

sought-after distinctive wines. With this question, the next phase of the *Thirsty Dragon* story begins.

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MICHAEL C. QIAN and THOMAS H. SHELLHAMMER (eds.): *Flavor Chemistry of Wine and Other Alcoholic Beverages* (ACS Symposium Series). American Chemical Society, Washington, DC, 2012, 368 pp., ISBN 978-0841227903 (hardcover), \$160.00.

This hardcover book printed on durable alkaline paper is part of an American Chemical Society (ACS) Symposium Series. The purpose of books in this series is to publish rapidly in book form the results of original research findings as well as timely reviews presented in the symposia. This book is based on an ACS symposium, “Flavor Chemistry of Alcoholic Beverages,” held in Boston, Massachusetts, in August 2010. General topics covered include those such as flavor and flavor precursors in wine grapes and their conversion in wine, as well as the aging process during

wine production resulting in degradation and formation of flavor compounds. As it describes advances in wine flavor chemistry, it is of technical interest to scientists and other professionals engaged in wine and other alcoholic beverage research and development.

Wine flavor research is the main topic of the book as it comprises 11 of the 17 chapters. Other alcoholic beverages discussed include beer, tequila, rice wine, and two Chinese liquors (Moutai and Langjiu). In this review, I will confine my comments to the presentations regarding wine. Many of the chapters are focused on technical aspects of the flavor of one of the grapes that is associated with the region of interest of the authors. Examples include Shiraz (Australia), Sauvignon Blanc (Australia), Pinot Noir (Oregon), Garganega (Veneto, Italy), and three new Chinese grapes, Ecolly, Meili, and Hutai. Other major topics of the book include the process of wine oxidation and the assessment and detection of smoke taint in grapes and wine.

The research is peer reviewed and technical in detail, but the conclusions are interesting and relatively easily understood by the nonchemist. Let us explore some of the findings to get a better flavor of this flavor-based book. Shiraz grapes can produce a high-quality wine with a major defining component as a “peppery” aroma and flavor. This can be directly attributed to the compound rotundone. This is an important discovery because the rotundone level can be influenced by viticulture practices as it comes directly from the grape or by wine-making practices. Smoke taint has become an increasing danger to grapes and wine as uncontrolled wildfires have become a frequent threat to vineyards. One chapter describes how the quantification of guaiacol glycoconjugates can assist in smoke taint quantification, while another chapter describes an enzymatic analysis that can be used relatively rapidly to assess smoke taint risk levels in the grape supply. An ancient technique of long skin maceration time of white grapes in clay vessels has been revived with some commercial success in Italy. Authors of the Veneto region of Italy where this technique is being used have studied its impact on wine aroma descriptors and aroma compounds. The future use of this method is aided by this basis of understanding in order to ensure that the fundamental aromas desired can be regularly achieved. The exposure of wine to oxygen can be both helpful in forming favorable aroma and taste compounds, or it can be deleterious as it can cause the rapid deterioration of wine. The results of one study emphasize the importance of oxygen management at bottling and the oxygen barrier properties of the closure in optimizing the sensory properties of wine. The authors found that natural cork stoppers or Saranex screw caps provide optimal oxygen transfer rates and were superior to other closures.

There is an unusual chapter among the wine chapters in that it was a review of the wine of Northwest China rather than a formal presentation of a chemical research issue regarding wine. The chapter is a bit difficult to read as its translation leaves ample room for interpretation; however, the fact is that China is now among the leading growers of grapes and producers of wine. This alone deserves attention. At the time of this publication, China was fifth in grape cultivation and seventh in

wine production in the world. Wine production in China started 9,000 years ago and currently includes the products of Chinese-developed hybrid grapes, wild grapes of China, and some European varieties.

As this is a reference book for scientists engaged primarily in enological research, I recommend this for wine economists interested in multidisciplinary research. The book chapters are available online, so if one has a specific topic of interest, one could purchase it online. Each chapter has extensive references, there is a well-formed subject index, and the book is bound in long-lasting hardcover and includes plenty of tables, figures, and color illustrations.

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