

BOOK REVIEWS

The Chemical Promise: Experiment and Mysticism in the Chemical Philosophy, 1550-1800. Allen G. Debus, History of Science Publications, Sagamore Beach, MA, 2006; hardcover, xxv + 548 pp, ISBN 0-88135-296-9.

Allen Debus, winner of the 1987 Dexter Award in the History of Chemistry, has long been considered the world expert on the history of iatrochemistry, that peculiar blend of alchemical thought with medicine and pharmacy which characterized much of the 17th and late 16th centuries and whose most lasting impact on modern chemistry was perhaps its success in introducing chemistry into the university curriculum under the guise of service courses for students of medicine and pharmacy. Far more complicated than this brief characterization would suggest, iatrochemistry was also coextensive in its early phases with the reformation and the collapse of both church authority and medieval scholasticism—events which created something of an intellectual vacuum into which rushed not only the early stages of the mechanical philosophy but also the revival of a bewildering array of mystical and occult beliefs ranging from Neoplatonism to the doctrine of signatures.

The 26 essays reprinted in this volume attempt to guide the reader through this intellectual labyrinth and have been organized into four categories: The Alchemical Background, The Chemical Philosophy, Chemistry and Medicine in National Settings, and The Eighteenth Century and the Chemical Revolution. At first glance the reader will be somewhat puzzled as to the origins of the essays themselves as neither the table of contents

nor the individual essays carry a bibliographical reference indicating where the essays originally appeared. Eventually, however, one discovers that this information is instead embedded in Debus' introduction and reveals that, though two or three of the essays have been reprinted from easily accessible sources, such as *Isis* and *Ambix*, the vast majority originally appeared in the proceedings of relatively obscure French, German, Spanish, and Dutch publications, and that, in fact, one or two have never been previously published. Since tracking down these original sources would be a nontrivial task, it is a great convenience to have all of them collected together in a single and easily accessible book. The reviewer was particularly delighted to see that this collection included the 1986 essay "Chemistry and the Universities in the Seventeenth Century," which he has often found to be of great use in his own teaching and writing.

Potential readers can probably best judge the extent to which this book will be of interest by their reaction to the claim put forward by Debus in the final paragraph of the book's concluding essay, "History of Chemistry: Key to Modern Science," where he states, "I believe that Paracelsus is fully as important to our understanding of sixteenth century science as is Copernicus, and van Helmont should be studied with as much care as Galileo." If one is interested in the question "Who was important in determining the content and direction of 16th century science?" — and this is certainly a question that has interested Debus throughout his career—then this is probably an accurate claim. If, on the other hand, one is primarily interested in the question "What are the lasting contributions of 16th-century science to present

day science? — and this is the historical question which is of most interest to practicing scientists and the public at large—then such a claim is dubious in the extreme. The important point, however, is that neither response is correct or incorrect; the appropriate response depends rather on the question being asked. But even if, like the present reviewer, you fall into the second, rather than the first, of these camps, this book will probably be of interest, since to properly deal with the answer to the second

question, one must have an accurate knowledge of the answer to the first question, and Debus is probably the most congenial guide to that answer as he sticks to the historical subject at hand and seldom mars his writings with the strident revisionist rhetoric so characteristic of many of the younger historians of the alchemical and iatrochemical periods. *William B. Jensen, University of Cincinnati.*

Mendeleev on the Periodic Law: Selected Writings, 1869-1905. William B. Jensen, Ed., Dover Publications, Inc., Mineola, New York, 2005, 314 pp, ISBN 0-486-44571-2, \$19.95.

The German chemist Lothar Meyer once complained during a priority dispute with Mendeleev that few European scientists could be expected to be fluent in Russian. This is even truer today. Almost all of Mendeleev's writings on the periodic law, including archival material, were published in Soviet Russia. All in Russian, these very valuable texts, crucial especially for the study of the history of chemistry, have not been easily accessible to English-speaking readers. As William B. Jensen, the editor of this book, urges (pp 5, 160), a fresh English translation of such Russian collections of Mendeleev's writings on the periodic law is highly desired, but Jensen decided that such a project was beyond his ability and the scope of one book.

