of polysaccharides can be combined with C^{14}-labeled sodium cyanide to give a cyanhydrin that on saponification yields a radioactive carbohydrate containing one carbon more than the parent polysaccharide. The reaction, which is the well-known cyanhydrin synthesis, converts a 6-carbon reducing end group to a 7-carbon unit containing a radioactive carboxyl. The presence of the carboxyl permits the separation and purification of the material by means of ion exchange resins. Thus absorption of the carboxyl derivative on a basic resin separates it from any unreacted polysaccharide, and elution of the absorbed material with aqueous ammonia provides a highly purified radioactive product. On account of the high sensitivity of radioactivity measurements, the combining proportion of the radioactive cyanide can be determined accurately. This is a measure of the average molecular weight of the reacting polysaccharide. The procedure provides not only a new tool for structural studies, but also a means for labeling carbohydrate material for biological and other investigations. Furthermore, it constitutes a sensitive method for ascertaining the number of carbonyl groups in a substance of known molecular weight. Reaction of polysaccharides with cold cyanide yields products that may have useful properties. The procedure is particularly suitable for the study of polysaccharides of relatively low molecular weight, and partially hydrolyzed products.

HORACE S. ISBELL

National Bureau of Standards
Washington, D. C.

Book Reviews

Crystal Growth. H. E. Buckley. New York: Wiley; London: Chapman & Hall, 1951. 571 pp. $9.00.

Anyone faced with the necessity of growing "perfect" crystals of any considerable size should first read this book. He will find it a bit slow going here and there, partly because of the author's weakness for long sentences (the first sentence on page 7 consists of 90 words), and partly because of his liberal use of "former" and "latter." If the reader is not disturbed by this he will find he has a very useful reference book.

The 12 chapters range from "The Artificial Preparation of Crystals" and "Theories of Crystal Growth" through "Modification of Crystal Habit by Impurities" to "Relationship of Substances during Crystallization." The thoroughness with which the author has covered his topics may be judged by the fact that he lists over 650 references to the literature, coming from the publications of more than 475 authors. The book contains 169 figures and 88 plates, all of high quality.

WHEELER P. DAVEY

State College, Pennsylvania

Problems of Cytology and Evolution in the Pteridophyta. I. Manton. New York: Cambridge Univ. Press, 1950. 316 pp. $8.50.

Most recent books dealing with the synthetic approach to problems of evolution have discussed, primarily, general principles, with illustrations taken from various groups of animals and plants. These books have established certain principles and methods of attack on evolutionary problems, on which there is an ever-increasing amount of agreement. The logical sequel to these works is a series of many-sided attacks on problems of evolution in particular groups of animals and plants. One such attack is the volume by Dr. Manton on the Pteridophyta, and it is one which sets a very high standard.

Upon even a casual examination of the book, one is impressed by the amazing technique Dr. Manton has developed for studying the cytology of the Pteridophyta. Ferns and their allies have always been regarded as extremely difficult material for chromosomal studies. Their chromosome numbers are very high, and their somatic chromosomes are usually long, slender, and entangled among each other so that they are difficult to count. Furthermore, their cytoplasm often contains heavily staining inclusions, which tend to obscure the chromosomes. As a result, before Dr. Manton began her work, the numbers of few species were known with exactitude. But the present volume contains page after page of photographs and drawings of meiotic smear preparations in which gametic numbers which range from $n = 13$ (in *Hymenophyllum tunbridgense*) to $n = 108$ (in *Equisetum* spp.), and even $n = 256$, recorded in *Ophioglossum vulgatum* as the highest chromosome number known for any living organism, can be counted by the reader either exactly or with a reasonable degree of accuracy. Dr. Manton's techniques, which would require much patience and experience to reproduce successfully, are nevertheless well described in an appendix, so that anyone who desires to and has sufficient skill may follow in her footsteps.

The text may also be commended for its readability. Dr. Manton has achieved a fine balance between scientific precision and a personal narrative style. While learning a multitude of hitherto unrecorded facts about the interrelationships among the fern species of northern Europe, the reader accompanies her on field trips to the native habitats of many of them, on explorations through the rich literature on their systematics and morphology, and in her contests with them as refractory cytological objects. For instance, she writes as follows about the well-known boreal and