

Historical Roots of the “Mad Scientist”: Chemists in Nineteenth-century Literature

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This paper traces the historical roots of the “mad scientist,” a concept that has powerfully shaped the public image of science up to today, by investigating the representations of chemists in nineteenth-century Western literature. I argue that the creation of this literary figure was the strongest of four critical literary responses to the emergence of modern science in general and of chemistry in particular. The role of chemistry in this story is crucial because early nineteenth-century chemistry both exemplified modern experimental laboratory research and induced, due to its rapid growth, a ramification and fragmentation of knowledge that undermined former ideals of the unity of knowledge under the umbrella of metaphysics and religion. Because most writers considered contemporary chemistry an offspring of “wrong alchemy,” all four responses drew on the medieval literary figure of the “mad alchemist” to portray chemists. Whereas early writers considered the quest for scientific knowledge to be altogether in vain, later writers pointed out the narrow-minded goals and views specifically of chemistry. A third response moved that criticism to a metaphysical and religious level, by relating chemistry to materialism, nihilism, atheism and hubris. The fourth response, the “mad scientist,” elaborated on the hubris theme by attaching moral perversion to the “mad alchemist.”

Introduction¹

In a speech to the American Association for the Advancement of Science in 1999, the famous Hollywood play writer and film director Michael Crichton replied to complaints by scientists that the media, particularly films, have shaped the bad public image of science by presenting scientists in a very distorted and negative manner.² Crichton, who is currently working on another “mad scientist” film,³ turned the tables and argued that, instead of the media misunderstanding science, scientists actually misunderstand the media. Film-makers

¹ This paper was submitted to *Ambix* in May 2004.

² Michael Crichton, “Ritual Abuse, Hot Air, and Missed Opportunities,” *Science* 283 (1999): 1461–63; repr. in *AAAS Science and Technology Policy Yearbook 2000*, Washington (Washington, DC: AAAS, 2000), 397–404.

³ The film in the making is based on Crichton’s science fiction horror novel *Prey* (New York: Harper Collins, 2002), which is largely composed of ingredients to be dealt with in later sections of this paper, “Reinventing the Medieval Alchemists in a Discourse about Chemistry” and “Chemists against God, II: Hubris and the Mad Scientist.”

do not reflect society but present interesting and entertaining stories with extreme figures, such that “All professions look bad in the movies.”

It is the task of the humanities, rather than of film-makers, to reflect on society, in which film-makers are but influential actors. Obviously, there is more to say about the literary clichés of scientists, about the historical roots and literary sources that make film-makers routinely employ such figures as the mad scientist.⁴ As Brian Stableford, in his entry on “Scientists” in the *Encyclopedia of Science Fiction*, laconically says: “the scientist had inherited the mantle (and the public image) of the medieval alchemists, astrologers and sorcerers. This image proved to be extraordinary persistent. It was still very prominent at the end of the 19th Century, and its vestiges remain even today.”⁵ Also, Rosalynn D. Haynes, in her study on representations of scientists in the literature, finds among other figures the “alchemist, who reappears at critical times as the obsessed or maniacal scientist.”⁶

In this paper, I explore the link in literature between today’s public image of science and medieval alchemy in more detail and with reference to the history of science, and I will do so by focusing on the literary representation of chemists in the nineteenth century. Since twentieth-century films and popular literature featuring mad scientists frequently draw on, exploit and simplify classics from the nineteenth century,⁷ it is this period that deserves particular attention. We will see that such figures as the mad scientist were created not for entertainment reasons, as Crichton believes, but in a nineteenth-century literary response to the emergence of modern chemistry. Whereas science in general, including its various subject fields, heroes, and methodologies, was treated in the literature in all kinds of ways, this is not the case with the representation of chemists. Chemistry is crucial in this story for two reasons. On the one hand, chemistry was the prototype of the experimental laboratory sciences that exploded in the nineteenth century and induced an ongoing fragmentation and specialisation of knowledge, which posed a serious threat to any ideas of the unity of knowledge. On the other hand, literary representations of chemists could easily draw on the well-developed literary figure of the medieval “alchemists,” which was already loaded with moral, social, metaphysical and religious criticism. Thus, in their critique of the emergence of modern science, writers focused on chemists, whom they depicted in the fashion of the medieval alchemist but equipped with some new attributes.

After some brief notes about the origin and characteristics of the medieval alchemist in the early literature, I discuss the literary discourse about the emergence of modern science and chemistry in four steps, which are layers of severity of criticism rather than historical steps.⁸ The third section of my paper deals with Christian Romanticism, which renewed the

⁴ See: Andrew Tudor, *Monsters and Mad Scientists. A Cultural History of the Horror Movie* (Oxford: Blackwell, 1989); and David. J. Skal, *Screams of Reason. Mad Science and Modern Culture* (New York: Norton, 1998).

⁵ Brian Stableford, “Scientists,” in *The Encyclopedia of Science Fiction*, ed. Peter Nicholls (London: Granada, 1979), 533.

⁶ Rosalynn D. Haynes, *From Faust to Strangelove: Representations of Scientists in Western Literature* (Baltimore: John Hopkins University Press, 1994), 3.

⁷ Christopher P. Toumey, “The Moral Character of Mad Scientists: a Cultural Critique of Science,” *Science, Technology, and Human Values* 17 (1992): 411–37.

⁸ The texts that are mentioned in the following are taken from a sample of hundreds of texts collected over the past five years with the additional aid of searching many voluminous online collections of classical texts for occurrences of “chemist” or equivalents in other languages. With only few exceptions, all the texts from the nineteenth century featuring a chemist fall into one or more of the four classes described below. Because it is common practice in literary studies to read the (nonironic)

older discourse about the “true alchemy” by arguing for religion and moral knowledge as opposed to natural philosophy or modern science. In the next section, we meet approaches that reintroduced the medieval alchemists in order to warn of the narrow-minded goals and misleading promises, particularly of experimental chemistry. The conflict then turns into a battle fought out with metaphysical and theological weapons in literary form. Taking chemistry as the embodiment of the Enlightenment ideas of science, writers related chemistry to atheism, materialism, nihilism, and hubris, and eventually reinforced the negative view by transforming the “mad alchemist” into the mad scientist. My overall thesis is that nineteenth-century writers created the mad scientist as one of four literary responses to the emergence of modern science in general and of chemistry in particular. Since these responses appeared in all Western countries, by their most prominent writers in different languages and in different literary styles and forms,⁹ it had far-reaching consequences, including the ongoing split between the so-called “two cultures” and the peculiar public image of chemists.

Unfortunately, the topic has not attracted much attention from scholars of literature studies,¹⁰ whereas the impact of alchemical theory, allegories and hermeticism on nineteenth- and twentieth-century authors has recently become a “hot topic” in the field.¹¹

⁸ *Continued*

employment of mad scientists by authors as a form of criticism of science by these authors, I follow that practice also in analysing the historical roots of the mad scientists. Although that may occasionally sound naive, I find the other option even more naive with regard to pre-twentieth-century literature, according to which “the work,” and not the author, speaks to the reader, particularly if hundreds of “works” speak a similar language.

⁹ Although there is, of course, some variation, depending on the literary form and the specific cultural traditions of authors, such differences are, from the comparative point of view of this study, less important in face of the overwhelming similarities. Future studies might explore whether cultural differences in the current public image of science are related to nuances in their corresponding literature traditions.

¹⁰ However, there are numerous literature studies that deal with the much wider Faustian and Promethean tradition, which may include almost any profession from philosophers to writers, engineers, and politicians, and several studies on the legacy of Mary Shelley’s *Frankenstein*, on which I occasionally draw. In addition, there are several studies on the literary image of medical doctors, including: Stephanie P. Browner, *Profound Science and Elegant Literature: Imagining Doctors in Nineteenth-century America* (Philadelphia: University of Pennsylvania Press, 2005); and Lawrence Rothfield, *Vital Signs: Medical Realism in Nineteenth-century Fiction* (Princeton: Princeton University Press, 1992).

¹¹ The best comprehensive book on various nineteenth- and twentieth-century authors is David Meakin, *Hermetic Fictions: Alchemy and Irony in the Novel* (Keele: Keele University Press, 1995); on French authors, although somewhat disappointing, there is Robert Marteau, *La Récolte de la Rosée. La Tradition Alchimique dans la Littérature* (Paris: Belin, 1995). A study on some English and American authors is Randall A. Clack, *The Marriage of Heaven and Earth. Alchemical Regeneration in the Works of Taylor, Poe, Hawthorne, and Fuller* (Westport: Greenwood Press, 2000). There are numerous monographs about the 20 or so most famous writers, first of all about Goethe, and their relations to alchemy and hermeticism, references to which may be found in the books above. I mention only two studies not cited there: Kurt Stiasny, *E.T.A. Hoffmann und die Alchemie* (Aachen: Shaker, 1997); and Pierre Deghaye, *Paracelse à Thomas Mann. Les Avatars de l’Hermétisme Allemand* (Paris: Dervy, 2000). A recent anthology is Alexandra Lembert and Elmar Schenkel (eds.), *The Golden Egg: Alchemy in Art and Literature* (Berlin and Cambridge: Galda & Wilch, 2002). From a history of science point of view, it is not always clear to what kind of alchemy these studies are referring.

The only monograph on the representations of scientists in (mostly English) literature is the already mentioned excellent study by Rosalynn D. Haynes. There is an older book on the “pharmacist” in the literature, written by Georg Urdang.¹² However, unlike what is suggested by the English term, the chemist, in the sense of the pharmacist, plays quite a different role in the literature that I omit in the following.¹³ In addition, Otto Krätz has collected some material on the role of chemists in nineteenth- and twentieth-century literature, on which I occasionally draw.¹⁴

Preliminary Notes about the Medieval Alchemist in the Literature

The literary figure of the alchemist had already been created in the fourteenth century by writers such as Dante Alighieri, Francesco Petrarch and Geoffrey Chaucer, and then became one of the favourite figures in social satires from the fifteenth to the seventeenth centuries, e.g. by Sebastian Brant, Desiderius Erasmus, Agrippa of Nettesheim, Reginald Scot, Johannes Claius, Thomas Lodge, Ben Jonson, and many more.¹⁵ Its roots go back to alchemical texts, to a debate on the true alchemy that accompanied alchemy throughout its existence. In fact, alchemical fiction and nonfiction were never as clearly separated as we are inclined to see them from our present point of view.¹⁶ A classic topic in alchemical treatises was the defamation of those who did not follow what the author himself considered the true alchemy. Opponents were usually called stupid and greedy, “puffers” without reason who blindly strive for gold instead of insight and spiritual improvement, and who in their greed

¹² Georg Urdang, *Der Apotheker im Spiegel der Literatur* (Berlin: Springer, 1921), later enlarged and modified as *Der Apotheker als Subjekt und Objekt der Literatur* (Berlin: Springer, 1926).

¹³ The dominant theme of the pharmacist in the literature is, according to Urdang, the intermediate social position, between being a scientist or a physician and a seller, which has led to some pseudoscientific characters, for instance ‘Homais’ in Gustave Flaubert’s *Madame Bovary* (1857).

¹⁴ Otto Krätz, “Chemie im Spiegel der schöngeistigen Literatur zur Zeit Leopold Gmelins,” in *Der 200. Geburtstag von Leopold Gmelin*, ed. W. Lippert (Frankfurt/M.: Gmelin Institut, 1990), 73–112; Otto Krätz, “Die Chemie im Spiegel der Literatur des 20. Jahrhunderts,” *Chemie in unserer Zeit* 25 (1991): 44–50; Otto Krätz, “Mad scientists und andere Bösewichter der Chemie in Literatur und Film,” in *Wenn der Geist die Materie küsst*, ed. K. Griesar (Frankfurt: Harri Deutsch, 2004), 131–47.

