

## REVIEWS

**Cotton.** By H. B. Brown. Second edition. (McGraw-Hill Publishing Co., Ltd.), 1938. Pp. 592. Price 30sh.

The appearance of a good book on cotton is a matter of special interest to Indian research workers on this important commodity. As proved by scientific and incontrovertible evidence, India was the first country to grow cotton on a fairly large scale and to use it for the manufacture of materials. During the middle ages the fame of its fabrics, its muslins and nainsooks, spread far and wide, indicating the presence of suitable raw material and a high degree of technical skill in the arts of spinning, weaving, dyeing, printing, etc. To-day, India produces the second largest crop in the world; and though the average quality of its cottons is not so high as that of the Egyptian or the American cottons, strenuous efforts are being made to grow better and still better types, and already a notable measure of success has been achieved in this direction. For all these reasons, we scanned with interest the pages of the second edition of Dr. H. B. Brown's book entitled *Cotton* and found, with a sense of pleasurable relief, that our labours were not wasted in any way.

Brown's book first made its appearance in 1926 and the present edition has been necessitated by the manifold advances made in the recent years in the domains of cotton breeding, study and control of cotton pests and diseases, and marketing and manufacture of cotton. The scope of the book is indicated by its sub-titles, which are as follows: History, Species, Varieties, Morphology, Breeding, Culture, Diseases, Marketing, and Uses. These sub-titles would give the reader a fair idea of the wide ground attempted to be covered by the book, which is profusely illustrated by graphs and diagrams and supplemented by tables containing useful data. Each chapter is followed by bibliographic references, for those who wish to pursue the subject further, to books and journals in which the subject-matter has been discussed at greater length.

Though the title of the book is perfectly general and a few references are to be found, scattered here and there, to non-American, especially the Egyptian varieties, the book deals mostly with the American cottons. Treatment on these lines may ensure continuity and impart an air of intensity; but,

on the other hand, it is bound to narrow down the usefulness of the book, especially to non-American readers, by omitting to take into account the work that is being attempted in other countries. Thus, to take a few examples relating to Indian cottons only, no mention is made of the work done in Bombay Province on wilt resistance, in Madras on pampheres, in the Punjab on the development of Punjab-American types or at the Technological Laboratory on the relationships between the fibre-properties and the spinning quality of cottons. This paucity of treatment of non-American cottons cannot be entirely due to want of space, because certain portions of the book, e.g., the history of Ely Whitney's litigations, are in our opinion unnecessarily discursive, and could well have been abridged without detracting from its value. Furthermore, the book contains, now and then, statements which seem to be the legacy of the past and remind one of the views sometimes expressed by old-fashioned practical carders and spinners. Thus, it is stated that "if their (fibres') diameter and twist or convolutions are uniform, they will fit together closely, thus making a strong thread". Actually, as anyone who has spent some time with a microscope on cotton fibres knows, uniformity of diameter or convolutions may be dreamt of as praiseworthy ideals, but are never achieved in practice.

In spite of these few drawbacks, to which we thought it our duty to draw attention, the book is a mine of useful information on most aspects of cotton, especially the American cottons, and the author has done well to bring out an up-to-date edition. There are certain chapters, such as those on economics of cotton production and cotton marketing, which should be carefully and widely read in India, where we have to learn a great deal from the experience gained in America. We can, therefore, confidently recommend this book, and hope that the new edition, like its predecessor, will find a place on the shelves of all those interested in cotton.

NAZIR AHMAD.

**Corrosion of Iron and Steel.** By J. C. Hudson. (Chapman & Hall, Ltd., London), 1940. Pp. 319. Price 18sh.

The annual loss to the world as a result of the wastage caused by the corrosion of



iron and steel is computed at more than several million pounds sterling. Although the evils of corrosion are commonly understood and have been known for ages, the problem of finding its causes, and steps to prevent deterioration of the metal due to corrosion is so complicated that until recently no scientific attempt was made for tackling it. About two decades ago, a Joint Committee was set up on behalf of the British Iron and Steel Institute and the Iron and Steel Federation to investigate this question. This Committee, consisting of eminent members of various Research Associations and practical steel makers and users, has, up till now, produced five valuable reports, which contain numerous experimental data collected from various service stations in different parts of the world, working under the control of the Committee.

