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Anne-Marie Moulin

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# Science and Empires

Edited by Patrick Petitjean, Catherine Jami and  
Anne Marie Moulin

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## PATRIARCHAL SCIENCE: THE NETWORK OF THE OVERSEAS PASTEUR INSTITUTES

Anne Marie MOULIN

The growth of the Pasteur Institute into its overseas branches<sup>1</sup> offers an intriguing case: a scientific imperialism which, although supported by colonialist lobbies and strongly flavoured with French chauvinism<sup>2</sup>, was not a mere by-product of 19th century expansion in Africa and Asia<sup>3</sup>. Two characters demonstrate the relative autonomy of this phenomenon. Firstly, the network of the Pasteur Institutes was initially established in both French dominions and foreign countries. Secondly, the network successfully outlived the toll of colonialism.

The scientific community which developed this network pursued some common goals and interests with the politicals, but they also followed a line of their own. Its members saw themselves as spreading a new Gospel, the so-called "Pasteurian methods" as they embraced the ideal of a scientific revolution of which they became zealous propagators. This new science was produced by a mostly, but not entirely, French body of scientists which described themselves as a "school". They obeyed the rules of their founder whose teachings and doings were engraved in their memory. The criteria for belonging to the "Pastorians" were less institutional than spiritual<sup>4</sup>: sharing of tradition<sup>5</sup>, fostered by teaching and strengthened by personal ties between master and disciples. The connections between the Pasteurian scientific ideology and the network of the Pasteur Institutes will be put here into sharp focus. This scientific ideology at the same time bore a distinctive nationalist character and heralded the advent of the "world-science"<sup>6</sup>, the almost unchallenged worldwide expansion of western science. In a word, and using a metaphor congenial to the topic, the scientific imperialism of the Pastorians cross-reacted with colonial imperialism without being absorbed into it.

During the last few years, Pasteur's work has been scrutinized by historians of science. They have begun to unravel the many scientific myths which were woven into the fabric of Pasteur's official saga and to analyze Pasteur's strategy in his march to power, the so-called "Pasteurization of Society"<sup>7</sup>. Less attention has been paid to the export of pasteurianism to the Tropics<sup>8</sup> and even around the world<sup>9</sup>. However, the pastorian sanitary movement and the colonial expansion closely

This grand program underwent a series of successive extensions. First the range of disorders under investigation covered all infectious diseases, and at the peak of the germ theory of disease nearly the whole field of pathology, "except for certain neoplasms and certain hereditary diseases". The second extension was geographical: the whole world was the legitimate field of microbiologists' curiosity. Biologists used their new tools, microbacteria, for mapping the three kingdoms and the five continents of Nature<sup>15</sup>. The Pastorians saw the Institute<sup>16</sup> as "the main scientific focus: here microbiological research all over the world is coordinated".

Pasteur's concern for overseas diseases has been eagerly highlighted by his early historiographers. They carefully collected anecdotes pointing to this effect: that Pasteur had repeatedly brooded over the yellow fever issue, going to Marseilles to investigate the causes of a mysterious epidemic; he had cared deeply for the mission sent by him to Alexandria (where Thuillier died of cholera)<sup>17</sup>.

The Pastorians loaded their early discourse with historical references whose symbolic impact they perceived: rabies treatment had inaugurated a scientific revolution, and since they had been right once, they should have just to follow the track. History was on their side, they could capture its potential by manipulating its semantic<sup>18</sup>. Pasteur himself had shown the way. By coining the term vaccination (from the Jennerian vaccine) for his grand program of universal prophylaxis, he appropriated one century of immunization. In 1902, the French laws for hygiene (an example often quoted of "pasteurian" legislation), inspired by the Pastorian deputy Chamberland, pivoted on the smallpox vaccination, made compulsory<sup>19</sup>. For a popular audience, this paradigm of preventive medicine acquired a pseudo-pasteurian character. In the same spirit, there was a confusion between the specific pasteurian techniques, such as rabies treatment and diphtheria serotherapy (which had largely benefitted from concomitant German research), and the development of bacteriology at large. Even Koch's postulates, generally referred to as Henle-Koch's postulates, which defined criteria for microbial diseases, were sometimes attributed to Pasteur.

In the same spirit, the Pastorians not only reported carefully their contemporary activities but also canvassed the historical context of their work. Every Pastorian displayed the proofs of his lineage: he was trained by one of the early companions of the prophet. The claim of transmission has been pursued by the successive generations. Each In-

stitute drew its legitimacy from its link to a Pilgrim Father and made an official version of its foundation circulate<sup>20</sup>.

This capture of the powers conferred by History could not have occurred if a community had not received the prophet's legacy and heard Pasteur's message<sup>21</sup>, probably apocryphal: *"Go and Teach All Nations"*, uttered under an oak in the Garches park<sup>22</sup>.

