Circumscribere
International Journal for the History of Science

2010 Allen Debus Conferences :

Public lectures of chemistry in 18th century France

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This paper revisits 18th century French chemistry, outside the academic milieus, through the many private and public courses delivered in Paris.

It first attempts to identify who were the lecturers, the major locations where chemistry was displayed and its audiences. Although most of the courses were meant for customers with a vocational interest in pharmacy, medicine or chemical arts, they attracted wider and heterogeneous audiences, including ladies, *gens du monde*, and philosophers. These lectures often combined spectacular demonstrations with more practical purposes such as cosmetics or pharmaceutical preparations. Thus, while remaining an auxiliary of medicine and pharmacy, chemistry became an integral part of Paris Enlightenment culture, cultivated both for entertainment and for its contributions to public welfare.

Then looking at the contents of some of the lectures, I will try to characterize the relations between experimental demonstrations and theoretical views. All lecturers covered various chemical operations and practical arts, including pharmacy, winemaking, and mining, but most of them also included theoretical considerations. In this respect, the decade of the 1770s seems to be a turning point in the longstanding tradition of public lectures, with the advent of new topics (such as mineralogy and docimasy) as well as new purposes such as testing the theoretical foundations of chemistry.

Through the 18th century, chemistry became an autonomous science in many parts of Europe. In France, this promotion was indeed the result of the creation of a class of chemistry at the Paris Academy of science as early as 1699, whereas a class of physics opened much later in 1785. However chemistry was also promoted in the public sphere as a useful science in the service of health and welfare as is suggested by the crowds who attended public lectures of chemistry. In Paris, their audience included medical doctors and pharmacists as well as amateurs and "philosophers".

The *Gazette de médecine* from 1761 provides us with a whole panorama of such courses, in which we can distinguish different types of public and private courses:

[•] Research leading to this conference was carried out with Christine Lehmann.

PUBLIC	PRIVATE		
Jardin du Roy	Bourdelin & Rouelle		
Jardin des apothicaires Rue de l'Arbalette	Alternatively: Couzié, De Moret, Julliot, La Planche, Bataille, sautere, Laborie, Azema, Trevez		
Ecole de Médecine Rue de la Bucherie	Bellot & Laplanche	De la Planche Rue de la Monnaie	Chemistry & Pharmacy Courses
Collège Royal de France Place Cambray	Poissonier	Macquer & Baumé Rue St Denis	Chemistry Course

The number of courses registered testifies the great popularity of chemistry in the French capital in the period of the editorial enterprise of Diderot's *Encyclopédie*. Yet the comments added by the *Gazette de médecine* suggest a depreciative look at chemists:

> "Our paper would not suffice to let know in detail all those who burn charcoal in Paris in order to illuminate such or such chemical truth and an in-folio would hardly suffice just to name those who burn charcoal without knowing why they do it".

Chemists are still viewed as people teasing fire for dubious purposes. In considering just those courses which are considered serious enough to be announced by the very official medical gazette, I will distinguish the two categories of public and private courses. Clearly chemists such as Rouelle and Laplanche were popular enough to attract audiences at both private and public demonstrations. Who were the lecturers? Who were their audiences ? What kind of chemistry did they teach?

"*Côté jardins*": Free courses open to the public

The Jardin des Apothicaires.

Chemistry courses were offered at the *Jardin des apothicaires* (the Apothecaries' hall) starting around 1700, as a part of the training for future apothecaries provided by the Guild of merchant apothecaries and spicers (*la Compagnie des Marchands Apothicaires-épiciers*):

> "[E]very year, one of the apothecaries from the aforementioned guild will offer a free, public chemistry course for the instruction of those who practice medicine and pharmacy […]"

The existence of these courses reminds us of the enduring alliance between chemistry and pharmacy, centered on the production of both medicines and other laboratory products. The *Jardin des apothicaires*, created in the middle of the 16th century by Nicolas Houël, was a philanthropic undertaking, intended to instruct orphan children "in piety, to serve and to honour God, in letters & subsequently in the Art of the apothecary". This teaching institution was entirely organized and financed by the guild of apothecaries.

The courses took place regularly between 1702 and 1723, and again starting in 1753, before being ended in 1768 by order of the Faculty of Medicine, unhappy with the idea of apothecaries

pretending to the status of professors.