¹⁵ Dante Alighieri, *Divine Comedy* (1310–21), Inferno, Cantato XXIX, l.118–39; Francesco Petrarch, “De Alchimia,” *De remediis utriusque fortunae* (1353–66), chap. 111; Geoffrey Chaucer, “The Canon’s Yeoman’s Prologue” and “The Canon’s Yeoman’s Tale,” in *Canterbury Tales* (ca. 1390); Sebastian Brant, “Von Fälscherei und Beschiss,” in *Das Narrenscheyff* (1494), chap. 102; Desiderius Erasmus, “Beggar Talks” and “Alchemy/Alcumistica,” in *Colloquia* (1524); Heinrich Cornelius Agrippa von Nettesheim, “Alchimia,” in *De incertitudine et vanitate scientiarum atque artium* (1530), chap. XC; Reginald Scot, *The Discoverie of Witchcraft* (1584), 14th book; Johannes Claius, *Altkumistica* (1586); Thomas Lodge, “The Anatomie of Alchymie,” in *A Fig for Momus* (1595), Epistle 7; Ben Jonson, *The Alchemist* (1610/12). The best survey of the English literature is Stanton J. Linden, *Darke Hieroglyphicks. Alchemy in English Literature from Chaucer to the Restoration* (Lexington: University Press of Kentucky, 1996). See also John Read, *The Alchemist In Life, Literature and Art* (London: T. Nelson, 1947).

¹⁶ For a selection of alchemical poetry, see Robert M. Schuler (ed.), *Alchemical Poetry: 1575–1700; from Previously Unpublished Manuscripts* (New York: Garland, 1995).

ruin themselves and cheat others. Writers such as Petrarch and Chaucer elaborated on this motif in great detail, and they did so by dividing the alchemist into two figures, or two phases, of “wrong alchemy.” The first one is the mad alchemist, the miserable seeker who is obsessed with the idea of gold-making and who spends all his money for nothing, ruins his health and his family, loses his social reputation, and ends up in the gutter. The second figure (or phase) is the tempting or “cheating alchemist.” Like a junkie turned into a drug dealer, he tries to finance his obsession by inducing the same obsession for gold-making in others. Once his victims are infected and become mad alchemists, the cheating alchemist uses some simple alchemical tricks to drain them dry.

Late medieval and early modern satires featuring the mad alchemist and the cheating alchemist had a much more general moral than being simply a critique of alchemical gold-making efforts. They were criticising the striving for material goods, such as money, or physical health and immortality, as in corresponding alchemist stories about “elixirs of life.” They were arguing for a spiritual life guided by moral and religious values. And by making kings, aristocrats, clerics and representatives of other social classes the blind victims of cheating alchemists, they were denouncing the corruptness of their society.

These alchemical figures slowly faded during the seventeenth century, as writers employed new figures, such as the “miser” and the “gamester,” for propagating similar moral messages.¹⁷ In addition, alchemy became extremely popular among educated people, as indicated by the number of published books in the seventeenth and eighteenth centuries. And since most of the popular philosophies of nature (from Aristotle to Bacon, Descartes, Boyle, Newton, and Leibniz) supported, or at least did not exclude, the transmutation of metals, the stories lost some of their plausibility for mediating the general message. It was not until the late eighteenth century that writers revived the alchemical figures with new industry when modern chemistry emerged.¹⁸

¹⁷ The “miser,” which goes back to Plautus’s *Aulularia* (ca. 200 BC), was revived by Lorenzino de Medici in his *Aridosia* (1536) and then became a popular theme, particularly in French comedies, e.g. de Larivey (*Les Esprits*, 1579), de Boisrobert (*La Belle Plaideuse*, 1655), Chappuzeau (*L’Avaré Dupé*, 1636), and, of course, Molière (*L’Avaré*, 1668). In England, the usurer Shylock in Shakespeare’s *The Merchant of Venice* was certainly influential. The “obsessed gamester,” who replaced the “mad alchemist,” was made popular, for instance, by Espinel (*Vida del Escudero Marcos de Obregón*, 1618), Shirley (*The Gamester*, 1633), de la Forge (*La Joueuse Dupée*, 1663), Dancourt (*La Désolation des Joueuses*, 1688), and Dufresney (*Le Chevalier Joueur*, 1697).

¹⁸ As Barbara Benedict observes in “The Mad Scientist: the Creation of a Literary Stereotype,” in *Imagining the Sciences: Expressions of New Knowledge in the “Long” Eighteenth Century*, ed. R. C. Leitz and K. L. Cope (New York: AMS Press, 2004), 59–107, the virtuoso and the medical doctor were subject to many satires in the seventeenth and eighteenth centuries. I disagree, however, with her thesis that this period created the mad scientists, because satires on virtuosi and, even more so, on medical doctors are much older. Instead, I argue in this paper that the mad scientist was created in the early nineteenth century by transforming the mad alchemist of the fourteenth century. In addition, in contrast to a widespread view, alchemy seems to be rather unimportant in early British gothic novels. Among the 208 gothic novels analysed by Ann B. Tracy in *The Gothic Novel, 1790–1830: Plot Summaries and Index of Motifs* (Lexington: University Press of Kentucky, 1981), there are only three that include some alchemy, including only one [William Godwin’s *St. Leon* (1799), see below] with an alchemist featuring as a main character, which some do not consider a gothic novel.

Just as the alchemist and to a lesser extent the astrologer had been the main (pre)scientific figures in medieval literature, the “al-chemist” and some related figures, such as the “physician” engaged in chemistry or pharmacy, became the main scientific figures in the nineteenth-century literature. I prefer using the term “al-chemist” because either the figures are really called alchemists or it is simply the medieval alchemist who appears in the disguise of a chemist or physician, if, for instance, gold-making is replaced with diamond-making or some drug fills the place of the elixir of life. Nonetheless, writers, while borrowing their literary equipment from medieval colleagues, were actually writing about contemporary science, as we soon see.

Renewing the Discourse about the True Alchemy in Christian Romanticism

Throughout the history of Latin alchemy there was debate on the true alchemy. Apart from differences concerning the right experimental approach and the correct theory of metals and transmutation, the dispute was about whether alchemy goes beyond material improvement to include spiritual (i.e. intellectual, moral, and religious) improvement of the adept and on how both aspects are to be combined. During the late eighteenth century, when experimental and theoretical chemistry became an increasing part of scientific research, that medieval debate was renewed in a particularly romantic fashion and with quite extreme positions.

An early example is the German Romanticist Johann Heinrich Jung (1740–1817) who called himself “Stilling” and about whom there was a rumour that he had been an alchemist because he dealt with alchemy in his quasi-autobiographical novel *Henrich Stillings Jünglings-Jahre* (1778).¹⁹ Stilling, then a teacher, describes a cheating alchemist, his colleague Graser, who tries hard to lead Stilling into temptation to become his companion. Stilling finally resists, but not without confessing that his own inclination to alchemy is actually his “inexhaustible hunger for knowledge about the prime forces of nature” that cannot be satisfied by philosophies of nature — he names Newton and Leibniz. We also learn that Stilling eventually drops alchemy altogether in favour of a more promising way, because alchemy is not in accordance with his primary sources of truth, among which he names the Bible. Stilling, who later became a leading figure of a Protestant movement, also had a priest-alchemist, his grandfather Pastor Moriz, in the first part of his quasi-autobiographical novel, *Henrich Stillings Jugend* (1777), which was, incidentally, published by Goethe without Stilling’s knowledge. The old priest-alchemist, to be sure not of the gold-making kind, remorsefully confesses that all his life has been spent in vain, leading to unhappiness. The miserable seeker, not of gold but of pure knowledge, explains that such a quest is led by egoistic motives leading to unhappiness as opposed to altruism, which, thanks to God’s blessing, leads to happiness.

¹⁹ The two autobiographical novels mentioned here were first published by G. J. Decker: Berlin-Leipzig (1777/1778), and were reprinted along with further autobiographical novels in J. H. Jung-Stilling, *Lebensgeschichte*, ed. G. A. Benrath, 3rd ed. (Darmstadt: WTB, 1992). On Stilling’s religiously motivated publications, see: Otto W. Hahn, *Jung-Stilling zwischen Pietismus und Aufklärung: sein Leben und sein literarisches Werk 1778 bis 1787* (Frankfurt/M.: Lang, 1988); and Martin Hirzel, *Lebensgeschichte als Verkündigung: Johann Heinrich Jung-Stilling — Ami Bost — Johann Arnold Kanne* (Göttingen: Vandenhoeck und Ruprecht, 1998).

Stilling's autobiographical account is interesting not only because of the early rediscovery of the medieval alchemical figures but also because of a new emphasis. The cheating alchemist is reduced to a mere criminal and clearly distinguished from the “seeking alchemist,” who appears to be, rather, a philosopher of nature. Attractive as the latter appears at first glance, there are religious and moral reservations that push the seeker in another direction. Alchemy, or natural philosophy, is rejected because mere knowledge of nature lacks morality; it is amoral. If there is a true alchemy, a true “philosophers' stone,” then it must focus on morality and religion.

There are many famous fairy tales of the time that carry a similar message, although in a clumsier manner. If we assume that the Grimm brothers in the period 1812–15 only wrote down older tales, their *Wasser des Lebens* (Water of Life) is probably the oldest one. The elixir of life, according to their moral, is to be found only if the seeker is morally perfect. The German writer and philosopher Christoph Martin Wieland (1733–1813) narrated a fairy tale called *Der Stein der Weisen* (The Philosophers' Stone, 1786–89)²⁰ in which he employed the full-fledged medieval figure of the cheating alchemist. His victim is a king of Cornwall who is as credulous and stupid as he is greedy and heartless. After his deception, he goes through a series of fanciful transformations, controlled by fairy-like figures, through which the king's former credulity and greed give way to the reason and morality of a simple and happy man. At the happy end, we learn that the true philosophers' stone, i.e. a remedy for happiness, is to be searched for in reason and morality. There is another fairy tale called *The Philosophers' Stone* written by the Danish writer Hans Christian Andersen (1805–75) around 1835. Here, it is a wise old Indian who is reaching for the “stone,” a remedy against death, that is said to be composed of the true, the good, and the beautiful, i.e. the medieval *verum, bonum et pulchrum*. After a series of unsuccessful attempts by his four sons, who are each characterised by extraordinary capacities of one of the senses, his blind daughter is finally able to collect the ingredients. This reveals to her father, as the tale finishes, that the secret stone is Faith, leading via Hope and Love (i.e. the three Christian virtues) to immortality.

