Rival Idioms for a Revolutionized Science and a Republican Citizenry

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ABSTRACT

This essay examines a conflict about language that penetrated to the core of French Enlightenment science and revolutionary politics. The conflict involved two conceptions of language that the essay proposes to characterize as “cultural” and “social.” This rivalry of idioms was at the center of two of the major disputes of the period: the controversy surrounding Lavoisier’s and his collaborators’ new chemical nomenclature of 1787 and the concurrent debate over a revolutionary system of civic education. The first of these disputes is scientific and the second political, so historians have tended to treat them separately. But they centrally involved some of the same people and many of the same arguments. Moreover, their major protagonists agreed that the projects of natural and moral science, philosophy and governing, were united by an underlying action of language in the shaping of ideas. At the same time, they disagreed, sometimes violently, about the nature of this action. The competition between cultural and social conceptions of language, moving between the controversies over the function of language in chemistry and in public instruction, dramatizes an often-overlooked interaction between science and politics, not through established fact or proven principle, but through shared disagreements.

Chemists . . . comprise a distinct people, few in number, having their language, their laws, their mysteries.—Gabriel François Venel (1753)

Sounds, and the words they represent, really in themselves have no relation, no conformity with things.—Guyton de Morveau (1782)

As men cannot make signs for themselves, except when they live together, it is a consequence that the basis of their ideas . . . is uniquely in their reciprocal commerce.—Étienne Bonnot de Condillac (1746)

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Table of names from the Méthode de nomenclature chimique (1787). The left-hand column lists the elements. Numbers 9–30 are hypothetical acid “radicals.”
THE PROCEEDINGS OF THE PARIS ACADEMY OF SCIENCES for February 1776
record major disagreements among chemists on the subject of “fixed air” (carbon
dioxide). The problem was not so much the substance as the phrase: “they generally agree
well enough upon the thing, but they are not in accord about the name.” This strife over
names went deep and escalated to a raging debate a little over a decade later, following
Antoine Laurent Lavoisier’s and his collaborators’ introduction of their new chemical
nomenclature. At the same time as chemists argued over the proper language for con-
ducting their new science, political revolutionaries establishing a system of civic education
debated the best language for molding a new citizenry. The scientific and political disputes
about language overlapped, centrally involving some of the same people and many of the
same arguments. This essay suggests that both disputes were propelled by a rivalry between
two conceptions of language, which I will introduce in Section I, proposing to call them
“cultural” and “social.”

In a 1959 essay entitled “The Encyclopédie and the Jacobin Philosophy of Science: A
Study in Ideas and Consequences,” Charles Gillispie sought a connection between revo-
lutionary politics and contemporary natural science. He argued that the Jacobins’ “resent-
ment for the new chemistry,” their broader attack on academic science, and even, by
implication, their violent radicalization of the Revolution were the outcomes of a volatile
combination that had emerged around midcentury in Encyclopedism: an antimodem, Ro-
mantic natural philosophy coupled with a politics more populist than liberal. This proposal
generated much controversy, driven by the difficulty of demonstrating links between par-

1 Registre des procès-verbaux (24 Feb. 1776), Archives de l’Académie des Sciences, Paris. The previous
spring, Lavoisier had claimed before the academy that “fixed air” was a misnomer, for the substance was not
released during burning from fixation in a solid but was produced by the combustion of “the eminently respirable
portion of the air” (oxygen) with charcoal. See Antoine Laurent Lavoisier, “Principe qui se combine,” in Oeuvres
de Lavoisier, 6 vols., Vols. 1–4 ed. J. B. Dumas, Vols. 5–6 ed. Edouard Grimaux (Paris: Imprimerie Impériale,
1862–1893), Vol. 2, p. 128. Here and throughout, all translations are my own unless otherwise indicated.

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ticular scientific programs and political parties. Nevertheless, the mutual resonances Gillispie pointed to between scientific and political argument in the revolutionary period remained undeniable.

The interlocking chemical and pedagogical disputes about language indicate a new way of analyzing these resonances between scientific and political argument. They resist the standard divisions between premodern and modern science, or tradition and Enlightenment, or revolution and counter-revolution. Instead, the competing cultural and social conceptions of language express conflicting views of how to carry out the projects of modern science, enlightened philosophy, and political reform. The movement of this rivalry of idioms between a scientific and a political dispute exemplifies an often-overlooked interaction between science and politics: an interaction, not through established fact or proven principle, but through shared disagreements and ambivalences.

A story about conflicts, ambivalences, and interdisciplinary interactions needs a binding element. Here that element is a universal preoccupation with language. Running beneath the disagreements and between the disciplines lay the common ascription to words of a deep and manifold efficacy. The capacity of words to shape ideas and, through ideas, cultures and societies was seen as central not just to arguments in the natural sciences but to psychological, pedagogical, and political debate—debate, that is, in the so-called moral sciences. Many hoped that the common action of language would serve as a master key, disclosing the foundations not only of the separate projects of philosophizing, teaching, and governing, but also of the relations joining these projects into an interdependent whole.

A rich body of recent work on the new chemical nomenclature has examined its epistemological function, on the one hand, and has called attention to the moral and political tenor of the surrounding controversy, on the other. But there has been little study of the relation between the two. Bernadette Bensaude-Vincent, in the introductory essay to her 1983 edition of the nomenclature, proposed that the lexicon was a "complex of claims, not just chemical, but also philosophical and even political." The philosophical and po-

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3 Condorcet defined the moral sciences as those “which have as the subject of their researches either the human mind in itself, or the relations of men to one another,” thereby joining epistemology and psychology with questions of proper behavior and good government: Jean-Antoine-Nicolas Caritat, marquis de Condorcet, “Éloge de Bucquet” (1780), in Oeuvres, ed. Condorcet-O’Connor and Arago (cit. n. 1), Vol. 2, pp. 410–433, on p. 410. In what follows, I will use the word “moral” in its eighteenth-century meaning, as encapsulated in Condorcet’s definition.

litical elements of this complex have generally been treated independently, though in close proximity. In a 1992 issue of the *Eighteenth Century* devoted to the Chemical Revolution, two essays focus primarily upon the nomenclature. Lissa Roberts’s interest is epistemological; she assesses the influence of Étienne Bonnot de Condillac’s philosophy of language upon the nomenclature and upon new chemists’ methods. Jan Golinski’s interest is political; he contrasts French and English objections to the nomenclature. More recently, Bensaude-Vincent and Ferdinando Abbri have edited a volume on the dispersion of the new nomenclature in Europe, in which several contributors indicate that the debates accompanying this dispersion were often political.3

Assessing the nomenclature’s role in the formulation of chemical theory, historians have called it an instrument of research. Addressing its moral and political implications, they have shifted their focus and treated the nomenclature as a different, though “analogous,” kind of “instrument . . . to be used in the construction of a demonstrative discourse” and the maintenance of “a centralized political and linguistic order.”6 But in the eyes of the natural philosophers and political actors who first identified these two instrumentalities—epistemological and moral—they were really one. A useful comparison is to the subjects of contemporary experimental physics: the behaviors of heat, light, electricity, and magnetism. The separate fields of inquiry associated with these phenomena were united by the general hypothesis that such forces were carried by weightless fluids. These fields of inquiry were also united by overarching disagreements about just how these fluid mechanisms worked.8 In the same way, the new natural science of chemistry and the new moral science of public instruction were united by the hypothesis of a hidden action of language in the molding of ideas. But chemists and pedagogues were also engaged in a common controversy about just how language exerted its several powers and how these could be harnessed.


I. TWO CHEMISTRIES OF LANGUAGE

Gabriel François Venel, professor of chemistry at the University of Montpellier, early staked out his position in the struggle over a language for the emerging science of chemistry. Venel was the chief writer on chemical topics for Diderot’s Encyclopédie and the author of its article entitled “Chymie.” Here he called chemists a “distinct people” with their “own independent manner” of conceiving things, a manner “which gives them a language” of their own. Arguing the importance of preserving this separate language for chemistry, Venel appealed to the Lockean epistemological principle that knowledge derives entirely from sensory experience. He praised the “chemical idiom” for expressing “reflections suggested by the immediate exercise of the senses.” A distinct language, recording chemists’ unique experience of nature’s diversity, yoked their science firmly to their sensations.

Similarly, Venel admired the experience-based language of chemical artisans and even respected the enigmatic writings of ancient alchemy for having been “rich in facts.” Indeed, he deemed obscurity itself a virtue in chemical writing. In his view, the clarity and order so admired by “the journalists, the novelists, the Poets,” actually distorted scientific research. The artificial clarity of systematic treatises belied the burgeoning confusion of sensory experience. Luckily, the opacity of chemists’ argot shielded their philosophy from the fashionable spirit of system. The style of the German chemist Georg Stahl was a model: “difficult” and “dense,” it preserved chemistry from becoming “à la mode” while at the same time “swarming with the sort of images that spread from the sensible object.”

“Chymie” appears oddly contradictory. Venel argues initially, in terms that Gillispie has described as proto-Jacobin, that the “high contemplations” of natural philosophy are nothing but the “experience of the worker covered with the varnish of science.” But to defend chemistry against the trend toward system building, he ultimately concludes that it should be reserved for an elite of connoisseurs. Writing for the third volume of Diderot’s Encyclopédie, the mission of which was to disseminate arcane knowledge, rendering the arts and sciences accessible to a literate public, Venel nonetheless closes with a vindication of “obscurity” in chemical writing. These contradictions no doubt reflect a general uncertainty about the Encyclopédie’s project: at once to celebrate the specialized technical knowledge of craftspeople and to challenge the cloistering of such knowledge within the crafts, two purposes that could fall into conflict.

