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The Application of Taylorism in France: The Role of the Michelin Family in the Rationalization of French Work

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Early in the twentieth century, the first works concerning Frederick W. Taylor's theories were published in France. Real interest in applying these new work methods began at the end of World War I, when entrepreneurs began looking for new and better ways of avoiding waste in their work forces and operations. In this essay, I analyze the Michelin Company's particular attraction to Taylorism, which began during the 1910s. Marcel Michelin introduced the firm to the principles of scientific management after a journey to the United States to study the new theories. Michelin began an important campaign to disseminate information about the Taylor system in the French industrial sector, resulting in 1921 in the founding of the Comité Michelin. Although the committee ended its campaign in the early 1930s, Michelin's interest continued, and the company went on to create and publish a magazine that dealt with Taylorism and its uses at Michelin.

The first works dealing with the theories of Frederick Winslow Taylor appeared in France at the beginning of the twentieth century. Most were translations of books written by Taylor or his followers.[1] The real interest

[1] Georges De Ram, "Quelques notes sur un essai d'application du système Taylor dans un grand atelier mécanique français," *Revue de Métallurgie* 6 (Sept. 1909): 929-33; Henri Le Chatelier, "Le système Taylor," *Bulletin de la Société d'encouragement pour l'industrie nationale* 113 (March 1914): 449-50; Henri Le

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URL: http://www.thebhc.org/publications/BEHonline/2009/tesi.pdf.

in his methods grew among French entrepreneurs at the end of World War I. The condition of French industry after the war explained this attraction, as the country faced significant new challenges.

With declines in the quantity and quality of the labor market, industrialists began to look for innovative and better methods of organizations to avoid waste in their work forces as well as in their operations.[2] They wished to have the best performance from both mechanical and human labor.[3] This led to the creation of systems inspired by the American example. As interpreted and adapted, they became important elements in a "French rationalization."[4] The establishment of centers for technical and scientific research, such as the Center of Administrative Studies founded by Henri Fayol, revealed the attraction to scientific management.[5] However, the organizations dedicated to scientific management were really information and propaganda centers, not research centers; they tried to adapt American methods to the French mentality, rather than contributing original science of their own.

In light of this, we can analyze the special attraction of the Michelin Company to Taylorism.[6] During the 1920s, Michelin began a propaganda campaign to advance the Taylor system, creating the Comité Michelin. The committee's activities ended in the early 1930s, but the firm continued to support the adoption of Taylor's ideas, publishing a magazine, *Prosperité*, that dealt with scientific management and its applications in the French firm.

Chatelier, "Frederick Winslow Taylor, 1856-1915," *Revue de Métallurgie*, 12 (April 1915): 185-96; Frederick Winslow Taylor, *Organisation scientifique: principes et applications* (Paris, 1915), 5-25; Taylor, *Études sur l'organisation du travail dans les usines* (Angers, 1907), 400-412; Taylor, *La Direction des ateliers: Étude suivie d'un mémoire sur l'emploi des courroies et d'une note sur l'utilisation des ingénieurs diplômes* (Paris, 1923), 633-736.

[2] Aimée Moutet, *Les logiques de l'entreprise: La rationalisation dans l'industrie française de l'entre deux guerre* (Paris, 1997), 20.

[3] André Citroën, "L'Organisation scientifique du travail," report presented at the Musée Social on 21 Dec. 1918, pp. 1-2.

[4] Antonin Franchet and Léon Franchet, *Pour former les hommes qu'il faut à la France de l'après-guerre* (Paris, 1923), 6-7; Charles de Fréminville, *La mise en pratique des nouvelles méthodes de travail* (Paris, 1918), 9-10; Commandant Hourst, "La taylorisation et son application aux conditions industrielles de l'après-guerre," *L'ingénieur–constructeur* 106 (Sept.-Oct. 1916): 193-219.

[5] Henri Fayol, *Administration industrielle et générale, prévoyance, organisation-commandement, coordination-contrôle* (Paris, 1925), 95-99.

[6] Paul Devinat, *Scientific Management in Europe: History of Management Thought* (1927; New York, 1979), 78-79.

Michelin's interest in Taylorism was born during the early 1910s, when Marcel Michelin traveled to the United States to learn the principles of scientific management. They were first applied in Michelin's French workshops at Clermont Ferrand in connection with production during the First World War. By examining Michelin's propaganda activity, we can see the successes and failures in the company's efforts to advocate the introduction of Taylorism in France.

The Role of the Michelin Brothers in the Dissemination of Scientific Management in France

During the 1920s, Michelin began a propaganda campaign in support of Taylor's method. This action led to the creation of the Comité Michelin.

The Comité Michelin: An instrument for supporting Americanization

During the 1920s, Edouard Michelin and his brother André originated a new propaganda organization to promote Taylor's ideas. The special committee relied on the cooperation and support of the most important leaders and engineers of that time, including Charles de Fréminville, Henri Le Chatelier, Paul Nusbaumer, and others.[7] The French firm financed the activities of the Comité through the Fondation Michelin, formed by the company's most important managers, including Marcel Michelin, Pierre Bourdon, and Robert Puiseux.

The committee's first act was the creation of a special library, which was located in the building where the Société d'Encouragement pour l'Industrie Nationale (SEIN) was located and, therefore, became part of that pre-existing library.[8] A new librarian was hired, whose duties included updating a special collection concerning Frederick W. Taylor and all the connected topics, and especially maintaining a list of the most important articles that appeared in American journals such as *Engineering Magazine*. Between 1922 and 1923, the committee organized six seminars dealing with Taylorism. Charles de Fréminville presented the

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[7] Charles de Fréminville, *Les Principes fondamentaux de la méthode Taylor* (Paris, 1918), 4-16.