The first markers of pasteurianism were invented very early. The epithet *pastorian* was already in use in the 1890s and is said to have been invented by the novelist Fleury for the emerging community. Teaching played a considerable role in the making of the Pastorians and was a constant concern of Pasteur's spiritual heir, Emile Roux<sup>24</sup>. The teaching started with the foundation of the Institute in 1888. In contrast with the teaching from the faculty, based mainly on the clinic (the basic sciences were said to be "accessory"), it focused on microbiology in all its aspects and included predominantly lab work, which turned students into competent microbiologists<sup>25</sup>. Microbiology was not part of the official curriculum before World War I, and the teaching previously offered by the professor Victor Cornil at the Medical School remained almost entirely theoretical. The transfer abroad of microbiological techniques was easy<sup>26</sup>. They were based on the use of a microscope, an incubator, an autoclave, and animal facilities. But the Pastorians insisted on the special skills which they displayed in adapting this equipment to changing conditions, thanks to their particular training<sup>27</sup>.

The first course attracted fifty students, one third of whom were foreigners. In the following years, the "Grand Course" displayed an uninterrupted two-way flow of men and ideas. Foreign students returned to their home countries and retained a link to their tutors. The network of the Pasteur Institutes was made possible by this circulation. The Saigon Institute was, in 1891, the first example of this tentative extension to the universe of the pasteurian model.

#### The 1891 Model: Saigon

The story of this foundation needs to be told in detail since it constitutes a motif which will be replayed with many variants. The Saigon episode is symptomatic of the collusion of the colonial lobby and the Pastorian scientists. In 1890, the *Corps de Santé Colonial* was created<sup>28</sup>; it had long been advocated by Eugène Etienne<sup>29</sup>, the influential leader of the ascending "colonial party"<sup>30</sup>. Training took place at the newly-created *Ecole de Santé Navale* in Bordeaux. Additionally, the students of the *Corps de Santé* came for a stage to the Pasteur Institute

and were rapidly enrolled in the Pastorian cohorte<sup>31</sup>. The Institute initially only staffed five full-time researchers, the department heads and a few technicians. The other researchers received little or no money. The *Corps de Santé Colonial* which trained tropical doctors provided the Pasteur Institute with a multiplier of power and lessened its financial burdens: they supplied an elite of military servants, well-trained and ready to obey to the Pasteur command while being appointed by the state. The "War on disease", a new issue in medicine<sup>32</sup> that was reinforced by Metchnikoff's theories of phagocytosis<sup>33</sup>, fitted perfectly the new medical corps.

The collusion between the military and the scientists is obvious in the Saigon episode. Etienne, then sous-secrétaire for the Colonies (there was no Ministry at this point), asked Emile Roux to appoint a trainee to start a department of bacteriology and vaccinotherapy in Cochinchine. Clearly, the Pastorians appropriated the Jennerian legacy. In the subsequent years all vaccinations would be included under the pasteurian revolution, which was celebrated in all French books on hygiene and public health.

Albert Calmette, himself a military doctor<sup>34</sup>, settled within the precincts of the military hospital of Saigon. He overcame the difficulty of importing cows for smallpox vaccine production by successfully adapting the strain to the local buffalos. This adoption was the first signal of local "acclimatization". The laboratory provided bacteriological analyses when available for diagnoses of the main contagious diseases (typhoid, cholera, liver abscesses, dysentery) and took in charge the surveillance of drinking water and food. Calmette also ventured into tropical pathology: beri-beri, malaria, elephantiasis.... Above all, he started preventive treatment against rabies. He identified the "disease of mad dogs", which had long been familiar to the natives, to the pasteurian scourge. He had again to adapt the original procedure for attenuating the virus through animal passages. Rabies treatment would be the distinctive Pastorian signal<sup>35</sup>. In 1921, for example, the main justification for the establishment of the Teheran branch was the presence of rabid wolves in the wild Zagros mountains in Kurdistan. In other countries, if rabies had been unnoticed, cases would be actively sought.

But Calmette did not restrict himself to medicine. At once imitating and adopting Pasteur's own fields of interest, he studied fermentations such as the local production of rice alcohol and identified in the indigenous methods a special yeast called *Amylomyces rouxii*, in honor of the director in Paris. Special attention was given to the fabri-

cation of nuoc-mam, the main condiment of vietnamese food, and morphine, opium being not prohibited in the colony. Studies on silk were not even missing, a clear reference to the studies conducted by Pasteur in the south of France on the diseases of the silkworm. In two years, Calmette had made of the Pasteur Institute in Saigon an "*Institut Pasteur en petit*" which would in turn serve as the model for other Institutes. His first reports unmistakably suggested a pattern in striking conformity to Pasteur's pathway: from industrial fermentations to plant and animal diseases and finally to human infections. This pattern would be replicated more than once. The statutes of the Athens branch in 1921 first mention "*the study of the virulent diseases of man and cattle which are ravaging the Greek territory*"; then follows<sup>36</sup> "*the application of the pasteurian methods to agriculture and fermentation industries (wine-making, dairies), the development of which is crucial for the future economy of Greece*".

