The Propertisation of Science: Suggestions for an Historical Investigation

Version d'auteur

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For thirty years scientific institutions have been engaged in a process of propertisation, whose symbolic beginning may be considered to be the US Bayh-Dole Act of 1980. This legislation, which enables universities to benefit from intellectual property rights for their inventions when they are developed within them and supported by federal funds, is associated with the emergence of an "entrepreneurial science",[1] particularly in the field of health and medical research.[2] This issue has been the subject of lawyers' and economists' attention, focused on biologists' relationship to intellectual property rights (IPR), whose development is sometimes seen either as a challenge to the normal functioning of these disciplines or as a way to strengthen them.[3] Nevertheless, this strengthening of intellectual property in science is considered "a major change in institutional functioning and cognitive science".[4]

This rupture, testified by the intrusion of intellectual property in scientific institutions, has inspired questionable dichotomies such as the now famous distinction between a traditional mode of "pure science" and a new mode of "science in context".[5] However, assuming that science would have been characterised in the past by selflessness and the withdrawal of scholarly communities tends to ignore the complexity of relationships that scientists have always had with the economic and political sphere.[6] This relationship is, in fact, neither stable nor continuous. Others have therefore been conducted to distinguish different systems of organising science, such as the "Protoindustrial Regime", the "Cold War Regime" and "Globalised Privatisation",[7] but they actually insist on the last

1 H. Etzkowitz, Entrepreneurial Science in the Academy: A Case of the Transformation of Norms, in: Social Problems 42 (1989), no. 1, pp. 14-29; H. Etzkowitz, Entrepreneurial Scientists and Entrepreneurial Universities in American Academic Science, in: Minerva 21 (1983), no. 2, pp. 198-233.

2 B. Coriat/ F. Orsi, Establishing a New Intellectual Property Rights Regime in the United States: Origins, Content and Problems, in: Research Policy 31 (2002), no. 8-9, pp. 1491-1507.

3 R.S. Eisenberg, Proprietary Rights and the Norms of Science in Biotechnology Research, in: The Yale Law Journal 97 (1987), no. 2, pp. 177-231; F.S. Kieff, Facilitating Scientific Research: Intellectual Property Rights and the Norms of Science – A Response to Rai and Eisenberg, in: Northwestern University Law Review 95 (2000), p. 69.

4 R.K. Merton, The Matthew Effect in Science, II: Cumulative Advantage and the Symbolism of Intellectual Property, in: Isis 79 (1988), no. 4, pp. 606-623.

5 M. Gibbons et al., The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies, London 1994.

6 S. Shapin, The Scientific Life: A Moral History of a Late Modern Vocation, Chicago 2008.

7 P. Mirowski/ E.-M. Sent, Introduction, in: ibid. (eds.), Science Bought and Sold. Essays in the Economics of Science, Chicago/ London 2002, pp. 1-68.

two regimes and neglect the first. However, if the current privatised form of science may be opposed to the public funded one existing during the Cold War, how ought we to consider modern scientific life prior to WWII? Should an analysis of the pre- "Big Science" regime not put the privatisation of science in perspective? After all, did not Max Weber diagnose a bid of science in capitalist process before the end of the First World War?[8]

An historical inquiry is therefore necessary and the concept of propertisation appears all the more appropriate as it enables long term analysis, which requires the *longue durée* characterising intellectual property and scientific institutions. Using propertisation frameworks may allow tools to be forged for comparative work, which is often lacking. When it is not overlooking the long term dimension, the analysis of "privatised science" is often too focused on the American model of science and intellectual property, and overvalues its particularities. Both science and intellectual property rights have to be taken into account in a global framework. Moreover, using a propertisation concept prevents analysis from being confined to a single disciplinary approach: the evolution of intellectual property in science is not only matter of law and economics; it also refers to social and cultural dimensions.

This article presents some observations in order to promote such an historical inquiry on this topic; it represents the first stage of a wider project, which aims to establish the meaning and practice of scientific property between the middle of the 19th century and World War II. Here, three fields are explored: the relationship between scientific authorship and property; the place of science in the French patent system and the international controversy regarding scientific property during the interwar period.

1. Science, authorship and property

The history of propertisation in science cannot be separated from the issue of scientific authorship, which has been the subject of increasing attention in the last decade.[9] Mario Biagioli has drawn a precise distinction between scientific authorship and intellectual property. While the latter bestows property rights which are economically recoverable, the former allows a symbolic recognition of scientific work based on credit and reputation. Unlike copyrights, scientific authorship is not based on creativity or originality but on the truth of assertions made. Unlike patent law, it does not emphasise utility. Scientific authorship engages the author's responsibility but not on a legal level.

8 I. Kalinowski, Leçons wébériennes sur la science et la propagande, Marseille 2005, pp. 257-268.

9 M. Biagioli/ P. Galison (eds.), Scientific Authorship: Credit and Intellectual Property in Science, New York 2003; D. Pontille, La signature scientifique. Une sociologie pragmatique de l'attribution, Paris 2004.

The scientific author is in fact subject to trial by his peers, so it is both "the producer and the product of the produces he or she produces".[10] However, the boundaries of scientific authorship are not static and depend both on compromises negotiated between disciplines and on changes due to the development of science, which is becoming increasingly collective.

