

SCIENCE THE HANDMAIDEN OF RELIGION: THE ORIGINS OF THE PARDEE SCIENTIFIC COURSE AT LAFAYETTE COLLEGE

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WHEN the trustees of Lafayette College announced the offering of the Pardee Scientific Course on March 28, 1866, they were, with many other voices, answering a nationwide call for more useful higher education than the classical course of tradition. The cry had first been heard decades earlier but reached a crescendo in the 1850's and the years of the Civil War. The response was both public and private. In 1862 the United States Congress passed the Morrill Act granting public lands to the states to establish colleges offering programs in agriculture, the "mechanic arts," science, and military training. In the course of the decade individual benefactors contributed an estimated \$5 million to higher education.¹ Though part of this sum was used to establish new schools following traditional patterns and to improve facilities in old ones, the greater share was directed toward the endowment of scientific, technical, and agricultural education. New technical schools were founded—Massachusetts Institute of Technology, Lehigh University, Cornell University. Old schools widened their offerings—Joseph Sheffield endowed the Scientific School at Yale and gave it his name; Columbia opened its School of Mines; Lafayette offered the Pardee Scientific Course.

The form of science and engineering education at Lafayette in the 1860's was unusual if not unique. The distinctive characteristics were the closely integrated curriculum and the common faculty of the scientific and the more traditional courses. Such technical education as had been offered in earlier decades was either in institutes devoted exclusively to technical subjects, or in scientific schools associated very loosely, with no curricular

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¹Merle Curti, *The Growth of American Thought* (third edition, New York: Harper and Row, 1964), p. 456.

integration, with colleges offering the standard course built on the classical languages and leading to the Bachelor of Arts degree.² This pattern of divorce of the technical and scientific from the classical persisted in the decades after the Civil War, except at Lafayette. Another peculiarity of Lafayette's program was the full absorption of the scientific course and its students into the religious instruction and life on the campus. These distinctions were neither an accident nor the execution of some grand design. They were, rather, the result of the history of the college since it was chartered in 1826 and the outgrowth of accumulated traditions and practices.

The founders of Lafayette College would have been happy could they have shared in announcing the Pardee Scientific Course. None of them was still on the Board of Trustees in 1866; and its first chairman, the Easton lawyer James Madison Porter to whose inspiration Lafayette College owes its existence, died in 1862. He and the Eastonians he gathered around him in 1824 to establish a college in their town had actually envisioned in a dim way a prototype of what Lafayette came to be in 1866, though they had a military rather than a religious school in mind. The kernel of the idea can be detected in the Resolutions adopted at the first meeting of the men interested in a college on December 27, 1824:

... the persons assembled at this meeting, will endeavour to establish at this place, a civil and military institution of learning, which shall comprise in its course of instruction, the dead, the English, French & German Languages, mathematics, natural and moral philosophy, mechanics, geography, history, and generally the various branches taught in our colleges and universities, together with civil and military engineering and military tactics.³

There was nothing unusual or original in the desire of Eastonians to provide a college and preparatory school for the sur-

² West Point, founded in 1804, Rensselaer Polytechnic Institute in 1824, Brooklyn Polytechnic Institute and Cooper Union in the 1850's are examples of the first; the Lawrence Scientific School at Harvard, the Scientific School at Yale, both founded in 1847, and Dartmouth's Chandler School of Science, founded in 1851, are examples of the second.

³ David Skillman, *The Biography of a College* (2 vols., Easton: Lafayette College, 1932), II, Appendix A, "Minutes of Meeting of Citizens, December 27, 1824," p. 295.

rounding community, if only to protect its sons from the hazards of attending college in Philadelphia. Before the Revolution the wish might have appeared bizarre, for then higher education was considered an unnecessary if perhaps attractive ornament for the truly scholarly or theologically minded and an instrument of self-perpetuation for a small theological and political elite. Since independence, however, the national atmosphere had changed. The first several Presidents of the Republic, inspired perhaps by French examples, thought and occasionally talked about the creation of a national university. Congress, in the Northwest Ordinance of 1787 and in subsequent ordinances providing for the government of territories and their development to statehood, encouraged the formation of state colleges and local grade schools and colleges by setting aside land allotments for such purposes. Local communities created academies that grew into colleges, and various churches endeavored to assure the propagation of their sects at the intellectual level by establishing denominational colleges. This spirit, transforming collegiate education from an almost exclusive class institution into a bulwark of the nation, was the motivating force behind the hopes and actions of Easton's citizens. Only one of the charter trustees of Lafayette College was a college graduate, Joel Jones of Yale College and the Litchfield, Connecticut, Law School, secretary of the Board of Trustees from 1826 to 1835. All the rest wanted for their sons something that had not been thought necessary or even desirable by their fathers.

The idea of education at the collegiate level in technical subjects, civil as well as military engineering, and in the modern languages was not original with James Madison Porter and his associates. In the decade of the 1820's there were many expressions of dissatisfaction with the classical education offered by the old established colleges and several attempts to found what were called literary and scientific or polytechnic institutes. The immediate inspiration for the founders of Lafayette was one of these experiments—the American Literary, Scientific and Military Academy, founded at Norwich, Vermont, in 1819, and incorporated in 1835 as Norwich University. Here all students took military training but could elect the literary, the engineering, or the agriculture course. The program for Lafayette was expected to be a more ambitious one, and therein lay the innovations. Had

the trustees found the right president and professors, students of more than average human gifts of mind and body, and an endowment of equally superior substance, and had these resources then been adequately exploited to build an institution in accordance with the blueprint specifications of the founders, Lafayette would have been in the vanguard of innovation in higher education and in harmony with the spirit of American democracy, nationalism, and expansion.