The mass of information contained in these reports is so voluminous and of such detailed nature that it was felt that practical steel users, interested in corrosion, would have no time to go through these. The Committee, therefore, authorised one of its members, Mr. J. C. Hudson to publish a brief book on "the corrosion of iron and steel" giving a brief account of the reasons for corrosion, qualities of steel and iron that get most easily corroded, the agents of corrosion and finally the remedies to be adopted for minimising the effects of corrosion.

The earlier chapters of the book deal with the oxidation of iron and steel at elevated temperatures, the significance of rolling mill scale on the rusting process, and other corroding agents of iron and steel, *viz.*, atmosphere, sea-water, etc. Detailed account of the rusting of iron and steel in atmosphere and the practical suggestions given for prevention of this evil are full of interest. Use of low alloy steels containing small percentages of copper and chromium for steel structures, and various kinds of protective coatings for iron and steel are practical suggestions which should prove of considerable interest to designers of steel structures. As a result of elaborate investigations conducted by one of the Sub-Committees, detailed instructions have been suggested to the practical user of steel regarding the nature of paints to be used, the preparation before painting of the various steels to be protected, nature of inhibitive priming coats and finishing paints, as also compositions of suitable priming and finishing paints.

It may be of interest to users of steel

in this country that the premier steel producing company in India, *viz.*, The Tata Iron and Steel Company, have, during the last few years, put on the market a special non-corroding steel, called by name, 'Tiscor' used for various steel structures.

The remedies for prevention of corrosion against chemical attacks—a problem of great importance to chemical industries—are briefly referred to. Extensive types of steels which are generally recommended for this purpose, *viz.*, stainless steels, containing large percentages of chromium or chromium and nickel have been dealt with. A comparison is made of these special types of steel with the mild steel as also of ferrous and non-ferrous metals. The variations in the rate of rusting are noted.

The last few paragraphs give a clear description of the importance of fundamental research and laboratory work. The actual work conducted at the various research institutions and universities and the uses to which these results have been put to are all described in detail. An account of the field tests conducted in various countries—United States of America, Belgium, France, Germany, etc.—is also referred to. Further, a survey is given of the present state of knowledge of soil corrosion, as also of the atmospheric corrosion of wires and the corrosion of steel sleepers.

The concluding part of the book touches on what remains to be done for preventing rusting. The author recommends several improvements in painting procedure and suggests subjects for further research on atmospheric corrosion, soil-corrosion, marine corrosion, etc.

On the whole, any reader who glances through the book will be highly impressed with its extensive scope and the very efficient manner in which the mass of details worked out by the main Committee have been condensed into easily understandable matter. One has no hesitation in stating that the book should prove of great service to all who are to deal with the manufacture, fabrication or sale of ferrous products.

D. V. KRISHNA RAO.

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**Sedimentary Petrography.** By H. B. Milner. (Thomas Murby & Co., London), 1940. Third edition. Pp. xviii + 666, 100 figures, 52 plates. Price 45sh.

This well-known book has now reached a third edition. The second edition, published in 1929, had 514 pages, whereas the latest edition has increased to 666 pages of



a larger size (5" × 8½"). New detail has been added to all the old chapters, and chapters now appearing for the first time include one on physical examination by means of X-Ray Crystal and Spectrum analysis, Fluorescence, etc., and two on the study of soils and applied sedimentary petrology.

It is impossible to review in detail the wealth of material present in this book, familiar in any case to those who have used the earlier editions. Its author has not only added to knowledge of the broader principles underlying the distribution and provenance of detritals, but has worked extensively on the commercial applications of sedimentary petrology. It is this combination of research with purely scientific motives and research on economic problems which is so valuable, leading to an appreciation of what methods are ideally desirable, and what, as in the case of daily routine work in petroleum geology, are actually attainable. Particularly interesting chapters on the more academic aspects of the subject are those discussing principles of correlation and palæogeographical problems, while the practical applications are seen in accounts of oil sand differentiation and correlation, soil study, and applied sedimentary petrology. The asphalt industry building and cement technology, refractories, ceramics and even forensic geology are all briefly discussed.