One question about scientific authorship is to know how this notion is taken into consideration by the actors and which name it may assume. At the beginning of the 19th century, scientists were aware of this problem of scientific authorship, whose definition obviously varied from discipline to discipline. Some, such as botany, zoology and medicine, were particularly involved in promoting scientific authorship. Ever since Linnaeus' *Philosophia botanica* (1751), the manner of applying names to plants and animals has been codified.[11] Progressively, during the first half of the 19th century, the "law of priority" became increasingly important. One of its instigators, the botanist Augustin de Candolle, suggested in 1813:

> "All this scaffolding of botanical nomenclature would fail from the base and would inevitably collapse if the universality of Naturalists did not recognize the principle I mentioned, namely the need to accept the name given by the inventor of a plant, whenever this name is consistent with the rules. A name must not be changed because it is insignificant; then the second may be removed if we find a third best, and so may the third if there is a fourth etc., therefore there is no more fixity in the nomenclature or rather there is no more scientific nomenclature. Even the author who first coined the name has no more right than any other to change it for a simple question of impropriety. [...] The priority is in effect a fixed term that admits nothing positive nor arbitrary nor biased."[12]

Scientific authorship was not only a question of truth and responsibility. In this case, botanical authorship, based on the law of priority, appears to be a condition for establishing a fixed nomenclature and, in fact, a basis of scientific botany.

Furthermore, the question of nomenclature concerned the issue of property. In his famous work *Règne animal,* published in 1817, Georges Cuvier drew a clear connection between these two notions by asserting that "it is in [his] eyes no more sacred than property of conceptions of the mind and the use, which has become too common among naturalists to hide plagiarism by changes of names, has always seemed to [him] a real crime".[13] This notion of "the property of the conception of the mind" evoked a Lockean point of view regarding the emergence of intellectual property. Just as

10 M. Biagioli, Rights or Rewards? Changing Frameworks of Scientific Authorship, in: M. Biagioli/ P. Galison (eds.), Scientific Authorship: Credit and Intellectual Property in Science, New York 2003, pp. 253-279.

11 S. Tillier, Terminologie et nomenclatures scientifiques: L'exemple de la taxonomie zoologique, in: Langages 39 (2005) no. 157, pp. 103-116.

12 A. de Candolle, Théorie élémentaire de la botanique ou Exposition des principes de la classification naturelle et de l'art de décrire et d'étudier les végétaux, Paris 1813, p. 250.

13 G. Cuvier, Le Règne animal distribué d'après son organisation, pour servir de base à l'histoire naturelle des animaux et d'introduction à l'anatomie comparée, tome 1, Paris 1817, p. XXIX.

every man owns the results of his labour, every scientist – like every author – owns those of his mind. Therefore the "law of priority" had a different aim to that of fixing zoological and botanical nomenclatures. It was intimately linked to intellectual property. In 1835, Alphonse de Candolle, the son of Augustin, suggested this justification:

> "This priority rule is fair to the authors who have provided outstanding services to science and, since each book is dated, it is extremely accurate. It avoids the friction of self-esteem that can result from not adopting the words of one author. It sets a limit to the invasion of unnecessary technical terms and draws a line between real scientists and charlatans in science."[14]

The rule of priority was not only a way of avoiding confusion in botanical nomenclature, but also of recognizing the achievements of real botanists.

This idea became more and more prevalent in the middle of the 19th century. In 1842, during the annual meeting of the British Association for the Advancement of Science, a committee was appointed "to consider the rules by which the Nomenclature of Zoology may be established on a uniform and permanent basis". It stressed the importance of "priority" for zoological nomenclature:

> "Now in zoology no one person can subsequently claim an authority equal to that possessed by the person who is the first to define a new genus or describe a new species; and hence it is that the name originally given, even though it may be inferior in point of elegance or expressiveness to those subsequently proposed, ought as a general principle to be permanently retained. To this consideration we ought to add the injustice of erasing the name originally selected by the person to whose labours we owe our first knowledge of the object; and we should reflect how much the permission of such a practice opens a door to obscure pretenders for dragging themselves into notice at the expense of original observers."[15]

The law of priority appears as a way of improving the professionalization of disciplines by avoiding the instability of nomenclature and arbitrary denominations. A good scientist was someone who renounced any superficial originality, agreeing to recognise the genuine originality of his predecessors. Thanks to his own labour and self-sacrifice, he was able to attain scientific fame by in his turn giving his name to a real discovery. As has been suggested by R. K. Merton, the law of priority, whose moral dimension is obvious since its violation is considered an "injustice", was one of the conditions required in promoting a scientific ethos.

Furthermore, this development of the priority may be interpreted as a significant moment in the propertisation of science. Not only was the "property of the conceptions of the mind", since Cuvier at least, one of the bases of the priority law, but also the notion of "scientific property" was based on the law of priority. The expression of "propriété scientifique" appeared progressively in many

14 A. de Candolle, Introduction à l'étude la botanique ou traité élémentaire de cette science, Bruxelles, Méline 1837, p. 242.

15 Report of the XIIth Meeting of the British Association for the Advancement of Science, London 1843, p. 109.

French journals of medicine at the beginning of the 19th century. Later, the link between priority and scientific property became clearer from fierce controversies shaking disciplines such as zoology. In 1857, the French editor of the *Revue et magasin de zoologie pure et appliqué,* Félix-Édouard Guérin-Méneville, accused the American entomologist James Thomson of having plagiarised his own work and having allowed himself to appear as a plagiarist. He denounced an attack on his "scientific property" and asserted that "the property of a scientific work is as sacred as a literary one".[16]

In 1863, American zoologists were disquieted by a strong dispute between Louis Agassiz, professor of zoology at Harvard University, and his former student, Henry James Clark, who was employed by the Museum of Comparative Zoology (MCZ), created and managed by Agassiz.[17] Clark considered the *Contributions to the Natural History of the United States of America*, which were edited only under Agassiz' name, contained several important passages which were actually based on his own research on embryology. Clark demanded Agassiz recognise his debt but he refused categorically, claiming that Clark had worked under him and thanks to his own resources. As a result, Clark decided to publish a *Claim for Scientific Property,* which he sent to many learned societies around the world. As a result, Clark was fired from the MCZ on March 1863. Some months later, Agassiz decided to impose a strict control on his collaborators' research. A statement, adopted on 5 November 1863, stated:

> "No one connected with the Museum is authorized to work for himself in the Museum during the working hours fixed for Museum work. Whatever is done by any one connected with the Museum, during that time, is to be considered the property of the Museum, but due credit is to be given him by the Curator in his Annual Report […] No one is authorised to publish, or present to learned societies, anything concerning his work at the Museum, without the previous consent of the Curator. All such contributions are to be submitted to the Curator for examination."[18]

In fact, Agassiz distinguished authorship from scientific property. The former was merely a link between a discovery and a discoverer (or, more precisely in this case, between a description and its author). This relationship could be recognised without any problem. However, authorship did not necessarily mean scientific property, which was in fact controlling publications. Agassiz' collaborators had the right to be recognised as authors of discoveries but they were not authorised to publish anywhere. According to Agassiz, the Museum, which employed them and funded their research, was the legitimate owner of their publications. Agassiz could claim to control his

16 F.-É. Guérin-Méneville, Matériaux pour une monographie des coléoptères du groupe des Eumorphides, et plus spécialement du genre Eumorphus, in: Revue et magasin de zoologie pure et appliquée (1857), p. 569.

17 For all this passage, see M.P. Winsor, Reading the Shape of Nature: Comparative Zoology at the Agassiz Museum, Chicago 1991, pp. 47-65.

18 Annual Report [of the Museum of Comparative Zoology] for 1865, p. 48, quoted in: M.P. Winsor, Reading (anotation 17), p. 59.

collaborators' results because he owned the "scientific capital", whereas his collaborators were only his employees. In fact, scientific property was at the same time the basis and the result of a form of scientific capitalism, which would be based on the cumulative control of scientific work through a hierarchical organisation and a command of material resources.

This interpretation has to be precisely understood. These two examples refer to economic considerations. In the first case, the conflict is not only the one which concerns two specialists of Eumorphids; it opposes two competitors in scientific zoological publishing.[19] Concerning the second case, the litigation can be explained by Agassiz' willingness to control the work of his collaborators but also, according to Mary P. Winsor's analysis, by his attempt to promote the development of his Museum and of its publications, which both necessitated important funds and could not be exposed to competition. Agassiz' relationship to scientific property may be analysed as an attempt to impose his own monopoly on American zoology. In fact, however, such analysis has to refer to a specific conception of economics.

Economics of science has long been neglected by many approaches, which on the one hand postulate an asymmetry between factors considered as essential for science, and, on the other hand, social and economic factors seen as contingent. Even if he had already weighted their importance, Max Weber saw these factors as exogenous characters of the scientific profession.[20] Similarly, Robert K. Merton's work is primarily limited to the symbolic aspects of scientific institutions as evidenced by his particular conception of intellectual property which is defined as the right to peer recognition and not as an economic right.[21] Finally, this asymmetry is also evident in Pierre Bourdieu's approach, for whom scientific capital, which is necessary to scientists in their fight against their competitors, is split between a truly "scientific capital" and a "mundane" one, which is not directly related to intellectual skills.[22] At the same time, neoclassical economics of science, which reduce knowledge to information and scientists to maximising agents, forget the symbolic dimension the actors bestow on their activity and consider the scientific life as a market.[23]

Discussing the economic aspects of propertisation in science allows us to insist on the material dimension of science – and the scarcity of its resources – without eclipsing its social and cultural

19 It is not the place in this programmatic paper to underline the place of economic arguments in the controversy between Guérin-Méneville and Thomson. For details, see F.-É. Guérin-Méneville, Matériaux (annotation 16); J. Thomson, De Monsieur Guérin-Méneville et de trois Eumorphides, Paris 1858.

20 M. Weber. La science, profession et vocation, Marseille 2005, p. 9.

21 R.K. Merton, Priorities in Scientific Discovery: A Chapter in the Sociology of Science, in: American Sociological Review 22 (1957), no. 6, pp. 635-659.

22 P. Bourdieu, Science de la science et réflexivité, Paris 2001.

23 For criticism, see P. Mirowski, The Effortless Economy of Science?, Durham/ London 2004.

dimensions. Scientific propertisation bridges these two aspects in other disciplines such as medicine and archaeology. In the medical field, scientific property appeared necessary in order to distinguish those who contributed to the advancement of the science. At the same time, it promoted a diffusion of medical knowledge, since recognising scientific priority necessitated scientific publishing.[24] Scientific property in archaeology had another meaning, since scientific property had come to mean the ownership of archaeological discoveries. In fact, a historical analysis of scientific property also has to take two dimensions into account: the symbolic recognition of intellectual work and the material economic dimension of scientific activity. A relevant interpretation of scientific propertisation cannot overlook the fact that science is embedded in both social and economic contexts. If scientific authorship and scientific property are related, their significance cannot be examined while ignoring the material or symbolic economics of science.[25]

2. Science and intellectual property law

Analysing scientific propertisation necessitates studying the relationship between the scientific property and intellectual property rights which developed in the course of the 19th century. Being at the first stage of our project, we will insist on the French case here, but it is obvious that a history of this kind has to be undertaken in a global and connected framework: both the evolution of intellectual property and of scientific institutions depend essentially on international regulations.