All these literary examples revive the discourse about the true alchemy. Writers involved in that discourse argued in favour of a spiritual alchemy based on morality or religion, or they even reformulated alchemy in pure terms of the Christian doctrine, as Anderson did. In this context, as in the internal medieval debates, the cheating alchemist only helps point out the distinction between true and wrong alchemy. However, the new opposition has different elements now. Whereas the true alchemy is the Christian belief system or the search for God, the wrong alchemy is modern science or the search for scientific knowledge. The writers of what might be called Christian Romanticism rejected modern science altogether, because it no longer had any basis in Christian religion. Echoing Augustine, they considered curiosity-driven search for knowledge as idle, useless, and

²⁰ This is part of a collection of fairy tales first published anonymously as *Dschinnistan oder Auserlesene Feen- und Geistermärchen* (Winterthur: Steiner, 1786–89; repr. Zürich-Stuttgart: Manesse, 1992). Wieland's tales bear some similarities to the *Tales of the Thousand and One Nights*. His “Stein der Weisen” is probably inspired by the “Story of Hasan of El-Basrah” (see below). For a structuralist interpretation of Wieland's “moralistic tale,” see Helmut Nobis, *Phantasie und Moralität: das Wunderbare in Wielands “Dschinnista” und der “Geschichte des Prinzen Biribinke”* (Kronberg: Scriptor, 1976), chap. IV.

misleading.²¹ They strongly opposed the contemporary efforts to separate knowledge of nature from moral knowledge. In sum, they revived the discourse about the true alchemy in order to express their strong opposition, not to alchemy or chemistry in particular, but to the general Enlightenment idea of science, which at that time flourished.

Reinventing the Medieval Alchemists in a Discourse about Chemistry

Unlike the aforementioned writers, who rejected science altogether, there are more specific romantic positions with particular attitudes towards chemistry. In his autobiographical *Dichtung und Wahrheit* (1814), Johann Wolfgang von Goethe (1749–1832) described his early interest in and fascination with experimental chemistry. Furthermore, his detailed analogies between chemical relations and social relations in his *Wahlverwandtschaften* (1809) revealed profound knowledge of contemporary chemical theories. How, then, did this “chemistry-friendly” Romanticist, who helped establish a chair of chemistry in the philosophical faculty at the University of Jena in 1789,²² consider the development of modern chemistry in his literary work?

His two-part tragedy *Faust* (1806, 1832) provides surprisingly detailed insight. In fact, the tragedy includes a certain genealogy — Faust’s father, Faust himself, and Faust’s famulus Wagner — that reflects his view on the historical development of chemistry. In Part I (vv. 1034–55), Faust provides a brief account of his father, who is introduced as an adept of the iatrochemical tradition and who worked hard in the laboratory to produce various medicines according to cryptic prescriptions. However, these medicines killed more people than the pestilence, says Faust. Despite that, people praised iatrochemists like his father, who were in fact nothing else than “cheeky murderers.” Unlike Faust, Wagner, who according to standard interpretations represents Goethe’s contemporary academia, including chemistry, strongly approves of the practice of Faust’s father. What he did, says Wagner, was to apply the knowledge of his time in a conscientious and meticulous manner. Moreover, Wagner suggests that one should honour Faust’s father and take his state of the art as an important step in the progress of science. For Faust, the intermediate figure in the genealogy, belief in that progress of science is a grave error, because such science provides only useless and fragmentary knowledge. The tragic Faust, the poet-philosopher with “two souls in his breast,” represents the splitting state of romantic natural philosophy reaching out for a new orientation. The new chemistry, represented by the famulus with only limited knowledge, is no alternative, since it is allied with blind and unscrupulous applications of former days. Goethe did not provide optimistic prospects in his tragedy, as he did not argue for a true alchemy. Instead, his play is full of specific attacks on chemistry, among which I pick out but one.

In Part II (1832), Faust leaves the university and his former famulus Wagner, who in the meantime has become a famous doctor of science (vv. 6643ff.). This scholarly chemist,

²¹ A similar criticism of science can be found in the works of the early eighteenth-century British moralists Alexander Pope, Samuel Johnson, and William Cowper.

²² See Hugo Döbling, *Die Chemie in Jena zur Goethezeit* (Jena, 1928), *Zeitschrift des Vereins für Thüringische Geschichte und Altertumskunde*, Beiheft 13. On Goethe’s general relationship to chemistry, see also: Dorothea Kuhn, “Goethe und die Chemie,” *Medizinhistorisches Journal* 7 (1972): 264–78; and Georg Schwedt, *Goethe als Chemiker* (Berlin: Springer, 1998).

whom Goethe provided with many characteristics of the medieval "puffer" (vv. 6678–82), has been busy for months with his "great work." Eventually, the right mixture and processing of "hundreds of substances" yields the intended result, a chemically created homunculus. Rather than being a Frankensteinian monster, to which we come back in "Chemists against God, II: Hubris and the Mad Scientist," the homunculus is a witty and curious little man who is soon taking the initiative during the subsequent travels of Faust and Mephistopheles. The baffled chemist, seeking advice from his creation about what his job should now be, is told by the homunculus to stay at home, upon which Mephistopheles sardonically comments that eventually we all depend on our own creations. The obvious moral is that chemists, if they successfully apply their skills, lose control over their own creations. As compared to their extremely powerful skills, chemists' capacities to understand, foresee and evaluate the effects of their own doings are very poor because they lack the deeper understanding of a more comprehensive philosophy of nature.

Since the relationship between the famulus/chemist Wagner and the master/chemist Faust is exactly mirrored in Goethe's earlier ballad *Der Zauberlehrling* (1797, *The Sorcerer's Apprentice*), we have good reasons to interpret that ballad along the same line. Here again, the apprentice/chemist, while the master/chemist is temporarily out of town, tries to employ the master's skills for his own purposes, although without real understanding. After initial success, the apprentice loses control over his work. This time, the apprentice is less lucky than Wagner because his work quickly grows dangerous. The catastrophe is prevented only by his master's return at the very last moment.

If these famous passages reflect the relationship between romantic alchemy or a holistic natural philosophy, on the one hand, and modern experimental chemistry, on the other, as I suggest, then we have little reason to read Goethe in the ahistorical or even prophetic way that is widespread nowadays. At the beginning of the nineteenth century, there was not yet the kind of powerful industrial technology, let alone genetic engineering, that we have today. Instead, there was a debate about the scope of natural philosophy and its fragmentation into the modern scientific disciplines. In this drama, chemistry was the main character, because it emerged as the first experimental discipline, leaving natural philosophy and the metaphysical tradition behind. Unlike later writers, Goethe saw nothing wrong with chemistry as such, since it owed everything, including its powerful skills, to its ancestors, as the master–apprentice or master–famulus relation suggests. Problems arose only if this newborn child pretended to be independent, if it applied its mother's skills for its own purposes without her wisdom.

Goethe is but one example, and not even the earliest, among many authors who, by literary means, expressed their critical view on chemistry's growing independence from natural philosophy. A widely used scheme was first to convert the miserable seeker of the Middle Ages into a successful seeker and then to point out that the alleged success is actually a failure or at least worthless. By so doing, writers criticised the narrow-minded scope of aims and the reduced circumspection of chemists, while at the same time acknowledging the power of chemical experimentation. However, as they anachronistically employed the medieval alchemists for their purpose, with the aims of making gold, elixirs of life, or homunculi, their criticism did not represent what contemporary chemists were actually doing. It seems that writers were too much occupied by the motifs of their literature tradition.

An early example is Wieland's already mentioned fairy tale *Der Stein der Weisen* (1786–89), where the author discusses at length how the economy would break down if alchemical gold-making were successful. Exactly the same thread of economic inflation, although

expressed in a completely different literary style and with several references to contemporary chemists (Humphrey Davy), is expounded in Edgar Allen Poe's hoax short story "Von Kempelen and His Discovery" (1849).²³ In his tragedy *Der Adept* (1838),²⁴ the Austrian writer Friedrich Halm (1806–71) let his "Magister of chemistry," through the successful making of gold, become morally corrupted and guided only by avarice, excessiveness, and unrestrained ambitions. As a kind of curse, the poor chemists meets the same vices in all other people, before he returns to his old virtues of altruistic and idealistic scientific research at the happy end.

Compared to Halm's simple moralistic play, William Godwin's second and much earlier novel, *St. Leon* (1799),²⁵ is rather subtle and was both more original and influential. Godwin revived the medieval topic of the alchemist's obsession with the philosophers' stone and the elixir of life, but, as his sixteenth-century hero is indeed successful, the obsession is extended towards using these gifts for the benefit of humanity. Thus, the miserable seeker turns into a miserable benefactor. Wherever he tries to apply his gifts, the results are disastrous. What the tragic alchemist underestimates and ignores is that society is driven by different forces, political and religious ideas. Inasmuch as Godwin's hero owes a lot to Paracelsus, and the legends spun around this historical figure, we find a similar plot a few decades later in Robert Browning's huge pseudobiographical poem *Paracelsus* (1835).²⁶ Let us now consider two other nineteenth-century elixir of life stories. In Honoré de Balzac's *L'Elixir de longue vie* (1830),²⁷ Don Juan's father successfully gained an elixir that needed to be applied only after death, but his son refused to do so because of selfishness and avarice. The successful but dying alchemist in Richard Garnett's short story *The Elixir of Life* (1881) does not even try to use his invention, and nor is he willing to give the elixir to anybody else, except a monkey, because he "forbore to perpetuate human affliction, and bestowed a fatal boon where alone it could be innocuous."²⁸

Of course, the making of gold, elixirs and such things has always been a metaphor for striving for material goods, against which writers have been using their skills at any time and with various literary means, including the alchemical figures. However, the medieval alchemist underwent an extraordinary literary revival at the beginning of the nineteenth century, after nearly two centuries of virtual absence. It seems that, in the view of many writers, the emerging chemistry was the scientifically professionalised form of striving for material goods, and thus became their new target. The old alchemical motifs, originally giving a general message against avarice and stupidity, were now directly related to chemistry.

²³ First published in *The Flag of Our Union*, 4 (14 April 1849). Burton R. Pollin, in *Discoveries in Poe* (Notre Dame: University of Notre Dame Press, 1970), chap. 10, considers the story as the "culmination of Poe's efforts in the field of the literary hoax" (166). Resuming "the entire orientation of Poe to experimental and theoretical science," he concludes that "Poe humorously maintained that modern inventions are inferior copies or postludes to the glories of Egypt and makes a poor joke about the present lack of advance" (184).

²⁴ First published Wien: Gerold, 1838; repr. in *Werke* (Gerold: Wien, 1856), vol. 2.

²⁵ First published London: Robinson, 1799.

²⁶ First published London: Effingham, 1935.

²⁷ First published in *Revue de Paris*, vol. 19 (24 October 1830): 181–210.

²⁸ First published in *Our Times* (July 1881): no. 1; repr. in R. Garnett, *The Twilight of the Gods and Other Tales* (New York: A. A. Knopf, 1888; 2nd ed. 1926). Garnett was a distinguished scholar of literature history before he became a writer.

Clichés as they were, they worked well to transport the literary ideas without bothering much about details of contemporary chemistry. Those who did bother carefully searched for further links between the new chemistry and the old alchemical ambitions — or invented them, as did Poe with his reference to gold-making in a “Diary of Sir Humphrey Davy.” Some writers even familiarised themselves with details of the new chemistry, in order to elaborate a modern, state-of-the-art variant of the medieval alchemist — the chemist as diamond-maker.

