

## THE PROGRAMME DEVISED IN 1791 BY FOURCROY FOR THE ESTABLISHMENT OF CLINICAL LABORATORIES

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Laboratories are a characteristic feature of modern medicine. E. Ackerknecht describes the period of clinical medicine starting in the middle of the 19th century as "laboratory medicine" which succeeded the period of "hospital medicine."<sup>1</sup> For some of the newer disciplines within medicine, such as clinical chemistry or microbiology, the clinical laboratory is the central place of work. Our studies have shown that the origin of clinical laboratories can be traced back to the 18th century.<sup>2</sup> Probably the oldest programme for a clinical laboratory is that devised in 1791 by the French physician and chemist Antoine François de Fourcroy (1755-1809) under the title *Idées sur un nouveau moyen de rechercher la nature des maladies*.<sup>3</sup> Medical historical research has practically ignored this work.<sup>4</sup> For this reason, here Fourcroy's programme will be explained and set against a broader historical background.

Fourcroy was born in Paris in 1755, the son of an apothecary, and grew up under modest conditions.<sup>5</sup> The anatomist Félix Vicq d'Azyr (1748-1794) at a visit to Fourcroy's family took notice of him. Vicq d'Azyr was secretary of the newly-founded Société Royale de Médecin, and with the support of members of

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<sup>1</sup> Erwin H. Ackerknecht, "Elisha Bartlett and the philosophy of the Paris clinical school," *Bulletin of the History of Medicine* 24, 1950, pp. 45-60, on pp. 49-50.

<sup>2</sup> Johannes Büttner, "Die Entstehung klinischer Laboratorien in den deutschsprachigen Ländern im 19. Jahrhundert," in *Johann Christian Reil (1759-1813) und seine Zeit*, ed. W. Kaiser, A. Völker (Halle (Saale): Martin-Luther-Universität Halle-Wittenberg, 43, T 73, 1989), pp. 118-135.

<sup>3</sup> [A. F. Fourcroy], "Idées sur un nouveau moyen de rechercher la nature des maladies," in *La Médecine éclairée par les sciences physiques, ou Journal des découvertes relatives aux différentes parties de l'art de guérir* (Paris: Buisson, 1791), vol. 1, pp. 142-145.

<sup>4</sup> A short reference will be found in: Georges Kersaint, "Antoine François Fourcroy (1755-1809), sa vie et son oeuvre," *Mémoires du Muséum National l'Histoire Naturelle* (Paris: Editions du Muséum, 1966), Séries D. Science physico-chimiques, vol. 2, p. 204.

<sup>5</sup> For Fourcroy's biography see: William A. Smeaton, *Fourcroy. Chemist and Revolutionary 1755-1809* (Cambridge: W. Heffer & Sons, 1962) and Kersaint (n. 4), *Fourcroy*.

that society Fourcroy was able to study medicine in Paris. In 1780 he acquired the degree of *Docteur en Médecine*. During his study, he devoted himself particularly to chemistry. His teacher was Jean Baptiste Michel Bucquet (1746-1780), who had been professor of chemistry at the Paris medical faculty since 1776. After Bucquet's death in 1780, Fourcroy first gave private courses in natural history, chemistry and materia medica. In 1783 he became professor of chemistry at the *École Royale Vétérinaire* in Alfort near Paris and in 1784 he succeeded Pierre Joseph Macquer (1718-1784) as professor of chemistry at the *Jardin du Roi*.

Stimulated by his teacher Bucquet, Fourcroy very soon became interested in the chemical analysis of vegetable and in particular animal materials. He foresaw very clearly the great significance of such analyses for medicine. In his *Thèse de pathologie* he criticised the use of chemistry in medicine in the past and emphasised the significance of the chemical analysis of body materials in discovering the nature, causes and treatment of diseases.<sup>6</sup> Also in his very first book, the *Leçons élémentaires d'histoire naturelle et de chimie*, Fourcroy dealt with this idea.<sup>7</sup>

