Plant Resins: Chemistry, Evolution, Ecology, and Ethnobotany. Jean H. Langenheim. 2003. Timber Press, Portland, Oregon. Pp. 586 + illus. $49.95 (hardcover). ISBN 0-881925-748.

Jean H. Langenheim's text seems certain to become the most widely read and cited book about plant resins for many years to come. Dr. Langenheim is professor emeritus of biology and a research professor at the University of California, Santa Cruz and has been one of the most eminent researchers in the field of plant resins for over 40 years. This work finally replaces *Vegetable Gums and Resins* (1949) by Frank N. Howes as the most up-to-date and comprehensive treatment of this subject.

This ambitious book presents an integrated view of plant resins that includes their formation, composition, defensive functions for the plants, and their importance to the many insects and mammals (including people) that use them. The first of the book's three parts covers plant resin production with chapters emphasizing the definition and chemistry of different resin types, an overview of the evolution of resin-producing plants, and a description of the structures plants use to secrete and store resin. Part II covers the geological history and ecology of resins. Its chapters describe the knowledge and mysteries of amber (fossil resin) and the interactions between plants, herbivores, and resins.

The third section of *Plant Resins* covers resin ethnobotany, with chapters explaining the past importance and future use of resins. One overview chapter within Part III provides fascinating accounts of the importance of amber and resins to people from the Stone Age to the present. The chapter illuminates the numerous times throughout history that procuring and trading resins have had profound impacts on cultures and economies across the globe, especially in the case of amber and various incenses. Later, more specific chapters detail the origins and uses of three major classes of resins—oleoresins, fragrant and medicinal balsams, and varnish and lacquer resins. The best chapters make connections between the history of resin use with the biological aspects of the resin source and formation. Some examples, however, do not have the same level of well-roundedness, but do provide the basic facts about all of the common and many of the obscure resins found throughout the world.

One of the book's simplest and most important contributions is in providing clear definitions of what plant resins and their subcategories are and, just as important, what they are not. These definitions give readers a solid foundation for understanding the many facets of this book and in helping sort through other works that may use ambiguous or inaccurate meanings about resins and other plant exudates. For example, Langenheim points out (p. 27) that the trade term "essential oil," which refers to volatile terpenes in some plants, is misleading out of the industry context because these compounds are "neither essential to plant metabolism nor are they true oils; essential refers to their essence or fragrance, and oil to their feel." The clear descriptions of the basic classes of terpenoid and phenolic resins are particularly helpful for nonchemists, because they help explain how differences in resin composition influence the degree to which a resin re-

mains fluid or hardens after exposure to air, a key property that affects its ecological function and/or human use.

Any ethnobiologist who has encountered plant resin use by people will gain a deeper appreciation for resins by learning about them through the eyes and efforts of diverse investigators cited in this book. *Plant Resins* provides a vivid example of the way ethnobiology can advance as an interdisciplinary field by synthesizing information and insights from chemists, ecologists, and anthropologists. The author writes about each subject area with clarity, confidence, and precision. The glossary will help readers with no scientific background to easily understand most of the information and concepts in the book. Dr. Langenheim draws heavily on her own extensive work and brilliantly connects the salient points from hundreds of other researchers in the field. When she believes other researchers' conclusions are not supported by solid evidence, however, she does not accept their views without reservation.

On a slightly critical note, each paragraph contains numerous references, although every phrase does not have a corresponding citation. This format makes the text more readable than scientific journals, but sometimes leaves the reader wanting to know the specific source of a particular point. The meticulous illustrations including maps, plant and plant parts, chemical structures, and flow charts complement the text well. The color and black and white photographs bring to life the processes relating to resin formation and harvest.

Dr. Langenheim's prowess as a scholar has allowed her to bring together an impressive array of the past and current explorations about plant resins into one book. Her length and breadth of experience with the diverse aspects of this topic have also enabled her to critically analyze the information from a holistic standpoint and recommend topics that should be investigated in the future. Some of the enticing puzzles that researchers will face include elaborating resin formation processes in plants, unraveling the complex physiological and ecological resin interactions with insects, and investigating new ways that people can utilize plant resins. *Plant Resins* will become the standard reference for this subject because it brings together the many dimensions of plant resin research and will inspire the next generation of researchers to probe new resin mysteries.

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REFERENCE CITED

Howes, Frank N. 1949. *Vegetable Gums and Resins.* Chronica Botanica, Waltham, Massachusetts.