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More about Mme. Lavoisier than M. Lavoisier*

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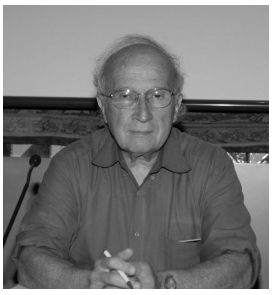

Roald Hoffmann was born in 1937 in Zloczow (a Polish town at the time, and currently belonging to Ukraine). He obtained a doctorate at Harvard University, and afterwards worked for that university for a few years. Since 1965, he is a Professor at Cornell University, in the state of New York. His work has been recognized with some of the most important awards in his specialty, including the Nobel Prize Nobel in Chemistry, which he shared with Japanese Kenichi Fukui in 1981. He has trained scientists from around the globe in his department, with whom he maintains ties of friendship and collaboration, and to whom he has transmitted his enthusiasm for science and many other activities. In 1991, he was given an honorary degree (degree honoris causa) from the University of Barcelona. Hoffmann has also been dedicated to communicating and divulging chemistry in television, he has published several poem books, and is coauthor of a play (Oxygen, written with Carl Djerassi). He has lived with plastic artists, learning from them the technique of pottery and the dying of plant fabrics and fibers. In exchange, he explains to them the scientific basis of these processes. Together with Pere Alemany, some months ago, Hoffmann organized a workshop of theoretical chemistry for young researchers of Arab countries and Israel where, during a week, they lived with their instructors in an environment of dialog and mutual knowledge in the Jordanian city of Petra. The goal of this project was not only for the participants to broaden their knowledge of theoretical chemistry and practice quantitative computational chemistry. More importantly, they attempt to stimulate the approximation between people that history, politics and religion have slowly brought apart.

In 1771, Marie Anne Pierrette Paulze was a lively girl of thirteen. When her mother passed away, the young woman left a convent school to help her father as a hostess. Her vivacity attracted a friend of the family, the fifty year old Count d'Amerval. A remarkable letter survives in Cornell's Lavoisier collection in which Marie Anne's father diplomatically yet directly declines the Count's proposal.

Another suitor was much more welcome. Antoine Laurent Lavoisier had a law degree, but his passion was for science. As a young man, he impressed the French scientific establishment with his geological and chemical research. Lavoisier had just bought a half share in the *Ferme Générale*—the *Ancien Régime*'s version of what our IRS might be heading for in some conservative dream—a private company collecting taxes for the crown. Marie Anne's father was one of the leading "farmers".

Lavoisier was a frequent visitor at the Paulze house. He and Marie Anne played romantic board games, but also spoke of geology, chemistry and astronomy. When a marriage was proposed by the father, both the young Antoine and Marie Anne welcomed it; he was twenty-eight and she was thirteen at the time they were married. A lovely self-portrait of Mme. Lavoisier survives. It must have been painted not long after.

Figure 1. Self-portrait of Marie Anne Pierrette Paulze Lavoisier. Private Collection.

Antoine Laurent Lavoisier

In telling the story of Mme. Lavoisier, I will not do justice (in several ways) to her husband. This young natural philosopher mastered the art of careful experiment in chemistry and physics. Independently wealthy from his *fermier*'s income, he filled a

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private laboratory with balances, burning lenses and metal vessels of an unmatched magnitude and quality. In a way, Lavoisier's science was the big science of his day. His feeling for another sort of balance, honed in the *Ferme Générale's* business, as an economist, and later as a director of the Discount Bank, found expression in science: "Nothing is gained, nothing is lost" could be applied equally to economics and to the mass balances of chemistry.

Lavoisier gave the first correct accounts of burning, respiration and rusting. In bringing about the Chemical Revolution, he properly defined the elements (though he thought heat was one), showed that water was a compound and air a mixture, and proposed a new systematic nomenclature for chemistry. In the remainder of his time, he dealt with one practical problem after another—he debunked mesmerism, thought about contagious disease in the cities, ensured that the young America got its gunpowder, adjudicated disputes on ballooning, and after the revolution, participated in the work on the metric system. Citizen Lavoisier's work for the French Republic did not save him from the Jacobin terror. On May 8, 1794, he and his father-in-law were executed, along with twenty-six other general-farmers.

