at this point in the river, causing the water to back up at Middletown, Portland, Hartford and even to Windsor Locks, a distance up stream of some twenty-five miles. Throughout most of this length the river had a fall in the recent flood of less than three inches per mile, while at the place where it is retarded it had a potential fall of more than three feet per mile.

It seems a simple thing, therefore, both in theory and in the execution to restore the river to its ancient channel with the expected results of, first, a quicker disposition of all flood waters, second, some five feet less flood at Hartford and, third, the saving of millions of dollars of property from destruction.

It is not our privilege here to discuss other plans for flood control, some of which certainly have their place in any scheme for protection. Some of these projects are expensive in view of the benefits expected; many of them are of decreasing effectiveness with increasing flood height; most of them carry with them hazards that, beyond a certain point, may add to the destructiveness of the flood. A spillway such as we contemplate would be the more effective the greater the flood. Floods can not occur when there is adequate drainage down stream.

It is believed that the restoration of the river to its proper course could be accomplished most expediently by opening up a mere trench east of the Portland Hill, where indeed the river itself came within a couple of miles of achieving the desired results; then we would leave the main excavating work to the flooding waters themselves. One good flood—and the water rises to twenty feet at Hartford three out of every four years—might thus be turned to a useful purpose and to its own disadvantage.

A better appreciation of the setting of this project may be had from an examination of the Middletown Quadrangle of the United States Geological Survey.

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SCIENTIFIC BOOKS

A SCIENTIFIC ENCYCLOPEDIA

Hutchinson's Technical and Scientific Encyclopaedia. Edited by C. F. TWENEY and I. P. SHIRSHOV. Macmillan Company, New York. No date (published during 1935–36), 4 volumes, 2468 pages.

A MONTH'S use of this four-volume compendium has left the reviewer with mingled feelings: chiefly those of gratification that so useful a work is now available and of awe at the size of the completed task, but also of regret at the numerous minor faults which are present.

Before deciding on the worth of such a work, one must first of all decide as to what needs it is to satisfy and as to what sort of people will use it most. In covering a field as broad as the whole of modern technology and science, many choices must be made between different methods of exposition, and many subjects must be omitted completely. A work which is useful as an expanded dictionary, giving mostly definitions and short descriptions in semi-technical language and serving as a starting point for further reading in more detailed texts, will serve a quite different purpose than an encyclopedia for the general layman, giving the fundamental facts and principles of each subject in simple language. Choices of this sort had naturally to be made by the editors; and it is only fair to them, and to the reader, to judge their work from the point of view of their decisions.

Ordinarily, the editor's purpose could be determined from the preface; but in the present case there is no preface, so their purpose must be ascertained from the text itself. In the reviewer's judgment, the Encyclopedia is really an expanded dictionary of technology and science, primarily defining and describing technical terms and usages, and only secondarily elucidating general concepts. As such, it is an excellent and much-needed contribution and should be extremely useful to librarians and to scientific and technical workers wishing to study in fields somewhat outside their own.

The selection of material has been almost wholly from the point of view of the practical engineer; very little pure science or scientific theory is included. For instance, the article on sedimentary rocks takes up but 14 lines; and there is no mention of the polar front theory of meteorology. The whole subject of atomic theory is dismissed in the following surprising manner: Under the item "Quantum Theory" is simply the reference "See Wave Mechanics"; and there is no item "Wave Mechanics." Those theoretical discussions which do appear are rather fragmentary, and, in a few cases (under Pyrometers, for instance), are misleading.

The exclusion of theoretical subjects is quite allowable, however, although the publisher's claim on the jacket that "the work traverses the whole field of Physics, Astrophysics, Meteorology, . . ." is rather misleading. After all, one can not cover all the aspects of science and technology in four volumes, and a work traversing the field of *applied* physics, *applied* meteorology, etc., is a useful and welcome addition to any library.

The material on electrical engineering, on the other hand, is satisfyingly complete, particularly in the field of communication engineering (in fact, the best articles in the work seem to be in this field). There are good articles on filters, microphones and sound reproduction, to mention a few. There are also many good discussions of photography and of the allied arts of process engraving, motion picture photography and so on. The fields of organic chemistry and chemical engineering are well represented, the properties and preparation of innumerable organic compounds being listed.

To pick a few items at random: there are interesting articles on hormones, internal combustion engines, alternators, glass, vitamins, cotton, escapements, haemoglobin, telephony, metallography and calculating machines; though this last article neglects any discussion of integrating devices or electrical methods.

The bibliography, consisting of about 3,000 references, is, on the whole, satisfactory and up to date; although the inclusion of more German and American titles (along with the English ones) would have made it more representative. For instance: the list of books on acoustics is quite complete, except that no German title is included; on the other hand, of the fifty titles listed under physics, only one book published after 1930 is mentioned. The listing of some of the titles is curious, to say the least: for instance, books on atomic and nuclear physics are placed under chemistry. For that matter, some of the items in the main work are placed in rather incongruous categories. For example, the item "Cathode Sputtering" is labelled as belonging to the field of acoustics.

The book is well printed, though the publisher could have chosen a more readable type. The usefulness of the work for quick reference and for the non-technical person is unfortunately reduced by a number of minor faults which could easily have been remedied. Many more cross references could have been introduced, which would have eliminated much hunting for items without materially increasing the size of the volumes. In the long articles, more section headings and important words could have been printed in boldface or italics, to obviate the necessity of scanning the whole article to find a single item. Full captions could have been used for all illustrations, to reduce the amount of study needed to correlate cut- and subject-matter. For instance, stainless steel is not listed, though it is discussed in the article on chromium—not very helpful unless one knows the composition of stainless steel. Also, in looking up "Equilibrium Diagram," one is referred to "Metallography" (no subdivision title given), where one must look through five pages of text to find the word mentioned, referring to a Fig. 10, which is without caption. If Fig. 10 had had a caption, the item could have been more easily discovered, and the significance of the figure would be more obvious. Again: on page 3211 in the article on thermionics, the caption on Fig. 11 refers only to pentode characteristic curves, although the figure actually shows tetrode curves as solid lines and pentode curves only as dotted lines.

