In recognition of the occasion the Physiological Society had appointed Dr. K. J. Franklin to write "A Short History of the International Congresses of Physiologists." This excellent record appeared in the *Annals of Science* for July 15th and in reprint form was presented by the society to all members of the congress. The "History" is appropriately dedicated to "Charles Scott Sherrington, one of the general secretaries of the congresses from 1892 to 1907, who by his experimental demonstrations at successive meetings and by his personal encouragement of younger physiologists has for half a century put into practice the principles laid down by the founders of the congresses."

The Zurich congress was notable for its observance of the principles of simplicity which Michael Foster and others insisted upon at the early congresses: a minimum of pomp and ceremony, no official delegates, quiet entertainment, often *en famille,* and a sympathetic and well-mannered press. The scientific proceedings were marvellously organized in five simultaneous programs beginning on Monday afternoon, August 15th, and continuing twice daily (save for the excursion on Wednesday afternoon) until Friday afternoon. A new and highly successful feature of the congress were the fifteen symposia embracing set topics of current interest such as the kidney, acetylcholine, fœtal respiration, adrenal cortex and vitamin B_2, at which the major contributions and principal discussions were by invitation. There were also many demonstrations, conspicuous among which was evidence of the growing popularity of cinematographic demonstration.

Scientifically speaking, it was generally felt that the Zurich congress was the most successful of any held in recent years, and it set a standard which English members will find it difficult to equal in 1941 when the seventeenth congress is to meet in Britain. From the international standpoint there were several features worthy of note. It was a source of profound regret, after the brilliant congress at Leningrad and Moscow in 1935, that not one Russian physiologist could be present in Zurich. Professor Orbeli, however, was elected to succeed Pavlov on the international committee, and it is earnestly hoped that we shall be able to welcome him and his colleagues in England in 1941. A source of gratification to the entire congress was the large delegation of physiologists from Spain, led by Professor Negrin himself and including Professor August Pi Sunyer of Barcelona and Professor Jaime Pi Sunyer of Santiago de Galicia. The German delegation was unexpectedly large, consisting of 130 members, though many eminent physiologists of Germany (including Bethe, Warburg, von Brücke and Otto Loewi) were conspicuous by their absence. Drs. Oskar and Cecile Vogt happily were present in Zurich. Apart from several junior students from European laboratories, only one physiologist came from the Far East (Professor Yas Kuno).

For its skill in handling the problems of diplomacy with which the congress was faced the Swiss committee deserves the admiration and gratitude of all those interested in the welfare of physiology; and in this connection the names of Professor Hess and of Professor Ernst Rothlin, the general secretary, come most prominently to mind, together with that of their able assistant, Dr. Oskar Wyss. After unanimously voting to accept the invitation to meet in England in 1941, the congress responded enthusiastically to Professor Houssay's invitation to meet in Buenos Aires in 1944; the South American invitation, however, will not be voted upon until 1941.—*Correspondent of The Lancet.*

SCIENTIFIC BOOKS

PHYSICS TEACHING AND THE TEXT-BOOKS

USUALLY at the beginning of the academic year a great variety of new texts, or new editions of surviving old-established text-books, arrive in astonishingly large numbers. The diversity of objectives and expectations of a physics course is probably the main reason for this flood of texts which attempt to satisfy the great differences of conditions to be met in this country. Physics is taught as a foundation for engineering and applied sciences, as a basis for natural philosophy, and finally as a part of the general survey course on the natural sciences which is becoming increasingly popular in secondary schools and colleges.

Depending on the purposes of the course as set by the instructor, the outlook on the subject is bound to vary. But the reason for the appearance of so many different texts is due not only to the different fundamental concepts or minimum requirements of a general physics course, but also to the variety of entrance requirements into colleges which exist in different parts of the country and in different schools. From those students who have had no high-school physics at all and hear about physics for the first time in the sophomore year, to those students who have had one year or more of college work and are required to take two years of physics, all intermediate stages are encountered. It is, therefore, to be understood that no two texts are alike and that in most cases each book will appeal to some special group only. Some of the texts submitted in Table 1 are written by authors long versed in undergraduate teaching in this country, while others are of English origin. The main difference between