An overseas Institute was first a modest laboratory dominated by a Pastorian personality and informally linked to Paris. Only after a trial and error period was an official agreement signed up between the colonial authority (or the local one) and Paris, which organized the budget, dispatched responsibilities, and conferred to the new organism financial and moral personality. The new branch was thus legitimated by being firmly anchored to the mother institution and receiving its orders.

Many colonial Institutes were founded according the above pattern, on the joint initiative of politicians and Pastorian leaders. Tunis is a case in point. The Agriculture Director, Paul Bourde, solicited scientific help from Pasteur for solving yeast selection for wine-making. The problem was crucial for the settlers who hoped to benefit from the phylloxera crisis in metropolitan France. Pasteur sent his own nephew, Adrien Loir, and charged him with the additional task of investigating<sup>37</sup> "*the main diseases of the Regency*". In 1893, Loir started rabies vaccination and smallpox vaccination. He exchanged information with the local medical body and explored a pathology new to him. Millet, the *Résident Général*, was partisan of an autonomous cultural development supported by a local elite. He urged Loir to transform his modest department<sup>38</sup> into "*a center for scientific research according to the pasteurian methods*". The appellation "*Institut Pasteur*" was in current use long before it became official and before the Institute was built up in its present location, with Charles Nicolle, the future Nobel Prize winner, at its head.

Same plot, again, with the foundation of the Pasteur Institute in Morocco. The first one was in Tangiers at the outposts of French penetration<sup>39</sup>. In 1906, in retribution for the murder of a young Frenchman, the ambassador, Regnault, obtained a land in the best neighbourhood of the city and Emile Roux<sup>40</sup> urged the Administrative Council "to support both scientific interests and French influence". Remlinger came from Constantinople to Tangiers and the new Institute opened in 1913.

But the initiative belonged sometimes to outsiders whose contribution would be frequently overlooked by official history. In Algiers, two professors of the Medical School, Trolard and Soulié, established in 1894 rabies and smallpox vaccine departments. They also developed anthrax vaccine and a variant against the sheeppox which threatened the cattle (*clavelée*). The lab, under control of the civil administration, was also concerned by the wine-making problems:<sup>41</sup> "Dr Trolard plans, briefly, to put into practice all the discoveries which Pasteur's school has brought to us". Trolard even planned to experiment on the diphteria serotherapy which Roux had just introduced into the pediatric wards of the Necker Hospital in Paris. Nevertheless, in 1909, he was dismissed and replaced by Edmond Sergent, the head of a mission sent to Algeria by Roux for testing the vectorial transmission of malaria (the role of the mosquito) (who had been there since 1900<sup>42</sup>).

This same pattern of a collaboration between local authority and the Paris direction was operating in different contexts. In 1893, the Ottoman Sultan Abdülhamid, a former sponsor of the Pasteur Institute, was frightened at the onset of a cholera epidemic, and asked Pasteur to send him an expert in bacteriology<sup>43</sup>. André Chantemesse came to Constantinople for a short mission and was succeeded, by Maurice Nicolle, who founded the Imperial Institute of Bacteriology. There he investigated local diseases, from the oriental sore to piroplasmiasis and plague. The rabies department had been organized by a<sup>44</sup> *zimmi*, Zoeros Pasha, who had followed the Course in Paris. After his dismissal, this department was staffed by a French Pastorian, a military physician from Tunis, Paul Remlinger. Remlinger assumed the directorship of both Institutes when Maurice Nicolle, vexed by the administration, left Constantinople.

The Institute, which was never called a Pasteur Institute, continued to be supervised by the Ottoman administration; the Pastorian experts were confronted with foreign colleagues for cross expertise on the cause of incoming epidemics. This subtle division of labor was one

of the Ottoman strategies to control foreigners while still benefiting from technological advances<sup>45</sup>. An Ottoman pastorian, also a *zimmi*, Haïm Bey, nevertheless remained in charge of the Institute until 1932, long after Mustapha Kemal came to power. Emile Roux was in close touch with the French embassy in Constantinople. From his rocking-chair in Paris, he appears to have been well-informed on the political events in the Ottoman Empire and of the struggles between Old Turbans and Young Turks, moslems and minorities.