Once established, numerous diamond-makers would follow in the literature. The earliest example I found, and perhaps the most original one, is the last and fragmentary novel by Jean Paul (1763–1825), *Der Komet oder Nikolaus Marggraf* (1820–22).²⁹ Like all of his satirical novels, the story is full of fantastic fictions and parodies. Nikolaus Marggraf, the diamond-maker, is not really a chemist but a chemically skilled apothecary with strong social ambitions or, to be more correct, egomaniac delusions. Owing to the riches eventually resulting from his successful diamond-making — for which Jean Paul, as always, gives scientific details — the would-be nobleman is able to buy himself a court with all its pomp and glamour, including a court society. Yet soon a rival appears who calls himself the devil and disputes Marggraf’s right to the court, and the fragmentary novel abruptly ends during the quarrel. Instead of drawing a simple moral, Jean Paul used the story of social advancement to furnish it with many satires on political events of the time as well as on contemporary literary movements such as German Romanticism. Perhaps the latest classic example is one of the earliest short stories of H. G. Wells (1866–1946), entitled *The Diamond Maker* (1894).³⁰ Here, it is an amateur chemist who obsessively performs chemical experiments in his small apartment during fifteen years of increasing poverty, during which he nearly starves to death, and who in great detail resembles the medieval mad alchemist. When he eventually succeeds in making diamonds (or some similar stuff), he gets into trouble with the police, to the effect that he is unable to sell and thus benefit from his creation.

All the stories mentioned thus far reintroduce the medieval alchemist as the miserable seeker but modify the plot, in that they concede some experimental success in the making of gold, elixir, or diamonds. In so doing, writers acknowledged to some extent the experimental power of chemistry but criticised the experimenters’ narrow-minded scope of aims. As the British writer Wilkie Collins (1824–89) put it in his *The Woman in White* (1860) “the illimitable power of Chemistry remains the slave of the most superficial and the most insignificant ends.”³¹ Thus, the medieval plot needed to be modified in order to point out that experimental success is by no means success overall, that the human condition is much

²⁹ First published Berlin: Reimer, 1820–22, 3 vols. (repr. Zürich: Manesse, 2002). On this “comedy,” see Susanne Gierlich, *Jean Paul: “Der Komet oder Nikolaus Marggraf, eine komische Geschichte”* (Göppingen: Kümmerle, 1972).

³⁰ First published in *Pall Mall Budget* (16 August 1894); repr. in *The Stolen Bacillus and Other Incidents* (1895). Wells’s oeuvre is, of course, a rich source of alchemists, including, from the nineteenth century alone, Nebogipfel in ‘The Chronic Argonauts’ (1888), Moreau in *The Island of Doctor Moreau* (1896), and Griffin in *The Invisible Man* (1897). As J. R. Hammond [*H. G. Wells Companion* (London: Macmillan, 1979), 63] observes, these “are variants on a similar theme. Each, in their different ways, testifies to his deep conviction that science has unlimited possibilities for both good and evil and that knowledge without moral responsibility corrupts and ultimately destroys its possessor.”

³¹ First published London: Sampson Low, 1860, 3 vols.

more complex, and that reducing one's effort to chemistry is but blind obsession. Writers thereby reflected the growing impact of chemistry on society and warned of uncritical hopes and promises.

There are also other nineteenth-century stories that reintroduced the medieval alchemist with only little modification but elaborated on the theme in more psychological, dramatic or criminological detail. The most well-known, although perhaps overestimated, example is Honoré de Balzac's novel *La Recherche de L'Absolu* (1834),³² which in English translations is known as *The Alkahest*, *The Quest of the Absolute*, or *The Philosophers' Stone*. Balthazar Claes, a Flemish diamond-maker, is explicitly said to have been a former pupil of Lavoisier in Paris before he returned home to marry and run the business of his wealthy family. Nonetheless, the story retells the fate of the miserable seeker, the mad alchemist, which Balzac composed with every detail he could find in the medieval literature. After fourteen years of harmony and wealth, Claes suddenly becomes infected with a "moral malady," i.e. the addiction to diamond-making, transmitted by a Pole who figures as the medieval tempter. As it happens, Claes ruins his family both financially and morally — his wife dies from sorrow — and destroys his mental and physical health, social status, and so on. By referring to the chemical debates of the early nineteenth century, e.g. electrochemistry, and Prout's conception of a *materia prima*, Balzac tried hard to make the link to contemporary chemistry plausible, because his hero should, as he later confessed, "represent all the efforts of modern chemistry."³³ At the same time, it helped him to introduce the dramatically necessary ups and downs of the plot. Yet the story remains within its medieval models, as the miserable seeker keeps on with his unsuccessful work until his death at the very end.

With his preference for crime thrillers and his own admirable way of interlocking stories with each other, al-chemists figure prominently in many novels of Wilkie Collins. In *Jezebel's Daughter* (1880; chap. XV),³⁴ the plot remains basically within the medieval scope, like that of Balzac's *La Recherche*. Placed in early nineteenth-century Germany at the University of Würzburg, the physician and professor of chemistry Dr. Fontaine is successfully tempted by a Hungarian chemist, who pretends to be able to make gold, diamonds, and the philosophers' stone. The usual process of addiction and obsession follows, such that Fontaine ruins his family financially and morally, which Collins relates in heart-rending letters written by Fontaine's wife, Jezebel. However, in *The Haunted Hotel* (1879),³⁵ Collins went one step further than Balzac and medieval writers. The final three chapters present, as one partial solution of that intricate crime thriller, a different al-chemist story set in the 1860s. Here the al-chemist is a Baron "with a single-minded devotion to the science of experimental chemistry" who has already spent all his money on his costly experiments. In need of further money for his "final" experiment, he first marries his sister (or lover and companion) to a rich English nobleman. When this financial resource runs dry, the two of

³² First published Paris: Vve Béchét, 1834.

³³ In a letter to Hippolyte Castille, Balzac explains, "Le héros de *La Recherche de L'Absolu* représente tous les efforts de la chimie moderne" [quoted from Madeleine Ambrière, *Balzac et la Recherche de l'Absolu* (Paris: Presses Universitaires de France, 1999), 401].

³⁴ First published London: Chatto & Windus, 1880, 3 vols. Despite the abundance of al-chemists in Collins's works, reference to this is rare in the secondary literature; for an exception, see Chris Baldick, *In Frankenstein's Shadow: Myth, Monstrosity, and Nineteenth-century Writing* (Oxford: Clarendon, 1987), 184–85.

³⁵ First published London: Chatto & Windus, 1879, 2 vols.

them decide to kill the Englishman in order to get his life insurance premiums. To that end, they first replace him with his butler, who is incidentally dying of bronchitis and, being in a foreign country, let a local doctor write a death certificate. Afterwards, they murder the Englishman, and the al-chemist uses his chemical skills for anaesthetising (chloroform), killing (poison), and dissolving the remains (acids). Collins went beyond the familiar medieval plot in furnishing his al-chemist with much more criminal energy and with many criminal means borrowed from contemporary chemistry.

As a remarkable rule with only few exceptions, al-chemists reappearing in nineteenth-century literature are said to be from different countries than the authors themselves and their primary readerships. This striking fact calls for interpretation. The most obvious reason is that authors regarded chemistry as being extremely alien to themselves. Unlike Chaucer, who let the miserable seeker, the yeoman, narrate his own story, nineteenth-century writers preferred a third-person narrative to describe the foolish and wrong deeds of their al-chemists from a critical and distant viewpoint. Inasmuch as they considered chemistry a threat from the (intellectual) outside, their al-chemists bear a foreign nationality, frequently reflecting a nationalistic bias of their time. Furthermore, if the plot contains a tempter (as, for instance, in Wieland's *Der Stein der Weisen*, Balzac's *La Recherche de L'Absolu*, and Collins' *Jezebel's Daughter*), that character is usually a stranger from very far away, mostly from the east, who is equipped with various xenophobic ingredients, including the attribute “fiendish.”

Strangely enough, the literary model appears to be one of the medieval Arabic *Tales of the Thousand and One Nights*, which were very popular in eighteenth- and nineteenth-century Europe after Antoine Galland had first compiled and translated most of the tales into French (1704–17). The “Story of Hasan of El-Basrah,”³⁶ although its origin is still uncertain, is perhaps the oldest literary source of a cheating and tempting alchemist. Hasan, impoverished by luxurious life, is tempted by a foreign alchemist from Persia who promises to teach him the art of gold-making. In spite of his mother's warning of cheating alchemists, Hasan is credulous and greedy enough to be fooled and then kidnapped by the Persian. As it turns out, the alchemist is not only a foreigner but also a follower of a pagan religion “who hated Moslems with exceeding hatred and destroyed all who fell into his power.” He is “a lewd and filthy villain, a hankerer after alchemy” who is “wont, every year, to take a Moslem and cut his throat for his own purposes,” which, in this case, means sacrificing Hasan as part of some magical practice.³⁷ Ironically, European writers borrowed their xenophobic motifs from Arabic sources, just as Latin alchemists had taken their knowledge from Arabic alchemists many centuries before.

Unlike the authors who had general Christian reservations about science overall discussed earlier, the authors discussed in this section expressed specific objections to chemistry, including pharmacy and chemical physiology, and they did so by picking up the medieval alchemist. Because they acknowledged to some extent the success of experimental chemistry, the medieval plots needed to be revised and modified. On the one hand, they

³⁶ This is the title of the story in Edward Lane's edition (1838–41), vol. 3, chap. 25. In John Payne's edition (9 vols., 1882–84), one finds the story in vol. 7 as “Hassan of Bassora and the King's Daughter of the Jinn.” In Richard Burton's edition (10 vols., 1885) it appears as “Hassan of Bassorah” in vol. 8. I am indebted to J. C. Byers for this information.

³⁷ Quoted from Burton's edition, vol. 8, 781st Night.

furnished their figures with some modern ingredients, such as diamond-making, and references to contemporary chemistry and chemists. On the other hand, they tried to show that, even if experimental efforts are successful, all the goals pursued by such efforts are narrow-minded and blind and lead to failure rather than success overall. For many writers, who saw themselves in the humanistic tradition of moral education, the increasing impact of experimental science on society, on societal promises and hopes, was a threat, something alien to themselves and their moral ideas. Thus, during an atmosphere of growing nationalism in Europe, they transformed the fiendish temptation of medieval alchemy plots into a threat from those countries most different from and hostile to their own.

Some of the writers discussed in this section went much further than that, however. They started what would nowadays be called a “Science War,” by bringing up a battery of metaphysical and religious weapons to which we now turn.

Chemists against God, I: Materialism and Nihilism

God created everything out of nothing.
 But you alchemists,
 False children of light,
 God's antagonists!
 You make nothing out of everything.

(*God and the Alchemists*)³⁸

At first glance, the above epigraph appears to express a strong position in the medieval debates about alchemy. However, the phrase “false children of light” reveals that it was really a conservative response to the Enlightenment, which was linked to contemporary chemistry. Alchemists continued to be a pejorative term for contemporary chemists in nineteenth-century poetry. In fact, it was the German poet Friedrich Haug (1761–1829), a friend of Schiller, who composed the poem in 1805. Since the poem summarises the attitude of many famous later writers, Haug's lack of poetical fame is probably undeserved.

