

satisfactory equalisation of load. Another method through which the equalisation of power can be attained will be to utilise the rotation of the earth. The idea behind the proposal is to get power plants which are situated at different meridian distances in an east-westerly direction to co-operate systematically. An extreme case of such co-operation would be between a power plant which is situated on the extreme east of Asia and a similar one on the extreme west of Europe (Fig. 3). These power plants should work with a day and night displacement of 12 hours, in spite of the fact that according to absolute time calculations no time displacement exists. In this way night power in the extreme west of Europe could be transferred to day power in the extreme east of Asia

and *vice versa*. At present it is rather difficult to visualise so great a relative time displacement between the maximum load of similar power plants. But even with a time shift of 3 or 4 hours much can be gained, specially in electrical tramways and suburban railway services.

The exploitation of water-power resources is essential for the needs of India. However great the distances to be covered, there are no inherent difficulties from the engineering point of view that could not be surmounted. Industry and agriculture are both in need of a "grid scheme". Sooner or later the provision of a "grid" supply is inevitable, and the Government should look ahead and find the necessary capital for the scheme.

Reviews.

NEW PATHWAYS IN SCIENCE (Based on the Messenger Lectures of 1934). By Sir Arthur Eddington. (Cambridge University Press, 1935). Pp. x+333. Price 10s. 6d. net.

Six years have elapsed since Sir Arthur Eddington's "*The Nature of the Physical World*" was published. These years have not witnessed any revolution in theoretical Physics such as that represented by the birth of quantum mechanics. The time, however, has been utilized to take stock of the implications of the new theory and much that was obscure and changing has cleared and crystallized. Sir Arthur has seized the opportunity afforded by the Messenger Lectures delivered by him in 1934 to write a sequel to "*The Nature of the Physical World*" which bears the impress of this process of taking stock. On the other hand, recent years have produced astounding discoveries in the realm of experimental physics: we have had the neutron, the positron, heavy hydrogen and induced radio-activity coming in rapid succession before our astonished gaze. These discoveries have had their repercussion on the problems of Astrophysics so near and dear to Sir Arthur. We accordingly find in the present book a portion dedicated to the consideration of the internal constitution of stars and of the expanding Universe; another part describes the philosophical outlook of modern science as Sir Arthur interprets it. The connection between the Universe of the

Relativity theory and the atom of the Quantum theory which is the theme of Sir Arthur's theory of the fine structure constant is dealt with in another chapter. Incidentally we find a treatment of Probability and the Theory of Groups included. An introductory chapter will enable any one not conversant with the modern development of Physics to get a rapid acquaintance with the most recent discoveries. The subject is throughout treated in the charming pictorial style which we have come to associate with Sir Arthur. In spite of the difficult nature of some of the topics dealt with, even a layman will have a chance of understanding the direction in which modern Physics is advancing as viewed by Sir Arthur. The Indeterminacy Principle, Eddington's recondite theory of the fine structure constant, and the theory of Groups are all explained in such a lucid manner that we feel we have understood something of even these difficult matters. Sir Arthur thus provides an example of how even higher mathematics may be made intelligible to laymen.

This success in providing a popular exposition of such difficult subjects has, however, one drawback: the language is imaginative and picturesque, but the metaphorical statement sacrifices something of precision and the reader is likely to mistake a vague idea which he sometimes obtains for a profound understanding of the subject. Thus Pauli's principle that no two electrons

can have the same n , l , (s), m_l and m_s values has been presented in the form "No two electrons may occupy the same orbit." Since m_s is not connected with the orbit of the electron, we see how even a careful popular statement may lack accuracy. The same trouble arises in connection with the presentation of the philosophy of modern science: the figurative language very often confuses the thought. Sir Arthur has tried to answer such criticisms by protesting that a popular account should not be made dry-as-dust by hankering after precision. We do agree, but include a warning to the reader that he must also keep this in mind. We imagine that Sir Arthur's philosophy has been criticised by philosophers mainly as the result of misunderstanding the working convictions of a scientist for a profound philosophical system. Science does not attempt a philosophical system which can hold true for all its parts without any discrepancies. A view reached after studying a topic from a particular standpoint may not *exactly* represent the idea one gets by pursuing another subject by a method appropriate to the latter. If it has been shown that according to present theoretical possibilities of refinement in measurement in Physics, a certain amount of uncertainty necessarily attaches to the simultaneous values of two conjugate quantities, we can only say that Physics has for the present to be satisfied with a theory which tolerates and takes into account this uncertainty. But we cannot lay it down as a philosophical dogma that indeterminacy is at the bottom of modern scientific method. If we express the law of causality in the form that the same set of circumstances always produce the same phenomena, we see that the principle is the basis of all science. We may doubt our ability to produce the same circumstances or to be sure of their sameness when they are produced. Thus in radio-activity we cannot say which of two apparently similar atoms will explode next because we have no detailed knowledge of the real difference between them. But if we doubt whether the same results will always follow when *all* the conditions are theoretically supposed to be fulfilled, science and particularly experimental science would be at an end. This is the aspect which Planck and Einstein have stressed and Silberstein has elucidated in his book on causality. Whenever circumstances which are apparently the same produce different