Three kinds of intellectual property rights are traditionally distinguished. Whereas scientific property is not a legal set of rights assigned to scientists, copyright and literary and artistic property laws protect the original work of an author or of a creator.[26] Patents recognise rights for an industrial invention. In fact, the definition of intellectual properties depends on a continuous process, which has always been subject to strong challenges. From the 18th century onwards, there have been two main, opposing views regarding the ownership of "things of the mind". In 1763, publishing his *Letter on the book trade*, Diderot suggested:

> "Indeed, what property may belong to a man, if a work of mind, the only fruit of his upbringing, his education, his vigils, his time, his research, observations, his finest hour, the finest moments of his life, his own thoughts, feelings of his heart, the the most valuable part of himself, that which is eternal, immortalised, does not belong to him? What comparison between man, the essence of man, his soul, field, meadow, tree or vine that nature offered at the beginning equally to all, and that the individual appropriated through culture, the first

24 For an example, see La Presse médicale belge, 25 December 1859, p. 1.
25 P. Mirowski/ E.-M.Sent, Science Bought (annotation 7).
26 J. Boncompain, La Révolution des auteurs. Naissance de la propriété intellectuelle, 1773-1815, Paris 2001.

> legitimate means of possession? Who is more entitled than the author to have his thing by gift or by sale?"[27]

Diderot's conception clearly reflects a Lockean perspective, since, for John Locke, things are earned by working for them, thus their property is an extension of the property of himself. Things of the mind are all the more justified as the subject of a property insofar as they result from what a man possesses more intimately.

This conception of intellectual property, which, although not thus designated is still considered to be a natural right, found its opponent in the person of Condorcet, the mathematician and philosopher, who said in 1776:

> "There can be no relationship between ownership of a work and that of a field which can be cultivated by one man; a piece of furniture that can serve only one man, and whose property, therefore, is based on the nature of the thing. So here it is not a property derived from the natural order, and defended by a social force. It is a property founded by society itself. This is not a real right but a privilege, like the exclusive enjoyment of all that can be removed from the sole possessor without violence."[28]

From this perspective, intellectual property concerns immaterial objects whose use is essentially collective. Thus the appropriation of such things by a single individual is only a social concession which is justified by their contribution to the common good. Throughout the 19th century – and beyond –, the debates and controversies relating to intellectual property were dependent on national legal traditions and on the relationship between socio-professional groups which contributed to building the frameworks of intellectual property at both national and international levels. However, they were still structured by these two models – IPR as natural rights *versus* social privilege.

In addition, many of these debates concerned the differential definition of intellectual properties. During the 19th century, the author and the inventor appeared as the two main Romantic figures of creativity. Like the author, the inventor was regarded as someone struggling against the hostility of the common people, who were not able to understand his genius.[29] In France, however, although the defence of intellectual property was based on a common ideological basis, ie Diderot's conception, different arguments were advanced in the 19th century to distinguish not only the rights, but also the

27 D. Diderot, Lettre historique et politique sur le commerce de la librairie, in: ibid., Œuvres complètes, Paris 1876, p. 30.

28 Condorcet, Fragments sur la liberté de la presse, in: Œuvres de Condorcet, tome 11, Paris 1847, pp. 308-309.

29 On the heroic conception of inventors, see C. MacLeod, Heroes of Invention: Technology, Liberalism and British Identity, 1750-1914, New York 2007; on the French case: G. Galvez-Behar, Si loin, si proches. Inventeurs et artistes au regard de la propriété intellectuelle dans la France du XIXe siècle, URL: http://halshs.archives-ouvertes.fr/halshs-00008326/fr (accessed August 1, 2010).

status, of these two social figures of creativity.[30] Balzac, as an important actor in the defence of copyright, suggested the ambiguity of this relationship. In his novel *Illusions perdues,* he insisted on the fraternity of the inventor and the poet, but was in fact reluctant to claim the two intellectual properties could be aligned. According to him, there was no "lower parity" between a technical invention and a creative work.[31] For Balzac, the former created a need, was useful and, therefore, indispensable to society. However, artistic works quickly lost any utility. Therefore, unlike that of inventions, their property would not infringe any interest. Thanks to their uselessness, the author could be accorded the broadest rights, while the inventor, locked in the cage of ophelimity, had to sacrifice his interests to society.

In the second half of the 19th century, while the controversy over industrial property was still in full swing, the French economist and senator Michel Chevalier, an opponent of the patent, did not hesitate to rush to the aid of literary property. For him:

> "Literary and artistic works have a character of individuality perfectly sliced. For even they are a separate property that the law can recognise. Conversely, there is a lack of individual character in real or supposed discoveries that are the subject of patents, because what one has done today another hundred others will do tomorrow. That is why the monopoly conferred by patents shall in principle be accused of being unfair and can be completely abolished by the legislature without any result against the recognition of literary property."[32]

Considering the fact that technical inventions were collective and therefore impersonal, Michel Chevalier denied any property rights for the inventor's creations. Little imagining the reverse argument – after all, what Balzac did, could not another also do it? –, it thereby contributed to making the industry an anonymous world. As a consequence of this difference in design, literary property and the right of the inventor underwent separate paths: the former was never really criticised and was recognised for a longer time than the duration of the contested patent (15 years maximum in France).

Intellectual property can therefore not be viewed as a monolithic object and the question thus arises as to whether scientific work had a special place in the intellectual property laws defined in the 19th century around the world. To answer such a question, the extremely dense chronology of legislative reforms in this area should be borne in mind, as well as the debates they provoked on an international level.[33] Furthermore, scholarly publications grew in the 19th century with the process of

30 For the history of literary property in 19th century France, see L. Pfister, L'auteur, propriétaire de son œuvre. La formation du droit d'auteur du XVIe siècle à la loi de 1957, Thèse, Strasbourg 1999.