TABLE 1

Author	Title	Year	Publisher	Price
Bidwell and Bayley	Physics	1936	Macmillan	$3.50
Bowden, A. T.	Man's Physical Universe	1937	Macmillan	
Champion and Davy	Properties of Matter	1937	Prentice-Hall	4.50
Culver, C. A.	A Textbook of Physics	1936	Macmillan	4.00
Edser, E.	Heat for Advanced Students	1936	Macmillan	1.75
Eldridge, J. A.	College Physics	1937	Wiley and Son	3.75
Erickson, H. A.	Elements of Mechanics—3rd Ed.	1936	McGraw Hill	2.25
Fermi, E.	Thermodynamics	1937	Prentice-Hall	3.00
Filon, L. N. G.	A Manual of Photoelasticity for Engineers	1936	Cambridge Univ. Press	1.50
Fletcher-Mosbacher-Lehman	Unified Physics	1936	McGraw Hill	1.80
Hadley, H. E.	A Class Book of Magnetism and Electricity	1936	Macmillan : London	2.50
Hirst, A. W.	Electricity and Magnetism	1937	Prentice-Hall	4.50
Hobbie, J .R.	Introduction to College Physics	1936	Farrar and Rinehart	3.50
Jones, A. T.	Sound	1937	D. van Nostrand	3.75
Kimball, A. L.	College Physics—5th Ed.	1937	Henry Holt and Co.	3.75
McLachlan	Acoustics	1936	Oxford Univ. Press	2.75
Millikan, R. A., Roller, D.	Mechanics, Molecular Physics	1937	Ginn and Co.	4.00
Osgood, W. F.	Mechanics	1937	Macmillan : New York	5.00
Page, N. C.	Lessons and Problems in Electricity	1936	Macmillan	2.75
Ramsey, A. S.	Electricity and Magnetism	1937	Cambridge Univ. Press	3.25
Ramsey, A. S.	Hydrostatics	1936	Cambridge Univ. Press	2.35
Schrader, J. E.	Physics for Students of Applied Science	1937	McGraw Hill	4.00
Spinney, L. B.	A Textbook of Physics	1937	Macmillan	3.75
Timoshenko and Young	Engineering Mechanics—Statics	1937	McGraw Hill	2.75
Timoshenko and Young	Engineering Mechanics—Dynamics	1937	McGraw Hill	2.75
Vigoureux and Webb	Principles of Electric and Magnetic Measurements	1936	Prentice-Hall	5.00
Williams, S. R.	Foundations of College Physics	1937	Ginn and Co.	4.00

American and English texts lies in the different emphasis on modern developments. All American authors attempt to make the subject more interesting by stressing modern developments and emphasizing the importance of modern physics in its applications to other sciences and industry. This tendency, which we believe is sound and worth-while, is noticeably lacking in the English texts. It seems that our English colleagues stress mainly the fundamental concepts of physics as given by the framework of classical physics and leave modern developments almost entirely to graduate study.

The new tendency to offer physics as a part of a survey course in the general sciences is particularly striking in the new book by Bowden. This book, written in an interesting and easily readable style, should be excellent in the hands of an experienced teacher or, better still, of a group of teachers administering the course. For where can a teacher be found nowadays who has the self-confidence and training to teach all the subjects of geology, astronomy, physiology, chemistry and physics? Moreover, the book can hardly be recommended as a book which the student could use without the help of an instructor, since most of the developments are sketched so briefly that they require amplification in the lecture or recitation, and since many statements need clarification and correction.

Of the great number of general physics texts, many, like Spinney, Kimball, Hobbie and Culver, appear in new editions brought up to date and somewhat enlarged. Of the new texts the book of Eldridge is remarkable for its enthusiastic approach. Problems are well chosen, and everywhere the author has tried to emphasize the clarity of concepts and their mathematical developments. It is unfortunate, however, that in an attempt to avoid the introduction of "abstract" mechanics the author starts with elasticity and liquids, which can scarcely be properly understood without the knowledge of elementary mechanics. The general feeling seems to be that no student can be interested enough in the development of mechanics, and so consequently many text-books make the introductory chapter more "interesting" by dealing with material which logically could only be treated after the concepts of mechanics are fully understood. In this respect the book of Williams is a notable exception. Carefully arranged in logical order—see, for instance, the introduction of magnetism!—this author has given a clear outline of the principles of classical physics from a modern view-point. Excellent illustrations accompany the discussion, which is amplified by good problems and valuable exercises. While modern developments are taken into account everywhere, one feels that the treatment in some chapters is too cursory to be effective. Particularly the section on optics should be enlarged. The book seems particularly well adapted for use in a general science course.