But it is possible to make sense of Venel’s contradictions. He did not intend to shield chemistry behind a veil of secrecy. On the contrary, the article opens by regretting the general “incuriosity” about chemists and their work. In its most cited passage, Venel calls for a “new Paracelsus,” “clever, enthusiastic, and bold,” who would place chemistry on a par with physics. This new Paracelsus would promote chemistry through powerful language, with a “noisy ostentation . . . a decided and affirmative tone.” Venel’s project was

8 Venel, “Chymie” (cit. n. 1), pp. 408, 409, 416, 419.
9 Ibid., pp. 419, 408, 436–437. The style that evolved from the writings of chemical artisans and alchemists comprised what Bensaude-Vincent has called “the natural language of chemists,” a natural language that was later supplanted, she implies, by the artificial nomenclature: Bernadette Bensaude-Vincent, “Introductory Essay: A Geographical History of Eighteenth-Century Chemistry,” in Lavoisier in European Context, ed. Bensaude-Vincent and Abbrri (cit. n. 5), pp. 1–17, on p. 2. Her phrase echoes Venel’s own belief that the obscurity of traditional chemical language reflected the diversity of physical sensation.
certainly public relations. He meant to popularize chemistry; only his was a particular, and somewhat polemical, conception of chemistry and so, too, of chemical language.

Venel wrote that chemical theories were not rational expositions but “exhibitions” of nature. They were derived not from principles but from unguided “groping,” from the “vague signs” chemists were able to divine in their objects, and from what he described as chemists’ capacity for “experimental premonition.” Physics and chemistry, each with its own “general manner of envisaging” its subjects, must each have a “different language.” While the language of physics was rigorous and mathematical, chemistry would always be “vague and approximate.” Chemists’ knowledge, Venel implied, could be expressed but not articulated; it was a matter of sensation and intuition, not system.12

A manner of thinking, a mode of speech, a way of life, all rooted in a natural basis of physical sensation and instinctive response: these were principal ingredients also in the nascent conception of culture.13 Étienne Bonnot de Condillac defined “culture” in his Dictionnaire des synonymes as “the care one gives to a piece of land to render it fertile. It is said figuratively of customs, the mind, the sciences, etc.” By analogy, one did not deliberately invent customs, manners of thought, or sciences according to first principles, but only fostered their natural growth. To “cultivate” the “mind, the memory, the arts, the sciences,” was a matter of developing one’s responsiveness to this organic process—one’s sensibilities and intuitions—more than one’s rational faculty. Condillac and his comrades, cultivating their garden, resolved to “work without reasoning.” Though Venel’s recommendation to chemists to shun the systematizing “tone” of contemporary physics and return to the traditional “chemical idiom” was in that sense reactionary, his project was, in its effort to preserve a cultural identity, strikingly modern. In the language of enlightened political philosophy, Venel defended the “right” of chemists to their idiosyncratic style as at once a “liberty” and a “possession.” His ideal of scientific language was far from old-fashioned; it retained its vitality through the last years of the century.14


13 Isaiah Berlin traces the “modern concept of culture, and of what may be called cultural pluralism,” to Vico and, more generally, to the eighteenth-century “birth of the new belief . . . in the value and importance of the singular and unique, of variety as such”: Isaiah Berlin, “Giambattista Vico and Cultural History,” in The Crooked Timber of Humanity (New York: Knopf, 1991), pp. 49–69, on pp. 59, 56. Natalie Zemon Davis writes that in the eighteenth century “reflections on the history of language as well as on the history of religion . . . produced a theory . . . of primitive culture.” She identifies this theory as an early step toward a modern “anthropological concept of culture” and identifies this concept at play in an eighteenth-century work on proverbs. See Natalie Zemon Davis, Society and Culture in Early Modern France (1965; Stanford, Calif.: Stanford Univ. Press, 1975), pp. 255–256. Raymond Williams writes that “in French, until C18, culture was always accompanied by a grammatical form indicating the matter being cultivated. . . . Its occasional use as an independent noun dates from MC18”: Raymond Williams, Keywords: A Vocabulary of Culture and Society (New York: Oxford Univ. Press, 1976), p. 78.

Opposing Venel’s vision of an organic style of chemical expression was a different tradition of reformers of chemical language. One creator of this tradition was Pierre Joseph Macquer, who in 1766 published a dictionary of chemistry in which he proposed new, systematic conventions governing the names of salts.\textsuperscript{15} This proposal was adopted and expanded to include all chemical names, first by the Swedish chemist Torbern Bergman, then by the Dijon lawyer and chemist Guyton de Morveau, who had been a student of Macquer’s and was a friend of Bergman’s, and, finally, by the tax farmer, academician, gunpowder commissioner, and chemist Lavoisier. It was this movement for the instantiation of a systematic chemical language that culminated in the new chemical nomenclature published by Morveau and Lavoisier in 1787, in collaboration with two others, Antoine François de Fourcroy and Claude-Louis Berthollet.\textsuperscript{16}

From Macquer to Lavoisier, these natural philosophers sought conventions grounded not in experiment, enthusiasm, tradition, or cultural autonomy, but in “the relation of ideas with words.” They defied the Lockean dogma that ideas originate solely in physical sensation and the corollary, drawn by Venel and his followers, that natural philosophical theory and culture must be allowed to emerge spontaneously from sensation and emotion. While Venel disparaged books as faulty because artificial sources of chemical knowledge, Macquer claimed that the sciences had been conceived with the invention of writing and born with the practice of clear, systematic exposition. Research required a written plan as its guide.\textsuperscript{17}

Those who adopted Macquer’s project of renaming chemical substances believed that language directed as well as recounted experience, shaped as well as described experiments. Rather than growing spontaneously, as a jargon, from accreted experiences and responses, chemical theory was to be engineered, as a lexicon, from first principles. Thus Bergman observed that technical words, “like coins, owe their currency to prescription.”\textsuperscript{18} A science depended upon a conventional vocabulary, just as a society relied upon a conventional system of values. These conventions were formal, expressing no inarticulable intuitive power. They were deliberately chosen and could be deliberately altered.

If the conception of language informing Venel’s “Chymie” was a cultural one, the new chemists’ model of scientific language might well be described as social. The word “so-

\textsuperscript{15} Macquer suggested naming salts according to their constituents. Each salt would have a generic name denoting the acid it shared with other members of its group and a specific name denoting the metal that combined with the acid to form it. See Pierre Joseph Macquer, \textit{Dictionnaire de chymie}, 2 vols. (Paris: Lacombe, 1766), Vol. 2, pp. 673–674. On Macquer’s innovations for the naming of salts see Beretta, \textit{Enlightenment of Matter}, p. 137.

\textsuperscript{16} In their 1787 publication, all four authors of the nomenclature defended a view of scientific language formulated primarily by Morveau and Lavoisier. In what follows, I ascribe this view in its essence to all four authors. For information about “the complexity of Lavoisier’s intellectual heritage” in the next decade, and in particular about his collaborators’ adherence to and departures from their own new chemical system, see Janis Langins, \textit{La République avait besoin des savants} (Paris: Belin, 1987), pp. 53–62. Langins analyzes the chemistry curriculum at the new École Polytechnique, first called the École Centrale des Travaux Publics, in 1794. Fourcroy, Berthollet, and Morveau were largely responsible for the curriculum and adhered to the new chemical program to varying degrees. See also Nicole Dhombres and Jean Dhombres, \textit{Naissance d’un nouveau pouvoir: Sciences et savants en France, 1793–1824} (Paris: Payot, 1989), pp. 496–504. On Fourcroy’s promulgation of the nomenclature see Robert Siegfried, “The Chemical Revolution in the History of Chemistry,” in \textit{The Chemical Revolution: Essays in Reinterpretation}, ed. Arthur Donovan, \textit{Ostris}, 2nd Ser., 1988, 4:34–50.


RIVAL IDIOMS FOR A REVOLUTIONIZED SCIENCE

cial,” we learn from Diderot’s Encyclopédie, was also a “word newly introduced into the language,” used to designate that which suited one “to the commerce of men.”19 Whereas “culture” implied shared intangibles—modes of thought, varieties of experience and intuition—“social” denoted deliberate and rule-governed collaboration. Condillac defined “social” as pertaining to those “qualities that render one suited to society” and “society” as a “body of several persons . . . joined by mutual engagements called laws.” Rousseau’s “social” meant “corporate and collective.” His “social order” was formed by an act of will and “founded on conventions.” It resulted, in Jean Starobinski’s phrase, from “man’s dangerous privilege to possess in his own nature the powers by which he combatsthat nature and nature itself.” The “social” in Rousseau’s philosophy is for Starobinski ultimately an “antinature.”20 “Social” differed from “cultural” in connoting deliberately orchestrated, rather than organically arising, human activity.

Bergman applied the binomial system of his compatriot, Linnaeus, to the project of prescribing a new set of linguistic conventions for chemistry, thereby dismissing organic tradition as a valid source of chemical names. Nevertheless, Bergman preserved a natural basis for scientific language, proposing that denominations should be “in keeping with the nature of things.” Newly discovered substances, he said, should be given “names conforming to their characters”—names that directly expressed their observable properties rather than offering metaphorical descriptions (“oil of vitriol”) or conjectures about their origins (“fixed air”).21

The subsequent abandonment of the principle that a name should reflect the nature of its object marked the origin of the new chemical nomenclature. In 1782 Morveau published a call for a systematic reform of chemical names in which he denied outright Venel’s and Bergman’s common assumption that names should be founded in facts. Facts alone, Morveau asserted, “say nothing to the mind.” He then casually anticipated a concept that would dominate much twentieth-century language theory: the arbitrary relation of the sign to the signified.22 Morveau claimed that all names were essentially artificial: “sounds, and the

19 Alain Pons, ed., Encyclopédie; ou, Dictionnaire raisonné des sciences, des arts et des métiers (articles choisis), 2 vols. (Paris: Flammarion, 1986), Vol. 2, p. 319. Raymond Williams writes that a “development can be seen in social, which in C17 could mean either associated or sociable, but by LC18 was mainly general and abstract: ‘man is a social creature; that is, a single man, or family, cannot subsist, or not well, alone out of all society ’”: Williams, Keywords (cit. n. 13), p. 246.