Between 500 and 1000 posters were pasted up around Paris to announce these courses. The announcement of these courses presented the names of nine demonstrators charged alternately with the course in chemical experiments. The contents were decided collectively, without any possibility for one of the lecturers to impose his will. No one held the teaching position. The courses were taught in turn by each master apothecary from the guild, who were each limited to a maximum of two years teaching in succession.

The courses were held in the laboratory of the Apothecaries' hall itself, which had been constructed in 1700. The auditorium was used exclusively for the teaching of chemical operations and preparations, and was an integral part of the laboratory. An "Inventory of the House and Garden" known by the name of the *Collège de pharmacie* was drawn up in 1788 and offers a very detailed description of the building:

> "On the left we find a laboratory in which has been constructed a large oak tiered seating arrangement composed of nine tiers with two benches on the floor. The tiers are surrounded by a barrier. On the right of the fireplace there is a counter on which one can place the objects for the demonstrations, as well as the ovens and tools for the same ends… At the back of the laboratory there is a mantle over the fireplace constructed along the whole of its length […] Under the aforementioned fireplace there are limestone supports for the ovens […] In the aforementioned laboratory there are fifty of the most ordinary chairs".

The domain of the demonstrator – between the hearth of the fireplace and the table for the demonstrations – was distinct from that of the public, separated and protected by a barrier. The tiered seating allowed everyone to follow the demonstrations. The "fifty of the most ordinary chairs" mentioned seem to constitute part of the laboratory equipment on a par with the fireplace, the ovens, the glassware and the porcelain. This suggests that the laboratory was conceived of as a meeting place involving seated spectators.

Outside the hours of official courses, the public was free to witness the pharmaceutical preparations carried out in the laboratory. One of the guild's deliberations from 1763 mention the possibility of using the laboratory "to work at all sorts of preparations, both chemical and Galenic, that will be carried out there with all possible care and precision under the eyes and the by the hands of the Master apothecaries".

Thus, everything was organised at the *Jardin des apothicaires* so that the experiments would be carried out under the eyes of spectators with the pedagogical aim of transmitting an art through the apprenticeship of gestures and manipulations.

What was important here was the professional training, and the public for these courses was above all constituted by apprentice apothecaries, who were joined by physicians, as the faculty of medicine did not offer its own chemistry courses. But the archives also mention "a multitude of amateurs and of students from all states, both national and foreign who have come here to learn", which might be the reason why the laboratory needed to be enlarged in 1760. This heterogeneous public was characteristic of all the chemistry courses around the middle of the 18th century. Nevertheless, the courses at the *Jardin des apothicaires* lay outside the circuit of polite society, belonging rather to a system of apprenticeship enabling entry into a guild, than to the culture of curiosity.

The official courses at the Jardin du Roy.

In contrast to the courses at the *Jardin des apothicaires*, the courses offered at the *Jardin du Roy* (the Royal botanical gardens) were an official institution. Essentially dedicated to the collection of medicinal plants, the *Jardin du Roy* initially limited its teaching to botany. Nevertheless, chemistry succeeded in grafting itself onto this original teaching mission and came to represent an ever more significant proportion. Two positions, one as professor and the other as demonstrator were created to teach the composition of medicinal plants. The description of the professor's responsibilities changed several times, but always in the direction of an increasing preponderance of chemistry.

Nearly all the chair-holders as well as their replacements were members of the Paris Academy of Sciences, and all except Boulduc were doctors, while all the demonstrators (except for Davisson) were pharmacists. The last in the list, Antoine-Louis Brongniart had already been appointed demonstrator at the new *Collège de pharmacie* founded in 1777, when he joined the *Jardin du Roy* two years later.

Until the renovation undertaken by Buffon in 1787, the chemistry courses at the *Jardin du Roy* were held in an amphitheatre that Jussieu described in the following terms: "This amphitheatre, which could hold 600 students, was located in the building that lay between the large entrance to the Jardin and the terrace of the great hillock". Thouin added the information that "it was too small by half to contain the members of the audience". Here then, there was a 600-place amphitheatre, and it was only half the required size! It means there must have been at least 1,000 people attending these courses . An impressively large public.

The theoretical and the practical parts of the teaching were to be offered by two different people – a professor and a demonstrator - in separate places. Did the students move from amphitheatre to laboratory in order to watch the practical operations, or was the material carried into the amphitheatre? The question remains open. The amphitheatre was polyvalent, being used for the anatomy course in the winter. With the arrival of spring, however, the rising temperature meant that the cadavers became difficult to preserve and so anatomy gave way to the botany and chemistry courses for the duration of the summer months, as advertised in the *Gazette de médecine* of 1761.