[8] Jean-Antoine Chaptal and other leaders, engineers, and statesmen of that time founded the SEIN in 1801. Its activity permitted the understanding and dissemination of inventions and discoveries such as photography, the four-stroke engine, cinema, and so forth. Pietro Redondi, "Nation et enterprise: la Société d'Encouragement pour l'industrie nationale, 1801-1815," *History and Technology* 5 (May 1988): 193-222; Michel Letté, "Henry Le Chatelier et les réformes de la Société d'Encouragement pour l'industrie nationale, 1884-1906: une integration progressive de la science industrielle comme principe directeur de l'innovation," *Sciences et Techniques en Perspective* 1 (1997): 347-404; Michel Letté, "Henry Le Chatelier (1850-1936) et ses archives privées récemment deposes à l'Académie des Sciences," *Comptes rendus de l'Académie des sciences* 322 (1996): 707-12.

first one; the others were offered by an industrialist who had made a study trip in the United States.[9] Conferences sponsored by the committee took place in one of the SEIN rooms. At the same time, the Comité established new relationships with the *Grandes Écoles*, which provided a majority of the members of the Comité.[10] A cycle of seminars took place at the Conservatoire des Arts et Métiers, the École des Ponts et Chaussées, and at the École des Mines.

The meetings were divided into two sections. The first dealt with general principles of scientific management, which were explained in general terms. During the second section, students could study and analyze practical applications of those principles. In 1924, the Comité became a member of the Taylor Society and received monthly bulletins from its American partner.[11] Moreover, it financed publications of works dealing with Taylorism and also organized some practical classes. For example, a class on timing took place at the Conservatoire des Arts et Métiers. The first session began in 1922, and engaged seventy people. The same type of course was offered at the École Nationale des Arts et Métiers.[12] The École de Ponts et Chaussées and the École des Postes, Téléphones et Télégraphes were the only institutions that organized special classes on organization. The first special class arranged for Albert Irénée Caquot to give six seminars on the organization of sites of public

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[9] Meeting on 16 June 1924, Michelin Foundation, Taylor System, box 5, Archives of the Academy of Sciences, Committee on Scientific Management.

[10] These are the Conservatoire des Arts et Métiers, the École des Ponts et Chaussées, the Polytechnique, the École Centrale, and the École des Mines.

[11] In 1910, a dozen members of the American Society of Mechanical Engineers, led by such men as James M. Dodge, Frank B. Gilbreth, Robert T. Kent, Conrad Lauer, Carl G. Barth, Morris L. Cooke, and H. King Hathaway began to meet regularly for continued, more intensive, discussion of management. At the beginning there was no formal society, but in the winter of 1910-1911 the organization was formalized and the Society to Promote the Science of Management came into being. It continued to hold formal meetings, and in December 1914 began publication of a periodical bulletin. After World War I, the society established a New York office with a full-time executive and, in honor of the pioneer of engineer-executives who had died in 1915, changed its name to the Taylor Society; see Percy S. Brown, "The Works and Aims of the Taylor Society," *Annals of the American Academy of Political and Social Science* 119 (May 1925): 134-39.

[12] Victor Cambon, *L'Industrie organisée d'après les méthodes américaines, leçons professées à l'École Centrale des Arts et Manufactures* (Paris, 1920), 14-26.

works.[13] The second featured Charles de Fréminville, who summed up his experience with the organization of the mail, telegraph, and telephone service in three sessions. After the courses, students had to undertake two-week apprenticeships in a company and write a report on their experience.

Between 1922 and 1923, 73 young engineers were divided among fourteen different companies. The following year the number of apprentices grew to 105, and by 1925, there were 128 people involved in this endeavor. Between 1926 and 1932, 70-80 people participated each year. By 1931, however, only a few factories were available to be involved in this activity.[14]

Marie Jean Majorelle drew up an analysis of the reports delivered by the students, classifying them into four categories: "mediocre or poor," "passable," "quite good," and "good."[15] The worst two groups presented some difficulties. They tended to be articulate because they were given at a public meeting, but they were inaccurate. Moreover, they showed an incomplete assimilation of the ideas explained during the apprenticeship, and even worse, copied the suggestions and explanations given by the supervisors. They also contained many spelling errors. Reports graded "quite good" were descriptive, but they were well written and revealed serious effort. Nevertheless, their analysis was restricted to a superficial version of the facts. The best group could be divided into two categories. The first included descriptive analyses whose authors tried to explain and understand the activities within the company where they served their apprenticeship. The second category comprised reports of engineers involved in dealing with a particular aspect of a problem. After having found a solution, they presented their results as a case study.[16]

The majority of the reports were poor. That consideration led the Comité to develop another strategy that reduced the number of stages and increased their length. The quality problem was most evident for the Génie Maritime (Naval Engineers) and the École Supérieure de l'Aéronautique (School of Aviation).

The firms involved in the program dealt in various ways with the engineers who were assigned as their apprentices. Sometimes companies left the students free to move around and decide where they wanted to

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[13] He was a student of the École polytechnique (graduating in 1899) and of the École des Ponts et Chaussées. In 1922, he became professor of materials at the *École des Mines*.

[14] Report of the meeting of the Michelin committee, 11 June 1931, box 7, Archives of the Academy of Sciences.

[15] He was a student of the École Polytechnique (graduated 1913) and of the École des Mines of Paris (graduated 1919).

[16] Note on the reports presented after the apprenticeship in 1925, Michelin Foundation, Taylor System, box 7, Archives of the Academy of Sciences.

begin. Other companies required the engineers to attend some preliminary meetings, after which they worked with a supervisor. Sometimes they were asked to solve a problem connected to the company's activities.

The majority of the student apprentices preferred the first approach because it helped them to write a better, more interesting report. The second approach produced worse results in terms of uncompleted reports. Nevertheless, it appeared that greater freedom of access within the company could permit a curious and intuitive spirit to understand many different aspects of running a company and therefore obtain better results.[17]

According to Aimée Moutet, despite the data collected, the apprenticeships were considered partial failures. Scientific education and lack of work experience by the Comité's technician members prevented them from understanding the real role of practical experience.[18] Many of them were not really involved in any practical aspect of scientific management other than timing.[19] They devoted little effort to work rationalization. In fact, of three hundred engineers who experienced the benefits of an apprenticeship, only three-quarters became high-level scientific planners. Yet the Michelin Company assigned almost all its available resources to the activities of the Comité (see Table 1). Its participation rose from 80,000 francs in 1922 to 100,000 francs in 1926.[20] The Comité organized 860 sites in the French companies that adopted Taylor's method.[21]

Moreover, thanks to the committee's support, the first conference on scientific management took place in Paris in 1923.[22] In reality, the idea of gathering the most important experts on scientific management came from a small group of journalists and management consultants. The event was a success, thanks to the support of Henri Le Chatelier and his fellows, Henri Fayol, SEIN grants, the Society of Civil Engineers, important figures

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[17] Reports of the apprentices, Michelin Foundation, Taylor System, box 5, Archives of the Academy of Sciences.