In 1784 Fourcroy began extensive analytical chemical work on the analysis of body fluids, concrements (*calculi*) and tissues; he carried out a major part of this work in cooperation with Nicolas Louis Vauquelin (1763-1829), who in the same year became Fourcroy's laboratory and lecturing assistant. In a *Mémoire* presented by Fourcroy at the *Société Royal de Médecine* in 1784, he reported for the first time on the examination of pathologically modified materials.<sup>8</sup> In the period that followed, Fourcroy systematically analysed a great number of normal and pathological body materials with chemical methods, this work being done usually in cooperation with Vauquelin.<sup>9</sup> In a short outline of the history of animal chemistry, Fourcroy summarized his own work up to 1799.<sup>10</sup>

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<sup>6</sup> Antoine François de Fourcroy, *De usu et abusu chemiae in medendo* [Thèse, Faculté de Médecine Paris, 18. November 1779] (Paris: Quillau, 1779). The thesis was rejected by the Faculty. Fourcroy had to submit a further thesis on another subject and in September 1780 was finally awarded his doctoral degree (see: Kersaint (n. 4) *Fourcroy*, pp. 16-17).

<sup>7</sup> Antoine François de Fourcroy, *Leçons élémentaires d'histoire naturelle et de chimie* (Paris: Rue et Hôtel Serpente, 1782), vol. 1, p. 7.

<sup>8</sup> Antoine François de Fourcroy, "Mémoire sur la nature des altérations qu'éprouvent quelques humeurs animales, par l'effet des maladies et par l'action des remèdes," *Histoire et Mémoires de la Société Royal de Médecine* [Paris], année 1782/3, 1787, pp. 488-501.

<sup>9</sup> Before the publication of his programme in question here, Fourcroy had already published various papers on the chemical investigation of animal materials. A review will be found in Smeaton (n. 5) *Fourcroy*, pp. 136-162, and Kersaint (n. 4) *Fourcroy*, pp. 203-212.

<sup>10</sup> Antoine François [de] Fourcroy, *Système des connaissances chimiques, et leur applications aux phénomènes de la nature et de l'art* (Paris: Baudouin, 1801-1802), vol. 9, pp. 33-34.

Fourcroy was convinced, and his own investigations strengthened that conviction, that "the successes of chemistry would one day change the face of medicine and result in a beneficial revolution."<sup>11</sup> To assist this development, in 1791 he founded his own journal which bore the title *La Médecine éclairée par les sciences physiques, ou Journal des découvertes relatives aux différentes parties de l'art de guérir*. A total of only four volumes appeared and most of the contributions came from Fourcroy's pen.<sup>12</sup>

The contribution "Idées sur un nouveau moyen de rechercher la nature des maladies" of interest to us here is four pages long and was published in the spring of 1791.<sup>13</sup> In the introduction Fourcroy outlines the difficulties encountered in medicine in "investigating the inner nature of diseases," and then points out that the latest discoveries in chemistry and physiology open up new paths to the physician:

Los connoissances étendues de la chimie, l'analyse plus facile des matières animales, l'origine de la chaleur animale découverte,<sup>14</sup> la digestion<sup>15</sup> et l'animalisation<sup>16</sup> presque connues, le rapport et la liaison des diverses fonctions animales mieux appréciés,<sup>17</sup> font naître l'espoir qu'on

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<sup>11</sup> Fourcroy (n. 10), *Système des connoissances*, vol. 9, p. 36.

<sup>12</sup> Like numerous contributions to this journal, the article referred to here (see n. 3) was not signed. The fact that Fourcroy was the author is however clearly apparent from a reference made by the physiologist Pierre Nysten (1771-1818), who mentioned Fourcroy's programme. See: Pierre H. Nysten, *Recherches de physiologie et chimie pathologiques, pour faire suite à celle de Bichat sur la vie et la mort* (Paris: J.A. Brosson, 1811), pp. VIII-IX.

<sup>13</sup> Fourcroy (n. 3), "Idées sur un nouveau moyen."

<sup>14</sup> Compare for example the paper of Lavoisier and Laplace, in which the relationship of "air fixe" (CO<sub>2</sub>) and the formation of animal heat is set forth: [A.L.] Lavoisier, [P.S.] de Laplace, "Mémoire sur la chaleur," *Mémoires de l'Académie Royal des Sciences [Paris]*, année 1780, 1784, pp. 355-408.