The story “Chemists against God” has many chapters, if it is not the framing theme of nearly all occurrences of al-chemists in nineteenth-century literature. At its core, however, there are two interrelated issues, materialism and hubris. Materialism, in the view of writers, included first of all atheism, and then positivism, nihilism, and the denial of all sorts of spiritual and mental realms, including morality, free will, and immortal soul, i.e. everything that the popular meaning of metaphysics has since come to include. Moreover, since materialism/atheism also means denying that material nature is God's Creation, any chemical change of matter is suspected to be against God's will. Hubris, on the other hand, is more complex. If hubris means comparing or measuring one's own capacities with God's capacities, then somebody accused of hubris cannot at the same time, without self-contradiction, be accused of materialism/atheism, i.e. the denial of God. Thus, hubris is only one step towards atheism, in that God's authority, both as creator and moral legislator, is not

³⁸ Johann Christoph Friedrich Haug (also: F. Hophthalmos, Frauenlob d. J.), *Epigramme und vermischte Gedichte* (Berlin: J. F. Unger, 1805), no. 77 “Gott und die Alchymisten” [repr. in J. C. F. Haug, *Gesellige Gedichte*, ed. H. Schlaffer (Stuttgart: Cotta, 1996), 38]: “Gott schuf Alles aus Nichts. / Aber ihr Alchymisten, / Falsche Kinder des Lichts, / Gottes Antagonisten! / Schaffet aus Allem Nichts.”

acknowledged in the appropriate or desired manner. Moreover, while materialism is a metaphysical position, in the strict sense, hubris is a property of somebody’s character, which usually makes it easier to employ in literary plots. Although nineteenth-century writers frequently combined both themes, despite the risk of self-contradiction, I will deal with them separately. I begin with materialism and its cousin nihilism in this section, before dealing with hubris and the emergence of the mad scientists in the next section.

Since materialism was first popular in France, I take the first example from Honoré de Balzac (1799–1850). His *Comédie humaine*, particularly the *Études philosophiques*, are full of “chemists.” Some of them are actually historical figures provided with detailed characters and a human face, for instance Vauquelin in *César Birotteau*. In *La Peau de Chagrin* (1831, *The Magic Skin*), however, Balzac presented a rather general view of his contemporary scientists.³⁹ There is a wondrous piece of leather in the possession of Raphael that fulfills all his lustful wishes. However, for each wish, as the fiendish pact goes, Raphael loses a period of his remaining lifetime, represented by the stepwise shrinkage of the skin. When the piece has already shrunk to an alarmingly small size in Chapter 3 (“The Agony”), Raphael is seeking advice from scientists to learn more about the skin and how to expand it in order to prolong his lifetime. The first scientist to be asked (for this metaphorical elixir of life) is a *naturaliste*, i.e. a historian of nature. This “high priest of zoology” gives a great many details about animal species, but finally confesses that he has nothing to say about the issue. The second is the mathematician Planchette, a professor of the mechanical philosophy of nature, who at first delivers a long pseudophilosophical speech about the principles of movement, nature, and God, and then suggests that the skin should be subjected to his ingenious invention, a gigantic hydraulic press. As it happens, the skin resists the press, which instead flies in all directions. Finally comes the chemist Baron Japhet. Without much talking, he suggests a battery of methods for chemical analysis (e.g. fluoric acid, melted potash, nitrogen chloride, electric shock, galvanic battery), which all turn out to be like playthings to the skin. Science, so Balzac’s general moral goes, is powerless concerning existential matters.

Besides his generally low opinion of the sciences, Balzac provides a series of particular attacks on chemistry during a conversation in the chemical laboratory. One reinforces the powerlessness of chemists: “Since you cannot invent substances, you are obliged to fall back on inventing names.” Another one is directed against their positivism: chemists are as “stupid as a fact.” For our purposes, the most interesting attack is unravelled in a brief dialogue between Japhet, the chemist, and Planchette, the mechanical philosopher:

“I believe in the devil,” said the Baron Japhet, after a moment’s silence.

“And I in God,” replied Planchette.

Each spoke in character. The universe for a mechanician is a machine that requires an operator; for chemistry — that fiendish employment of decomposing all things — the world is a gas endowed with the power of movement.

We are now at the heart of the problem. The mechanical philosophy of nature, that seventeenth-century child of natural theology, might be powerless in its deeds, but at least it includes — according to Boyle and Newton, it even strongly emphasised — the necessary existence of God. Chemistry, on the other hand, has no need for God. According to Balzac,

³⁹ First published as *La Peau de Chagrin: Roman Philosophique* (Paris: Gosselin et Canel, 1831), 2 vols. See Alain Schaffner, *Honoré de Balzac, La Peau de Chagrin* (Paris: Presses Universitaires de France, 1996), 72ff.

the chemical worldview is materialism proper, because for chemists there exists nothing else than matter with its own principle of motion, or self-organizing matter, to use a term more fashionable nowadays.⁴⁰ Moreover, not only do chemists explain the world without an operator God, but according to Balzac, even worse, they also destroy His Creation by “decomposing all things.” Thus, their atheistic worldview is complemented by their fiendish practice — chemists are “God’s antagonists,” as Haug had already said before.

The nineteenth-century literature of various genres and countries is full of both materialistic–atheistic and fiendishly destructive chemistry. From the materialism–atheism genre, I will give but one prominent example from Russia and then a general response from a US chemist. In Fyodor Mikhailovich Dostoyevsky’s (1821–81) *Brothers Karamazov* (1879), Mitya Karamazov is charged with the murder of his father and imprisoned. Although he regards himself to be innocent, he feels prepared to endure the fate of the threatening punishment (20 years in Siberia) with a martyr-like attitude, inspired by the idea that God will help him, as he later confesses to his brother Alyosha (pt. 4, bk. 11, chap. 4). But then the atheist Rakitin visits him in prison and tells him about the latest news regarding the chemical physiology of nerves — Dostoyevsky mentioned Claude Bernard. When Alyosha arrives shortly after Rakitin’s departure, he finds his brother crying in confusion and despair: “I am sorry to lose God [... and the belief that] I’ve got a soul, and that I am some sort of image and likeness ... It’s chemistry, brother, chemistry! There’s no help for it, your reverence, you must make way for chemistry.”

Now that chemistry was regarded as the protagonist of atheism, in the literature as well as in public discourses, how did contemporary chemists respond to that accusation? In a remarkable book entitled *Chemistry and Religion* (1864),⁴¹ Harvard professor of chemistry Josiah Parsons Cooke (1827–94), a very pious Christian with profound knowledge of theology, tried not only to reconcile chemistry with religion but also to prove that modern chemistry reinforced belief in God. His theological arguments were not original, but he combined the old approach of natural theology with the new chemical and physical knowledge of the time. First, he developed the chemical complexity of the atmosphere as global circles of great harmony in order to provide “numberless indications of adaptation in the materials of our atmosphere” (8). Since there are two possible explanations for such adaptation, divine design and material self-organization, Cooke tried to exclude the latter in order to argue for the former. By referring to contemporary approaches of kinetic theory (his main source was John Tyndall’s *Heat Considered as a Mode of Motion*, 1863), Cooke argued for a strict mechanistic–atomistic reduction of all chemical phenomena. This accepted, the divine designer is required as creator of the atoms and the mechanical laws and as the prime cause of motion in the mechanistic universe — here, Crook could easily follow traditional lines of deism or Leibnizian natural theology. Thus, chemistry provides “evidences of design, and therefore evidences of the existence of a personal God, infinite in wisdom, absolute in power” (ibid.) only if it becomes part of the mechanical philosophy of nature. In other words, reconciliation of chemistry and religion depended heavily on mechanistic reductions. However, for the majority of writers who, like Balzac, did not believe in mechanistic

⁴⁰ It is not clear what contemporary chemist Balzac actually had in mind concerning this position of Stoic, Neo-Platonic, or Hermetic heritage, which has incidentally led many Christians, such as Giordano Bruno, to the heresy of pantheism. Perhaps he was referring to the physician Pierre Jean Georges Cabanis (1757–1808), as he actually did in his *La Messe de l’Athée* (1836).

⁴¹ New York: Scribner, 1864; 2nd ed. 1880.

reduction, chemistry was opposed to religion. That is the nineteenth-century religious background of the reductionism issue, which is again in vogue nowadays.

What about Balzac’s second line of attack, chemistry as the fiendish destruction of divine creation? It echoes the medieval complaint that chemical manipulation changes nature at the basic level and thus destroys the Creation.⁴² If applied to material (and personal) destruction, this line was frequently elaborated on together with the hubris theme, to be dealt with in “Chemists against God, II: Hubris and the Mad Scientist.” However, once the notion of destructive chemistry had been established, it also became part of an interesting analogy between chemistry and critical thinking: just as chemical analysis destroys material bodies, so does critical analysis destroy ideas and beliefs. In his *Fathers and Sons* (1862),⁴³ Ivan Turgenev (1818–83) mentions “young chemistry students [at the University of Heidelberg], who cannot distinguish oxygen from nitrogen, but are brimming over with destructive criticism and conceit.” Thus, the main character of the novel, the arch-nihilist Bazarov, is characterised by his fascination with and practice of experimental chemistry. And when Pavel Petrovich complains that Germans have from romantic poets “turned into chemists and materialists,” the nihilist cries: “A decent chemist is twenty times more useful than any poet” (chap. 6).

Turgenev was not the inventor of nihilism, and nor did he invent its association with chemistry. The earliest association is probably in the novel *Die Ritter vom Geiste* (1850/51; bk. VII, chap. 12)⁴⁴ by the German writer Karl Ferdinand Gutzkow (1811–78):

Oleander was reading a book of the new philosophical school, the critical or chemical school as he called it. “Chemical” because these philosophers of the absolute Nothing are the Liebigs of the invisible world, as he told Siegbert. Such as the chemical retort invents element after element, each being decomposed over and again, such does the philosophical, heartless intellect of the school resolve Everything into the perfect Nothing by criticism ... even believing that the immortality of the soul would have been disproved.”⁴⁵

Without going over Liebig’s elemental analysis, there was of course also a direct way to link chemistry with nihilism, because what writers usually meant by nihilism was nothing else than materialism (including atheism) or some sort of sensualism, as in Turgenev’s novel. To end this section with another French example, Alexandre Dumas père (1802–70) showed us how “chemical nihilism” consequently, but not without tragedy, leads to self-destruction and death. The story is told in the “epilogue” to his play *Le Comte Hermann* (1849),⁴⁶ which in English is also known separately under the title *Dr. Sturler’s Experiment*. This Dr. Sturler

⁴² See Joachim Schummer, “The Notion of Nature in Chemistry,” *Studies in History and Philosophy of Science*, 34 (2003): 705–36.

⁴³ First published in *The Russian Herald* magazine in March 1862; on the nihilist character, see also Frank F. Seeley, *Turgenev: a Reading of His Fiction* (Cambridge: Cambridge University Press, 1991), chap. 10.

⁴⁴ First published Leipzig: Brockhaus, 1850–51, 9 vols. (repr. Frankfurt: Zweitausendeins, 2000).

⁴⁵ “Oleander las in einer Schrift der neuen philosophischen Schule, der kritischen oder chemischen, wie er sie nannte. Chemisch deshalb, sagte er zu Siegbert, weil diese Philosophen des absoluten Nichts die Liebigs der unsichtbaren Welt sind. Wie die chemische Retorte Urstoff auf Urstoff entdeckt und diesen immer wieder aufs Neue zerlegt, so hat der philosophische, gemüthlose Verstand der neuesten Schule Alles durch die Kritik bis zum vollkommensten Nichts aufgelöst und [...] nun auch glaubt, die Unsterblichkeit der Seele selbst widerlegt zu haben.”

