The public furor that followed the publication of *The Principles of Scientific Management* in 1911 underlined the appeal of Taylor's ideas and their applicability to nonindustrial settings, from social welfare agencies to public school systems. Among the educators who reacted positively to Taylor's message were faculty members at the burgeoning American universities of the second and third decades of the century. University professors, particularly those who prepared students for business careers, were attracted to scientific management because of its implications for the practical curriculum and for their relations with colleagues in more academically respectable and theoretically rigorous disciplines. Intrigued by time study, wage incentives, cost accounting, and other features of Taylor's work, but especially by the idea that management techniques were the building blocks of a larger edifice, a body of theory applicable to any institution, professors of business and engineering found scientific management highly useful. In the decade after Taylor's death, they made it a notable feature of the practical curriculum. By 1930 they rivaled the consultants as promoters of scientific management. As the role of the university in business and society continued to grow, they became the leading interpreters of Taylor's legacy.

The author is indebted to Steven A. Sass and Guy Alchon for their comments and suggestions, and to the National Endowment for the Humanities for financial assistance.
The background to this development is one of the most dramatic chapters in the history of the multiversity. College enrollments grew during the early decades of the century, spurred by the rise of technical and professional occupations and the spread of secondary education. During the most critical growth period, 1915 to the mid 1920s, the proportion of eighteen- to twenty-one-year-olds attending colleges rose from 8 to 12 percent. An additional potent factor was the "entrepreneurial zeal" of administrators and professors, particularly at the less prestigious urban and state universities. Perceiving that middle-class parents would only pay college tuitions if they were confident that their sons (and some daughters) would qualify for well-paying jobs, they aggressively developed new curricula that satisfied the needs of employers and the demands of parents and students. As David O. Levine explains, the university curriculum "became inextricably tied to the nation's economic structure, particularly its white-collar, middle-class sector."

The best example of this development was the growth of collegiate business education. The Wharton School of the University of Pennsylvania, founded in 1881, was the only university college of commerce for more than a decade. Six institutions added business programs between 1898 and 1900; thirty-three universities introduced business majors between 1900 and World War I; and thirty-seven others added business studies during the war period, expressions of the wartime emphasis on discipline and practicality. The postwar years saw a "veritable craze for business education," with 117 new programs by 1924, despite a decided reaction against the asceticism of the war era. Many other schools also introduced business courses on a piecemeal basis. One observer estimated that at least 400 colleges offered some form of business training by 1924. In 1915 there were 9000 business majors; by 1918, 17,000; by 1920, 37,000; and by 1926, 58,000. The number of degrees awarded rose from less than 1000 in 1918 to more than 6000 per year in the late 1920s. Rapid expansion created tensions as well as opportunities. Administrators and professors discovered to their chagrin that many students were career-oriented and anti-intellectual. At such fast-growing urban universities as Northwestern and New York University, which had extensive night school programs and many parttime students, professors struggled against a pervasive trade school outlook. The
Northwestern faculty, for example, had to emphasize job training to maintain enrollments. More surprising was the prevalence of narrowly utilitarian attitudes among fulltime residential students. Administrators found that many students stayed only for a year or two while they took technical courses that qualified them for entry-level jobs. The dean of the Wharton School confessed in 1913 that a two-year liberal arts requirement for admission to the professional program would decimate the school. As it was, Wharton’s junior class was only one-third the size of its freshman class.

The expansion of business studies also exacerbated tensions between the arts and sciences and business faculties. To the former, business education smacked of the clerical and secretarial courses offered by proprietary “business colleges.” After thirty years, Wharton professors still suffered from the “sneers and suspicions” of their colleagues. At many other universities, business professors were isolated and intimidated. A recent study of higher education concludes that business studies “had low prestige, a practical orientation and small scope for knowledge enhancement.” Even before the boom some administrators and professors had tried to raise the quality and reputation of their work. After 1915, as the pressures of the enrollment surge threatened career aspirations, professional recognition, and potentially the quality of the nation’s business leadership, they redoubled their efforts. Their reactions gradually gave business education the aura of serious inquiry and professional respectability that had seemed so notably lacking.

One response grew out of the rise of accounting as a professional specialty and an area of academic concentration. In an era of industrial expansion and big business, the demand for accountants and accounting education seemed inexhaustible. In many universities the growth in accounting enrollments and course offerings was the immediate reason for separating business from economics departments. By all quantitative measures, accounting overshadowed other business disciplines before 1930. It was the raison d’être of university business education. Because of close association with scientific management, it also had the potential to redefine the character and image of business education. Costs systems had been a staple of early systematic management and Taylor had been a prominent accountant before he achieved fame as an expert on
production and labor issues. He and his followers, notably Harrington Emerson, pioneered in the extension of standards to cost data and in the analysis of variances between standard and real performance. By the mid 1920s they had made accounting a powerful management tool, not just a technique for recording and presenting financial data. The link between accounting, the most popular business specialty, and scientific management, the most notable effort to integrate business operations, had potentially fruitful implications for the business curriculum and the role of business education within the university.