When a foreign country entering the era of industrialization such as the Ottoman Empire appealed to the Pasteur Institute, it was not only the signal of the quest for modernity addressed to the elites, but the mark of a diplomatic choice. After the war, the Shah of Persia sent a mission to Emile Roux, composed of Zoka el Molk, delegate of the Persian Government to the Peace Conference, the dean of the medical school in Teheran, and the shah's own brother. A cousin of the shah, the prince Farman-Farma, offered a piece of land to the Institute whose first director was Jean Mesnard<sup>46</sup>.

The diplomatic choice was in some cases still more explicit. During the First World War, Sir Armand Ruffer, himself a former Pastorian trainee in Paris and director of the *Conseil quarantenaire d'Egypte* for 20 years, had been asked to reorganize the bacteriological staff in Athens. He never reached the Greek capital because his ship was hit by a German torpedo. After the war, the British played an equivocal game by sending arms to the kemalist army momentarily defeated by the Greeks. The French doctor Arnaud, director of the Army Health Services in the Greek Army, seized this opportunity. He persuaded the wealthy Basil Zaharoff to sponsor the foundation of a Pasteur Institute in Athens<sup>47</sup> in order to

"intensifying the links of scientific cooperation between Greece and France, by uniting the efforts of scientists of the two countries at the level of research and practical applications of pasteurian methods".

The Greeks gambled on the French scientific influence<sup>48</sup>.

Medicine was diplomacy through different means. In Latin America, where the Pastorian influence had been considerable, the biologists were often in favour of a link to a remote power whose scientific influence was not detrimental to their political autonomy, in contrast to the British and later American allegiance<sup>49</sup>. The Pasteur Institute in Brazil was founded nearly simultaneously with the Institute in Paris, but disappeared after the Emperor Pedro II fell. Subsequently,

the Republicans established the Instituto Serologico do Manguinhos, later Instituto Oswaldo Cruz (after his founder's name, himself a former trainee from the Pasteur Institute) which, although strongly influenced by the pasteurian model, maintained its autonomy and fixed its own scientific goals and standards.

The Pasteur Institute was much more reluctant to legitimize a scientific establishment if suggested by a minority group in the Middle East. When the Egyptian doctors Khouri and Zeitoun requested the Pasteur label for their modest Department of Microbiology in Alexandria (*Institut Pasteur d'Egypte*), they did not obtain permission from the rather condescending Dr. Roux<sup>50</sup>. In the 1920s, the criteria for recognition hardened: the scientific director had to be nominated by the Paris Institute, and scientific control was entirely in the hands of the Paris management. Moreover, the new Institute did not receive any financial help and had to subsist through the sale of vaccines and sera (a condition hardly fulfilled by the mother institution!).

Nor was the Pasteur Institute of Palestine, founded in Jerusalem by Leo Boehm (still during the Ottoman period) ever officially recognized as part of the network, in spite of the support given by the pastorian Marmorek, member of the Zionist League. The Institute, called the "International Institute of Public Health"<sup>51</sup>, was "a bond between small Palestine, lost and ignored in the Middle East and the big scientific centers of France and Germany"; it had to face political unrest. It produced bacteriological analyses and smallpox and rabies vaccines. Its bulletin was written in Hebrew and in French (for the Arab doctors).

Another case in point is the Shangai Institute, created in 1928. The initiative came from Chinese students who had studied in France. Money was available from the indemnities paid by China after the Boxer's rebellion. Scientific production was meager. The Shangai labs, without any program of collaboration with Chinese scientists and curriculum for the Chinese, remained second rank centers<sup>52</sup>. For this failure the historian of China Marianne Bastid-Bruguère incriminates the vagueness of the Pastorian project and suggests that addressing the failures rather than successes of the Pastorians would better illuminate the complex nature of Pastorian science. Pastorian science came to fruition only when a local drive for efficiency and adaptation complemented Paris' desire to extend its sphere of influence.

The Paris Institute wanted to keep control of what was going on at its periphery. The colonial Institutes had been primarily established for practical purposes. It remained implicitly granted that the Pasteur

Institutes were devoted to applied research and that Paris was more dedicated to pure research<sup>53</sup>. An independent pavilion in Paris was established to shelter experiments related to tropical pathology but too complex to be done abroad, the so-called Pavillon d'Outremer, directed by Marchoux, who had pioneered in creating the laboratory of microbiology of Saint Louis du Sénégal in 1896<sup>54</sup>. However, the vocabulary commonly in use did not make this distinction. Brami, the general secretary for Indochina, spoke of the "development of the pasteurian theories and methods." The pasteurian epistemology ignored the gap between pure and applied science<sup>55</sup>: doctors in the Tropics hoped to make discoveries in proportion to their distance from the metropole in the wilderness of unexplored countries. Remlinger complained from Morocco about the "Europeanlike" pathology of the country:<sup>56</sup> *There is no room here for original research, for pure science*".