results, we try to find out what other circumstance we have omitted to take into consideration and which was responsible for the difference in the results. Modern physical theory may not be able to rise above the uncertainty involved in the methods of measurement it can contemplate. It is therefore profitable to recognize this uncertainty, but it would seem as if a belief in the principle of causality was the driving force at the back of the never-ending striving after new knowledge. Since as Sir Arthur pertinently points out, science is not wedded to one self-consistent and immutable philosophical system, we may possibly add that it is fruitless to consider either the principle of causality or that of uncertainty as a philosophical dogma. Let us however employ the one as a working principle without being blind to the existence of the other in modern Physical theory. Sir Arthur has tried to show that adherence to the principle of causality is not demanded by modern Physics; but it may not be opportune to give up a principle which has been the basis of all scientific development, particularly since there is nothing in Physics which demands its sacrifice. A perusal of Sir Arthur's replies to his philosopher critics shows that he has taken his stand as a man of science to whom philosophical consistency is not the main consideration. If this point is grasped there is no necessity for any criticism regarding his having stated his convictions not always in the same terms. We do not profess to have penetrated the mystery underlying his theory of the fine structure constant, but recent discussions of the accuracy of grating measurements of X-ray wave lengths show that the experimental value of that constant is quite near the figure demanded by his theory and even the small discrepancy which remained appears now to vanish. Under these circumstances, we welcome the lucid exposition of the idea behind the formidable mathematics of his theory. And though one may not see eye to eye with the author in all that he says, one must welcome the appearance of such an able account of present-day problems and must recognize the not very common success with which abstruse subjects have been made intelligible to the common understanding.

T. S. S.

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GRAINS DE MATIÈRE ET DE LUMIÈRE:
PREMIÈRE PARTIE: EXISTENCE DES GRAINS

(12 fr.); DEUXIÈME PARTIE: STRUCTURE DES ATOMES (14 fr.); TROISIÈME PARTIE: NOYAUX DES ATOMES (7 fr.); QUATRIÈME PARTIE: TRANSMUTATIONS PROVOQUÉES (12 fr.). By Jean Perrin. (ACTUALITÉS SCIENTIFIQUES ET INDUSTRIELLES, Nos. 190, 191, 192 and 193. Hermann et Cie, Paris, 1935.)

All who have been charmed by the vivacious style and the beautifully clear exposition of Perrin's "Atoms" will welcome these monographs by the same master hand. There is the same verve and elegant presentation undiminished by the passage of years. It is interesting to learn incidentally from these books the part played by Perrin in the modern development of Physics. The first two parts contain an account of the structure of atoms and molecules presented in a fresh and logical manner without any mathematical details but including the results of mathematical arguments. The third gives an account of radioactivity while the fourth discusses the modern discoveries of the neutron, positron, heavy hydrogen and artificial radioactivity and the implication of these in the structure of nuclei. The treatment throughout the four monographs is from a modern viewpoint, the old problems being organically connected with the latest results. Towards the close are some interesting speculations about the structure of neutrons, protons and nuclei and the origin of cosmic rays. There is unfortunately a larger number of misprints than we should like to see. There are also one or two mis-statements such as the one which ascribes Compton's discovery to the year 1925 or which says that the atomic number of Pt is 77. These are, however, very minor matters. The fresh and unified presentation of the old and the new can elicit nothing but admiration; the range of topics includes the latest developments which cannot yet be found in any text-book. The books will no doubt thrill all readers into enthusiasm for the subject they treat and we heartily recommend them to scientific workers and lay readers alike.

