A biographical study of Denison Olmsted, focusing upon his own Christian world view and its connection with his various activities in science, supports the view that religion served as a significant factor in the promotion of science in America during this time period. Olmsted taught physics, meteorology and astronomy at Yale from 1826 to 1859, and from this position of influence, helped mold the minds and outlook of a new generation of scientists, of hundreds of students who came to Yale to obtain a liberal education, and of those members of society who attended his popular lectures. Olmsted’s personal perspective was that science was God-ordained, that it would ever harmonize with religion, that it was indeed a means of hastening the glorious millennium.

Olmsted lived in an era characterized by an unprecedented revivalism and emphasis upon evangelical Christianity. He graduated from Yale (1813) at a time when its president, Reverend
Dr. Timothy Dwight, one of the most influential clergymen in New England, was at the height of his fame. Olmsted subsequently studied theology under Dwight, but before completing his preparation for the ministry, Olmsted was appointed to a professorship of science at the University of North Carolina where he taught from 1818 until he was called to Yale in 1826.

As a scientist, Olmsted initiated the first geological survey to be sponsored by a state (1824), made a comprehensive study of the famous meteoric shower of November, 1833, formulating a cosmical theory of its origin, was the first in America to sight Halley's comet in its return of 1835, and manifest a life-long interest in such phenomena as the zodiacal light and the aurora borealis, publishing a paper on the latter topic in the Smithsonian Contributions to Knowledge in 1856. In addition, he often lectured on scientific subjects to popular audiences.

As a teacher, Olmsted actively promoted science at Yale, constantly revising his classroom lectures and authoring successful textbooks in physics and in astronomy. Olmsted was a scientist almost inadvertently; he viewed teaching as his peculiar sphere of usefulness; but he was, above all, a Christian.

As a Christian, he believed it was his duty to teach more than science, and his classroom lectures were imbued with religious sentiment. He imparted wisdom along with knowledge,
leading his students from nature to nature's God. During his later years, his time was increasingly occupied with contemplative writing on natural theology. Many of the topics he chose were those he had presented to his classes at Yale. An analysis of his natural theology displays his Christian perspective in his choice of data and his method of reasoning. He emphasized the good in nature because he knew God was good and found evidence of his goodness in adversity as well as in prosperity. Thus, his writings on natural theology were a natural outgrowth of his Christian world view.
Denison Olmsted (1791-1859), Scientist, Teacher, Christian: 
A Biographical Study of the Connection of Science 
with Religion in Antebellum America

by

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I. INTRODUCTION

The present study has been undertaken to contribute to an understanding of the relationship between science and religion in America in the decades that preceded the Civil War. A biographical approach offers unique opportunities to view the events of the past in the context of that time. It seems desirable that the personality chosen for study qualify as a member of the community of scientists, and that some of his writings deal with religion (implicitly if not explicitly). In short, he should be a religious scientist so that he is an active participant, not a disinterested onlooker.

The tendency among historians interested in the relationship of science and religion has been to concentrate attention on the negative aspects of this relationship.\(^1\) This tendency may result in part from an uncritical acceptance of a positivistic thesis that science and religion are inevitably in conflict.\(^2\) A related tendency has been to scrutinize those areas of science where conflict with religion is most likely.

Two areas of science with obvious potential for conflict with religious beliefs during the antebellum period are those of biology
and geology. During such conflict, with the attendant emotional response, it is to be expected that arguments presented are especially liable to be strongly colored with a rhetoric which distorts contemporary beliefs. Additionally, these beliefs are so interwoven with specific scientific problems as to prevent ready separation. Even granting the possibility of valid separation by careful analysis, these beliefs still represent those of a special group with a vested interest in their special area of science; such beliefs probably reflect that interest and may not accurately reflect the beliefs of scientists in general. For these reasons, it was thought desirable to choose a scientist whose field was less subject to conflict than biology or geology.

Although Denison Olmsted taught geology for several years during the early part of his professional career, his main fields of interest were astronomy, meteorology, and natural philosophy. He spent the greater part of his career at Yale, one of the most influential colleges of that time. However, before considering Olmsted himself, it will be useful to sketch several threads in the history of America which will help put Olmsted in proper perspective.

Religious beliefs and moral attitudes had played an important role in America since the arrival of the Pilgrims. As Ahlstrom has written, "The architects of the 'Puritan Way, ' . . . were in a very real sense the founders of the American nation." In the years
1831-32, the Frenchman Alexis de Tocqueville traveled in the United States, observing the young nation in action. Upon his return to France, he wrote his Democracy in America, in which he asserted: "There is no country in the world where the Christian religion retains a greater influence. . . ." Although de Tocqueville was referring primarily to the connection between religion and politics, the statement was substantially true in a larger sense.

During the antebellum period, science in America was being transformed from a sometime activity of a "gentleman amateur" to a relatively sophisticated professional occupation, with the "typical" scientist moving from the laboratory of an earlier time to the professorship of a new age. Interaction between cherished religious values and growing scientific interest was virtually inevitable.

Revivalism is an important component of the religious history of America. Indeed, one historian has suggested that "to write a history of revivalism would be to write a history of America." He has identified five periods of revival or "awakening," the first commencing as early as 1600. The next, generally called the "Great Awakening," was initiated around 1730, following a period of general religious decline. Though not initiated by Jonathan Edwards, the Great Awakening has been closely identified with his name and he, above all, became its defender. In New England,
the movement was attended with such manifestations of conversion as weeping, shrieking and fainting. Edwards, though he allowed that some might be converted without these outward signs and was even willing to admit that in some cases the signs might be of demonic origin, still insisted that in general the Great Awakening was of God. He actively promoted an experiential religion in opposition to the routine formalism so prevalent just prior to the revival, and by defending revivals, "put his mark on the New England conception of Christian piety for a century and more." ⁷

By the time Edwards died (1758), the Great Awakening was in the past. A "Second Great Awakening" commenced some time after 1790. There followed a series of unprecedented revivals which continued throughout the remainder of the antebellum period. It was during this period that revivalism "played its most significant role in American history." ⁸

Thanks to sensationalists, the word "revivalism" is sometimes associated primarily with the excesses which took place at Cane Ridge, Kentucky. There, some ten to twenty thousand persons attended a camp meeting in August of 1801. Stimulated by the (simultaneous) preaching of a score of ministers, individual listeners engaged in a host of supposedly involuntary exercises, such as "falling," "jerking," "dancing," "barking," "laughing," "running," and "singing," manifestations later cited as the greatest outpouring
of the Spirit since Pentecost! But to equate revivalism in America with emotional extravagances as occurred in such isolated incidents is to err. Revivalism also came to Connecticut, the "land of steady habits," and there it was marked with a calmness among the participants. Furthermore, the fruits of the revival--reformed morals and improved spirituality--were available for all to see.9

To be sure, revivalistic religion was not directed exclusively to the intellect; it also aimed for the heart. After all, revivalists did not confine their attention to the heathen. The revival in Northampton under Jonathan Edwards had taken place among his parishioners, who had heard him expound truth many times before. It was not simply a matter of intellectual assent to a set of doctrines, but a renewed zeal for truth previously heard that characterized a revival. Likewise, in the early years of the Second Great Awakening, "plain gospel truths" (God's sovereignty, man's depravity, Christ's love) were embraced by those long familiar with such concepts. From all this it seemed clear to the leaders of the Second Great Awakening that the revivals were sent by God, in accordance with his own wise plan. The role of the revivalist was subsidiary.10

Nevertheless, changes in outlook did come. The doctrine of the Fall of Man had loomed large in Edwards' theology. Man's nature was utterly depraved and only God could change it. From
such a theology, the prominent role of God in revivals followed readily. Edwards' grandson, Timothy Dwight (d. 1817) whose lectures on theology served as a guide for a generation, began a new theological trend, initiating the "New Haven Theology," which culminated with the work of his student, Nathaniel W. Taylor (d. 1858). Taylor maintained that man's depravity was not inherent, but associated with his willful choice. Revivalists were admonished to confront sinners with this fact. Thus, revivals came to be seen more in terms of achievements of mighty preachers, than the acts of God. Whereas for both Edwards and Taylor, revivalism involved a cooperation of man and God, the emphasis shifted from God for the former to man for the latter. Such a shift was consonant with the more general religious trend.  