But these possibilities never materialized because of two contrary developments. First, the management accounting methods that Taylor, Emerson, and their allies developed were exceedingly cumbersome and costly in the era before the electronic computer. Executives concluded that costs outweighed potential benefits and abandoned them. Second, the growth of external corporate financing and intrusive government, in the form of the income tax amendment, the Federal Reserve Act, the Federal Trade Commission Act, and other measures, overshadowed the link with scientific management. The “demand for financial reports audited by independent public accountants” had a “profound and lasting influence.” In the universities, this pressure insured that financial accounting retained its central role in the accounting curriculum and that accounting education continued to focus on technical detail. Though critics within the profession often complained that universities offered “narrow technical training,” neglected “basic principles of accounting,” and only prepared students for the CPA exam, the move toward narrowly defined specialties, mastery of technical detail, and job training was irresistible. Following the example of engineers in the late nineteenth century, accounting professors created a network of specialized professional groups and formulated canons of professional behavior that emphasized technical virtuosity and peer approval. A larger vision was not necessary.

Wharton was the acknowledged leader of this development. As it evolved from an elite institution into an urban university (night classes were introduced in 1904 and an extension night school that operated in other Pennsylvania cities was added in 1913) the accounting program flourished. Enrollments grew, the accounting faculty became large and distinguished, and course offerings
became increasingly specialized. Moreover, under dean Emory R. Johnson (1919–1930) accounting became a model for the rest of the school. In the 1920s Wharton's specialized offerings proliferated. It became the "best place" to learn the "practical intricacies" of business. The Wharton approach was a stimulus to other urban universities. In part this was due to Wharton's commanding size and influence. Its large graduate programs were a major source of faculty and precedents for other universities. Wharton graduates made the University of Pittsburgh business school a virtual clone of the Wharton operation. In the 1930s a dean recruited from the Wharton faculty had a similar effect at Columbia. But the Wharton influence transcended such associations. As one of the largest and most prestigious business schools, Wharton offered administrators at other urban universities a convenient rationale for doing what logic and the economics of a parttime student body dictated anyway. Northwestern, with no direct ties and a substantial reputation in its own right, embraced the Wharton approach in the late 1910s and 1920s. Courses proliferated and "the specialized, technical fields expanded enormously." New York University, which had the largest business program of any university by the 1920s, exceeded even Wharton in its varied course offerings.

The problem with the Wharton approach was that it looked suspiciously like a rationalization for inaction. The financial accounting model, which had many critics, often broke down when it was applied in fields with less explicit vocational connotations. Even the Wharton faculty had trouble creating professional specialties in transportation and marketing. The other urban universities failed to escape the shadows of improvisation and opportunism. Their continued reliance on parttime faculty was a powerful indictment. Even more serious, was the narrow, technical character of many of their Wharton-type specialties. When the Massachusetts Institute of Technology considered the introduction of a business major in 1913, an alumni committee dismissed the urban universities as models because their programs were "largely devoted to accounting, and as such are little better than those given at the so-called 'commercial colleges,' whose principal province is to train clerks and amaneunses." Clearly, the accountants' approach provided only a partial answer to the challenges of intellectual and academic legitimacy.
Other academics embraced scientific management with fewer inhibitions. During Taylor’s lifetime several professors had become scientific management practitioners and others eagerly sought his advice. In the late 1910s, they and their colleagues joined the Taylor Society en masse, converting a narrowly conceived sanctuary for technicians into a center of the liberal avant garde. In the late 1910s and 1920s they became the most vigorous promoters of scientific management. Like many industrialists, they were interested in time study and other managerial techniques that enhanced day-to-day operations. But their principal concern was the broader principles, especially the notion of management as a feature of all business endeavor. Taylor’s writings suggested to even the most naive reader that industrial management required some sense of the larger character of the enterprise. To the better informed, they underlined the essential principles of the management movement: the necessity of systematic organization and communications, the value of organized planning and research, and the importance of performance standards and managerial controls.25 To the professors, they made sense of the experiences of successful big businesses and the disjointed prescriptions of management reformers and publicists. Above all, Taylor’s message had the potential to bring coherence to the practical curriculum and greater professional standing to those who prepared students for business careers. It was a powerful and satisfying alternative to the accounting model.

Between 1910 and the 1920s these individuals introduced scientific management to most large American universities.26 The process was irregular and haphazard, particularly in the early years, and had many dimensions. One indicator of it was the introduction of courses on management subjects in the curricula of engineering and business departments. The appearance of management courses was rarely an isolated occurrence. In the vast majority of cases it was a proxy for the growth of professional consciousness among faculty members and contacts with Taylor and his followers, the Taylor Society, or other organizations devoted to the study and dissemination of scientific management. Table 4.1 includes information on twenty-one universities, chosen for their size, prestige, and regional importance.27 The first two columns indicate when courses specifically devoted to management subjects appeared in engineering and business departments.
### TABLE 4.1
Management Courses in American Universities