Many of the methods outlined in this book take much time, and cannot be carried out by field geologists who, in the course of a single season, may have to examine igneous, sedimentary and metamorphic rocks, as well as ore deposits and problems of water supply. The final comprehensive study of the separate aspects of the field geologists' work tends increasingly to be handed over to a body of specialists, more or less permanently stationed in laboratories. There is perhaps a danger in this division of labour and specialisation, and in the multiplicity of elaborate devices required to establish the nature of a single grain, essential though such technique is. But specialisation has invaded geology in the same way as the other sciences, and for any adequate understanding of regional geology collaboration between field geologists and laboratory specialists becomes increasingly necessary.

In India, where distances are great and research grants in universities are small, research in sedimentary petrography would seem to offer increasing scope for students who cannot afford to carry out extensive

mapping in interesting but out of way places. It may be hoped that co-operation between the universities and the Geological Survey of India may further develop in the future. In the field of sedimentary petrography there should result valuable generalisations about the manner of formation of the Purana and Gondwana sediments. Oil companies have already done much work on the tertiary formations, but the results lie for the most part buried in competitive secrecy.

As is customary in Murby's geological publications, the illustrations are excellent. The photomicrographs of individual mineral grains are one of the most striking and helpful features of the book. It only remains to state that the latest edition of this book is essential for any research work carried out on sediments.

J. B. AUDEN.

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**Classical and Modern Physics.** By Harvey E. White. (Chapman & Hall, Ltd., London), 1940. Pp. 712. Price 21sh. net.

The title of this book may lead one to imagine that it is one of the now fairly numerous publications concerned with what is styled as a 'philosophical' discussion of the classical and quantum mechanical aspects of physics. Really, however, it is an elementary text and as the author puts it "a descriptive introduction" to the fundamentals of physics. Prof. H. E. White, who is the author of an excellent treatise on 'atomic spectra', which is much valued by all serious students of spectroscopy, has found time to produce an elementary text-book in which 'that phase of natural phenomena now classified as modern physics and atomic structure has been treated in greater detail' than is done in ordinary physics text-books. The treatment is mainly descriptive, all complicated mathematical processes including the calculus being scrupulously avoided. In addition to the usual subject-matter found in elementary texts, there are chapters devoted to X-rays, radioactivity, photo-electricity, cosmic rays, artificial atomic disintegration including the latest discovery of nuclear fission. The concluding sections of the book deal with astrophysics—the sun, the stars and the theory of relativity.

Each chapter deals with an historical account of the discovery followed by an experimental demonstration of the phenomenon, practical applications and a short account of the accepted theory. A set of questions and simple numerical problems



based on the subject-matter of the text are included at the end of every chapter. The book is profusely illustrated with excellently drawn sketches and good photographs. As a thoroughly sound and up-to-date elementary exposition of the fundamentals of physics, both in its so-called classical and modern aspects, the book under review will have few rivals. Teachers of physics in intermediate and technical colleges will find it an excellent reference book. The author has demonstrated that it is possible to present to the beginner the fundamentals of modern physics in an entertaining and intelligible manner, without using much mathematics. Scientists, whose specialised activity is in branches of science other than physics and who wish to gain a clear understanding of the essence of all present-day discoveries in the field of physics, will find this book of inestimable value.

C. K. S.

**A Text-Book of Sound for B.Sc. Students.** By R. N. Ghosh and R. N. Rai. (The Indian Press, Allahabad), 1940. Pp. 353. Price Rs. 5.