It was anticipated that Lafayette would be a combination of a traditional college, a literary and scientific institute, an agricultural and mechanical institute, and a military school as well. There is no suggestion in the memorial submitted to the Pennsylvania legislature in 1825 in petition for a charter that there would be any electives for the student. He would maintain his own speed in a preparatory school to equip him for the college course. Once ready, he would take the prescribed curriculum. Military tactics would be required during the time usually allotted the student at other colleges for physical exercise, "to a degree sufficient for preserving his health." Latin and Greek, the languages usually taught, would remain. In addition, however, the student would study English and other modern languages, with stress on German because of its usefulness in Pennsylvania, all to be mastered in the time usually devoted to the classical languages alone. The mathematics requirement would include both the traditional mathematics courses intended to "discipline the mind and induce habits of patient investigation," and with "practical utility constantly in view . . . those parts of the mathematics which illustrate the principles of Mechanics." Natural and moral philosophy and the other subjects in the typical classical course would be included. Finally, there would be "Civil Engineering." This subject "has of late," the memorial asserted, "become a very prominent branch of education, and what is remarkable, not a College in our Country . . . has made it a part of their course. This important branch of knowledge will be most thoroughly taught."⁴

When the college opened its doors in 1832, this rich educational diet had been abandoned for a more Spartan one. There were

⁴ Skillman, *Biography of a College*, II, Appendix B, "Memorial To The Honorable the Senate and House of Representatives of the Commonwealth of Pennsylvania . . .," pp. 297-303.

specific local reasons and underlying national circumstances for the change in regimen. The old colleges founded in the pre-Revolutionary period set the pace in higher education in the first half of the nineteenth century even though they were out of tune with national sentiment. The faculties of Harvard, Yale, Columbia, and Princeton had no objection to technical instruction as such. But in their view, it had no place in the structure of American collegiate education. For example, in 1828 the faculty of Yale College, in a thunderbolt from their olympian heights, proclaimed that the purpose of higher education was to discipline and furnish the mind, with more emphasis on the first objective than on the second. There was one way alone to achieve this twofold objective—classical education.⁵

The Yale Report became the main weapon of the educational conservatives before the Civil War. When the older colleges established scientific schools, they did so reluctantly and persisted in discriminating against them. Provisions were made for separate but not necessarily equal faculties and facilities, and graduates from these stepchild programs were not to receive the Bachelor of Arts degree, but rather in some instances only certificates of achievement. This conservatism would have meant little, and the older colleges might have drowned in the backwash of a forward movement, had they not been so influential in the educational circles of the time.

Most of the new colleges founded in the first half of the nineteenth century were the creatures, directly or indirectly, of graduates of the older schools. Lafayette was no exception. The first president of the College, the Reverend Doctor George Junkin, though not a graduate of one of the older schools, was the product of a newer college emulating them, Jefferson College in Cannonsburg, Pennsylvania, where he received the Bachelor of Arts degree in 1813. He studied for the ministry under the Reverend J. M. Mason, who had such a strong hand in shaping Columbia's curriculum in 1811 that he was made provost to supervise it. At its core was the classical course. President Junkin's idea of the correct college curriculum was this same course, with its

⁵"The Yale Report, 1828" reproduced in Theodore Rawson Crane, *The College and the Public, 1787-1862* (Richmond: William Byrd Press, 1963), pp. 83-99.

heavy overlay of moral philosophy and the evidences of Christianity, both to be taught by himself.⁶

Though President Junkin was not totally conservative in his educational philosophy, as will be seen, he was not interested in technical subjects. He was either unaware of or indifferent to the fate of civil engineering in the Lafayette College curriculum when it was extinguished as an incidental casualty of his onslaught against military science and tactics. When he agreed to become president of the college it was with the understanding that the charter would be amended to exclude military training. The original charter of March 9, 1826, authorized a college at Easton "for the education of youth in the various branches of Science and Literature, the useful Arts, Military Science, Tactics and Engineering and the learned and foreign languages. . . ." This charter was amended on April 7, 1832, a month before the first classes were held, to allow the trustees "to dispense with the maintenance and observance of military discipline and with the teaching of military science and tactics and *civil* and military engineering. . . ." By the charter, the college could still teach "the useful Arts," and President Junkin intended to do so by means of a manual labor program.

Though out of sympathy with the expressed desire of the founders and the specific terms of the charter, George Junkin became Lafayette's first president because of the financial policy of the college. He was the first man offered the presidency who was willing to accept the terms of the contract. The trustees would do no more than provide physical facilities. President and faculty would have to make the college a going concern and collect compensation from tuition proceeds. The founders had expected military science and tactics to fulfill a threefold function: technical engineering education, training in the duties of citizenship, and physical exercise for bodily health. The substitute President Junkin offered, manual labor, was also to have a threefold function: bodily health through hard work, training in mechanical and agricultural pursuits, and profit. Though of European origin, the so-called Fellenberg combination of

⁶ President Junkin's title at Lafayette College was "President and Professor of Mental and Moral Philosophy, Logic, Rhetoric and the Evidences of Christianity."

study and manual labor became a popular educational experiment in democratic America of the 1820's. When George Junkin was approached by the trustees of Lafayette College he was head of a financially unsuccessful experiment, the Manual Labor Academy of Pennsylvania in Germantown. When he came to Lafayette he moved the entire academy too, with the intention that it would become economically viable in the new surroundings. He felt he had reason to say that he and the manual labor idea were the origins of Lafayette.

When classes started in 1832 Lafayette College offered manual labor and the classical course, patterned with few alterations on that established at Harvard College almost two centuries earlier. No one seemed to appreciate the incongruity of combining the aristocratic college course, the direct descendant of Renaissance humanism, with democratic on-the-job training in crafts and agriculture for the poor farm boy. But again, Lafayette was not alone. Many of the small pre-Civil War colleges were created to serve farmer and artisan and, under the influence of the old guard colleges of the Eastern seaboard, offered the classical curriculum "for strengthening and adornment of the mind."⁷ The trustees of Lafayette College in their first Annual Report, October 10, 1832, perhaps forgetting that the original purpose had been completely abandoned, proclaimed the contradiction: "Lafayette College is a moral and religious, a literary and scientific, and an agricultural and mechanical institution."⁸ They perhaps believed in a somewhat humbler and more reverent way their hopes for combining the classical and technical had been achieved by Dr. Junkin.

Manual labor could have been an experiment in the type of laboratory experience usually offered today in engineering programs. This was, indeed, what happened at Rensselaer Polytechnic Institute, also founded in the 1820's, and the only truly technical school at the collegiate level in the 1830's and '40's. At Lafayette College the manual labor program sounded like learning by doing, but in actual fact it amounted to three or four hours' work

⁷ Richard Hofstadter and C. DeWitt Hardy, *The Development and Scope of Higher Education in the United States* (New York: Columbia University Press, 1952), p. 12.