The situation of Guillaume-François Rouelle as demonstrator is unique in the history of the *Jardin du Roy*, as he was appointed with the title "demonstrator of chemistry at the *Jardin des plantes* under the title of professor of chemistry". His teaching was not coordinated with that of the professor, Louis-Claude Bourdelin. Thus, he had to present both the chemical operations and chemical theory simultaneously. The testimonies of his contemporaries give a colourful image of an untidy, warm, enthusiastic, loud professor, who knew how to communicate his passion for chemistry to his audience. Several anecdotes related by Grimm convey the eccentric side of his personality, as well as the difficulty involved in "doing" and "talking" at the same time.

Rouelle normally had two assistants. Their role was not only to prepare the experiments but also to avoid any accidents as is suggested by Grimm's famous account of an explosion. On this particular day, Rouelle was not assisted by his brother, Hilaire-Marin, and his nephew. As he started igniting an essential oil with spirit of nitre, he left the experiment alone for a moment to finish his explanation while turned to face the audience:

> "Suddenly, the ignition experiment exploded and broke the lid with a crack, giving off a bright light and filling the amphitheatre with thick and suffocating smoke. The terrified public immediately started to flee and fan out through the garden in fear, while the operator stunned and motionless, had escaped with only the loss of his wig and shirt-cuffs."

Rouelle's courses enjoyed considerable success. According to Diderot, they attracted "a

quarter of the city" from every class of society, including "the children of nobles who wanted to learn." Rouelle not only trained most of the chemists in the eighteenth century – Macquer, Venel, Brongniart, Bucquet, Sage, Lavoisier… to mention but the best known – but also the *philosophes* of the Enlightenment, Diderot, Rousseau, Turgot, Malesherbes, as well as various other members of polite society.

Thus, the courses offered at the *Jardin du Roy* responded both to a demand for training and to a demand for culture. They helped to make chemistry a fashionable science in the eyes of the public and one cultivated by the *philosophes*. Furthermore, the success of these public demonstrations helped to raise the status of experimental practice. Both Venel in his article on chemistry in Diderot's *Encyclopédie* and Diderot himself in his *Interprétation de la nature* praised the "experimental manual workers" and the heroism of the chemist-as-artist.

But these were not spectacular experiments, indeed the chemist's heroism lay in his effort, in his labouring, "the passion of a madman" that such experiments demanded. The spectacular, the explosions were quite exceptional.

Private, fee-paying demonstrations

Alongside these public courses, which were free, there also existed a long tradition of private fee-paying courses that continued throughout the 18th century. Among the best known were those taught by the two Geoffroy brothers, both master apothecaries and members of the Academy of Sciences, with Etienne- François, the older brother, famous for his affinity table. They taught the course in their pharmacy in the rue Bourtibourg, while Rouelle taught in the rue Jacob from 1746, Macquer and Baumé in the rue St Denis starting in 1757, and de La Planche in rue de la Monnaie.

Who was the public of these private courses?

We know that there were many of them (in 1764, Venel claimed to have 42 students), even though the registration fees were very expensive. It cost 96 *livres* to follow Macquer and Baumé's course (half price for those who had already taken a private chemistry course). The course offered by Venel and Montet in Montpellier cost half that amount, the price that students in medicine and pharmacy were expected to pay.

Nevertheless medical students were not alone. We should keep in mind that chemical experiments were largely practiced throughout the French society. On the one hand, a number of aristocrats had their own private laboratories at home where they practised a bit of chemistry for entertainment. For instance, the Fermier general Charles Dupin owned a private laboratory near Blois and hired Jean Jacques Rousseau to teach chemistry to his son. Rousseau himself had been initiated into chemistry by Madame de Warens, who was fond of medical preparations. He even authored a textbook of chemistry entitled *Institutions chymiques*, that compiled various sources, such as Boerhaave, Rouelle and Senac, to which Rousseau added his own personal reflections on chemistry. On the other hand, despite the growing importance of the guild of perfumers in Paris, in many bourgeois families women were still in charge of the fabrication of medicines, cosmetics and cleaning products. Their role required a familiarity with chemistry. Marie Murdrach's famous treatise *La chimie charitable et facile des dames* (1666) suggests that empirical practices had to be grounded on a minimum theoretical basis. And this book remained popular for many decades.