T. S. S.

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AU DELA DE L'ÉLECTRON. By Sir J. J. Thomson, O.M., F.R.S. Translated by R. Fric. (ACTUALITÉS SCIENTIFIQUES ET INDUSTRIELLES, No. 211. Hermann et Cie, Paris, 1935.) Price 7 fr.

This is a translation of Sir J. J. Thomson's "Beyond the Electron" with a preface by M. A. Cotton. It is befitting that the discoverer of the electron should also try to

give us a picture of its constitution. Until recently the electron played a rôle only as a point charge but modern developments have made it necessary to probe into its structure. Though giving only a partial explanation, Sir J. J. Thomson's attempt to deduce the properties of the electron from a hypothetical structure is very interesting. The wave-like and particle-like natures of the electron are made to appear as necessary concomitants of its structure: the electron is supposed to have a double structure, one part consisting of lines of force where the energy is localised, and the other a train of waves in resonance with this and determining its trajectory. In this respect the electron appears to be somewhat similar to the wave-packet assumed by Sir J. J. Thomson in his theory of light. The mechanical and magnetic moments of the electron, however, do not follow from the theory, while the success of Dirac's theory was due to its explanation of just these properties. Now that Born and Infeld's theory of the electron as a singularity in the field appears so successful, it is very profitable to see how much a less formal and more intuitional conception can explain. As a contribution to this end, Sir J. J. Thomson's monograph deserves careful perusal and the present French translation will no doubt serve to draw more attention to this interesting attempt of Sir J. J. Thomson to extend classical ideas so as to furnish an answer to some of the questions which have so far found only a quantum-mechanical treatment.

T. S. S.

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PRACTICAL SOLUTION OF TORSIONAL VIBRATION PROBLEMS. By W. Ker Wilson. (Messrs. Chapman & Hall, London, 1935.) Pp. 438. Price 25s.

The practical experience gained by the author for several years in carrying out investigations on torsional vibration in different types of installations has been set forth in this book in a manner suitable for everyday reference. Those that are engaged in the design of high-speed engines, turbines, turbo-generators, internal combustion engines, marine installations, etc., will find the book extremely useful as the author has tackled every conceivable problem connected with their torsional vibrations. Every case discussed theoretically has been illustrated with an actual numerical example from practice and this feature adds to the value of the book a good deal.

Starting with the fundamental definitions, the natural frequency of torsional vibrations, position of nodes, and relative amplitudes for one, two, three, and multi-mass systems are calculated in the first chapter. The method of tabulating these results, taking as examples four typical engine aggregates, *viz.*, two types of direct-coupled generator and two types of marine installation, and the interesting deductions from these results, occupy a major portion of the second chapter and they are of immense value to the designing engineer and the draftsman. Practical method of tuning the oscillating system of a direct-coupled generator and the shaft system of a marine installation to produce a favourable disposition of critical speeds, are also given in the same chapter.

The oscillating systems of actual installations are, however, much more complex than the ideal systems usually discussed in books, and with a view to assist the designer in his attempt to reduce any system to the standard one, a fairly big chapter has been devoted to the calculation of equivalent masses, equivalent elasticities and equivalent systems. The determination of stresses due to torsional vibration at non-resonant speeds, phase and vector diagrams for multi-cylinder engines, stress diagrams and calculation of dynamic magnifiers are spread over two chapters and typical examples taken from Electrical Engineering and Marine Engineering practice, have been worked out.

Accurate measurements of torsional vibration amplitudes under service conditions have to be made to enable theoretical calculations to be checked and reliable damping factors to be established. The author has therefore given a full description and the method of using (1) the Geiger Torsiograph, (2) the D. V. L. (Deutschen Versuchsaustalt fur Luft fahrt) Torsiograph, (3) Rotational Decelerometer, and (4) Electro-Photographic Vibration Recorder. Torsiograph records for various engines have been given and the actual values obtained from these curves have been compared with the figures obtained from theory and any difference is accounted for.