<table>
<thead>
<tr>
<th>Institution</th>
<th>Engineering</th>
<th>Business</th>
<th>Management</th>
<th>Scientific Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penn State</td>
<td>1906</td>
<td>***</td>
<td>1908</td>
<td>1915</td>
</tr>
<tr>
<td>Cornell</td>
<td>1905</td>
<td>*</td>
<td>1914</td>
<td>1920</td>
</tr>
<tr>
<td>Purdue</td>
<td>1908</td>
<td>*</td>
<td>1919</td>
<td>1932</td>
</tr>
<tr>
<td>Carnegie</td>
<td>1908</td>
<td>*</td>
<td>1910</td>
<td>1919</td>
</tr>
<tr>
<td>MIT</td>
<td>1899</td>
<td>*</td>
<td>1915</td>
<td>1920</td>
</tr>
<tr>
<td>Drexel</td>
<td>1919</td>
<td>*</td>
<td>1919</td>
<td>1926</td>
</tr>
<tr>
<td>Elite</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harvard</td>
<td>1914**</td>
<td>1908</td>
<td>1908</td>
<td>1919</td>
</tr>
<tr>
<td>Dartmouth</td>
<td>1918</td>
<td>1904</td>
<td>1911</td>
<td>1915</td>
</tr>
<tr>
<td>Chicago</td>
<td></td>
<td>*</td>
<td>1913</td>
<td>1915</td>
</tr>
<tr>
<td>State</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ohio State</td>
<td>***</td>
<td>1911</td>
<td>1913</td>
<td>1923</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>1909</td>
<td>1915</td>
<td>1910</td>
<td>1918</td>
</tr>
<tr>
<td>Michigan</td>
<td>1914</td>
<td>1914</td>
<td>1916</td>
<td>1918</td>
</tr>
<tr>
<td>Iowa</td>
<td>1905</td>
<td>1915</td>
<td>1915</td>
<td>1921</td>
</tr>
<tr>
<td>Urban</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penn</td>
<td>***</td>
<td>1901</td>
<td>1914</td>
<td>1919</td>
</tr>
<tr>
<td>NYU</td>
<td>1914</td>
<td>1903</td>
<td>1915</td>
<td>1916</td>
</tr>
<tr>
<td>Northwestern</td>
<td>*</td>
<td>1908</td>
<td>1913</td>
<td>1912</td>
</tr>
<tr>
<td>Pitt</td>
<td>1920</td>
<td>1911</td>
<td>1911</td>
<td>1920</td>
</tr>
<tr>
<td>West/South</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>California</td>
<td>*</td>
<td>1913</td>
<td>1918</td>
<td>1921</td>
</tr>
<tr>
<td>Washington</td>
<td>1924</td>
<td>1917</td>
<td>1917</td>
<td>1917</td>
</tr>
<tr>
<td>North Car.</td>
<td>1921</td>
<td>1919</td>
<td>1919</td>
<td>1921</td>
</tr>
<tr>
<td>Vanderbilt</td>
<td>1921</td>
<td>1919</td>
<td>1920</td>
<td>*</td>
</tr>
</tbody>
</table>

*inappropriate or unavailable
**cooperative program with MIT
***cross-listed courses

The third column adds the date when references to "scientific management" or specific activities associated with Taylor first appeared in course descriptions. The table also dates the introduc-
tion of courses in employment and personnel management, which after Taylor’s death became a hallmark of the new, broader approach of the second generation of theorists and practitioners.28

A significant effort to utilize scientific management in business education occurred in engineering schools, where a small number of influential professors responded to mounting evidence that engineering graduates became industrial managers as often as they became inventors and designers. Their efforts had an immediate impact on engineering education that persists to the present. Beyond that restricted area, however, their work had comparatively little effect. Engineering was based on esoteric skills that most students who aspired to business careers did not have and probably could not hope to attain. The professors’ primary objective was to broaden the outlook of students who had chosen engineering as a course of study, not to recruit additional students whose principal interest was business. Within engineering departments there were other obstacles. By the early twentieth century, engineers had a clear conception of who they were and what they did. They conceded that management was becoming a common and appropriate activity for engineers, but they insisted that it was different from and probably subordinate to the technical activities that defined their profession. They were willing to add management to the engineer’s function, but not to make it a central feature of that function.29

The experiences of the Pennsylvania State College engineering college made that institution a prototype for other engineering schools. In 1907 Hugo Diemer, an Ohio State graduate who had taught at the University of Kansas, became the head of the Penn State Mechanical Engineering department. While a faculty member at Kansas, Diemer had become a devotee of scientific management and a close acquaintance of Taylor’s; his appointment at Penn State may have been due to Taylor’s influence.30 His goal was to make management studies an integral feature of the mechanical engineering program. Penn State already had a course, “Shop Economics,” which covered many of the specific features of scientific management. In 1907 Diemer added “Factory Planning,” and in 1908 introduced a concentration in “Industrial Engineering” within the mechanical engineering curriculum. In 1909 he won approval for an industrial engineering department, the first in any American university. Students took conventional
engineering courses for their first two years. They studied "Shop Time Study" and "Manufacturing Accounts" as juniors, and "Shop Economics," "Labor Problems," and "Factory Planning" as seniors. In 1913 Diemer added "Industrial Management," devoted to "departments and departmental reports, planning, scheduling, time study, labor and efficiency, wage system and welfare methods." The following year he added an advanced course on "Scientific Management," which used Taylor's writings as texts. Diemer left Penn State during World War I but his successors, E. G. Kunze and J. O. Keller, were sympathetic to his approach. By 1921 the industrial engineering department had 12 faculty members, six of professorial rank.