In both the First and Second Awakenings, revivals had a similar spiritual goal, viz., the conversion of individual souls. But during the latter period, there was a new emphasis upon communal aspects; revivals were envisioned, not only as rescuing individuals, but as a means of saving the nation. Thus, in a significant sense, revivals became relevant to national concerns; they were accepted as a uniquely American phenomena. In a word, revivals came to have important social functions as well as spiritual. Thus, it is not surprising that the period of the Second Great Awakening was accompanied with a variety of attending general movements. It is
not essential that one establish a cause-effect relationship between these movements and revivalism. In actuality, there was a mutual reinforcement between them. Some of these movements such as the missionary societies, the Bible societies, the Sunday schools, the tract societies and the moral societies were deeply religious. Others, such as education societies, temperance societies, and the anti-slavery movement, while not exclusively religious, nevertheless owed much of their motivation and support to religion. The religious could easily identify with such voluntary associations. Both the First and Second Great Awakenings in America were accompanied with a millennial hope, i.e., a religious belief that the consummation of all things was at hand. In the time of Jonathan Edwards, his Calvinistic leanings prevented him from expecting that man would play a large role in hastening Christ's kingdom of glory. Nevertheless, he confidently predicted that the kingdom of heaven would be a reality within two centuries. But as we have seen, the theology of Edwards' spiritual descendants (especially N.W. Taylor) stressed that man had a legitimate role to play. In his own salvation, in revivals, in spreading the gospel to the world, man was to work with God; man's role was active, not passive. Such a theology legitimatized and motivated the missionary movement and social reforms. It allowed men to believe that they could be co-workers with God in hastening his coming kingdom. Americans
were certain that they were on the way to the land of promise, and the fruits of revivalism reinforced this belief.  

Turning now to education, from the outset, the Puritans who came to America actively promoted education, regarding it as one of the most important foundations of piety. Among the statutes of Harvard, the first institution of higher learning in New England (founded in 1636), is the statement: "Everyone shall consider the main End of his life and studies, to know God and Jesus Christ which is Eternal Life. John 17.3." During the remainder of the Colonial period, the number of colleges increased slowly (there were only nine by 1780); almost without exception, they were founded by formal religious bodies. For the most part, they were dedicated to the promotion of Christian principles, but were neither primarily theological seminaries nor narrowly sectarian in scope.

In particular, Yale had been established in 1701 by a group of clergymen (mostly graduates of Harvard) who were motivated in part by a concern for the liberalism which had pervaded Harvard. The Yale founders, with a "sincere regard to and zeal for upholding and propagating of the Christian Protestant Religion. . .," (words in the charter granted by the General Court of the Colony of Connecticut) had adopted a course of study embracing the "liberal arts and languages" as well as "sciences" with the avowed purpose of fitting youth "for public employments, both in church and civil
Throughout the eighteenth century, Yale viewed its own purpose as largely religious. For example, in 1754, President Thomas Clap wrote,

Religion is a matter of so great Consequence, and Importance; that the knowledge of the Arts, and Sciences, how excellent soever in themselves, are comparatively worth but little, without it.21

Whereas in 1780 there were fewer than a dozen colleges in America, by the turn of the century the total had more than doubled. By 1830, it had doubled again, and over 130 colleges were added in the 30 years ending in 1860.22 This proliferation of colleges (largely denominational) was an outgrowth of the revivalism of the early part of the nineteenth century, with the concomitant emergence of new denominations and sects, seeking their own identity, and struggling to carve for themselves a niche in Christian ideology. Charges of sectarianism were frequent, despite the fact that most colleges maintained a non-sectarian admission policy.23 But even the opponents of alleged sectarianism in higher education were largely agreed on the desirability of an essentially Christian basis of education.

Early in the eighteenth century, Harvard had already begun exhibiting a liberal trend in matters of religion, and in 1805 capitulated to Unitarianism, that "half-way house on the road to infidelity," as Moses Stuart characterized it.24 Yale, on the other hand, remained the citadel of Congregationalism through the greater part
of the nineteenth century. During the first half of the nineteenth century, Yale continued to champion religious orthodoxy. It was at Yale that the "New Haven Theology" was founded by Yale's president (1795-1817), Timothy Dwight and promulgated by Yale's professor of divinity, N.W. Taylor.

It is significant that, in several respects, it was Yale and Princeton (the stronghold of Presbyterianism), not Harvard, that set the tone for higher education in antebellum America. The characteristic form of college government throughout the eighteenth century (and well into the nineteenth century) followed the pattern of Yale: control by a board of nonacademics, a significant fraction of whom were clergymen; denominational affiliation; significant power invested in the president of the institution; and little control or support by the state. Most of the college presidents, and a large majority of the faculty were clergymen. The influence of Yale and Princeton is also illustrated by the following statistics: "Among 110 presidents of 75 colleges in operation before 1840, 36 were graduates of Yale and 22 of Princeton," accounting for over half of the total! 25

An underlying religious commitment was by no means the only shared characteristic of American colleges. The course of study known as the "classical tradition" had been brought to America from Europe. The curriculum of a "liberal education" retained to a
degree its emphasis upon Latin and Greek, logic and metaphysics, rhetoric and disputation until well into the nineteenth century, the newer colleges in America copying the example of their northeastern counterparts.

Initially, the basic scientific subject (natural philosophy) was taught from an Aristotelian textbook, but by the mid-eighteenth century the subject matter of natural philosophy as taught in American colleges was assuming a definite Newtonian character. By the last quarter of the century, a number of professorships devoted to mathematics and natural philosophy had been instituted, although some of these were on a tenuous basis. Thus, the trend was toward an increasing emphasis upon the sciences in the curriculum.

During the eighteenth century, an area of special interest among the professors of science seems to have been astronomy, especially such "spectaculars" as comets, transits of the planets, and meteors. In the course of the century, there developed a trend toward the adoption of textbooks written by popularizers of science, rather than by professionals. Such a trend, though deplorable in one sense, was perhaps more realistic, in that there were no course electives in the curriculum; students all took the same course of study. The trend also illustrated an important
heritage of the eighteenth century, viz., an optimistic belief in the educational value of science.  

At Yale in particular, the course of study during most of the eighteenth century retained a theological orientation. In the ancient languages, the Old Testament was the textbook for Hebrew, the New Testament served a similar purpose for Greek, and Virgil was used for Latin. It was almost the end of the eighteenth century before Cicero and Horace were added. As might be expected, in the area of theology the Protestant position was stressed, and instruction included in the early years a study of the Westminster Catechism and Confession. Supplemental studies included logic, rhetoric, oratory, disputation, and ethics. In the later part of the eighteenth century, Thomas Clap's Essay on Moral Virtue and Obligation (1763) and Jonathan Edwards' Enquiry into the Freedom of the Will (1754) were introduced (presumably) the first American textbooks used at Yale.  