Advanced science text-books written by Indians to suit Indian conditions have been very rare in the past. It is fairly recently that the enterprising publishers of the present book started to remedy this defect by publishing the now well-known treatise on heat by Saha and Srivastava. This they followed up with Saha and Saha's *Modern Physics*, and other text-books have since been issued by the same firm. The present book is a welcome addition to Indian scientific literature, and is on the whole a praiseworthy attempt to put before B.Sc. students not merely a digest of older text-books but a good introduction to most of the modern developments in acoustics, both scientific and technical. The Calculus is sparingly used and the derivations of formulæ rest on a good discussion of the underlying physical principles. Occasional references to ancient Hindu ideas relating to the subject and some discussion of Indian music and musical instruments add to the value of the book. At the ends of some of the chapters brief biographical sketches of famous men of science who have enriched the subject of Sound have been given and photographs of some of these men enliven some corners of the book. The arrangement of the subject-matter is fairly logical but the many forward references to matters treated later on could reasonably be expect-

ed to be minimised. The get-up is good and the printing satisfactory, though we think Indian presses are capable of even better work. There is a large number of mistakes and misprints which require correction; we have made a list numbering about 60. Some faulty turns of expression such as: "we have described above the ear," "Aircrafts," "experiments were carried in a room," "cause the diaphragm to vibration," etc., incorrect spelling such as: "Tympanium," "Stethoscope," "Kriger Menzel," "Tortional," "Aelian," "Whetstone bridge," etc., and some wrong statements like "10 micro-watts or 100 ergs,"  $\frac{(\cdot 0002)^2}{40}$  ergs =  $10^{-16}$  watts," "g = force due to gravity," etc., require immediate correction. The matter included in the book, though highly interesting, may prove too much for adequate treatment in a B.Sc. class. But much of it may safely be left to the student himself to master, since the presentation is usually simple. In fact the book may be warmly recommended for the use of B.Sc. students; it really and adequately fills a lacuna that existed in the scientific literature available to Indian students.

T. S. SUBBARAYA.

**The Manufacture of Compressed Yeast.** By F. G. Walter. (Chapman & Hall, Ltd., London), 1940. Pp. viii + 254. Price 15s.

The commercial production of compressed yeast, an organism known to man for ages, is one of the brilliant achievements of applied science. To the man of pure science, this little, microscopic, unicellular organism, had offered one of the most fruitful and fascinating fields of scientific endeavour. Year after year, there has been a steady and ever-increasing stream of contributions to our knowledge of this organism.

Yeast has given mankind not only the time-old and exhilarating liquors but has revealed to the scientific investigator that it constitutes one of the richest sources of enzymes, vitamins and other fine biochemicals. Recent work has established the virtues of yeast therapy in the prevention and cure of some of the major deficiency diseases.

Thanks to these discoveries, the yeast, to-day, has attained the dignity of a commercial product and constitutes the principal raw material for a number of vitaminised foods and fine chemicals.

The volume under review is a contribution to the applied science of yeast



manufacture. The author has presented a comprehensive description of the various methods employed in the cultivation of yeast. The fundamental principles involved in each of the processes—mashing, wort making, aeration, etc.—are discussed and their application to large-scale practice illustrated.

The raw materials and their conversion into yeast foods and methods of enriching them, are described in a manner, extremely helpful and suggestive to the manufacturer. The author has given a description of the plant and for the more important units, the constructional details are presented.

This is an extremely useful and highly practical volume; yeast is a crop of great economic value to the community providing as it does, a rich and inexpensive source of an important class of vitamins, which might be employed for enriching and fortifying the vitamin-deficient diets of this country. India has the necessary raw material for the manufacture of compressed yeast, in the form of molasses. Those interested, in the conversion of molasses into a useful product, will find this volume indispensable.

M. S.

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**A Text-Book of Zoology.** By T. J. Parker and W. A. Haswell. Sixth edition. Vol. 2. Revised by C. Forster-Cooper. (Macmillan & Co., Ltd., London), 1940. Pp. xxiii + 758. Price 36sh.

With the growing need for a more up-to-date knowledge of Zoology, it was essential that the famous text-book known throughout the world as "Parker and Haswell" be revised and the first volume of the sixth edition of this work was reviewed in September last (*Curr. Sci.*, 1940, 9, No. 9, 425). A change in the contents as well as appearance was the natural result of this revision. The second volume (Chordata) follows the same plan. The type method of treatment for which the work has been so famous has been maintained and within the bounds of this general plan it has been possible to revise the text. And none better could have been found for this task than Dr. C. Forster-Cooper, who, by virtue of his position as the Director of the British Museum (Natural History) was most eminently suited to undertake it. It is clear that Dr. Forster-Cooper has been hampered by the limitations imposed on him by the general plan of the original work whose form he had to maintain and which has clearly imposed on him