[18] Moutet, *Les logiques de l'entreprise*, 36-37.

[19] Fiscal year 1922-1923, fiscal year 1923-1924, Michelin Foundation, Taylor System, box 5; Committee of Scientific Management, 30 July 1926; both Archives of the Academy of Sciences.

[20] Moutet, *Les logiques de l'entreprise*, 38; Jean Milhaud, "Quelques Aspects actuels de l'Organisation industrielle aux États-Unis, philosophie de l'homme d'affaire," paper presented during a session of the Comité National de l'Organisation Française, 18 July 1929 (Paris, 1929), 3-31.

[21] Stephen Harp, *Marketing Michelin: Advertising & Cultural Identity in Twentieth-Century France* (Baltimore, Md., 2001), 198.

[22] Report of the meeting of the Michelin Committee of 11 June 1931 at M. H. Le Chatelier's house, 17 June 1931, p. 1, box 7, Committee of Scientific Management, Archives of the Academy of Sciences.

from universities, and the financial (though unofficial) support of the Comité, which refused to support the conference publicly.

Beginning in 1925, the activity of the Comité was reduced significantly, but its creation paved the way for the founding of the Comité National de l'Organisation Française (CNOF) in 1926.[23]

TABLE I
Michelin Company Grants to the Comité Michelin, 1922-1926

Balance:	**1922-1923**	**1923-1924**	**1924-1925**	**1925-1926**
Credit available:	81,597.90	100,220.15	100,248	100,075.20
Residual in the schools coffers:	1,597.90	220.15	248	75.20
Credit granted by Michelin:	80,000.00	100,000	100,000	100,000
Expenditure:	71,075.80	50,857.90	55,217.85	59,598.20
Surplus:	10,522.01	49,362.25	45,030.15	40,477.00

Sources: Fiscal year 1922-1923, fiscal year 1923-1924, Michelin Foundation, Taylor System, box 5; Committee of Scientific Management, 30 July 1926; both Archives of the Academy of Sciences.

Comité activity ended between 1931 and 1932, following the death of André Michelin in 1931. The Comité had to face its weaknesses. First, the students never used the library as a real research center. Moreover, because of the widespread dissemination of Taylor's theories, many teaching institutions in France offered classes or conferences on scientific management. These factors diminished the importance of the committee's work in the business world.

Developing a different means of propaganda: the revue Prospérité

During the second half of the 1920s, the Michelin company changed its attitude toward the promotion of scientific management. The firm financed a training school for young engineers and then hired the best of them in its workshops.[24] At the same time, Michelin began a propaganda campaign by publishing a magazine called *Prospérité*.[25] The title gave a

[23] Moutet, *Les logiques de l'entreprise*, 37.

[24] Devinat, *Scientific Management in Europe*, 79.

[25] It was published from 1928 to 1933.

simple explanation of the goals of scientific management: by modernizing the work system, Taylor's principles increased output and brought prosperity and wealth. Through the circulation of this magazine, the firm continued its personal struggle to affirm the supremacy of scientific management. Michelin exploited its own experience to point out the improvements the method could bring to any firm. The contents of *Prospérité* can be divided into three categories: works of popularization, technical issues, and miscellaneous subjects.

The popularization category was an effective means of propaganda.[26] The technical issues explained how scientific management had been applied in Michelin's workshops.[27] In the first two issues Michelin illustrated the most important characteristics of Taylor's principles through some practical examples.[28] They presented Taylor's life and his attitude toward solving problems connected to his work. The importance of adopting the Taylor system was well explained by André Michelin during a conference at the École Centrale of Paris:

> Study each action with care and one by one, strive yourself to put everything in the right place on your list . . . ; show to your workmen they don't have to make useless movements . . . ; finally, my dear fellow students, let me wish you two qualities: have imagination, be revolutionary, but be so in the right sense, clear out our industry from the old mistakes that would condemn it to disappear . . . .[29]

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[26] *Ce que Taylor dit de sa méthode (expose fait par F. W. Taylor devant une commission d'enquête* (Clermont Ferrand, 1927), 5-6; *Le succès (causerie à de jeunes ingénieurs par F. W. Taylor)* (Clermont Ferrand, 1927), 3-16; "Aux dépens du gaspillage ou cela vaut-il la peine de s'occuper de la méthode Taylor?" *Prospérité* 1, no. 3 (Jan. 1929); "Sa Majesté le client," *Prospérité* 1, supplement to no. 4 (March 1929): 8-9, 16; "Sam et François," *Prospérité* 2, no. 5 (April-May-June 1929); "Sur le tas ou conseils pour débuter dans la méthode Taylor," *Prospérité* 2, no. 7 (Dec. 1929); all in Michelin Archives.

[27] "Pourquoi et comment chronométrer," *Prospérité* 1, no. 1 (April-May-June 1928), 29; "La préparation du travail," *Prospérité* 1, no. 2 (July-Aug.-Sept. 1928): 8; "Comment nous avons taylorisé notre atelier de mécanique d'entretien," *Prospérité* 1, supplement to no. 2 (Aug. 1928): 4; "Sur le tas ou conseils pour débuter dans la méthode Taylor," *Prospérité*, 2, no. 7 **(**Dec. 1929): 6-14; "Le Chronographe," *Prospérité* 4, no. 9 (April-May-June 1931): 1-15; "Suggestions: Comment nous avons amené notre personnel à collaborer avec nous à la recherche des progrès et des économies," *Prospérité* 6, no. 15 (Oct.-Nov.-Dec. 1933): 25; all in Michelin Archives.

[28] "Sur le tas ou conseils pour débuter dans la méthode Taylor," *Prospérité* 2, no. 7 (Dec. 1929): 1-7, Michelin Archives.

