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Book Review

Molecules at an Exhibition: Portraits of intriguing materials in everyday life by John Emsley

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Molecules at an Exhibition: Portraits of intriguing materials in everyday life by John Emsley Oxford University Press, Oxford, England; New York, 1998. xiii + 250 pp. 16.0 x 24.0 cm. $25.00, £18.99 HB ISBN 0-19-850266-4.

For those concerned with the current epidemic of chemophobia (the inordinate fear of chemicals), and that should include all of us, this book brings good news. Its author, John Emsley, lectured for a quarter-century at the University of London and is now Science Writer in Residence, first at London's Imperial College of Science, Technology and Medicine and presently at Cambridge University. In his earlier popular science book, *The Consumer's Good Chemical Guide: A Jargon-free Guide to the Chemicals of Everyday Life* (W. H. Freeman: New York, 1994), which received the 1995 Rhône-Poulenc Science Book Prize, Emsley, recipient of the 1993 Glaxo Award for Science Writing, promised a second volume in which he would deal with additional chemicals that have given rise to alarm in the media, such as MSG, preservatives, chlorine, nicotine, methanol, HFCs, and others as well as nutrients that have led to unrealistic hopes of improved nutrition and health, such as vitamin C and calcium. Except for MSG, he has now fulfilled this promise and also dealt with a multitude of other chemicals involved in our quotidian life.

The topics in Emsley's latest book developed from articles that he originally wrote for newspapers (his "Molecule of the Month" column in London's *The Independent*), magazines (pieces from his "Radicals" column in *Chemistry in Britain*), and various company publications. Others are from his "private collection" - "subjects that have simply taken my fancy and I am writing about for the first time." According to Emsley, "in writing for newspapers and magazines, a lot of background material, interesting side issues, historical perspectives, and my own personal views have to be omitted. Writing a book enables me to put all these in, and it also enables me to provide a broader perspective on molecules that feature in the news for a few days but then are rarely heard of again." In our opinion he has admirably succeeded in accomplishing this goal.

The metaphorical title of the book, in Emsley's words, "a personal collection of chemicals that I find particularly interesting," is obviously derived from the 19th-century Russian composer Modest Petrovich Mussorgskii's "Pictures at an Exhibition," and Emsley traces it to his friendship with chemist and art collector Alfred Bader. Each of the 79 "portraits" of a substance, compound, class of compounds, element, chemical product, or plant (e. g., mistletoe), is complete, self-contained, and often cross-referenced, making the volume ideal for browsing. The portraits are grouped into eight "galleries," each with a common theme, and reading the book gallery by gallery, however, reveals close relationships and differences that would be lost by mere browsing. In keeping with the informal and lighthearted (but accurate and documented) character of the book,

which exemplifies popular science writing at its best, the galleries and portraits are endowed with catchy and humorous but pertinent titles. The galleries are of about equal length (ca. 30 pp), and the individual portraits range in length from a page (Phosphoric Acid) to 5 pages (Penicillin). One "family portrait" amounts to 7 pages but is devoted to seven elements (Sn, V, Cr, Mn, Mo, Co, and Ni) important in nutrition. Regardless of the degree of the reader's scientific or chemical knowledge or sophistication, he or she will find curious, fascinating, and little-known facts and anecdotes in almost every portrait.

Among the numerous intriguing questions about the materials making up our world that Emsley answers are: Which natural drug protects the heart? (Selenium.) What's the secret of Coca-Cola? (A blend of seven oils and caffeine.) What is nature's sleeping pill? (Melatonin.) What radioactive lifesaver should be in every home? (Americium.) What's the molecule that turns men on? (Nitric oxide.) What metal could galvanize your sex life? (Zinc.) What is the clean, cold fuel for the coming century? (Hydrogen.) What is the most bitter substance on earth? (Bitrex.) What is the worst-smelling one? (Methyl mercaptan.) Among the materials that he profiles are water, oxygen, glass, iron, and highly versatile plastics such as celluloid, polyethylene, polypropylene, polystyrene, polyurethane, and poly(ethylene terephthalate), as well as polymers such as Teflon and Kevlar.