<sup>15</sup> This might refer to the investigation carried out by Lazzaro Spallanzani (1729-1799) on the significance of saliva and gastric juice to digestion: Lazzaro Spallanzani, *Dissertationi di fisica animale e vegetabile* (Modena: Presso la Società Tipografica, 1780), vol. 1.

<sup>16</sup> The processes of "vegetation," i.e. the transformation of mineral substances to vegetable material, and of "animalisation," i.e. the transformation of vegetable material to animal material, were a source of great interest in Paris in 1791/92. In the summer of 1792 the Académie des Sciences took up a proposal made by Lavoisier and offered a prize for research in the field of animal nutrition, in particular the part played by the liver and bile. This project found a premature end with the closure of the Académie in 1792. See: Frederick L. Holmes, *Lavoisier and the Chemistry of Life. An Exploration of Scientific Creativity* (Madison: University of Wisconsin Press, 1985), p. 483.

<sup>17</sup> This remark also refers to work done by Lavoisier, who had concluded in 1790: "... nous avons fait voir que la machine animale est gouvernée par trois régulateurs principaux: La respiration ... La transpiration ... La digestion ..." See: Armand Seguin, Antoine Laurent Lavoisier, "Premier mémoire sur la transpiration des animaux," *Mémoires de l'Académie des Sciences [Paris]*, année 1790, 1797, pp. 601-612.

pourra au moins éviter les erreurs anciennes et trouver des vérités nouvelles dans ce genre de recherches.<sup>18</sup>

A discussion then follows on the examinations which can be employed in studying and detecting diseases:

Analysér avec soin les crachats, les urines et les diverses évacuations des malades, déterminer avec précision le nombre des pulsations et des inspirations par minute, mesurer le degré de chaleur sensible des principales régions de leur corps, connoître par un examen eudiométrique aujourd'hui aussi facile que certain, la quantité d'acide carbonique et de gaz azote sortis des poumons par l'expiration, et par conséquent la quantité d'air vital altéré dans l'inspiration, et celle du carbone et de l'hydrogène dégagés du sang<sup>19</sup> apprécier la nature et la quantité de l'humeur, de la transpiration et de la sueur.<sup>20</sup>

Strikingly, blood is not expressly mentioned as a material to be investigated. Fourcroy was familiar with the work of his teacher Bucquet<sup>21</sup> on blood and in 1789 published a brief report on the chemical testing of blood in a patient suffering from haemorrhages.<sup>22</sup> In 1790 he reported, again working with Vauquelin, on the detection of 'bile' in ox blood.<sup>23</sup> However, the first stimulation to systematic investigations of the blood in diseases came from the extensive work of Antoine Augustin Parmentier (1737-1813) and Nicolas Deyeux (1745-1837), which was published in 1791.<sup>24</sup>

Fourcroy's test programme, which employed recognized methods in chemistry and physiology, was a novelty in medicine of the period. It is a programme bearing the handwriting of a natural scientist. He stated that the test programme

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<sup>18</sup> Fourcroy (n. 3), "Idées sur un nouveau moyen," p. 143.

<sup>19</sup> It is very probable that Fourcroy had in mind here the experiments on respiration carried out somewhat earlier (1789) by Lavoisier and Seguin. See: Armand Seguin, Antoine Laurent Lavoisier (1789), "Premier mémoire sur la respiration des animaux," *Mémoires de l'Académie des Sciences* [Paris], 1793, pp. 566-584 [read 1789]. These experiments are illustrated in two drawings by Mme. Paulze Lavoisier. Reprinted in: Édouard Grimaux, *Lavoisier 1743-1794 d'après sa correspondance, ses manuscrits, ses papiers de famille et d'autres documents inédits* (Paris: F. Alcan, 1888), tables opposites to pp. 118 and 128. See also: Holmes (n. 16), *Lavoisier*, chapter 16.

<sup>20</sup> Fourcroy (n. 3), "Idées sur un nouveau moyen," p. 143.

<sup>21</sup> This work of Bucquet was not published. Fourcroy gives a detailed report on it in his *Leçons élémentaire* (n. 7), vol. 2, pp. 714-721.