In certain cases the natural frequency can be modified so as to secure a safe working speed range and for this four important methods are thoroughly discussed in a chapter. The amplitude of torsional vibration can be reduced by altering the position of the critical speed (1) by altering the torsional rigidity of the shafting, (2) by

modifying the dimensions and distribution of the attached masses, (3) by elastical connecting a supplementary mass to the main system at a point remote from the nodes, so that the natural frequency of the added system is equal to that of the original system, and (4) by addition of supplementary mass at a point remote from the node and connecting it to the main system so that there is a periodic variation of natural frequency or an automatic change of natural frequency at critical speeds.

Alternatively, frictional damping device or alteration of firing order, can be used.

The last chapter deals with the dynamic characteristics of electrical generating sets direct-coupled to internal combustion engines. Among other things, the procedure indicated for obtaining the flywheel effect necessary for the satisfactory operation of parallel running alternators driven by internal combustion engines, is particularly interesting.

On the whole, the book is as eminent practical as it is theoretical and a very useful addition to any Engineering Library.

In future editions, the explanation of all the notations might with advantage be given at the beginning of the book, instead of repeating them in each chapter, and also the numbering of all the equations in the book may be made continuous instead of according to chapter.

E. K. RAMASWAMI.

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THE PRINCIPLES OF ELECTRIC POWER TRANSMISSION BY ALTERNATING CURRENTS. (Third Edition.) By H. Waddicor, A.M.I.E.E. (Chapman & Hall, Ltd., 1935.) Pp. 449. Price 21s. net.

This publication is a revised and enlarged edition of the standard book on Power Transmission familiar to Engineers and Engineering students and is very useful for any Technical Laboratory.

The author has collected valuable information from a large volume of literature published from time to time including several standard publications of manufacturing firms of repute and given a systematic exposition of the principles of design of transmission lines and a comprehensive list of valuable references for the investigator and teacher.

The economic and fundamental electrical principles are treated in separate chapters and the calculations concerned are carefully worked out. The performances of short and long transmission lines are treated

separately with graphical and diagrammatic illustrations of the standard type. The various points of design and manufacture of conductors, supporting structures and insulating materials for overhead lines are treated in separate chapters, with full discussion of the various standard designs and their adaptability under different conditions. Voltage control by phase modifiers and prevention of dangerous currents are ably dealt with giving details and wiring diagrams of apparatus employed.

The chapter on underground cables deals in great detail with all the aspects of power transmission through underground cables and the latest developments in the design and manufacture of High Tension cables have been thoroughly discussed with very neat illustrations.

Pressure rises and protection against abnormal pressure rises is very well written and the practical Engineer as well as the teacher will find the book very interesting and useful.

R. P.

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EXPERIMENTAL PHYSICAL CHEMISTRY (Second Edition). By Farrington Daniels, J. Howard-Mathews and John Warren Williams. (McGraw-Hill Book Company, Inc., New York and London, 1934.) Pp. xix + 499, 140 Figs. Price 21s. net.

In this new edition, the general arrangement of the first impression has been retained. Part I which provides a laboratory manual stands greatly altered in that sixteen of the less satisfactory experiments have been omitted and nine new ones have been added. Amongst the additions are experiments on: molecular films on liquids, electrokinetic phenomena, distribution of particle size in an emulsion, the dilatometer in the study of reaction rates, galvanic cells with and without transference, the glass electrode, the heterodyne beat method for dielectric capacity and heavy hydrogen. In several of the exercises retained the experimental technique has been modified with a view to secure higher accuracy. Part II (which deals with apparatus found most suitable for advanced work or research on topics dealt with in Part I) has been slightly amplified with a view to keep pace with recent literature by addition of topics such as Heyrovsky's polarograph, Raman spectrum, vapour density balance, high vacuum technique, etc. The chapters on photochemistry and capacity have been considerably amplified. Part III dealing

with miscellaneous operations has been extended to include chapters on vacuum tubes and errors of measurement. One who goes through the book is greatly impressed by the number and variety of exercises and the adequate theoretical background for each of them. In view of the profuseness of the material it is to be regretted that no reference is made to the following: McBain's quartz spring balance (useful in studying solid-vapour equilibria), the determination of the thermal conductivity of gases and the construction of precision air thermostats. The importance of corrections (as determined by Harkins and co-workers) in the "ring" and the "drop weight" methods of determining surface tension could have been pointed out with advantage. In spite of these minor omissions the book would be highly useful to students as well as teachers.

