

REVIEWS

Lehrbuch der Theoretischen Physik. Von Prof. Dr. G. Joos. (Dritte Auflage, Leipzig), 1939. Pp. 704. Price 24 R.M.

This third edition of the well-known book on theoretical physics by Prof. Joos is a marked improvement on the old editions in subject-matter as well as manner of presentation. In making these improvements the author has throughout kept in view the aim, mentioned in the *Foreword* to the first edition, that the contents of the book have been determined by taking into consideration the needs of the experimental and technical physicist.

In the present stage of the development of theoretical physics it is easy to write a book on the subject without any physics in it! It is perhaps equally easy to go to the other extreme and present all the theory needed by the experimenter in a ready-made form without going into the actual physical significance of the theory. While one could justify the statement "An ounce of experiment is worth a ton of theory" on some grounds, it is also possible to justify the opposite statement "An ounce of theory is worth a ton of experiments" on other equally reasonable grounds. Here, as elsewhere, it is the compromise between these two extreme view-points that is at all likely to succeed as the correct method of presentation for the *understanding* of both aspects of the subject. This is the method adopted in Prof. Joos' book, and it has succeeded admirably in the elementary plane to which the author has confined himself.

The brief and clear account of nuclear physics running to about 20 pages is a welcome feature of the book, and the author has taken care to include the most recent topics like the β -decay and the neutrino hypothesis, and even the mesotron. Similarly there is a short account of the theory of ferromagnetism which is of such great practical significance and has been subject recently to intensive theoretical development. The author's aim in presenting these modern topics has been that "klare erkenntnisse bedürfen nicht vieler Worte zu ihrer Übermittlung".

To write a text-book on theoretical physics is a task of great complexity. Further, to

write an elementary book which is not altogether unwieldy, and which does not omit essentially important things, appears to be an art by itself. This volume before us running to 700 pages shows how this can be done successfully. No elementary course on theoretical physics which does not prescribe Joos as a text-book or a book of reference is worth anything at all.

B. S. MADHAVA RAO.

Fluorescence Analysis in Ultra-Violet Light. By J. A. Radley and Julius Grant. Third Edition. (Chapman & Hall, Ltd., London), 1939. Pp. xvi + 424. Price 22/6 net.

That the authors should be called upon to publish a third edition of this book within six years of its publication, is in itself an indication of its usefulness and interest to a wide public.

Part I of the book deals with the theory and technique of the method in a simple manner; the newer developments in the production of steady sources of ultra-violet light and in the preparation of light filters have received due attention. Part II deals with "the applications of the method to a large and varied number of ramifications of pure and applied chemistry". Indeed the scope of this method of analysis appears to be amazingly wide; and in the hands of an experienced worker, the observations can lead to safe conclusions. It may be of interest to note certain typical practical applications:—

"Fish and meat show a marked change in fluorescence due to bacterial action."

"Edible and poisonous varieties of mushrooms are detectable."

"So strong is the blue fluorescence of margarine that its presence to the extent of 15% can be detected in butter."

"The preservatives, boric acid, salicylic acid, sulphur dioxide, hypochlorites can be detected when present in 10 p.p.m."

"Lubricating oils can be tested with a view to find out their relative gumming tendencies."

"A mammoth's tusk carved to depict a woman found in some pre-historic dwellings was proved by Franz to be

the untouched work of a carver of the glacial period."

"It is claimed that polluted water containing proteins and ammonia can be readily distinguished from pure water."

"In a fatal case of calendine poisoning in which the chemical and the botanical examination gave negative results, ultra-violet light produced a marked yellow fluorescence in the intestines which was similar to that produced by the juice of calendine."

The method has yielded exceedingly interesting results in legal and criminological work relating to the identification of inks, finger-prints, stains, seals, adhesives, erased writing, forged signatures, repairs and over-painting of old pictures, drugs in body fluids, etc.

The book deals with these practical applications in an exhaustive fashion. The references have been carefully shifted and are up to date. The authors, however, very rightly point out that though "in the early days the results were so encouraging that this method was hailed as rapid, accurate . . . and for many purposes, indispensable to the analyst . . . maturer consideration showed that the accuracy was limited and the reproducibility dependent on strict standardisation of working conditions."

With this caution, this book may be recommended for use not only to all analytical chemists, but also to pure scientists who are interested in the interaction of light and matter.