Her husband's helpmeet, and after

Mme. Lavoisier ran a popular salon, to be sure. But from early on in her marriage she took instruction in chemistry to help her husband in his work. She learned English and Latin to translate important books from languages Lavoisier lacked. Mme. Lavoisier also learned to draw from Jacques-Louis David. His expensively commissioned portrait of the couple (published earlier in American Scientist, 1996, Jan-Feb pp 69) tells us of their relationship: the two are physically close—her arm rests on his shoulder—but there is a distance between them. To me there is also a certain tension in the leaning posture of Mme. Lavoisier—or am I imagining that she is pressing in, that she would like to enter Lavoisier's realm of crucial instruments in the right-hand part of the picture? Lavoisier looks at his wife; she looks out as us, at the world. They had no children.

After her husband's death, Mme. Lavoisier herself spent sixty-five days in jail. Emerging, she recovered his confiscated books and kept his works in print. Long loved by Pierre Samuel Dupont de Nemours, she rejected him, but in 1805 married instead the American/British/Bavarian adventurer, inventor, and scientist, Benjamin Thompson, Count Rumford. The marriage was an unhappy one—it's reported that she poured boiling water on his flowers—and ended four years later.

Marie Anne Lavoisier lived on until 1836, and although there is no biography of her, I personally think she deserves an opera.

A nécessaire

About twenty years ago David Corson was showing me Cornell's fantastic Lavoisier collection. Finally, he put before me a book-like object, its title "Histoire des Theâtre", before saying, "It's not a book."

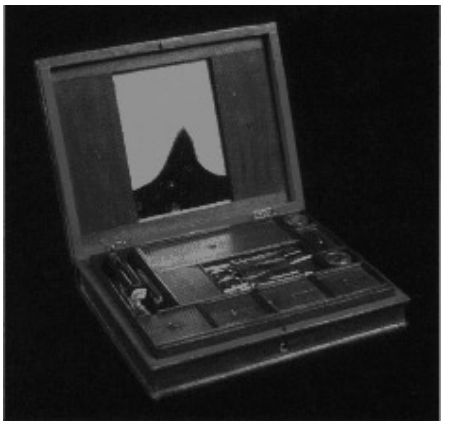

Figure 2. Mme. Lavoisier's nécessaire. Cornell University Libraries, reproduced by permission. Photograph by Charles Harrington.

It wasn't. It was a cleverly designed *nécessaire*, Marie Anne Pierrette Paulze Lavoisier's travel kit. Opened, you see many intricately covered compartments. Among them was a sewing kit—thread, a thimble, a darning egg, needles—, and all the cosmetic accoutrements of an eighteenth century lady of refinement, such as Mme. Lavoisier. Underneath a tray is some stationery. The *nécessaire* is lined with marbled paper, and there is an *etiquette* of the Paris shop that supplied it "*A la Bonne Feuille Anglaise*" (maybe the English provenance explains the misspelled faux-book title).

In the top part of the "book" is a jagged, broken mirror; with a space behind it. Twenty years after I first saw the *nécessaire*, Carl Djerassi and I wrote a play, "Oxygen", in which the space behind the mirror takes a star turn.

The first time I saw the *nécessaire*, I was driven to open some small vials resting in carefully crafted compartments. In them were dried traces of cosmetics, in various pastel colors. After two hundred years their fragrance was gone. But I could feel Mme. Lavoisier's hand as she reached in to them.

But was she a chemist?

There is no published scientific paper in Marie Anne Lavoisier's name. She translated from the English Kirwan's "An Essay on Phlogiston," with appended notes by Lavoisier and friends, notes intended (correctly) to systematically demolish Kirwan's argument. The original edition did not carry her name as translator, but subsequent ones did.

Elsewhere, she draws herself, in their laboratory. Two of her strikingly realistic and beautifully composed images of Lavoisier's work on respiration survive. These are classic visual documents of chemical experimentation. (See Figure 3 for one of these drawings). Mme. Lavoisier is at the right, sitting at a table, quill in hand. She turns to observe the experiment, waiting to write down the measurements as they are called out by her husband or his assistant. Here she is an amanuensis. She was more at times; she also wrote the plan for what experiments were done at Lavoisier's Arsenal laboratory on a particular day.