21 Torbern Bergman, Opuscula chymiques et physiques, trans. Guyton de Morveau, 2 vols. (Dijon: L. N. Frantin, 1780), p. xxviii. In the binomial system, a first name denoted the class to which a substance belonged, and a second name identified it as a particular member of that class. Bergman assigned single names to acids, alkalis, and earths; he then proposed double names for the compounds formed from these substances. These double names would reflect the compounds’ compositions: a compound’s first name denoted the substance it shared with other members of its group, and its second name denoted the individuating component unique to it. Concerning Bergman’s revisions of chemical nomenclature see Beretta, Enlightenment of Matter, pp. 137–147. For a more general discussion of binomial nomenclature in Enlightenment science see John E. Lesch, “Systematics and the Geometrical Spirit,” in The Quantifying Spirit in the Eighteenth Century, ed. Tore Frängsmyr, John L. Heilbron, and Robin E. Rider (Berkeley: Univ. California Press, 1990), pp. 73–111, on p. 93.

22 Morveau, “Dénominations chimiques” (cit. n. 1); and Guyton de Morveau, Hugues Maret, and Jean-Pierre François Guillot Duhamel, eds., Encyclopédie méthodique: Chymie, pharmacie, et métallurgie, 6 vols. (Paris: Panckouke, 1786–1815), Vol. 1, pp. iii–iv. It should be noted that though Bergman had preserved a basic commitment to naturally derived names, he had also begun to move in the direction of arbitrary naming, writing
words they represent,” he wrote, “in reality have, by themselves, no relation, no conformity with things.” So, in the case of an individual substance that one “envisions only for itself,” and not in relation to any other substance, any name that “means nothing” would serve the purpose. In fact, he preferred meaningless names for such independently considered substances and recommended that nomenclators “distance themselves as much as possible from familiar usage.” For the purpose, he advised taking roots from classical rather than vulgar languages.23

Linguistic conventions were prior to meaning, Morveau believed, and therefore they were themselves meaningless. They alone connected sounds with things. In the case of chemistry, only after convention had “attached a first idea to a word” could denominations be sought that expressed, in a limited way, the natures of their objects. For example, having arbitrarily assigned a name to a substance, chemists could give its derivatives names that were derived from its name.24 These derived names would then express the derivative substances’ natures, but only in terms of the original, arbitrary name. The empirical truth of chemical names was thus, to Morveau, necessarily a derivative truth, ultimately founded in arbitrary convention.

He did not confine his arguments to chemical language, nor yet to the technical vocabularies of natural philosophy, but intended them to apply to language in general. And indeed, the notion that names refer only arbitrarily to their objects was a principal element in Condillac’s theory of language, upon which Morveau and Lavoisier both drew heavily.25 Condillac named John Locke as his chief inspiration. However, Condillac’s (and subsequently Lavoisier’s) Lockean epistemology had been given a sharp interpretive twist, a twist that transformed the function of language, and of social convention, in natural science.26

at one point that “as it is not easy to apply names exactly expressive of the thing defined, we are to adopt such as having no determinate meaning may have their sense ascertained by definition”: Bergman, Physical and Chemical Essays, trans. Cullen (cit. n. 18), Vol. 3, p. 303, Sylvain Aurox, in his comprehensive study of Encyclopedists’ writings on language, notes that the “originality of the Enlightenment was perhaps to have invented linguistic arbitrariness”: Sylvain Aurox, La sémiotique des encyclopédistes (Paris: Payot, 1979), p. 47; see esp. pp. 48–53, on eighteenth-century theories of the arbitrary relations of words to their objects.


25 Beretta stresses the importance of the “fierce debate on the origin of language,” set off by Condillac’s writings, to the genesis and reception of the nomenclature, writing that “between 1746 and 1780, the question of language and its origins became the main topic of European philosophical and scientific discussion”: Beretta, Enlightenment of Matter, p. 189.

Locke had warned natural philosophers against “abusing” words by “taking them for Things” and indeed had drawn an example from chemistry to illustrate this pitfall. The word “gold,” Locke claimed, referred not to any real thing-gold, but only to a certain complex of sensations and perceptions that people attributed to some essentially unknowable object. When chemists demonstrated, for example, the “Fixedness or Solubility” of gold under certain conditions, they merely expanded the definition of the word “gold” by adding an experience to the complex. Yet chemists were seduced by their own language into thinking that they had perfected their idea of the thing itself. Locke’s firm belief in the eternal impossibility of understanding natural objects in themselves led him to conclude that natural philosophy was just “not capable of being made a Science.”

But if language was no source of natural knowledge, it was, Locke wrote, the medium of “Society,”” God having “designed Man for a sociable creature.” Moreover, moral philosophers did not share natural philosophers’ worries about words, not studying natural entities but only social conventions, or what Locke called “mixed modes.” Because mixed modes were essentially conventional, they entailed no gap between name and object. The “real Essence” of a mixed mode was a matter of definition and could be fully captured by language. So, for example, a moral philosopher might distinguish among “Chance-medly, Man-slaughter, Murther, Parricide” without risk of abusing the terms. The actual things to which these words referred were themselves conventions, identical to the definitions of their names. Words simply dictated the difference between, say, murder and manslaughter.

This capacity for precision in moral philosophy meant, to Locke, that morality, in contrast with chemistry, was “capable of Demonstration, as well as Mathematicks,” and was therefore the “proper Science . . . of Mankind.”

Condillac accepted Locke’s claim that words were purely arbitrary conventions, but not the corollary that conventions were incapable of generating ideas or indicating natural facts. On the contrary, Condillac granted the arbitrary conventions of language a primary and powerful epistemological function. Experience generated ideas, he said, by means of a process of analysis, like mathematical analysis, in which people decomposed and recomposed their sensations. This process resided in the art of naming. To break a sensation into its component parts was simply to name them. Words were accordingly the prerequisites of ideas and an original source of all knowledge. Concerning the relation of natural and moral science, Condillac thus sharply diverged from his model philosopher. Locke had used what he took to be the essentially social function of language to set moral science apart from natural philosophy. But Condillac used what he took to be the dual purpose of language, social and epistemological, to bring the natural and moral sciences together. A successful science and a successful society came together in a well-made language.

28 Ibid., pp. 402, 516–517. Locke defines “mixed modes” as consisting of “several Combinations of simple Ideas of different kinds” (p. 288). He refers to mixed modes as belonging to the fields of “Divinity, Ethicks, Law and Politics” (p. 294). His initial examples of mixed modes are “Obligation, Drunkenness, A Lye” (p. 288).
Condillac argued that thought relied upon the use of what he called “institutional signs.” The defining features of these were the deliberateness and artifice associated with the “social.” Institutional signs were deliberately chosen and had “but an arbitrary relation with our ideas.” For Condillac, the purposefulness involved in associating an arbitrary sign with an idea was a feature of social interaction rather than individual reflection. A child raised by bears, he imagined, would not even recognize his own natural cries as signs, never hearing the like of them from any other creature. Only if he “lived with other men” could he perceive the general significance of natural human cries. Institutional signs, without even a natural basis, were all the more reliant upon interaction with others. Condillac concluded that people could “make signs for themselves only when they live[d] together.” Thus the original basis of their ideas was “uniquely in their reciprocal commerce.”

Language, and therefore thinking, and therefore natural philosophy, were all ineluctably social enterprises. This was the central principle of the linguistic philosophy informing Morveau’s and Lavoisier’s new language.

Venel and Morveau thus represented starkly divergent philosophies of the function of language in natural science. Venel espoused a scientific language steeped in emotional and traditional meaning, an eloquent jargon spontaneously expressive of natural philosophers’ sensations and of chemists’ own esprit. In contrast, Morveau proposed a lexicon whose first terms were purely and deliberately meaningless, strictly neutral with regard to both culture and experience. His code’s rigor required not only its divorce from traditional language but the severing of scientific words from their primary grounding in empirical fact. The epistemology Morveau and his collaborators assumed in their use of language was thus neither natural nor cultural; it was social. It arose from what they took to be the essentially collaborative nature of thought—and of natural science.

II. WORDS AND VIEWS

A popular notion, codified by Montesquieu in L’esprit des lois, held that geographic variations in climate were the natural explanation for the differences in scientific and artistic achievement among nations. Condillac rejected this idea on the ground that differences in climate influenced “only the organs,” not the development of talent. He identified a social rather than natural basis for differentials in national achievement, maintaining that the progress of the sciences relied “uniquely upon the progress of languages.” The poor use of language in a society posed the most serious problem for scientific research, Condillac warned his readers, and the greatest impediment to their scientific education was the fact that “before studying the sciences, you already speak the language, and you speak it badly.” He recommended, “Do you want to learn the sciences with ease? Begin by learning your language.”


In keeping with this instruction, Lavoisier sought the source of scientific errors in the popular misuse of words. Studying transpiration in animals, for example, and the reason why humidity renders heat more disagreeable, he interposed a rigorous analysis of a common phrase. To say that “the weather is heavy,” Lavoisier remonstrated, was to mix several statements into an enunciation so “vague” as to be true only because “it presents no determinate idea.” The exact meaning of “the weather is heavy” must be some combination of “the air just now has no dissolving virtue, it is saturated with water; insensible transpiration is suppressed, and replaced with sweat.” The mixing of statements always reflected an essential ignorance of causes. In order to discover causes, one had first to identify and label their separate effects—to analyze phenomena, in Condillac’s terms, by means of the art of naming.  

