

Capturing the Invisible: Heat, Steam and Gases in France and Great Britain, 1750-1800

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Over the course of the eighteenth century the common perception of air, that invisible but omnipresent element of nature, experienced a profound change. This essay argues that a common field of knowledge emerged through the materialization of aerial fluids, including gases, steam and heat. This topic inspired the creativity of a hybrid milieu of practitioners, who extended the investigation of air while embedding it in public concerns. A growing culture of consumption, especially in urban contexts in France and Britain, helped nurture a number of new devices and apparatus aimed at mastering these fluids for various purposes and in everyday life. They offered the capacity to reshape the interplay between scientific results, social needs and political incentives, presenting new horizons for the public good and public health.

This essay reformulates assumptions (and raises questions) regarding the ‘sites’ where new approaches to air were forged. From the seventeenth century, air was closely linked to the rise of the experimental sciences. Calculating the weight and pressure of the air and understanding the vacuum, were crucial to a change of perception embodied in devices such as the air-pump. Imbuing immaterial air with a new kind of materiality fostered the emergence of “a set of practices which centered on the climate, meteorology, the atmosphere and electricity.” According to Simon Schaffer, “aerial philosophy” played a major role in this change and “acted as a wider and grander theater of power and *also* as a space in which a new economy of understanding and control might operate.”¹ Discoveries in the 1770s of various elastic fluids challenged and diffracted the category of “air” as a unified, natural body and, together with the identification of various gases, reframed the growing field of pneumatic chemistry.² However, while the role of prominent European chemical practitioners in this story is familiar, this essay explores how investigations of air engaged the creativity of a less familiar and more heterogeneous set of practitioners,

1 Simon Schaffer, “Natural Philosophy and Public Spectacle in the Eighteenth Century,” *History of Science* 21 (1983): 1-43, on 16.

2 Joseph Priestley, *Experiments and Observations on Different Kinds of Air* (London: W. Bowyer and J. Nichols, 1774).

who engendered novel communities and new audiences around their inventions and devices.

To do this entails a methodological displacement through a focus on the sociomateriality of the devices through which this broad range of practitioners contained, investigated and manipulated aerial fluids, including small-scale inventions, machines and commodities such as lamps, ventilators, gas masks, firebombs, “œconomic” stoves and furnaces. Discussion of specific cases draws on a body of printed ephemera – leaflets, advertisements, subscriptions, short essays, trade cards – and project descriptions sent to various societies, academies and societies of arts. The essay thus moves beyond tired distinctions between scientific and more commercial practices which were in fact closely interconnected. In this account the manufacture of certain technical inventions may be seen to have operated as both what Rheinberger has called an “experimental arrangement” and as a social and epistemological one.³ Considering “air” as a boundary object helps to formulate new assumptions about the epistemic nature of the devices that materialized invisible aerial fluids for a wide range of audiences.⁴ This enables a more general questioning of changes in perceptions of nature at the end of the eighteenth century, and the relationship between material and knowledge production, which entailed the co-construction of an investigative field. Mapping the intellectual and social milieux in which people engaged with materiality through the making, use and understanding of small-scale devices and the substances they contained reveals how changes occurred at the level of daily practices.

This essay centers on an understanding of aerial fluids through technical work that practically interacted with air qua matter. André Leroi-Gourhan’s anthropology of techniques is an inspirational source for the essay’s approach.⁵ The specificity of aerial fluids (such as rarefied air, noxious air, expanded air, inflammable air) inspired specific operative work on the shape and composition of devices (such as containers and vessels) designed to capture, investigate and make use of the fluids. Reinterpreting chemistry from the angle of technology recalls the pattern of Catherine Jackson’s ‘glass revolution’ – the way in

3 Hans-Jürgen Rheinberger, “Experiment, Différence and Writing I,” *Studies in History and Philosophy of Science* 23 (1992): 305-331, on 309.

4 Susan Star, James Grisemer, “Institutional Ecology, ‘Translations’ and Boundary Objects: Amateurs and professionals in Berkeley’s Museum of Vertebrate Zoology, 1907-39,” *Social Studies of Science* 19 (1998): 387-420.

5 André Leroi-Gourhan, *L’homme et la matière* (Paris: Albin Michel, 1943).