<sup>22</sup> Antoine François de Fourcroy, "Observation sur une singulière altération du Sang par l'effet d'une maladie," *Annales de chimie* [Paris] 1, 1789, pp. 65-69.

<sup>23</sup> Antoine François de Fourcroy, Nicolas L. Vauquelin, "Copie de quelques découvertes chimiques," *Annales de chimie* [Paris] 6, 1790, pp. 177-182.

<sup>24</sup> Antoine Augustin Parmentier, Nicolas Deyeux, *Mémoire sur le sang* (Paris, 1791), reprinted in *Journal de physique, de chimie, d'histoire naturelle et des arts* [Paris] 44, 1794, pp. 372-390, 435-473.

must be carried out "continuously on a large number of patients."<sup>25</sup> Towards the end of the 18th century, the physician was used to seeing the diseases of the individual patient, and not considering a large number of cases comparatively. M. Foucault drew attention to the significance of this "perception of the frequencies" in the development of modern clinical medicine, since "la certitude médicale se constitue non pas à partir de l'individualité complètement observée, mais d'une multiplicité entièrement parcourue de faits individuels."<sup>26</sup>

As Fourcroy further pointed out, the examination of a large number of patients brings practical problems because it cannot be carried out in a usual physician's practice. On the contrary, premises and apparatuses are required which cannot easily be assembled in private homes. He further emphasized that this type of research was impossible in a busy practice. On the contrary, such research "took up one's entire time."<sup>27</sup>

To solve this problem, Fourcroy presented a completely new proposal: the investigations should be performed in a hospital intended especially for that purpose:

Un pareil hôpital devrait être amplement fourni de tout ce qui peut servir l'exécution de ce plan. A peu de distance d'une salle de vingt ou trente lits, seroit construit un laboratoire de chimie pourvu de tous les matériaux et de tous les ustensiles nécessaires à l'analyse animale. Un grand nombre de thermomètres comparables, de baromètres, d'électromètres atmosphérique, de balances de Sanctorius,<sup>28</sup> pour peser les malades; un ou plusieurs lits, de baignoires, disposé de façon à pouvoir être pesés commodément; les machines nouvelles pour la respiration,<sup>29</sup> des appareils d'eudiométrie, suivant les derniers principes de M. Seguin;<sup>30</sup> en un mot tout ce que la physique exacte peut fournir de ressources, des moyens et d'instruments pour connoître les phénomènes de la vie, doit être rassemblé autour des malades.<sup>31</sup>

Fourcroy also had an answer to the question as to who should do these examinations: they should be "entrusted to young physicians versed both in the

<sup>25</sup> Fourcroy (n. 3), "Idées sur un nouveau moyen," p. 143.

<sup>26</sup> Michel Foucault, *Naissance de la clinique*, 2me édition (Paris: Presse Universitaire de France, 1972), p. 101.

<sup>27</sup> Fourcroy (n. 3), "Idées sur un nouveau moyen," p. 144.

<sup>28</sup> This refers to the balance used by Santorio Santorio (Sanctorius) (1561-1636) for investigating the perspiratio insensibilis and for physiological experiments. See: Santorio Santorio, *Ars ... de statica medicina* (Venice: Apud N. Polum, 1614).

<sup>29</sup> See: Seguin, Lavoisier (n. 19), "Premier mémoire sur la respiration."

<sup>30</sup> Fourcroy is referring here to the work, which appeared in the same year, of Armand Seguin (1765-1835), who together with Lavoisier had conducted the famous experiments on animal respiration (see n. 19). Seguin had devised his eudiometer (a so-called phosphorus eudiometer) for this purpose. Armand Seguin, "Mémoire sur l'eudiométrie," *Annales de chimie* [Paris] 9, 1791, pp. 296-303.