31 F. Pollaud-Dulian, Balzac et la propriété littéraire, in: L'Année balzacienne (2003), no. 1, pp. 197-223.

32 M. Chevalier, L'exposition industrielle de 1862, Paris 1862, p. 168.

scientific professionalisation, to such an extent that scientific publishing was becoming an economic sector necessitating regulation through intellectual property.

2.1 Scientific property and copyright

It is therefore not surprising that the question of scientific property was referred to on several occasions. This was particularly true in France, where the draft law on literary and artistic property was discussed between 1862 and 1866. The lawyer Frédéric Mourlon, in his legislative considerations on the topic, rejected the distinction between this form of property and the ownership of scientific insight resulting from the scientist's work as being as personal as the work of a writer.[34] According to Mourlon, making the scientist change his condition or leave to others the economic results of his discovery was tantamount to "denying him the result of his work". He added, on a prophetic note:

> "After scientific property we will have medical property. Once a doctor discovers an effective remedy against tuberculosis, he and his own will be alone, perhaps for a century, to be authorised to sell life to the consumptive. [...] Once medical property has been accepted, similar forms of property will soon occur. If a skilled surgeon discovers a new binding, except him and his family, none of his colleagues will, for a time, use it medically. [...] We will have, therefore, in addition to medical property, surgical property. Once this has been dedicated, others will follow. If you want to constitute one, two, at the most three properties, you will have a swarm."[35]

However, the French law of 1866 on literary and artistic property did not recognise any special status for scientific property, although courses, lectures and communications were considered as works which might be protected.

Nevertheless, the debate was not closed. In 1883 the issue was raised again at the Berne conference, which had been organised by the *International Literary Association* in order to create a General Union of literary and artistic property. During the inaugural session, a debate opposed advocates of an inscription of the word "scientific" in the title of the draft convention and all others. For the former, it not only had to take into account Spanish and German legislation (the latter offering particular rights to universities and learned societies) but also to provide protection for "certain designs that are not inventions and can not be patented, and that are nonetheless not literary works, such as maps, visual art for teaching, topography, etc.".[36] For others, such as the lawyer Eugène

33 For a survey, see C. MacLeod/ A. Nuvolari, Inventive Activities, Patents and Early Industrialization. A Synthesis of Research Issues, in: Druid Working Paper, no. 06-28, URL: http://www3.druid.dk/wp/20060028.pdf (accessed August 1, 2010).

34 F. Mourlon, Etude critique sur le projet de loi sur la propriété littéraire et artistique, Paris 1864.

35 Ibid., p. 68.

36 Bulletin de l'Association littéraire internationale, (1883), no. 18, p. 5.

Pouillet, the term "science" was not relevant, and some even feared being forced to “defend geometric figures and to protect cubes, because we had written the word “science” in the title of the draft convention”.[37] This approach was imposed, which may explain why the question of scientific property was then treated in the context of discussions on industrial property.

This analysis should not be limited to the constitution of the legal framework but must be extended to uses of intellectual property. In a context of increasing internationalisation of science, translation rights, and how they are managed by scientific publishers, for example, are an important indication of this process of propertisation. A history of scientific propertisation has to pay special attention to the role of scientific property in defining literary and artistic property, both in terms of discourse and practice. This prerequisite also applies to industrial property, which developed during the 19th century.[38]

2.2 Scientific property and patents

Analysing the relationship between scientific property and patents helps determine to what extent science is patentable or not and to describe the practice of industrial property by scientists. Patentability, the definition of which is never immediately provided but results from a complex legislative and common law process, has a number of characters that must be put into perspective.

During the 19th century, scientific discoveries and principles were very often regarded as unpatentable because invention had to be distinguished from discovery. This distinction was proposed by the Scottish philosopher Dugald Stewart, who wrote, in his *Elements of the Philosophy of the Human Mind*:

> “Before we proceed it may be proper to take notice of the distinction between Invention and Discovery. The object of the former, as has been frequently remarked, is to produce something which had no existence before; that of the latter, to bring to light something which did exist, but which was concealed from common observation. Thus we say, Otto Guerricke invented the airpump; Sanctorius invented the thermometer; Newton and Gregory invented the reflecting telescope; Galileo discovered the solar spots; and Harvey discovered the circulation of the blood. It appears, therefore, that improvements in the Arts are properly called inventions; and that facts brought to light by means of observation, are properly called discoveries.”[39]

37 Ibid.

38 J. Lerner, 150 Years of Patent Protection (August 1999), URL: http://ssrn.com/abstract=179188, consulted on August 1st 2010.

39 D. Stewart, The Works of Dugald Stewart, vol. 1, Cambridge 1829, p. 232. However this distinction in Dugald Steward's work was more complex than what thought autors like French lawyer Augustin-Charles Renouard.

Such a distinction, however, which influenced European lawyers such as the French Augustin-Charles Renouard, was not as obvious as suggested by the debates on the French patent law reform of 1843-1844.

In the 1840s, the French patent laws were renewed after years of complaint regarding the patent system inherited from the Revolution.[40] The governmental project foresaw that the patents covering the principles, methods, systems, designs and theoretical or purely scientific discoveries, would be null and void. The physicist, astronomer and deputy François Arago was opposed to this proposition, even though he did not try to totally remove it, since he agreed that an idea without any indication of industrial application should not be patented:

> "If anyone should today discover the square of the hypotenuse," he declared, "I do not wish it to be patented so that he might have the right to request a salary from astronomers using this proposition in order to measure the height of mountains on the Moon."[41]

However, Arago did want a scientific idea to be patentable from the moment its author indicated precisely one industrial application. Arago's proposition was a way of promoting a kind of scientific property, i.e. – even though he did not use these terms – a legal possibility whereby a scientist could claim a part of the benefits enabled by his discovery. It can also be interpreted as a way of preventing scientists' work from being eliminated from patentability.