Therefore the writings in this collection are not fresh English translations of Russian originals. The editor uses the nineteenth century English, German, or French translations. This is partly due to Jensen's lack of knowledge of Russian. However, there is also another rationale. Even though Mendeleev learned German, French, and Latin in his school days and studied in Germany for two years, his knowledge of these languages was limited. He always wrote in Russian and asked his friends and

colleagues to translate his writings when necessary. All of Mendeleev's writings in languages other than Russian are translations. Therefore, the papers collected in this book also reflect the story of the reception of the periodic law by nineteenth-century chemists outside Russia. Furthermore, this book offers several episodes that show Mendeleev's poor knowledge of spoken foreign languages (the epigraph, pp 6, 154).

Jensen's selection comprises thirteen translated papers that appeared in European journals from 1869 to 1905. The papers are presented in roughly chronological order and divided into three groups, reflecting the period corresponding to the initial establishment of the periodic law (Papers 1-3, 1869-1871), a period of priority disputes and experimental confirmations (Papers 4-8, 1871-1886), and a final period of general acceptance for the law (Papers 9-13, 1887-1905).

Paper 1: "On the Relation of the Properties to the Atomic Weights of the Elements" [*Z. Chem.*, **1869**, *12*, 405-406]

Paper 2: "On the Correlation between the Properties of the Elements and their Atomic Weights" [*Zhurnal Russkogo Khimicheskogo Obshchestva*, **1869**, *1*, 60-77]

Paper 3: "On the Periodic Regularity of the Chemical Elements" [*Ann. Chem. Pharm.*, **1871**, *8* (Supplementband), 133-229]

Paper 4: "On the Question Concerning the System of Elements" [*Ber. Dtsch. Chem. Ges.*, **1871**, 4, 342-352]

Paper 5: "On the Application of the Periodic Law to the Cerite Metals: A Reply" [*Ann. Chem. Pharm.*, **1873**, 68, 45-63]

Paper 6: "Remarks Concerning the Discovery of Gallium" [*C. R. Séances Acad. Sci.*, **1875**, 81, 969-971]

Paper 7: "The Periodic Law of the Chemical Elements" [*Moniteur Scientifique*, **1879**, 21, 691-693]

Paper 8: "On the History of the Periodic Law" [*Ber. Dtsch. Chem. Ges.*, **1880**, 13, 1796-1804]

Paper 9: "The Periodic Law of the Chemical Elements" [*J. Chem. Soc.*, **1889**, 55, 634-656]

Paper 10: "On Argon" [*Nature*, **1895**, 51, 543]

Paper 11: "How I Discovered the Periodic System of Elements" [*Revue Général de Chimie Pure et Appliquée*, **1899**, 1, 211-214, 510-512; **1901**, 4, 533-546]

Paper 12: *An Attempt Towards a Chemical Conception of the Ether*, Longmans, Green & Co., London, 1904

Paper 13: "The Grouping of the Elements and the Periodic Law," [*Principles of Chemistry*, Longmans, Green & Co, London, 3rd ed., 1905, Ch. 15]

When only German and French but no English translations were available, the editor himself translated those into English. (Papers 1, 4, 5, 8, 11). When English translations existed alongside their German or French versions, Jensen revised the English translations after a comparison with their German or French versions, since English translations were usually secondary and tertiary translations from German or French (Papers 2, 3, 6, 7). English versions translated directly from Russian originals are retained with minimum revisions, such as appropriating American spellings, rearranging footnotes as endnotes, and breaking apart "unending sentences" (Papers 9, 10, 12, 13).