As for science, Yale lagged behind most other colleges in one respect. William and Mary, Harvard, Pennsylvania, Columbia, Princeton, and Brown all boasted professorships in science before Yale instituted her first one. Yale's conservatism in this respect did not, however, imply a disinterest in science. As early as 1714, Connecticut's agent in London arranged for a shipment of books to Yale which included gift copies from such scientists as Sir Isaac
Newton, William Whiston, and Edmund Halley. Thomas Clap, who served at Yale as president (1739-1769), constructed an orrery for instructional purposes and even tried his hand at theorizing on the nature of comets. When he resigned, a professorship in mathematics and natural philosophy was established, although its incumbents had to be content with an uncertain salary and year-to-year appointment. Nehemiah Strong, the first to occupy the post, was active in the publication of almanacs, and also published three lectures on astronomy for the use of the students. After Strong resigned, President Ezra Stiles took over the duties of teaching science, assisted occasionally by Tutor Meigs. For all these individuals (Clap, Strong, Stiles, and Meigs), astronomy seems to have held a special fascination.

In terms of textbooks in science, Yale made a poor start, adopting an Aristotelian text in natural philosophy at about the time that Harvard was replacing hers. In the 1720's, Yale switched to Rohault's *System of Natural Philosophy*, a more up-to-date choice. This was replaced by s'Gravesande's *Mathematical Elements of Natural Philosophy* in 1743 (the same book was concurrently introduced at Harvard). Around 1760, s'Gravesande's work was replaced by less professional works which possessed breadth at the expense of depth. Some 30 years later, William Enfield's *Institutes of Natural Philosophy* was adopted at both Yale and Harvard. Enfield was
not a scientist and, for that reason, his book was largely a compilation. Enfield's book was supplemented by James Ferguson's *Astronomy Explained upon Sir Isaac Newton's Principles, and Made Easy to Those Who Have Not Studied Mathematics*, and Joseph Priestley's *History and Present State of Electricity*. Thus, the trend in textbooks at Yale was not unlike that in the other American colleges.36

During the greater part of the eighteenth century, natural history held an insignificant place in the college curriculum in America. Many of the American naturalists, like their European counterparts, were physicians whose training had included courses in botany, anatomy and chemistry. Others were content to function primarily as seedsmen, sending their collections on to Europe for arrangement and classification, but after the Revolutionary War, a rising nationalism coupled with the development of medical schools in America resulted in an increased interest in natural history, with the establishment of professorships devoted to the subject.37

Throughout much of the eighteenth century, chemistry was generally treated in the colleges as a particular topic in the more general subject of natural philosophy. The first professorship devoted to chemistry in a liberal arts college was not instituted until 1796. The medicinal aspects of the subject were taught in the medical schools, notably at Philadelphia, which became an
important early center for chemistry in America. There, a professorship in the medical school attracted such men as Benjamin Rush and John Woodhouse. In 1792, Woodhouse founded the Chemical Society of Philadelphia, perhaps the first chemical society in the world. This society promoted Lavoisier's relatively new system of antiphlogistonic chemistry, as well as more practical matters, such as the chemical analysis of minerals. It was interest in this latter subject which led to the invention of the oxyhydrogen blowpipe by Robert Hare, a society member, in 1801. Thus, at the turn of the century, interest and activity in chemistry were on the increase.

Interest in the composition of minerals implied close ties between chemistry, mineralogy and geology. An early American pioneer in these subjects was Samuel L. Mitchill, a physician whose Medical Repository was the earliest periodical in America devoted to science. Started in 1797, it contained numerous articles of a geological nature. Mitchill also founded the first geological society in America, the American Mineralogical Society (1798), which was however, directed almost exclusively toward the discovery of mineral resources in America. It was in 1803 that William Maclure, of Scotland, began a geological inspection of America at his own initiative, which resulted in his Observations on the Geology of the United States and the first geological map, published in 1809.
Yale was not one of the leading centers of science as the eighteenth century drew to a close. In 1795, Timothy Dwight became the president of Yale and, convinced of the importance of science, took steps to institute a change. He obtained a charter for the Connecticut Academy of Arts and Sciences in 1799 (the first state academy), thus carrying to completion a course of action his predecessor had contemplated as early as 1763. In the Professorship of Mathematics and Natural Philosophy, Dwight replaced Josiah Meigs, who seemed to have a knack for controversy, with the steadier Jeremiah Day, who had tutored at Yale. Dwight also convinced the Yale Corporation of the need of a professorship in Chemistry and Natural History, and subsequently chose Benjamin Silliman, another Yale tutor, for the post.

Silliman, who had virtually completed his studies for an entirely different profession (law), now spent a large share of the next two years studying chemistry under John Woodhouse at Philadelphia, where he also became good friends with Robert Hare. In addition, Silliman gleaned valuable guidance from John Maclean at Princeton. Back at Yale, Silliman accomplished the task of outfitting a chemical laboratory, lecturing to his first classes in the fall of 1804. The following year was spent abroad, where he purchased books and apparatus for Yale and met such men as Robert Fulton, James Watt, William Wollaston, Henry Cavendish, and
William Nicholson. At the University of Edinburgh, he listened with interest to both sides of the Neptunist-Vulcanist debate in geology. Back at Yale, Silliman promoted science with a zeal which earned for him the title "father of American science." He acquired a cabinet of minerals in 1807 and with its help began teaching a course on mineralogy. However, the geology he taught was confined to what he could integrate into his chemistry course.

In 1807, Silliman also published (with his colleague, James L. Kingsley) an account of the spectacular Weston meteor. This account, accompanied by Silliman's chemical analysis of fragments, eventually found its way to London and Paris where it created quite a stir. About the same time, Silliman began giving popular lectures on chemistry, complete with demonstrations, an activity which he was to continue for many years, and through which he would bring attention to Yale as well as science.

Several years later, Silliman used his influence to persuade Colonel Gibbs, who had the best collection of minerals in America, to deposit his collection at Yale, and with this acquisition, launched a separate course in geology. Through this course, Silliman was to influence such men as Amos Eaton, Edward Hitchcock, and James D. Dana.

Before 1820, Silliman had embarked upon a venture of singular importance, the launching of the American Journal of Science,
which was to be the leading scientific journal in America for at least a generation. In a day when periodicals frequently appeared and almost as frequently disappeared, Silliman served as sole editor until 1838. The very first volume of this Journal contained a "Postscript" announcing the recent formation of an American Geological Society, duly incorporated by the legislature of the state of Connecticut, formed "by an association of gentlemen, residing in various parts of the United States." Clearly, the intent was to make this a national society devoted to geology, mineralogy and allied subjects. Indeed, the membership comprised individuals from Maine, Kentucky, and South Carolina as well as Maryland, Pennsylvania, New York, Massachusetts and Connecticut. William Maclure, the father of American geology, was elected president, and subsequently donated a sizable volume of material to the "library" of the society.

The society was not intended simply for all who might be casually interested in geology; indeed, there were provisions in the constitution for maintaining an aura of scientific respectability. Limits were imposed on the numbers of regular, honorary, and corresponding members; names of candidates for membership were to be proposed by a committee of nomination, and the approval of the members was required. Provision was made for quarterly meetings.
Records of the proceedings of the meetings are scarce, but some meetings were apparently taken up with reports of mineral descriptions, catalogues, and maps. The papers presented at other meetings give evidence of a serious commitment to geology: one was a sketch of the geology of several counties in Connecticut; another dealt with the geology of the River Connecticut regions; a third treated the question of the origin of the gold deposits in North Carolina.  

Biographical information on the members of the American Geological Society helps to illuminate the nature and characteristics of science in America in the early part of the nineteenth century. Of some 40 members, at least half of them actively engaged in the collection of minerals, an interest commensurate with that of the society. The society encouraged the forwarding of mineralogical specimens by its members and also by the public at large, a fact which suggests a relatively unsophisticated stage of the science of mineralogy, during which amateurs could make valuable contributions through collection. At least half of the members devoted a portion of their activity to teaching. About half of these, in turn, wrote textbooks in some branch of science, and several of the group were noted as being outstanding teachers. Thus it appears that educators were playing a significant role in science during this time. Of those in education, the largest percentage taught in
liberal arts colleges, but a significant number were associated with medical schools. This fact suggests continued influence of medical doctors on science. Indeed, of the 40 members, almost a third were M D's.