⁸ Lafayette College Archives, *Journal of the Board of Trustees of Lafayette College*, "Annual Report," October 10, 1832. Hereafter referred to as *Journal of the Board*.

a day for the student for hire in either shop or field. President Junkin ran the manual labor plant as a business enterprise with the honorable motive of helping the poorer student work his way through college and the practical one of profit for the institution and himself. There was no integration of these applied mechanics and agriculture with the curriculum, except for the student who might read Horace while working at the bench or the plow.⁹ The shops and farm were supervised by managers who were not part of the faculty, and the students were the laborers. The program was admitted to be only a means of bringing education to the poor boy, "The only plan," as the trustees announced in their first Annual Report, "whereby classical and scientific education can be brought to the door of the poor as well as the rich."¹⁰ The educational objective of Lafayette College was the traditional one, democratized through pay-as-you-go manual labor.¹¹

In 1838 the trustees, hoping to get public assistance to establish an authentic agricultural college, petitioned the state legislature for funds "to keep up and sustain the character of a farm school where the principles of the most important of all the sciences, that of agriculture, may be efficiently taught by being embodied in the practical art."¹² Funds were to be used to equip a chemical lecture room for lectures in agricultural chemistry. The petition was rejected. The next year Dr. Junkin recommended the dissolution of the manual labor program because it was financially unsuccessful and was resented by the "laboring public."¹³

⁹ Skillman, *Biography of a College*, I, 84.

¹⁰ *Journal of the Board*, "Annual Report," October 10, 1832.

¹¹ The graduation statistics for the first years demonstrate this point. The first five graduating classes, 1836-1840, totalled twenty-nine recipients of the degree of Bachelor of Arts. Of these, ten became ministers, eight lawyers, five educators, three businessmen, one a farmer, one a physician, and one a bank president. From these same classes there were one hundred and twenty dropouts and transfers from the college course and one hundred and fifty-three from the preparatory course. One can only conjecture as to the causes for this wasting away: future ministers (thirty-three), lawyers (twenty-four), educators and editors (nineteen), and physicians (sixteen) running away from manual labor; future manufacturers and businessmen (fifty-four), bankers (thirteen), farmers (five), and engineers, army officers and mine operators (seventeen) shunning Latin and Greek. The figures are taken from an alumni survey reported in Selden J. Coffin, *The Men of Lafayette* (Easton, 1891). Sixty-four alumni were listed as "unreported," men who apparently had run away from both manual labor and Latin and Greek and wanted no further association with the college.

¹² *Journal of the Board* "Memorial to the State Legislature," December 10, 1838.

¹³ Skillman, *Biography of a College*, I, 127.

When manual labor was eliminated, Lafayette College became known as "a college established by Presbyterians founded by one [Dr. Junkin] whose ruling motive was to help educate young men for the gospel ministry."¹⁴ It was also "conspicuous mainly for plain living and thorough work."¹⁵ At the cornerstone-laying exercises for what is now called South College, on July 4, 1833, James Madison Porter dedicated the building to "the cause of science and education."¹⁶ When manual labor was abandoned the college became known as a "Literary Institution" and its officers themselves referred to it as such. Some science, however, was contained in the educational program of the college.

Science instruction had by the early nineteenth century become part of the classical course in American higher education. Mathematics and natural philosophy formed one of the four main divisions of the typical curriculum, the other three being the classical languages, rhetoric, and moral philosophy. Lafayette's course was no exception. The first published curriculum, in 1832, shows offerings of six semesters in mathematics, two semesters in natural philosophy, and one each in chemistry, mineralogy, and botany.¹⁷ The 1841-1842 catalog carries the mysterious addition of a one-semester offering in "Civil Engineering," replaced in 1845-1846 by, simply, "Engineering." In 1851-1852 the offering disappeared as mysteriously as it had appeared a decade earlier.

Mathematics was usually taught in the first six semesters. The texts used for many years were those prepared by one of the foremost mathematics teachers in the country, Elias Loomis (1811-1889), head of the Mathematics Department at Yale and known for his contributions to mathematics and the growth of its importance in the American college curriculum.¹⁸ For two areas of mathematics, members of the Lafayette College faculty prepared their own texts, Professor Washington McCartney for differential and integral calculus, and Professor James Henry Coffin for conic sections and analytical geometry.

¹⁴ Donald G. Tewksbury, *The Founding of American Colleges and Universities before the Civil War* (New York: Teachers College, Columbia University, 1932), p. 83.

¹⁵ R. Freeman Butts, *The College Charts Its Course* (New York: McGraw-Hill, 1939), p. 140.

¹⁶ Skillman, *Biography of a College*, I, 83-84.

¹⁷ *Ibid.*, I, 63.

¹⁸ Charles F. Thwing, *A History of Higher Education in America* (New York: Appleton, 1906), p. 304.

Natural philosophy was taught in one or two semesters of the junior or senior years. Traditionally, natural philosophy meant natural science. What was taught under this title in the early years of the college were physics and the remote ancestor subjects of the various branches of engineering. The references to civil engineering or engineering in the college catalogs of the 1840's, and in those of some other colleges of the time, were a sign of a growing awareness of the technological as distinct from the purely scientific. But the line could not yet be drawn sharply enough between them. Nor was the time ripe for the recognition of education in either science or technology in its own right at the college level. In 1851-1852, the year engineering disappeared from the college catalog, natural philosophy was offered in the second term of the junior year. The text used was by the Yale professor of mathematics and natural philosophy, Dennison Olmsted, *An Introduction to Natural Philosophy designed as a textbook for the use of students of Yale College*, first published in 1831 and followed by many subsequent editions. What the term natural philosophy meant to the nineteenth century is clarified by the contents of this two-volume work. Volume I covered "Mechanics and Hydrostatics," Volume II "Pneumatics, Electricity, Magnetism and Optics."

Also in 1851-1852 and for that year only, the seniors were offered anatomy and physiology in the second semester. Chemistry was also offered, together with a term of surveying and navigation (Loomis's) and a term of astronomy. This pattern prevailed with minor variations until the founding of the Pardee Scientific Course. Two significant additions were made in 1857-1858, when the college was organized on a three-term basis. A two-term course in geology was added in the senior year, using a text by Dr. Edward Hitchcock of Amherst, *Elementary Geology*, first published in 1840 and in its thirtieth edition when it appeared in the Lafayette College catalog; and a one-term senior course in anatomy and physiology reappeared. In 1861-1862 mineralogy was listed for the second term of the three-term senior year.