When Lavoisier and his collaborators later devised a new language for their science, they would assume, following Condillac, that the knowledge of natural causes relied upon the social institution of language. With Condillac, they denied that philosophy arose naturally from either sensation or génie. However necessary sensation was to the progress of a science, Lavoisier and Morveau maintained that it was insufficient. To keep themselves on the straight and narrow path to truth, chemists needed something else: a “well-made language” expressing neither individual experience nor cultural identity. By its very neutrality, this language would permit philosophical collaboration, the reciprocal commerce of people prerequisite in Condillac’s philosophy to rational thought.

The new chemical nomenclature of 1787 rested upon two axioms drawn from Condillac’s philosophy of language: that names are social conventions, and that all thinking is therefore dependent upon a social institution, the institution of language. These tenets were responsible for the two most interesting and radical features of the new chemical language.

The first of these concerns the names of the elements and Morveau’s principle of arbitrary names for the simplest entities. In keeping with this principle, the elements’ names ought to have been meaningless. In practice, they were neither arbitrary nor meaningless, except in a limited, technical, but nonetheless significant, sense. Only four names in the table were entirely new: caloric (heat), oxygen, hydrogen, and azote (nitrogen). And even these four had meanings. The nomenclators did follow Morveau’s earlier recommendation of using classical roots to distance their technical language from the vernacular. But they coined names whose etymologies reflected salient characteristics of an element (e.g., “hydrogen” to suggest a relation to water or “oxygen” to acids). Lavoisier explained that these meaningful etymologies were to “relieve the memories of beginners, who retain with difficulty a new word when it is absolutely empty of meaning.” Even Morveau conceded that “altogether meaningless words” offered no “hold for the memory.”

33 Lavoisier, “Nécessité de perfectionner la nomenclature de la chimie” (cit. n. 17), pp. 12–14. This self-consciousness about the importance of institutional change to scientific progress suggests that current work on the role of language in the new chemistry could profitably be combined with recent work on the force of social institutions in shaping scientific thought. Historians have tended to choose examples in which experimenters and natural philosophers were largely unaware of the thrill of their social contexts. An example is Steven Shapin’s A Social History of Truth (Chicago: Univ. Chicago Press, 1994), in which he argues that the modern conception of scientific truth was a product of the rules of gentlemanly behavior in early modern England. With the new chemical nomenclature, we have a contrary instance in which the new chemists were not only aware of the dependence of chemical knowledge upon a social institution but actively embraced this dependence as an integral part of their philosophical program—in fact, as an instrument of research.

Still, despite such concessions to practicality, the elements’ names were arbitrary in a crucial, technical sense, that is, with regard to the rules of nomenclature. This was because these rules made composition the basis for classing and naming chemical substances. So the compounds were classed and named according to their elementary constituents. But the elementary substances themselves had, by definition, no constituents. Therefore their names were necessarily prior to the rules.\textsuperscript{35} It was this practice of placing the simplest chemical substances, and their names, outside the rules of classing and naming that applied Morveau’s principle of arbitrary naming and was foundational to the nomenclature. The nomenclators’ commitment to technically arbitrary names for the elements was tested in 1787, when Berthollet disproved the hypothesis that oxygen caused acidity by producing an acid (prussic) without it. He himself argued for the preservation of the name “oxygen,” arguing that since it had in theory been meaningless from the beginning, its falsity should now be irrelevant.\textsuperscript{36}

The second important feature of the new chemical nomenclature involved the names of the compounds. Like the botanical specimens in Linnaeus’s binomial nomenclature, each chemical compound had two names in the new system. But whereas the two names in the Linnaean system denoted directly observable plant structures, the new chemical names referred to hidden, and often hypothetical, components.\textsuperscript{37} The first name of a compound indicated the group it belonged to and was formed from the name of the simple substance that the compound ostensibly shared with all other members of the group. A second name identified the individuating simple substance, or “radical,” that was unique to the particular compound. So, for example, the nomenclators defined a group of compounds each formed of oxygen and a metal. Each member of this group had the first name “oxide” and a second name of the individuating metal, as in “oxide de zinc.”\textsuperscript{38} This central rule for naming compounds was responsible for a striking characteristic of the resulting table: many, indeed most, of the substances in the nomenclature had predictive names—that is, names that referred to substances not yet isolated and compositions not yet determined.

Consider the acids. Lavoisier believed that each acid was the compound of an “acidifying principle,” which he mistakenly identified with oxygen, and a radical or “acidifiable base.” The nomenclators assumed “by analogy” that acids whose radicals had not yet been discovered nevertheless did contain acidifiable bases. Acting on this assumption, they

\textsuperscript{35} This practice represents an important departure from the Linnaean system, in which the same rules applied to naming and classifying all specimens. The Linnaean system therefore did not involve placing certain specimens outside the bounds of the system and naming all the rest in terms of them. See Lavoisier, “Nécessité de perfectionner la nomenclature de la chimie,” p. 17; and Antoine Laurent Lavoisier, \textit{Traité de chimie} (1789), in \textit{Oeuvres}, Vol. 1, ed. Dumas (cit. n. 1), pp. 6–7.

\textsuperscript{36} Claude-Louis Berthollet, \textit{An Essay on Chemical Statics} (Paris, 1803), pp. 450, 455.

\textsuperscript{37} Lesch writes that Linnaeus’s “system gives a privileged place . . . to the visual sense”: Lesch, “Systematics and the Geometrical Spirit” (cit. n. 21), p. 77. External form and internal composition were of course not unrelated in eighteenth-century natural philosophy. In contemporary crystallography, indeed, a central project was to relate visible structure to hidden composition, a task that the crystallographer René Haüy achieved by means of his hypothetical \textit{molécules intégrantes}. See Hélène Metzger, \textit{La genèse de la sciences des cristaux} (Paris: Felix Alcan, 1918), p. 197. But for our purposes, the difference between classification by visible structure and by hypothetical components was the difference between descriptive and predictive naming.

\textsuperscript{38} Lavoisier, “Nécessité de perfectionner la nomenclature de la chimie” (cit. n. 17), pp. 19–21; and Morveau, “Mémoire sur la nomenclature chimique” (cit. n. 34), pp. 55–57, 38 (“radical”). Morveau had inaugurated the use of the term “radical” in its modern chemical sense the previous year, in the \textit{Encyclopédie méthodique} (cit. n. 22), Vol. 1, p. 142. See Crosland, \textit{Historical Studies in the Language of Chemistry} (cit. n. 4), p. 302. The word “radical,” developed from sixteenth- and seventeenth-century botanical usage denoting that which pertains to the root, had been used to signify the crux or basic principle of an entity in linguistics as of 1754 and in mathematics as of 1762: \textit{Trésor de la langue française} (Gallimard, 1990), Vol. 14, p. 241.
named twenty-two simple substances that they had not yet isolated, forming names from the word “radical” and the relevant acid—for example, “citric radical.” The first column of the nomenclature listed the simplest substances; of these, numbers nine through thirty (out of fifty-five) were the undiscovered bases of undecomposed acids. The new chemists’ commitment to a language founded in the assignment of arbitrary names to simple objects made the entire nomenclature dependent upon the elements. Yet almost half of these were unknown substances. In turn, nearly all the acids were named in terms of these unknowns. And likewise for the salts, which were named in terms of the acids, and therefore in terms of the elements. This domino effect meant that more than half of the new chemical names, compounds and elements alike, involved references to substances not yet discovered.39 (See Frontispiece.)

To say that the nomenclature was an artifice is by no means to say that it was a fiction. On the contrary, in the eyes of its authors, the nomenclature’s whole value lay in the empirical truths it would generate. But, they held, language could be a “faithful mirror” of nature only through artifice, the conventional manipulation of arbitrary signs. The result was a scientific language conceived as an institution, not an expression. The new nomenclature was engineered to precede and direct experiment, even more than to follow and describe experience. Lavoisier said that it “mark[ed] in advance the place and the name [of] new substances yet to be discovered.” In fact, he called the nomenclature “more a method of naming than a nomenclature,” because it would “adapt itself naturally to the work that will be done in the future.” The nomenclature and its accompanying system of signs would present “at once what has been done in chemistry, and what remains to be done.” The new chemists offered their system of names as a portrait of their science’s future.40

These claims were not window dressing. The nomenclators’ attitude toward language was integrally involved in the internal development of their science and in its practice.41 Word changes were foundational to Lavoisier’s chemistry, indeed even before the nomenclature. For example, he credited the word “expansibility,” coined by the philosophe and civil servant A. R. J. Turgot for an eponymous Encyclopédie article, with having figured centrally in his understanding of combustion and his conception of gases. Turgot had defined “expansibility” as the mutual repulsion caused by heat among the parts of a fluid or air. Lavoisier never suggested that Turgot had identified a new phenomenon. Mutually repulsive fluids were common in contemporary natural philosophy. Instead, Lavoisier cred-


40 Lavoisier, “Nécessité de perfectionner la nomenclature de la chimie” (cit. n. 17), pp. 14, 16–17; and Antoine Laurent Lavoisier, “Rapport sur les nouveaux caractères chimiques” (1787), in Oeuvres, Vol. 5, ed. Grimaux (cit. n. 1), p. 378. There was a recent precedent for the predictive use of names in chemistry. Macquer’s proposals for the binomial naming of salts according to their constituents, presented in his Dictionnaire de chimie, included names of unknown salts that he assumed could be made from familiar metals, like gold, tin, zinc, and antimony. See Crosland, Historical Studies in the Language of Chemistry (cit. n. 4), p. 137. I am grateful to Frederic Lawrence Holmes for bringing this precedent to my attention.