Nearly a third of the individual members exhibited a remarkable breadth of scientific interest. For example, one member (Henry Schoolcraft) was an ethnologist as well as a geologist; another (Chester Dewey) published papers on botany, geology, meteorology, and chemistry. Four of the members (Archibald Bruce, George Featherstonhaugh, Samuel Mitchill, and Benjamin Silliman) at one time functioned as editors of scientific periodicals publishing articles on a wide variety of scientific topics. Likewise, a third of the individuals displayed a serious religious interest; several were clergymen, a number of others had studied theology and still others wrote on religious topics. The prevalence of such a religious interest was, of course, in keeping with the times.

The American Geological Society numbered among its members such pioneers in geology as Parker Cleveland, J. F. Dana, S. L. Dana, Chester Dewey, Amos Eaton, Richard Harlow, Edward Hitchcock, Isaac Lea, Samuel Mitchill, Gerard Troost and Lardner Vanuxem. Nevertheless, perhaps the effort to organize a national society was premature. The American Geological Society apparently disintegrated around 1830. The Geological Society of Pennsylvania
was begun in 1832, but few of its members achieved more than a local reputation, and the organization dissolved after four years. A national effort at scientific organization did not succeed until 1840, when the Association of American Geologists was begun. 50

During the antebellum period, science enjoyed an increasing emphasis in America. Evidence for this includes: the proliferation of scientific societies (from 9 in 1805 to 130 by 1855), including the achievement of a national organization, the AAAS, in 1848; the growth of government support for scientific ventures (the first state geological survey was undertaken in 1824; by 1860, similar surveys had been instituted in some 28 other states); the increase in scientific journals (in 1805, 12 existed; by 1848, there were 90); the founding of astronomical observatories (in 1830, there was one; by 1860, there were 31); the emphasis on science in the colleges, exemplified by the curriculum at mid-century, and by the rise of scientific schools at Yale and Harvard. 51

An integral part of the increasing emphasis on science in America was a movement of popularization of science, a movement especially compatible with a rising democratic spirit. As early as 1817, Amos Eaton who had studied under Silliman, began giving public lectures on science, an activity he pursued throughout New England for some seven years. Another student of Silliman's, Josiah Holbrook, initiated the lyceum movement, which, beginning
about 1826, rapidly expanded until, by 1834, there were some 3000 lyceums in the United States. Scientific topics, with apparatus for demonstrations, was a prominent feature of the lyceum program.52

One outgrowth of the lyceum movement was the Lowell Institute, begun in Boston in 1840. The institute supported lecture programs designed for the "intelligence and information" of Bostonians, and among the most popular lecture topics were those dealing with science. Silliman, Charles Lyell, Asa Gray, Louis Agassiz, and others participated, offering some 25 "courses" on science during the 1840's, which entailed nearly 600 individual lectures with an average attendance of not far from 1000! There is evidence (at least in the case of Benjamin Silliman) that these lectures were not mere exercises in superficiality, but that an honest attempt was made to convey information on a level not much different from that of the classroom lectures in college.53

But it would be a mistake to conclude that the diffusion of scientific information exhausted the purpose of the popular lecture. Another important aim was the promotion of science; and these two goals were complementary, not mutually exclusive. Indeed, there is reason to believe that the promotion of science constituted a substantial portion of the college classroom lectures as well, a state of affairs which reflects the lack of curriculum electives as well as the state of science at the time.
In the promotion of science, American scientists (and others) made a pardonable blunder, confusing technology and science. They repeatedly praised Lord Bacon for his insight which was (they believed) largely responsible for the great technological advances—the steam engine, the steam boat, the railroads, and that wonder of wonders, the telegraph. In the young nation, the idea of progress was in the air, an idea which fit in well with the perfectionism and millennial hopes of the revivalistic mentality of antebellum Americans.  

It is in conjunction with the promotion and popularization of science that American scientists made notable references to the relation of science to moral and religious considerations. The lectures of several prominent scientists, including Louis Agassiz and Asa Gray, at the Lowell Institute are cases in point. Concerning the Lowell Lectures given by Benjamin Silliman in 1843, the Boston Transcript wrote:

Professor Silliman, whom all the Bostonians love as a Christian and honor as a man of science, concluded his series of valuable and instructive lectures...which...have been continued for four years...Admiring as we do the perfection of science exhibited continually by the lecturer...we have yet a higher love and reverence for that beautiful exhibition of divine truth to which Mr. Silliman constantly alludes, as seen in the wonderful works which he has successfully presented as designed by the Almighty power, and made known to man by human intelligence...55

In the performance of these lectures, Silliman saw himself
discharging his "responsibility for the honor of Yale College, and . . . still higher moral obligations. . . ."\textsuperscript{56}

The association of moral values with scientific knowledge was commonplace in antebellum America. The idea was expressed in the newspapers: "Religion, morality, and true science. . . are 'inseparable companions'," averred one writer.\textsuperscript{57} "That science lifts the mind to God was a constant theme in the religious and popular press," concluded McElligott in a recent study of American magazines during the period 1830-1860.\textsuperscript{58} Nor was this theme a mere fabrication on the part of non-scientists. Indeed, it was a common assertion in the press that contemporary scientists were friends of religion, an assertion which could be substantiated readily by turning to pronouncements of the scientists themselves.\textsuperscript{59}

For example, Increase Lapham in a speech to the Milwaukee Lyceum in 1840, assured his listeners that the study of natural science, especially for the young, was "one of the surest safeguards against immorality and vice."\textsuperscript{60}

But it was not only in the course of the popularization and promotion of science to the public at large that scientists exhibited such sentiments. In their classrooms they also took advantage of opportunities to impart "wisdom" along with knowledge, pointing to the First Cause. Particular examples include Benjamin Silliman's textbook on chemistry and Benjamin Peirce interrupting a lecture to insert the comment, "Gentlemen, there must be a God."\textsuperscript{61}
Of course, a mingling of moral values with scientific knowledge was neither original with Americans, nor new in the nineteenth century. Among the virtuosi in seventeenth century England, it was commonly agreed that an increased knowledge of nature was conducive to a deeper appreciation of spiritual truths. Similar sentiments were expressed by Cotton Mather in his Christian Philosopher, printed in 1721 in America. The point to be noted is, however, that this sentiment persisted well into the nineteenth century in America. Thus, the extent to which "the older religious motives for studying science gradually withered away" during the antebellum period has perhaps been exaggerated. The "older religious motives," in fact, appear to have permeated higher education, in general during the entire antebellum period.

Natural theology was in vogue in the early part of the nineteenth century. William Paley's Natural Theology; or, Evidence of the Existence and Attributes of the Deity Collected from the Appearances of Nature, published in 1802, enjoyed a long period of popularity in America. For example, it was used at Yale until after the Civil War! The Bridgewater Treatises, published in England during the 30's, were also duly republished in America. In addition, there were theoretical expositions of the foundations of natural theology.
The prevalence of natural theology in the early nineteenth century is a fact which has been recognized.\textsuperscript{65} The "explanations" of this fact (seldom explicit, but often implicit in discussions of science in the nineteenth century) have usually emphasized the elements of tension between science and religion. For example, in Charles Gillispie's \textit{Genesis and Geology}, which treats an area of science in which the tension was particularly acute, one can almost see the religious scientist, his back to the wall, waging a losing battle of reconciliation of irreconcilables. Two other more recent studies also emphasize the reconciliation aspect. The titles of both are significant: "Geology and Religion before Darwin: the Case of Edward Hitchcock, Theologian and Geologist (1793-1864)" and "Before Darwin: Religion and Science as Presented in American Magazines..."\textsuperscript{66}

George Daniels has taken a somewhat different viewpoint, looking at antebellum science in America from a sociological perspective.\textsuperscript{67} Though an explanation of the popularity of natural theology is not a central issue in his paper, or subsequent book, he does offer an explanation which is plausible. During the process of professionalization, so the argument goes, the scientist invades a field within the domain of an established profession--viz., that of the theologian. In an effort to legitimatize his profession, the scientist "practices" natural theology, whereby some of the "aura of
the theologian" is attached to the scientific profession. In short, the scientist "misuses" science, giving lip-service to religion, in order to further his "real" end, viz., the establishment of science. Daniels is certainly not the first to imply that scientists in America exploited a general religious atmosphere for their own ends. In 1948 Dirk Struik wrote of Benjamin Silliman: "Like so many American and British scholars of his generation, he was constantly trying to pacify the orthodox clergy by asserting that nothing in the teachings of modern science was antagonistic to the Bible."