The Institute invested a considerable amount of energy to the periphery; Roux and Calmette, respectively director and vice-director, followed carefully what transpired there. While the Institute underwent a crisis in terms of recruitment and of finances between the two wars<sup>57</sup>, the overseas houses appeared more successful. The network was managed by a handful of men who exchanged one place for another: Remlinger left Turkey for Morocco, Blanc left Athens for Teheran, then Teheran for Casablanca, Baltazard Casablanca for Teheran.... From Tunis, Charles Nicolle did not spare his sharp criticisms toward the obsolete management of Emile Roux. Perhaps he dreamt of gathering around him the forces of the empire and becoming the "Emperor of the Mediterranean Sea"<sup>58</sup>. He corresponded with Pasteur Vallery Radot, Pasteur's grandson, and discussed a reorganization of the institution. The Paris Institute, at Emile Roux's death, was lagging behind some of its more brilliant progeny<sup>59</sup>.

These difficulties illustrate the paradox of imperialist science. Pasteurianism had based its success on fidelity to a historical model, which was linked to a period of relative grandeur and prosperity for France. The post-independence period saw the Pastorians confronted with the task of maintaining themselves in a new geoscientific space. Then the existence of a Pastorian community (and no longer the attachment to outdated scientific methods) would be their remaining asset. This cultural community transcending new national borders may be strong enough to maintain exchange and mutual recognition and even allow revival, when political circumstances allow it<sup>60</sup>.

Once more, the Pastorian institution played with its mixed definition (a private institution dedicated to public health) and obscured at will the undesirable components of its image. In the period of transition after the independence, it participated in the making of professional local elites, unduly postponed<sup>61</sup>. Not only did most of the colonial Institutes remain, but some new ones appeared, the most well-known being at Bangui (1960) and the Cameroun Institute in Douala, but also in Addis-Abeba in Ethiopia (1953); and a Japanese project in Kyoto is being discussed today.

The Pastorian strategy has reorientated itself. Its historical reference has shifted from outdated scientific methods, once presented like archetypes, to something much more like an *ethos*. The ideological nature of the former scientific discourse is thus recognized and reinforced. Still, a potentially devastating charge has been leveled against this remaining claim: some countries are questioning the universal value of the Western scientific approach. In Moslem countries, the fundamentalists, well aware of the growing divorce between scientific progress and national development, have pointed out the evil character of a science based on materialism and atheism, and medicine has not been immune from their attacks<sup>62</sup>. But even there, the Pastorians could claim that some of their heroes were perfectly aware that they came to restore the harms which civilization had introduced: Jamot, in East Africa, acknowledged, notwithstanding the administration, that colonizers had created the pathways of infection and disrupted the mechanisms of balance of primitive societies<sup>63</sup>. In Cochinchina, the indigens suggested that France had brought smallpox and Calmette took the pains of quoting from ancient local scholars to disprove the charge<sup>64</sup>.

The magical tour which, thanks to funding from Aids agencies, transformed a modest Microbiology Institute in Bangui in Central Africa, founded in 1950, to a sophisticated molecular biology lab, is suggestive of a "redéploiement" of the Pastorian ideology and an indirect proof of its remaining vitality<sup>65</sup>. The French anthropologist Bordier used to say: "Transformism in Medicine is pastorism"<sup>66</sup>. The metaphor captures the essence of pastorism: adaptation of pasteurian methods to new cultures was its political password as adaptation of virulent cultures was its scientific one. Thus we may understand that this scientific imperialism survived without the Empire. While the content of the pastorian doctrine radically changed, the Pastorians survived on their historical capital. The Pasteur Institute of Paris is no longer a ge-

ographical center<sup>67</sup> "where all microbiological research is coordinated"; but the Pastorians still claim to be at the origin of historical times in Public Health and Medicine.

*Centre National de la Recherche Scientifique et Institut National pour la Santé et la Recherche Médicale (U138), Paris*

### Notes

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<sup>1</sup> In 1990, the network of the overseas Institutes comprised about thirty establishments throughout the world. Every year a meeting of the directors was held, alternatively in Paris and in another Institute. The network was represented by a permanent delegate at the Pasteur Institute in Paris. J.L. Durosoir, *L'Institut Pasteur, Recherche Scientifique, Les Dossiers de l'Outremer*, 1985, 90, p.47-52.

<sup>2</sup> Albert Calmette, promoter of the overseas Institutes and vice-director of the Institute in Paris wrote: "Without Pasteur's discoveries, the development and emancipation of indigenous populations, and the exploitation of their discoveries, colonial expansion of France and other great civilized nations would have been impossible". quoted by N. Bernard, *Microbiologie, L'oeuvre de Pasteur et ses conséquences*, Masson, Paris, 1937, p.6.