There are some minor mistakes, because of Jensen's unfamiliarity with the Russian language and literature

on Mendeleev in that language. The source of Paper 2 should be written as shown above. The Russian Chemical Society, founded in 1868, and the Russian Physical Society, founded in 1872, merged into the Russian Physical-Chemical Society in 1878, with individual Chemistry and Physics Sections, as proposed by Mendeleev. *Zhurnal Russkoe Fiziko-Khimicheskoe Obshchestvo* (used here in the grammatically incorrect form; the correct form is *Zhurnal Russkogo Fiziko-Khimicheskogo Obshchestva*) is the name of the journal of the combined new society, which did not exist in 1869. Paper 2, Mendeleev's first paper on the periodic law, was read by the Russian chemist, Nikolai Menshutkin, not because Mendeleev was ill at the time (p 11), but because he was away inspecting cheese-making cooperatives for the Imperial Free Economic Society (see, for example, a well written first English biography of Mendeleev, Michael Gordin, *A Well-Ordered Thing*, 2004, p 30). Jensen writes that it is unclear from Walden's bibliography whether Mendeleev ever completed his revision of the eighth Russian edition of *The Principles of Chemistry* (p 160 n.24). Mendeleev did complete it, the eighth edition appearing in 1906. As Jensen noticed, Mendeleev loved wordy footnotes, and this tendency went to extremes in *The Principles of Chemistry*. However, in the eighth edition, all the notes were separated from the main text and placed in the second half of the book [see this reviewer's publication for the details, "D. I. Mendeleev's Concept of Chemical Elements and the Principles of Chemistry," *Bull. Hist. Chem.*, **2002**, 27, 4-16 (pp 10-12)]. In this way, the "typesetter's nightmare" (p 157) was avoided.

This book is the product of Jensen's lectures for the annual history of chemistry course for chemistry majors at the University of Cincinnati. His aim—provision of a single, easily accessible source for Mendeleev's principal writings on the periodic law—has been successfully fulfilled. On the whole, this long overdue "English-language collection of Mendeleev's most important writings" (p 5) on the periodic law is a most welcome contribution to the history of chemistry. *Masanori Kaji, Tokyo Institute of Technology, W9-79, 2-12-1 Ookayama, Meguro-ku, 152-8552 Japan*

De Re Metallica: The Uses of Metal in the Middle Ages, Robert Bork, Ed., Ashgate, Burlington, VT, 2005, xxii+401 pp. ISBN 0 7546 5048 0, \$99.95.

This volume is a collection of papers that examine metal objects and technical writings on metallurgy from Western Europe from the early Middle Ages to the Renaissance. *De Re Metallica*, not to be confused with Georgius Agricola's treatise with the same title, is divided into five sections: 1) "metal for secular display," that discusses metal bodily decoration and other personal metal objects; 2) metal objects that possess a religious significance; 3) "metals for everyday use;" 4) metals used in buildings and architecture; and 5) treatises about metal production. The final section is likely to be the most interesting to historians of science, because of its analysis of how metallurgical knowledge was conceived, explained, and transmitted. The detailed descriptions of metal objects and reconstructions of medieval technologies from the book's earlier archaeological and art historical sections also give us a richer understanding of the material history of medieval science. The level of scholarship in this work is high; the authors almost uniformly rely on careful examinations of physical and documentary evidence and refrain from speculative conclusions. The argumentation is precise and thorough. Someone hoping to gain a comprehensive knowledge of medieval metal production and other metallurgical topics, however, would be advised to turn elsewhere. General assessments are shunned in favor of investigations into particular objects, texts, and locales.

The first four articles of the first section consider bodily ornaments from early medieval northern Europe. Gale R. Owen-Crocker uses metal remnants found in fifth- to seventh-century Anglo-Saxon graves as a means to discuss wealth and its display in that society. Brooches, pendants, and other metal objects are often the only surviving artifacts of these graves and, therefore, offer important clues to the material culture of Anglo-Saxons. Thus Gabor Thomas applies ninth-century metalwork as evidence for determining the Northumbrian style of metalwork found in strap ends and concludes that Viking influence in Anglo-Saxon Northumbria was not as great as previously thought. Nancy L. Wicker discusses the social significance of bracteates found as pendants in Scandinavian graves from the Migration Period. Niamh Whitfield describes in detail a tenth-century "kite" brooch excavated from the Temple Bar West site in Dublin. Michèle Hayeur Smith continues the examination of

Scandinavian subjects by using experimental trials to recreate Viking Age mold-making techniques. The last two articles of the section change the geographical setting and move into the later Middle Ages. In one of the more fascinating articles of the volume, Elisabeth Antoine decodes the magical inscription on a signet ring owned by Guillaume de Flouri, a Frenchman who was the Viscount of Acre during the 1270s. John Cherry's piece closes the section by interpreting the metal decoration found on the Savernake Horn, a carved elephant's tusk from fourteenth-century England.