The titles of the galleries and the number of their constituent portraits provide a glimpse of the book's scope and contents: 1. "Nearly as nature intended" (9): "Some curious molecules in the foods we eat;" 2. "Testing your metal" (8): "Metals which our bodies must have;" 3. "Starting lives, saving lives, screwing up lives" (11): "Molecules that can help and harm the young;" (This gallery contains a subgallery, "Private Collection: Restricted Viewing Only" exhibiting five portraits, which are "included as a public service about the dangers of taking illicit and potentially dangerous substances:" Ecstasy; cocaine, heroin, and designer drugs; nicotine; epibatidine; and melatonin.); 4. "Home, sweet home" (11): "Detergents, dangers, delights and delusions" (Emsley delights in alliteration); 5. "Material progress and immaterial observations" (9): "Molecules that make life a little easier;" 6. "Landscape room: environmental cons, concerns and comments" (9): "Molecules that stalk the world; 7. "We're on the road to nowhere" (10): "Molecules to transport us; 8. "Elements from Hell" (11): "Molecules that are mainly malevolent."

Emsley thinks that you should not need a degree in fine arts to take pleasure in viewing great paintings, one in music to appreciate a symphony concert, one in media studies to enjoy a movie, or one in literature to be enthralled by a good book. Nor do you need a degree in chemistry to read and understand *Molecules at an Exhibition* (p xi). Believing that language, although the primary medium of communication, can also be a barrier to understanding, he avoids scientific jargon and has "not included any chemical formulas, equations or molecular diagrams." Instead, for further reading he includes a list of 47 books, one publshed as recently as 1998. (In *The Consumer's Good Chemical Guide,* Emsley eschewed chemical formulas in the text, but he provided structural formulas and additional technical data on 193 substances in a 54-page cross-referenced alphabetical appendix.) "A Quick Guide to Things Large and Small" (2 pp) introduces the nonscientist to scientific units and everyday equivalents.

Emsley provides his readers, with and without scientific backgrounds, with unexpected, surprising, and reassuring answers that expose media scares and the misinformation and disinformation that surround many of the controversial chemicals that we all encounter today and that impinge on our everyday lives. For example, he exonerates dichloromethane (DCM), the solvent used for extracting fat from greaves (the dried form of abattoir waste that is converted to high-protein cattle fodder), from environmentalists' accusations that it damages the Earth's atmosphere because, like CFCs, it contains ozone-depleting chlorine atoms. The earlier conviction of DCM as a dangerous pollutant now seems to have been a sad miscarriage of justice. Indeed, had it not been wrongly convicted, it might have prevented bovine spongiform encephalopathy (mad cow disease) and so saved the lives not only of millions of cows but also of several humans (p 168). He also clears aluminum from complicity in Alzheimer's disease, and antimony oxide in mattress foam of complicity in infants' "cot death"; the latter was a "classic media scare" in the the UK in the early 1990s.

For citizens unduly fearful of terrorist attacks with nerve gases, Emsley explains the important distinction between such substances and toxic metals: chemical toxins like sarin, atropine and CS can usually be destroyed fairly easily because they are organic molecules whose toxicity is very much linked to their

structure. Change that slightly, and they can be rendered harmless. Metals are different. You cannot destroy a metal atom; once it has gained access to your body, the best you can do is excrete it rapidly (p 214).

Emsley deals with molecules recently in the limelight such as nitric oxide (*Science* magazine's 1992 "Molecule of the Year" and the title of Carl Djerassi's "science-in-fiction" novel, *NO* (for a review see G. B. Kauffman and L. M. Kauffman, *The Chemical Educator*, **3 (5)**, [1998]) in the portrait "Sexual chemistry," and he discusses aphrodisiacs in his portrait of keratin. (Rhinoceros horn has the reputation of being the most powerful aphrodisiac of all, although phenylethylamine, contained in chocolate and discussed in the very first portrait in the book, "Aztec dreams," has more of an effect on the brain but not a sexually arousing one).

Considering the panoramic breadth of the book, the errors are few and minor: e. g., "their" for "his or her" (p 51); "Rachael" for "Rachel" Carson (p 164); omission of the word "metal" in the sentence "Aluminium is the most abundant in the Earth's crust " (p 172); and "shishmatosis" for "schistosomiasis" (p 226). John Emsley's unusual blend of science, history, literature, technology, and current affairs, couched in accessible, nontechnical language, will be of interest not only to the public at large but also to instructors of chemistry, biology, environmental science, and risk-assessment courses. Moreover, it makes a great read.