J. C. GHOSH.

A Text-Book of Heat. By H. S. Allen, M.A., D.Sc., F.R.S., and R. S. Maxwell, M.A., B.Sc. Part II. (Macmillan & Co., Ltd.). Pp. 531-848. Price 10s. 6d.

It is with intense pleasure that I have read the II Part of this beautiful book on Heat. It starts with the Laws of Thermodynamics and after dealing with convection and radiation, proceeds to treat of statistical methods and the quantum theory. The treatment of the First Law of Thermodynamics is lucid and adequate, and calls for no special remarks. Chapter XXIX begins to explain the Second Law—admittedly more difficult—and deals with the pioneer work of Sadi Carnot, whose argument was described by Joseph Larmor (1918) as "perhaps the most original in physical science, whether as regards simple abstract power

or in respect of grasp of essential practical principles". It is well stated that whilst the first law asserts the equivalence of heat and energy the second is concerned with the 'method' by which heat can be transformed into mechanical work, and the 'direction' in which natural processes occur (p. 603).

The law is given in its negative form, and since it is proverbially difficult to prove a negative, we have to be satisfied with the assurance that the law is in harmony with our general experience (p. 604). Later on, however (p. 628), Clausius is quoted, stating the law in its positive form in the famous words: "The entropy of the world tends to a maximum", which are equivalent to Lord Kelvin's dictum: "The available energy of the world is tending towards zero" (p. 631). Now, since the available energy in the universe has not yet reached zero, one is led to conclude that either the world must have had a beginning, or its energy must be infinite, or an outsider must have interfered with the cosmic processes. But if the world's available energy is infinite, it is somewhat difficult to understand how it can tend to zero. Therefore, excluding the third hypothesis, one would say that the world is not eternal. The authors seem to have been afraid of these metaphysical depths, and have tried to save themselves by subscribing to G. N. Lewis's assertion that increase of entropy "corresponds merely to a loss of information with regard to a state of a system and is thus a purely subjective concept" (p. 815). These are dangerous words, and one wonders what would remain of physical science, if they were followed to their last conclusions. Apparently less sweeping is R. A. Millikan's remark that from the second law we cannot deduce the 'heat-death' of the universe (and its corresponding beginning), for it is not legitimate to make a sweeping generalisation from man's experience on the surface of the earth to the universe in all its parts (p. 815). Hence one would say that there are parts of the universe where, what Oswald calls perpetual motion of the second kind is not impossible (*cf.* Planck's *Treatise on Thermodynamics*, transl. by Alex Ogg, 1927, Part III, pp. 79 and ff.).

The authors state very clearly Boltzmann's relation between entropy and probability, and explain that Boltzmann's constant is to be regarded 'universal', *i.e.*, having the

same value for any system that may be chosen, no matter whether one chooses a terrestrial or a cosmic system. But if we accept Millikan's remarks, we confess we feel less confident about this asserted universality, as well as to the universality of Planck's constant and many recent conclusions of Astrophysics.

In some parts of the book one notices a very close connection with G. Castelfranchi's *Modern Physics*. (I have at my disposal only the IV Italian Edition of 1934. Hoepli, Milano.) Cfr. for instance the authors' treatment of Debye's Theory of Specific Heat (p. 779) and Castelfranchi's treatment. The similarity, however, may simply be due to the fact that both have made use of Debye's original *Memoir*. Yet one regrets that while Castelfranchi deals at sufficient length (pp. 430 and ff.) with the quantisation of rotary motion as suggested by Bjorrum and Schwarzschild, which throws some light on the behaviour of specific heats, our authors are silent about it.

But, in spite of these criticisms, one must end with a note of admiration for the clarity, painstaking diligence and accuracy with which the authors have acquitted themselves. Their task was not easy. They have done it well. Nothing need be said on the get-up of the book, which reaches the excellence which is usual with Macmillan & Co.

D. FERROLI, S.J.

An Introduction to Chemistry. By A. H. B. Bishop and G. H. Locket, Oxford. (Clarendon Press), 1939.

In writing this book the authors have attempted to meet an insistent demand for a sound introduction to Chemistry, and have succeeded most admirably. A text-book for high schools must be brief, clear and cheap, and the present introduction certainly satisfies the first two tests, and probably the third as well. The matter is well set out, the diagrams are neat, the plates are fine and the charts present a good bird's-eye view of the matter. To select a few points for special praise: The essentials of Dalton's contribution to the building up of Chemistry are clearly stated, and the point where his theory stops short is indicated (pp. 76-79). The various natural processes by which nitrogen in air is brought into combination with other elements are well described and the importance of these processes is explained (pp. 152-59). The interest and activity of

the students is stimulated. Cfr. for instance, the questions on the action of nitric acid on metals (p. 146).