<sup>31</sup> Fourcroy (n. 3), "Idées sur un nouveau moyen," p. 144.

fundamentals of modern sciences and in nosology."<sup>32</sup>

Finally, Fourcroy proposed to include in chemical investigations material obtained in autopsies and to combine the anatomical post-mortem examination with the chemical analysis of the humors and all parts altered by the disease.<sup>33</sup>

Here, Fourcroy is taking up an idea which became of great importance in the development of the new clinical medicine at the end of the 18th century: linking clinical observations to the findings of post-mortems. Pathological anatomy is employed because it is able to furnish 'positive' reasons for the nosology.<sup>34</sup> At the end of the 18th century, in Paris, as well as at other French universities, clinicians regularly carried out autopsies on their patients. This was done for example by the surgeon Pierre Desault (1738-1795) at the Hôtel Dieu (during the Revolution: Hospice d'Humanité). In contrast to the clinicians, Fourcroy considered one purpose of pathological investigations to be "to investigate changes in the fluids and solids of the body which are suitable for such investigations" in order to determine the essence of the pathogenic state.<sup>35</sup>

With his programme, Fourcroy discovered completely new paths in the application of chemistry to clinical medicine. Although medicine in the 17th and 18th century had employed the chemical laboratory (*laboratorium chymicum*), it had done so mainly to prepare chemical medicines. The idea of carrying out chemical examinations on patients and establishing a laboratory in a hospital for that purpose was new.

Fourcroy's ideas must be seen against the background of the philosophical and political changes of that time. The medicine of the 18th century is characterized by numerous attempts to put the medical knowledge in a theoretical system. Examples are Georg Ernst Stahl's animistic theory and the biodynamistic systems by William Cullen and John Brown. The newly developing natural sciences raised hopes of a reliable foundation for medicine. It was the new 'antiphlogistic chemistry' which appeared particularly suitable for this purpose, since its application to physiology had already had great successes.<sup>36</sup> Fourcroy's plans are also influenced by contemporary ideas of a reform of clinical methodology and teaching. M. Foucault coined the term *naissance de la clinique* for this

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<sup>32</sup> *Ibid.*, p. 144.

<sup>33</sup> *Ibid.*, p. 145.

<sup>34</sup> Foucault dealt with the epistemological significance of this relationship in detail. See: Foucault (n. 26), *Naissance*, ch. VIII.

<sup>35</sup> Antoine François Fourcroy, "Introduction," in *La Médecine éclairée par les sciences physiques, ou Journal des découvertes relatives aux différentes parties de l'art de guérir* (Paris: Buisson, 1791), vol. 1, pp. 1-47 (on p. 27).

<sup>36</sup> Fourcroy himself adopted antiphlogistic chemistry step-wise. It was not until 1786 that he fully accepted Lavoisiers theory.

change, which is important for the foundation of modern medicine.<sup>37</sup>

In France in particular, practical medicine had reached a desolate situation.<sup>38</sup> In the "cahiers de doléances," the complaint books compiled by the representatives of the Third Estate in 1789,<sup>39</sup> there are numerous references to the poor condition of medical care. The revolutionaries put their hopes in a "médecine libérée" by radical reform of the health system. In the years of the Revolution, numerous suggestions were published to this end and submitted to the Convention Nationale.<sup>40</sup> Fourcroy's programme is also to be seen in this context, as clearly apparent from its concluding sentences:

C'est dans le moment où la France se régénère, c'est au milieu de la puissance nationale en activité, que l'on doit offrir ce projet; il doit entrer dans les réformes des études en Médecine, dans la création des moyens propres à accélérer les progrès ... on doit solliciter auprès des administrations de département, de districts et de municipalités, l'addition des amphithéâtres et laboratoires indiqués ci-dessus aux hôpitaux déjà existans, ou à ceux qu'on bâtit dans les différens points de la France. Cet objet mérite bien de fixer l'attention des comités de mendicité et de salubrité, que l'Assemblée nationale a chargés de s'occuper de tout ce qui peut améliorer le sort des malades infortunés, et accélérer les progrès de l'art de guérir.<sup>41</sup>

