vibrations of the whole earth that confirm exactly the previously developed theory of an earth core and shells. Elsasser and Bullard suggested that the earth's magnetic field is related to a self-excited dynamo in the core. Paleomagnetic orientations were found to vary between continents. The paleomagnetic data have revived Wegener's hypothesis (1911 to 1922) of continental drift. Perhaps Antarctica, South America, Africa, Australia, and peninsular India, carried on the backs of deep convection cells, began to separate approximately 250 million years ago.

Isotopic ages indicate that plants go back about two billion years, animals 600 million. The juvenile earth was probably unable to hold atmosphere or hydrosphere, and gases that were later expelled from the rocks probably did not include free oxygen, so that the first oxygen may have come from the decomposition of carbon dioxide during photosynthesis by the oldest plants. Animal life became possible after oxygen had accumulated.

Exploration of the upper air has shown that the earlier theories of atmospheric circulation were incorrect. At high latitudes the upper winds blow mostly east, a result of the Coriolis effect. A north-south exchange of heat and moisture is nevertheless effected, in Antarctica by high-level movements of air toward the pole and lower level movements away from it, in the northern hemisphere through the occasional whipping back and forth of the eastward moving jet stream (p. 122). Oceanographers have shown that turbid flows rush down submarine canyons (p. 71 and plate XIII), and that bottom currents, such as the counter current to the Gulf Stream (p. 142), move sand and silt on the floor of the deep ocean.

This book describes new knowledge. It does not emphasize sufficiently the incomplete or uncertain state of some theories, including the theory of continental drift.

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Pure and Applied Mathematics Series

Point Set Topology. Steven A. Gaal. Academic Press, New York, 1964. xiv + 317 pp. Illus. $9.75.

This is a textbook for a first-year graduate course and is therefore neither a treatise nor a one-semester affair for juniors and seniors. It has aspects of the former in its systematic treatment of some topics, but few of the latter; it would be difficult to carve an introductory one-semester course out of these rather firmly riveted 300 pages.

Beginning graduate texts on topology must treat certain topics—types of sets in topological spaces (open, closed, connected, compact, and locally compact), the various separation properties, continuous maps, metrizable spaces and metric spaces, convergence (sequences, and filters or nets), and processes for building new spaces from old ones. The introductory treatments for these being now well standardized, the distinguishing question is—what else appears in the text? As indicated by the subjects of the five chapters (topological spaces, separation properties, compactness and uniformization, continuity, and theory of convergence), the author has restricted himself essentially to the topics that have been mentioned; however, he has discussed some in considerable detail or in depth, notably uniform structures, the relation between paracompactness and full normality, and the relations between various separation properties. He has chosen to exclude algebraic topology, in sharp contrast to Hocking and Young, and to go into topological algebra no farther than the theorems of Stone-Weierstrass, Arzela-Ascoli, and Banach-Steinhaus, in contrast to Kelley. (He has, however, included material on real functions on linearly ordered spaces, with an eye to real variables.) In brief, here are 300 pages of general point set topology, done in detailed epsilonic style.

For each section there are exercises; these include too many explanations of solutions for my tastes. To postpone the treatment of functions to page 175 also seems questionable. There are excellent indexes of notation, authors, and subjects, and at the end of each chapter useful notes and a bibliography.

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Commentaries on the Literature

International Review of Forestry Research. vol. 1. John A. Romberger and Peitsa Mikola, Eds. Academic Press, New York, 1964. xii + 404 pp. Illus. $13.

In the preface to this first volume of a new series, the editors state that the series is addressed primarily to research workers, teachers, and advanced students, is academic and fundamental in its approach, and emphasizes biological principles. The articles published will contain reviews, summaries, commentaries, and syntheses based on the world literature, or they may deal with newly recognized problems. In any case, it is intended that they shall contain adequate and accurate surveys of existing literature. Although the publication is international in scope, the papers will be published in English, and a special effort will be made to keep the style simple. Authorship will be by invitation. Both authors and subjects will be selected with regard to study and research in forest science, whether or not they are attached directly to professional forestry proper. The editors are aided by an internationally constituted editorial advisory board.