The result of Arago's intervention was the adoption of an amendment. Patents on scientific principles would be null and void unless any industrial application had been indicated. Thus the disposition in the 1844 French patent law provided a basis for the "patent of principle", which could protect both an industrial application and its theoretical principle. Lawyers such as Étienne Blanc considered that:

> "An idea or a system can not be validly patented in so far as the patent contains a statement of means with which we can apply the idea or the system to the industry. But if the idea or the system are new, the patent taken as mentioned above is what is in practice known as a "patent of principle", whose effect is to effectively protect the idea or the system so that nobody can apply it any longer, even with different means."[42]

Some courts shared this opinion, but it seems that during the second half of the 19th century the "patent of principle" was strongly attacked by other lawyers such as Dalloz and Eugène Pouillet.[43]

40 G. Galvez-Behar, La République des inventeurs. Propriété et organisation de l'innovation en France (1781-1922), Rennes 2008.

41 Quoted in: A. Huard, Répertoire de législation et de jurisprudence en matière de brevets d'invention, Paris 1863, p. 354.

42 É. Blanc, Traité de la contrefaçon en tous genres et de sa poursuite en justice, Paris 1855, pp. 459-460.

43 Dalloz *et alii*, Jurisprudence générale: recueil périodique et critique de jurisprudence, de législation et de doctrine en matière civile, commerciale, criminelle, administrative et de droit public, deuxième partie, Arrêts des cours impériales, Paris 1859, p. 161-162, [Imperial Court of Lyon – 25 May, 1859]; E. Pouillet, Traité théorique et pratique

For Pouillet, a patent dealing with a theoretical idea could not be granted if it indicated an industrial application, but it could only be valid for the application which had been mentioned. In fact, this discussion of the "patent of principle" revealed the contradictions regarding the statute of scientific discoveries to be part of the public domain. Even Arago's position appeared contradictory, since he claimed that scientific work could be recognised but refused to pay royalties to anyone discovering a new theory. This French example suggests how complex the early question of the (un)patentability of science was and demonstrates that scientists, even if there were only a few, could be interested in such a topic.

The patentability of drugs was another problem considered by some scientists. The law of 1791 did not prevent patents from being granted for drugs. However, throughout the first half of the 19th century, the policy of medicine and pharmacy took precedence over the right of the inventor. In 1829, the French Royal Academy of Medicine, founded nine years earlier, was against the patenting invention for drugs. The exclusion of drugs from the scope of patentability did not occur until 1843 and 1844 with the reform of the patent law.[44] Proponents of the patenting of drugs were led by the famous chemist, senator and trustee of Saint-Gobain Compagny Gay-Lussac, who defended three arguments: 1) it had to distinguish the conception of drugs from how they were run, 2) the patents would encourage the drug market and 3) the right of the inventor had to be defended, even for drugs. For others, an exclusion of drugs was essential in order to moralise the drug market. Not only must it protect the public from quackery, health could not be the subject of exclusive appropriation, even temporarily. This latter argument prevailed. The law of 1844 excluded drugs from the scope of patentability. These debates highlight the different attitudes of scientists towards the propertisation of science. While chemists such as Gay-Lussac were able to support the patentability of drugs, practitioners refused it in the name of moral considerations but perhaps more in order to avoid any control over their profession.

Scientists' relationship to the patent cannot, however, be reduced to the problem of patenting theories and drugs. It is also related to the question of scientific precedences, i.e. scientific discoveries on which a patent are based, but which may also lead to the cancellation of the latter for lack of novelty. The famous case of the "Fuchsine" clearly illustrates this point. In 1859, a chemical company in Lyons, *Renard frères et Franc*, took out a patent on a dyestuff which had been invented by its French chemist Verguin, largely inspired himself by the German chemist August Wilhelm von

des brevets d'invention et de la contrefaçon, Paris 1879, pp. 377-380.

44 M. Cassier, Brevets pharmaceutiques et santé publique en France: Opposition et dispositifs spécifiques, in: Entreprises et histoire 36 (2004), no. 2, pp. 29-47.

Hofmann[45]. Thanks to this patent, *Renard frères et Franc* were able to bring lawsuits against competitors, who responded to the courts that the considered patent was null due to prior chemists' publications on this dyestuff, including Hofmann's works. On March 31, 1863, the Parisian Court of Appeal ruled that the patent held by the company *Renard frères et Franc* was not invalidated. In its ruling, it said:

> "In vain is it claimed that such an interpretation would tend to strip science for the benefit of industry; [...] this distinction is in the nature of things [...] science tends to develop useful knowledge, to advance the arts and industry; [...] in chemistry above all, it often makes observations and watches without considering the industrial results it could produce, by not stopping there, by not formulating them, by not supplementing them but by opening the door for all, and by finding glory in the benefits that others derive; [...] the industry, however, is merely limited to produce, by taking advantage of the ways opened by science and by providing society with the results that the patent law only intended to protect."[46]

This decision suggested a strong distinction between science, which was regarded as a free domain, and industry. In a sense, Arago's fear came true: because scientists were supposed to work for free, their discoveries could be privatised by industrialists. This sort of judgement created a stir in both legal and scientific circles. Over fifteen years later, Eugène Pouillet regretted the confusion caused by such decisions which led to the belief that science could not possibly call into question the validity of a later patent.[47]

This paradoxical propertisation of the scientific public domain was also unacceptable to scientists. In this regard, the protection of Louis Pasteur's work on wine is quite interesting. In April 1865, Pasteur took out a patent on a warming process of wine. Not only did he consider taking out a patent as a good way in which to publish his scientific work, he also thought that, by abandoning his patent later, he could ensure that his scientific discovery would not be privatised by industrialists.[48] This question of priority and scientific publication did not arise, however, except for scholars. In the 19th century, the boundary between scholarly activity and industrial activity was not very clear – and it probably still is the case. In order to claim their inventions, inventors did not hesitate to communicate to learned societies, but they thereby underwent the risk that early publication of their inventions might cancel their patents, as evidenced by Henry Bessemer, inventor of a steel

45 H. van den Belt, Why monopoly Failed: The Rise and Fall of Société La Fuchsine, in: The British Journal for the History of Science 25 (1992), no. 1, pp. 42-63.