⁴⁶ First published Paris: Marchant, 1949.

is a German chemist–physician, once more at the University of Heidelberg in 1840, who is weary of his life because his scientific endeavours have turned out to be unsuccessful. His last experiment, “for the betterment of science,” is actually carried out on two different levels. On the profane level, he takes a well-known deadly poison and then carefully records every change of his body, while he has his latest chemical invention, the antidote, up his sleeve for the second phase of the experiment. On the spiritual level, the experiment is designed to test the depth of his nihilism by the strength of his wish to die, since Dr. Sturler believes neither in moral improvement nor in any religious idea. Instead, “I believe in nothing . . . To nothingness from which I came — to nothingness, I am going to return.” If he takes the antidote in time, the profane experiment will be completed for the benefit of humanity, whereas the spiritual experiment would yield the weakness of his nihilism, to the detriment of scientific materialism. Constructing the plot as he did, Dumas did not hesitate to employ contradictions by letting Dr. Sturler argue for atheism (denying the existence of God) via hubris (comparing oneself with God): “Am I not God like God — more God than God since I can retake and give back life, cause death to be born, and destroy death?” This idea makes him disdain to take the antidote, because “If I believed in something beyond this world, I should have drunk [the antidote] and I would be saved — I believe in nothing and that convinced me to die!” With his dying breath, when it is much too late to take the antidote, the spiritual experiment takes a sharp turn. For the spiritual betterment of science, Dumas let the dying chemist shout: “My God! Lord — pardon me!”

The historical parallel of the “Chemical Revolution” and the “French Revolution” at the heyday of the Enlightenment let many conservative writers, particularly of the French Restoration, lump both together. Emerging as the first and for some time dominating experimental discipline from the received natural philosophy, chemistry became, for many writers, the embodiment of the Enlightenment idea of science and thus the target of severe metaphysical and religious criticism. They considered chemistry’s focus on the analysis and synthesis of materials and the investigation of material change, which was a necessary confinement in the course of discipline formation, a metaphysical commitment to materialism. It is probably due to the legacy of eighteenth-century French materialism that nineteenth-century writers associated with nineteenth-century chemistry a series of metaphysical positions, such as atheism and the denial of all sorts of spiritual, mental and moral realms, including morality, free will, and an immortal soul, which all came to be known as nihilism. The antimetaphysical attitude of the new chemistry, through its basis in operationally defined elements, the lack of any reference to natural theology, unlike mechanics, and the establishment of (organic) chemical analysis as the basis of experimental research, all contributed to the metaphysical bias and the religious indignation of Christian authors. In sum, chemistry was not only alien to these writers, but became the embodiment of everything they opposed.

Chemists against God, II: Hubris and the Mad Scientist

Hubris or presumption, in the sense of comparing one’s own capacities with those of the divine creator, is an issue deeply rooted in the peculiarities of Christian theology. If the divine creator creates humans in his own image, as Genesis 1:27 says, then human imitation of the creator’s creation, including the comparison of divine and human capacities, is the

natural consequence.⁴⁷ In addition, medieval theologians strictly confined alchemy in particular and technology in general to the imitation of nature, to the effect that alchemists tried to investigate and apply the secrets of the divine creation in their laboratory.⁴⁸ Thus, accusations of hubris are always dubious, because what is forbidden is at the same time demanded, such that the concept lacks a consistent ethical and theological basis. As we will see in this section, this lack of ethical arguments proper called for additional literary efforts, the offspring of which is the mad scientist.

Before dealing with the hubris theme in nineteenth-century literature, I would like to start with an early example in which the related imitation-of-nature theme is developed with regard to chemistry. Despite his utmost perversion, Donatien Alphonse François de Sade (1740–1814) had a philosophical feeling for the weakness of woolly traditional notions, which made him, in the view of many modern historians, a prominent child of the Enlightenment. In the third part of *La nouvelle Justine ou Les malheurs de la vertu* (1797), we find de Sade in Sicily experiencing raptures about the destructive power of the fire-spewing volcano Aetna and wishing to copy its disastrous effects for his own “sadistic” inclination.⁴⁹ Suddenly, a chemist appears who confesses that he shares the same enthusiasm. This chemist, called Almani, explains at length how his scientific studies have revealed to him the evil and destructive character of nature, including the secrets of her devastating power. During the past twenty years, he has used this knowledge to imitate nature’s destructive effects to the detriment of humans, and now offers de Sade his chemical assistance in the imitation of the volcano. Thus, the two of them start building their artificial volcanoes, bombs with which they eventually kill 25,000 Sicilians, as de Sade proudly states.

Whatever one might think about de Sade, he was one of the first authors who employed a chemist, instead of the medieval alchemist, in his novel — a “sadistic” chemist who cynically drives the old imitation-of-nature theme into absurdity. De Sade remarkably arranged the matter in such a way that applying the most destructive forces of chemistry for the most evil purposes, i.e. what we would consider morally deeply corrupted scientist, eludes the accusation of hubris. One should keep this contrast in mind when regarding the following examples, which all try hard to make hubris a moral failure.

In explicit terms, the hubris theme with reference to the al-chemist is most prominent in French literature, particularly in the works of Balzac and Dumas père. In *La Recherche de L’Absolu* (1834), at a time when synthetic organic chemistry was still in its infancy, Balzac presented the hubris theme in a most ambitious manner in a dialogue between Claes, the al-chemist, and his religious wife (chap. VI):

“I shall make metals,” he cried; “I shall make diamonds, I shall be a co-worker with Nature!”

“Will you be the happier?” she asked in despair. “Accursed science! Accursed demon! You forget, Claes, that you commit the sin of pride, the sin of which Satan was guilty; you assume the attributes of God.”

“Oh! Oh! God!”

“He denies Him!” she cried, wringing her hands. “Claes, God wields a power that you can never gain.”

⁴⁷ David F. Noble, *The Religion of Technology: the Divinity of Man and the Spirit of Invention* (New York: A. A. Knopf, 1997).

⁴⁸ See Schummer, “The Notion of Nature in Chemistry.”

⁴⁹ See also Krätz, “Chemie im Spiegel,” 74–75, for this scene.

At this argument, which seemed to discredit his beloved Science, he looked at his wife and trembled.

“What power?” he asked.

“Primal force — motion,” she replied. “This is what I learn from the books your mania has constrained me to read. Analyse fruits, flowers, Malaga wine; you will discover, undoubtedly, that their substances come, like those of your water-cress, from a medium that seems foreign to them. You can, if need be, find them in nature; but when you have them, can you combine them? Can you make the flowers, the fruits, the Malaga wine? Will you have grasped the inscrutable effects of the sun, of the atmosphere of Spain? Ah! Decomposing is not creating.”

“If I discover the magisterial force, I shall be able to create.”

In nineteenth-century literature, such chemical ambition to equal the total capacity of divine creation is difficult to find. Instead, the elixir of life and its counterpart, poison, figure prominently in the literature as God-like means to control life and death. As we have already seen, that is why Dumas let his Dr. Sturler say “Am I not God like God — more God than God since I can retake and give back life, cause death to be born, and destroy death?” Dumas had already employed the same idea in *Joseph Balsamo: Mémoires d'un médecin* (1846–48),⁵⁰ his version of the life of the famous eighteenth-century Sicilian “alchemist” and impostor Cagliostro (1743–95), pseudonymous “autobiographies” of whom were very popular at the beginning of the nineteenth century. Here it is Cagliostro’s alchemical master Althotas who, in chapter 60 entitled “The Elixir of Life,” in a dialogue with Cagliostro about contemporary materialist philosophers, says: “Some jokers are debating about the existence or non-existence of god instead of trying, like me, to become God himself.” His way of trying is, of course, the mixing of an elixir of life. Because the final ingredient is still missing, the aged alchemist orders his pupil to bring him this crucial material into his hidden laboratory. According to Dumas’s bizarre fantasy, the successful elixir requires the last three drops of a child’s arterial blood, for which, of course, the child must be killed. Since Dumas considered the hubris theme alone not convincing, he felt obliged to add some moral perversion to his main characters. This essential lack of moral argument for the hubris theme is, I suggest, the common origin of the mad scientist, of which Dumas was by no means the inventor, in the literature.

Balzac had already applied the same combination of hubris, moral perversion and bizarreness in his already quoted *L'Elixir de longue vie* (1830). Here, Don Juan, greedy to inherit the wealth of his dying father, hypocritically says to him “we must submit to the will of God,” whereupon the father, in possession of the elixir, responds, “I am God!” When it is Don Juan’s turn to die or to “play God,” through an accident the elixir revives only his head. Balzac finished his grotesque story with a bizarre scene inside a church: the head of Don Juan, while shouting blasphemies, removes itself from the dead body, gets a firm hold with its teeth on the head of a priest, and kills the priest, crying “Idiot, tell us now if there is a God!” Compared to his usual narrative style, with his meticulously detailed descriptions of characters and environments, this is perhaps the weirdest scene of Balzac’s complete oeuvre.

The need to add further plausibility to the hubris theme inspired the imagination of writers more than anything else. We should recall that the actual contemporary target, represented by the elixir motif, was nothing else than rudimentary medicinal chemistry, against which neither commonsense morality nor philosophical ethics could and did raise

⁵⁰ First published Paris: Cadot, 1846–48.

any objections. However, writers had strong concerns about the use and possible abuse of chemistry’s power, which they thereby conceded to exist. “There is nothing that human imagination can figure brilliant and enviable, that human genius and skill do not aspire to realise,” wrote William Godwin at the very beginning of his al-chemist novel *St. Leon* (1799). In retrospect, this sounds like a programmatic division of labour, where the writers should take the part of the imagination for the purpose of warning, and then decide how scientists might realise it.

Although there is still debate about how much she was influenced by her father, twenty-year-old Mary Shelley (1797–1851) seems to have taken these words of her father to heart in writing her famous novel *Frankenstein, or the Modern Prometheus* (1818), the most famous of all stories that combine hubris with the mad scientist.⁵¹ The plot is much too well known to require a detailed description. The ambitious Swiss scientist Frankenstein creates an artificial human being that eventually turns out to behave like a monster, killing his brother, his friend, and his wife, and finally committing suicide, after Frankenstein himself dies during his remorseful but unsuccessful hunting of the monster. The interesting point here is how Shelley tried to relate all this to contemporary chemistry, because Frankenstein is, of course, a chemist of the late eighteenth century.⁵²

Chapters 2–4 of the novel, while at the surface level describing steps in the adolescence of Victor Frankenstein, provide an interestingly detailed version of the history of science, which has largely been overlooked in literature studies.⁵³ Indeed, Victor’s ambitions at various ages reflect periods of the history of science of the corresponding centuries, if one multiplies his age by a hundred. Describing “the birth of that passion which afterwards ruled my destiny” (25), thirteen-year-old Victor became an ardent enthusiast of the thirteenth- through sixteenth-century alchemical writings of “Cornelius Agrippa, Albertus Magnus, and Paracelsus, the lords of my imagination” (28). Unlike his intimate’s occupation with the “moral relations of things,” Victor’s inclination is towards the “physical secrets of the world” (24), which suggests the split of philosophy into moral and natural philosophy. He is fascinated with the philosophers’ stone and, particularly, the elixir of life that “could banish disease from the human frame and render man invulnerable to any but a violent death!” (27). After a couple of years of that occupation, Victor is affected by (late sixteenth-century, early seventeenth-century) scepticism: “It seemed to me as if nothing would or could ever be known” (28). This period is followed by temporary enthusiasm

⁵¹ All quotes below are from the 1831 edition (London: Colburn & Bentley).

⁵² Strangely, the reference to chemistry has received little attention in the hundreds of existing *Frankenstein* interpretations. Chris Baldick (*In Frankenstein’s Shadow*, 6ff.) distinguishes between ahistorical psychological interpretations and what he calls the “technological reductions,” which, again, ahistorically project all kinds of mechanical, electrical and genetic engineering onto the novel. Whereas Baldick himself seeks a historically informed multidimensional interpretation to explain *Frankenstein* as the birth of a “modern myth,” my point is that the “Frankenstein myth” is not a modern invention but, beyond being a Faustian variant, is another transforming step from the fourteenth-century mad alchemist.

