BOOK REVIEWS

Characters in Chemistry: A Celebration of the Humanity of Chemistry, Gary D. Patterson and Seth C. Rasmussen, Eds., ACS Symposium Series 1136, Washington, DC, American Chemical Society (distributed by Oxford University Press), 2013, xiii+248 pp, ISBN: 978-08412-2800-9) $150 (hardback; e-book also available).

There seems to be general agreement among the authors of these chapters that a true chemical character is an individual who has made significant historical contributions to the science of chemistry and also had unusual personal traits that have made him or her stand out. The various chapters in this book cover a variety of chemical characters, ranging from the well-known, such as Bunsen, Crookes, and Davy, to the less familiar, like Yegor Vagner and George Rosenkranz. Not all of the individuals described in the book fulfill both of these qualifications, and, indeed, two of the chapters focus on topics that do not strictly correspond to either criterion. None the less, the overall result is a very readable and interesting excursion through the history of chemistry.

As described by William Jensen, Robert Bunsen certainly qualifies as having made many important contributions and also having had a rich personal history. In fact, there are so many Bunsen anecdotes that they are given a special classification as *Bunseniana*. The two observations about Bunsen that resonated most strongly with this reviewer are that the skin on his hands was so thick that he could take the cover off a hot crucible without using tongs, and that his official residence at Heidelberg was large enough so that he could set aside a separate room for his unwanted mail. Readers who have either burned their fingers from picking up a hot crucible lid or found that their office was not big enough for all the papers they wanted to store will probably sympathize with these choices.

There is much less anecdotal material available about the next chemist who is profiled in this book. Joseph Black, the Scottish chemist who is best known as the discoverer of carbon dioxide, left surprisingly little personal information despite his rather long and distinguished career. Black was a popular teacher, an effective consultant to industries, and seems to have been very active socially. A significant number of his letters have recently been published, but these deal mainly with scientific and technical matters, giving little impression of his personal life. Robert Anderson, who wrote the chapter on Black, concludes that, ". . . Black as a person remains something of an enigma."

Alan Rocke emphasizes the diversity of those who have contributed to chemistry by contrasting the lives of John Dalton and Humphry Davy. Dalton was a Quaker from a small town who believed in the plain life, whereas Davy aspired to the life of a London aristocrat. The two men were also poles apart philosophically, with Dalton as the traditional Enlightenment realist, and Davy, who was twelve years younger, being more of a Romantic who wrote poetry in his spare time. Seth Rasmussen focuses his chapter specifically on the early years when Davy was investigating the properties of gases. Gilbert and Sullivan fans will probably appreciate the fact that Davy was born and raised in Penzance, home of the famous Gilbert and Sullivan pirates. Like the Modern Major General in that play, Davy seems to have made himself an expert on many things without much formal training. As Rasmussen points out, "The greatest discoveries are not always made by the most highly trained or highly educated people." On the other hand, many chemists

may be stunned to learn the extent to which Davy chose to experiment on himself by breathing various toxic gases for significant lengths of time, so much so that he became addicted to nitrous oxide. Davy was very lucky that he lived long enough to have such a distinguished career, so perhaps luck can be as important as training.

William Brock argues that Sir William Crookes personified the definition of the term chemical character in that he not only made significant contributions to chemistry but also had an unusual personality. Crookes had little formal training and did not make his career in either industry or an academic institution but instead made his living mainly as a scientific journalist. Despite this he was an innovator in many fields, including photography, chemistry, physics, agricultural science, and public health. Crookes was a keen observer and developed many scientific breakthroughs, such as the Crookes tube and the radiometer, from his observation of anomalies that apparently escaped the attention of others. His most unusual personality trait was his strong belief in spiritualism. His commitment was so strong that some of his critics said that it was as though he had two different personalities, one a rational scientist and the other a gullible believer in miracles.

Balazs and Istvan Hargittai tell the story of five Hungarian scientists, Theodore von Kármán, Leo Szilard, Eugene P. Wigner, John von Neumann, and Edward Teller, who emigrated to the United States before World War II to escape the persecution of the Jews by the Nazis. Each of them began their studies in chemistry, but later expanded to other disciplines; however, their chemistry background was very useful when they worked on the Manhattan Project to create the atomic bomb. In order to explain their unusual intellectual abilities and their strange accents the story spread that they were actually Martians, and the group happily adopted this label.

As far as this reviewer is concerned, my favorite Martian was Leo Szilard. According to one tale, Szilard was the origin of the story that the Hungarians were Martians. When Enrico Fermi was wondering why, if there were life on other planets, they had not made it to the Earth. Szilard replied that the Martians were already here; they were called Hungarians. Szilard's mind worked so fast that he often understood the meaning of other people's data before they had understood it themselves. In 1933, he was disgusted with the shortsightedness of Lord Rutherford's statement that the idea of obtaining energy on an industrial scale from the transformation of atoms was "moonshine." As he was going across the street near his London hotel he was suddenly struck with the realization that it might be possible to use neutrons to create a nuclear chain reaction. This became the basis for the research that led to the atomic bomb. Later on, Szilard was one of the scientists who encouraged President Franklin Roosevelt to create the Manhattan Project.