[29] Cambon, *L'Industrie organisée*, 165.

The other subjects addressed in *Prospérité* included social action by Michelin to improve its workers' living conditions.[30]

At the same time, Michelin emphasized the importance of proceeding in phases, trying to answer the elementary questions. Only then would it be possible to move to more structured problems. The company explained, through examples, the role of a deep preliminary analysis of the issues.[31] Trying to persuade its workers to support the new method, Michelin compared the economic status of a French worker and an American worker. The better conditions of the American work force were attributed to the adoption of the Taylor system in the United States. Michelin used the data collected by its American plant in Milltown, New Jersey.[32] Many of the American workers had higher salaries, a house with land, and a car. Adopting two imaginary characters called Sam and François, Michelin explained that Sam led a satisfactory life, while his French counterpart François did not have the same possibilities.

According to the company's argument, the situation could change only by achieving a simple goal: increase output. Boosting production meant reduced prices and raised purchasing power. Michelin warned readers about the hindrances that could prevent them from reaching their final goal: waste of time and materials.[33] Referring to its relationship with its workers, the tire maker dealt with a delicate issue: the determination of salary. Michelin showed how the application of the principles established by Taylor could end the disagreements between owner and worker. According to the French company, Taylor's life could be used as an

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[30] *Une expérience de natalité: Peut-on faire plus d'enfants en France? Les résultats obtenus chez Michelin permettent de répondre: oui!* (Clermont Ferrand, 1926), 5-9; *Œuvres sociales de Michelin et Cie* (Clermont Ferrand, 1927), 9-12; *Allocations et rentes pour famille nombreuses* (Clermont Ferrand, 1926), 3; *Une expérience de natalité* (Clermont Ferrand, 1926), 3-11; "Une dépense qui paie: un service médical," *Prospérité* 1, no. 3 (Oct.-Dec. 1928): 2; "Une expérience de natalité," *Prospérité* 1, no. 4 (Jan.-March 1929): 12; "La Jambe de Ben Kacem ou comment nous appliquons la loi sur les accidents du travail," *Prospérité* 2, supplement to no. 5 (May 1929): 1-2 , 4-6; "Une expérience d'éducation physique," *Prospérité* 5, no. 12 (April-June 1932): 5-7; all in Michelin Archives.

[31] "Sam et François," *Prospérité* 2, no. 5 (April-May-June 1929): 1-7.

[32] Milltown Historical Society, *History of Milltown* (Milltown, N.J., 1936), 30-47; Mira Wilkins, *The History of Foreign Investments in the United States, 1914-1945* (Cambridge, Mass., 2004), 421-24; Mira Wilkins, "French Multinationals in the United States: An Historical Perspective," *Entreprises et Histoire* 3 (May 1993): 14-29.

[33] "Aux dépens du gaspillage ou cela vaut-il la peine de s'occuper de la méthode Taylor?" *Prospérité* 1, no. 3 (Jan. 1929): 4-25.

example for teaching the right way to act in business. Strong attention and determination on the part of the worker, careful analysis of the time spent on any action, and reduction of waste could bring about a satisfactory agreement between the work force and the company.

From a Study Trip to the Application of Scientific Management in the Company's Workshops

The study trip to the United States made by Marcel Michelin in 1912 was the first step toward the application of Taylor's method within the French company.

From Marcel Michelin's trip to the application of scientific manage-ment at Milltown

Analyzing the origins of Michelin's interest in Taylor's ideas, it is important to consider the role played by Marcel Michelin's study trip in 1912.[34] It was Henri Le Chatelier who introduced André and Edouard to scientific management. The two brothers read Taylor's works in English and understood the implications of this new method for the industrial development of their firm. On June 28, 1912, Edouard sent a letter to Frederick Winslow Taylor asking to send his nephew for a short study trip in the United States. The patron explained the reasons for this voyage to the American engineer:

> I have read with the greatest interest your book on Shop management and Scientific organization of works. . . . Being unable to go to America, I send you my nephew Marcel Michelin and I hope you will be kind enough to allow him to visit some of the works where your methods are applied. . . . I understand fully that a long time is necessary to master those matters . . . but I think that, when my nephew returns home . . . we may discuss the matter more fully, and that I will be able to choose the engineer whom I may then send in America, to learn fully and completely this new science.[35]

Two days later, Henri Le Chatelier also sent a letter to Taylor. He explained that the French tire maker had expressed a great interest in his principles and was ready to send some engineers to the United States after

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[34] Marcel Michelin was one of André Michelin's sons. He served an apprenticeship at the company subsidiary in London to learn the English language. He began to work in Clermont Ferrand in 1909. Beginning in 1913, he was placed at the head of the testing department. "Marcel Michelin," *Bulletin Intérieur Michelin* 16 (June 1945): 1, Michelin Archives.

[35] Letter of 28 July 1912, Correspondence between Frederick Winslow Taylor and Edouard Michelin, Michelin Archives.

analyzing the results of Marcel's trip.[36] Marcel reached the American coast on August 10.[37]

He began his visit to the workshops on August 19, 1912. Marcel met Taylor only once during his trip, however. Writing to Edouard Michelin, Taylor apologized for not being present during Marcel's visits.[38] H. King Hathaway was appointed to be Marcel's guide during his trip.[39] During the first week Marcel visited the Tabor Manufacturing Company and the Link-Belt Company.[40] Then he showed Hathaway the Michelin Tire Company in Milltown. Hathaway's impression was positive. He wrote to Taylor, saying, "Their plant is, however, very well managed as it is, and the greatest increase in production would come as a result of minute and painstaking study of each of the operations that would lead to improvements in the methods and appliances use."[41]

Marcel was interested in the possibilities of applying Taylor's system to the machine shops, which were very small in Milltown, employing twenty-five to thirty workers.[42] He also visited some automobile plants with which Michelin did business. The following week, Hathaway brought Marcel to the Plimpton Press, the Acme Wire Company, the Yale & Towne Manufacturing Company, and the Brighton Mills of Passaic.[43] (Hathaway could not take Marcel to the Watertown Arsenal because the law prevented access by a non-U.S. citizen to arsenals or navy yards.[44]) Before going back

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[36] Letter from Henri Le Chatelier to F. W. Taylor, 30 July 1912, file 63B, Frederick Winslow Taylor Collection, Samuel C. Williams Library, Stevens Institute of Technology, Hoboken, N.J. (hereafter, Taylor Collection).