41 Whether the nomenclators were correct in assigning such importance to language in the progress of their science is a controversial matter. Frederic Holmes has objected that the theories of composition expressed in the nomenclature were virtually complete before the language reform was begun; thus the nomenclators’ own previous research belied their claims for the necessity of linguistic change to scientific progress. In the following discussion, I respond to this objection by suggesting that Lavoisier’s attention to language long predated his work on the nomenclature itself. More generally, however, I am interested in the nomenclators’ theory of scientific language. That theory informed their transformation of their science and its language, whether or not it presented a strictly accurate representation of their own trajectory.
ited Turgot with having “fixed the sense” of a new word, thereby making available “the most vast and the newest views.” One view that “expansibility” helped Lavoisier to adopt was that airiness was a state rather than a kind of matter. That is, he surmised, any common body “in a state of expansibility” would make a gas. Moreover, if aerial fluids were not intrinsically airy, but could pass from a state of “expansibility” to one of solidity, then oxygen might pass from the air to combine with roasted metals. Thus, the second view “expansibility” supported was that combustion was the combination of a substance with oxygen, rather than the release of a hypothetical fiery substance that contemporary chemists called “phlogiston.”

The nomenclature made manifest Lavoisier’s principle of the reliance of views upon words. It was intended, and was treated, as a research program, even by those who emended it. Humphry Davy, for example, while engaged twenty years later in decomposing the undecomposed acids to discover their radicals, determined that what had been called “oxymuriatic acid,” ostensibly an oxygenated form of muriatic (hydrochloric) acid, in fact contained no oxygen. Davy renamed the substance “chlorine,” deliberately choosing a simple, “arbitrary designation” in keeping with its newly elementary status. He wrote that such changes of terminology were intrinsic to the progress of chemistry, a process of naming, experimenting, and renaming. Echoing Lavoisier on “expansibility,” Davy thought the word “chlorine” could help in “unfolding just views.”

This engagement of naming in the conduct of chemical experiments and the elaboration of chemical theory has led several historians—notably Golinski, Roberts, and Trevor Levere—recently to liken the nomenclature to a laboratory instrument. The particular sort of philosophical instrumentalism that Morveau and Lavoisier assigned to language had as much in common with social engineering as it did with experimental manipulation. Condillac’s deliberately chosen institutional signs, the elements of language, required the “reciprocal commerce” of people and in turn directed that commerce by shaping its participants’ ideas. The instrumentality of words in his philosophy arose from the inseparability of thought and communication. For Morveau and Lavoisier, as for Condillac, language operated by directing the essentially collaborative activity of rational reflection.

A compound of epistemological and social reform, the new nomenclature proved highly irritating, especially to those who took a cultural view of scientific language and believed that words should describe experience, not transform it. Much of the controversy following its publication in 1787 focused upon the assignment of arbitrary names to simple objects envisioned uniquely “for themselves.” This practice distanced chemical language from common experience, the objects of which are seldom perceived in isolation. New chemists invoked an uncommon kind of experience, generated by a hybrid of linguistic and chemical analysis. They decomposed common substances like air, water, and the acids into sub-

42 Anne Marie Robert Turgot, “Expansibilité” (1756), in Encyclopédie, ed. Diderot and Alembert (cit. n. 1), Vol. 1, Pt. 6, pp. 274–285, on pp. 277–278; and Lavoisier, “Principe qui se combine” (cit. n. 1), pp. 122, 127. This incorporation of oxygen during burning made sense of the weight gained by calcinated metals, a phenomenon that had stumped phlogistonists since they believed burning involved the loss of a fiery matter. Crosland has emphasized “the importance that Lavoisier, early in his career, attached to the names of substances”: Crosland, Historical Studies in the Language of Chemistry (cit. n. 4), p. 169.


44 Roberts writes that language, for the new chemists, was “as much an instrument of experience as the material instruments of the laboratory”; Roberts, “Condillac, Lavoisier, and the Instrumentalization of Science” (cit. n. 5), p. 260. See also Golinski, “Chemical Revolution” (cit. n. 5), p. 244; Levere, “Lavoisier” (cit. n. 5), p. 211; and Levere, Chemists and Chemistry (cit. n. 5), p. 317.
stances so uncommon as to be found only in the laboratory. By Condillac’s art of naming, they bestowed upon the rare products of these experiments the status of elementary substances. Their opponents did not object to the experiments themselves but to the practice of naming the results as basic substances, which they judged an inversion of the natural order of experience.

So, for example, the commission appointed by the Academy of Sciences to evaluate the new nomenclature doubted whether it was “more natural” to consider sulfur, composed in a laboratory from vitriolic (sulfuric) acid and hydrogen, as a simple substance than to treat common air as elemental. In general, they hesitated to credit a “crowd” of simple substances that “all analogy” seemed to suggest were actually composed, being the end-products of laboratory procedures, in place of the traditional four elements, found everywhere in nature. Jean François De Machy, one of the most outspoken opponents, had the same quarrel with calling sulfur an element. The substance was, he said, “not even natural in a volcano . . . too many complicated conditions are necessary to obtain it.” He found it foolish to “take the products of art” for nature’s own elements. To name the acids according to the products of their decompositions, rather than naming the products according to the acids from which they were derived, seemed to De Machy sheer perversity: “Products, the last efforts of analyzing subtlety, taken for elements, for principles!”45

De Machy concluded that the nomenclature was nothing but a misguided “jargon, swollen with Greek, bristling with Latin, worthy of the theban Sphinx.” He and other critics condemned the nomenclators’ estrangement of scientific from traditional language, along with their distancing of scientific from common experience. The two went hand in hand, as an anonymous critic pointed out. The objects of common experience had names furnished by “popular idiom,” so he proposed that the elements of a proper nomenclature would be the most composed (and therefore most common), rather than the simplest bodies. Jean Claude de La Métherie, editor of the Journal de Physique and a foe of the new chemistry, likewise denied that there was any valid distinction between technical and vernacular vocabularies. Words must arise “tacitly” out of “usage” and could not be imposed by artificial “convention.” La Métherie argued for the organic unity of a society’s language in aesthetic terms. Making “euphony” a cardinal rule of nomenclature, he held that technical terms should adhere to the génie of the French tongue. He then objected, term by term, to the nomenclature’s music: “I prefer lactic salt to lactate, which is hard and barbaric.”46

Some critics had recourse to ridicule. One corrected Lavoisier’s Greek, claiming that he had reversed his active and passive inflections. “Oxygen,” reprimanded an anonymous reviewer, properly meant “engendered by acid,” not “engendering acid,” and “hydrogen” similarly meant “engendered by water.” A prominent detractor, Georges Balthazar Sage, riffed on this theme. Claiming that “oxide,” translated correctly, meant “vinegar,” he con-

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struked “oxygen” as “the son of a vinegar-maker.” To such frivolities, Morveau responded seriously. He cited the article “Etymology” that Turgot had written for the Encyclopédie, in which he favored the mixing and changing of languages. For those who adopted classical roots to create French words, Turgot had recommended studying the ancient languages “not just in [their] purity and the works of good authors, but also in [their] most corrupted forms,” as a lesson in inventiveness and flexibility. Words, Turgot had said (and, as we know, Morveau agreed), had no necessary relations with the things they expressed and should therefore be changed as needed.47

The new chemists assumed, in keeping with Turgot’s article, that words were deliberately chosen social conventions. They departed from Venel’s cultural understanding of scientific language by declining to privilege custom as the natural expression of sensations and intuitive responses. In return, critics objected to what they took to be the nomenclators’ cavalier attitude toward experience—both the empirical experience of the senses and the historical experience invested in tradition. Venel’s exclusivism had disappeared; no one on either side of the 1780s debate over chemical language suggested that chemists’ vocabulary should insulate them from outside meddling. But exclusivism had never been Venel’s essential purpose. Rather, he had intended to popularize a particular view of chemistry, according to which chemical knowledge was so firmly rooted in sensation and intuition as to be essentially inarticulate. The job of a chemical language, in Venel’s view, was to express rather than to articulate.

Like him, the critics of the new nomenclature took a cultural view of language. They maintained that a scientific vocabulary should reflect the tradition that produced it—not, as Venel had argued, the chemists’ own tradition, but the national traditions to which chemists belonged. The transition from Venel’s culture of chemists to the later notion that chemists participated in national cultures is part of a general development that historians of eighteenth-century Europe have detailed extensively, the formation of a concept of national cultural identity. The question of the epistemological role of words was crucial in this larger development as well. Discussion of French culture involved competing assessments of the function of the French language. The philosophes, unsurprisingly, agreed upon the supremacy of French, but they marshaled conflicting epistemological arguments in its support. Diderot and other sensationists argued that French was the most natural of languages because French syntax followed the primitive order of perception. In contrast, Condillac judged French to be the clearest rather than the most natural of languages, exactly because it departed from the order of perception.48

The authors of the nomenclature followed Condillac in their judgment of what makes a language good and promised that their predictive names would conduct chemists’ ideas toward yet unperceived truths. Opponents objected on Lockean grounds that only sensory experience could generate authentic knowledge. The linguistic reformers had placed “WORDS . . . but Daughters of Earth,” on the throne of “THINGS . . . the Sons of Heaven.” To those who conceived of scientific language in cultural terms, as the spontaneous ex-


pression of natural experience, the nomenclature’s social engineering appeared flatly coercive. Lavoisier had advertised that the new language would “bring about a prompt and necessary revolution” in the teaching of chemistry by forcibly preventing teachers from straying from the theoretical and pedagogical path it defined. Henry Cavendish believed him, for what could more effectively “rivet a theory in the minds of learners than to form all the names which they are to use upon [it]?” He pronounced this feature of the new chemical language “very mischievous.” Sage, in an angry letter to Lavoisier, likened the right to choose one’s technical vocabulary to religious and political freedom: “allow me, my dear colleague, to have my religion, my doctrine, my language.”