46 Annales de la propriété industrielle, artistique et littéraire 9 (1863), art. 965.

47 E. Pouillet, Traité théorique (annotation 43) pp. 346-354.

48 Pasteur wrote that the patent "in my opinion is the best method of advertising that a scientist who wants to follow his work patiently can adopt, without resorting to the solemnity of a scientific publication." In: L. Pasteur, Œuvres de Pasteur, tome 3, Études sur le vinaigre et sur le vin, Paris 1924, p. 352. However, Pasteur's attitude towards patenting seems to be more complex and has to be analysed more precisely. G.G. Geison, The Private Science of Louis Pasteur, Princeton 1995.

producing method in the 1850s, who lost his French patents due to of a conference pronounced in a British learned society.

The history of intellectual property quite clearly suggests that this right is controversial always and everywhere. The specification of different intellectual property rights results from a long process of definition in which the attributes of originality or utility are not immediately and definitively given. Therefore, the opposition between scientific authorship and intellectual property law is no longer very clear. Finally, we cannot forget that scientists themselves have used intellectual property rights from early on. Such practices do not necessarily respond to a desire for personal enrichment, but they do reveal scientists' willingness to control the fruits of their discovery.

3. Intellectual work and scientific property in the first half of the 20th century

If further investigations are necessary to analyse these practices, an evolution may however be suggested. At the beginning of the 19th century, scientific property referred to scientists' claims for the recognition of their own work and was a means of promoting their professionalisation. By the end of the century, the propertisation of science no longer had the same significance. The development of scientific professions, which had grown stronger during the second half of the 19th century, the intensification of the relationship between science and industry, and the organisation of capitalism, which undermined the individualistic conception of property rights, together provided a new context. Due to a reappraisal by Romanticism, scientists were new figures of intellectual creativity and technical progress. At the beginning of the 20th century, scientific property was progressively being understood as the attempt of scientific professions to have their economic contribution recognised.

The development of a more collective form of innovation and the integration of skilled graduates in science and technology in a wage relationship led to stronger claims by so-called "intellectual workers" seeking to obtain fairer industrial property rights. In particular, the German controversies of the early 20th century regarding employee inventors' rights highlight this point.[49] The *Bund der technisch-industriellen Beamten,* created in 1906, demanded in 1907 that "technical employees should be guaranteed intellectual property rights on their inventions and that a fair share of the profits from their practical usage should clearly be assigned to them".[50] By 1905, the Reichstag had

49 K. Gispen, New Profession, Old Order: Engineers and German Society, 1815-1914, Cambridge 1990.

50 M. Seckelmann, Industrialisierung, Internationalisierung und Patentrecht im Deutschen Reich, 1871-1914, Frankfurt am Main 2006, p. 382.

been seized with applications to amend the patent law and in July 1913 the imperial government presented a project confirming its intention to abandon the first-to-file principle, which was supposed to disadvantage the true inventors, and to establish fair compensation for the inventor employee. Examination of this reform, which was strongly criticised by representatives from industry, was interrupted by the war. In fact, the professionalisation of intellectual workers in industry was progressing and the propertisation of intellectual work becoming a stake of the relationship between employers' and employees' new organisations, which began to structure the intellectual professions.[51]

A new regime of propertisation in science was thus emerging. It was characterised by a new form of involvement by scientists in economic matters, especially concerning intellectual property, and by the development of organisations representing scientists. In France, for example, some scientists defended the role of science in industry and did not refuse to take part in the debates on industrial property. For many French chemists, the national patent law explained the inferiority of the French chemical industry in comparison to that of Germany. The First World War accentuated this evolution. In all the belligerent countries, scholars were engaged in the service of the army and allowed to develop new weapons.

Aware of their role during the conflict, scientists did not intend to return to the *status quo ex ante* after the war. In any case, the difficult post-war economic context promoted new organisations such as the French Confederation of Intellectual Workers (*Confédération des travailleurs intellectuels,* CTI) created in 1920.[52] The representation of intellectual workers also increased on an international level. In September 1921, the *League of Nations* accepted the French suggestion to create an international organisation of intellectual work. In January 1922, the International Committee for Intellectual Cooperation (*Commission internationale de coopération intellectuelle,* CICI) was created by the Council of the League as an advisory and provisional entity.[53] The CICI failed to work very well, however, thus, in order to promote both intellectual cooperation and its influence, France decided in 1926 to create the International Institute of Intellectual Cooperation (*Institut international de coopération intellectuelle,* IICI), which became the permanent secretariat of the CICI. In 1931, the International Committee for Intellectual Cooperation, the International Institute of Intellectual Cooperation and other national committees for intellectual cooperation, which had

51 G. Sapiro (ed.), L'organisation des professions intellectuelles, Paris 2006 (Le Mouvement social 214/ 2006).

52 A. Chatriot, La lutte contre le 'chômage intellectuel': L'action de la Confédération des Travailleurs Intellectuels (CTI) face à la crise des années 1930, in: G. Sapiro (eds), L'organisation (annotation 51), pp. 77-91.