The present volume contains seven articles: Kurt Mantel (University of Freiburg), "History of the international science of forestry with special consideration of Central Europe"; Leo Heikurainen (University of Helsinki), "Improvement of forest growth on poorly drained peat soils"; Carl Olof Tamm (Royal College of Forestry, Stockholm), "Determination of nutrient requirements of forest stands"; Charles W. Ralston (Duke University), "Evaluation of forest site productivity"; Lalit M. Srivastava (Harvard University), "Anatomy, chemistry, and physiology of bark"; Ken-ichi Hatano (University of Tokyo) and Suminiko Asakawa (Government Forestry Experiment Station, Tokyo), "Physiological processes in forest tree seeds during maturation, storage, and germination"; and A. D. Voûte (Institute for Biological Field Research, Arnhem, Netherlands), "Harmonious control of forest insects."

The editors' maiden voyage suggests that their ship will be a happy one. The book contains a wealth of valuable material, on several subjects, gathered together in one place for ready reference. It is well printed, illustrated,

and indexed. If the editors' promise holds good, others will follow and will be in demand by the growing body of students who are finding that forest science contains intellectual challenges of first magnitude. A major value in the series is its international coverage, long needed in forest science.

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Communications Facilities

Data Transmission. William R. Bennett and James R. Davey. McGraw-Hill, New York, 1965. xii + 356 pp. Illus. $14.50.

This book presents a survey of the development and current technology of data transmission; attention is focused on techniques applicable to transmission over band-limited channels, with special emphasis on voice-band telephone circuits.

The central problem of data transmission over such channels is the intersymbol interference that results from band-limiting and nonuniformity of channel amplitude and phase. Efficient transmission requires a signal design suited to the bandwidth limitations of the channel and equalization of the channel characteristics to reduce channel-induced perturbations to an acceptable level. The authors focus their attention on the question of signal design for band-limited channels; in particular, for each of a number of modulation-detection systems, received-signal spectra are derived which result in zero intersymbol interference. Results are obtained for the low-pass, or "baseband," channel and for amplitude, frequency, and phase modulation. The spectra derived are directly applicable for signaling over an ideal, band-limited channel. The effects of perturbations inherent in real channels are considered only qualitatively. Although the results presented are interesting in their own right, the degree of mathematical detail tends to emphasize the differences between the various signaling systems rather than the underlying principles that lead to zero intersymbol interference. It should also be noted that the "raised-cosine" shape which forms the basis for most of the spectra considered is only one of a class of spectra that lead to the desired result; omitting consideration of alternatives results in a biased picture of their relative importance.

Considering the book as a whole, great emphasis is placed on the question of signal design, whereas questions of channel equalization, carrier recovery, and synchronization are given comparatively brief treatment. The potential for much more efficient utilization of band-limited channels, which has been demonstrated in recent work on error correction techniques and adaptive receivers, is mentioned only in passing.

In summary, this book presents a useful compilation of contributions to the problem of signal design for data transmission and includes a brief survey of other topics relating to data transmission by telephone line.