Diemer succeeded in creating a professional specialty, but not in making scientific management an integral feature of the engineering curriculum or the basis for a broader business curriculum. Though he wrote a popular, nontechnical management text, his preoccupation with machine shop activities strongly suggested that industrial engineering was factory management. To most engineers it was a peripheral vocational specialty; to most business students, an inaccessible and undesirably narrow option.

The experiences of Cornell and Purdue, two other leaders in industrial engineering, were similar. Dexter S. Kimball, a mechanical engineer who, like Taylor, had served a traditional apprenticeship and worked as a machinist before attending college, introduced a required junior-level course on the principles of manufacturing and an elective in works administration at Cornell in 1905. The former covered manufacturing methods, cost accounting, and plant management; the latter, retitled "Industrial Organization" in 1910, focused on welfare work, wage systems, and labor legislation. In 1914, when Kimball was appointed to head a new Department of Industrial Engineering, he revised "Industrial Organization" to include "modern industrial tendencies and the principles that underlie modern methods of production." Kimball also introduced a senior course, "Industrial Administration," that covered "modern time-keeping and cost-finding systems, methods of planning work and of insuring production, administrative reports, time and motion study, purchasing, etc." He thus insured that Cornell students became familiar with contemporary scientific management. Yet, even as dean of the College of Engineering (after 1921), he made no effort
to make scientific management more than a specialty for students who anticipated careers as industrial managers. Industrial Engineering remained an unimportant major in a small and declining engineering program.38

Purdue introduced “Industrial Engineering” in 1908 as a senior requirement for mechanical engineering students. The two-semester course covered factory construction and power generation as well as “organization and management of shops; methods of paying wages; systems of cost accounting and shop bookkeeping. . . .”39 Charles Henry Benjamin, the dean of the engineering school, taught the course until 1910, when L. W. Wallace joined the faculty. Under Wallace, who would later become a leader of the management movement, the introductory course increasingly reflected the popularity of scientific management. By 1919 it focused on the “fundamental principles of Management.”40 Wallace also added advanced courses on scientific management methods and, like many of his colleagues, embraced personnel management as a feature of industrial engineering. Wallace left during World War I, but the Purdue program continued to be closely connected to the scientific management movement. In the 1920s the faculty added courses on time study technique and in the early 1930s lured Lillian M. Gilbreth to help teach them.

Other universities followed the examples of Penn State, Cornell, and Purdue and created majors for students who had a strong interest in management or a weak interest in “pure” engineering. Several took an additional step and broke the implicit link between engineering and industrial management. In 1910 the Carnegie Institute of Technology responded to employer requests for technically educated sales representatives with a major in “Commercial Engineering.”41 A “special feature” of the program was “the attention given to the scientific methods of management and production. . . .”42 Students took two years of conventional engineering courses, together with “Works Management,” which the Mechanical Engineering department had introduced in 1908. During the next two years they studied various business subjects, taught by a small Commercial Engineering faculty and the university’s social science departments.43

The Carnegie Tech program was the prototype for MIT’s Course XV, the best known of the engineering and business curricula. By the turn of the century Davis R. Dewey, MIT’s
The distinguished economist, and several colleagues offered courses in economics, law, and history, which Dewey wanted to expand into a social science major. He was unable to win the support of the university administration, in part because of an anticipated merger with Harvard. When the merger failed, Dewey succeeded in introducing Course XV, which combined existing courses in engineering and social science with several new courses in business management. Dewey ran the program until 1930. Although his interests in banking and corporate organization were reflected in the course requirements, he also insisted that management was an important feature of the curriculum. An unhappy alumnus recalled that Course XV was “really a course in ‘scientific management’ and Frederick Taylorism.”

Among business schools, scientific management first influenced the elite universities and then spread to the business departments of the midwestern and western state universities during the boom years of the late 1910s. At Harvard, Dartmouth, and a growing number of private and public business schools, scientific management became the basis of the practical curriculum. Each university introduced courses in factory operations, like the engineering schools, but also promoted a conception of executive activity based on the principles of scientific management that transcended production. Two factors were essential to this development. First, the elite universities were under no pressure to provide narrow vocational training; indeed, as the urban universities and their accounting-based curricula became more prominent, the selective schools had a powerful incentive to adopt a broader and more theoretical approach. Second, scientific management emerged as an appealing option during the formative period of university business education, before disciplinary lines had hardened and the majority of business professors identified with a professional specialty. As a result administrators and faculty had more flexibility than the engineers of that period or their successors of the 1920s and later.

The individual who had the greatest influence on this process was Edwin F. Gay, the distinguished economist who became the first dean of the Graduate School of Business at Harvard in 1908. Gay had no intention of presiding over a trade school or an urban university and was determined to make manufacturing and marketing, not accounting, the basis of his curriculum. Most impor-
tant, he was "convinced there is a scientific method involved and underlying the art of business. . . ." Initially, he had no idea how to proceed. At the suggestion of Dean Wallace C. Sabine of Harvard's engineering school he visited Taylor in May, 1908, listened to a lecture on scientific management, and toured the Tabor Company to see Taylor's approach in operation. Taylor encouraged him to incorporate scientific management in the business school curriculum. Gay was receptive. That fall he introduced "Industrial Organization," a course designed to provide the kind of integrative experience, based on the study of modern manufacturing, that he wanted to make the core of the Harvard program. "The principles of organization, carefully elucidated in connection with the factory," he wrote, "will then be traced in their wide application to other forms of enterprise."