K. S. GURURAJA DOSS.

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THE GEOLOGY AND MINERAL RESOURCES OF BURMA. By Dr. H. L. Chhibber, Ph.D., D.Sc., F.G.S., F.R.G.S. (Macmillan & Co., Ltd.) Vol. 1, Geology of Burma, pp. xxviii + 530. Price 30s. net. Vol. 2, Mineral Resources, pp. xv + 309. Price 18s. net.

The two volumes before us constitute a substantial contribution to our knowledge of the geology and mineral resources of Burma, a country which is so aptly described as "still a land of the future." Almost immediately after he entered on the teaching staff of the newly formed Department of Geology in the University of Rangoon under the direction of Dr. L. Dudley Stamp in the year 1924, Dr. Chhibber realised the need for a decent and comprehensive manual on the Geology of Burma, and soon resolved to supply this want himself. During the next few years he deliberately set out to qualify himself by travel, field work, and laboratory study for the efficient execution of this task; and the books now under review are the result of these labours. As Dr. L. Dudley Stamp says in his appreciative Foreword, these two volumes by Dr. Chhibber "represent a valuable combination of personal research and field work and a minute and critical examination of existing literature" on the geology and mineral resources of Burma.

Vol. 1 deals with the geology of Burma and is made up of 34 chapters covering about 500 pages in all. A few of these chapters have been written in collaboration with Mr. R. Ramamirtham of the Geology

Department, University College, Rangoon. The first 9 chapters deal with such aspects of general geology as River systems, Lakes, Earthquakes, Mud volcanoes, Denudation, etc. The next 17 chapters are devoted to the stratigraphy of Burma and contain a detailed and connected account of the constitution, classification, and characteristic fossils of the different rock formations in their stratigraphical order. The palæontological portions of these chapters have been read through and revised by such eminent palæontologists as Prof. A. Morley Davies and Dr. F. R. Cowper Reed. The remaining 8 chapters deal with an intensive study of igneous activity in Burma under such aspects as its relation to tectonics, variation in time and space, variation diagrams, etc. and in writing these the author has had the valuable criticism and guidance of such well-known petrologists like Prof. P. G. H. Boswell, Prof. A. Brammal and Dr. G. W. Tyrrell. The book concludes with two valuable appendices on the correlation of the geology of Burma with that of Malaya and Assam, the former by Mr. J. B. Scrivenor, late Director of the Geological Survey Department, Federated Malay States, and the latter by Mr. P. Evans, Geologist of the Burma Oil Co., Assam.

The second volume on the mineral resources of Burma is much smaller than the first and has about 300 pages, divided into 16 chapters dealing with the various kinds of deposits of economic value found in Burma—ranging from gem stones like ruby and sapphire to soils, road-stones, and building materials. Under each type of mineral deposit, an account of its geological and geographical distribution, and present methods of exploitation have been given, together with chemical analyses, statistics of production, etc. In a few cases valuable suggestions have also been made regarding the future development of some of these mineral deposits. In writing some of these chapters, the author has wisely taken the assistance of several competent men, and thus has secured a certain amount of authority for his work. For instance, the chapter on Petroleum is wholly written by Dr. L. Dudley Stamp; many of the statements made in the chapter on Salt have had the approval of Mr. E. G. Robertson, Chief Collector of Salt Revenue, Burma; and the chapter on Soils has been written in collaboration with Mr. S. P. Aiyar of the Burma Agricultural Service. It is well known that

from the point of view of mineral resources, Burma is undoubtedly the most important province of the Indian Empire; and we have no doubt that the present volume by Dr. Chhibber will be of great assistance to all those who are interested in the development of these mineral resources.

In both the volumes under review, at the end of each chapter numerous references to original papers have been given; and a perusal of the complete list of such references is enough to impress us with the extent and volume of library work which the author must have done in writing these volumes. With the subject-matter so nicely arranged and classified, and aided by the numerous and excellent illustrations so well reproduced, we have no doubt that Dr. Chhibber's volumes will long remain as valuable books of reference for those interested in any aspect of the geology of Burma.