⁵³ Martin Tropp [*Mary Shelley’s Monster* (Boston: Houghton Mifflin, 1976), 59f.] seems to recognise the parallel, but since for him, as for many others, the “history of science [goes] from alchemy to technology” (59) or from Descartes to mechanical engineering (53), he overlooks most of it. This case suggests the urgent need for greater collaboration between historians of science and historians of literature.

with mathematics and the mathematical philosophy of nature, which obviously represent seventeenth- and eighteenth-century Cartesianism and Newtonianism. Interestingly, Shelley emphatically stressed the difference between alchemy/chemistry and mathematical physics by describing the latter, in Victor's retrospective narration, as "the immediate suggestion of the guardian angel of my life — the last effort made by the spirit of preservation to avert the storm ... but it was ineffectual" (28). When Victor, at the age of seventeen, enrolls at the University of Ingoldstadt⁵⁴ to study "natural philosophy," the subject matter is completely dominated by modern (late eighteenth-century) chemistry (chap. 3). Victor, ready to revive his former alchemical passion, is at first surprised and disappointed, because he only meets professors who are followers of the new (Lavoisean) chemistry. The first professor, Kempe, is no less surprised at Victor's ambition: "Have you ... really spent your time in studying such nonsense? ... I little expected, in this enlightened and scientific age, to find a disciple of Albertus Magnus and Paracelsus. My dear sir, you must begin your studies entirely anew" (32). What Victor dislikes in this professor, who represents the temporary state of the "chemical revolution," is that the "ambition of the inquirer seemed to limit itself to the annihilation of those visions on which my interest in science was chiefly founded" (33). A couple of days later in the lecture hall, Frankenstein is listening to a much more ambitious chemistry professor (Waldheim), who gives a "panegyric upon modern chemistry"; this is Victor's initiation as a follower of the new chemistry:

"The ancient teachers of this science," said he, "promised impossibilities and performed nothing. The modern masters promise very little; they know that metals cannot be transmuted and that the elixir of life is a chimera but these philosophers ... have indeed performed miracles. They penetrate into the recesses of nature and show how she works in her hiding-places ... They have acquired new and almost unlimited powers."

Such were the professor's words — rather let me say such the words of the fate, enounced to destroy me. As he went on I felt as if my soul were grappling with a palpable enemy; one by one the various keys were touched which formed the mechanism of my being; chord after chord was sounded, and soon my mind was filled with one thought, one conception, one purpose. So much has been done, exclaimed the soul of Frankenstein — more, far more, will I achieve; treading in the steps already marked, I will pioneer a new way, explore unknown powers, and unfold to the world the deepest mysteries of creation.

From this day natural philosophy, and particularly chemistry, in the most comprehensive sense of the term, became nearly my sole occupation. (34–36)

Shelley narrated the life of her tragic hero in parallel with a quasi-historical account of science.⁵⁵ The parallelism allowed her to transfer the biographical determinism of

⁵⁴ Note that the University of Ingoldstadt had moved to Landshut in 1800. In 1776, the professor of natural and canon law Adam Weishaupt founded the pseudo-freemason order of the Illuminati in Ingoldstadt, about which there was the reactionary but dubious rumour spread all over Europe in the 1790s that the Illuminati would have substantially influenced the French Revolution in 1789. Mary Shelley definitely knew this rumour, as a friend of her husband, Jefferson Hoog, had already literarily expanded on the rumour in his *Memoirs of Prince Alexy Haimatoff* (1813). There is little doubt that she chose Ingoldstadt for the education of her Frankenstein precisely because of the alleged Illuminati–Revolution connection, as also Alexandre Dumas père let his swindler "alchemist" *Balsamo* (1844–46) be a member of the Illuminati and work for the French Revolution.

⁵⁵ Since the first appearance of the novel, there has been much debate as to whether Shelley's Frankenstein is a representative of old alchemy and occult science or of modern science; see Fred Botting, *Making Monstrous: Frankenstein, Criticism, Theory* (Manchester: Manchester University

Frankenstein’s life [“Destiny was too potent, and her immutable laws had decreed my utter and terrible destruction” (28)] to the historical determinism of scientific development. In the final step, however, she encountered serious difficulties when chemistry needed to turn into the artificial creation of human beings (chap. 4). In fact, the step is obscured, Victor saying that these dangerous secrets must not be disclosed. All we learn is that Victor makes “some discoveries in the improvement of some chemical instruments” (37) and turns towards “those branches of natural philosophy which relate to physiology” in order to “examine the causes of life” (37), which might reflect the actual interest of contemporary chemists and physicians in galvanism and mesmerism. In order to continue her deterministic account, Shelley presented the crucial discovery as the natural offspring of the state of the art, since it is “so simple, that ... I was surprised that among so many men of genius who had directed their inquiries towards the same science, that I alone should be reserved to discover so astonishing a secret” (38). On the other hand, she employed all the well-known details from the medieval mad alchemist when she described Frankenstein’s obsession and thoughtlessness in pursuing his “great work.”

Unlike the authors of most of the later mad scientist and earlier mad alchemist stories, Shelley let her hero remorsefully recant his “fiendish ambition” in the face of the disaster he caused. This enabled her to put a Stoic message into the mouth of dying Frankenstein (chap. 24, 196): “Seek happiness in tranquillity and avoid ambition, even if it be only the apparently innocent one of distinguishing yourself in science and discoveries.” The message once more emphasises the determinism, now on the psychological level. Once you allow yourself to have an ambition for science, you are lost. Once you get involved in the chemical investigation of nature, i.e. the secrets of the divine creation, you are necessarily driven to commit the sin of hubris with disastrous effects. However, as with all nineteenth-century mad scientist stories, and despite Shelley’s efforts to point out the determinism, the disastrous effects are attached in order to make the moral plausible. *Frankenstein* not only stands out as the first modern anti-modern mad chemist novel, but it is also the most radical one, because it transferred the fate of the obsessed mad alchemists to the fate of science. Although we are today inclined to read the novel as a warning of *possible* scientific misconduct, it actually suggests both psychological and historical determinism, according to which the “seeds of evil” necessarily develop in the course of the scientific endeavour.

Perhaps the second most famous early author of mad scientist stories is the American writer Nathaniel Hawthorne (1804–64). His short stories are particularly interesting because they allow us to analyse in more detail the transformation from the medieval mad alchemist to the modern mad scientist. In one of his early tales, *The Great Carbuncle* (1837),⁵⁶ Hawthorne introduced a medieval mad alchemist whose madness largely remains

⁵⁵ *Continued*

Press, 1991), chap. 10, which also provides an interesting reflection on the relationship between technology and the humanities. Samuel H. Vasbinder [*Scientific Attitudes in Mary Shelley’s Frankenstein* (Ann Arbor: UMI Research Press, 1984)] rightly points out that Frankenstein is a representative of modern science, but does not appreciate the complete account of Shelley’s history of science and wrongly identifies Frankenstein’s science with “Newtonianism.”

⁵⁶ From *Twice-Told Tales* (Boston 1837), 213–34 (probably written in 1834). The alchemist/chemist is only one among seven miserable seekers of the Great Carbuncle, who each confess their different motives for the pursuit. In some sense, the whole story may be read as a metaphorical classification of various kinds of alchemists/scientists or Faustian seekers. William Bysshe Stein, in *Hawthorne’s*

within the scope of self-destruction: “He was from beyond the sea, a Dr. Cacaphodel, who had wilted and dried himself into a mummy, by continually stooping over charcoal furnaces and inhaling unwholesome fumes, during his researches in chemistry and alchemy ... he had drained his body of all its richest blood, and wasted it, with other inestimable ingredients, in an unsuccessful experiment — and had never been a well man since.” Later in the story, a new, modern aspect of his “madness” appears. Being one of several miserable seekers of the Great Carbuncle, a miraculous and holy Indian gem hidden in the mountains, the chemist confesses that he is eager to take this holy gem apart by chemical means in order to learn its elemental composition by destruction. From destroying one’s own health to destroying holy things is only the first step in the transformation of the mad alchemist. The next step of madness, the step towards moral perversion, is hurting or killing other people as a result of one’s scientific obsession and hubris, on which Hawthorne later wrote at least two stories.

The Birth-mark (1843)⁵⁷ features an al-chemist of the late eighteenth or early nineteenth century.⁵⁸ Alluding to contemporary Romantic philosophies of nature, Hawthorne let this al-chemist temporarily exchange his love for alchemy with the love for his new wife, who is described as the ideal of beauty, save for a small birthmark on her cheek. After a while, the birthmark, in the view of the al-chemist, grows to an intolerable symbol of material imperfection. Eventually, he revives his old chemical laboratory and brews a remedy to remove the spot. However, at the end of the story, it turns out that his wife’s birthmark is the only bond of her “angelic spirit” with the “mortal frame” of her body, such that the successful removal results in her death. The moral of this fable is easy to grasp: material perfectionism by chemical means, i.e. the hubris of improving the divine creation, results in destruction and death. As with other mad scientist stories, in order to make the moral plausible, Hawthorne requires surreal elements (here, the bond of her angelic spirit with her mortal frame) such that the story turns into a fable only at the very end.

In *Rappaccini’s Daughter* (1844),⁵⁹ Hawthorne introduced a new component that changed the mad alchemist into the full-fledged mad scientist. Dr. Rappaccini is a physician at the University of Padua “very long ago,” who is experimenting with vegetable poisons — as chemical physiologists actually did in France at that time. According to his colleague Professor Baglioni, “he cares infinitely more for science than for mankind. His patients are

⁵⁶ *Continued*

Faust: a Study of the Devil Archetype (Gainesville, Florida: University of Florida Press, 1953), places Hawthorne’s mad scientists in the Faust tradition, as received in Puritan New England, and points out Hawthorne’s interest in ancient myths as “marvellously independent of all temporary modes and circumstances” (25). By uncritically making Hawthorne’s view his own, however, Stein decontextualises Hawthorne’s mad scientist stories and reads them as prophecies of “inevitable doom, a fate which the atomic and hydrogen bombs seem to confirm” (148). Historian of science William R. Newman has recently argued against such ahistorical reading in *Promethean Ambitions: Alchemy and the Quest to Perfect Nature* (Chicago: University of Chicago Press, 2004), 2–5.

⁵⁷ First published in *Pioneer*, I (March, 1843): 113–19; repr. in *Mosses from an Old Manse* (New York, 1846), vol. I, 32–51.

⁵⁸ Hawthorne wrote, “when the comparatively recent discovery of electricity, and other kindred mysteries of nature, seemed to open paths into the region of miracle.” Since “amber electricity” was already known in antiquity, I suppose that he referred to either Galvani’s experiments (1786) or Volta’s pile (1799).