"Industrial Organization" brought together the leading figures of the contemporary management movement. Though Gay himself was the nominal instructor, J. Newton Gunn, the prominent industrial consultant, did most of the work. The course began with a series of lectures by Charles B. Going, editor of Engineering Magazine, on management as an executive function. Other experts on factory operations followed. The course concluded with Taylor, who gave three lectures, and Carl G. Barth, who discussed scientific management techniques. Taylor gave his standard introductory speech, a talk on industrial discipline, and a lecture entitled "The Organization of a Manufacturing Establishment Under Modern Scientific or Task Management," his last original paper and his only effort to describe the responsibilities of top managers. "Industrial Organization," and Taylor in particular, were extremely popular. Melvin T. Copeland, a Harvard faculty member, recalled that the course "was new and . . . newsworthy. It was concrete, dealing with specific factory problems. And to many it seemed to provide something of a formula for management."

Scientific management became increasingly important in the Harvard curriculum in the following years. Taylor repeated his lectures every year until his death, and the roster of lecturers in "Industrial Organization" became virtually a list of his closest followers. Sanford E. Thompson, Taylor's time study expert, also gave lectures on time study methods in an advanced course. In 1911, C. Bertrand Thompson, one of Gay's former economics
students, took over his classroom duties. With Gay's support, Thompson also conducted extensive research on the application of scientific management and wrote the first scholarly analyses of Taylor's work. By 1914 he was a successful practitioner and F. L. Coburn, a naval officer who had been involved in scientific management installations in government shipyards, took over his courses. In the meantime, Gay had approved an advanced course on "The Practice of Scientific Management," which featured both lectures by Barth, Sanford E. Thompson, Morris L. Cooke, and H. K. Hathaway and the installation of scientific management techniques, first at the Rindge Manual Training School and the Harvard University Press and later at other Boston-area plants. H. L. Farquhar, a business school graduate who assisted and then succeeded Coburn, acknowledged that this approach "did not really teach the Taylor System as it should be taught." Even this modest effort, however, exceeded the resources and patience of local manufacturers. In 1920, Wallace Donham, Gay's successor, complained that with fifty students in the advanced course, "we can no longer find sufficient factories on the Taylor System to give the instruction which we wish to offer. . . ." Despite such obstacles, "The Taylor System" continued to be a notable feature of the Harvard curriculum until 1926, when it was absorbed into the burgeoning course offerings of a Department of Industrial Management.

Equally important were the indirect effects of scientific management on the Harvard program. Taylor's lectures and his followers' work provided a "formula for management" that fulfilled Gay's promise of a "scientific method . . . underlying the art of business." Their success spurred related efforts, particularly in marketing. Under Donham, Harvard turned decisively against the Wharton approach and emphasized broad executive functions and responsibilities. The Harvard program became a model for others who sensed the potential of Taylor's writings.

Harlow S. Person, who had received a Ph.D. in economics at the University of Michigan in 1902 and joined the faculty of Dartmouth College's Amos Tuck School of Business, introduced a course entitled "Business Management" in 1904. Like many of his colleagues he was attracted to Taylor's work and became active in the scientific management movement. When Morris L. Cooke lectured at Dartmouth in early 1911, Person persuaded him to
return in the fall to convene a national conference on scientific management. The Tuck School Conference, in October, attracted more than 300 executives, educators, and consultants and was an important stimulus to the diffusion of scientific management. It was also a turning point in the evolution of the Tuck School. Person revised his introductory course to make scientific management its focus, added “Problems of Management,” a course that emphasized the application of scientific management techniques and, in 1913, introduced a related course, “Principles and Mechanism of Scientific Management.” By that time he had also become the school’s first professor of management. His colleague Harry W. Shelton, who worked closely with him, introduced “Scientific Management in Distribution” and “Scientific Management in Manufacturing” in the mid 1910s. When Person left Dartmouth in 1919 to become the permanent secretary of the Taylor Society, Nathaniel G. Burleigh and Harry Wellman, specialists in production and marketing respectively, took over his management courses. For many years they sustained the approach to business education that Person had pioneered.