a restriction of scope as well as of method. But for this, Dr. Forster-Cooper's work would have been even greater. But then, it would not have been "Parker and Haswell". He has however, boldly excised from the book the chapters on geographical distribution, Philosophy of Zoology, History of Zoology and such general considerations. It would have, for one thing, been impossible to condense these into the very little space available; for another, while there are a number of recent books dealing with the above subjects which place these general topics within easy reach of the student for whose standard "Parker and Haswell" is meant, no useful purpose would be served by incorporating these voluminous theories into a text-book. This has made "Parker and Haswell" a strictly morphological treatise, and that, we believe, was the original intention of the authors.

The first striking change that meets the eye of the student is the newer schemes of classification adopted in the book. Nothing causes more annoyance and confusion to the young mind than the diversity of nomenclature and classification that is met with in zoological treatises, some incorporating new ideas in classification, others fighting shy of them and retaining the old ones. It is here that a popular, useful and established text-book like "Parker and Haswell" can pursue as well as set a definite policy in the matter of the adoption of newer schemes of classification for lesser books to follow. Dr. Forster-Cooper has done this with distinctive success and it is hoped that much of the confusion caused by the multiplicity of the schemes will be dispelled.

Detailed considerations of Palæontology of vertebrates too would occupy too much space and would unnecessarily overburden the text and even here, newer publications specially devoted to this branch of study could easily be consulted by the interested student. This is especially so with regard to the extinct groups of fishes, reptiles and mammals whose forms are so many and so varied that not to deal with all or most of them would amount to not dealing with any of them. But Dr. Forster-Cooper has utilised our knowledge of these groups to summarize the present position regarding their interrelationships. The agnathous fishes have been dealt with at length and the number of recently described fossil forms have been treated in detail, because they form, for a clear understanding of the fishes



in general, a perfect introductory note. The classification of fishes has been revised and brought up to date.

Much light has recently been thrown on the structure of the skull of reptiles, both extinct and modern, and the temporal region of the skull provides the key for a correct understanding of the phylogeny of the group. In a series of diagrams drawn specially for the book, Dr. Forster-Cooper has shown the relative arrangement of the different bones of the skull in the several orders and has traced the ancestry of the avian and mammalian temporal regions. The lower jaw of the fossil reptiles is another feature which has lent itself for a discussion of the ancestry of higher vertebrates and Dr. Forster-Cooper has summarized our knowledge of the structure and phylogeny of the reptilian lower jaw.

The treatment of birds has not undergone any considerable change and in fact the rather limited scope of the work has precluded the consideration of the varied natural history and the diverse adaptations of these animals and the student is referred to one or the other of the numerous books on the subject. But, we ask, is any treatment of birds complete without an account of their migration, their parental instincts and their marvellous adaptations to different modes of life? In our opinion the book is the poorer for the exclusion of these interesting facets of bird life.

Mammals have received wide attention at the hands of the reviser. The young student's heart will jump at the enumeration in serial order of the characters of the typical mammal. A very detailed account of the Prototheria and Metatheria presents the salient features of these groups and provides the student with adequate information regarding these two zoologically interesting sub-classes.

In the classification of the mammalia the fossil groups like Allotheria, Triconodonta, Symmetrodonta and Pantotheria have been included along with the modern forms and brief descriptions of them have been incorporated in order to present an idea of the ancestry of the modern mammals. In fact the entire treatment of the mammalia is based on the underlying idea of the appearance in time of its different classes and presents a variation over that of the older editions. Thus the former Ungulata Vera is replaced by the Perissodactyla and Artiodactyla each of which has a different an-

cestry and each of which has been treated as an independent order.

The format of the book also has changed for the better. The page size is larger and so is that of the types. A wider spacing of the lines presents a better appearance and makes for easier reading. The addition of over a hundred figures has been necessitated by the augmented text. The reviser as well as the publishers are to be congratulated on the production of a useful and attractive edition of this famous book.

B. R. S.

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**Energy and Economics—A Plea for a New View-Point.** By Gilbert J. Fowler, D.Sc., F.I.C., F.R.San.I., F.N.I. (The Times of India Press, Bombay). Price 12 annas or 1sh.