There is general agreement that a process of professionalization of science did occur in antebellum America. Nevertheless, recent studies have suggested that the process was extremely complex. During the process, there was promotion, popularization, diffusion, and advancement of science, and it is scarcely surprising that tensions arose as partisans of the several possible emphases defended their personal preferences. Especially in a land committed to democracy, the potential for conflict was marked. Benjamin Silliman was criticized for including "wretched trash" in his American Journal of Science. Popular lectures in science were denounced as taking valuable time away from scientific research and as casting scientific pearls before swine. On the
other hand, some scientists contended that research rendered the
teacher of science narrow and ineffective.\textsuperscript{73}

It is true that by mid-century there was an increased empha-
sis upon the advancement of science as opposed to its diffusion,
but a significant number of the scientific community were still
teachers of science, committed to an earlier view of science as an
instrument of liberal education and ethical training. Therefore, the
issue of professionalization can easily be overdrawn.\textsuperscript{74} Furthermore, Daniels' suggestion of "exploitation-of-religion" by
scientists, though quite different from the "conflict-of-science-
with-religion" viewpoint, shares with the latter viewpoint an
emphasis upon the conflict between science and religion. However,
other considerations suggest a degree of compatibility between
science and religion which is often minimized or overlooked.

Guralnick has recently re-emphasized the fact that, though
denominational colleges were founded in large numbers in ante-
bellum America, they were not generally sectarian in nature. He
has suggested that the term "denominational college" is therefore
misleading. Nevertheless, it seems that his reference to the
"secularization" of American colleges is also misleading. It is
certainly true, as he notes, that these colleges did not specialize
in teaching theology. The truth probably lies in an intermediate
position: the colleges in antebellum America were neither sectarian nor secular, but religious. 75

In antebellum America, revivalism did give rise to a proliferation of sects and denominations. However, this very movement fostered a revolt against denominationalism and the non-sectarian nature of colleges reflects this revolt. 76 Guralnick has also pointed out that a significant fraction of science professors had studied theology before taking up science. 77 This latter fact (rather than indicating a secularization) is likely another reflection of anti-sectarianism. (No doubt, an important additional factor was one of economics—the availability of a job!) If such is the case, there is a pleasing parallel between the nineteenth century and the seventeenth century. As Richard Westfall has noted, it was "against a background of sectarian controversy" in seventeenth century England that natural theology arose, with the promise of restoring certainty. 78

With such considerations, it is not at all remarkable that natural theology was in vogue in antebellum America. After all, many of the scientists were themselves "almost-theologians." 79 Therefore, Daniels' explanation for the prevalence of natural theology may be true in word, but in an entirely different sense than he intended. He suggested that the prevalence arose from scientists "misusing science for their own ends." By "their own
ends, "Daniels meant the legitimatization of science. A study of
Denison Olmsted has suggested that his "misuse" of science was for
his "own end," but that this end was largely a religious end.
Indeed, one can almost say that a "natural theology mentality"
carried over to all his activities, which were seen by him as means
to further the cause of religion.

In several respects, Olmsted's background is representative
of that of a significant fraction of his contemporary fellow-
scientists. In Guralnick's recent Science and the Ante-Bellum
American College, there are biographical sketches of some 38 pro-
fessors of Mathematics/Natural Philosophy/Astronomy/Natural
Science who taught at least five years in one or another of 15
prominent colleges in America sometime between 1828-1853. Of
these 38 professors, no less than 13 (including Denison Olmsted) had
studied theology after college graduation. Daniels' earlier book,
American Science in the Age of Jackson, contains biographical
sketches of 55 "leading scientists," active during the period 1815
to 1845. Of these 55, at least nine (including Olmsted) had studied
at Yale. By comparison, seven had studied at Harvard. 79

In a recent comprehensive study, Clark Elliott has analyzed
various biographical data on some 500 American scientists who
published at least three papers during the period 1800-1862 which
appeared in the Royal Society Catalogue. 80 On a per capita basis,
Massachusetts was the most common birth-place for these scientists, with Connecticut (Olmsted's home state) in second place. Though the most common occupational category of the fathers of these scientists was one of the professions, such as lawyer, clergymen or educator, agriculture accounted for 20 percent (Olmsted's father was a farmer). Of the scientists whose religious denominational background was available, half came from a background of the "established American religious denominations," Congregational (in Olmsted's case), Presbyterian, and Episcopalian. About half of the scientists were college graduates; of these almost half were graduates of either Harvard or Yale. Of those who did post-graduate work, about half studied medicine, but a significant percentage (15 percent) studied theology (as did Olmsted). Of the occupations of the scientists themselves, the one in which Olmsted engaged (professor of science) accounted for the largest percentage (20 percent). Despite a growing professionalism, some 30 percent of the scientists published (as did Olmsted) in areas "wholly unrelated to science."

Olmsted's activities as a professor of science are illustrative of the state of science during this period. He provided one of the first American college textbooks in Natural Philosophy, replacing a long out-dated English text by the compiler Enfield, a non-scientist. Olmsted's text proved to be quite popular and was being
used in some 40 colleges within a decade. By that time he had also written a textbook on astronomy "for the students at Yale."

Olmsted was also responsible for initiating, promoting and undertaking the first geological survey to be sponsored by a state. As Guralnick has pointed out, "we must understand that the preparation of textbooks when there were none, or the participations in geological surveys when the country was yet scientifically unexplored, were legitimate scientific endeavors in the nineteenth century."81

Like many of his fellow-members of the community of scientists, Olmsted was an avid promoter of science, by means of lectures on scientific topics delivered to popular audiences, by means of newspaper articles explaining and describing such striking natural events as comets and solar eclipses, and by means of books written for the intelligent layman. Another avenue whereby science could be advanced was through scientific organizations. Olmsted was a member of such early scientific societies as the Connecticut Academy of Arts and Sciences, the American Geological Society, the American Association of Geologists and Naturalists, and the American Association for the Advancement of Science.

Though Olmsted thought of himself principally as a teacher of science, his efforts were by no means confined to the promulgation and promotion of science. He published papers on several subjects
of current scientific interest, making original contributions to such
topics as the formation of hail, the origin of meteoric showers, the
nature of the zodiacal light, and the periodicity of the aurora
borealis.

In some ways, Olmsted was not a "leading" scientist in
America; he was not on a par with, say, members of that legendary
group, the Lazzaroni, which included such men as Joseph Henry,
Alexander D. Bache and James D. Dana. But there is reason to
believe that a "leading" scientist, by that very fact, would have a
tendency to transcend his time. A "lesser" scientist might be
expected to more accurately reflect his time, being more a product
of that period, and therefore presents a useful perspective from
which to analyze historical issues.