On reading through the two volumes, we are, however, inclined to make a few observations by way of comment. In Vol. I we think that a good bit of the information of the kind given in the first 9 chapters, though interesting, is hardly necessary in a book of this kind, and might well have been cut out, thus reducing the entire matter to about half its present size, without in any way sacrificing the value of these chapters as an introduction to the study of the geology of Burma. It is also difficult to appreciate the propriety of such an intensive treatment of the igneous rocks of Burma as is embodied in chapters XXVIII to XXXIII. While we have no doubt that the information given in these chapters is of the most valuable kind, we still feel that such a detailed study dealing with igneous petrography and petrogenesis—though it be all relating to the rock types from Burma—has hardly a place in a book like this devoted to a general study of the geology of Burma. If however it is considered desirable or necessary by the author, to include these chapters for the sake of completeness, we might well ask why the same treatment should not also have been extended to the sedimentary and metamorphic rocks? With these concluding chapters in Vol. I very much abridged, and with a certain amount of general trimming in Vol. II in places where the present methods of mining etc., have been described in much too great a detail, we think it should have been possible for the author to achieve his original intention to cover in *one* volume both the geology and the mineral resources

of Burma; and this, we feel, would have been better.

In both the volumes again, we regret to see certain features in expression which are usually considered undesirable. For instance, in Vol. I, almost within a page or two, we see one and the same person variously referred to as "Stamp", "Dr. Stamp", "L. D. Stamp", "Dr. L. D. Stamp", and "Dr. L. Dudley Stamp". A locality is spelt "Nwetaung" in one place and "Ngwetaung" in another. In mentioning the fossils of the different strata, there is no consistency in the classification adopted. In one place (p. 150) Mollusca is considered as a unit of the same status as Hydrozoa or Anthozoa; while in another (p. 142) the name Mollusca does not appear but the three different classes of this phylum—Pelecypoda, Gastropoda, and Cephalopoda have been mentioned individually and each given the same status as the term Mollusca on page 150. On page 173 one cannot see why the phylum Arthropoda should come in between Pelecypoda and Cephalopoda; and on page 226 the term "Pelecypoda" which has been used so far is suddenly dropped and we get the term, "Lamelli-branchiata" instead. Similarly in mentioning the different species of a genus, no consistent procedure is adopted. In one place it is *Rafinesquina imbrex* and *subdeltoidea*; in another place it is *Orthis irrawadica*, *Orthis chaungzonensis*, *Orthis subcrateroides*; and in a third place it is *Productus cora*, *P. cylindricus*, *P. graciosus*.

There are also quite a large number of passages in both the volumes where it is difficult to understand exactly what the author means, where the construction of the sentences is rather loose and not altogether happy, or where the idea expressed is much too common place to be seriously mentioned. A few such examples from Vol. I are given below: "Some of them (lakes) are important because amongst the sediments with which they have become filled in are minerals of value, including oil shales and lignite. In the southern parts of the Shan States, one of the lakes formed in this way still remains; this is the Inle lake." (p. 40); *Aristocystis* "is one of the peculiar fossils of the Ordovician period." (p. 138); "Besides *Camarocrinus asiaticus*, *Lingula quadrata*, *Orthis irrawadica*, and *Plectambonites repanda* have been found in them." (p. 145); "But fortunately for Burma, there is within easy reach a whole series of richly fossiliferous Silurian

deposits of this period with their rich faunas." (p. 149); "Out of 26 species found in the Irrawadian series, six are entirely of aquatic habit and two are semi-aquatic. Seven to nine lived chiefly in marshy swamps, while the remaining eight are identical with Indian Siwalik forms. Out of the 26 species, 11 at least are identical with the India Siwalik forms." (p. 254); "The origin of fossil wood is due to colloidal material associated with waters laying down the deposits in which it is preserved." (p. 256); "It was not until late Cretaceous or early Eocene times that the subterranean fires once more awoke to vigorous action". (p. 291): "In each case there is little remaining evidence to show the action of the igneous rock upon the soft sands and clays through which it passed, due partly to the rapid rate at which these beds are denuded, but at the same time, had these intrusives been accompanied by heat then the beds in contact would have shown some indications of metamorphism." (p. 393); "In the absence of fossils it is very difficult to announce the age of a formation." (p. 470).