The Clarendon Press has done its work very well indeed.

D. FERROLI, S.J.

Quantitative Zoology—Numerical Concepts and Methods in the Study of Recent and Fossil Animals. By G. G. Simpson and Anne Roe. First Edition. (McGraw-Hill Publishing Co., Ltd., Aldwych House, London, W.C. 2), 1939. Pp. 414. Price \$4.

Broadly speaking, the general Zoologist normally exhibits a natural dislike to the use of mathematical methods involving the application of complicated formulæ. The authors of this interesting book have made an earnest attempt to kindle interest in the use of statistical methods in the hope that zoologists may not 'lose sight of the purpose of his study'. Throughout the book emphasis is laid on methodology of zoology than on mathematical statistics. This volume will be of considerable help in zoological laboratories where extensive numerical data are available for study.

The volume is well got-up and we recommend the book to all zoologists.

A. S. R.

An Introduction to the Vertebrates. By L. A. Adams. Second Edition. (John Wiley & Sons, Inc., New York; Chapman & Hall, Ltd., London), 1938. Pp. 479. Price 17/6 net.

The progress of zoological knowledge in all its specialised branches has taken such enormous and rapid strides in recent years that the sphere of zoological research has considerably enlarged. Recent advances in Embryology, Palæontology and Cytology have thrown considerable light on the problem of elucidating genetic relationships and any attempt to present a comprehensive picture of animal life from a comparative standpoint is likely to meet with greater success and scientific precision in the light of these recent advances in knowledge.

In various Universities, both in India and abroad, schools of Comparative Anatomy and Embryology have been established and it is essential for higher zoological studies, to have a background of Comparative Anatomy of animals—a knowledge to be checked and

verified in the light of Embryological, Palæontological and Cytological studies.

In the wake of such remarkable progress there have appeared excellent treatises on Comparative Anatomy of Vertebrates and Invertebrates. However, there are very few books which present the subject-matter in a manner suited to the needs of a beginner in Zoology. Adams has, therefore, rendered a signal service to the students of Zoology by bringing out the book under review.

The book under review is divided into three parts. The first part gives an outline of the characteristics on which the modern system of classification of Chordates is based. This part is fairly comprehensive and gives a clear outline of the leading characters with typical examples.

The author devotes the second part of the book for a detailed description of the different systems of organs from a comparative view-point.

In part three, the author deals with the different classes of Vertebrates and gives an analysis of the anatomy and specialised characters under each class.

An interesting feature of the book is the resume which we find at the end of each chapter and the glossary at the end of the book which, we are sure, are valuable aids to the students of Zoology.

The book is well illustrated with a large number of line drawings and the get-up is very good. We have no hesitation in recommending the book to all students of Zoology.

A. N. R.

Tetrapod Reptiles of Ceylon. By P. E. P. Deraniyagala. (Colombo Museum, Ceylon), 1939. Pp. XXIX + 412 with 24 plates, 137 text-figs. and 62 tables. Price Rs. 10.

Under the auspices of the *Ceylon Journal of Science*, the first volume of the Tetrapod Reptiles of Ceylon is just published and we need hardly say that herpetologists will welcome it as a most outstanding contribution to our knowledge. The author, Mr. P. E. P. Deraniyagala has been engaged in the study of reptiles of the Island for a long time and his researches have been published from time to time in the *Ceylon Journal of Science* and in the book under review, a large part of the matter and figures are from his original papers.

