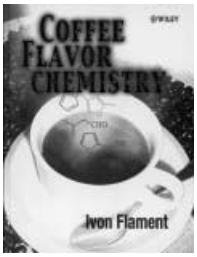
Spilling the Beans

Coffee Flavor Chemistry. By *Ivon Flament*. John Wiley & Sons Inc., New York 2002. 410 pp., hardcover £ 125.00.—ISBN 0-471-72038-0

Of all the food and drink products, coffee undoubtedly heads the list with regard to the number of aroma and flavor substances that have been identified. The subject of coffee aroma has been studied for many years (from the 19th century, through work by Payen and others). Some early groundbreaking investigations were published by Reichstein and Staudinger in 1926. The subject has been returned to sporadically again and again, for example, by research groups led by Tressl (ca. 1980), Vitzhum, Steinhart, and Holscher (up to the end of the 1990s), to name only a few.



This book is concerned with aroma substances in both raw and roasted coffee. Currently there are about 850 known volatile constituents in roasted coffee, and about 300 in raw coffee. The book consists of five chapters. A short introduction outlines the history of coffee, describes the main constituents, and lists some important books and review articles on coffee (which the reader will find very useful). Chapter 2 is devoted to raw coffee. The most important groups of nonvolatile constituents (alkaloids, trigonelline, proteins and amino acids, carbohydrates, fats, chlorogenic acids) and volatile constituents are described briefly. Chapter 3 ("From the Raw Coffee Bean to Roasted Coffee") gives a short description of the Strecker breakdown process and the Maillard reaction, which are the most important processes that produce the volatile aroma constituents in roasted coffee. The author does not attempt to describe in detail the mechanisms involved. The most important modern methods for physical and chemical characterization (including sensor devices) are described, and different approaches to evaluating aroma constituents (e.g., dilution analysis of aroma extracts, the CHARM system, OSME) are discussed. This chapter also contains a summary of results on the most potent aroma substances in coffee from the research group led by Grosch. Chapter 4 describes the history of coffee aroma research, from its beginnings (around 1800) to the present. To give an idea of where the main emphasis lies in this book, these four chapters occupy only about 80 pages, whereas Chapter 5 consists of about 260 pages.

Chapter 5, the main part of the book, lists every compound identified up to now, giving the structural formula, information about its discovery and the group reporting it, its properties, relevant sensor technology, quantity, and mechanism by which it is formed (chemical synthesis, formation during roasting). The CAS Registry number is always given, and the FEMA number if available. The compilation is arranged according to compound types, beginning with hydrocarbons and ending with sulfur-containing compounds. The method of classification by compound types is appropriate and useful.

Some errors and omissions are inevitable in a work of this kind, but those that I found are relatively few and not very serious. Two examples are mentioned here. On page 292 it is stated that pyridine has only been determined quantitatively by one research group; in fact there are at least two other publications reporting concentrations (which are in a similar order of magnitude to the first). On page 229, where 5-(hydroxymethyl)furan-2-carbaldehyde (HMF) is mentioned, no data on concentration are given, despite the fact that a value of about 350 mg/kg in coffee has been detemined. However, these are really only slight shortcomings which do not detract from the usefulness of the compilation.

The keyword index is very useful. For example, under "organoleptic properties … green coffee" the index lists a large number of sub-categories such as "chicory", leading one to individual constituents that have that aroma. The literature coverage is very comprehensive and up-to-date, with over 1300 references extending to 48 pages. The book is of outstanding quality in its factual content, and is essential for everyone working in the area of coffee aroma and flavor or needing information about the subject.

Ulrich H. Engelhardt
Institut für Lebensmittelchemie
Technische Universität Braunschweig
Braunschweig (Germany)

Structure and Bonding in Crystalline Materials. By *Gregory S. Rohrer*. Cambridge University Press, Cambridge 2000. 539 pp., softcover £ 29.95.—ISBN 0-521-66379-2

This textbook of about 540 pages presents an approach to the subject of structure and bonding in crystalline solids. My choice of the word "approach" is intentional, because if it were not already obvious that such an enormous subject could not be covered exhaustively in a book of this size, that