Despite their interest in scientific management, academics such as C. B. Thompson and Harlow Person objected to Taylor's derogatory references to workers like “Schmidt” and his contentious relations with trade union leaders. On such issues they were closer to the contemporary proponents of systematic welfare work than they were to Taylor and his closest disciples. As their presence in the movement grew, they helped erase the last vestiges of the conflict between the engineers and organized labor. In the 1920s they made the Taylor Society the most liberal business organization of the time. On campus they promoted the discussion of labor issues and personnel management. From the beginning, Gay’s “Industrial Organization” included lectures on labor problems. Person introduced a course, “The Employment Function in Management” in 1915, and his successors continued to teach it as a feature of their series of courses on scientific management. By the early 1920s Harvard’s introductory course, “Industrial Management” devoted almost as much attention to labor and personnel topics as it did to more conventional scientific management subjects. It is unlikely, however that the students noticed a marked change in perspective between the Taylor disciples and Ordway Tead, Ralph G. Wells, and Earl D. Howard,
leaders of the nascent personnel management movement, or even Sidney Hillman, the president of the Amalgamated Clothing Workers, who discussed his efforts to use scientific management to stabilize employment and improve working conditions.64

The broader conception of scientific management was also apparent in the evolution of the business curriculum at another elite school, the University of Chicago. Despite earlier efforts, Chicago did not have a business program of any consequence until 1912, when new funds became available.65 L. C. Marshall, a student of Gay's who had been dean at Chicago since 1909, then turned to his mentor for advice. In 1913 he introduced a course in industrial organization, emphasizing manufacturing problems and scientific management.66 In 1916 he added a course in personnel management, which became another staple of the Chicago curriculum.67 The Chicago program soon became almost indistinguishable from the Harvard and Tuck School curricula and Marshall, like Gay and Person, was satisfied that he had resolved the issue of the legitimacy of university business education. The Association of Collegiate Schools of Business, which he and Gay founded in 1916 to promote the professionalization of their enterprise, was a tangible expression of that confidence.68

The examples of the elite schools, coupled with the contemporary furor over Taylorism, had a profound impact on the hundreds of other schools that were introducing or expanding their business programs. Like Gay and Person, the academics of the 1910s and 1920s found in Taylor's writings a way to make sense of the vast organizational changes of the preceding decades and to pass on the essence of that experience to students who would work in the new hierarchies. As a result they introduced a series of courses on the techniques and details of scientific management, often in competition with their industrial engineering departments. They also created courses on management principles and the application of those principles to nonfactory activities, especially marketing, the fastest-growing specialty of the postwar era. By the time that the enrollment boom slowed in the late 1920s, they were committed to teaching management as well as technical detail.

The large midwestern universities provide the clearest examples of this process. In 1911 Mathew Hammond, a prominent figure in The Ohio State University economics department, introduced a course in industrial organization that emphasized
factory operations and welfare work. In 1913 he added a section on scientific management. When business became a separate college in 1916, "Industrial Organization" became a senior requirement for students of manufacturing. In the following years Hammond and his colleagues introduced related courses in factory organization and management, office management, and time and motion studies, and an ever-growing host of specialized offerings. By the mid 1920s, parallel series of courses, emphasizing "principles" and "management," had evolved in marketing and finance. The pattern at Illinois was similar. At Michigan and Iowa the engineering departments first introduced courses in factory operations and scientific management, which were open to advanced business students. Beginning in the mid 1910s, however, the business colleges at both universities introduced courses in office, sales, store and employment management, and then, having preempted the field, added factory and production management. By the late 1920s they had comprehensive management programs, not unlike those at Ohio State and Illinois.

The development of the business curriculum at Wisconsin differed slightly because of faculty opposition to rigid disciplinary barriers. In 1909, business professor Stephen W. Gilman introduced "Business Organization and Management," which examined "the fundamental principles and methods of modern business procedures." The following year the Department of Mechanical Engineering introduced a major in commercial mechanical engineering, which included lectures by business professors on "shop management, methods of remuneration of labor and the effects upon the cost of production." Their collaboration continued in the following years. Gilman's course evolved into a series of courses on industrial and marketing management ("Factory and Office Administration" became "Fundamentals of Management" in 1919) and commercial mechanical engineering became an industrial engineering major. In 1918 the Economics Department added a program in employment management, which became the basis for a related series of courses. Students were encouraged and in some cases required to cross disciplinary boundaries. With this exception, Wisconsin's business program was essentially indistinguishable from Ohio State's by the mid 1920s.

Universities in the West and the South soon caught up with the other schools. At California, Washington, North Carolina, and
Vanderbilt, the business faculty and curricula were extremely modest until the late 1910s, when the enrollment surge created pressures for more elaborate programs. By that time there was no need to improvise. Many of the newer faculty were graduates of the eastern and midwestern universities and introduced similar courses. By the mid 1920s, the business curricula of the western and southern universities, while still modest by the standards of other areas, bore many resemblances to the curricula of the midwestern universities, including courses in industrial, sales, and personnel management.  

The urban universities were equally vigorous in grafting the approach of the elite institutions onto their accounting-based programs. Wharton had offered courses in industrial management since 1900, but there is no evidence that they included instruction in scientific management or that it played more than a tangential role in the curriculum. A major obstacle was J. Russell Smith, who headed the department of geography and industry for nearly a decade. A geographer, Smith made no effort to keep abreast of developments at Harvard or Dartmouth. Since several of his courses required field trips to Philadelphia factories, his students may have been exposed to the practice of scientific management but he, and the Wharton program, were wholly unaffected. In the late 1910s, Smith was succeeded by Richard Lansburgh and Joseph Willits, who were conversant with scientific management, active in the Taylor Society, and aware of the new emphasis in business education. Like their colleagues at the elite universities, they “saw themselves as involved in a much more grandiose enterprise” than teaching factory management. Still, their influence was not substantially greater than Smith’s. Lansburgh’s courses on industrial management emphasized the techniques of scientific management and Willits’s specialty, personnel management, flourished because it, like other popular fields at Wharton, prepared students for a specific vocation. Lansburgh and Willits filled embarrassing gaps in the Wharton curriculum, but their “more grandiose enterprise” had to await another generation of administrators and professors.