In the part devoted to Introduction, the author deals chiefly with local herpetology,

zoogeography, definition of reptilia, economics and classification, while in the latter part, the orders Testudinata (comprising Athecoidea and Thecophoroidea) and Emydosauria are detailed. Among the Testudinate chelonians, the genera Dermochelys, Lepidochelys, Caretta, Eretmochelys, Chelonia, Melanochelys, Testudo and Lissemys and among the Crocodiles, the genera Crocodylus and Oopholis are represented in Ceylon. Exhaustive descriptions of colour, pholidosis, osteology, food, secondary sexual characters, reproduction and some developmental stages of Testudines are given. Out of the chelonians only the rare circumtropical Dermochelys is the athecate form, of which we knew so little till now. The animal shows certain features of primitive nature, combining at the same time, some aquatic adaptations. Of the former the lizardlike scaly covering of the young, archaic skull and pelvis, osteodermal corselet and ridges of the adult are prominent, while the streamlined body with terminal limbs, the absence of claws and the presence of web would characterise the latter. Two loggerhead turtles, Lepidochelys and Caretta occur in Ceylon and the former genus was thought to be cospecific for a long time with the Atlantic Caretta and it was first shown by the author recently that they differed considerably osteologically. In Carettidæ, the second pair of ribs is covered by the second pair of costal scutes and in Cheloniidæ, it is the first pair of costal scutes that covers. The Ceylon form is now differentiated as *C. caretta gigas* from its Atlantic congener *C. caretta caretta*. The breeding range of chelonians appears to be identical with the range of Coral growth. While some stages of the development of Lepidochelys are described, nothing is known of Caretta. Among the enemies of turtle's eggs, mention is made of monitor lizards, wild boar, dogs, leopard and man while the young fall a prey to cats, gulls, herons and crows. The hawk's bill (*Eretmochelys*) is important because of its valuable scutes,—the "tortoise-shell" and is therefore commercially exploited. In this, the second costal scute covers three costal plates. The green turtle (*Chelonia mydas*) is prized exceedingly because it affords appetising curry. This is the only marine turtle where the young has a white plastron as in the majority of scuteless aquatic forms. Amongst others, a very interesting variation is recorded where a single adult was

scuteless and smooth-skinned. The burrow-dwelling *Melanochelys* exhibits variations in the corselet shape. There are two subspecies, *M. trijuga thermalis* and *M. t. parkeri* sub. sp. nov. Like the former subspecies, *t. parkeri* is also essentially a terrestrial form. Among the land tortoises, *Testudo* (*Geochelone*) is most striking by its black and yellow stellate patterns. "Its shape possibly prevents carnivores obtaining sufficient purchase for their jaws to crack this protection and also serves to store a considerable amount of peritoneal fluid which apparently assists the animal to withstand the rigors of prolonged drought, which does not cause any appreciable mortality in this species." Two races of this are represented in Ceylon. In many adults the quadrate and jugal have fused in the skull to form a great part of the zygoma and sometimes a contact between prevomer and parasphenoid appears. This tortoise buries her eggs and probably revisits them. *Lissemys*, the soft terrapin is monotypic with 3 or 4 subspecies, of which *L. punctata granosa* is native to Ceylon. The Indian specimens of *Lissemys* is indistinguishable from the Ceylon forms except in the possession of a somewhat smaller entoplastral callosity and a tendency for the corselet to ossify less rapidly than in the latter.

The two representatives of *Emydosauria* in Ceylon are *Crocodylus palustris kimbula* and *Oopholis porosus*, the latter of which was brigaded under *Crocodylus* for a long time. It is noted that the Osteodermal armature would form a more stable character of taxonomic importance. The Indian Crocodile is separated from the Ceylon swamp Crocodile and is called *C. palustris palustris*. This lives "usually if not always above the limits of salt water". The author remarks that the Indian Crocodile avoids man, but this is not always true, for man-eaters are however reported. The eustarine *Oopholis* is definitely a man-eater. Some stages of the development of these Crocodiles are reported and it is noted that the reproduction of *Oopholis* discloses embryonic phases of considerable taxonomic importance.

In dealing with the cranial bones, the author remarks that in *Testudinata*, postfrontals are absent and labels in his figures (17, 58, 69, 95) a bone as "postorbital" which other authors have considered to be a postfrontal. How exactly this author has come to adopt this nomenclature, it is difficult to

say. At any rate in a recent book on Vertebrate skull, the chelonian bone referred to above is designated as "postfrontal". Moreover, an interparietal is also recorded in Crocodile. The choanal opening on the ventral aspect of the Crocodilian skull (p. 311, p. 330) is not indicated.

As regards the figures, by way of criticism we need only remark that it is with great difficulty we could read the magnification (fig. 26, p. 58) and labellings in some (fig. 24, p. 54; 58, p. 145; 116 (b), p. 307) and we hope these will be set right in the next edition.