Believing that experience and tradition were the only legitimate sources of scientific language, Sage and others were conservatives in the matter of linguistic reform. The combined principles of meaninglessness and predictiveness, a vocabulary denying past meanings while claiming to shape future experience: these held sinister implications that were reinforced by Lavoisier’s boasts of bringing about a “revolution,” a word with new and powerful reverberations. In response, La Méthérie made conservatism both the first and second of his rules of linguistic reform: “1. these changes must be effected little by little,” and “2. one must . . . distance oneself as little as possible from the old words.” The message of the Academy of Sciences commission appointed to evaluate the new nomenclature was also essentially conservative. They wrote that it was not “in a day that one reforms, that one practically annihilates a language.” In 1788 Jean-Antoine Chaptal reported to Lavoisier, “I have read everything written against the new nomenclature, I have even become acquainted with the jokes they permit themselves.” He permitted himself a small linguistic joke in turn: “they want the revolution to happen gradually.”

After Thermidor, Joseph Priestley addressed the surviving members of the alleged chemical cabal: “as you would not, I am persuaded, have your reign resemble to that of Robespierre, few as we are who remain disaffected, we hope you would rather gain us by persuasion, than silence us by power.” He meant that the new language had been an instrument of philosophical tyranny, serving to silence rather than to persuade. Retrospective associations of the chemical and political revolutions were rife. They were helped along by the prominence of systematic linguistic reform as a feature of the political revolution, from the ten bucolic month-names of the revolutionary calendar; to the Babel of Greek prefixes for the new decimal system of weights and measures; to the renaming of

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all variety of objects, among which Sage cited pears: those hitherto known as *bon chrétien* became *bon citoyens*, while others called *cuisses madames* became *cuisses citoyennes*.52

Many years later, Sage would look back upon the chemical and political revolutions and associate them with one another by what he took to be their common attitude toward language. One diatribe mentioned a play entitled *Neologomania* in which a main character, “Oxiphile,” rallied his co-conspirators thus: “Messieurs! you know that we aim to have a new physico-chemical nomenclature adopted! Messieurs, seconded by you, we will be able to force public opinion.” Into old age, after the fall of Napoleon (and after the emperor himself had privately confessed to Sage that he was a “pneumatist,” an adherent of new chemical doctrine), Sage stuck to his guns. “The revolution was fecund in neologists,” he would write, and many of them had been vengeful chemists. According to Sage’s history of the Revolution, Morveau, still stinging from the academy’s rejection of his nomenclature, had avenged himself as a member of the Committee of Public Safety in appropriately neological style: he had eliminated the academy by renaming it the “institute.”53

Gillispie was by no means the first, then, in 1959, to connect the dispute over chemical language with revolutionary politics. Strikingly, however, he drew exactly the opposite connection from Sage and Priestley.54 Gillispie linked Jacobinism not with the new nomenclature but with Venel’s view of chemistry and its language, in which Gillispie discerned “the authentic voice of the *sans-culotte.*” Recently, Golinski and John McEvoy have again redrawn the connection between the scientific and the political debates. McEvoy presents two competing conceptions of community: the French model, a “private” and “specialized” meritocracy, reflected in the nomenclature; and the British model, the open “commonwealth.” He suggests that Priestley’s appeal to “common usage” as the sole legitimate basis for a chemical language applied the commonwealth model to the community of chemists. Similarly, Golinski distinguishes French and English critics of the nomenclature by their divergent political motivations. He sees English objections to Lavoisier’s abandonment of traditional usage as largely expressing a communitarian approach to language, the objections of French critics as expressing their conservatism.55

Yet among both the French and English critics of the nomenclature were persons with very different political affiliations. This diversity may indeed account for the remarkably divergent ways in which contemporaries and historians have drawn the connection between the scientific and the political argument. While Sage condemned the new chemical language as Jacobin despotism, Jean Paul Marat cursed it for academic smoke and mirrors.


55 Gillispie, “*Encyclopédie* and the Jacobin Philosophy of Science” (cit. n. 2), p. 260; McEvoy, “Priestley Responds to Lavoisier’s Nomenclature” (cit. n. 5), pp. 131, 133–135; and Golinski, “Chemical Revolution” (cit. n. 5). See also Golinski, *Science as Public Culture* (cit. n. 6), pp. 149–150.
Of Lavoisier, Marat wrote scathingly: "he changes systems as he changes his shoes . . . he changed the term acide to oxygine, the term phlogistique to azot, the term marin to mutriaticque, the term nitreux to nitrique and nitraque. Voilà his claims to immortality."56 The argument about the nature and function of scientific language had moral and political resonance from the start—but the political implications of this debate were as ambiguous as they were apparent. Detractors of the nomenclature held views across the political spectrum, prominently including a Mason, a Jacobin, and a constitutional monarchist, as well as both Sage and Marat, on the French side, and Edmund Burke as well as Joseph Priestley among the British.57

The variety in political motivations and larger political affiliations among the nomenclature’s critics makes their considerable common ground even more significant. They agreed upon both the epistemological principle that experience always precedes language and the moral injunction against denying this precedence. If, as McEvooy and Golinski suggest, some of these critics were meritocrats and others democrats, some communitarians and others traditionalists, these opposing political categories shared a common logic, the logic of Lockean empiricism. The distinction I have been proposing, between cultural and social conceptions of scientific language, may be useful here. It runs orthogonally to broad political conflicts between Enlightenment and counter-Enlightenment, or revolutionary and counter-revolutionary, and so turns up a quieter but no less effective set of differences, addressing how to pursue the programs of Enlightenment and revolution.

During the Revolution, as during the concurrent argument over scientific language, the political implications of systematic linguistic reform were always ambiguous. The question of whether language records past experience or directs future experience, whether it codifies knowledge or creates it, was intensely controversial, in particular in the debate surrounding the issue of public civic education: how to create an intellectually and morally fit citizenry for the new republic by means of instruction. This debate featured conflicting conceptions of the proper use of language in teaching and in natural science familiar from the controversy surrounding the new chemical nomenclature. Indeed, Lavoisier was a central participant in the discussion of public instruction, as a prominent member of the Academy of Sciences, as a close associate of the members of the Revolutionary Committees on Public Instruction, notably of the marquis de Condorcet, and as the author of a treatise on public instruction, delivered to the National Convention in 1793. Meanwhile, his Traité de chimie, presented as the textbook of a science revolutionized by language, first appeared in March 1789 and went through four editions by 1793.58 Condorcet, thinking about public instruction, understandably looked to the new chemical nomenclature as an example of the pedagogical function of language. There were those, however, who saw the nomenclature as an example to be avoided at all costs.


57 De Machy was the Mason, Darcet the Jacobin, and La Méthérie the constitutional monarchist. It is notoriously hard to correlate even political attitudes with well-defined groups of political actors during the Revolution. Patrick Brasart has emphasized the difficulty of associating clear political positions with parties in the National Convention: Patrick Brasart, Paroles de la Révolution: Les assemblées parlementaires 1789–1794 (Paris: Menville, 1988), pp. 134–137.

III. “LA SCIENCE PARLIÈRE” VERSUS “LA SCIENCE SANS-CULOTISÉE”

Rousseau recommends in his didactic novel Émile that one should “let the child’s vocabulary . . . be limited; it is very undesirable that he should have more words than ideas.” Later, he advises, “keep the child dependent on things only. By this course of education you will have followed the order of nature.”59 The revolutionary debate over civic education turned largely upon such oppositions between things and words, nature and convention, experience and language. This debate’s guiding philosopher was, however, not Rousseau but Locke.

Locke’s tabula rasa supported much revolutionary programming. A typical manifesto on public instruction published during the Jacobin ascendancy recommended that educators seek “to give rise to sensations before ideas.” It was “clearly demonstrated,” the author announced, “that all ideas derive from sensations.” Therefore the “whole art of instruction” must be in the “linking of sensations.” Joseph Lakanal made the same argument several years later in a proposal to the Council of Five Hundred for a program of instruction in the technical arts. Rejecting the “sterile” teaching methods of the Old Regime, Lakanal affirmed that “experience is the only candle that can illuminate genius.” Marat in the interim dismissed Old Regime academicians as “little talented in the spirit of observation, ignorant of the art of experiments.” An anonymous correspondent of the National Assembly similarly condemned the Academy of Sciences, not just for its “aristocracy” but, more damningly, for its detachment from empirical experience, its spirit of “Systematic ignorance.” The abbé Grégoire, reporting upon the establishment of the Conservatoire des Arts et Métiers, promised that, in this haven of handiwork, “experience alone, speaking to the eyes, will have the right to command assent.”60

From the early days of the Revolution, the Lockean notion of the “abuse of words” was a recurring theme in the National Assembly. Patriots and pamphleteers invoked what Jacques Grégoire has characterized as a “language of facts,” an “empiricism of words.” Such a revolutionary language would eliminate, as one journalist put it, all words for “rational entities” and leave only “realities.” Syntax as well as semantics had revolutionary import; linguistic activists argued that the ordering of words, as well as their individual meanings, could influence citizens’ ideas and, therefore, their political judgments. Hence the emergence of a “patriot-grammarians” and a “Sans-culottes Grammar,” as well as a “Sans-culottes Alphabet.”61

Inside the debate over civic education, a distrust of specialized language accompanied the sensationist view of pedagogy. The language of the sciences and the use of language in science teaching under the Old Regime were favorite culprits of revolutionary pedagogical reformers. An example is a pamphlet published in the year 2 of the Republic, entitled La science sans-culotisée: First Essay on the Means of Facilitating the Study of Astronomy . . . to Effect a REVOLUTION in Teaching. The author of this manifesto, a Citizen Decremps, found fault chiefly with the language of astronomy, which he deemed too far

removed from common experience and practical application. A sailor, having a homely knowledge of the sky’s configuration and an urgent need for astronomical results, would want these conveyed in “living languages,” not Greek or Latin.62