This was an impressive array of mathematics and science for future ministers and lawyers.¹⁹ But the question must be raised:

¹⁹ The total student enrollment from the class of 1836 to that of 1863 was 1,096, of whom 304 graduated. Of this number, 214 became ministers, 201

How much science was actually learned by the student, and how much appreciation of the scientific method did he gain? The relative classroom time devoted to science and mathematics reveals something of their importance in the curriculum.²⁰ Thirty-five percent of the class hours were devoted to mathematics and astronomy in 1842 and twenty-eight percent in 1865, a slow and almost imperceptible decline over the period. Between two and three percent were allotted to chemistry and natural philosophy.

Since so large a portion of the college course was devoted to mathematics, the college was concerned about effective teaching in this area. After a few false starts the trustees were successful in 1835 in recruiting a reputable man in this and related fields, when Dr. McCartney joined the faculty as professor of mathematics, natural philosophy, and astronomy. He was succeeded in 1846 by Dr. Coffin, who held the chair until 1873. These men were full members of the faculty, though Dr. McCartney also maintained an active law practice in Easton. In 1842 the trustees tried to lower his salary because of his outside activities.²¹ When he protested on the ground that his chair must be considered as of equal importance to that of classical languages, the trustees made him promise to "engage in no pursuit that may be considered by the Board as at all interfering with the duties of his Professorship."²² In his teaching Dr. McCartney was assisted by tutors, that is, drill masters, in the more elementary mathematics courses. He himself lectured on more advanced mathematics, on natural philosophy, and in the courses on nautical astronomy and navigation. Somewhat the same pattern was followed by Dr. Coffin.

Though mathematics and natural philosophy were considered an integral part of the classical course and warranted a full-time, adequately trained teacher of professional rank who would take his proper place on the faculty and in the activities of the college, the same was so with other branches of science. Shortly after the

lawyers, 122 physicians, 63 educators, 178 merchants and manufacturers, and 70 went into the "technical professions," that is, civil engineering, mining, or military service. See Coffin, *Men of Lafayette*, p. viii.

²⁰ Dr. William Baxter Owen, class of 1871, professor of Latin language and literature at Lafayette College, prepared an analysis of the curriculum before and after the establishment of the Scientific Course. It appears in Coffin, *Men of Lafayette*, pp. 19-55.

²¹ Skillman, *Biography of a College*, I, 149.

²² *Journal of the Board*, "Minutes of Meeting of the Board of Trustees," September 19, 1844.

college opened, President Junkin recommended to the trustees that "it might promote the interests of the institution to make a few honorary appointments of lecturers on specific branches of science who should when classes require it, treat the specific subjects, but who *should not be*, ex officio, members of the faculty. . . ."²³ An even more reprehensible precedent had already been established. When Dr. Samuel D. Gross, M.D., a young practicing physician in Easton, destined to become a nationally famous pioneer in surgery, was told by the trustees in 1832 that he had been appointed professor of chemistry, mineralogy, and botany, he protested that he had neither the time, nor, with respect to chemistry, the background for the post. After he was assured that he had no cause for concern, for there would be no classes in these subjects for some time to come, he held the title for two years without holding a class.²⁴

It was not unusual that the college should wish to offer chemistry as a course separate from natural philosophy. Even at colleges where any departure from the classics course was viewed with scorn, chemistry was taking its place as a separate subject. The fruits of American research, led by Professor Benjamin Silliman in his underground laboratory at Yale, were augmenting the rich European harvests of Priestley and Lavoisier, Nicholson and Carlisle, Sir Humphrey Davy, and Berzelius. In 1837 the first real effort to offer *bona fide courses* in science was made at Lafayette when the Easton physician Dr. Traill Green was appointed professor of chemistry. Except for a period of twelve years, 1841-1853, he was on the faculty until 1891. Since Dr. Green had a highly successful medical practice in Easton and was an active citizen in the community, he was not a full-time member of the faculty and his services as a teacher were restricted to lecturing. It is not clear whether he delivered lectures every year or only when the occasion demanded, and he was specifically and officially requested by the trustees to lecture regularly. He was also occasionally requested to lecture in botany and mineralogy.²⁵

Other areas of science received at least catalog recognition.

²³ *Ibid.*, Junkin to Porter, April 10, 1834.

²⁴ Skillman, *Biography of a College*, I, 61-62.

²⁵ *Journal of the Board*, "Minutes of the Meeting of the Board," July 26, 1853, July 25, 1854, July, 1862.

Since geology, prodded by European systematization and American exploration, was following on the heels of chemistry towards respectable status as an independent subject in college curricula, the trustees in 1838 appointed a professor of mineralogy and geology. He was Peter Arrel Browne, a charter trustee of the college, an eminent jurist in Philadelphia, and corresponding secretary of the Franklin Institute. Professor Browne was listed as a member of the faculty for ten years but he did not teach. In 1858, after a trial run,²⁶ geology was indeed taught, using Dr. Hitchcock's text, but it was not until 1865 that his son, Charles Henry Hitchcock, joined the Lafayette faculty as professor of mineralogy and geology. In 1851 the Reverend John Leamon was appointed financial agent for the college and professor of natural history to teach anatomy and physiology. Although he gave no courses until 1858, he did so then "with commendable zeal."²⁷

These men were for the most part a credit to Lafayette College. The professors of mathematics and natural philosophy made names for themselves in their fields. Professor McCartney, a graduate of Jefferson College in 1834, was not only a great teacher, as student testimonials bear witness, but also a highly successful lawyer and president judge of the Third Judicial District of Pennsylvania. He wrote a definitive and widely used text on *Differential and Integral Calculus*, published in 1844. Proficient not only in mathematics, he held the chair of mental and moral philosophy from 1849 to 1853, and wrote in the field of history *The Origin and Progress of the United States*, published in 1847. Professor Coffin, a graduate of Amherst in 1828, had a distinguished career most notably in meteorology, gaining a national reputation for *Winds of the Northern Hemisphere* (1853) and his *Winds of the Globe*, completed by his son after his death and published by the Smithsonian Institution in 1876.