However, in contrast to many contemporaries whose reform proposals were ignored, Fourcroy's political activity gave him the opportunity during and after the Revolution of implementing his plans at least partly. In April 1789, in the election assembly of his district Fourcroy had been appointed third substitute. He participated in the drafting of the *cahiers de doléances*. On July 14, 1789, he was amongst the group of revolutionaries in the Paris Hôtel de Ville. It was however not until August 1792 that he took up political office. In the election to the new Convention Nationale he was nominated by Jean Paul Marat (1744-1793) and finally elected fourth substitute. After Marat's assassination in 1793, Fourcroy took his place. He was elected to several Comités of the Convention Nationale, including the Comité d'Instruction Publique, where he devoted himself intensively to the reform of the education system, particularly higher education. As a consequence of the war and closure of universities (August 1792), there was a dramatic shortage of military physicians. To remedy this

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<sup>37</sup> Foucault (n. 26), *Naissance*. Erwin H. Ackerknecht, *Medicine at the Paris Hospital 1794-1848* (Baltimore: The Johns Hopkins Press, 1967).

<sup>38</sup> See for example: David M. Vess, *Medical Revolution in France 1789-1796* (Gainesville, Florida: University Presses of Florida, 1975).

<sup>39</sup> Fourcroy also participated as elector during the election assemblies of a Paris district in 1789.

<sup>40</sup> Vess (n. 43), *Medical Revolution in France*, ch. 3. Matthew Ramsey, *Professional and Popular Medicine in France, 1770-1830. The Social World of Medical Practice* (Cambridge, New York etc.: Cambridge University Press, 1988), pp. 72f.

<sup>41</sup> Fourcroy (n. 3), "Idées sur un nouveau moyen," p. 144.

situation as quickly as possible, in March 1794 a Conseil de Santé was formed for the purpose of drafting a reform of medical education. Fourcroy was a member of this Conseil. In the 7th Frimaire an III (November 27, 1794) he submitted to the Convention Nationale the proposal for the establishment of a large École Centrale de Santé in Paris. Fourcroy could refer to several plans for the reform of medical education, discussed in earlier years.<sup>42</sup> The decisive feature of Fourcroy's proposal was the change in the concept of teaching:

la pratique, la manipulation seront jointes aux préceptes théoriques. Les élèves seront exercés aux expériences chimiques, aux dissections anatomiques, aux opérations chirurgicales, aux appareils. Peu lire, beaucoup voir, et beaucoup faire.<sup>43</sup>

Fourcroy proposed to use the patients of three of the Paris hospitals for clinical teaching.<sup>44</sup> The Convention Nationale took up Fourcroy's proposal and in the 14th Frimaire an III (December 4, 1794) passed a décret, although with the modification that Écoles de Santé be established not only in Paris but also in Montpellier and Strasbourg.<sup>45</sup>

In Paris the building of the former Académie de Chirurgie was used for the École. A small hospital was set up in the Couvent de Cordelier in the immediate vicinity. The décret foresaw twelve chairs for the Paris École, each one provided with an assistant (adjoint) for lecturing and practical instruction of the students.<sup>46</sup> Practical training in anatomical, surgical and chemical operations was expressly prescribed in the décret.<sup>47</sup> Article 6 says: "Il y aura ... des salles et ces laboratoires destinés aux exercices pratiques des élèves dans les arts qui doivent

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<sup>42</sup> In 1789 a committee of the Académie Royale de Médecine prepared a "Nouveau Plan de Constitution pour la Médecine en France." Fourcroy was a member of this committee. The Plan was published in 1790: "Nouveau plan de Constitution pour la Médecine en France," *Histoire et mémoires de la Société Royal de Médecine* [Paris], année 1787-1788, 1790, pp.16 ff. See: Toby Gelfand, "A clinical ideal: Paris 1789," *Bulletin of the History of Medicine* 51, 1977, pp. 397-411. Antoine Laurent Lavoisier, "Reflections sur l'instruction publique," in *Oeuvres de Lavoisier* (Paris: Imprimerie Nationale), vol. 6, 1893, pp. 515-558. See: Harold I. Abrahams, "Lavoisier's proposals for training in science and medicine," *Bulletin of the History of Medicine* 32, 1958, pp. 389-407.

<sup>43</sup> *Rapport et projet de décret sur l'établissement d'une École centrale de Santé à Paris, fait à la Convention Nationale, au nom des comités de salut public et d'instruction publique, par Fourcroy, le 7 Frimaire de l'an III (November 27, 1794)* (Paris: Imprimerie Nationale, an III (1794)).