There is an additional consideration. Men such as the
Lazzaroni were primarily interested in scientific research; that is,
in the advancement of knowledge, not its diffusion. It is true that
some of these men taught science, but it would probably be safe to
say that they taught science so that they might do research.
Olmsted was of another mold; he envisioned his "peculiar sphere
of usefulness" (as he would have put it) as that of a teacher. His
research was done primarily (though not exclusively) that he might
do teaching—effectively and authoritatively. Olmsted believed that
it was quite impossible for one individual to perform successfully
the duties of teacher and researcher. As a teacher, he was in a position to influence minds, not only those of the next generation of scientists, but those of all college students. His perceptions of science and its relation to religion would be imbibed by many hundreds of youth. Therefore, they merit an examination.

This biographical study of Denison Olmsted is intended to establish the following points. His view of the importance of moral and religious training as a part of the "proper" educational goals of the college coincided with that of his colleagues at Yale and thus (presumably) with a significant number of his contemporaries in teaching. His promotion of science and his emphasis upon its utility were motivated by his personal, religious beliefs. His writings on natural theology were predominantly an exercise in worship, motivated by a personal, religious experience, and coinciding in content with his own religious outlook.
II. THE FORMATIVE YEARS

Train Up a Child... (1791-1809)

childhood: "...that sweet season between the cares of infancy and the anxieties of youth." 83

Denison Olmsted's maternal grandfather, Mr. Denison Kingsbury, was a farmer in Hebron, Connecticut. In the New England tradition, he exerted a strong influence over his children. 84 To their young minds, his knowledge of Scripture and religious doctrine was outstanding; they often quoted his authority in religious matters. Kingsbury's daughter, Eunice, assimilated her father's instruction. At home, she learned to read and write, and memorized passages of Scripture as well as the greater part of Isaac Watt's Psalms and Hymns. Coupled with what she heard on Sundays from the preacher, her religious education was extensive, if not profound, and that was significant. Though she "never went to school but a fortnight," she was asked to teach at a school in a parish of East Windsor. 85 It was probably in East Windsor that she first met Mr. Nathaniel Olmsted. They were married in 1783. Eunice, a farmer's daughter, was now a farmer's wife.

In the summer of 1791 (June 18) their home was blessed with a fourth child, a son. They named him Denison, after his grandfather. But the family happiness was soon marred by the father's
illness. That winter, Denison became ill, also. He would cling to his mother, and she, exhausted with caring for father and son, found it necessary to keep out of Denison's sight. Meanwhile, Nathaniel grew steadily worse. The father died—the victim of consumption—when Denison was scarcely a year old. It was feared that Denison's "lung complaint" would soon terminate his young life, but his mother, using the best remedies she knew (bread soaked in molasses and raccoon's oil), nursed him back to health, with the help of God.

With the help of God to be sure. The same God who took her husband in death gave her strength to bear the loss. And He surely restored her son to her. She must have relied heavily on Him in raising her little brood. Like Eunice the mother of Timothy (in New Testament times) so Eunice Olmsted, by her early counsels and warnings, by her earnest prayers, and by her own example, endeavored to instill in her children a measure of her own deep faith in God. For her, religion was "emphatically the great business of life." If not the subject of every conversation, it was at least the subject to which her every conversation returned. Long afterwards, Denison was to recall with warm satisfaction these first years of home training.

When Denison was eight years of age, his mother married Mr. Ephraim Webster of Farmington, Connecticut. Mr. Webster
already had a large family of eight children and it was decided that Denison and his older brother Nathaniel should remain at Hartford. The arrangement did not last long—Denison was "taken sick" with the mumps, complications set in, and he was soon with his mother again. The trip from Hartford to Farmington (fully 10 miles) was an eye-opening experience for Denison. Prior to this, he had disputed with a small friend on whether the world ended where the sky rested on the mountains west of Hartford!

For a year or so, Denison was jostled here and there; he spent a summer with his grandmother, a year (perhaps) with his uncle, returning at intervals to visit his mother at Farmington. No doubt, his mother recognized the unsettling effect of such an arrangement. Denison's older brother had gone into a trade, and was no longer at home, but Eunice Olmsted had in mind a higher goal for her youngest. She hoped that he would become a minister of the everlasting gospel. Her second husband was uneducated, and his children uncultured. Clearly Denison needed a more suitable environment, one that might properly raise his aspirations by means of a life worthy of emulation. Eunice Olmsted decided upon the household of John Treadwell, Lieutenant Governor of Connecticut, a man who was to exert a significant influence upon Denison.

Treadwell, a Yale alumnus, had appreciated the opportunity of a liberal education. Upon graduation, he had studied law; his
participation in the American Revolution had thrust him into a career of civil service. He had become a member of the Corporation of Yale College in 1792 and subsequently served with vigor as a member of the Prudential Committee of Yale. He retained a scholarly bent, continuing to read Virgil and Horace in Latin and studying his Greek Testament faithfully. He always considered the opportunities at Yale for religious instruction of paramount value, and his love for learning carried with it an exalted view of the value of learning to the church. Nor was his devotion to learning confined to those privileged to attend Yale. He was one of the prime movers in establishing the Connecticut School Fund, which sought to render the blessings of a common school education as "free as the common air." 

From his youth, Treadwell had been taught by Puritan principles. He had learned that the Scriptures are a revelation from God and the standard of truth. Thus it is not surprising that he was closely connected with the rise of the missionary effort in Connecticut. The Connecticut Missionary Society, organized in 1798 "to christianize the heathen in North America and to support and promote Christian knowledge in the new settlements within the United States" chose John Treadwell as its first president, a post he retained until 1816. The Connecticut Evangelical Magazine, which began its monthly appearance in 1800, was an early
publication of the Connecticut Missionary Society. Treadwell not only promoted the publication, but contributed articles as well. When the American Board of Commissioners for Foreign Missions was organized in 1810, Treadwell became its first president. 93

Treadwell also exhibited a strong interest in mathematics, and it was he who gave Denison his first lessons in the subject. Late one evening, after reading from his Greek Testament by candlelight as was his custom, Treadwell turned to young Denison and asked, "How many farthings make a penny?" "I don't know, sir," was the reply, "but I guess ten." 94

It was to such a man, whom Denison was later to describe as one of "unsullied integrity, pure patriotism, fervent piety and enlarged usefulness," to a man who exhorted his family to choose God as their portion that Eunice Olmsted entrusted her son, telling him that it was no sin to aspire to know as much as Governor Treadwell. 95

Still under the direction of Treadwell, Denison was not yet 13 when he began working as a merchant's clerk. It was not long before it was proposed that he move to Burlington where Lieutenant Governor Treadwell's son was opening a store. His mother was reluctant to let him go. To trade off a comfortable Christian environment for a place where he might meet with dangerous temptations seemed unwise to her. Nevertheless, she finally
yielded to Denison's pleading and let him go, taking comfort in the thought that this turn of events was a manifestation of an over-ruling providence.

This is not to say that she left it all up to God. No, indeed. She wrote to her son, reminding him of the need to read the Bible, the importance of meditating on its words, "by which your heart and actions will be tried." Denison's future was often in her thoughts.

I can almost say with David [she wrote], 'Rivers of water run down mine eyes' while I consider your critical situation. But if the privileges you have enjoyed... should be improved to make you useful in the world, how happy I should be in such a son.

It was not her wish that Denison be great, but that he be good. As for his future profession, her personal choice, as always, was that he become a clergyman, but she admonished him that it would be better to be an honest farmer, than a king untrue to his trust.