In the other areas of science the record is also respectable. Dr. Traill Green graduated from the University of Pennsylvania School of Medicine in 1835 and was a prominent physician in Easton except for the short period 1841-1847, when he was pro-

²⁶ *Ibid.*, "Annual Report of the Faculty" in "Minutes of Meeting of the Board of Trustees," July, 1858.

²⁷ *Ibid.*, "Annual Report of the Faculty," "Minutes of Meeting of the Board," July, 1859.

fessor of natural science at Marshall College. He was a fellow of the American Association for the Advancement of Science and the first president of the American Academy of Medicine. His best known work, published in 1861, was *Zoological and Floral Distribution of the United States*. The Reverend John Leamon studied at Princeton and received his medical degree at Jefferson Medical College in 1837. After ten years of medical practice he changed careers, became licensed to preach, and held a pastorate at the time he was appointed to the faculty of Lafayette. Dr. Charles Hitchcock was an Amherst graduate of 1856 and lecturer on zoology at Amherst before being appointed to the Lafayette faculty.

These men, with the possible exception of John Leamon, were scientists. What could they do at Lafayette College as mathematics and science teachers? There was, first of all, inadequate equipment from the opening of the college until 1866. This was not too much of a problem in mathematics, and the finest texts available were used. But what about natural philosophy, chemistry, and the other occasional courses in scientific subjects? The trustees were not unaware of the need for adequate classroom equipment. In their first Annual Report they expressed their recognition that "a literary Institution without library and apparatus cannot hope success in the higher branches of study," and their concern that more advanced students were leaving because of inadequate facilities. The most pressing wants were "Those of Globes, Maps, Philosophical and Chemical Apparatus."²⁸ Each year the appropriate faculty member made a report to the trustees on the adequacy and condition of the library and the "philosophical" apparatus, and the trustees frequently made efforts to improve them.²⁹ Occasionally pride and satisfaction with the facilities were expressed. In the 1841-1842 catalog, for example, the college claimed that "the means of Instruction in Chemistry were considerably increased at the commencement of the present year. The

²⁸ *Ibid.*, "Annual Report," October 10, 1832.

²⁹ In 1838, when appealing to the state legislature for financial aid to develop the agricultural college and a course in agricultural chemistry, the trustees also expressed hope of building facilities for natural history, shelves and cabinets for "Specimens of vegetables, minerals, birds, beasts, fishes, shells, etc., etc." In 1842 the trustees attempted to obtain the apparatus of the Lyceum at Belvidere, New Jersey. See the *Journal of the Board*. "Minutes of Meeting of the Board," August 4, 1842.

apparatus is now more complete than before, and provision is made for a full course of lectures and experiments in that department."³⁰

This equipment was not used for experimentation but rather for demonstration. No laboratory work was provided for the student.³¹ He listened to lectures in chemistry and natural philosophy, *watched* illustrative experiments, and studied the text, drilled therein by a tutor, most likely a recent graduate intent on a career in the ministry. He received some instruction in the use of such instruments as the telescope and the surveyor's transit. When anatomy and physiology were added to the curriculum, the lectures were illustrated "with demonstrations of Diagrams and Anatomical Specimens,"³² and the students articulated a skeleton. Otherwise, the closest equivalent to laboratory work as it is known today was the field trip for surveying, geology, and botany.³³

The equipment was not adequate even for these limited purposes, and the inadequacy was not altogether appreciated. One clue can be found in the status of and the attitude towards the library, which had been slowly increasing in size over the years until it could be reported in 1860 that there was a total of 2,256 volumes, of which 1,935 were actually in the library. In his report to the trustees the librarian added with satisfaction that "the library has been actively used during the past year by the students and it is getting to be of some service to the faculty."³⁴ If a library of that size was considered adequate in a college devoting sixty-five percent of its classwork to what would today be called liberal arts subjects, the standards of adequacy for chemical and "philosophical" apparatus could not have been much higher. The money spent on chemicals in the academic year 1842-1843 was \$28.24.³⁵ As late as 1859 Professor Coffin could report to the trustees:

. . . no material change has occurred in the Philosophical apparatus of the College since last year. The amount paid

³⁰ *Lafayette College Catalog, 1841-1842.*

³¹ Only at Yale was there a chemistry laboratory until just before the Civil War.

³² *Lafayette College Catalog, 1858-1859.*

³³ *Ibid.*, 1860-1861.

³⁴ *Journal of the Board*, "Minutes of the Meeting of the Board," July, 1860.

³⁵ *Ibid.*, "Minutes of the Meeting of the Board," September 20, 1843.

for repairs and for chalk, crayons, etc. for ordinary use has been \$2.45 and for articles for Chemical lectures \$5.20. New apparatus to the amount of \$75.00 has been spoken for but not yet received. There has also been paid from funds in the hands of the undersigned, derived from Matriculation fees, the sum of \$109.55 for the purposes of the college library.³⁶

The total of college expenditures for the fifteen-year period 1850-1864 was \$123,398.66. Of this amount the library, equipment, and chemical supplies received only \$2,315.63, not quite two percent.³⁷

The classical course, to repeat, was designed to discipline and furnish the mind. The intellectual postulate of American educators until the mid-nineteenth century was that there was a certain body of knowledge to be placed in the mind of the student, a set of furniture of standard design. Moral philosophy and natural philosophy embraced what would today be called the social sciences and physical sciences. The information was fixed and the values were eternal truths. In the presentation of either, there was no thought to explore new frontiers of knowledge or to question old standards. By "the discipline of the mind" was meant training it to concentrate, to study and absorb and to think logically, that is, deductively. This was the prevalent intellectual orientation at Lafayette College in the years before the Civil War. Perhaps the true Baconian spirit was felt by James Madison Porter and some of his colleagues. Certainly Dr. Green and Dr. Coffin were true scientists and Dr. McCartney a true mathematician. But it is doubtful if much of the Baconian or scientific spirit was transmitted to the student in the classroom.