New York University was characteristically bold and adaptable. It offered no courses in industrial management until 1914, when it introduced “Factory Organization” (in a new Industrial Engineering program) and “System and Organization in Com-
mercial Business," which examined the implications of scientific management for office and service activities. In 1916, it created a Management department, headed by Lee Galloway, that taught a variety of management courses and a management seminar devoted to controversies over the application of scientific management. No university responded more quickly to the opportunities of the moment. In the following years NYU introduced more specialized courses on industrial and labor management in response to the demands of the swelling student population. Yet courses disappeared as fast as they appeared, faculty turnover was high, and there was no evidence that the swollen curriculum was more than a reaction to the uproar over scientific management and the labor problems of the war period. Accounting and finance remained the core of the ever-burgeoning business curriculum.

Northwestern and Pittsburgh were more typical of the urban universities. The former introduced a course in industrial organization in 1908 and a course on labor problems in 1912. In 1913 Professor Arthur E. Swanson introduced "Business Organization," which included a section on scientific management, and an advanced course on factory organization. Henry P. Dutton took over "Factory Organization" the following year and continued to teach it and related courses on personnel management for many years. Swanson, Dutton, and the other instructors had distinguished careers but, like Lansburgh and Willits, only a slight effect on the college's curriculum. In 1920, only three of forty-two faculty taught courses on management; in 1923, only six of fifty-four. The Pittsburgh faculty introduced a course, "Industrial Management," which emphasized scientific management, in 1911 and taught it every year for the rest of the decade. Yet despite this early start, and the presence of several specialists in production and labor problems, there were few course offerings in management and factory operations, general or specialized, until 1922, when the Evening College introduced an Industrial Engineering major, and 1924, when the business college expanded its Industry department. High faculty turnover and a large part-time student body probably insured that even these developments had little impact on the Pittsburgh program.

By the mid 1930s the first phase of the twentieth-century evolution of business education was largely complete. University business education was no longer a novelty to employers or the
university community. University graduates occupied a growing percentage of entry-level jobs in large corporations, and business professors occupied more secure and prestigious niches in their institutions. But the quantitative changes—in enrollment, faculty positions, curricula, and professional activities—were only part of the story. University business education was also qualitatively different and this difference was an important measure of the diffusion of scientific management. More specifically, five important changes in university business education were apparent by 1930.

First, scientific management had become a central feature of the practical curriculum. Most obviously, it was the foundation for programs in industrial engineering and production management. It was also a decisive influence in the growth of other management specialties, notably employment and marketing management. Above all, it had become an important integrative factor in business education, an antidote to the centrifugal forces that undermined the integrity of university business studies. As a consequence, business education matured and business professors rapidly superseded the consultants and manufacturers as the disseminators of scientific management. Henceforth, the spread of the principles and techniques depended more on the developments within the universities than on "object lessons," the personalities of individuals, or contacts with the public.

Second, by the 1920s business professors enjoyed a more secure professional role in the university and the business community. By establishing their claims as heirs to the intellectual legacy of Taylor and his followers, they were able to answer the "sneers" of colleagues and the complaints of executives that they were preoccupied with technical detail. By the end of the decade they could confidently argue that their work was no less informed by theoretical insights than that of their counterparts in other utilitarian disciplines.

Third, professors became increasingly important as innovators of management theory and technique. Nearly all of the individuals mentioned above wrote texts that became authoritative works in their specialties. In the process they and their students refined and extended what they had learned, just as Taylor had revised and extended the ideas of an earlier group of theorists. None of their innovations rivaled Taylor's in influence but collectively their work had at least two major effects. It helped recast the image of scientific management as a progressive force, compatible with
trade unionism, advanced personnel management, and an activist state, and it blurred the distinctions between orthodox and unorthodox ideas and methods that had been so important to Taylor's generation.

Fourth, training in factory management, including personnel work, became as widely available as training in accounting had been in 1910. Between industrial engineering and management programs, nearly every university that offered any type of business education provided some instruction in production management. Though the total number of students in accounting and in marketing continued to be substantially higher, the university graduate was no more an oddity in the factory of 1930 than in the sales or accounting office.\(^84\)

Last, from the 1910s to at least the 1940s a large percentage of business students and a smaller but not inconsiderable proportion of engineering students were exposed to the tenets of scientific management, whether they realized it or not. At Harvard in the early 1910s and at other institutions at various times, they listened to Taylor, Taylor's closest followers, or professors who identified their information with the Taylor System. In many other cases, they listened to professors and read texts that encouraged them to think about management as Taylor had thought about it, as a rational, systematic endeavor based on attention to detail, and on the application of the scientist's perspective to economic activity.