The following section limits itself to objects relevant to religious life that were composed of metal. The articles range widely through time and space. Michael Ryan concludes that, in Ireland in the years around 1000, as a result of economic factors, more effort was expended in decorating Eucharistic vessels than in architecture. Karen Blough analyzes a gold plated sculpture of the Virgin and Child that was likely commissioned by Mathilde, a Princess-Abess from Essen. Sally J. Cornelison, by deducing its originally intended location, skillfully reconstructs the inspirations for a bronze casket that Lorenzo Ghiberti made for the church of Santa Maria degli Angeli in Florence.

The third section is called "Mundane Metals: Metals for Everyday Use in War and Peace." Finding a common theme among these three disparate yet strong pieces is challenging. Kevin P. Smith describes how iron was produced at a farm in Háls, Iceland during the Viking Age, making sober estimates about the workforce, the scale of production, and methods and materials used. David Starley provides a starting point for further investigations into the materials and efficacy of quarrel-point arrowheads from late medieval England. And Julia Lea-Jones gives a detailed account of a water conduit built of lead during the fourteenth century in a Carmelite friary in Bristol, England.

While metal objects are often the only matter that survived in Anglo-Saxon graves and, therefore, essential to reconstructions of what is no longer extant, frequently the opposite prevails in medieval buildings, where stone has endured the centuries, but metal structures have corroded, are inaccessible, altered, or looted. It is in this light that the authors in the fourth section examine the employment of metals in medieval architecture, in both famous cathedrals and more modest structures. Carl F. Barnes, Jr. shows that Villard de Honnecourt was not an architect and that his interest in the role of metal in architecture was limited. Jennifer S. Alexander looks at

the use of lead, as well as other substances, in joints in medieval masonry, primarily in England. Sabine Lepsky and Norbert Nussbaum examine how lead was used in clamps, ties, joints, brackets, and window bars in a Cistercian Church in Altenberg, near Cologne. A. Richard Jones reconstructs the original ironwork in the highest parts of the Spire in Salisbury Cathedral through a careful consideration of both physical evidence and documentary sources. Phillippe Bernardi and Phillipe Dillmann wish to diminish the dichotomy between stone and iron skeletons in their treatment of the Papal Palace at Avignon. Charles R. Morscheck, Jr. shows how the various kinds of pegs, rods, templates, and rings gave structural strength to the seemingly stone Milan Cathedral.

The final section of *De Re Metallica* is dedicated to metallurgical writings. Ricard Córdoba de la Llave shows how a fourteenth-century Spanish vernacular treatise, the *Liber que enseña ensayar cualquier moneda*, explained the techniques needed to assay silver, a topic common among many vernacular arithmetic books of this era. Because of the ubiquity of debased coins during this period, assaying was of great value to both states and merchants. Córdoba de la Llave recreates the steps described in the treatise, demonstrating that assayers had not only numerous technical skills, honed through experience, but also used sophisticated methods of quantification and measurement in their practice. David E. Connolly gives a linguistic analysis of the “rhetorical

practice of restatement” (i.e., the use of “and” and “or”) in Ulrich Rülein von Kalbe’s *Bergbüchlein*, a theoretical and empirical account of metals that was printed repeatedly during the sixteenth century. In a separate article Connolly provides a detailed research bibliography on the *Bergbüchlein*, which, while useful, would benefit from the inclusion of alchemical treatises. Even if von Kalbe was at times dismissive of alchemists, he shared a theory of the creation of metals with them. Peter L. Siems summarizes the laws for the Schlackenwald (in present-day Czech Republic) tin mines enacted by Ferdinand I in 1548. He then discusses Ferdinand’s motivations and the effects these laws had on miners and their communities, judging that these laws probably improved working conditions slightly, changed the status of miners to that of paid workers instead of independent cooperatives, and did not greatly increase royal revenue.