If there is enough time available—and we believe there should be—then the method used by Millikan and Roller should be admirably suited to create more interest on the part of the student and teacher in the logical development of physical thought. To break the trend of abstract reasoning Millikan and Roller insert some chapters on historical developments. We found that students prefer this type of presentation, and we believe that a book of this caliber should be extremely useful in the teaching of both science and engineering students. However, we note with regret that in a book which is the first part of a two-year physics course no mention is made in the section on mechanics of the importance of *reference systems*. This material would help greatly in clarifying such concepts as centrifugal force, and would also be of advantage in the under-

standing of relativity later on. We also feel that in the part on heat some space should be devoted to the clarification of the concept of entropy, and in this way problems in thermodynamics could be handled with better understanding, and the connection of thermodynamics with the kinetic theory of matter would be made clearer.

The question whether calculus should be used in an elementary physics course is answered by different teachers in different ways according to the nature of the course. A two-year book, like the one of Millikan and Roller, and the more advanced text, like Bayley and Bidwell, have in this respect an advantage over texts which have to struggle with the derivation of physical concepts by circumventing calculus.

Nothing perhaps brings out more clearly the difference in material as the second-year books, which introduce the student to the different branches of physics in detail. Erickson's well-known text on mechanics is entirely elementary, so that it could be well used by a beginner. The books of Timoshenko and Osgood will require a broader background. Timoshenko's book (one of the few books to be recommended to the almost extinct species of student who studies independently), "Engineering Mechanics," is written for engineering students, but it will certainly be extremely useful in any intermediate course in mechanics. The large number of problems will help a great deal to understand the principles of mechanics and their application, and will be useful for any physics student who wants to gain a real working knowledge of mechanics. Osgood's book is of an entirely different character. In the preface Professor Osgood states that this book might be used in "a first course in mechanics given for sophomores," but where, oh, where is there a sophomore who has enough background to follow Osgood from the simplest concepts of mechanics to Hamiltonian dynamics? In most schools this book will serve well in a beginning graduate course. It is interesting in this connection to compare the training we offer in mechanics with that obtained in the English schools. A. S. Ramsey's book on "Hydrostatics" is a text-book for the use of first-year students in the universities and for the higher divisions in secondary schools. While the book is truly elementary in character (the problems are to be recommended to every physics teacher), there will hardly be any first-year students in our universities with enough training to use this book. Again it will be useful as a text in intermediate physics, especially in connection with Ramsey's other text on dynamics.

The subject of acoustics is treated only too briefly in most physics courses. A. T. Jones's book on "Sound" should appeal not only to the beginning physicist, but is simple enough to be used by a student of music who has had elementary physics. McLachlan in his new "Acoustics" stresses the applications of modern acoustical development in communication, broadcasting and transcribing music. He also gives an excellent introduction to the modern ideas about speech, and the book will be useful as a cross-reference in an elementary course in acoustics.

Edser's intermediate text on "Heat" has been somewhat enlarged and brought up to date. As such it will keep its place as a favorite with teachers and students.

Fermi's "Thermodynamics" is an elementary introduction which also gives some modern developments, but is rather condensed. While useful for an introductory course in thermodynamics, it needs a great deal of amplification on the part of the instructor to make the condensed treatment of value to the student. The problems are well chosen and interesting.

It is always a problem where to treat such subjects as capillarity, viscosity and diffusion properly. This gap is supposed to be filled by the text of F. C. Champion and Davy's "Properties of Matter." Modern developments are treated, and especially the chapters on capillarity should be useful. It contains, besides, such varied subjects as gravitation, elasticity, compressibility, seismic waves, method of determining Planck's constant, etc. While this variety may be useful for the book as a reference work, it is a handicap to use it as a text in a course.

As usual there are a large number of texts on electricity. For the beginner Ramsey's "Electricity and Magnetism" should be an excellent introduction to the more advanced text to be used in graduate courses. Hadley's book on "Electricity and Magnetism" is remarkable for the historical development, treated extremely carefully, and the good foundation it gives on the level of *high-school physics*. This illustrates again how much more training is required from the high-school student abroad as compared with the meager training we give in this country in high-school physics. The texts of Hirst and of Vigoureux and Webb are useful in the laboratory. It is somewhat startling to see that in Hirst's book, "Electricity and Magnetics," electrostatics is relegated to the very end of the book, which does not seem to be justified in view of the modern applications of electrostatics methods. Particularly useful are N. C. Page's "Lessons and Problems in Electricity." The material is not only well arranged, but the selection of problems and mathematical developments are such that both physics students and engineering students profit a great deal by its study.