<sup>3</sup> For a distinction between Imperialism in Medicine and Medicine in Empire, see *Disease, Medicine and Empire*, R. MacLeod and M. Lewis eds., Routledge, London, 1988, p.1-17.

<sup>4</sup> For a comparison with the British schools on tropical medicine, see M. Worboys, "Manson, Ross and Colonial Medical Policy: Tropical Medicine in London and Liverpool, 1899-1914", in *Disease, Medicine and Empire*, op. cit., p.21-37; P.E.C. Manson-Bahr, *The History of the School of Tropical Medicine in London 1899-1949*, Lewis, London, 1956; with the Dutch, see *Dutch Medicine in the Malay Archipelago 1816-1942*, G.M. Van Heteren and coll., Rodopi, Amsterdam, 1989.

<sup>5</sup> See R. Dedonder, "Depending on location, the various Institutes differ with regard to their administrative situation. Some are directly linked to the Pasteur Institute in Paris; some in foreign countries have special agreements with Paris; others no longer have formal links. But each time you enter such an Institute you feel immediately the parenthood, even through the smell(!)". *World's Debt to Pasteur*, S. Plotkin ed., Alan Liss, New York, 1985, p.135.

<sup>6</sup> Xavier Polanco, *La science-monde, La Découverte*, Paris, 1989.

<sup>7</sup> C. Salomon-Bayet, *Pasteur et la révolution pastoriennne*, Fayard, Paris, 1986; B. Latour, *The Pasteurization of French Society*, Harvard University Press, Cambridge, 1990.

<sup>8</sup> Interesting remarks appear in *Imperial Medicine and Indigenous Societies*, D. Arnold ed., Manchester University Press, Manchester, 1989.

<sup>9</sup> On the history of the Pasteur Institute, see A. Delaunay, *L'Institut Pasteur, des origines à aujourd'hui*, Editions France-Empire, Paris, 1962. On the overseas Pasteur Institutes, see H. Mollaret et J. Brossolet, *Alexandre Yersin ou le vainqueur de la peste*, Fayard, Paris, 1985; H. Mathis, *L'oeuvre des Pastorians en Afrique noire*, Presses Universitaires de France, Paris, 1946.



- <sup>10</sup> For a discussion of the national styles in bacteriology (French versus German) see O. Amsterdamska, "Medical and Biological constraints: early research on variation in Bacteriology", *Social Studies of Science*, 1987, 17, p.657-687.
- <sup>11</sup> G. Canguilhem, "L'effet de la bactériologie dans la fin des théories médicales", *Iddéologie et rationalité dans l'histoire des sciences de la vie*, Vrin, Paris, 1977, p.55-77.
- <sup>12</sup> The history of this still very active and influential institution retains the character of a "hot topic". Research has been made sometimes difficult by the understandable reluctance of some institutions to open their archives; and it has been further complicated by the dispersion of the documents among many countries.
- <sup>13</sup> Minutes of the Administrative Council, 22 May 1886, Archives of the Pasteur Institute, Paris, p.2.
- <sup>14</sup> L. Pasteur, *Comptes rendus de l'Académie des Sciences*, 1881, 92, p.1383.
- <sup>15</sup> The French divide the world into five continents, while the Americans divide it into seven! In 1893, the Administrative Board of the Pasteur Institute registered the departure of three simultaneous missions, Loir in Australia, Le Dantec to Brazil, Calmette in Saigon, while antirabies departments were founded in Algiers and Lisbon. Minutes of the Administrative Council, Pasteur Institute, Paris, 22-2-1893, Archives of the P. I., Paris.
- <sup>16</sup> N. Bernard, Lettre au Gouverneur Général d'Indochine, 1924, Archives of the P. I., Paris.
- <sup>17</sup> A. M. Moulin, "Révolutions politiques et Révolutions médicales", *Revue du Monde Musulman et de la Méditerranée*, 1989, 52, p.111-123.
- <sup>18</sup> See for example the Pastorian appropriation of Laveran's discovery of the malaria agent, Plasmodium, prior to Pasteur's medical work, Ed. et E. Sergent, et L. Parrot, *La découverte de Laveran*, Collection du centenaire de l'Algérie 1830-1930, Masson, Paris, 1931.
- <sup>19</sup> C. Marenko et S. Godevarica, *La vaccination des sujets en France 1880-1890*, University of Paris IX, Paris, 1982, unpublished dissertation.
- <sup>20</sup> C. Nicolle, "L'Institut Pasteur de Tunis", *Archives de l'Institut Pasteur de Tunis*, 1906, 1, p.5-16; G. Blanc, "L'Institut Pasteur du Maroc", *Archives de l'Institut Pasteur du Maroc*, 1932, 1; P. Remlinger, "L'Institut Pasteur de Tanger", *Maroc Médical*, 1913, 49, p.1-5; N. Bernard, "Les Instituts Pasteur d'Indochine", *Comptes Rendus de l'Académie des Sciences Coloniales*, 1927, p.415-424; R. Wilbert et M. Delorme, "Pastoria, centre de recherches biologiques et d'élevage de singe, Institut Pasteur de Kindia", *Bulletin de la Société de Pathologie Exotique*, 1931, 24, p.131-149; M. Robert, "L'Institut Pasteur de Bangkok", *Bulletin de la Société de Pathologie Exotique*, 1920, 13, p.720-725....
- <sup>21</sup> "The Pasteur Institute organizes scientific missions some of which have developed on a permanent basis and constitute the present network." J. L. Durosoir, 1985, *op. cit.*
- <sup>22</sup> Rapport Commission Lacroix pour la réorganisation de l'Institut à la mort d'Emile Roux, 1934, also quoted by Dujarric de la Rivière, *Emile Roux*, s.l., s. d., p.301, Archives of the P. I., Paris.
- <sup>23</sup> Close to the department for serums and vaccine production.
- <sup>24</sup> E. Lagrange, *Monsieur Roux*, Goemaere, Bruxelles, 1954. The epithet Pastorian comes from M. de Fleury, *Pasteur et les Pastoriens*, Paris, 1895.
- <sup>25</sup> M. Faure, "Cent ans d'enseignement à l'Institut Pasteur", Colloquium "Les cent ans de l'Institut Pasteur", Paris, 1988.
- <sup>26</sup> For a general discussion of technology transfer to the periphery, see D. R. Headrick, *The Tentacles of Progress: Technology Transfer in the eve of Imperialism*, Oxford University Press, Oxford, 1988.