Partnership between apothecaries and physicians

The private courses, known as *cours particuliers* were advertised in medical journals or by means of posters. Sometimes they required that students sign up for the course in advance. The courses included oral presentations and practical demonstrations. They took place on apothecaries' territory – in the laboratory adjoining the pharmacy. This private space was at the same time a place

for the preparation of medicines a place for commerce, being an annex of the pharmacy itself, and a place for teaching. The teacher was usually an apothecary himself, although during the 18th century most courses were delivered by a duo made of a pharmacist and a physician. Thus, in Paris, the doctor Pierre-Joseph Macquer taught with the apothecary Antoine Baumé, and in Montpellier Gabriel-François Venel, who was a physician, paired up with Jacques Montet. In the 1780s, the apothecary de La Planche started a new course with Jean-Baptiste Bucquet, a medical doctor.

What was the reason of such partnerships? Vicq d'Azyr in his *Eloge de Macquer* gives us a hint:

> "Custom dictates that theory should be kept apart from demonstration & that these two aspects, which are mixed together in order to render teaching attractive, should be dealt with by two men, one of whom only talks, while the other acts and talks simultaneously."

A footnote indicates that the custom of a professor and a demonstrator jointly teaching courses was still current in several universities in Germany and Italy.

The origin of this custom lies in the statutes that governed the guilds. Medical doctors were required to teach in full costume and their lessons could not be other than *scriptis et auribus*, written or oral. They explicitly prohibited themselves from carrying out any manual operations. Indeed, Vicq d'Azyr points out how they were bogged down by this rigmarole.

> "For a number of centuries physics has been nothing but a tissue of systems, a patchwork of authorities drawn from the Ancients, which the doctors, fenced around with magisterial pomp, teach to their disciples. When the progress of knowledge forced them out of their schools to interrogate nature in the laboratory, they thought that to retain their dignity they needed to appear in their robes: these outfits mean they are reduced to the situation where it is impossible to do anything other than talk."

As far as the apothecaries were concerned, the statutes of their guild forbade anyone who was not a qualified apothecary from holding a demonstration. This prohibition applied particularly to medical doctors. Hence, complex relationships between doctors and apothecaries: socially speaking, the apothecaries occupied a subaltern position, with physicians' organizations policing the preparation of drugs and inspecting the pharmacies. Nevertheless, the doctors depended on the apothecaries to perform the experiments as they themselves were not supposed to get their hands dirty.

Theory and experiment

This ambivalence had an effect on the relationship between theory and practice. In principle, the role of the experiment was simply to make the doctrine that the professor was presenting available to the audience's senses of sight, smell, and touch. Indeed, many of these courses were accompanied by treatises, and sometimes buying such a treatise was one of the preconditions for attending the course.

What was exactly the balance between theory and practice in such courses?

From what we know about the audiences it is clear that many customers came to learn how to do things, by *seeing* and *hearing*. By looking at the demonstrations performed in front of them they were supposed to learn the knowhow of delicate manipulations. Occasionally, the demonstrator mentioned tricks or details to enable the audience to reproduce the experiment by themselves. That style of teaching was in between the methods of apprenticeship whereby artisans

acquire their manual skills, their *habitus* through practicing the art, and bookish knowledge that one acquires by reading a treatise. According to Baumé, his courses included more than 2,000 experiments, during which he would analyse the three kingdoms.

Nevertheless, it is clear that apothecaries did not avoid theory. They operated across both fields, combining word and gesture, and eventually dominating the stage, relegating the physician to the role of "narrator" behind the stage. Theory and experiment overlapped both in public and private courses.

Consider for example, De La Planche, who taught his own private course as well as teaching at the *Jardin des apothicaires*, and the Faculty of Medicine. His advertisement offered a veritable technical training, but he subtly integrated theory, even including it in his title "A Course of experimental chemistry, following the principles of Becher, Stahl and Boerhaave". He started with theory; then, while studying the vegetable kingdom he presented technical operations, maceration, infusion, decoction, etc. Wherever possible, he would put the emphasis on applications, such as the "art of the bulk treatment of ores". He also proposed "curious chemical experiments" on metals, and promised to develop experiments on the theme of "the discoveries made by some of the most famous chemists in Europe".