By the eve of the Depression, then, collegiate business education was securely established, intellectually and institutionally. A blend of the accounting model and scientific management had become the basis of the practical curriculum in virtually all universities and professors enjoyed a more satisfying professional role. Anti-intellectual students and courses that emphasized technical minutiae had not disappeared, but they were no longer the threats they had been in the early 1910s, or so it seemed. The collapse of the economy in the early 1930s created compelling pressures for job-oriented training and effectively ended opportunities for curricular innovation.\(^85\) The result was a new round of specialized course offerings that eventually provoked criticism reminiscent of the 1910s and demands for broader, more explicitly theoretical approaches.\(^86\) The critics' ahistorical analyses captured only a part of the reality of business education and missed entirely the transforming effects of the scientific management movement.
NOTES

1. The appeal of scientific management was by no means confined to engineering and business professors. The argument here is simply that its impact was greatest among those groups. For suggestions of a similar effect in home economics, see Bettina Berch, "Scientific Management in the Home: The Empress's New Clothes," *Journal of American Culture* 3 (Fall, 1980), pp. 440-45. Taylor's education theories are summarized in Daniel Nelson, *Frederick W. Taylor and the Rise of Scientific Management* (Madison, 1980), pp. 186-88. See also Morris L. Cooke, *Academic and Industrial Efficiency: A Report to the Carnegie Foundation for the Advancement of Teaching* (New York, 1910).


19. Agnes Lynch Starret, Through One Hundred and Fifty Years, the University of Pittsburgh (Pittsburgh, 1937), pp. 408–10, 416–17.


26. Despite the popularity of scientific management in Europe, I have found little evidence of a parallel development in European institutions of higher education. The closest analogue was apparently in British education, where industrial engineering curricula appeared in the late 1910s and 1920s, and business courses with an emphasis on management emerged in the 1920s. See L. Urwick and E. E. L. Brech, The Making of Scientific Management, vol. 2 (London, 1949), pp. 128–29, 139–42. Robert R. Locke writes that by the 1930s German business economics "had become, with American, the most highly developed in the world." Robert R. Locke, Management and Higher Education Since 1940: The Influence of America and Japan on West Germany, Great Britain, and France (Cambridge, 1989), p. 91.

27. I am indebted to the following individuals who assisted with the case studies: Barbara Krieger (Dartmouth), Kevin Boyle (Michigan), Stephen P. Waring (Iowa), Donald L. Winters (Vanderbilt), Kathy Burgess (Penn), Laura O'Keefe (North Carolina), Daniel Meyer (Chicago), Kathy Marquis and Alan Taylor (MIT), Steve Sims (California), Angela Chin (New York University), Florence Bartoskesky (Harvard), Diane L. Bridgman (Washington). I was unable to find anyone to help with the University of Illinois material, which explains the near omission of that formidable program.


31. *Pennsylvania State College Bulletin* 3 (April 1909), p. 120.
32. Ibid. 7 (March 1913), p. 193.
33. Ibid. 8 (February 1914), pp. 206-8.
37. Ibid., 1915-1916, p. 27.
39. *Annual Catalogue of Purdue University, 1908-1909*, p. 128.
40. Ibid., 1919-20, p. 126.
53. See the Thompson-Gay correspondence file, Dean's Office Files, Harvard Graduate School of Business Administration (Baker Library, Boston); C. Bertrand Thompson, ed., *Scientific Management; A Collection of the more Significant Articles Describing the Taylor System of Management* (Cambridge, 1914); C. Bertrand Thompson, *The Theory and Practice of Scientific Management* (Boston, 1917).
57. Dartmouth College, Announcement of the Amos Tuck School of Administration and Finance, 1904-1905 (Hanover, NH, 1904), p. 32.

58. H. S. Person to Frederick W. Taylor, March 7, 1911, Frederick W. Taylor Papers (Stevens Institute of Technology, Hoboken, New Jersey), File 116A. Cooke's plan was to make the Tuck School Conference "a reunion similar to the one in Washington" at the famous 1910 Eastern Rate Case hearings. Morris L. Cooke to Taylor, March 15, 1911, Taylor Papers, File 116A.


60. H. S. Person to Frank B. Gilbreth, March 15, 1913, Frank B. Gilbreth Papers (Purdue University, West Lafayette, Indiana).

61. Catalogue of Dartmouth College, years 1919 to 1930 inclusive.


64. Harvard, The Graduate School of Business Administration, 1921-22, pp. 54, 57-58; Wallace B. Donham to F. C. Hood, Feb. 10, 1921, Dean's Office Files.


67. Chicago, Annual Register, 1916-17, p. 404. Robert Hoxie was scheduled to teach a course, "Scientific Management and Labor," during the 1915-1916 school year but died before the course was offered. Annual Register, 1915-16, p. 121.


70. Sixteen Years at the University of Illinois (Urbana, 1920), pp. 215-16.


75. Sass, Pragmatic Imagination, p. 175.


83. Ibid., 1920–1921, pp. 23–24; 1924–1925, p. 30; Pittsburgh, School of Engineering, 1922–1923, p. 35.


85. Geiger, To Advance Knowledge, pp. 247–48. Business and engineering curricula at the twenty-one universities were virtually unchanged in the 1930s.