[37] Ship manifest of the trip made by Marcel Michelin. URL: http://www.ellisisland.org.

[38] His wife was seriously ill and Taylor could not leave her. Letter from F. W. Taylor to Edouard Michelin, 29 Aug. 1912, file 180C, Taylor Collection.

[39] H. King Hathaway was an engineer who became F. W. Taylor's most important collaborator.

[40] Daniel Nelson, *Managers and Workers: Origins of the Twentieth-Century Factory System in the United States, 1880-1920* (Madison, Wisc., 1996), 62-64; Kazuo Usui, *The Development of Marketing Management: The Case of the United States, 1910-1940* (Burlington, Vt., 2008), 34.

[41] Letter from H. K. Hathaway to F. W. Taylor, 27 Aug. 1912, file 180C, Taylor Collection.

[42] The machine shop in Clermont Ferrand employed 2,500 men. The department manufactured rims. Ibid.

[43] Patricia J. Fanning, *Norwood: A History* (Charleston, S.C., 2002), 35; Jean Chevalier, *La Technique de l'organisation des entreprises*, Préface de Ch. de Fréminville (Paris, 1928), 22.

[44] Hugh G. J. Aitken, *Scientific Management in Action: Taylorism at Watertown Arsenal, 1908-1915* (Princeton, N.J., 1985), 19-45.

to France, Marcel sent a letter to Taylor describing his first impressions of Taylor's method:

> . . . I derived great pleasure and benefit from the visits of the various plants I made together with Mr Hathaway. . . . Now I understand a great deal better what is meant by "Scientific management" and I realize what an enormous advantage can be obtained by working in accord with such a method. I am going back to France now, and I am quite prepared to discuss, with my uncle, the way in which we will apply your method to our particular branch of industry.[45]

Hathaway drew up a twelve-page report and sent it to Marcel Michelin. In it, he gave some suggestions about the application of the Taylor system in the Michelin workshops; he explained the meaning of Taylor's theories and outlined a plan for their application in the French workshops. Hathaway explained that the system was adaptable and could be used in a number of different industries. The report was divided into three parts. In part one, he suggested the characteristics of the two French workers who would be sent to the United States. In part two, he analyzed the organization of the workshops in the American plant. Finally, he explained how to speed up the introduction of scientific management in the factory in France.

The introduction of the Taylor system, Hathaway wrote, needed time. A long period of preparatory work was the first step, geared toward changing the mental attitude and habits of the employees.[46] For that reason, Hathaway was convinced that scientific management should first be applied in the American plant, then in France. He proposed that two men from Clermont Ferrand should be sent to Milltown. There they would assist, under the direction of a competent consulting engineer, in the system's development. The two men needed to be mechanical engineers with experience in the workshops as both workers and supervisors.

One would possess a deep knowledge of workers and their habits. He would be acquainted with the work done in the machine shops and rim department. After his training he would able to master some important aspects of scientific management, such as the standardization of tools, machines, and the routing system. The second man should be familiar with manufacturing tires. He would have to devise improvements to existing machines and make new ones.[47] Hathaway estimated that the expected time to finish the system's installation was three years.

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[45] Letter from Marcel Michelin to H. K. Hathaway, 11 Sept. 1912, file 180C, Taylor Collection.

[46] Report to Mr. Marcel Michelin, Clermont, France, 20 Sept. 1912, p. 2, file 180B, Taylor Collection.

[47] Ibid., 3.

At the same time, Hathaway explained his opinions regarding the activities at Milltown. Some changes were needed. The first step was to establish a central planning department that would coordinate all the other departments. The progress of work had to be recorded at each stage; each department should establish a sub-planning department that would lay out the order of work and receive reports of the work done.

The organization of the department where tires were molded and vulcanized needed to be improved. Processes had to be studied and modified. Current production methods involved too many phases and people. Hathaway thought that women could do the work in the department where small jobs (such as assembling valves and preparing various rubberized strips of cloth) were performed after the department adopted a routing system and standardized the processes.[48]

The inner tube department already operated at a very high level. Some improvements could be realized by making changes in the machinery and appliances used. The department where the crude rubber was prepared was well organized with a small number of workers. In order to extend the system in Clermont Ferrand, a corps of workers could be trained in Milltown, together with the two engineers coming from France. Each could take charge of some part of the system. Once they were ready, they could then introduce what they had learned in Clermont. The two engineers would assume the general direction in adapting the Taylor system.[49]

Finally, Hathaway wrote a program for the development of the system in Milltown. Michelin should make a preliminary study, which involved collecting data about its plant, organization, products, and methods of manufacture. A group of employees had to undertake the development of one or more phases in each department, including storeroom organization, storage system, tool room system, maintenance department, and collection of data concerning machinery, products, and materials. The next step was to establish a routing system and a planning department.

By adopting these structures, the firm would effect a change in the type of foremanship in the shop, moving it to a functional role, serving the needs of the entire company. A time study of the various processes, improvement in methods, fixing standards, and establishing a system of functional foremanship would permit the company to master the new method. The factory also had to create a bonus system and a cost accounting system, and a process for delivering periodic reports.[50]

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[48] Ibid., 5.

[49] Ibid., 6-7.

[50] Ibid., 9-10.