George Rosenkranz was another chemist born in Hungary, although he was not part of the group of so-called Martians. He studied and worked initially in Zurich but later immigrated first to Cuba and then to Mexico to escape the Nazis He achieved several breakthroughs in the field of steroid chemistry using Mexican plant sources as raw materials. James Traynham bases his chapter on a personal interview that he had with Rosenkranz. While in Zurich Rosenkranz supported himself by coaching a table-tennis team, performing in a theater troupe, and teaching people to play bridge. Bridge has always been his special passion. He has written 14 books on the subject and has been the national bridge champion of Mexico several times.

Gary Patterson describes Paul John Flory as yet a different kind of chemical character. Flory's scientific expertise is undisputed; he won the Nobel Prize in 1974 for his work in polymer chemistry. It is the other half of his qualifications that makes him an unusual character. For much of his professional life, Flory opposed violations of human rights, mainly in what was then the USSR. He worked to free scientists who had been imprisoned in Russia, opposed travel restrictions that the Soviets imposed on scientists, and helped individuals and their families immigrate to this country. As Patterson summarizes, "He was willing to risk his own life and reputation to support those who were persecuted or repressed."

David Lewis reports on the special contributions of Yegor Yegorovich Vagner, who first proposed the correct structure of α-pinene in a series of articles beginning in 1867. Previously, nine different chemists had attempted to solve this structural problem, and so Vagner's contribution was especially important. Vagner's most unusual trait was his commitment to amateur theater, an interest that started when he was a child and continued throughout the rest of his life. While he was a student at the university in Kazan he was well known for not only his attendance at the theater but also for his performances in amateur productions and his willingness to criticize the professional productions that he attended regularly.

By no means is the book limited to those who fit the definition given in the first paragraph above. Cathy Cobb presents an informative chapter on those individuals suspected of using poisons during the Renaissance.

She describes the advantages and disadvantages of the various poisons available in considerable detail, and also evaluates the charges of using poison that have been brought against various figures of the time, including Lucrezia Borgia (possibly innocent) and Caterina de' Medici (more likely guilty). It was particularly impressive that the author not only sampled the odor of a piece of arsenic ore, but also trained her dog to find a piece of the ore in a pile of debris. This is the sort of behavior that might get her included in a future volume about characters in chemistry.

Carmen Giunta's chapter on chemists as characters in fiction will be particularly useful to teachers who wish to assign out-of-class readings to supplement the topics on their syllabus. He suggests several resources that catalogue chemists in fiction, including WorldCat and Lab Lit.com. If a teacher would consider adding some popular references to his or her reading list, an additional source would be the ACS Undergraduate Blog on the topic, "Who are your favorite fictional chemists?" (http://acsundergrad.wordpress.com/2012/03/06/who-are-your-favorite-fictional-chemists-here-are-ours/). Some teachers may look askance at this web site, since it includes Walter White, who is a well-known example of a chemist using his knowledge for evil purposes. Another possible supplement to the excellent information that Giunta offers is the online article called *Literature and Chemistry* by Jay Labinger. (https://www.its.caltech.edu/~bi/labinger/nontechpdfs/16chemlit.pdf)

The history of chemistry is a fascinating field of study, and one of the reasons for this appeal is the diverse character of those who study chemistry. As this book demonstrates, chemistry has attracted poets, pacifists, amateur thespians, bridge masters, humanitarians, spiritualists, and yes, even poisoners. Perhaps equally important, those who have made important discoveries have included both scientists trained at the best institutions of their time as well as those who had little formal training. Patterson and Rasmussen urge teachers to celebrate this diversity so that young people thinking about making chemistry their career will better understand that there is potentially a place for them regardless of who they are. This is a powerful message which deserves to be heard. It is to be hoped that many chemistry teachers will be inspired by this book to enliven their classes by sharing some of these stories about the characters who are responsible for creating the field of chemistry.

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Toxic Airs: Body, Place, Planet in Historical Perspective, James Rodger Fleming and Ann Johnson, Eds., University of Pittsburgh Press, Pittsburgh, 2014, xiv + 284 pp, ISBN 978-0-822-96290-8, $28.95.

Toxic Airs is a collection of essays that investigate a wealth of worries about "bad" airs. Ranging from medieval worries about witches' breath to contemporary concerns with the rising levels of carbon dioxide, the essays of this book reveal a persistent anxiety about and fascination with the air we breathe. As the editors explain, "Humans are, not surprisingly, threatened by compromises to their air, and they have reacted by wielding their full arsenal of understandings on toxic airs" (p ix).

Humans' many and varied reactions to compromised air are what motivate the book and will interest readers. Taken as a whole, this is not merely a catalog of aerial concerns, but a full examination of how humans, in different times and places, have tried to address perceived problems with the air they breathe. Detailed case studies of tear gas, smog, acid rain, deadly airs, ozone, radiation, and automotive emissions reveal a wide range of attempts to contain or cope with compromised airs.

The majority of these cases are twentieth and twenty-first century issues, but there are three outlier chapters on earlier periods that deserve considerable attention because of the counterpoints they offer to contemporary studies. Brenda Gardenour Walter contributes an essay on the late medieval period that provides a useful overview of how longstanding medical traditions imbued airs with both natural and supernatural powers. Christopher Hamlin's close reading of Reginald Orton's discourse on cholera and deadly air yields a powerful insight for modern medicine and medical historians: that medicine should