Rouelle's public course is best known thanks to the notes taken by various students. The course lasted for three years and treated the three kingdoms of nature, although with an emphasis on the mineral kingdom. Most of his presentations consisted in experimental procedures, and Rouelle advocated a Baconian approach to chemistry and distrusted all systems. He performed and described dozens of procedures and confined the theoretical statements to a few introductory remarks. This epistemic choice however does not mean that Rouelle's chemistry was theory-free. Rather, his approach was shot through with theory.

According to Rappaport, it was Rouelle who spread the doctrine of the German chemist Stahl to France. In fact he did not content himself with references to Stahl. He rather combined views taken from various sources – including Boerhaave and Newton. For what is exactly the function of theory when it is basically a speech accompanying gestures? It is not meant at providing a coherent system with an account of the ultimate causes acting in nature. Rather it just aimed at making sense of what is going on in the experiment thanks to a narrative identifying the actors and various protagonists of the chemical performance.

As he focused on solvent extractions, Rouelle used the notion of element as the key to interpret what happened in the process. Taking up Stahl's concept, Rouelle made a decisive conceptual shift. He rejected the ancient distinction between elements (ultimate molecules) and principles (first compounds made of elements). Chemistry, he said, "deals with separations and unions of the constituent principles of bodies, whether they are operated by nature or results of the procedures of art, in order to discover the *properties and uses* of such bodies." He nevertheless admitted four elements: air, earth, water and fire (the latter being identified with Stahl's phlogiston). The importance of the ancient four-element theory in the mid-18th century was not a reverence to the past, a marked traditionalism among chemists, as Duncan suggested. Rather Rouelle rejuvenated the Aristotelian doctrine thanks to a redefinition of the notion of elements in the light of affinity chemistry and displacement reactions..

Rouelle introduced his four-element theory under the heading "Instruments". This chapter included four natural instruments: fire, air, water and earth and two artificial instruments: *menstrua* and vessels. The ancient radical distinction between nature and human artifacts was thus blurred in favor of an instrumental view of matter as an active process of operations. Rouelle attributed a dual function to elements: they were both the constituent units of mixts, responsible for the conservation and transport of individual properties through chemical changes, and they were instruments of chemical reactions. Material principles were always at work, circulating from mixts to mixts whether it be in the chemist's vessels or in the depth of earth and the heights of heavens.

Rouelle's elements were individual, indestructible, and radically invisible, never isolable. They abandoned a combination to enter into another mixt. Thus, they were made accessible only through displacement reactions, through the chemists' operations performed in the laboratory. In stark contrast to corpuscularian theories of matter, principles were not characterized as ontological units. Rather they were defined as units of operations of nature and on nature. One single word was used for what we presently call reactions and manipulations: operations. Hence, a specific mode of theorizing quite different from physics theory. The theory was framed by operating priorities as a discourse meant to make sense of practical operations.

However, it seems that the popularity of Rouelle's courses was due to their experimental components rather than to the consistence of their theoretical foundations. At least it was under the title "chemical experiments" that Rouelle advertised his private courses. Two major aspects of experiments were put forward.

First, experiments were useful. Rouelle lured potential clients by mentioning the products he would extract or synthesize. From plants, he would extract "essential oils, essential salts, fixed salts"… He would present the preparation of varnish or of coloured precipitates that could be used in dyes and paint. The course would provide useful recipes:

> To promptly determine the metal content in an ore,
> To perform an assay with precision,
> To separate metals from one another,
> To use metal salts to make coloured glass.

Second, experiments were spectacular. Rouelle promised that the last part of his course would reveal "the substances that are taken from the entrails of the earth" and would be the object of "unusual experiments" on bitumen, nitre, marine salts and the acids. The effects of all the mixtures would produce "changes in colour, detonations and the production of flames"!

Such announcements suggest that chemists used experiments as advertising slogans. They downplayed theories in order to emphasize practical and spectacular effects. The conclusion of Rouelle's advertisement clearly expressed this state of mind:

> "With these experiments we will limit ourselves to making the advantages that physics and medicine have drawn from works of chemistry known. Further, we will make every effort to give examples of the utility of these same operations in several arts, & even their utility in everyday domestic uses."

Turning point in the 1770s.