At Lafayette the traditional educational attitude was fortified by religion. So powerful had the religious atmosphere become that it would in 1866 permeate the entire scientific course as well as the classical. The keystone of the classical curriculum in the nineteenth century in religiously oriented colleges was the senior course in mental and moral philosophy and the evidences of Christianity. To stress its fundamental structural importance the course was usually taught, at Lafayette as elsewhere, by the college president. Of significance was the close relationship in the course between moral philosophy and the evidences of Chris-

³⁶ *Ibid.*, "Minutes of the Meeting of the Board," July 26, 1859.

³⁷ William Baxter Owen, "Historical Sketches of Lafayette College," 1876, found in Coffin, *Men of Lafayette*, p. 49.

tianity. Moral philosophy was a comprehensive title for almost all thought and consideration of problems today considered the realm of the social scientist. The intellectual foundations of the teaching in moral philosophy were supposed to be the dictates of reason. A favorite text, supporting the principles of laissez faire, was *The Elements of Moral Science*, written in 1835 by Francis Wayland, president of Brown University for almost thirty years. If there was questioning, it was of existing social patterns and mores and the extent of their departure from the dictates of reason, followed by exhortations to the students to return to the ideals.

Through the close relationship of moral philosophy and the evidences of Christianity, the dictates of reason became one with the dictates of the Christian religion. The favorite text on evidences was Bishop Joseph Butler's *The Analogy of Religion, Natural and Revealed to the Constitution and Course of Nature*, first published in 1736. This work was occasionally supplemented by a popular book on the subject by the Reverend Archibald Alexander, professor of theology at Princeton Theological Seminary from 1812 to 1851.

The motive of these men and other writers on the subject was to find the evidence in nature for the existence of a benevolent Deity and therefore for the validity of the Christian faith. If, as Richard Hofstadter writes,³⁸ the major function of the course in moral philosophy was "to summarize, synthesize and justify" the fixed body of truth presented to the students over the preceding three and a half years, and if the justification was based on a mixture of reason and revelation, sparse soil and unfavorable climate existed on the campus for the cultivation of the scientific spirit. If only three percent of classroom time was devoted to natural science, the soil where the scientific spirit might sprout, it had slight chance of growth in the prevailing winds on campus, blowing off the hot dry desert of Christian evidences.

The religious activities at Lafayette were not intended by President Junkin, by his successors, or by the faculty, to be "perverted to sectarian purposes."³⁹ Nevertheless, and primarily

³⁸ Hofstadter and Hardy, *Higher Education*, p. 14.

³⁹ In their first annual report the trustees boasted proudly that "No religious sect is known" on the campus. *Journal of the Board*. "Annual Report," October 10, 1832.

for financial reasons, the trustees reluctantly placed the college under sectarian control. The price for financial assistance from the Presbyterian Synod of Philadelphia, complete control over appointments of trustees and faculty, was regularized by appropriate amendments to the charter in 1854. All the lay trustees, led by James Madison Porter, resigned; the board became an instrument controlled by the synod, and students had to survive the scrutiny of a synodal delegation before receiving their degrees. The first president inaugurated under the synod's control, George William McPhail, defended the dual purpose of this arrangement. It was the function of the church, he said, both to educate the young and to assure "a broadly educated and intellectual clergy."⁴⁰ More than ever it could be said that the purpose of the college was to train Presbyterian ministers.⁴¹

Under the synod's influence, Bible study became an integral part of the curriculum. The first hour of classes on Monday morning was dedicated to religious instruction, Bible study for freshmen, sophomores, and juniors and the Presbyterian Confession of Faith for the seniors. When Dr. William C. Cattell became president in 1864 this course was organized "to make the Bible the central object of study in the whole college course."⁴² At the precise time, then, when pressures were mounting nationally for education to give more attention to science and to "practical" courses, religious influence was growing stronger at every level of the campus.

While this heady religious atmosphere might have protected the student from any overexposure to the scientific spirit of sceptical doubt and curiosity, it cannot be said that the trustees or the faculty were *against* science. It had its place in education as a certain body of truth accepted as a minor furnishing in the well furnished mind. And scientific research for the interested faculty member, if it were inexpensive, was not frowned upon. Possibly Professor Coffin's researches were also condoned because astronomy was a popular subject not only in the classroom but also in the public lecture hall, public libraries, and even in

⁴⁰ Skillman, *Biography of a College*, I, 235.

⁴¹ Of the sixty-eight honorary doctorates awarded by Lafayette College from 1836 to 1865, fifty-nine were doctorates of divinity, the remaining nine doctorates of laws.

⁴² Skillman, *Biography of a College*, I, 258.

manuals of self-help. The first serious and nationally reputable research activity on the Lafayette campus was that of Professor Coffin. When he joined the faculty in 1846 he already had seven years' experience on the Williams College faculty and was building the reputation that would earn him the title of the Father of American Meteorology.⁴³ The trustees of the college, at the same meeting at which they accepted the terms of the synod of Philadelphia, October 30, 1849, authorized Professor Coffin to make necessary alterations in one of the college buildings to facilitate his meteorological observations. They also resolved to get him a telescope, hoping to borrow one "now laying [*sic*] useless at Harrisburg" from the state.⁴⁴

It must also be recognized that it was during the administration of President McPhail, theologian and Yale graduate of the class of 1853, that the science offerings in the curriculum were broadened to include the course in anatomy and physiology. Also during his tenure, and when the majority of the trustees were clergymen, the board accepted Dr. Traill Green's offer to build an observatory and to provide a telescope for Professor Coffin's researches.⁴⁵ Thus, in 1860 the first building to be erected specifically and wholly for scientific purposes was authorized. This action was taken more out of concern for Professor Coffin's interests than for curricular considerations. Professor Coffin's teaching activities were primarily in mathematics and natural philosophy. He gave one two-term course in his specialty in the three-term senior year.

When confronted with the challenge of survival during the Civil War, Lafayette was thus a college under denominational control, strongly religious, offering the classical course with Biblical studies as the foundation and Christian evidences as the keystone, with science instruction as an incidental ornament to the façade. In July, 1863, at the critical turning point of the war, the enrollment of the college was reduced to nineteen students. The financial straits of the college were such that the president resigned in order that his salary could be saved, and the teaching staff accepted reduced salaries. It was recognized by the faculty, how-

⁴³ *Ibid.*, pp. 189-196.