Advocates of an experience-based pedagogy generally disparaged technical vocabularies and saw language as the enemy of empiricism. A plan for a “Republican secondary school” proclaimed, for example, that the “language the Savants spoke was not that of nature; that of observation and experience, for which it suffices to have senses.” And a report on the new Conservatoire des Arts et Métiers urged, as the proper ideals for the new institution, teaching students “la science des faits” rather than “la science parlière” and “[making] them see” rather than “making them speak.”63

The moral implications of Lockean sensationism were constantly invoked during the revolutionary debate over public instruction and became overtly political. Sensationism rapidly evolved into a moral doctrine of the sensory origins of virtue and a political doctrine of the source of good citizens. So the comte de Lacépède argued that political stability would grow from a national program of education founded in “facts.” Another theorist of civic education, preaching to the Committee on Public Instruction, proclaimed: “it is by way of the senses that the virtues enter the heart . . . [and] vices enter by the same door.” A third suggested that moralists seek the source of social ills in the physical sensations that first gave rise to harmful ideas. He decreed that “physics [should] be always the guide of morality” and demanded, “Let a course of experimental physics . . . serve as an introduction to moral education.”64

The purported sensory origins of ideas had various effects upon the shape of revolutionary educational programs. One problem logically indicated by sensationist pedagogy concerned the instruction of the sensory-impaired. The implications of Lockean epistemology for the mental processes of blind and deaf people had been tested over the preceding century. The Revolution transmuted these philosophical exercises into matters of policy. Many correspondents of the National Convention and its Committee on Public Instruction treated the subject of schooling for blind and deaf students. An exemplary petitioner for special institutions of blind and deaf education implored the revolutionary government to consider the difficulties encountered by those without sight or hearing “if, in fact, our sensations are the only channel for our ideas.” Another marshaled the Lockean axiom against those who held that deaf students in schools would suffer from loneliness for their families. Such an objection, this good associationist reasoned, falsely attributed “to deaf-mutes, in whom the minds are absolutely inert, moral sentiments . . . and this supposition is certainly inadmissible, as I have never believed in innate ideas.”65


The question of whether a well-designed language could compensate for curtailed physical sensation was paramount in discussions of instruction for the blind and deaf, though with miscellaneous results. In one case, deafness was held to imply a need for perfect linguistic rigor, since the “mores-or-lesses of bad definitions” would not be corrected in the daily course of a deaf student’s experience. In another, a reporter upon the recent invention of sign language eagerly assured the assembly that this new way of speaking transcended mere rigor, the application of “cold, purely conventional signs.” Instead, like vocal language, signs permitted the empathetic expression of sentiment, exploiting “the organs, and particularly the eye,” to convey “the most secret affections of the soul.”

More generally, the sensory origin of ideas was frequently invoked to justify a classical emphasis upon physical training and a preference for the technical arts. Projecting an image of the naturalist’s work as an essentially aesthetic exercise, an immersion in the evidence of the senses, theorists of public instruction also tended to make natural history their chosen science. “Citizen Legislators,” declared Lakanal, “if there is a science that adds to the beauty of the countryside . . . it is Botany.” Often these different emphases inhabited in pairs, as when Félix Vicq d’Azyr argued before the National Convention that natural history must be regarded as “one of the most important branches of human knowledge, for its direct and continual application to the useful arts.” In a similar combination of winning arguments, an advocate of establishing botanical gardens throughout France argued that “as a science, natural history has the advantage over the others, of exercising the body.”

Lavoisier, defending the Academy of Sciences against these trends during the convention’s period of antiacademic activism, argued the other side, emphasizing the inadequacy of sensory experience alone in education. He affirmed the reigning pedagogical consensus that young children’s bodily sensations naturally guided them to their first discoveries about the physical world, confirming their hypotheses by pleasure or correcting them by pain. But Lavoisier distinguished formal schooling from the natural learning of infancy. Scientific ideas, in particular, “neither affect our existence nor our welfare; and we are not


forced by any physical necessity to correct them.” Pedagogy must then compensate for
the insufficiency of physical experience in formal scientific education.68

In forming his pedagogical philosophy, Lavoisier drew upon his own experience as a
pupil. He had studied chemistry with Venel’s own master, Guillaume-François Rouelle,
pharmacist and charmingly unruly chemical demonstrator at the Jardin du Roi. (See Figure
1.) Rouelle had transformed French chemistry by reintroducing Stahl’s theory of phlogis-
ton in France, along with a thoroughgoing empiricism. His students learned that chemical
transformations were due to combinations of material substances rather than occult forces
and pursued the practical art of producing “new, more perfect” combinations by means of
decomposition and recomposition.69

Rouelle’s courses were attended by Rousseau, Buffon, and Diderot, the last for three
years running, and met with almost universal approval. Diderot’s enthusiasm was such
that he had his notes copied for distribution, and Venel closed his article “Chymie” with
a plug for Rouelle’s lectures. Lavoisier, however, had some serious misgivings about the
master’s methods, misgivings that focused on Rouelle’s use of language. Many years later,
in some notes on the teaching of chemistry, he recalled his confusion during Rouelle’s
course. “I had been accustomed,” he wrote, “to that rigor of reasoning which mathemati-
cians put into their work.” In chemistry it had been “another world . . . they presented me
with words that they were not at all in a position to define.”70 Like Condillac, Lavoisier
likened linguistic to mathematical analysis and found rigorous language essential to good
teaching.

Lavoisier’s treatise on public instruction, delivered to the National Convention in 1793,
opened with the requisite avowal of orthodox Lockean associationism: “Man is born with
senses and faculties,” it began, “but he brings with him not a single idea: his brain is a
blank slate.” This profession of faith once accomplished, though, Lavoisier argued that the
education of a nation through scientific research required not just sensations and experi-
ences but proper “institutions”—by which he meant the Academy of Sciences, which he
was then struggling to preserve. His description of the importance of institutions to sci-
entific progress also, however, evoked another kind of institution: the nomenclature. Re-
search, he said, required institutions that “by their essence, by the very mechanism of their
organization, [were] continually expanding the limits of our knowledge.” Such institutions
were intended to foster mental rather than physical industry, the “employment of the
faculties of the mind.” Their success relied not just upon empirical methods but upon
“independence” and “liberty”—which meant state support.71

This support was justified by the importance of public instruction and its institutions,
often linguistic, to political and economic improvement. For example, once again follow-
ing Condillac’s lead, Lavoisier placed political economy under the rubric of civic educa-

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rescue the Academy of Sciences during the Jacobin period see Roger Hahn, The Anatomy of a Scientific Insti-
251; and Dhombres and Dhombres, Naissance d’un nouveau pouvoir (cit. n. 16), pp. 13–22.
69 Guillaume François Rouelle, Prospectus du cours d’expériences chymiques (Paris, 1759); and Denis Diderot,
“Partie de règle végétale redigée par M. Diderot,” Archives, Académie des Sciences, Fonds Chabrol, carton 3,
dossier 24 (quotation).
70 Venel, “Chymie” (cit. n. 1), p. 437; Antoine Laurent Lavoisier, “Sur la manière d’enseigner la chimie”
(n.d.), Archives, Académie des Sciences, Fonds généraux, MS 1259; and Lavoisier, Traité de chimie (cit. n. 35),
p. 5.
71 Antoine Laurent Lavoisier, “Réflexions sur l’instruction publique” (1793), in Oeuvres, Vol. 6, ed. Grimaux
tion, attributing France’s economic difficulties to widespread agronomic ignorance. And he attributed this ignorance, in turn, to linguistic poverty. Condillac’s treatise on political economy had begun with his accustomed formula: “Each science requires its particular language.” With the introduction of linguistic precision, “the science develops of itself.” Economic problems came from sloppy speaking, and their solutions lay in a system of public instruction in the proper employment of economic terms. Clarity of expression would bring economic health. In particular, Condillac’s recommendations for public economic instruction rested upon his understanding of the word “value.” He objected to the use of “value” to denote an “absolute quality, inherent in things independently of the judgments we make.” Instead, he wrote, “value” meant a conventionally determined quality, arising from people’s judgments of the “utility” of an object, their needs and uses for it. Not grain and wine in themselves, but deliberate judgments of their importance, were the original source of a nation’s wealth. Like chemical nomenclature, economic words derived their meaning, according to Condillac’s philosophy, neither from natural fact nor from cultural expression, but from social prescription.

Lavoisier, too, sought economic well-being in strictly enforced linguistic clarity. In a study of France’s agricultural wealth presented to the National Assembly’s Committee on

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72 Ibid., p. 529. See also Antoine Laurent Lavoisier, “Mémoires présentés à l’Assemblée provinciale de l’Orléanais” (1788), in Oeuvres, Vol. 6, ed. Grimaux, pp. 238–312, on p. 262. For Condillac’s treatise see Étienne Bonnot de Condillac, Le commerce et le gouvernement considérés relativement un à l’autre (1776), in Économistes financiers du XVIIIe siècle, ed. Eugène Daire (Paris, 1847), Vol. 1, pp. 247–448, on pp. 247, 444–445, 249, 254–259. In policy terms, the conventional basis of “value” meant that, contrary to contemporary Physiocratic doctrine, economic exchanges could result in net increases: each side could value what it received more highly than what it gave. Condillac held that taxes on commerce would inhibit such exchanges and should be eliminated on that basis—not, as the Physiocrats would have it, because of the sterility of commerce and the unique productivity of agriculture.
Taxation in 1791, he argued the importance of rigorous definitions. Writers on agricultural wealth had, he claimed, mistreated their subject through an inexact use of words, making “a host of double and triple uses; they counted the same value two or three times, and arrived at false and exaggerated results.” He gave the example of tallying the costs of a farm by entering the prices of straw and wheat separately. This was a mistake, for since straw was converted into manure and used in the production of wheat, its value was “implicitly mingled into that of the wheat.” The same principle applied to horses’ fodder and oats: their value made up part of the value of the final product.\(^{73}\)

To distinguish intermediate from final products, Lavoisier named three separate categories: the “natural agricultural product,” which included products consumed in the making of other products as well as those ultimately convertible into money; the “real revenue” in money or products convertible into money; and the “net revenue,” the amount claimed by proprietors and taxes, once the “expenses and charges of farming” had been subtracted. Agronomic reform, like the advancement of chemical knowledge, rested upon the inculcation of a new terminology, and so Lavoisier made enlightened agriculture a “part of public instruction.” It was primarily mental industry, not “working with one’s arms in the material use of force,” that would increase the nation’s wealth. Government sponsorship should free savants to perform their “laborious meditations” and educate the public.\(^{74}\)

Unfortunately, compensation for mental industry smelled to members of the National Convention like a restoration of corporate privileges, and Lavoisier fought a losing battle. So did another leading advocate of a program of civic education founded in linguistic reform, upon whose proposals Lavoisier had modeled his own plan: Condorcet.