53 J.-J. Renoliet, L'Unesco oubliée. La Société des nations et la coopération intellectuelle (1919-1946), Paris 1999.

been founded in the 1920s, were gathered into the *Intellectual Cooperation Organisation* of the League of Nations.

These organisations played an important role in the development of an international IPR and, more particularly, in the discussion of the scientific property issue.[54] In 1921, the CTI and the *French Union of Inventors* proposed an amendment to the French patent law. Inventors, lawyers and scholars, brought together under mathematician Paul Appell's chairmanship, aspired to measures promoting scientific institutions which had been shaken by the war, but also attempted to find new financial resources. The CTI then submitted its draft to the CICI and convinced its president, Henri Bergson, to put scientific ownership on the agenda. In August 1922, the CICI gave a subcommittee devoted to intellectual property the task of preparing a report. This was published in 1923 by Italian Senator Francesco Ruffini, who called for the recognition of specific intellectual property for scientific discovery, in addition to industrial property – which protected the technical invention – and the copyright. This scientific property had to initiate the process of rewarding scientists' contribution to economic progress, which was already enjoyed by industrialists.

Presented to the General Assembly of the League of Nations, the report was referred to member countries for advice. Only thirty states responded – including ten which spoke favourably. While the government in France seemed keen about Ruffini's recommendations, the consultations launched by the Minister of Education in 1923 gave rise to more lukewarm responses. Work also continued within the CICI in 1924 and 1925, when it was decided to convene a meeting of experts and to obtain feedback from industry. Three years of consultations were still necessary before a new report was produced, written by the French senator and lawyer Marcel Plaisant. Although less ambitious than Ruffini's draft, Plaisant's report was still criticised. Referred to the League's members, it received unfavourable opinions from more than two thirds of the forty countries that had responded. The early 1930s saw the issue of scientific ownership decline and then disappear with the global crisis. In 1946, however, the newly established UNESCO seized on the matter, demonstrating the topic's importance beyond the 1920s and 1930s, and thus highlighting the relationship between scientific property and the ends of war.

Despite the event and the issue's importance, few works have as yet been devoted to their history. Only one conference by Soraya Boudia and an article by David Miller have attempted to analyse this controversy and drawn up a chronology.[55] The interest of Soraya Boudia's text is that it mentions the impact of this debate in France and highlights the unsuccessful property law project proposed in

54 See I. Löhr in this volume.

1927. However, these studies have not been really developed. Even though it is very interesting, David Miller's article mainly focuses on Senator Ruffini's project and the reactions it caused in Britain and the United States. Paradoxically, French reactions are not discussed in detail even though the debate on scientific property began in France and found strong echoes there subsequently.

This ten-year international controversy, however, suggests a simple problem: How were scientists led to claim a proper right on their findings, even to distance themselves from the ethics of disinterestedness? Such a study would rely primarily on the archives of the ICIC (located at UNESCO), but would also be based on a large quantity of printed documentation generated by the question. In order to establish a solid comparative basis, the French case, which has been neglected, should be particularly studied by focusing on the 1927 law project. The attempted reform of literary property initiated by Jean Zay in 1936, which was strongly influenced by the issue of intellectual workers, should also be considered. Foreign records could be used to understand the return of the scientific property issue in 1946. It could highlight the international circulation of the concept of scientific property and its adaptation to different national contexts.

Diachronic cross-analysis of the symbolic and material economics of science and of the practice of intellectual property in science should shed new light on the interwar debates. Moreover, it would be necessary to consider the reasons for the failure of such a claim, both on the international and national levels. In short, the assumption that should be considered is that this failure, far from resulting from an already independent scientific field, contributed to making science more autonomous.

Conclusion

These propositions are not conclusions but the first steps in an emerging project. They indicate, however, that the propertisation of science did not begin in the 1980s, since science and scientists have always dealt with property in the modern period. The history of the propertisation of science should not attempt to determine the origin of property in science; it should rather distinguish the different patterns of such a process, as the result of a comparative study in time and space.

55 Soraya Boudia, La propriété intellectuelle en science et la communauté scientifique française (1900-1930), Franco-American Conference on the Law, Economics and History of Intellectual Property, Berkeley, October 5-6, 2001, URL: http://emlab.berkeley.edu/users/bhhall/ipconf/boudia_abs.doc (accessed August 1, 2010); D. Miller, Intellectual Property and Narratives of Discovery Invention: The League of Nations' Draft Convention on 'Scientific Property' and its Fate, in: History of Science 46 /2008), no. 3, pp. 299-342.

In the 19th century, scientific disciplines developed their own conception of property which was necessary for their work. Propertisation in science was profoundly linked to the professionalisation of science. However, this quasi-Mertonian – but not functionalist – assumption is not sufficient. Science does not ignore mundane intellectual property rights, since scientific property shares with IPR a common ideology which enables scientific work to be recognised. Moreover, IPR also allow the relationship between science and industry to be managed. More precisely, it is the place where the distinction between science and industry is established. Therefore scientists use nearly the whole spectrum of intellectual and scientific property tools: publications, copyright, patents, *plis cachetés*, etc. An historical inquiry into scientific propertisation has to take into account this diversity of discourses and practices.

Finally, our project is part of a wider discussion. The theoretical objective relates to a dual analysis of science. Can we reduce science to its "worldly" aspects? Should we emphasise "strictly scientific" factors? Can we, alternatively, place these two types of approaches on the same level? The history of scientific propertisation offers a new and conducive basis for reflection. It refers to both mechanisms of reputation and to intellectual property rights. And it concerns both symbolic and material economics. It does not require favouring one over the other and justifies interest in the historical economics of science. It makes us understand this current issue without being prisoners of the short term.

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