Taylor, who analyzed Hathaway's reports, was satisfied with his collaborator's work, but he asked him to make few changes and send them to Marcel. He reduced the time necessary for fully adopting the method from three years to six to twelve months. He also suggested increasing the number of workers sent from Clermont to Milltown. Each would learn one aspect of the method; once the workers mastered these tasks they could go back to France and begin applying them.[51] A year later, Michelin decided to send Revol, one of his engineers, to Milltown.[52] Henri Le Chatelier informed Taylor about this decision, but Michelin changed his mind. The tire maker decided to introduce scientific management in his workshops without sending more people to the United States. The firm exploited Revol's experience at Renault's works and also used Hathaway's reports and Taylor's lectures.[53]

Applications in the Michelin's workshops

Taylorism clearly influenced the French company's activities. It is possible to identify three types of practical applications: in production, in social affairs, and in pedagogical functions. The production field changes included time-motion studies done with a stopwatch, the reorganization of the gas mask workshop, airplane production during World War I, and the reorganization of the machine workshop. Social aspects included the construction of housing for the work force.[54] Finally, the creation of an employee suggestion system was an example of the third type of application.[55]

The use of the stopwatch brought about a reduction in production costs. In trying to increase workers' productivity, the company had to

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[51] Letter from F. W. Taylor to H. K. Hathaway, 3 Oct. 1912; letter from H. K. Hathaway to Marcel Michelin, 4 Oct. 1912, both file 180C, Taylor Collection.

[52] Revol was an engineer who had worked for Renault. H. Le Chatelier asked him to go to the United States to learn the Taylor system. Taylor was enthusiastic about this project, because he believed the French engineer would be able to introduce his method to many French companies. The project was abandoned because Michelin hired Revol. letter from F. W. Taylor to H. Le Chatelier, 17 Sept. 1912, file 63B, Taylor Collection; Patrick Fridenson, *Histoire des usines Renault: Naissance de la grande enterprise, 1898-1939* (Paris, 1972), 65-82.

[53] Letter from H. Le Chatelier to F. W. Taylor, 8 July 1913, file 63B, Taylor Collection; Patrick Fridenson, "Un tournant taylorien de la société française: 1904-1914," *Annales ESC* 5 (1987): 1031-61.

[54] Georges Ribeill, "Aperçu Sommaire sur la rationalisation et l'industrialisation du bâtiment dans l'entre-deux-guerres," Actes des colloques des 16 et 17 novembre 1983, plan construction et habitat, pp. 63-78.

[55] Hugo Munsterberg, *Psychology and Industrial Efficiency* (New York, 1913), 49-56.

consider factors such as measurement of worker's movements, useless or inefficient movements, the adoption of the most efficient method, and the definition of how quickly a given worker could complete a given task.[56] Michelin began to institute the timing method in 1908. Time-keepers were not specialists. They could be foremen, engineers, or workers, but they had to have three characteristics: intelligence, practical experience, and commitment progress.[57]

Michelin first applied Taylor's ideas in its workshops during World War I. They were adopted for the assembly of the Breguet-Michelin airplanes and in the manufacturing of gas masks, which involved a female work force.[58] The French company's engineers planned an efficient production system. After the time necessary for any single task was determined, each part of the mask was put on an automatic belt, creating an assembly line. The workers were placed on both sides of the belt. Any of them could pick up a piece and complete the work. Once finished, the piece was put back on the belt for the following operation, and when the object was complete, it fell into a basket.[59]

In the 1920s, Michelin reorganized its machine workshop. This represented the first application of Taylorism in an area not connected to war production and the first time Michelin adopted a planning system. The workshop received many orders every day. Its customers were the various company services; the shop made pieces for repairs and others for machines assembled by the company itself. Michelin had to increase output and reduce production costs. In addition, the workshop had to guarantee the highest quality for any item produced.[60]

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[56] "Pourquoi & comment chronométrer," *Prospérité*, 1, no.1 (April-May-June 1928): 3.

[57] Ibid., 4, 21, 30.

[58] Emmanuel Chadeau, *De Blériot à Dassault: Histoire de l'industrie aéronautique en France, 1900-1950* (Paris, 1987), 100-101, 305; Antoine Champeaux, *Michelin et l'aviation 1896-1945: Patriotisme industriel et innovation* (Paris, 2006), 20-70; Champeaux, "Bibendum et les débuts de l'aviation (1908-1914)," *Guerres mondiales et conflits contemporains*, no. 209 (2003), 25-43; Commandant Guignard, "Les fabrications de l'aviation militaire pendant la guerre mondiale," in *L'Aéronautique pendant la guerre mondiale*, ed. M. L. Marchis (Paris, 1919), 385; Annie Moulin Bourret, *Guerre et industrie, Clermont-Ferrand, 1912-1922: La victoire du pneu*, 2 vols. (Clermont Ferrand, 1997), 2: 204-5, 305.

[59] Cambon, *L'Industrie organisée*, 165-66.

[60] "Comment nous avons taylorisé notre atelier de mécanique d'entretien," *Prospérité*, 1, supplement to no. 2 (Aug. 1928): 4, Michelin Archives.

The application required two weeks of preparatory work.[61] In January 1921, a first analysis of the difficulties facing them was ready. The machines were old and not designed for their tasks. Michelin had purchased many machines to support the war effort, and they had become obsolete. Moreover, it was necessary to reorganize the plan of the workshop. The firm had to improve access to tools: under the system in use, if workers needed a special tool, they had to leave their places to find or make it. Items in need of repair were abandoned on the shelves without tags identifying the work required. Some information was not communicated in drawings, but was orally transmitted from the client to the head of the workshop, then to the foreman, then to the boss of the service, and, finally, to the worker. This long chain of oral communication could easily produce mistakes.[62] At the same time, customers were poorly informed regarding the status of their orders. The room where completed objects were placed on the shelves was not well organized. On the other hand, there were some positive aspects that the firm wanted to maintain, such as the good quality of the work and repairs, a result of the competence of the staff.[63]

In January 1921, Michelin made a list of the problems to solve:

I. Recover the machines in a good condition;

II. Eliminate the waste of time and materials caused by a bad workshop layout;

III. Create good tools;

IV. Maintain the tools in a good condition;

V. Eliminate the waste of time and materials caused by the replacement of tools;

VI. Eliminate the waste of time and materials caused by the delivery of bad materials;

VII. Eliminate the waste of time and materials caused by lack of accuracy in the orders;

VIII. Eliminate the waste of time by workers during the change of tasks; machines must not be stopped when they can work;

IX. Eliminate mistakes;

X. Inform customers without bothering the workshop;

XI. Obtain the best return by the workers, paying them in a correct way;

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[61] "La préparation du travail," *Prospérité* 1, no. 2 (July-Aug.-Sept. 1928): 8.