⁴⁴ *Journal of the Board*, "Minutes of the Meeting of the Board," October 30, 1849.

⁴⁵ *Ibid.*, "Minutes of the Meeting of the Board," July 1860.

ever, that it was not merely the war that accounted for the reduction in enrollment. There was a deeper and more chronic difficulty, the curriculum itself. Pressure was growing to change it fundamentally, first to allow students to graduate with modern languages rather than with Latin and Greek, and second to offer "practical" courses in science and engineering.

As to the first pressure, the faculty recognized the increasing number of students who "would be glad to enjoy the cultivation and the learned habits and associations of college life, but who will not study Greek and Latin."⁴⁶ The Yale faculty of the 1820's would have been outraged at this observation. According to the Yale Report of 1828, Greek and Latin studies *were* "the cultivated and learned habits . . . of college life." Yet by 1864 the Lafayette faculty could distinguish Latin and Greek as merely one means rather than the very essence of collegiate education. At this moment, when Lafayette College was standing at the same crossroads of higher education in nineteenth-century America where so many other colleges would stand, the complexion of its faculty was a decisive factor in the assessment of the problem and in the decisions made.

When Dr. Cattell, professor of classics since 1855, resigned his chair in 1860 to accept a pastorate, the faculty recommended that his position not be filled. His teaching load would be absorbed by the remaining teachers. This generosity, appreciated and (naturally) accepted by the trustees, did not reflect any great respect for what had once been considered a teaching position second in importance only to moral philosophy. It was an unrealistic gesture, for within a year the faculty recognized the need for a classics professor, either because the required courses demanded a full-time teacher or because the subject matter demanded a specialist. The Reverend Dr. Lyman Coleman was appointed in 1861 as professor of classics. When he joined the faculty, Dr. Coleman was fully qualified to teach his subject. However, his interest was not so much with classical studies, classical history, and classical geography, as it was with Biblical studies, Biblical history, and Biblical geography. Latin and Greek were for him no more than tools for Bible study. And it was he who in 1864

⁴⁶ Lafayette College Archives, *Lafayette College Faculty Minutes*, July 1864, "Report to the Board of Trustees."

organized Biblical instruction "to make the Bible the central object of study in the whole College course." The man, then, who would be expected to be the champion of the classics was willing to subordinate them to the position of a tool subject for the more sublime Biblical course, and was ready later to permit Bible study in English, French, and German instead of Latin and Greek.

Even before the classical citadel was subverted from within, when Plato and Cicero were replaced by the Bible as the core curriculum, it was exposed to an onslaught from without. Francis Andrew March, a graduate of Amherst who had worked with William C. Fowler on his *English Grammar*, was appointed by the faculty in 1855 as a tutor. Two years later he was given a unique title and a unique opportunity. He was made professor of the English language and lecturer on comparative philology and authorized to develop a program for the study of English as one would study Latin or Greek. The result was a pioneer venture in the study of English literature and modern philology. Professor March's idea was not to supplant Latin and Greek, for he was himself a classical scholar. But his insistence that English and other modern languages could be studied with the same approach as the ancient tongues was radical indeed.

The conservative educational idea was that a background in the classics made the student more articulate in his native tongue and also made the study of other modern languages by formal instruction unnecessary. "To begin with modern languages in a course of education is to reverse the order of nature," was the persistent view of the conservative.⁴⁷ Until the 1860's modern languages were offered at Lafayette only as electives and not too regularly. Until the time of Professor March the required course in rhetoric and belles lettres exposed the student to a text on the philosophy of rhetoric and a few English classics in order to shape his oratorical and literary tastes, but no serious effort was made to study the structure of the English language as such. The success of Professor March's program ruined the argument that only through Latin and Greek could the disciplining and furnishing of the mind be accomplished. Once Professor March charted a different and alternate course to that same end, it be-

⁴⁷ Quoted from the Yale Report of 1828 in Hofstadter and Hardy, *Higher Education*, p. 16.

came the more attractive route. It was therefore not too difficult for the faculty in 1864 to argue "that a method of teaching the English and other modern classics may be used which will give in a good degree the same kind of discipline that is derived from the study of Latin and Greek."⁴⁸ They could easily recommend the establishment of a chair of French and German, and propose that students who had not studied Latin or Greek at the college level be permitted to graduate and receive degrees.

The faculty recognized also that the demands for "practical" education were being heard and answered elsewhere. "Polytechnic Schools, Commercial Academies and Agricultural Colleges are springing up around us in answer to this want, and," the faculty observed, "most of the great universities and colleges have added to the old Classical Studies a parallel Scientific Course."⁴⁹ Lafayette had made one concession in the 1850's. Students could matriculate with special standing, take what little Lafayette had to offer that interested them, and then go on their respective ways, either without a degree or to another institution that would grant one without the Latin or Greek requirement. If the numbers of such students continued to increase the faculty would either have to be augmented or the students for their own sake turned away. Why not, asked the faculty, provide adequate personnel to teach them at Lafayette? It was proposed therefore that a professorship of engineering be established.⁵⁰

Finally, the faculty recommended the creation of a scientific course leading to a bachelor's degree because of what the college had to offer as the fruits of its experience. The proposal was a new course to parallel and in places overlap the classical course.

Our present Collegiate system [reported the faculty] has grown up under the fostering care of the Church, and the relations of our present College studies to manly culture and religious training have been studied by generations of Christian educators. Our Professors have the experience of centuries to direct them in making the most of every department for the moral and intellectual development of the students . . . the new course should not be removed from the old landmarks, and . . . the old,

⁴⁸ *Faculty Minutes*, July, 1864, "Report to the Board of Trustees."

⁴⁹ *Ibid.*

⁵⁰ *Ibid.*

approved methods of instruction should be used as far as they are applicable to the new branches.⁵¹

Under the new program the student would take the original classical course without Latin and Greek. In place of these he could substitute "new branches of Natural Sciences, of Commercial learning, and English, French and German language and literature."⁵²

These recommendations to be made to the board were being considered by the faculty at the time Dr. Cattell was inaugurated president in July, 1864. He was sympathetic. He had been a member of the faculty from 1855 to 1860 as professor of Latin and Greek and might have been expected to defend the classical course against its attackers. His attitude, however, was one with that of Dr. Coleman. It was with his blessing that Dr. Coleman organized the Bible course as he did. In 1865 Dr. Cattell even forsook responsibility for instruction in moral philosophy, separated this professorial chair from the presidency, and assumed the title and responsibilities of professor of Biblical instruction.