- <sup>27</sup> See for example in M. Nicolle, "how one can use an oven, two boxes and a candle to start an operational, if primitive, microbiology laboratory", M. Nicolle and P. Remlinger, *Traité de microbiologie générale*, Doin, Paris, 1902.
- <sup>28</sup> *Histoire des médecins et pharmaciens de marine et des colonies*, II. Pluchon, ed. Privat, Paris, 1985, p.222 and sqq.
- <sup>29</sup> H. Sieberg, *Eugène Etienne und die französische Kolonialpolitik (1887-1904)*, Westdeutscher Verlag, Köln, 1963.
- <sup>30</sup> H. Brunschwig, *Mythes et réalités de l'impérialisme colonial français*, A. Colin, Paris, 1960.
- <sup>31</sup> See Lapeyssonnie, *Histoire de la médecine coloniale*, Seghers, Paris, 1984 and also his *Toubib des Tropiques*, Laffont, Paris, 1982.
- <sup>32</sup> See interesting comments in A. Tauber, *From Metaphor to Theory*, Oxford University Press, Oxford 1991.
- <sup>33</sup> In 1934, Charles Nicolle still recalled his teaching: "those marvellous living beings and patrolling cells, their instincts, their weapons, their battles and their tactical fantasmagory." C Nicolle, *Introduction à la carrière de la médecine expérimentale*, Alcan, Paris, 1934, p.19.
- <sup>34</sup> N. Bernard, *La vie et l'oeuvre d'Albert Calmette*, La Colombe, Paris, 1961.
- <sup>35</sup> "La vaccination antirabique, inséparable de toute activité pastorienne", M. A. Chabaud et R. Néel, Les Instituts Pasteur de Tanger et de Casablanca, *Maroc Médical*, 1963, 456, p.350.
- <sup>36</sup> Statuts de l'Institut Pasteur hellénique, Journal officiel, 1er Mars 1920, Article 2.
- <sup>37</sup> Archives of the Foreign Office, Paris, File Tunisia, Instruction Publique, vol.310.
- <sup>38</sup> A. Loir, Archives of the Foreign Office, File Tunisia, Instruction publique, id.
- <sup>39</sup> See M. A. Chabaud et R. Néel, *op. cit.*, 1963, 456, p.349-351; R. Néel, "L'Institut Pasteur du Maroc", *Presse Médicale*, 1963, 71, p.1783-1785.
- <sup>40</sup> Minutes of the Administrative Council, Archives of the P. I., Paris, 24-7-1909.
- <sup>41</sup> Rapport sur le fonctionnement de l'Institut Pasteur depuis le 1er Novembre 1894, jour de l'inauguration, jusqu'au 31-12-1896, *Bulletin de l'Académie de Médecine*, 1897, 37, p.358.
- <sup>42</sup> Notice sur l'Institut Pasteur d'Alger, Carbonel, Alger, 1949.
- <sup>43</sup> See A. M. Moulin, "La médecine ottomane à l'heure pastorienne", *La ville dans l'empire ottoman*, P. Dumont et F. Georgeon ed. (forthcoming).
- <sup>44</sup> A *zinnii* belongs to a non-Moslem minority group (Jews, Greek Orthodoxes, Armenians ...) that is "protected" by the Sultan.
- <sup>45</sup> E. Ihsanoglu's paper, in this book.
- <sup>46</sup> M. Ghodssi, "L'Institut Pasteur de l'Iran", *Bulletin de Liaison AAED de l'Institut Pasteur*, Paris, 1964, 22, p.34-41.
- <sup>47</sup> P. Mercier, "L'Institut Pasteur hellénique", *Bulletin de Liaison AAED de l'Institut Pasteur*, Paris, 1962, 13, p.54.
- <sup>48</sup> Dr Athanasaki to Albert Calmette: (he thanks him) "along with Dr. Roux, to bring your enlightenment to create in Greece an accomplishment which will radiate, I hope, extending French influencethrough the entire Orient". Letter, 9 May 1920, Archives of the P. I., Paris.
- <sup>49</sup> I. Lowy, "La fièvre jaune à Rio et la mission de l'Institut Pasteur", communication at the Colloquium "Les cent années de l'Institut Pasteur", Paris, 1988.
- <sup>50</sup> Lettres de M. Zeitoun et J. Khouri à A. Calmette, 8 Octobre 1928, Archives of the P. I., Paris
- <sup>51</sup> S. Kottek, Les tribulations de l'Institut Pasteur de Palestine, forthcoming paper.
- <sup>52</sup> M. Bastid-Bruguère, "Les Instituts Pasteur de Chine", *Les cent ans de l'Institut Pasteur*, M. Morange ed., La Découverte, Paris (forthcoming).