The regard was mutual. Condorcet implicitly invoked Lavoisier’s chemical nomenclature when he argued that both research and education, philosophy and pedagogy, should be based upon two principal sources of philosophical progress. One was the “art of uniting a great number of objects under a systematic disposition.” The other was the “institution of a universal language” for each science. Echoing Condillac’s and Lavoisier’s equation of linguistic with algebraic analysis, Condorcet said the language would be “learned with the science itself, like algebra.”\(^{75}\)

In the weeks leading up to the purge of the Girondins in June 1793 (see Figure 2), Condorcet made a last-ditch attempt to rescue the Revolution from the “false politics” he saw overwhelming it. As his biographer, Keith Baker, has emphasized, Condorcet’s instrument was language. He enlisted linguistic reform as a social tool. His collaborators were the abbé Sièyes and Jules-Michel Duhamel, who had previously acted upon his belief in the constructive power of language by affiliating himself with the Institution for the Deaf-Mute. Together, Condorcet, Sièyes, and Duhamel created the *Journal d’Instruction Sociale*, which, they hoped, would teach a citizenry to think, not through sensations and

\(^{73}\) Lavoisier, “Résultats extraits d’un ouvrage intitulé De la richesse territoriale du royaume de France” (1791), in *Oeuvres*, Vol. 6, ed. Grimaux, pp. 403–427, on pp. 406–407. Jean-Pierre Poirier identifies a similar attitude at work in Lavoisier’s activities as National Treasury commissioner in 1791: “He wanted to invent a new ... method of financial nomenclature similar to the one he had devised for chemistry. For example, the word *comptabilité*, accounting, had been used for all paying operations. Thereafter, one would use the word ‘verifica ... for the control of actual payments and the word ‘accounting’ for the control of their validity.” See Jean-Pierre Poirier, *Lavoisier: Chemist, Biologist, Economist*, trans. Rebecca Balinski (Philadelphia: Univ. Pennsylvania Press, 1993), p. 283.


emotions, but through a carefully designed vocabulary. The journal’s prospectus claimed that common language and its failings presented a primary obstacle to moral and political progress.\textsuperscript{76}

Condorcet identified a cause of errors in the moral sciences that Condillac had already indicated in the natural sciences and that the new chemists had highlighted in their nomenclature. It was a linguistic problem, the use of words that had, “in the vulgar language, different meanings than their philosophical senses.” Condorcet charged public instruction in the moral sciences with the task of transforming these words for public usage, supplying people with “the rigor and precision of their philosophical senses.” Instruction must collapse the linguistic distance between “the man and the philosophes,” because, Condorcet believed, justice depended “uniquely upon precision of ideas” and, therefore, of language.\textsuperscript{77}

Condorcet, Sièyes, and Duhamel’s ideal of social education rested on a recognition of the shortcomings of dogmatic empiricism. Sièyes denied that the science of society should be based upon an empirical study of the historical record. Nor, according to Condorcet, should it be founded in natural facts. He called public instruction an “eternal battle . . . between nature and genius, between man and things.” Education should counteract nature. The purpose of social institutions, Condorcet judged, was to “diminish . . . natural inequality.” The innate superiority of some would not engender dependence in others if all were made conversant in the essential conventions and institutions governing social life: the three R’s and the elements of law. The first year of Condorcet’s proposed educational program was thus taken up with reading and writing and focused heavily upon the acquisition of vocabulary. Students should be taught, Condorcet said, that language is the guide of sensory experience and that books would train them to “see better.” He also recommended the use of technical terms in teaching children. Scientific language was preferable to vulgar language, he said, because its “convention” was “less tacit.”\textsuperscript{78}

Condorcet was criticized for his departure from the principle that all ideas originate in sensations. A reviewer of his memoirs on public instruction derided him for stating that men were born with virtuous “habits” and an innate moral sense. How, the reviewer asked, could “a being who has never acted have habits, when its memory is a blank slate?” Within the Committee on Public Instruction, too, Condorcet defended an increasingly unpopular position. The division of sentiment was encapsulated in a distinction drawn by Jean-Paul Rabaut, a speaker before the National Convention who so impressed the members of the Committee on Public Instruction that they invited him to join their ranks. Rabaut distinguished between instruction and education: while instruction sought to enlighten the mind with “books, instruments, calculations, methods,” education was a matter of cultivating the “body and heart” by means of “circuses, gymnasia, weapons, public games.” He concluded that a state should educate its citizens, but never instruct them.\textsuperscript{79}

\textsuperscript{76} Condorcet et al., \textit{Journal d’Instruction Sociale: Prospectus} (cit. n. 1), p. 606.


\textsuperscript{78} Jean-Antoine-Nicolas Caritat, marquis de Condorcet, “Cinquième mémoire” (1791), in \textit{Écrits sur l’instruction publique}, ed. Coutel and Kintzler, Vol. 1, pp. 237; Condorcet, “Première mémoire” (1791), \textit{ibid.}, pp. 35–37; and Condorcet, “Seconde mémoire,” \textit{ibid.}, pp. 85–87, 93. “Sièyes had frequently insisted that to base the social art on an appeal to history was to acquiesce in the tyranny of fact . . . . Society, for Sièyes, was an artificial construct, an edifice; and the science of society was therefore to be truly an architecture sociale”: Keith Michael Baker, \textit{Condorcet: From Natural Philosophy to Social Mathematics} (Chicago: Univ. Chicago Press, 1975), p. 354.

Ultimately, Condorcet lost the revolutionary struggle over public instruction. The decisive moment came in December 1792, eight months after he had presented his pedagogical program to the Legislative Assembly on behalf of its Committee on Public Instruction. In the interim a new committee on instruction had been formed, following the replacement of the Legislative Assembly by the National Convention and the declaration of the Republic. Pierre-Toussaint Durand de Maillane, a member of the new committee, criticized Condorcet’s plan before the National Convention. Durand de Maillane appealed to what had by then become the dominant popular ideal of public instruction. “To be good citizens,” he claimed, “it is necessary to have less science and more virtue; to talk less, to write less and to act better.” Just as the Academy of Sciences had rejected the new chemical nomenclature—and for reasons that were strikingly similar—the Committee on Public Instruction set aside Condorcet’s plan.


81 Mona Ozouf has called attention to the word “regeneration” as it “looms up in the tide of brochures, lampoons, pamphlets . . . that accompany the meeting of the Estates General” and displaces the word “reform.” “Regeneration,” she writes, primarily connoted physical renewal to some and spiritual rebirth to others. See Mona Ozouf, “Régénération,” in Dictionnaire critique de la Révolution française: Idées, ed. François Furet and Ozouf (Paris: Flammarion, 1992), pp. 373–389, on pp. 373–375. Lucien Jaume has described the central theme of Jacobin political philosophy as “the necessity of . . . reestablishing a lost nature. It is no longer a question here of natural right. . . . The ‘nature’ now evoked is that of the heart, of the sentiments.” See Lucien Jaume, Le discours Jacobin et la démocratie (Paris: Fayard, 1989), pp. 246–247.
cientific and common, were deliberately molded things. These systematic reformers sought to understand a world that they believed was inevitably shaped by their own efforts, whether to understand, to teach, or to govern. They made no pretense; they wanted not only to understand the world but to change it and to control its other inhabitants. They wanted to effect their control by shaping not experience or emotion, but understanding. As pedagogues they believed that human nature could be much improved by social intervention. And as philosophers they believed that they could actively invent rather than merely passively receive truths about nature.

It would be a mistake, I believe, to treat this divergence as a struggle between tradition and progress. Both Venel’s and Morveau’s philosophies of language expressed central Enlightenment preoccupations: cultural diversity and empiricism on the one hand, social universalism and epistemological rigor on the other. Similarly, in the pedagogical conflict, Condorcet and his opponents were united in their rejection of traditional methods and their call for modern—even republican—ones. The quarrel over language use in teaching and scientific research persisted precisely because its two sides defined no easy contrast between modernity and antiquity, progress and tradition, revolution and counter-revolution. Both sides professed an earnest wish to move beyond the mistakes and constraints of the Old Regime into a remodeled modern world. Beneath their divergent theories of how to carry out the remodeling, they shared a common project. And so they remained locked in dispute.

Post-Thermidorian Idéologues, the practitioners of a new science of ideas that included neurophysiology and criminal psychology, would seek the widespread moral and political application of Condillac’s philosophy of language. They would invoke Lavoisier’s chemistry as evidence of their linguistic program’s validity. Discussion of civic education would return time and again to the problem of the relative roles of sensations and words in shaping pupils’ intellects and moral faculties. The nomenclators’ chemical language would gain an ever-wider acceptance, and their conception of chemical research as the elaboration of a table of names an ever-mounting success, in the first decades of the next century. Even so, their assumption that a science’s language does not just express its practitioners’ experiences, but actively shapes its progress, would remain controversial. Georges Cuvier, in his Napoleonic retrospective of French science, could yet declare that “to intend [the nomenclature] as an instrument of discovery” was “ridiculous.”82