To readers of *Current Science* this interesting brochure may present many familiar features. Dr. Gilbert Fowler in republishing the article originally contributed to this *Journal*, has furnished an "Introduction", two appendices and a supplementary bibliography relating to the subject of Energy and Economics. The Introduction, which summarises the views on the subject of a "new order" in the economic sphere, provides the most stimulating reading. It is obvious that in our society the unemployed, in the first place, are the scapegoats of an organisation which is unable to incorporate technical progress into its general social frame-work. For mechanical progress does not necessarily signify social progress. When society is thoroughly reorganised, economically and psychologically, and can keep pace with the advance of industry, is continuous improvement possible. Efforts must therefore be made to influence men to think ahead, to maintain the courage and sense of adventure which are so successfully used in the realms of service for the welfare of society. Dr. Gilbert Fowler has the faculty of thinking far ahead of his generation, and though his ideas for the economic betterment of society may at the present moment seem unorthodox, they are bound to create a general reformation in our concept of "money", "wages", "credit" and "production" which now under the influence and power of the financier, underlie all social unrest and upheaval. On page 8, there is a courageous and truthful utterance against the "money power", of England, in contrast with the German system of basing credit on the energy of the people. "It is here that the



world of science must be awakened." After all the problem of finance cannot remain long without being "brought within the domain of science or fundamental truth". "To a scientific thinker it seems absurd that the reward of any worker, be he a statesman or a scavenger, should depend on anything other than the value of his labour to the community." We agree with Dr. Fowler when he says that the solution for the social evils lies in the community control of money credit and interest and that no single individual or institution should be permitted to "affect the fortunes favourably or unfavourably of thousands of people," by "a simple manipulation of the currency". After a very careful and critical analysis of the affairs of men and money, Dr. Fowler announced the idea of the ERN, which he has elaborated in a series of articles distinguished alike for their clearness of thought and cogency of argument. "It is a definite measure of potential man power,—the daily nitrogen ration of an average human being with its equivalent energy, i.e., 10 grams of nitrogen and 300 calories of energy." Ultimately the world is bound to get rid of the tyranny of "money" and to adopt an international currency unit which would settle once and for all those factors which militate against our social and spiritual progress. Dr. Fowler has found the way. We must have the needful vision and boldness to tread that path—the path of fundamental truth.

**Experiments for the Haveli Project on a model of the rivers Jhelum and Chenab downstream of their confluence.** By Dr. N. K. Bose and L. Thakar Dass Gulati. (Punjab Research Institute Research Publication), 1940. Vol. II, No. 24. Pp. 58. Price Rs. 1-8.

Before undertaking the construction of the Emerson Barrage across the river Chenab, experiments were conducted on a model of the rivers Jhelum and Chenab downstream of their confluence with a view to investigate the best orientation of the weir at the proposed site, the best position and shape of the guide banks, leading diversion cuts to the weir and the height of training works and embankments.

The model was built to a horizontal scale of  $1/300$ , limited by the available land at Malikpur and to a vertical scale of  $1/50$ . A time scale of 10 min. = 1 month was found to give the best reproduction of the

1936 cross-section starting from the 1915 cross-section, when the model was run with different discharges based on a discharge curve prepared by taking ten-day averages from hydrographs of the two rivers from the year 1922 onwards. Silt of the same grade as in the river was injected, half a cubic foot of silt for floods bigger than 150,000 cusecs and quarter cubic foot for floods between 80,000 and 150,000 cusecs and no silt was injected for lower discharges.

Experiments were conducted to study the behaviour of the river during the construction, diversion and post-diversion periods. During the construction period run, the right outside ring between the weir site and the main river was attacked by the river during heavy flood and a radial spur was put in to protect the bund.

A retired embankment was thrown across the river and leading cuts were introduced upstream and downstream of the weir. The model was run for 5 years corresponding to 1939 to 1943—the discharges being those of 1929 to 1933. After the run, the river downstream of the weir was found to follow its old right-hand course. The right guide bank was undermined at the upstream and downstream noses. The main stream struck the weir centrally, passed around the noses of the divide walls undermining them and carried silt into the pockets and finally into the canal. Belas were formed on the inside of the right guide bank upstream of the right divide wall and in the right river pocket.