<sup>53</sup> For a discussion of the question, applied to the case of the Maghreb Institutes, see M.P. Laberge, "Les Instituts Pasteur du Maghreb : la recherche scientifique médicale dans le cadre de la politique coloniale", *Revue Française d'Histoire d'Outre-Mer*, 1987, 274, p.27-42 and her thesis *Politiques scientifiques au Maghreb : l'implantation du système scientifique dans les sociétés maghrébines de 1830 à 1980*, Thèse de lettres, Montréal, 1987.

<sup>54</sup> This laboratory was transferred to Dakar in 1913 and officially recognized as Pasteur Institute in 1923.

<sup>55</sup> See R. Dedonder, director of the Pasteur Institute, in 1985: "There is a continuous thread between the most fundamental discoveries and the practical subjects that Pasteur was confronted with.", *World's debt to Pasteur*, S. Plotkin ed., Alan Liss, New York.

<sup>56</sup> P. Remlinger, *Maroc Médical*, 1913, 49, p.8.

<sup>57</sup> H. Plotz, "Report on the Pasteur Institute", Rockefeller Archive Center, R. F., 1. 1. Box 2, file 16, p.17-19. See A. M. Moulin, "Death and Resurrection of Immunology at the Pasteur Institute (1917-1940)", *Immunology: Pasteur's Inheritance*, P. A. Casenave and P. Talwar eds, East Wiley, forthcoming.

<sup>58</sup> Letter from Etienne Burnet to Charles Nicolle, 1920, Musée de l'Institut Pasteur.

<sup>59</sup> See Pasteur Vallery Radot's report to the Board of the Pasteur Institute, 1933, Archives of the P. I., Paris.

<sup>60</sup> Such examples might be China and Vietnam.

<sup>61</sup> Few natives had reached positions of responsibility, prior to the independence.

<sup>62</sup> Z. Sardar, *The Touch of Midas*, Manchester University Press, Manchester, 1983.

<sup>63</sup> J. P. Dozon, "Quand les pastoriens traquaient la maladie du sommeil", *Sciences Sociales et Santé*, 1985, 3, p.27-56. See early comments on the "germ exchange" promoted by colonization in C. Nicolle, *Responsabilités de la médecine*, Alcan, Paris, p.46: "To these imported ills, was added the expansion of particular diseases for these countries, as a consequence of the civilizing enterprise".

<sup>64</sup> A. Calmette: "I cannot discuss this question in an absolute way". "La Rage en Cochinchine et les vaccinations antirabiques", *Annales de l'Institut Pasteur*, 1893, 6, p.6.

<sup>65</sup> A popular topic: see B. Dyan, "Sur le front de la science et de la santé", *Géo-Science*, 1989, p.134-146.

<sup>66</sup> A. Bordier, "Les microbes et le transformisme", *Bulletin de la Société d'Anthropologie de Paris*, 1988, 11, p.743.

<sup>67</sup> N. Bernard., cf. note 16.