The editor, Robert Bork, should be commended not only for bringing together a group of meticulously argued papers, but also for the quality of the book as a whole. Numerous figures and images clarify the articles and inform the reader. The copyediting is excellent; translations are written in a clear style, and the thorough index is more than welcome. These articles will be key for future research on the individual topics they treat and, in themselves, demonstrate the variety of ways that metal artifacts can be used as historical evidence. *Craig Martin, Oakland University.*

Creadores de la Ciencia Moderna en España y América: Ulloa, los Delhuyar y del Río descubren el platino, el wolframio y el vanadio (Creators of Modern Science in Spain and America: Ulloa, the Delhuyar and del Río discover Platinum, Tungsten and Vanadium). Manuel Castillo-Martos, Muñoz Moya Editores Extremeños, Seville, 2005, 293 pp.

The relationship and exchange of technological and cultural ideas between Spain and the American continent have been the focus of many books authored and edited by Manuel Castillo Martos; in this particular work, the chemistry of minerals is the central theme, and, more

specifically, both the role played by Spanish scientists on the discovery of platinum, tungsten (wolframium), and vanadium and the impact of these scientists on mineralogy in America and Europe.

The book is clearly divided into two halves. The first one takes up a third of the book and has a general character which positions the reader in the historical framework where the four scientists operated. The second part presents their respective contributions to the discovery of the above cited chemical elements alongside detailed biographical information on each of the four scientists.

The first part of the book is titled “Historical Framework where Ulloa, the Delhuyars and del Río Operated”

and it is divided into four unnumbered chapters; its purpose is to position the reader in the general, economic, commercial, political, social, ideological, and cultural environments of both Spain and the American Viceroyships during the 18th century. After this, the book turns to a description of the state of science on both geographical areas, focusing specifically on the chemistry of the time, and its effects on the historical development of Spanish and American mining and metallurgy. The description begins by displaying the evidence of not only the Iberian scientific backwardness (relative to that of its neighboring countries in the European framework), but also the even more obsolete state of the mineral processing techniques in the Viceroyships of New Spain (Mexico) and New Granada (Colombia). This situation was concurrent with the (often accidental) discovery of the great quantities of mines and mineral deposits located in these lands. This situation is presented alongside social considerations, such as the “criollo” feeling of rejection against everything related to the “motherland.” In the narrative there is a brief reference to the pioneer work of Proust as professor in the “House of Chemistry” in Segovia; the author considers this information relevant, given a publication by Proust on platinum, and this being one of the themes around which the book revolves.

The second part, titled by the author “The Creators,” presents separately similar information about the four scientists, who are, in the order of the book, Antonio de Ulloa (1716-1795), the brothers Juan José (1754-1796) and Fausto Fermín Delhuyar (1755-1833), and Andrés Manuel del Río (1764-1849). In addition to the biographical character of this information, the narrative places the characters inside the history of the discovery of the elements to which each of them was devoted, giving special emphasis on just one of these elements for each case in particular. For instance, in the case of Antonio de Ulloa, the author presents details of this scientist’s geodesic expedition to Peru and his stay in this and other American countries, along with the more relevant facts in the history of the metallurgy of platinum. These facts include the importance of platinum to the Spanish Crown, aspects related to its commercialization, and the role that different contemporary European scientists such as (among others) José Celestino Mutis, Pierre Joseph Macquer, Antoine Baumé, Andreas Sigismund Margraff, Jean Baptiste Boussingault, George le Clerc (count of Bufón), and none other than Antoine Lavoisier and Pierre Simon Laplace (who were the first to melt platinum using “dephlogisticated air”) had on the isolation and characterization of the properties of said element. The ties

among the different scientists in the book integrate the narrative and make it more interesting, as, for instance, when the author reveals details of the efforts of Fausto Delhuyar in obtaining malleable platinum. It is in this manner that the entire work is intimately connected, and so its reading should be done integrally and sequentially, and not by random chapter selection.