Apart from these, the book is so crammed with information that no herpetologist could afford to be without one and rightly does Prof. J. Gardiner point out that "To the Zoologist this monograph will be a pleasure enabling him to dip deep in his search for law in correlation of structures and habits while the naturalist will gain all he desires". While congratulating the author, we have no hesitation in recommending it to every student of Zoology. L. S. R.

Study on the Legal Position of the Illegitimate Child. (Series of the *League of Nations* Publications IV.—Social Questions, IV, 6, Geneva), 1939. Pp. 27.

Whatever the League of Nations might or might not have achieved in the field of the political life of humanity, it has certainly rendered meritorious service in the cause of the solution of many outstanding social problems, both in the matter of creating right sort of public opinion by offering the reading public detailed information regarding the nature and solution of such problems in the different nations of the world as well as in more directly using its prestige in moving various governments to take definite measures. Of these social problems, those connected with children, naturally claim our peculiar attention. The volume before us is concerned with one of the problems concerning children. In most societies, there are large groups of persons towards whom, the society has assumed rather cruel attitude. Illegitimate children are, perhaps, the worst and the most undeserved sufferers from this attitude. The work under review gives an historical outline of the social and legal aspects of illegitimacy and then presents the contemporary legal position of the illegitimate child and its claims against its father and mother. Further, we are told,

how official documents in various countries have been tried to be reproduced without indicating illegitimacy. We are also told what is being done regarding guardianship of such children. Protection of mothers of such children is a relevant topic as it affects the health and well-being of these children and is specially treated in one chapter. Finally, a large amount of statistical information regarding the percentage of births in different countries and infant mortality rates among illegitimate children is summarised and also presented in the appendix.

An illegitimate child may be described as one born or probably conceived out of wedlock. Such a child may be born to an unmarried woman or to a widow, to a concubine or to a prostitute. The last category of illegitimate children may be left out of consideration both because there are many special circumstances as well as because the number is likely to be small. Illegitimate children born to concubines have always been treated by society with a little more consideration than other illegitimate children. It seems that the various disabilities, social and legal, against illegitimate children are intended to preserve the sanctity of the marriage tie; but in practice it is clear that the social attitude towards such children gave a sort of a licence to the male for extra-marital sex-intercourse with impunity. If such attitude protected the marital tie any time, to-day, at least, when we find that in some countries illegitimate births constitute 50 to 70 per cent. of all births and in many countries they constitute 20 to 30 per cent., it can hardly be said to have any influence on marriage tie.

That illegitimate children have a very bad time of it from their very birth—nay, even in the pre-natal condition—is clear from the high infant mortality rate, higher by 50–100 per cent. than the infant mortality rate among the other children. And this when the progress of legislation and provision of communal care on behalf of illegitimate children has gone so far that the present position is summarised in the book under review in the following words: "In many countries, the position of illegitimate children is coming to resemble more and more closely that of legitimate children." To offset the effects of the social stigma attach-

ed to illegitimacy, legitimation is the procedure allowed and adopted in many countries; maintenance rights are guaranteed in most and retention of the child with its mother is attempted in many countries. Nevertheless the circumstances of illegitimacy are such that in a number of countries it is found necessary to appoint official guardians for such children and even to place them in families. This shows that in these countries, and even in others, the distinction between the legitimate and illegitimate children remains marked though the actual conditions of living are ameliorated. The problem, it appears to the reviewer, is not a problem merely of amelioration but one that requires a radical treatment.

The actual number of illegitimate children being born every year must be very large indeed and the enormity of the problem would have been more poignantly brought to the notice of the reading public if these absolute figures were presented. In one of the previous publications of the same organization we read that in Germany alone in the year 1930 there were as many as six lacs of illegitimate children under communal care. The annual placements of illegitimate children in various countries would have enabled us to understand the extent to which the social attitude towards them is changing but the figures are nowhere given in the book. The procedure adopted in this book of presenting the material under various categories is not conducive to a proper understanding of the problem and the authors of the book themselves are at a loss to understand the causes of the varying rates of illegitimacy in different countries. If it is borne in mind that even the concept of illegitimacy is not uniform in all the countries, it will be readily admitted that the older procedure of presenting the material by countries rather than by these categories is decidedly better. The annual number of legitimations taking place in each country, if presented, would further enhance the understanding of the problem. In short, the reviewer is sorry to see that though much of the material is valuable there is no attempt to present an organic picture with a view to help radical understanding of the problem.

G. S. GHURYE.