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Mi Gyung Kim, *Affinity, that Elusive Dream: A Genealogy of the Chemical Revolution*. Cambridge, Mass.: MIT Press, 2003. xii + 599 pp. Tables, illustrations, notes, bibliography, and index. $55.00 U.S. (pb). ISBN 0-262-11273-6.

Review by Bernadette Bensaude-Vincent and Christine Lehman, Université Paris X.

Although she presents her book modestly, Mi Gyung Kim blows up the standard history of chemistry, as she radically erodes what she calls "the tale of three fathers" (Robert Boyle, Antoine Lavoisier, and John Dalton) in her conclusive chapter.

To be sure, she is not the first historian to deny that Boyle's analytic definition of chemical elements was the origin of modern chemistry.[1] Similarly, the impact of Lavoisier's revolution has been reappraised in the last decades by many Lavoisier scholars.[2] Yet, for a number of chemists and historians as well, Lavoisier's achievements were merely the beginning of a deeper revolution which culminated in John Dalton's *New System of Chemical Philosophy*.[3] In our view, the major merit of Mi Gyung Kim's work is to unearth the deep meaning of this tale, since all three heroes are supposed to have shared an inclination for an atomic view of matter. In other words, it is assumed that modern chemistry emerged out of the theoretical shift from old traditional principles to atoms via the operational definition of elements as simple substances.

The atom-oriented view is typically a biased historical view, distorted by whigism which mirrors the screen-effect produced by Lavoisier's chemical revolution. It does not stand a close investigation of the memoirs read at the Paris Academy of Science over the period. It rather leads to deep misunderstandings of eighteenth-century chemical philosophy because of an overemphasis on matter theories. In this respect, Kim's book may be read as an extension and continuation of Holmes's *Eighteenth-Century as an Investigative Enterprise*, a brief essay which initiated a deep revision of eighteenth-century French chemistry.[4] Like Holmes, Kim did a minute study of academic memoirs and argues that eighteenth-century chemistry was practice-oriented. Concepts and theories have to be understood in relation to this rich experimental culture. Kim points out with a touch of irony that the three alleged founding fathers shared one more feature: they differed from other chemists of their times by their inclinations toward sophisticated philosophy and were not considered as especially skilled chemists. Kim sets forth a narrative that does justice to "ordinary chemists," those physicians and apothecaries who promoted chemistry on the academic stage as well as in the public at large. Like Holmes, Kim emphasizes the crucial role of Wilhelm Homberg at the Paris Academy of Science. His work on the action of acids on various alkalis and his investigation of sulfur principle with a burning glass proved crucial and was followed up by Louis Lemery and Etienne Geoffroy who set the *table des rapports*. This famous table presented at the Academy in 1718 is described as a conceptual tool allowing beginners to get an overall view of the behavior of common substances and skilled chemists to predict the result of their operations. Kim refers the theoretical changes to the improved analytical instruments used by chemists as she claims--in contrast to Metzger--that the doctrine of five principles was undermined by analytical instruments rather than by the prestige of Cartesianism or Newtonianism.[5]

Kim identifies two major theoretical moments in French eighteenth-century chemistry. The first one resulting from the reorganization of the Paris Academy of Science in 1699 was the definition of chemical composition on the basis of physical analytical instruments such as burning glasses and hydrometers. The second theoretical moment took place toward the end of the century with the "Newtonian dream" of quantifying and mathematizing affinity. An innovative aspect of Kim's book is that both theoretical moments are credited not to single heroes but to groups. In the former case, Wilhelm Homberg was the "philosopher," but he was working in a collective research program with Nicolas and Louis Lemery and Etienne-François Geoffroy, who provided experimental data. In the latter case, Louis-Bernard Guyton de Morveau was the initiator of the "Arsenal group" who used to meet in Lavoisier's house with Antoine de Fourcroy and Claude-Louis Berthollet. Although she does not explicitly make the point, Kim does suggest the communal aspect of eighteenth-century chemical investigations. It is an important feature, at least in France, that would deserve more historians' attention.