The presentation of the studies of the Delhuyar brothers raises the interesting scientific controversy between them and Karl Wilhem Scheele over the discovery of tungsten, along with the differing opinions that established this name over that of wolframium to represent the new element (Translator’s Note: the name wolframio is still used to represent tungsten in Spanish). The portion of the book devoted to Andrés Manuel del Río highlights his extensive relationships with the scientists of his time (who included one of the Delhuyar brothers, Fausto), his stay in New Spain, and his extensive scientific activity in the field of mineralogy, which led him to the isolation of vanadium in 1801 and a polemic over this point with the Swede Nils Gabriel Sefström (Friedrich Wöhler also played a role in this drama). This controversy centered on the identity of the actual discoverer and on the name that is universally accepted today (del Río had initially named the element eritronio). Through a detailed examination of the written publications of the implicated scientists as well as those of their contemporaries and analogously to what is done with Antonio de Ulloa, each one of the sections is complemented with a detailed analysis of the facts associated with the quantitative and qualitative analytical techniques utilized at the time for the discovery, characterization, and isolation of said elements.

The book concludes with the presentation of five appendices where the author supplies supplementary information of a more chemical and less historical character: the natural occurrence, properties, uses, and applications of each of the three elements. Throughout the work, the author includes numerous footnotes that refer the reader to the final part of the book where the entire bibliography is completely referenced. The quantity, quality, and relevance of the references demonstrate the high degree of erudition on the part of the author and the very adequate use of primary and secondary bibliographic sources.

In summary, this is a well executed work, written in a frugal but agreeable style, and with a rigid adherence to the facts, as suggested by the bibliography that was consulted during its production and writing. In the bibliography the reader will find information not widely circulated in historical publications but presented in a

clear and orderly manner, so that this will be enjoyed by not only those interested specifically in mining and metallurgy but also by those studying the relationship between Spain and its American colonies. The reading of this book may prompt the reader to consider two other books written by the author on very similar topics: *Mining and Metallurgy: Technological and Cultural Exchanges between America and Europe during the Spanish Colonial Period* (translator's title; actual Spanish title: "Minería y Metalurgia: Intercambio tecnológico y cultural entre América y Europa durante el periodo colonial español") and *Precious Metals: the Union of Two Worlds. Technology, Commerce, and Politics of Spanish-American Mining and Metallurgy* (translator's title;

actual Spanish title: "Metales preciosos: unión de dos mundos. Tecnología, comercio y política de la minería y metalurgia iberoamericana"). Distributed by the same publisher, these two works study the diverse factors in the Spanish and American framework that affected the technical and cultural activities of American mining and the extension and transfer of mining and commercial techniques to other materials such as gold, silver, or mercury. *Simón Reif-Acherman, School of Chemical Engineering, Universidad del Valle, Cali, Colombia.*
Translation by Dr. Gorka Peris; Research Associate, Department of Chemistry, Boston College, Chestnut Hill, MA 02467, USA.

A History of Chemical Warfare. Kim Coleman, Palgrave Macmillan, Houndmills, UK, New York, 2005, xxv + 164 pp, ISBN 1-4039-3460-6; paperback, \$26.95.

Although few of the books on chemical weapons listed in Kim Coleman's bibliography were published within the past few years, the topic does seem to be undergoing somewhat of a resurgence. While reading Coleman's book, I came across a review of two other books on chemical weapons in *Chemical Heritage* (vol. 24, No. 4, Winter 2006/7, pp 46-7), one newly published in 2006 and the other a 2005 reprint of a 1965 publication. Perhaps the increased fear of terrorists and of their use of weapons such as poison chemicals, biological agents, and "dirty" bombs against civilian populations has aroused renewed interest in these topics.

Coleman's book—much slimmer than the two mentioned above—offers a history of the development and use of chemical weapons throughout the 20th century. It begins by mentioning some historical precedents, including the military deployment of poison gases and fumes as long as 4,000 years ago, and also sets out the context for the discussion of later topics. The historical chapters cover chemical agents in WWI, the years

between the two world wars, WWII, the Cold War (including Korea and Vietnam), and the recent conflicts in the Middle East, Afghanistan, and the Gulf region. As expected, the author's attempts to write a history of the most recent conflicts—the Iran-Iraq war (1980-88), the war in Bosnia (1992-95), and the Gulf wars (1991 and 2003-present)—are less successful than her discussions of events from earlier periods.