"What I wish you to do," she wrote, "is to put yourself in that situation where you can best serve God and do good in the world." 96

Denison listened to her counsel. When the chance came in 1807, he enrolled in a school taught by James Morris at Litchfield South Farms. At the time, Denison had no thoughts of going to college, but one can well imagine that his dear mother, who accompanied him to Litchfield, returned to her home with renewed hopes. Initially, his studies were English Grammar, Geography and Arithmetic, but before long he began studying with an eye
toward college. To this end, he returned to Farmington, to study under Reverend Noah Porter, a clergyman with a strong missionary zeal. 97

It was at Farmington that Denison had first participated in grammar school exhibitions, held in the village church. Here he had listened to the preaching of Reverend Washburn. Even more impressive than the sermons had been the Monday night meetings—held in Washburn's own home, where this dedicated preacher had instructed the young, with words expressly designed for them. It was at Farmington, too, that Lieutenant Governor Treadwell had inspired Denison to study mathematics. It was fitting that here Denison should prepare for college. 98

Denison's mother, ever mindful of her son's welfare, requested him to visit with Timothy Pitkin, a "golden link" which bound the present to the past. George Whitefield, the noted preacher of the Great Awakening, had preached in Pitkin's pulpit and had sat at his table. Denison visited Pitkin, first out of deference to his mother's wishes, but later out of sheer enjoyment of the conversation. Pitkin, having himself been a student at Yale, and being a member of the Yale Corporation, loved to talk of the college. Undoubtedly, his reminiscings filled Denison's mind with a glorified vision of Yale. 99
The summer of the year Denison came back to Farmington, an epidemic of spotted fever struck. The town was desolated; Denison's brother, his sister, and finally his mother contracted the fever, but Denison escaped. He "kept" a village school in the winter of 1808-1809. The following summer, he resumed his studies with Reverend Noah Porter at Farmington, entering Yale at the beginning of winter term, 1809.

The foregoing sketch exhibits the background of Denison's formative years. Deprived of a father at an early age, Denison derived his first values, and his concepts of the meaning and purpose of life, largely from his mother. Though uneducated herself, she impressed his pliable mind with a sense of high regard for education. It was doubtless from her lips and by her actions that he first learned his duty in life--to be useful. But most importantly, education, usefulness, meaning in life were all presented in the context of Christianity, the theme of paramount importance to his mother; a theme destined to loom large in his own experience.

Even after his mother's remarriage, when circumstances dictated that Denison spend significant periods of time away from home, his mother's influence persisted. It was she that chose to place him in the home of John Treadwell. Treadwell's long-time association with Yale, his active interest in common schools and his own personal involvement in the missionary movement were facts
which served to reinforce in Denison a markedly Christian world-
view. This view was further augmented by the very environment of
Farmington, where the church played such a central role in the
community. Finally, Denison was prepared for Yale by Reverend
Noah Porter, a clergyman. It is probable that Reverend Porter
was acquainted with the goal that Denison's mother cherished—that
her son would become a clergyman. Given Porter's zeal for
religion and the prerequisites for entering Yale which included an
ability to read from the Greek Testament, it is clear that
Denison's "preparation" was permeated with religious overtones.

Preparing for Service (1809-1817)

"... select that profession in which he can probably
be most useful..." 101

At this time, what was the character and reputation of Yale,
when Denison was to receive a liberal education? It is scarcely
possible to answer this question without discussing the character
and reputation of a most remarkable man who was then president of
Yale—the Reverend Doctor Timothy Dwight. 102

Dwight, an alumnus and former tutor of Yale, had spent the
decade prior to his presidency pastoring the Congregational Church
at Greenfield Hill, Connecticut. There, to supplement his meager
income, he had initiated an academy. Far superior to the usual
preparatory school, it had flourished, boasting over 50 students, many of whom received instruction in a series of regular courses not unlike those taught at Yale itself.

During the years at Greenfield Hill, deistic ideas and religious scepticism were prevalent in America. Dwight joined the fight against infidelity. His influence was not confined to his local parish; on the day preceding commencement at Yale in 1793, he preached a rousing sermon in New Haven on "the Genuineness and Authenticity of the New Testament." 103

When the presidency of Yale became available in 1795, there was little doubt but that Timothy Dwight was the man for the job. The college urged him to view the offer as an "important call of Divine Providence," and the Congregationalist Consociation accepted his resignation from the pastorate at Greenfield Hill, stating that his new office as President of Yale was "important to the interests of society and religion." 104 Yale had not escaped the secular trend in America. The "religious state of the college was extremely low." 105 The "college was in a most ungodly state. The college church was almost extinct. Most of the students were skeptical, and rowdies were plenty." 106 In fact, many of the seniors were infidels and had nicknamed each other Voltaire, Rousseau, D'Alembert, etc.
As Defender of the Faith, Timothy Dwight went into immediate action. Traditionally, the President had taught many of the senior classes. In Forensics, it was customary for the students to submit several subjects and then the President would pick one of these for disputation. To everyone's surprise, Timothy Dwight chose the question, "Are the Scriptures of the Old and New Testament the Word of God?" He admonished the students to prepare their arguments well. After they had finished their presentations (most of which supported the negative side of the issue), Dwight launched into a spirited defense of the divine origin of Christianity, pointing out the unfounded assumptions of atheistic reasoning. He followed this episode with a series of sermons on the "Evidences of Divine Revelation." The following year he addressed the seniors at graduation on "The Nature and Danger of Infidel Philosophy." Believing that sound reasoning, valid arguments and correct understanding were on his side, Dwight resolutely waged his war against the enemies of religion, confident in the ultimate triumph of truth.

When Dwight had begun his duties as President, the professorship of divinity was vacant. He agreed to undertake its duties and developed a series of lectures, giving one each Sunday, such that the entire series was completed in four years. Thus each student, in the course of his stay at Yale, had the opportunity of hearing the
entire series. After Dwight's death, these sermons (numbering over 170) were published in a set of volumes which became "a
popular religious classic" in both America and Great Britain,
passing through some 40 editions in Great Britain alone.  

The title of these volumes is significant: Theology, Explained and Defended..., with the sermons falling into two broad
categories. The first category dealt with the system of doctrines
and corresponded roughly to what might be termed a defense of
religion; these sermons were quite polemical in nature. But
Dwight was not content with a sterile intellectualism! He would
not settle for a mere contemplation of religion, but insisted on its
practical application to life. Therefore, nearly half of his series
of sermons stressed the explanation of religion, in which he dwelt
on the duties of the Christian.  

Dwight attempted to perform his duties as President in a
practical way. One of these duties involved the discipline of
students. Discipline, not punishment--for the two ideas were
essentially different in his mind. In his opinion, too much of the
discipline at Yale smacked of punishment, i.e., it was designed to
"reward" the sins, not to amend the character. Dwight determined
to manage the college students as he did his family--not by force
but by persuasion. In place of fines, he substituted private
admonition, remonstration and parental counsel. He encouraged
the students to come to him with their problems, and sincerely exerted himself to help them. By implementing this parental system of discipline, he engendered the confidence and love of his students. Though to the outside, he sometimes displayed an authoritarian air which gave rise to the appellation "Pope Dwight," yet to his pupils, he was "The Young Man's Friend." 111

At their own initiative, the students organized a voluntary association which they named the "Moral Society." In subscribing to the oath, the members promised to suppress vice, promote the morality of the Bible and abstain from profanity and the playing of cards. They scrutinized the actions of their fellow students, offering words of rebuke or encouragement as the case required. They built up a small library of books, conducted orations and debates on religious issues and were probably instrumental in the revivals that came to Yale. 112

And revivals did come, for the turn of the century ushered in a period of unprecedented revivalism. 113 The first such revival under Dwight's administration occurred in the spring of 1802. Over 60 souls were admitted to the college church. But with a continual turn-over in student population, it is not entirely surprising that the effects of this revival waned. By the fall of 1807, the number of professing Christians among the students was scarcely a dozen. That winter a remarkable revival occurred in
New Haven, but the students at Yale were scarcely affected at all. Dwight, first disappointed and then alarmed, preached a moving sermon on the "Youth of Nain," which precipitated a revival at Yale almost as powerful as that in 1802. Dwight, who dreaded a mere emotionalism with its attendant false hope, spent long hours laboring individually with those students who were "convicted," trying to establish their experience upon a sound basis. Of the converts during this revival, a score went on to become ministers.