[62] Ibid., 5.

[63] Ibid., 9.

XII. Establish a serious control of items;

XIII. Eliminate the waste of materials caused by quality defects;

XIV. Create the jobs necessary to staff a suggestion program; determine the role of each employee.[64]

Some of these points required a special effort by the firm. For example, Michelin initiated a tool replacement system. When an instrument needed to be changed, it was placed on a tray; this action caused two electric lamps to light. The signal attracted the attention of a delivery person, who changed the tool.[65]

In solving the problem of inaccurate orders, two instruments were introduced: a work schedule and a planning panel. Sketch forms indicating the various tasks were posted on a panel. An employee given the planner role, received them and updated the panel. A dossier that included a general sketch form, drawings, a sketch form of general instructions, and another for the work to be accomplished accompanied every order. Each dossier was placed in a folder. The person in charge of planning had to find solutions when problems arose.[66] The planner was also responsible for customer relations.[67]

The process of adopting scientific management in the mechanical workshop was extremely expensive in both human and financial resources. Over a two-year period, the organization of the workshop involved six engineers. Expenditures for materials, tools, and workers reached 255,000 francs, not including expenditures for the creation of central services.[68]

Firms used scientific management in areas where production was articulated and mechanization could play an important role. Creating a rhythm of output and improving performance were essential to adapting companies to the new necessities of the market. Given these criteria, the construction industry did not conform to the typical application of Taylorism.[69] However, its use by the Michelin Company in constructing worker housing represented an important step in the firm's history.

In building housing for workers (*cités ouvrières*), Michelin adopted methods and techniques to rationalize its building sites that had been

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[64] Ibid., 10.

[65] Ibid., 13.

[66] Ibid., 24.

[67] Ibid., 25; Moutet, *Les logiques de l'entreprise*, 166-67.

[68] La préparation du travail," *Prospérité* 1, no. 2 (July-Aug.-Sept. 1928): 29-31, 81-82.

[69] Horace Bookwalter Drury, *Scientific Management: A History and Criticism*, 2d ed. (New York, 1918), 139-40.

developed in the machine workshop.[70] Michelin applied some practices and concepts that were normally used in scientific management work. In his book, Stephen Harp explains that the French tire maker exploited Taylor's ideas to give birth to social welfare activities. In reality, neither Taylor nor Henry Ford had ever considered this aspect as important to increasing output.[71]

In 1909, Michelin founded the "Society of Cheap Housing" (Société des Habitations à Bon Marché) in Clermont Ferrand. It oversaw the construction of housing for workers, using external contractors. It began by creating common housing; every home had water, gas, and lavatories.[72] In 1910, ten individual houses were built. Increasing costs led the firm to build only common housing units between 1911 and 1913 (see Table 2).

TABLE 2
Housing for the Michelin Company

Year	# Housing units
1909-1911	181
1912-1913	213
1914-1917	37
1920-1922	596
1923-1924	664
1925-1929	1,752

Source: Laurence Mokrzycki, *L'Habitat Michelin à Clermont- Ferrand* (Master's thesis, Geography, Université Clermont II, 1985), 8.

In 1919, Michelin decided to build housing using its own work force. Pierre Boulanger was in charge of the operation.[73] The first project concerned the building of a common housing structure. Then the firm moved to the creation of six-room houses, each of which could be divided

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[70] Moutet, *Les logiques de l'entreprise*, 99-100.

[71] Harp, *Marketing Michelin,* 221.

[72] Christian Lamy and Jean-Pierre Fornano, *Michelin-Ville: Le logement ouvrier de l'entreprise Michelin, 1911-1987* (Créer, 1990), 60-100; Laurence Mokrzycki, *L'Habitat Michelin à Clermont- Ferrand* (Master's thesis, Geography, Université Clermont II, 1985), 8, 67; Ribeill, "Aperçu Sommaire," 63-78.

[73] He had experience as a building contractor in the United States from 1908 to 1914.

in two apartments. Michelin exploited the ideas of Frank Gilbreth to begin mass production in the construction field.[74] The work was organized in such a way as to allow the bricklayers to obtain efficient results, thereby conserving resources and work labor.[75] Reducing the cost of building the houses allowed Michelin to rented them for a lower price.[76] Michelin also organized a warehouse for the materials and supplies needed at the building sites.

The use of new materials such as cement helped mechanize the work. From a technical point of view, construction was divided into five steps, each accomplished by a group of workers. Rationalization allowed a reduction in the number of skilled workers needed. Only the team boss was a professional. By adapting scientific management to house construction, Michelin was able to decrease the number of hours necessary to build a house by 49 percent between 1920 and 1925.[77]

From a pedagogical point of view, Michelin was convinced that the adoption of Taylor's principles improved the relationship between the firm and its work force. The employees shared the company's destiny and felt they were part of it.[78] The creation of an employee suggestion program was designed to improve this involvement. Before 1927, Michelin tried to encourage its workers to present their ideas for advances or savings, using boxes or books in which they could leave messages. When Michelin decided to establish a suggestion service, the firm chose one of its engineers with experience in time-motion studies and economics to be its head. He was called the engineer of suggestions, and he worked with a group of twenty people in the service warehouse. His job was to examine their work. If he discovered an area needing economizing or progress, he asked the workers for suggestions.[79] If they did not see anything to change, he gave them few days to think about it. If they came back without any

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[74] Frank Gilbreth, *Motion Study: A Method for Increasing the Efficiency of the Workman* (New York, 1911), 15-55.

[75] Harp, *Marketing Michelin*, 200-201.

[76] *Deux exemples d'application de la méthode Taylor chez Michelin* (Clermont Ferrand, 1925), 2, Michelin Archives.

[77] In 1920, 11,643 hours were needed to construct a house; by 1925, the number had decreased to 5,548; see Claude Petitjean, "Compte rendu du voyage d'étude à Clermont-Ferrand," *Bulletin de la Société des ingénieurs civils de France* (Nov.-Dec. 1925), 926-27; Petitjean, "Une réalisation de la cité-jardin," *Science et industrie* 154 (1926): 17-21.

