trollable factors, *i.e.* time, hydrogen ion concentration, temperature, purity and concentration of reagents, stains.

The subject is covered in 21 sections, as follows: Microscopy; Equipment; Fixation; Decalcification; Sectioning; Stains and Staining; General Staining and Mounting Procedures; General Oversight Methods; Nuclear Stains; Cytoplasmic Granules; Enzymes; Endogenous Pigments; Exogenous Pigments and Minerals; Various Cell Products; Fats and Lipoids; Connective Tissue Fibers; Fibrin, Bacteria, Protozoa, and Other Parasites; Glia and Nerve Cells and Fibers; Hard Tissues; Various Special Procedures; and Buffers and Buffer Tables. The author throughout carefully specifies the Color Index Numbers of the stains and also the reference standards of purity of essential chemical reagents otherwise called for in his methods. A very useful series of tables for the preparation of buffer solutions is included. In so far as is possible, the rationale for procedures and the modification of old methods is indicated. The book is made a practical and workably integrated unit by virtue of many cross references. It is excellently indexed.

This treatise on histopathologic technic will satisfy a need long felt by many pathologists and histologists alike.

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Annual review of microbiology. (Vol. 1.) C. E. Clifton. (Ed.) Stanford, Calif.: Annual Reviews, 1947. Pp. vii + 404. $6.00.

This first volume is an attempt to provide a résumé of current research in the field of microbiology. It appears to be a critical evaluation of a wide range of subject matter including viruses, rickettsiae, bacteria, fungi, and protozoa, as well as some of their biological processes.

It is commendable that an annual review of this field has been started. Researchers now may have the opportunity to obtain a broad, comprehensive viewpoint in the working relationships of the various organisms.

There are 17 different subjects represented: Morphology and Cytology of Protozoa, Antigenic Variation in Protozoa and Bacteria, Life Cycle of Malarial Parasites, Variation in Phytopathogenic Fungi, Variation in Phytopathogenic Viruses, Some Aspects of the Problem of Growth Factors for Protozoa, Bacterial Metabolism, Nitrogen Metabolism, Industrial Fermentations, Quaternary Ammonium Compounds, Antibiotics, Chemotherapeutic Agents, Immunochemistry, Some Aspects of Active Immunization, Medical and Epidemiological Aspects of Enteric Infection, The Rickettsiae, and Respiratory Viruses.

Each of the 17 sections in this book is written by a contributor or contributors who have had personal experience with the particular subject. The editors have done an excellent job in their choice of contributors. The various authors have done exceptionally well with their assignments although somewhat handicapped for the sake of brevity. Each section is well documented by a good working bibliography. This will be extremely helpful for those who desire to obtain more information concerning the subject.

The volume concludes with an author and subject index totaling approximately 20 pages. Students and workers interested in the various aspects of microbiology will find this book a helpful and useful addition to their library.

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Kampen mot Ogräset, 1935–1946. ("Weed control experiments.") Hugo Osvald. (Ed.) (Publications from the Institute of Plant Husbandry, Royal Agricultural College of Sweden, No. 2.) Uppsala: Almquist & Wiksells, 1947. Pp. 318. (Illustrated.) 25 kr.

This volume of 18 papers presents the results of 12 years of weed control research at the Royal Agricultural College of Sweden. The type and scope of these investigations are worth noting since weed research programs are now expanding rapidly along many lines. All of the papers are of high technical quality, and space permits a review of only a limited number of them—principally those concerned with weed biology. Although Swedish is the language used, excellent English summaries are included, and all illustrations and tabular material are provided with English translations.

Two papers on germination biology, by von Hofsten and by Kolk, are here considered together. These concern after-ripening, storage, and the influence of light (especially different daylight intensities), temperature, and moisture on the germination of weed species in 21 genera, many of which are common weeds in this country. Freshly harvested seeds of *Matricaria inodora* germinated well in light, but, as they became older, the germinative capacity in darkness increased. Old seeds of *Thlaspi arvense* germinated only under fluctuating temperatures. Light retarded the germination of both light brown and dark brown seeds of *Sinapis* (*Brassica*) *arvensis* when they were exposed to fluctuating temperatures. On the soil surface the light brown seeds germinated less well than the dark brown. Seeds of *Avena fatua* germinated at a temperature as low as 2° C. Freshly harvested seeds of *Chenopodium album* did not germinate at all, while older seeds did germinate, and about 5 or 6 times as well in darkness as in light.

Kolk notes that the effect of light is modified by the age of the seeds. Four groups are recognized: (1) species in which young seeds germinate well in bright daylight and old seeds well in weak daylight (e.g. *Cirsium arvense*), (2) species that germinate well in weak daylight (e.g. *Capsella bursa-pastoris*), (3) species that germinate well in weak daylight or darkness (e.g. *Stellaria media*), and (4) species whose young seeds are unaffected by light, while older seeds germinate well in weak daylight (e.g. *Agrostemma Githago*). Varying temperatures (between 5° and 22° C) favor the germination of most of the species studied (e.g. *Sinapis arvensis*) as compared with constant temperatures (20°–22° C). For most of the species the optimum of germination, in weak daylight as well as in darkness, was found at a water content in the substrate (sandy soil rich in humus) of 60% of the maximum water capacity. At 30% of the maximum

water capacity seeds of species of *Centaurea, Galium, Sinapis,* and *Stellaria* germinate quite well. Studies of germination at various depths led to the recognition of three classes: (1) species that germinate well on the soil surface or at a shallow seeding depth, but not when covered more deeply than 2 cm (e.g. *Stellaria media*), (2) species that germinate better at a shallow seeding depth, but do germinate when covered more deeply than 2 cm (e.g. *Cirsium arvense*), and (3) species that germinate on the surface, at a shallow depth, and when covered more deeply than 2 cm (e.g. *Agrostemma Githago*).