In spite of these minor flaws, the Encyclopedia should be of considerable interest and value to the layman; for although most of the articles are written in fairly technical language, most of the terms are defined somewhere in the text. There may be possible confusion arising from the fact that English terminology is used (cinema, acceptor circuit, etc.), which differs from American usage at times, particularly in the field of electrical engineering. The difficulties will not be serious, however, except perhaps for reference librarians. There are a large number of well-printed photographs and line drawings, which add to the interest and clarity of the articles, especially for the layman.

Even a casual perusal of these volumes will impress both layman and technical worker with the tremendous development of applied science in the past twenty years. Here is material for both sides in that purely academic battle concerning the benefits and dangers of science. Literally hundreds of the article titles are new words, invented within the last two decades to describe methods or machines invented during that time. Many more titles are old words with new meanings.

Especially impressive is the evidence of the revolution caused in nearly all branches of engineering by the vacuum tube. Articles on its applications are sprinkled throughout the four volumes. A scientific toy before the war, it has now replaced nearly all mechanical devices for the measurement of small quantities and for the transferring of small motions. In combination with the photoelectric cell or with the microphone, it performs, automatically, tasks hitherto impossible except by human means—often impossible by any means.

All these developments are most graphically illustrated in the pages of the Encyclopedia. Its editors are to be congratulated on having completed so huge

a task and on having produced so interesting and useful a work.

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AMERICAN AGRICULTURE IN 1936

Year Book of Agriculture—1936. Printed by the U. S. Government Printing Office. For sale by the Superintendent of Documents—price $1.25 cloth. 1936.

THE old Annual Report series of the Department of Agriculture was divided in 1894, as the result of legislative action, into two parts, one, the purely business and executive matters, and two, the annual survey of the department's work by the secretary and popular scientific papers calculated to be of interest to farmers. The second series was named the Year Book. In addition to the papers mentioned, the Year Book contained in an appendix statistical matter in reference to agriculture. This had grown to several hundred pages and, while highly useful, was somewhat out of place in this type of publication. Hereafter, the statistical matter, with the exception of a few pages of general statistics, is to be published as a separate volume and is not included in the Year Book for 1936. Aside from the general review of the agricultural situation and the work of the department, by the secretary, the book is devoted to a survey of plant and animal breeding with special reference to "superior germ plasm."

It is a useful historical review of work that has been done in these fields, with special emphasis on the genetic and cytological aspects. A glossary of genetic terms is included.

The treatment is largely historical, leading up to the objectives now dominant and the improved techniques now available. The material for the germplasm part of the book was assembled by the Committee on Genetics.

The book should be helpful to plant and animal breeders and to students interested in these general subjects. With the index it includes 1,189 pages.

A. F. WOODS

SPECIAL ARTICLES

THE INDIANA GROUP IN AMERICAN MEN OF SCIENCE[1]

IT seems fitting at this half century meeting of the Indiana Academy of Science to make a survey of the men of science produced in this state and also of those from other states who now make Indiana their home. In order to do this one's mind turns naturally to Cattell's "American Men of Science," published in 1933. It would certainly be interesting to see what part Indiana has played in furnishing her quota of the 22,000 scientists noted in this edition. Indiana is noted for her fertile acres, and "out where the tall corn grows" is a favorite expression which not only locates but also stresses the fertility of our state. The lack of large cities in the state means that her 3,238,503 residents of 1930 are scattered in small centers and country communities. It is noted in the summary of "American Men of Science" (1932) that Ohio and Indiana have in residence less than half of the leading men of science they have produced. Hence, there must be some reason conducive to such results, for it surely could not be just a matter of accident.

GROUPS INCLUDED IN THE STUDY

It was decided to limit this study to three groups, namely: First, those born in Indiana; second, those who spent four years in Indiana colleges and have secured the bachelor or equivalent degrees from Indiana colleges; and third, those from other states who now make their home in Indiana. If those who spent from a few months to a few years, doing graduate work, were included, it would add considerably to the total number involved but would only tend to complicate matters and make an interpretation of the data more difficult. It was found that Indiana has a total of 1,109 out of the 22,000 names of scientists, or about 5 per cent. In order to get some information bearing on the early life of those of the 1,109 who were born in Indiana, they have been grouped in Table 1 according to the size of the town in which they were born. On this basis of Indiana's population of 3,238,503 in 1930, this amounts to one native-born scientist to every 4,534 citizens, or counting the 1,109 scientists belonging to the Indiana group, there is one scientist for every 2,920 persons. It has been estimated by Dr. A. D. Little in "The Fifth Estate" that it costs the state about $500,000 to find and develop a man to the extent that he is capable of advancing science. If this is the truth, it means that Indiana has spent about 500,000 times 714 or $357,000,000 for the

TABLE 1

NUMBERS AND PER CENT. BORN IN LARGE, MEDIUM AND SMALL TOWNS OR COUNTIES OF INDIANA

(1)	Small town or county (under 1,000)	440 or 61.6	per cent.
(2)	Medium size town	190 or 26.6	" "
(3)	Large towns (over 50,000)	84 or 11.8	" "
	Total	714 or 64.4	" "

[1] Presented at the fiftieth meeting of the Indiana Academy of Sciences.