who gets only a few poisonous snakes and relatively small crocodiles to hunt. That's just the small stuff, the mere rump of 65 million years of riotous evolution. Flannery is at his very best among the vanished larger creatures, as when he's caching his mastodon kill. Describing paleobiologist Dan Fisher's next-to-the-real-thing experiments with a horse submerged in a pond near Hell, Michigan, in February, he imagines the family in August. Devoted to science, they are eating their fortnightly roast of now-aged meat, green and cheesy smelling. An Australian big red would be a perfect, perhaps even essential, accompaniment.

BROWSINGS

A Chemical History Tour. Picturing Chemistry from Alchemy to Modern Molecular Science. *Arthur Greenberg.* Wiley-Interscience, New York, 2000. 332 pp. $59.95, £38.95. ISBN 0-471-35408-2.

In 118 light-hearted essays that range from the ancient Greeks to the atomic force microscope, the author highlights selected episodes from the history of chemistry (deliberately offering only sparse coverage of 20th-century work). His highly personal accounts pay particular attention to artwork and images from historical books and papers (such as the depiction of Priestley's pneumatic trough to the right).

The Character Concept in Evolutionary Biology. *Günter P. Wagner, Ed.* Academic Press, San Diego, CA, 2000. 644 pp. $79.95. ISBN 0-12-730055-4.

The contributors to this volume offer a variety of perspectives, sometimes clashing, on how characters are defined, identified, and used in biology. Some consider the functional, genetic, and developmental architecture of characters. Others focus on the evolutionary origins of such features as flower morphology, butterfly wing patterns, and tetrapod limbs.

Enriching the Earth. Fritz Haber, Carl Bosch, and the Transformation of World Food Production. *Vaclav Smil.* MIT Press, Cambridge, MA, 2000. 358 pp. $34.95, £23.95. ISBN 0-262-19449-X.

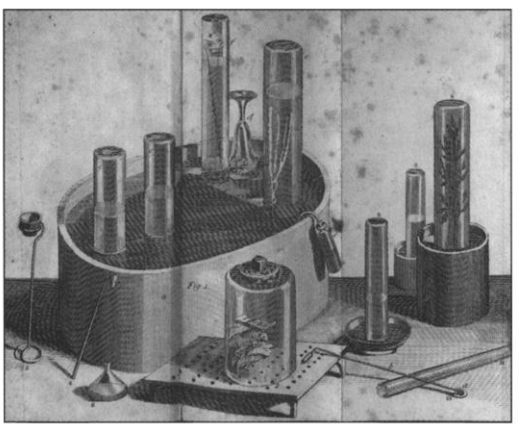
Smil provides a detailed account of the discovery and commercialization of ammonia synthesis, a process he identifies as the most important technological innovation of the 20th century. He discusses how the industrial production of fertilizer has come to directly support 40% of the global population, and he examines the ecological consequences of this intervention into Earth's nitrogen cycle. His enjoyable narrative will reward historians of science, economists, and anyone interested in how humans impact their environment.

CREDIT: COURTESY A. GREENBERG, *A CHEMICAL HISTORY TOUR* (WILEY INTERSCIENCE, NEW YORK, 2000)

NOTA BENE: CHEMISTRY

Some Things Never Change

A fictional encounter of three chemists and their wives or partners in 1777 is at the heart of Carl Djerassi and Roald Hoffmann's new play, *Oxygen*. The protagonists have come to Stockholm at the invitation of the Swedish king, who wants to see their scientific experiments on the isolation of the mysterious agent that is responsible for fire and the rusting of metal. Two of them believe that the agent is phlogiston, "the agent of fire" that leaves the metal when it rusts and is released into the air during combustion. The third believes that an element called oxygen enters the metal upon rusting and is removed from the air during combustion. History will prove him correct, but initially he meets fierce opposition.



Gas collector. The three chemists used pneumatic troughs such as this (Priestley's apparatus) to isolate gases derived from solids.

Fast forward to 2001, when a committee set up by the Nobel Foundation to decide who should be awarded the first "retro-Nobel" Prize for Chemistry. The committee quickly settles on the discovery of oxygen as the key to modern chemistry. But who should be awarded the prize? Should it be Carl Wilhelm Scheele, the Swedish apothecary who was slow to publish his discoveries but informally described his experiments to other scientists? Or Joseph Priestley, the English priest who had a passion not only for science but also for politics and who, to his death, believed that phlogiston rather than oxygen was the missing agent? Or Antoine Laurent Lavoisier, the French tax collector, lawyer, and banker who fell victim to the French revolution—but not before he had, with the assistance of his wife, performed the first accurate weight measurements of reagents and products of combustion and arrived at the conclusion that oxygen was responsible for the observations?

Written by two chemists who have in recent years expanded their activities to include writing fiction, essays, and poetry, the play shows that the familiar world of scientific competitiveness is not a new phenomenon, and that in the 18th century, scientists already followed the maxim "publish or perish." Repeated scene-switches between 1777 and 2001, with most actors playing roles in both eras, increase the feeling of continuity. After a slightly shaky start, the drama becomes entertaining, at least to an audience having some knowledge of chemistry. But I suspect that a nonscientist, or even a nonchemist, will find it hard to appreciate why the committee chooses to honor the discovery of oxygen and what distinguishes oxygen from phlogiston. The "play within a play" that is meant to illustrate this difference comes too late and does not explain the concepts very clearly. In addition, the intermission, which occurs only half an hour into the play of about an hour and a half, is quite disruptive, especially because the second act was much more engaging than the first. Reading the play might well be more satisfying.

The encounter in Stockholm and the occasional flashbacks to other events in the lives of the 18th century protagonists tell an intriguing story of scientific ambition and discovery. I found the meetings of the retro-Nobel committee less convincing. The interpersonal relationships seem a bit forced; too many strands, from women in science to scientific integrity, are pursued at once. And the absence of a science historian on the committee made no sense to me. Although *Oxygen* raises some intriguing issues and tells an interesting story, it may nonetheless fail to capture the imagination of a wider audience.

Oxygen
by Carl Djerassi and Roald Hoffmann
Wiley-VCH, New York, 2001. 128 pp. Paper, $14.95, £9.99. ISBN 3-527-30413-4.

Oxygen
by Carl Djerassi and Roald Hoffmann
Lyceum Theatre, San Diego, CA, 2 to 7 April 2001. See www.djerassi.com/oxygen/oxygen2.html for future performances.

—JULIA UPPENBRINK