A soil seed-population study of *Sinapis arvensis* by von Hofsten revealed an average of 267 living seeds for each 16.8 liters of soil (0–30 cm in depth), or 4,445 seeds/m^2 at that depth for 9 different samples, the largest number of seeds occurring in the depth range of 15–25 cm.

A remarkable example of the "equipment of plants in the struggle for space" is provided in the observations of Osvald on the poor germination and development of rape (*Brassica napus* and *B. rapa*) in patches of quack grass (*Agropyron repens*). Toxic root exudates were suspected. He cites the early work of Whitney (1904), and Livingston (1905, 1907), of the USDA, on the presence of toxins in unproductive soils and also notes that, with the discovery of the effects of penicillin, streptomycin, and phytohormones, the toxin theory has attracted revived interest. The substance extracted from finely ground dried stolons and roots is soluble in water and in alcohol. Tests indicate an acid, and the effects on germination resemble those of the growth substances. More than twice as high a concentration of the extract is required for the total inhibition of oat seeds (50%) than that of rape (20%). At moderate to high concentrations of the extract, mold fungi, *Mucor, Penicillium,* and others, were favored, but at still higher concentrations mold growth is retarded. Mold fungi grow at much higher concentrations than do oats. Seeds prevented from germinating by the toxin often succumbed to the molds. Osvald advances an hypothesis with far-reaching applications: Resistance of certain species to hormone derivatives may be due to the fact that "they . . . produce similar substances (or substances with similar effect) in fairly large quantities, and . . . are accustomed to these. Susceptible plants . . . probably produce growth substances in small quantities (or other types of growth substances)." By this hypothesis he notes that many phenomena of plant growth and grouping of natural vegetation may be explained, as "the ability of many grasses to supersede clover, the detrimental effect of grasses on fruit trees, and the inability of many wild species in open vegetation (for instance, in mountains and along shores) to compete with grasses, even if these do not form a close stand."

Three papers by Åberg, Schwanbom, and Wiklander are concerned with the effects of sodium chlorate on perennial weeds and on weed seeds in the soil. Osvald, von Hofsten, and Persson have an extensive study on preplanting soil treatments with calcium cyanamide in grain crops. Von Hofsten writes on control methods involving stubble cultivation and surface accumulation of weed seeds, on control of field thistle, and the use of herbicides on annual weeds. Åberg has a survey of weed-control work in the United States. Osvald, Denward, and Åberg have three articles on hormone derivatives in weed control. The editor, Hugo Osvald, closes the volume with a survey of present and future weed-control methods. Included here is an excellent tabulation (with a unique rating system) of the susceptibility of Swedish cultivated plants (64 spp.), weeds (90 spp.), and ligneous plants (20 spp.) to applications of sodium chlorate, calcium cyanamide, copper sulfate, sulfuric acid, dinitro-orthocresol, and hormone derivatives.

LAWRENCE J. KING
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The essentials of plant biology. Frank D. Kern. New York-London: Harper, 1947. Pp. vii + 440. (Illustrated.) $4.00.

This new textbook is designed for a one-semester course in elementary botany. The book employs a functional approach, yet presents basic botanical concepts in a progressive sequence which enables beginning students to obtain readily a clear understanding of the unity of plant life. The text comprises two major parts: the manifestation of life, stressing individual maintenance, and the perpetuation of life, covering various aspects of racial preservation. The overview of the plant kingdom is presented as a 50-page supplement on the great groups of plants. Attention throughout is centered upon plant activities and interpretation of life phenomena. The broad concepts of plant life bearing on human culture are expertly merged with the role of plants in contemporary affairs.

The book is profusely illustrated with 260 figures, most of which are new and especially well adapted to the full development of textual concepts. Several excellent full-page color plates contribute substantially to clarity of detail. The cuts are of uniformly high quality both in choice of material and excellence of reproduction. The format and headings are material aids to the organization of subject matter, and the author's style of presentation provides unusual clarity and interest for student readers. The author has achieved readability without sacrifice of scientific accuracy by minimizing the use of technical terminology and introducing it with care. Student interest has been attained by good organization, choice of interesting content, good illustrations, and diversity of references to practical applications of principles. The book is quite different from most of its kind, and for a one-semester text it gives the reader an exceptionally thorough grasp of plant science and its importance in modern life. The 16-page index is very complete and greatly facilitates reference use of the text.

The author has drawn ingeniously upon his rich first-hand acquaintance with the world flora and his long experience in presentation of the various disciplines of plant science. The excellence of content and style of the book will appeal to students and instructors.

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