origin, the approximate date of creation, and a brief explanation of function, make these pictures more meaningful to the viewer.

The first 67 plates show works by prehistoric artists of the North American continent from Alaska to Florida. Some of them testify to the primitive artist's remarkable skill in producing starkly realistic likenesses of men, birds, and animals. Others reveal his talents for conventionalized representation of natural forms. I should have liked to see some examples of the exquisite craftsmanship of the southwestern basketmakers and a few more works by early Eskimo artists and by the pre-Hopewellian occupants of the Ohio Valley. But the work of prehistoric southeastern Indians, who were skilled potters and fine carvers in wood and stone centuries before the founding of Jamestown, is very well represented.

The other 183 plates portray the great variety of artistic techniques and styles employed in the nine historic culture areas of North America. Some of these were developments from long, prehistoric traditions. Others were perfected under the stimulus of the iron tools and new materials, such as paints, dyes, trade beads, cloth, and silver and other metals, introduced by whites. There are numerous examples of carved and painted masks, carvings, paintings, and textiles executed in the very original style of the North Pacific Coast tribes in the 19th century. There are baskets finely woven by Indian women of California and the Southwest; painted pottery, masks, and kachina dolls from the Pueblos; Navaho weavings and silverwork; bold paintings on skin from the Plains tribes; and carved wooden masks, war clubs, and household utensils created by Indians of the Great Lakes.

Many of these creations of so-called primitive men and women have a strong appeal to modern artists, for these unschooled Indians and Eskimos achieved goals toward which modern artists are striving. Their wood, stone, bone, and ivory carvings reveal a deep feeling for three-dimensional form. Their paintings, weavings, and porcupine-quill-and-bead embroidery show a fine sense of design and marked ability to employ colors decoratively.

Dockstader's compact, 32-page text provides an admirable introduction to the pictures. It clearly traces the history of Indian and Eskimo arts and succinctly characterizes the regional styles of the historic period. The author explains the functions of these arts in the daily and ceremonial lives of the tribes who created them. A selected bibliography of more than 100 titles offers a helpful guide to further study for those whose interest in Indian and Eskimo art is aroused by this truly beautiful book.

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Intradisciplinary Monograph

The Eucalypts. Botany, cultivation, chemistry, and utilization. A. R. Penfold and J. L. Willis, Hill, London; Interscience, New York, 1961. xx + 551 pp. Illus.

One of the authors, A. R. Penfold, was previously director of the Museum of Applied Arts and Sciences in Sydney, Australia. The other, J. L. Willis, is the present director. Both have worked for many years with eucalypts.

In 1902 two men from this museum, Richard T. Baker (a botanist) and Henry G. Smith (a chemist), published *Research on the Eucalypts, Especially in Regard to Their Essential Oils*. Since the appearance of that remarkable book, in which the authors successfully attempted to reconcile the traditionally antagonistic disciplines of taxonomy and chemistry, there has been a continuous stream of publications from the museum on various aspects of eucalypts. The authors were Baker and Smith; Smith and Penfold; Penfold, Morrison, and McKern; McKern, Spies, and Willis; Willis; Penfold and Willis. It seemed inevitable that sooner or later the museum would publish, in one compact volume, the results of the more than half a century of work on eucalypts. Now the job has been accomplished, and *The Eucalypts* has been published.

In the preface the authors say "the book is written primarily for the interested layman but is also intended to be of value to the student, the specialist, and the technical user." And it is.

Four chapters (73 pages) are devoted to the morphology of the eucalypt: the stem (wood chemistry included), the leaf, the flower, and the fruit. Chapter 5 is devoted to classification of eucalypts, and chapter 6 to their cultivation, seed and vegetable propagation, and mycorrhiza. Chapter 7 deals with planting eucalypts in different countries, from Argentina to the U.S.S.R.

Then follow two chapters (67 pages) on pests and parasites. You are disturbed to learn that eucalypts are attacked by snout beetles, leaf-eating moths, leaf-cutting ants, green-wood borers, and termites and that eucalypts may be infected with brown rots and white rots and molested by marine borers, teredine borers, mistletoe, and twining parasites. When you begin to peruse the next chapter, on eucalypts timber, you are greatly relieved to know that, in spite of all these calamities, eucalypts grow to magnificent size and are cut into lumber of excellent quality. Ornamental values of eucalypts are not forgotten. Chapter 11 is devoted to trees for shade, shelter, and ornament, and there is a list of suitable species included.

The authors probably had to restrain themselves from devoting too much space to essential oils, in which both are so interested. Only 36 pages are given to the subject. Australia annually exports between 500 and 900 tons of eucalypt essential oil for medicinal, industrial, and perfumery purposes. The chemistry of over 200 species of eucalypts (out of approximately 600 total) has been analyzed, but fewer than 20 species have been exploited commercially. During the span of 60 years many new constituents of essential oil of the eucalypts have been described.

In 1900 H. G. Smith discovered in a eucalypt oil a ketone, peperitone, a starting material for manufacturing synthetic thymol and menthol; subsequent investigations brought to light many other interesting substances such as phloroacetophenone dimethyl ether or dehydroangustione (a β-diketone containing the ionone rings). According to the authors, "over fifty chemical entities have been found (in eucalypt oils) and no doubt many more remain to be discovered." A list of the most important eucalypts, showing the chemical composition of their essential oils, is included.