⁵⁹ First published in *United States Magazine and Democratic Review*, XV (December, 1844): 545–60, as ‘Writings of Aubépine’; repr. in *Mosses from an Old Manse*, 85–118.

interesting to him only as subjects for some new experiment. He would sacrifice human life, his own among the rest, or whatever else was dearest to him, for the sake of adding so much as a grain of mustard seed to the great heap of his accumulated knowledge.” In the story, Rappaccini’s main experimental subject is his daughter, whom he has fed with poison from an early age, to the effect that the touch of her body is poisonous to any other living being. Owing to a misunderstanding, she takes an antidote prepared by Baglioni and, because she somehow embodies the poison, the antidote kills her. The hubris theme plus moral perversion is still important in the story, since Rappaccini’s so-called “experiment” is an effort to “improve” the physical nature of his daughter according to his own ideals of perfection and power, i.e. “to be endowed with marvellous gifts against which no power nor strength could avail an enemy ... to be able to quell the mightiest with a breath ... to be as terrible as thou art beautiful.” However, the hubris theme is combined with moral criticism of the obsessed and unscrupulous scientist who knowingly runs the risk of doing harm to other people. Unlike in the examples discussed above, the harm is no longer superimposed clumsily or in fable-like manner, but is presented, without too many surreal elements, as the plausible outcome or risk of narrow-minded research. From Dr. Cacaphodel’s self-destructive obsession via the al-chemist’s hubris in *The Birth-mark* to the unscrupulous and hubris-driven Dr. Rappaccini, Hawthorne transformed the mad alchemist step by step into the mad scientist.⁶⁰

Nineteenth-century writers established a firm link between chemistry and hubris that was already prepared by the Faust tradition, which also flourished at the time. A reliable method to prove that the link had become a literary cliché is to look for stories featuring chemists who commit the “sin of hubris” without any direct reference to chemistry or alchemy. Such an instance is *The Haunted Man and the Ghost’s Bargain* (1848)⁶¹ by Charles Dickens (1812–70).⁶² Although the main character of that novel, Redlaw, is a chemistry professor and although most of the plot takes place at his university “in his inner chamber,

⁶⁰ Taylor Stoehr, in *Hawthorne’s Mad Scientists: Pseudoscience and Social Science in Nineteenth-century Life and Letters* (Hamden: Conn. Archon Books, 1978), has argued that Hawthorne’s mad scientist stories reflected the contemporary rise of “pseudosciences,” such as mesmerism, homoeopathy, and phrenology, rather than that of science. However, Stoehr’s distinction between science and pseudoscience is, like the term “pseudoscience,” rather an ex post facto projection onto early nineteenth-century popular American culture. As the reference to Dr. Cacaphodel “researches in chemistry and alchemy” illustrates, Hawthorne combines rather than distinguishes between traditions. In “The New Adam and Eve” (1842), he even goes as far as to equate the entire Harvard University library with “the fatal apple of another Tree of Knowledge.” Stephanie P. Browner, *Profound Science and Elegant Literature* (Philadelphia: University of Pennsylvania Press, 2005), chap. 2, argues that “Hawthorne’s repeated use of the trope [of the mad medical scientist] suggest that the evil medical man was not just a stock figure for him. Indeed, Hawthorne wrote again and again about medical ambition because he was genuinely troubled by the increasingly confident claim to somatic mastery that medicine was making in those years” (40).

⁶¹ *The Haunted Man and the Ghost’s Bargain: a Fancy for Christmas-time* (London: Bradbury & Evans, 1848).

⁶² Chris Baldwick (*In Frankenstein’s Shadow*), who, for some reason, sees *The Haunted Man* in the Frankensteinian rather than in the Faustian tradition (115), suggests another interesting method to prove the stereotypical connections between chemistry and villainy. In his criminal story *The Woman in White*, Collins “laid a false trail for us” by introducing a character as “being ‘one of the first experimental chemists living’ — which is almost enough for us to condemn him in advance as a murderer,” says Baldwick (184).

part library and part laboratory,” Dickens avoided any further mention of chemistry. Instead, since poor Redlaw is haunted by his memory of awful personal affairs in the past, he makes a “bargain” with a ghost. In that Faust-like pact, he receives the gift of forgetting all wrongs in the past as well as the capacity to pass on the same gift to everybody with whom he gets in touch. Playing “the benefactor of mankind” by freeing other people from the burden of their memory, Redlaw makes great use of his new capacity. Contrary to what he expects, this has disastrous effects, however, because all the infected people turn into heartless and selfish persons. As the ghost explains to the chemist in chapter 3, “you are the growth of man’s presumption” that overthrows “the beneficent design of Heaven.”

Did all nineteenth-century writers consider chemistry the embodiment of hubris? Of course not, but many from various countries did. German writers, usually quick with moral complaints, were relatively quiet about hubris in that period, which was probably due to the absorbing power of German idealism and the romantic philosophy of nature as an effort to reconcile science, religion, and the arts. However, I know only one literary example that took the opposite stand and ridiculed the hubris motif with respect to chemistry, which is from the American novelist Herman Melville (1819–91). In his picaresque satire *The Confidence-Man: His Masquerade* (1857),⁶³ this confidence-man, scene-by-scene, transforms into various pseudomoralistic figures. One is a herb doctor who lectures at length in front of a very sick man about the wrongs of chemistry-based medicine as opposed to his own natural herbs. Here, I quote only a small part (chap. 16):⁶⁴

Oh, who can wonder at that old reproach against science, that it is atheistical? And here is my prime reason for opposing these chemical practitioners, who have sought out so many inventions. For what do their inventions indicate, unless it be that kind and degree of pride in human skill, which seems scarce compatible with reverential dependence upon the power above? Try to rid my mind of it as I may, yet still these chemical practitioners with their tinctures, and fumes, and braziers, and occult incantations, seem to me like Pharaoh’s vain sorcerers, trying to beat down the will of heaven. Day and night, in all charity, I intercede for them, that heaven may not, in its own language, be provoked to anger with their inventions; may not take vengeance of their inventions. A thousand pities that you should ever have been in the hands of these Egyptians.

Eventually the sick man, unable to listen to the chatter of the quack any longer, buys a few of his herbs to get rid of him.

In the metaphysical battle against the emergence of modern science, which chemistry embodied for nineteenth-century writers, the hubris theme was the weakest argument, but became the strongest blow. It was weak not only because the actual research, such as the rudimentary steps of medicinal chemistry and the synthesis of some organic substances, gave little reason to compare chemists with the Christian creator; also, based on any of the ethical theories of the time, there was simply no moral objection to the improvement of medical or other material conditions of life. Moreover, the whole idea of hubris, which is rooted in and prompted by the peculiarities of Christian theology, is neither an ethical idea nor a theologically consistent one. In order to make hubris a morally convincing accusation

⁶³ First published New York: Dix, Edwards & Co., 1857.

⁶⁴ On the herb doctor, see Browner, *Profound Science and Elegant Literature*, 91–101; for related biographical anecdotes, see Jonathan Cook, *Satirical Apocalypse: An Anatomy of Melville’s The Confidence-Man* (Westport: Greenwood Press, 1996), 91–92, 106–9.

for their readers, nineteenth-century authors created the mad scientist. Transformed from the mad alchemist already established in the medieval literature, the mad scientist combines hubris with all the moral perversion that nineteenth-century writers could imagine. Borne out of the need for serious arguments, this literary figure has dominated the public view of science ever since. Although the mad scientist later moved on to other disciplines, such as biology and nuclear physics,⁶⁵ the figure continued to bear characteristics of the medieval alchemist, thereby revealing its chemical legacy.

Conclusion

Since the late eighteenth century, the notion of science has changed drastically with regard to its institutions, methods, and the content and structure of its knowledge. Formerly places for preliminary education before rising to the “higher faculties” of theology, law, and medicine, the philosophical faculties at the European universities became centres of discipline formation with PhD programmes, and with laboratories and research institutes for each of the emerging disciplines. The traditional form of chemical research, laboratory experimentation, became the prevailing research method in most of the sciences, including medical branches such as physiology and pharmacy. Scientific knowledge, produced by experimentation and published in the newly founded journals, proliferated and became increasingly fragmented due to the formation of separate disciplines that defined their own cognitive and practical goals. Unlike in the earlier period of natural philosophy, there was no longer a metaphysical system to provide an overall framework and orientation, and nor was it any longer acceptable for religious ideas to interfere in scientific matters. Furthermore, compared to the rapid growth of the sciences, the humanities considerably lost influence and reputation.

Many nineteenth-century writers, frequently with a background in the humanities, in law, or in theology, observed these tremendous changes with great concern. Not only were the approaches and methods of the new sciences alien to most of them, but they also worried particularly about the fragmentation of knowledge and the loss of any unifying metaphysical, moral or religious framework. The more they considered their profession as public moral education, the more they felt obliged to compensate for the growing independence of the sciences and their goals and to warn the public of misleading hopes and promises resulting from preliminary successes of the sciences.

In this paper I have distinguished between four kinds of literary response, which all picked up the alchemist from the medieval and early modern literature and transformed the figure for their own purposes. Some writers, particularly of the earlier period, considered the sciences altogether useless and recommended instead a spiritual and religious life that

⁶⁵ See Haynes, *From Faust to Strangelove*. Most influential for the shift to biology and “biological hubris” was H. G. Wells’s *The Island of Doctor Moreau* (1896), which became the basis for many films. However, Wells continued to use mad chemists, as in *The Food of Gods, and How it Came to Earth* (1904) and *The World Set Free* (1914). The latter novel is interesting not only because it was an apocalyptic call for World War I, but also because it narrates a history of chemistry that culminates in the development of a kind of nuclear fission bomb. Whereas this appears to anticipate the discovery of nuclear fission by the chemists Hahn and Strassmann in 1939, later mad scientist stories featured physicists as bomb-makers.

refrained not only from the temptations of the material world but also from the curiosity of any scientific investigation. Following up a medieval debate, they praised their own way as the true alchemy. A second group of writers, well aware of the contemporary success of the experimental sciences, particularly of chemistry and its applications, pointed out their narrow-minded goals and their reduced view of the world. In their writings, they refurnished the obsessed mad alchemist with some ingredients from modern chemistry and let him, after some preliminary successes, fail overall. A third group responded more aggressively, as if modern science was undermining the fundamentals of their culture. Their al-chemists are atheists, materialists, and nihilists, who reject any moral or spiritual values and who, in their blind obsession with science, are presumptuous and destructive fools. Of all these accusations, many writers considered the sin of hubris to be the most important one, since they elaborated on it to form a fourth response that featured the powerful figure of the mad scientist, which resulted from a transformation of the mad alchemist. Whereas the mad alchemist in his obsessive search for the philosophers' stone harmed primarily himself (his health, wealth, and social status), the new mad scientist did harm primarily to other people through his obsession with playing God. Because the actual literary instances of playing God were largely confined to research into pharmaceutical cures, which writers considered the hubris of assuming "God-like control over life and death," the accusation of hubris alone was hardly convincing. To compensate for the lack of ethical or theologically consistent arguments, writers equipped their mad scientists with moral perversion or satanic elements.

These literary responses to the rise of modern science are scattered throughout Western literature, including that of Russia. In addition to the mentioned works, they can be found in hundreds of other pieces of literature. Far from being only a topic of Romanticism or *Bildungsromanen*, they appear in all kinds of literary styles and genres, in novels, plays, short stories, fables, poems, and even operas. All these responses, from the modest to the most radical, tried to separate out science from the authors' own understanding of culture and thus prepared the much-debated split into "the two cultures."⁶⁶ Since chemistry was the main target of nineteenth-century authors, it is not surprising that chemistry became particularly alienated from the humanities.

In this cultural battle, the most effective blow was the creation of the mad scientist, a stigma that is still cultivated today, if only for entertaining reasons. In retrospect, one might be inclined to see early warnings of possible scientific misconduct in mad scientist stories. Yet such an ahistorical reading overlooks the fact that in the nineteenth century the main issue was not professional ethics but the organization of knowledge, the relationship between science and religion, and the reputation of science versus the reputation of the humanities.

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⁶⁶ See Charles P. Snow, *The Two Cultures and the Scientific Revolution* (Cambridge: Cambridge University Press, 1959).

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