Upon his appointment as president early in 1864, Dr. Cattell started out from Harrisburg to Easton attempting to raise money on the way. He admitted that all too frequently he met resistance because of "something disagreeable" in the past history of the college. "I would have rather begun *de novo*," he complained.⁵³ His success in winning the interest and financial support of the Hazelton coal mine operator Ario Pardee is just one, although the most impressive, of his accomplishments. Since the college was moving closer to the scientific course, he also aroused the interest and secured the financial assistance of many other businessmen and industrialists. He was also successful with the Synod of Philadelphia. For the first time since the college was placed under its control, this body fulfilled its financial commitments to the college with a grant large enough to pay the first year's salary of the president. He also persuaded the synod to accept more laymen on the board of trustees, particularly men with financial resources that they were willing to contribute to scientific and technical education. At the October, 1865, meeting of the board,

⁵¹ *Ibid.*

⁵² *Ibid.*

⁵³ Killman, *Biography of a College*, I, 260.

several of them appeared for the first time, among them Ario Pardee.

At this meeting the board heard the faculty report. Subsequently Ario Pardee wished to see the college go much farther with a more ambitious program to fulfill the aims of the faculty and made his substantial contribution to the college endowment for this purpose. On March 28, 1866, the board announced the authorization of the Pardee Scientific Course and a faculty increase far greater than the modest numbers recommended by the faculty.

As envisioned in 1866, the general scientific course was the old classical course with Anglo-Saxon, English, French, and German replacing Latin and Greek. It was designed "for those who wish to study the Natural Sciences, Mathematics, Modern Languages and Literature, History, Mental and Moral Philosophy, Rhetoric and Logic as a substantial basis of knowledge and scholarly culture, and who would be glad to enjoy the cultivation and learned habits and associations of College life, but who will not study Greek and Latin."⁵⁴ The degree to be granted was that of bachelor of science. If a student elected Latin, he could earn the bachelor of philosophy degree. The bachelor of arts degree was reserved for the student taking the full classical course.

The title of the new course was in a way misleading. There was nothing more scientific, by any definition of the adjective, about this course than there was about the classical course. It was obviously a dignified screen behind which the Greek requirement could be dropped and the Latin made elective. The dodge can be excused only on the shaky ground that this is what was happening elsewhere. At Yale, for example, in the Sheffield Scientific School, the general scientific course for those students with no other objective in mind than avoiding Latin and Greek would one day be called the Select Course.

However, there were arrangements for serious science and engineering education. A student enrolled in the Pardee Scientific Course could if he chose select as a substitute for the standard program of the senior year one of three specialized options, the engineering, the chemical, and the mining.⁵⁵ The college also provided for postgraduate work in these fields and announced

⁵⁴ Coffin, *Men of Lafayette*, p. 47.

⁵⁵ *Lafayette College Catalog, 1865-1866.*

plans to do the same for trade and commerce, modern languages and philology, and American history and institutions. This was the truly scientific and technological innovation in the program even though it served only a small minority of the students. In the years to come, it was from these specialized options that the varied program in science and engineering offered by the college evolved, while the general scientific course and the classical course slowly merged into the liberal arts curriculum offered today.

The trustees endorsed the views of the faculty that the old course and techniques of instruction had contributions to make to the new. They did not establish separate departments for the scientific course, but insisted that candidates for the bachelor of arts and bachelor of science degrees take all their common courses together. Furthermore, Ario Pardee agreed with everybody else that Bible instruction should not be sacrificed along with Latin and Greek. Indeed, it has been stated that the Bible course was included in the scientific course, "at the expressed desire of Mr. Pardee."⁵⁶ The catalog of 1865-1866 may be profitably quoted in its entirety on the role of religion in the new course:

It is perhaps scarcely necessary to add that the Board intend that the whole Scientific Course shall have the Christian character which they have endeavoured to impress upon the studies of the College, and that science shall be here so taught as to become "the handmaiden of religion." All the departments will be in the hands of Christian scholars, who will not fail to improve, in their various instructions, the opportunity constantly recurring of directing the students from Nature to Nature's God. But in addition to this and also to the systematic and thorough study of the Word of God in all the classes, both of the Classical and Scientific Course, special lectures will be given upon the connection of Science with Revealed Religion, that the student may be thoroughly informed upon the issues that are made, and be prepared to meet the arguments from Physical Science by which our common Christianity is usually assailed.⁵⁷

Had it not been for the influence of religion on the Lafayette campus, the Pardee Scientific Course might not have been estab-

⁵⁶ Skillman, *Biography of a College*, I, 281.

⁵⁷ *Lafayette College Catalog, 1865-1866.*

lished in 1866. Or, if established, it would not, judging by developments elsewhere, have been in such close intimacy with the classical course. Without the influence of religion, educational conservatism would most probably have prevailed. The faculty might well have rejected any scientific course, or have accepted it reluctantly and only with separate facilities. For better or worse, the religious influence was responsible for the peculiar curricular integration that prevailed at Lafayette College among the liberal arts, the sciences, and engineering. There is a legend that the founder of Lehigh University would have given his patronage to Lafayette College had it renounced its association with the Presbyterian church. Had such an inconceivable course been pursued, what could possibly have been the result? Certainly not the distinctive curricular pattern Lafayette offered for so many years.

In the catalog statement quoted, the Pardee Scientific Course appears to have been an adjunct to the evidences of Christianity. The old relationship prevailed in the scientific course as it had in the classical. Christian evidences was still the keystone of the student's studies. Butler's *Analogy* was read by all students in the last semester of their senior year. In 1896 the president of Cornell, Andrew Dickson White, published his two-volume classic, *A History of the Warfare of Science with Theology in Christendom*. The founders of the Pardee Scientific Course anticipated no major battles in that conflict on the Lafayette campus. On the frontiers of Western thought, in Europe and in the United States, Christian evidences had long since been recognized as a lost cause, theology using the wrong weapons on the wrong battlefield against the wrong enemy. But at Lafayette the battle was thought in 1866 to have been won by Biblical Christianity.