So, the message of the book is clear and well argued on the basis of a rich corpus of source materials, essentially memoirs of the Paris Academy of Science and chemical treatises. Kim is not forgetful of the role of the provinces, since she also considers the memoirs of the Dijon Academy, in particular Chardenon's memoir on phlogiston that was the basis of Guyton's more famous *Dissertation sur le phlogistique*. In addition, Kim provides a useful (albeit somewhat artificial) guiding tool to read these sources as she distinguishes between three layers of chemical discourse: level one--practice dealing with substances and operations; level two--theory dealing with composition and affinity; level three--philosophy dealing with principles and attraction.

This tool, however, may not be sufficient to meet Kim's ambition to tell the story of affinity, "that elusive dream of translating all chemical reactions in terms of quantified rapports" through more than one century of chemical literature. More precisely the book suffers from Kim's narrative choice. Detailed biographical sketches of the actors alternating with fine-grained analyses of their memoirs does not perfectly suit the project of a *longue durée* historical account.

Moreover, despite her focus on experimental practices, Kim favors the description of the theoretical moments. In particular, her view of the mid-century is not innovative at all. Chapter four, entitled "Chemistry in the Public Sphere," describes a sort of interlude between two creative moments. Thanks to brilliant lecturers such as Rouelle and Macquer, chemistry spread in the public sphere and conquered social legitimacy. Although Kim's nuanced description of the different social standpoints in this battle for dignifying chemistry is interesting, she has a tendency to deny any creativity to teachers and lecturers. In her view, they just transmitted and structured a chemical knowledge received from "authorities" and did not really author anything. For instance, she assumes that the *table des rapports* published in Diderot's *Encyclopédie* was a table that Rouelle derived from Geoffroy's last edition.[6] Rouelle's "theory of salt" was no more than a classification (p. 192). Rouelle's discussion of principles is said to mirror the theoretical difficulties encountered by chemists after the demise of the five principles. In order to catch more dynamic aspects of chemistry in the public sphere, it might be useful to investigate further the role of public demonstrations, their feedbacks on the organization of chemical knowledge as well as their societal impact.

Although one might reproach the final chapters for giving too idyllic a view of the Arsenal group, it remains that they offer a good synthesis of the current historiography on the chemical revolution. The overall bibliography provided at the end of the volume is up-to-date. In other words, this volume provides a remarkable synthetic view of French eighteenth-century chemistry. It is a useful tool for all historians of the French Enlightenment. Above all, it is an indispensable reference for historians of science, and it should encourage international comparisons with cultures of chemistry in other countries such as Britain, Sweden, Germany, and others.

NOTES

[1] Marie Boas Hall, "The History of the Concept of Element," in D.L.S. Cardwell ed., *John Dalton and the Progress of Science* (Manchester: Manchester University Press, 1968), pp. 21-39.

[2] Arthur Donovan, ed., "The Chemical Revolution: Essays in Reinterpretation," *Osiris*, second series, 4 (1988); Frederic L. Holmes, *Antoine Lavoisier, the Next Crucial Year* (Princeton, N.J.: Princeton University Press, 1998).

[3] See for instance the recent study of the same period as Kim by Robert Siegfried, *From Elements to Atoms: A History of Chemical Composition* (Philadelphia: American Philosophical Society, 2002).

[4] Frederic L. Holmes, *Eighteenth-Century Chemistry as an Investigative Enterprise* (Berkeley: Office for the History of Science and Technology, University of California, 1989).

[5] See Hélène Metzger, *Les doctrines chimiques en France du début du XVIIe à la fin du XVIIIe siècle* (Paris : Blanchard, 1969) and *Newton, Stahl, Boerhaave et la doctrine chimique* (Paris : Blanchard, 1971).

[6] In fact, the table published in the volume of *planches* is anonymous. Here Kim follows A.M. Duncan, who credited Rouelle's table dated from 1763 in "Some Theoretical Aspects of Eighteenth-Century Tables of Affinity-Part I," *Annals of Science* 18 (1962), 177-194. Duncan himself based his claim from Guyton, since he adds in note 13 : "It is reprinted in Guyton de Morveau, *Elemens de chymie théorique et pratique*, 3 vols., Dijon, 1777-1778, vol. i, p. 90. It is there called '*table des affinités*' and said to be Geoffrey's table altered by Rouelle."

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