<sup>44</sup> The Hospice de l'Humanité (Hôtel Dieu) for external cases, the Hospice de l'Unité (Charité) for internal cases, and the new Hôpital de l'École for rare and complicated cases.

<sup>45</sup> Convention Nationale, Décret 14 Frimaire an III (December 4, 1794). Reprinted in: James Guillaume ed., *Procès-verbaux du Comité d'instruction publique de la Convention Nationale* (Paris: Imprimerie Nationale, 1881-1904), vol. 5 (1904), pp. 281-283.

<sup>46</sup> Convention Nationale, Décret (n. 45), Article 5.

<sup>47</sup> *Ibid.*, Article 4.

assurer leurs succès."<sup>48</sup> Another important feature of the décret is the obligation of the professors and their adjoints to do research work "for the advancement of the art of healing."<sup>49</sup> Here animal chemistry is mentioned as one of the topics. In Paris the courses were opened in March 1795.

Fourcroy became professor for *chimie médicinale* and *pharmacie* at the Paris École. His adjoint was Nicolas Deyeux, whose work on blood has already been mentioned.<sup>50</sup>

The chair was provided with a large chemical laboratory and a separate lecture hall in the right wing of the main building. Visitors reported on the excellent and completely equipped laboratory.<sup>51</sup> There was a lecture in the morning usually given by Fourcroy. He emphasized in his lecture the chemical analysis of animal material and its importance for the "art of healing."<sup>52</sup> Demonstrations and practical exercises in the laboratory took place in the afternoon organized by Deyeux.

The décret had major consequences in the development of medicine. The natural sciences were to be taught at the hospital in close relationship with clinical medicine. The teaching hospital had to be accommodated with laboratories and equipment.

At the Paris École this was realized by Fourcroy who was convinced of the great importance of the new chemistry to medicine. His teaching laboratory was well equipped for chemical analyses and also suitable for research work.

But most hospitals were not able to establish their own laboratories. They could use the laboratories of pharmacies. Fourcroy had made efforts to incorporate pharmacy into medicine similar as he did with chemistry. Hospital pharmacy was developed as a special branch of pharmacy. In Paris in June 1795 (18 Prairial an III) the *Apothicairerie Générale* was set up, and in November 1796 (22 Brumaire an V) the *Pharmacie Centrale des Hospices* was established. At least the latter had a large laboratory. The establishment of hospital pharmacies of this type could explain that in France during the 19th century in most hospitals, clinical chemical analyses were performed in the pharmacist's laboratories instead of clinical laboratories. In other countries clinical laboratories

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<sup>48</sup> *Ibid.*, Article 6.

<sup>49</sup> *Ibid.*, Article 7.

<sup>50</sup> Parmentier, Deyeux (n. 24), *Mémoire sur le sang*.

<sup>51</sup> See for example the report of the German physician Jakob Wardenburg. He described in detail the first years of the new Paris École especially the teaching activities of Fourcroy and Deyeux. See: Jakob Wardenburg, *Briefe eines Arztes geschrieben zu Paris und bei den französischen Armeen vom May 1796 bis November 1797 zunächst für Aerzte und Statistiker* (Göttingen: Philipp Georg Schröder, 1798-1799).

<sup>52</sup> *Ibid.*, pp. 289-291.

were run by the clinicians, for instance in the German countries.

With Fourcroy's revolutionary plan the development of clinical laboratories was started. The first step was the establishment of Fourcroy's teaching laboratory at the *École de Santé* in Paris. At the end of this development we find the independent clinical laboratories of the present time.

### Summary

The earliest reference to the establishment of clinical laboratories in hospitals so far discovered is a programme presented in 1791 by the French physician and chemist, Antoine François de Fourcroy. This programme, which has received hardly any attention so far in the research of the history of medicine, is explained in detail and set against a wider historic background. As a member of the French Convention Nationale, Fourcroy played a decisive part in the reform of medical teaching. In this way his ideas were also incorporated into the plans for the foundation of the *Écoles centrale de Santé* in 1794 and partly realised.

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