The right guide bank was modified and turned round to control the bela formation. In the next diversion run the mainstream was led through a cut 300 feet wide, cuts leading to the centre of the weir and to the sluices were each 150 feet wide and the downstream cuts were all 300 feet wide. The model was run as before for five years corresponding to 1939 to 1943. During this run, the left-hand branch of the river downstream of the weir and the right-hand branch above the weir developed, the bela formed in the previous run almost disappeared and there was no scour at the nose of the right divide wall. There was a deep scour at the nose of the left divide wall due to the main current entering the pocket from the right of the divide wall, instead of directly into it. This defect due to the river approaching the weir at an angle could be overcome by turning the weir-line through  $10^\circ$  to  $15^\circ$  about its right



end till the left end was moved upstream to the nose of the left divide wall when the weir would be normal to the main stream with the pockets getting a straight current.

The construction of the Emerson Barrage was started after the above experiments

were carried out. Model experiments not only indicated a suitable design but prevented the adoption of faulty designs entailing possible future expenditure on protective and remedial measures.

C. GOPALAKRISHNAN.

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## AGRICULTURE IN AFGHANISTAN

WE owe the following brief summary of the agricultural features of Afghanistan and of the directions in which development is possible to extracts from the report of the Indian Agricultural Delegation which visited that country in the year 1939. The area fit for cultivation is said to be less than a quarter of the total extent of the country which is 270,000 square miles, mostly mountainous in character. The average height is about 3,000 feet and the central valleys are over 6,500 feet above sea-level. The rivers flow through deep gorges, are snow fed and liable to sudden spates. A peculiarity of these rivers is that as they get farther from their sources they dwindle away and get lost in the soil. The average annual rainfall including snowfall is only between 12 and 15 inches and in certain places no more than 2½ inches. The climate varies between an Alpine one in the north-east to a hot desert one in the south-west. The soils are on the whole fertile and under irrigation yield an abundant harvest. Irrigation is from streams, springs and from what are called "kerezes". The inhabitants are engaged mostly in agriculture and pastoral pursuits.

It is as a fruit-growing country that Afghanistan has impressed the Delegation and many useful suggestions are given for developing this industry on proper lines. These relate to the introduction of citrus fruits and of loquats, figs, and canning peaches, of better varieties as regards both quality and yield, of improved planting methods and pruning and to the control of insect pests and diseases. Improvements in propagation methods are indicated with special reference to suitable stocks from East Malling and elsewhere. Alongside of the fruit-growing industry is stressed the need for developing the fruit-products industry and for this purpose a fruit products laboratory is recommended to be

opened under Government auspices. Among other crops, cotton has made great progress, the staple is suited for 60 counts and the crop is remarkably free from diseases and pests. Sugar beet is extensively grown and a beet sugar factory is under construction. Its progress will depend upon the extent to which diseases can be kept under control. Wheat is the most extensively grown crop but it is subject to both rust and smut; the breeding of higher yielding and disease-resistant types is recommended. Large tracts are under rice and the Delegation thinks that the area may be reduced and money crops like cotton, tobacco, fruit, etc., may be substituted. Experiments with a view to establishing the cultivation of cigarette tobacco are suggested and an increase in the cultivation of potatoes is recommended especially because the cold climate will enable the country to meet the large Indian demand for both seed and table potatoes admirably. Artemesia is growing wild and an examination of its quality as a source of santonin is suggested. As mulberry grows extensively in the country the development of sericulture forms another recommendation. Likewise attention is drawn to the introduction of the bee-keeping industry both as an aid to fruit cultivation and as an independent source of income. The cultivation of berseem is desirable for fodder and green manure and also as a source of seed supply to India. Irrigation, artificial manures, and improved implements are briefly touched upon, with a keynote of caution. The Delegation on the whole has been so greatly struck with the agricultural possibilities of Afghanistan as to observe that "Its agricultural potentialities are immense" and that "it is round agriculture that the future prosperity and well-being of the country will revolve".

A. K. Y.