In Vol. II we have: "When these mines are active Shan women wash for gold as they do at present in the jade mine area, while their male relatives work for rubies and other gem stones." (p. 14); "In places it (gabbro) is so fine grained and granulitic that, without the aid of a microscope, it is difficult to distinguish externally from basalt." (p. 38); "Quartz is visible in thin sections but is very subordinate, and the rock appears to be a quartz diorite. The felspar is very largely altered, but however plagioclase is predominant." (p. 40); "A stray labourer might search for jadeite boulders from the bed of the stream. This is a laborious task as the man has not uncommonly to stand in water, about thigh deep all the time while, as a rule, the reward of his exertions does not arrive very promptly." (p. 65); "The average double prismatic cleavage angle is 87.3, while it varies from 85.2 to 89.0, depending upon the angle at which the crystal is lying in the section." (p. 67); "It is noteworthy that in sales and valuations, prices are not mentioned openly, but are indicated by a conventional system of finger pressures under cover of a handkerchief." (p. 78); "A considerable quantity of stone is smuggled across the border in addition to the small amount officially carried over by mules, which return from Burma to Yunnan and China with the advent of the rainy season." (p. 79); "The cutting

(of jadeite) is done with steel wire ; generally two of three wires are plied together. The boulder rests on a wooden frame and the saw is worked by two men sitting at either end. On one side there is a small basin containing coarse carborundum powder and water, and during cutting this moist paste is continuously poured on to the boulder by means of a long rod either by one of the workmen or by a small apprentice boy." (p. 81); "The country has undergone secular changes of depression, evidenced in the coast line and interior, followed by upheaval." (p. 177); "It (Mica) is associated in a medium grained pegmatite with a micrographic intergrowth of quartz and felspar. The author had a small pit dug to a depth of about 6 feet and found that mica continued to that depth." (p. 239); "With the invention of the internal combustion engine, it is becoming essential for the development of a rice country like Burma to possess a good system of roads, linking her main river systems with the railway termini and sea ports." (p. 87).

In pointing out some of these irregularities in expression and in quoting at some length these examples of what appear to us as unhappy in diction, let not our intention be misunderstood. We have nothing but praise and admiration for the great trouble which Dr. Chhibber has taken in compiling these two valuable volumes; we are however anxious at the same time that in a great work of this kind produced by one of us, there should be nothing which will tend to let it down in the estimation of the scientific public in India or abroad.

L. RAMA RAO.

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MANUAL ON THE AIR-SEASONING OF INDIAN TIMBERS. By S. N. Kapur, B.Sc., Ph.D. A.I.C., A.M.I.Chem.E., Officer-in-charge, Seasoning Section, Forest Research Institute, Dehra Dun. (Delhi, Manager of Publications, 1934.)

The seasoning of timber is a very important subject, which has suffered from undeserved neglect in India, considering her vast timber resources and the necessity for properly conserving them. In Europe and America, the old-fashioned method of air-seasoning has been superseded to a very large extent by the modern processes of kiln-drying. In India, however, for some reason or other, air-seasoning is the only method practised to any large extent. Even this method is not followed in an organized, scientific manner and haphazard methods of seasoning are responsible for the loss of large quantities of valuable timber. Mr. Kapur's book is therefore a very timely and useful publication.

The first part of the book is devoted to a general description of the principles and methods of seasoning timber. Among the important topics dealt with are:—Methods of Determining Moisture in Wood, Shrinkage and Moisture Relation of Wood, Mechanism of Wood-Seasoning, Seasoning Defects and their Causes, Water-Seasoning, Requirements of Air-Seasoning and Practical Methods of Stacking Timber for Seasoning. Each of the topics is briefly but very clearly dealt with and illustrated by numerous excellent plates.

The second part of the book is entirely devoted to an account of the air-seasoning characteristics of 120 of the commonest species of Indian timber. Directions about the proper methods of seasoning are given for each species. As these are mostly based on experiments by the author and his colleagues at the Forest Research Institute, they will be found very useful by all who are interested in the subject.

The printing and get-up of the book, and the illustrations are excellent. The author deserves to be congratulated for writing a very useful and instructive book on this important subject.

C. V.

Errata.

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Page	Column	Line	Read	For	Page	Column	Line	Read	For
341	1	56	Mergui	Murgyi	345	2	12	Na HKyam	Nam Hkyam
343	2	9	Adam's	Alam's	345	2	13	<i>Xenaspis</i>	<i>Xenorpis</i>
344	2	7	Uru	Uri	345	2	19	A new genus	The new
345	1	47	Trauth	Trouth				of the genus	genus
								<i>Hungaritidæ</i>	<i>Hungoritidæ</i>