In WWI all the combatants except the United States were signatories to the 1899 Hague Declaration, which prohibited "the use of projectiles the sole object of which is the diffusion of asphyxiating or deleterious gases" (p 9). This prohibition did not, of course, prevent their use in that war. First of all, they were available in large quantities. The significant growth of the chemical industry by the end of the 19th century made possible for the first time the production of large amounts of toxic chemicals for the battlefield. Also, it wasn't difficult to circumvent the Hague Declaration. The Germans developed a shell that contained not only a liquid tear gas, but also an explosive for producing shrapnel. In their well-known gassing of French troops with chlorine at Ypres in April, 1915, the Germans capitalized on Fritz Haber's suggestion of simply opening up canisters of gas when the wind was blowing toward the enemy trenches. Despite

the common misconception that the Germans were the first to deploy gas as a battlefield weapon in WWI—I certainly thought they did—the French actually were the first. In August, 1914 they fired tear-gas grenades filled with xylyl bromide at German troops without any significant effect.

For me, some of the most interesting material was the continued development of chemical weapons after WWI, especially the discovery of nerve gases in Germany despite the terms of the 1919 Treaty of Versailles that prohibited such research, as well as “the dog that didn’t bark,” i.e., the absence of chemical weapons in WWII even though both Allied and Axis countries had huge stockpiles and expected them to be used. With this material, Coleman finds her stride as a good storyteller, something she doesn’t always achieve.

The book’s final two chapters attempt to situate chemical weapons in today’s world, in terms both of terrorist groups and of current international agreements among nations. Again, the topics of these chapters are too close in time to lend themselves to historical treatment, and I think that Coleman succeeds less well in treating these recent events than in telling stories about the past and conveying their significance.

In general, I found Coleman’s writing both objective and well documented, especially in her examination of known and reported uses of chemical weapons throughout the 20th century. The one notable exception is her discussion of alleged US use of the nerve agent sarin in Southeast Asia in 1970 against American defectors and “also against American prisoners of war whom the [US] government decided would be a major embarrassment if they came home alive” (p 97). Unfortunately, Coleman offers no substantive evidence to support this allegation and gives a website as her only reference.

She then juxtaposes this allegation with yet another one concerning the suicide of a US Army sarin expert after a failed POW rescue mission in 1981. Her source for this is “Scott Barnes’ book,” which she neither identifies nor includes in her bibliography. The discussion continues with a quote from an unnamed source, who claims that the expert was probably murdered because of his knowledge of using sarin against American soldiers, and it concludes with the story of a CNN website on this topic, which mysteriously disappeared shortly after it was set up. This entire discussion is little more than innuendo and has the aura of a conspiracy theory with no documentation beyond websites, an unnamed book, and an anonymous source. The inclusion and presentation of this material seriously undercuts Coleman’s objectivity—perhaps fatally for some readers—but I was able to regain my confidence in her for the remaining pages.

While I learned a good deal from Coleman’s book, I obviously have some reservations about it. The author suffers a serious lapse in objectivity, and she sometimes provides a lot of details without necessarily weaving them into a compelling story. At the outset of the book I was troubled by the frequent lack of punctuation after introductory clauses and sometimes had to reread sentences for meaning. More troubling to me—as a former writing teacher—were the subject-verb disagreements. I found three on the first two pages, but either they disappeared or I stopped noticing them.

Even with the caveats mentioned above, I do recommend this book as a brief introduction to an important topic, one that unfortunately hangs over twentieth-century chemistry like a toxic cloud. *Richard E. Rice, P.O. Box 1210, Florence, MT 59833; charrice@juno.com.*

WEBSITES

HIST: <http://www.scs.uiuc.edu/~mainzv/HIST>

CHEMICAL HERITAGE: <http://www.chemheritage.org>

HISTORY OF SCIENCE SOCIETY: <http://www.hssonline.org>