Chapter 12 also contains a modest two-page account of the existence among eucalypts of physiological forms. Penfold and his co-workers used this term to indicate existence within a species of varieties that morphologically are undistinguishable from

the "type," but drastically different in the composition of their essential oils. This was an extremely important piece of research, for it showed clearly that differentiation of plants into taxonomic categories should not be judged by morphological characters alone but that they should also be judged by the chemical composition of their constituents. Occurrence of physiological forms was found to be widespread not only among eucalypts; it was also repeatedly detected by others in different plant families.

For those who are interested in eucalypts as providers of sugar and proteins for honey bees, there is a short chapter on this subject, which includes a list of "Eucalypts for honey and pollen."

Chapter 14 deals with miscellaneous uses and includes an important discussion of its uses for pulp and paper, "improved wood," veneer, and plywood and for extracting tanning materials and rutin. This last product has an interesting history. In 1887 it was found that leaves of *Eucalyptus macrorincha*, when boiled in water, yielded a yellow pigment. A couple of years later H. G. Smith analyzed the pigment, named it myrticolorine, and noted that "the presence of this dye material at once distinguishes *Eucalyptus laevopinea* from *E. macrorincha*. Later it was found that myrticolorine is identical with glucoside of quercitin, called rutin. In 1946, when rutin was elevated to the status of vitamin P (a regulator of permeability of small blood vessels), *Eucalyptus macrorincha* proved to be the best source of the product. Large quantities of rutin are exported now to the United States.

The last and longest chapter (142 pages) deals with descriptions of about 150 selected species of eucalypts. (The total number of species in the genus *Eucalyptus* is about 600.) This chapter will be consulted by all who work with eucalypts.

At the end of the book there are five distribution maps and 38 plates showing morphology of the eucalypts.

The other day one of my colleagues remarked that now is the time for monographs, cutting across accepted lines of botanical research. Penfold and Willis' book is precisely this kind of monograph.

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Man Discovers the Universe

Man's Conquest of the Stars. Pierre Rousseau. Translated from the French by Michael Bullock. Norton, New York, 1961. 356 pp. Illus. $5.

Splendor in the Sky. Gerald S. Hawkins. Harper, New York, 1961. xii + 292 pp. Illus. + plates. $5.95.

Among the sciences, astronomy has always had a special emotional and esthetic appeal to the educated public, and to this has now been added its "practical" interest as the background to space technology. These two books, written for laymen who can read thoughtfully, by professionals who can write clearly and vividly, should find a wide circle of readers. Neither book requires any mathematical preparation, but both presuppose an appreciation of simple logic and an interest in that form of ordered structure that is the essence of science. Though both are for the general reader, their aims differ.

Pierre Rousseau writes a closely integrated history of astronomy, from the Magdalenean cave man to Hoyle and Hubble. The aim is inspiration, as well as information. It is a celebration of the triumph of mind over space, and the style is appropriately flowing and lively, but always clear. A great amount of detail is presented, a canvas crowded with vividly characterized active figures; yet details nowhere obscure the general development of the principles under discussion. Minor advances are subordinated to major, great figures tower above small, and all is combined into a narrative of commanding sweep. It is a brilliant achievement. In fact, I feel that it is a little too brilliant. The true picture is not as clear-cut, as black and white, as this. Some of the dramatic simplifications are overdone, some of the thumbnail sketches misleading, and there are a number of minor misstatements of fact. But these are almost inevitable in a work of this range, written by one man; they are unimportant to the general reader, and the serious student will notice and discount them. The translation seems to convey well the spirit of the French original. One grotesque slip in this English edition is the statement, repeated on a number of pages, that the galactic system has the form of a *girdle*-cake! But I found no other. A full index is provided, but a bibliography of more critical and technical historical studies might well have been added.

Gerald Hawkins states that observatory "public nights" provided the basis for his book. Its content and form are well expressed by this statement. Each chapter is essentially self-contained, and they are grouped into six parts. Two parts are historical, the first carrying the chronicle of astronomy from the shepherds to Ptolemy, the second from Copernicus to Newton, and thence, more episodically, into the 19th century. The other four parts are topical, respectively setting forth our present knowledge of the planets, the stars (including the sun) and stellar systems within the galaxy, the meteors and comets and other nonplanetary material of the solar system, and the realm of the galaxies. The style is pleasing, clear, and direct. The book is excellently illustrated with 45 plates and 38 figures; it has an index and a good bibliography to guide the reader who wishes to extend his knowledge. I note one defect in the otherwise admirable presentation—inadequate emphasis on the imcompleteness of our data and the tentative, even controversial, nature of much that is given here as fact.

Both authors are to be congratulated, and both books are recommended.

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Clay Technology

Ceramics, Physical and Chemical Fundamentals. Hermann Salmang. Translated by Marcus Francis. Butterworth, Washington, D.C., 1961. 380 pp. Illus. $12.50.

There are few textbooks on ceramics available, and during the course of four German editions, Salmang's book (first published in 1933) has become a standard work, well known to ceramists. This English-language translation is essentially the same as the German fourth edition published in 1958.

The word ceramics has different definitions in different parts of the world, and its American meaning has changed over the last several years. As used by Salmang, *ceramics* is nearly equivalent to *clay technology*. In 380 pages all clay minerals and clay products are