During the 1770s, the chemical education of medical doctors and pharmacists was taken in hand by the Faculty of Medicine and the College of Pharmacy, respectively. One might think that this would have signaled the end of the private fee-paying courses, but this was not at all the case. Advertisements no longer appeared exclusively in the journals dedicated to medicine and pharmacy, as was the case 20 years before, but were now to be found in the daily papers. What is also noteworthy is the evident development of the spectacular side of the fee-paying courses offered by the apothecaries. The public was growing just as the territory covered by chemistry was, which came to include mineralogy, electricity and the "science of the airs" or pneumatic chemistry.

- The new star was the electrical fluid, which permitted Brongniart both to perform and to treat the sick using his magnetic fluid in the style of Mesmer:

> "The effectiveness of the electric fluid in treating several diseases, & especially in paralyses and deafness, &c. proven by a large number of experiments has persuaded M. Brongniart to receive patients at his home. The administration of this fluid will always be overseen and conducted by a physician of the Paris Faculty who has worked a great deal with this form of cure, and who will follow up the patients with much precision and care. Those who would like to be electricized may engage their own regular doctor to follow them."

- The new gases gave rise to a range of impressive experiments, often astonishing, and sometimes very smelly. Thus, Brongniart proposed a second part of his course where he would deal with 'air':

> "The different elastic emanations known under the general name of air, will be analysed in the greatest detail. Fixed air or mephitic acid, the knowledge of which brought about such a great revolution in physics and chemistry will be treated most accurately. We will demonstrate new apparatus required easily to perform the interesting experiments brought about by these special fluids." (*Journal de Paris*, n°37 6 February 1778)

For all this, the spectacular did not displace utility; the analysis of mineral waters remained a major topic throughout, and the interest for mineralogy increased in the last quarter of the 18th century. There was a revival of interest for the exploitation of subterranean resources, and a number of landowners either searched for or started to exploit mineral reserves. In his study of the elements covering water and the earths, Brongniart proposed such practical applications.

> "The analysis of different mineral waters can help country landowners throw light on the salubrity of the waters they find on their land. We will show them by what means – as uncomplicated as they are easy – they can know the quality of these waters, and how to render them into such a state that they can serve for different everyday uses. Finally, we will see […] the special analysis of different earths; the art of making glass, mirrors, and that of making pottery from simple earthenware to the finest porcelain. The arts of the plasterer, the lime burner, & the brick maker will be carefully presented in detail." (*Journal de Paris*, n° 111 Tuesday 21 April 1778)

The educational tradition was perpetuated by means of free courses in mineralogy and docimasy, such as those offered by Balthazar Sage at the *Ecole des Mines* (the School of Mines in Paris). This course, which was widely publicized, began on the 2nd of December 1778. The *Journal de Paris* announced that the course would be held on Monday, Wednesday, and Friday of every week, and mentioned that "although this course is free, those who would like to attend should enroll in it". This course enjoyed a considerable success, as is demonstrated by this engraving by Née in the work dedicated to *l'Hôtel des monnaies* (the Royal Mint). Sage's course had such a wide reputation that the painter Gabriel de Saint Aubin executed three ink drawings of the courses in 1779.

Conclusion

Overall, the different chemistry courses offered to the public in 18th century France reflect a number of general features characteristic of all natural sciences in the 18th century:

1) Experimental demonstrations were combination of pedagogical and commercial

enterprises. Public and private teaching enterprises operated side by side.

2) Knowledge was based on sensorial experience, tangible and visible phenomena (empiricism).

3) Experimental demonstration was an end in itself rather than the foundation or the illustration of theory.

4) Experimental demonstration had an educational function based on sensational effects rather than on understanding.

These courses also point to the distinctive features of chemistry itself:

1) Utility was the prime mover for the establishment of such courses. The majority of the public was interested in receiving a professional training, and we need to remember that at that time, chemistry only existed as a service science, an auxiliary to medicine and pharmacy.

2) The function of theory was not so much to "save phenomena" as to organize them as to make them teachable. Elements were considered as invisible and inaccessible causes of the visible phenomena, but they were not given any ontological status of hidden causes operating behind the stage. Rather they were treated as agents or instruments used by nature and mankind.

3) Public lecturers deliberately blurred the distinction between nature and artifact and this transgression of the old boundary imposed in medieval scholastic culture participated in the emergence of a new value system which praised public utility. Hence, the changing social status of chemists who became a model for science in Enlightenment culture.

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