And Marie Anne Lavoisier also produced the plates for La-

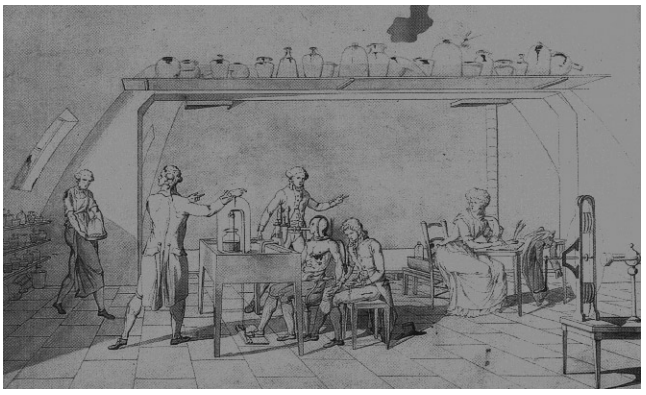

Figure 3. A drawing of Lavoisier's experiments on respiration, by Mme. Lavoisier. Note the assistant in a natural rubber and taffeta suit. Private collection.

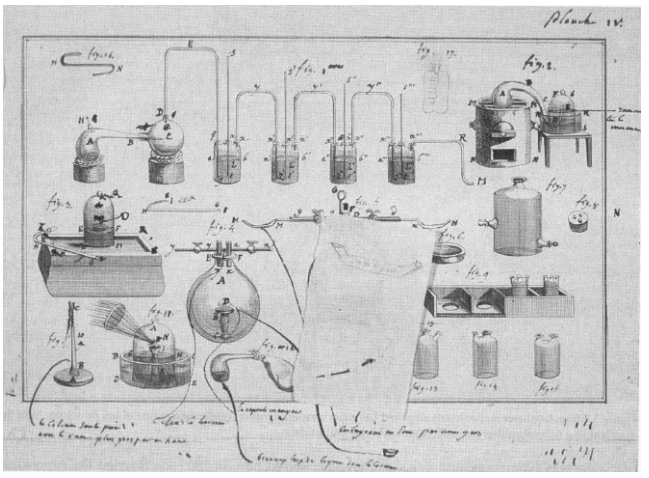

Figure 4. One of the proof pages, with comments and a pinned-on note by Mme. Lavoisier, for the plates of the Traité élémentaire de Chimie. Cornell University Libraries, reproduced by permission.

voisier's *Traité Elémentaire de Chimie*, published in the year 1789, that of another Revolution. In Cornell's library are her watercolor sketches for the thirteen remarkable plates that illustrated this book that changed chemistry. We have several *êtats* of the plates, including the one illustrated here, where she adds a correction in the 1789 equivalent of a "Post-It®", a paper note literally pinned to the print. (Figure 4) We have a copper plate which she engraved herself; the plates from beginning to end are Mme. Lavoisier's work. When satisfied, she signed a proof *Bonne*, followed by her initials. The print illustrated is not yet there. In the book there is no credit to her, only the plates, signed *Paulze Lavoisier sculpsit*, to testify to her engraving.

Mme. Lavoisier could not have been a chemist. No fault of her own, for she had the intelligence and the training—society did not allow women to follow that path for a hundred years after her time. That's how long France had to wait for another Marie.

There were exceptions, for in many ways 18th century French culture did provide a place for women as intellectuals, more so than other European societies of the time. Forty years before Mme. Lavoisier, there was Emilie de Breteuil, the Marquise du Châtelet (1706-1749), who studied mathematics and physics. She married, in the normal way of aristocracy, and led an intellectual life disjoint from her marriage. Voltaire, her lover for some years, encouraged her to undertake the first full French translation of Newton's *Principia*. This she did, ably so, and also wrote of Leibniz's work. A younger contemporary of Mme. Lavoisier was the mathematician Sophie Germain (1776-1831), who used a pseudonym to come into professional contact with J. L. Lagrange and Carl Friedrich Gauss.

The exceptions were just that; the world of the Salons—an exciting intellectual world to be sure—and a correspondence with natural philosophers is what upper class women could aspire to at best. I speculate that Mme. Lavoisier was not resentful; as many a woman has done over millennia, she simply shifted her creativity into other channels.

Still, when I think of the story of Mme. Lavoisier, I feel a great loss, a sadness. This smart woman was much less isolated from the scientific world than Mme. du Châtelet. As her drawings and the historical record testify, Mme. Lavoisier moved in the company of scientists, and good ones at that. The sadness that comes over me is that they, and her husband in the first line, did not recognize her abilities.

Acknowledgments

David Corson has shown me, and not once, that intimate treasure trove of Cornell's Lavoisier Collection. I thank Marco Beretta for allowing me to use some of the illustrations he so lovingly has collected and analyzed, and Pierre Laszlo for a corrective comment. An earlier version of this paper appeared in *American Scientist*, 90, 22-24 (2002).

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