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Note

Biographical Memoirs of the Fellows of the Royal Society, vol. 10 (Royal Society, London, 1964. 394 pp. $6) contains biographical memoirs of 21 Fellows: Kenneth Bailey by A. C. Chibnall; Gordon Herriot Cunningham by J. Ramsbottom; Gerhard Domagk by L. Colebrook; Claude Gordon Douglas by D. J. C. Cunningham; Herbert Spencer Gasser by Lord Adrian; Reginald Ruggles Gates by J. A. Fraser Roberts; George Ridsdale Goldsbrough by J. Proudman; Alan Arnold Griffith by A. A. Rubbra; Maurice Pascal Alers Hankey, First Baron Hankey of the Chart by Sir Basil Schonland; Edward David Hughes by Sir Christopher Ingold; David Keilin by T. Mann; David Keith Chalmers MacDonald by K. Mendelssohn; Sisir Kumar Mitra by J. A. Ratcliffe; Joseph Lade Pawsey by Sir Bernard Lovell; Carl Johan Fredrik Skottsberg by Sir Edward Salisbury; Edgar William Richard Steacie by L. Marion; Otto Struve by T. G. Cowling; Edward Charles Titchmarsh by Mary L. Cartwright; William Ernest Stephen Turner by R. W. Douglas; Ojvind Winge by M. Westergaard; and Sidney William Wooldridge by J. H. Taylor.

Each memoir includes a photograph of the Fellow and a bibliography of his published works.

New Books

Biological and Medical Sciences

Actions chimiques et biologiques des Radiations. M. Haissïnsky, Ed. Masson, Paris, 1965. 250 pp. Illus. F. 86. Three papers: "Dissociation processes in electronically excited molecules" by K. Funabashi and J. L. Magee; "Attachement électronique en phase gazeuse" by F. Fiquet-Fayard; and "Primary physical and chemical effects associated with emission of radiation in nuclear processes" by S. Wexler.

The Adrenals and Resuscitation. Mikhail Grigor'evich Kolpakov. Translated from the Russian edition (Moscow, 1964) by Basil Haigh. Consultants Bureau, New York, 1965. 113 pp. Illus. Paper, $17.50.

Advances in Fluorine Research and Dental Caries Prevention. vol. 3. Proceedings, 11th Congress, European Organization for Research on Fluorine and Dental Caries Prevention (Sandefjord, Norway), July 1964. J. L. Hardwick, Hans R. Held, and Klaus G. König, Eds. Pergamon, London; Macmillan, New York, 1965. 289 pp. Illus. $17.50. Thirty papers; the majority are in English, the others in German.

The American Oyster. *Grassostrea virginica* Gmelin (*Fishery Bull. 64*). Paul S. Galtsoff. Fish and Wildlife Service, U.S. Department of the Interior, Washington, D.C., 1964. 484 pp. Illus. Paper, $2.75 (order from Superintendent of Documents, Washington, D.C.).

Annual Review of Pharmacology. vol. 5. Windsor C. Cutting, Robert H. Dreisbach, and Henry W. Elliott, Eds. Annual Reviews, Palo Alto, Calif., 1965. 554 pp. Illus. $8.50. Twenty-three papers.

Autogenic Training: Correlations Psychosomaticae. Wolfgang Luthe, Ed. Grune and Stratton, New York, 1965. 339 pp. Illus. $14.50. Fifty-four papers on the following topics: Theory and Research (18 papers); Clinical Application (21 papers); and International Perspectives (15 papers); the papers are in German, English, or French.

The Behaviour of Arthropods. J. D. Carthy. Freeman, San Francisco, Calif., 1965. 156 pp. Illus. Paper, $2.50. University Reviews in Biology Series, edited by J. E. Treherne.

Bioastronautics Data Book. Paul Webb, Ed. Scientific and Technical Information Division, National Aeronautics and Space Administration, Washington, D.C., 1964 (order from Superintendent of Documents, Washington, D.C.). 410 pp. Illus. Paper, $2.25. The contributors are Kenneth C. Back, Charles E. Billings, Jr., W. Vincent Blockley, A. Charles Bryan, Randall M. Chambers, Charles E. Clauser, Beatrice Finkelstein, John G. Fletcher, George G. Frost, Douglas Grahn, Fred E. Guedry, H. T. E. Hertzberg, Harry J. Jerison, Gerald S. Kanter, Richard W. Lawton, Mildred K. Pinkerton, Emanuel M. Roth, Norman G. Roth, John W. Senders, A. A. Thomas, Paul Webb, and William J. White.

Biochemical and Neurophysiological

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