[78] Paul Négrier, *Organisation Technique et commerciale des usines d'après les méthodes américaines (système Taylor)* (Paris, 1918), vii, 1-5, 182-84.

[79] Suggestions: Comment nous avons amené notre personnel à collaborer avec nous a la recherché des progrès et des économies," *Prospérité* 6, no. 15 (Oct.-Nov.-Dec. 1933): 3.

ideas or solutions he explained what they had to do. Good suggestions were posted anonymously on a panel. When he had trained the first group, the engineer moved on to another.

The program created by Michelin had two tasks. Engineers explained to the workers the improvements achieved because of their suggestions, and they trained foremen to encourage the workers to provide new suggestions.[80] At the same time, the suggestion service had to study how to apply the workers' ideas. The pedagogic function was to allow the staff to understand the benefits derived from a suggestion. A spirit of collaboration between company personnel and the company's interests was accomplished by continuous research on economizing.

Proposals were encouraged through a bonus delivered by the foreman. It was up to the engineer to establish the value of the bonus.[81] This strategy reinforced hierarchical ties within the company. A lack of suggestions could mean the dismissal of a worker. It is important to note that the costs of the service were very high (see Table 3). In the beginning, the suggestion service could not rely on the experience of other services; the number of people connected to it rose to twenty-eight in 1929. As the service developed, the number of workers was reduced to seven or eight people by 1931-1932.

TABLE 3
Work Force Hired for the Suggestion Program

Year	**1928**	**1929**	**1930**	**1931**	**1932**
Personnel	15	28	14	8	7

Source: "Suggestions: Comment nous avons amené notre personnel à collaborer avec nous a la recherché des progrès et des économies," *Prospérité* 6, no. 15 (Oct.-Nov.-Dec. 1933): 20, Michelin Archives.

The engineers had four fundamental tasks: to teach the workers to present suggestions; to disseminate the proposals to the relevant services; to assign the bonuses; and to check on the application of the suggestions.

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[80] Ibid. 4-6, 20-22.

[81] Jean-Marie Lahy, *Le Système Taylor et la physiologie du travail professionnel* (Paris, 1916), 1-16; Jules Amar, *L'Organisation phycologique du travail*, introduction by Henri Le Chatelier (Paris, 1917), 24-35; James Hartness, *Le Facteur humain dans l'organisation du travail*, *traduit par H Perrot et Charles de Fréminville* (Paris, 1918), 1-7.

The number of suggestions presented each year increased (see Table 4), though the value of the service was more effective in the company offices than in the workshops.[82] Analyzing the quality of the suggestions proposed, the percentage of suggestions adopted rose from 38 percent in 1929 to 53 percent in 1932 (see Table 5).[83]

TABLE 4
Suggestions Presented in the Michelin Company

Year	Workshop (Mean)	Office (Mean)	Record in the Workshop	Record in the Office
1929	0.7	2.3	--	--
1930	1.6	5.6	5.5	14.9
1931	2.2	6.9	6.1	25
1932	2.6	7.3	4.8	16.5

Source: "Suggestions: Comment nous avons amené notre personnel à collaborer avec nous à la recherche des progrès et des économies," *Prospérité* 6, no. 15 (Oct.-Nov.-Dec. 1933): 25, Michelin Archives.

TABLE 5
Quality of the Suggestions by Worker, 1928-1932

Year	Good Suggestions/Total Suggestions (%)	Number of Workers Who Presented ≥ 1 Suggestion(s)/ Total Work Force (%)
1928	30	--
1929	34	38
1939	36	43
1931	49	46
1932	55	53

Source: "Suggestions: Comment nous avons amené notre personnel à collaborer avec nous à la recherche des progrès et des économies," *Prospérité* 6, no. 15 (Oct.-Nov.-Dec. 1933): 25, Michelin Archives.

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[82] Suggestions: Comment nous avons amené notre personnel à collaborer avec nous a la recherché des progrès et des économies," *Prospérité* 6, no. 15 (Oct.-Nov.-Dec. 1933): 25.

[83] Ibid.

Trying to simplify the work of the suggestion program, Michelin established a service of economies with a staff comprising people from law schools. Everyone had to focus on one sector of the firm and had to point out a possible savings every day in any field. To spur new suggestions, Michelin initiated a monthly newspaper featuring the proposals, which was distributed in the workshops.[84] Moreover, Edouard Michelin published some notes concerning the adoption of the best suggestions.[85] Also each year, the firm organized a two-week period devoted to suggestions. One week dealt with the realization of economies, the other to the aspects of the workshops that did not work well.

Conclusion

The introduction of the Taylor method in France presents some unique aspects. It explains the engineers' new role in the firm's activities. Michelin's interest in Taylor's ideas drove the company to send a family member to the United States. The company adopted the system in different fields. This strategy had consequences for the firm's private and public activities. Inside the workshops, Michelin tried to increase its performance and reduce costs.

The company supported Taylorism, first with the creation of the Comité Michelin and then by publishing the magazine *Prospérité*. From a practical point of view, by the late 1920s Michelin was in a difficult situation. It needed to preserve its internal market and to face new competition from U.S. tire makers.[86] The firm implemented a deep rationalization of its entire structure. This strategy permitted the company to gain ground. Because of World War II, the results of Michelin's efforts became evident only in the 1950s (and even more so, in the late 1960s) with the new invasion of the American market. We can affirm that Michelin represents a model of adapting and hybridizing methods and techniques imported from the United States. This approach was not in opposition to external influences, but rather a compromise, in which Michelin adapted a foreign system to local requirements.[87] This attitude represents the capacity of the firm to adapt to changing economic situations and to the needs of the tire market itself.

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[84] Ibid. 32, 21; 24.

[85] Notes d'Edouard Michelin, no. 14 (24 May 1928), Michelin Archives.

[86] Lionel Dumond, "L'arrière plan technique," in *Michelin les hommes du pneu*, ed. André Gueslin (Paris, 1993), 44-49.

[87] Jonathan Zeitlin and Gary Herrigel, *Americanization and Its Limits: Reworking US Technology and Management in Post-War Europe and Japan* (New York, 2000), 3.