Filon and Cooker published some years ago the standard work on photoelasticity. This book is used widely by engineers and physicists in industry for the

investigation of strength of materials. There has been, however, a great need for a book describing in simple language the elements of photoelastic measurements, and this gap seems to be filled by Filon's "A Manual of Photoelasticity for Engineers." It gives first a short introduction of the physical fundamentals of photoelastic methods, and then applies this knowledge to the treatment of instruments and measurements.

The great productivity in the field of general physics texts and of many specialized advanced texts is of course stimulated by the interest in modern physics and physical research in this country. Still there exists a great gap which has not yet been filled between the introductory text and the specialized treatise. Any physicist who has occasion to discuss physical problems with chemists, biologists or engineers is often confronted with the following plea: The Germans have Kohlrausch's "Practical Physics" or Riecke's two-volume text on physics; physico-chemists, in this country, have the excellent work of Hugh C. Taylor and his collaborators; physiologists can refer to Bayliss's standard text, but there is no physics text, in the English language, of this character, a book that makes it possible for scientists working in other fields to obtain an adequate knowledge in physics beyond the elementary text and without going to specialized handbooks. May we express the hope that the American Physical Society and the Association of American Physics Teachers will soon find means to prepare a text-book in physics to meet this demand!

K. LARK-HOROVITZ

PURDUE UNIVERSITY

SPECIAL ARTICLES

HETEROLOGOUS TRANSPLANTATION OF HUMAN AND OTHER MAMMALIAN TUMORS

VARIOUS claims to the successful grafting of human cancers to lower species of animals have not been substantiated by repetition, and at the present time the view generally held by workers in the field of cancer research is that such transplantation is impossible. In fact, the heterologous transplantation of tumors between even closely related species has met with little success. Murphy[1] was able to grow the Jensen rat sarcoma in developing chick embryos, and the successful transplantation of mouse carcinomata to rats has been independently reported by Shirai,[2] Putnocky[3] and others.

The transplantation of a uterine carcinoma of the rabbit into the anterior chamber of the eyes of other rabbits has been reported.[4] The ease with which the initial transplantation was made, in contrast to the complete failure of other modes of inoculation, suggested that this method might be used successfully for heterologous transplantation. The success of early attempts was recorded in the paper just mentioned. However, in view of the obvious importance of heterologous transplantation to both biology and cancer research, a preliminary report of the successful growth of rabbit tumors in other species of animals through serial generations and of a human cancer in rabbits seemed desirable.

Two rabbit tumors, an adenocarcinoma of the uterus and an adenocarcinoma of the breast have been successfully transplanted into the eye of the guinea pig. The methods employed were described in detail in the paper referred to above.[4] Transplantations were always made under anesthesia. The uterine tumor was taken from the sixth rabbit generation and so far has been transplanted serially through three generations in the guinea pig. The breast tumor was transferred to the guinea pig after two generations in the rabbit and is now growing in the second guinea pig generation.

Growth of the tumor in the foreign species presented the same characteristics as in the natural host. Microscopic examination of heterologous transplants show that so far the histological character of the tumors has remained unchanged. The cells of the transplant are descendants of the original neoplasm and not derivatives of the guinea pig.

The ultimate fate of the heteroplastic tumors is uncertain. At the present time, progressive growth has been observed in guinea pigs bearing the breast tumor for more than one hundred days and in pigs with transplants from the uterine tumor for as long as three months. So far, the tumors have not metastasized, but in no instance have the pigs been held for a period of time as long as that required for the development of metastases from homologous transplants.

A successful transplantation of a human scirrhus cancer of the breast has also been made, and slow but progressive growth has continued for more than eighty days.[5] In this instance, the transplantations were made during the summer months at a time when only a small percentage of homologous grafts are successful and growth rates are much reduced. Moreover, two hours

[1] J. B. Murphy, *Jour. Exper. Med.*, 17: 482, 1913.
[2] Y. Shirai, *Japan. Med. World*, 1: 14, 1921.
[3] J. Putnocky, *Ztschr. für Krebsforsch.*, 32: 520, 1930.
[4] H. S. N. Greene and J. A. Saxton, Jr., *Jour. Exper. Med.*, 67: 691, 1938.

[5] This tumor was obtained through the kindness of Dr. R. A. Moore and Dr. W. A. Cooper, of the Cornell University Medical College.