Of course, Dwight was more than simply a defender of the faith and a sparker of revivals. But no matter what he did, it must be understood within the all-encompassing context of his religion. Under his direction, Yale began to take shape as a national institution—a University. He established a Medical Department and laid plans for Departments of Theology and Law. He promoted knowledge by chartering the Connecticut Academy of Arts and Sciences (CAAS) and serving as its president until his death. He instituted a professorship in the relatively new discipline of chemistry. He promoted these enterprises because he was promoting America and he believed that knowledge was the key that would enable America to lead the rest of the world to the Promised Land.

Even in the appointment of faculty, Dwight's priorities surfaced. He chose Benjamin Silliman for the professorship of chemistry. Having observed Silliman for a number of years,
Dwight was certain about his character. As for his lack of knowledge in chemistry, that was a deficit which training could fill in. The case of Nathan Smith was exactly the converse. Smith, whose professional qualifications for head of the Department of Medicine were without equal, was reputed to be an infidel. Though Dwight badly needed a competent person to head this department, he waited until he was satisfied that Smith's religious sentiments had undergone an "entire alteration," before offering him the post. 116

The famous author, Peter Parley (alias Samuel G. Goodrich, 1793-1860), visited New Haven in the summer of 1809, when he was about 16. In his imagination, New Haven was "a sort of Jerusalem," "a holy place, containing Yale College, of which Dr. Dwight was president." Dwight was at the height of his fame, "unquestionably. . . the most conspicuous man in New England, filling a larger space in the public eye, and exerting a greater influence than any other individual. No man, since his time, has held an equal ascendancy, during his day and generation, in New England--except perhaps Daniel Webster." 117

The preceding sketch of Timothy Dwight is important, not only for what it says about the state of Yale College, but because of the personal influence that Dwight exerted upon the students in general and upon young Denison Olmsted in particular. In later
years, Olmsted was to refer many times to his former teacher and friend. Like Dwight, Olmsted became an educator who viewed education from a Christian perspective, looking upon his own role as parental, and regarding his students as sons, needful of moral as well as intellectual direction. Dwight's emphasis upon the practical reinforced a maxim that Olmsted had imbibed at his mother's feet--be useful, she had urged. Finally, the reputation that Dwight acquired as "Defender of the Faith," was to influence Olmsted's own perception of the state of religion. He was to see the battle against infidelity as essentially already won--to his own generation would be given the happier task of spreading a gospel already well on its way to a glorious triumph.

When Denison entered Yale, his mother was pleased. "I am happy to have you under the care of Dr. Dwight. . . ," she wrote. Yet, even here there were dangers. His mother reminded him that "learning" of itself would not be sufficient, and that Scripture admonished him to abhor that which was evil and cleave to that which was good. "It does not require much learning to distinguish between good and evil," she exhorted. ". . . pray God that the inspiration of the Almighty may give you understanding. Keep close in prayer."

Before Denison had completed his first year at Yale, he was called home. His older sister, Thankful, who had contracted
whooping cough even before Denison had left for Yale, was so weakened by this disease that she fell victim to consumption. Denison left his studies and came home to help care for her. His tears were mingled with those of his mother, as he witnessed the last dreadful scene. For a second time, death—the "King of Terrors"—had done his terrible work in the Olmsted family—again via consumption.

Still unsettled upon his future profession, Denison returned to Yale for his sophomore year. Since all students took the same sequence of courses (the first electives were not introduced at Yale until about 1820), an early decision was not required. Indecision at this stage was certainly not cause for undue anxiety, at least not unless it indicated ambivalent feelings with respect to a much more important "profession," viz., the profession of religion. Such was Eunice Olmsted's concern. With a tinge of apprehension, she wrote, "I flatter myself it is your determination to make a business of religion... It is my daily prayer that you may be fitted for usefulness in the world, and be willing to endure hardships and trials for the sake of promoting religion." 

Eunice had no complaints regarding her son's performance academically. Indeed, she was pleased with "the proficiency" he made in science. With regard to religion, however, things seemed less decisive. It is true that he was well-behaved. Already in
his freshman year, he had joined the Moral Society. Its oath bound its members to suppress vice and promote the morality of the Bible, to abstain from profanity and card games. Such goals were certainly commendable.

But the Moral Society meetings were also taken up with debates. From boyhood, Denison had often perplexed his mother by raising difficulties concerning some of the cardinal points of the faith (e.g., original sin, predestination). Sometimes, unable to answer his questions, she would weep. To what extent (she must have wondered) was Denison's interest in the Moral Society the result of a "mere" intellectual taste for such questions as: Can the unregenerate believe the Bible? Is a hypocrite worse than an infidel? Should the clergy take part in politics? Would a consideration of such topics ensure a personal commitment to religion?

Denison's first two years at Yale were largely occupied with a study of the classics. As a freshman he studied Collectanea Graeca Minora, Homer's Iliad, Livy, Cicero's De Oratore, Adam's Roman Antiquities, Jedidiah Morse's Geography (first volume), and Webber's Mathematics (first volume). As a sophomore, he recited Horace, Collectanea Graeca Majora (first volume), Morse's Geography (second volume), Webber's Mathematics (second volume), Euclid's Elements, an English Grammar, and Tytler's Elements.
of History. Instruction in both years was given almost exclusively by the tutors, although the (compulsory) twice-daily chapel exercises ensured that the students were not isolated from the influence of professors and president. 124

In the junior year, the second volume of Collectanea Graeca Majora was studied, plus English Grammar and Tacitus' History. In addition, there was Trigonometry, Navigation, Surveying and even Fluxions. During this year, science was also introduced, including astronomy, natural philosophy and chemistry. There was more extensive interaction between the upperclassmen and the professors. Jeremiah Day (the Professor of Mathematics and Natural Philosophy) delivered a course of experimental lectures at the rate of one per week, although by his own admission, he scarcely had time to familiarize himself with contemporary developments in natural philosophy, and hence, his lectures were largely a hodgepodge. Among the activities which occupied his time was that of writing a textbook in mathematics; his Algebra came out in 1814, the year following Denison's graduation from Yale. 125

The popular subject of chemistry was taught by Benjamin Silliman with ample apparatus and flair. Silliman gave over 100 lectures on the subject to the juniors, and he undoubtedly stressed the utility of the sciences. He also exposed the students to such
up-to-date topics as galvanic electricity and (presumably) Dalton's atomic theory. 126

Despite this increased emphasis upon science, there is evidence that Denison's thoughts about religion were exhibiting a more serious trend. It was in his junior year that he wrote his mother, asking her opinion about the origin of evil. She regarded his request as coming from a "sincere inquirer after the truth," but admitted that she felt "so ignorant when contemplating God's great plan in creating and governing the world, so dark-sighted . . . [that] I have almost given up my hope. . . . But we . . . can understand very little of God's wisdom in his great plan. . . . No doubt it was for wise ends. . . .that sin entered our world. . . . But I know that I have not answered your question. . . ." 127 Olmsted's later writings were to emphasize his acceptance of his mother's belief that all circumstances in the world were according to God's wise plan.

Denison entered his senior year, still undecided on any profession. Though his mother nobly strove to let him make his own decision, he was clearly aware of her desire that he become a minister. There is no available evidence as to Olmsted's personal preference at this time. Provided his own ambition lay in another direction, he would be torn between that course and the desire to please this "best of possible mothers."
On the other hand, even if Denison wanted to become a minister, he was not thereby free to proceed with his preparation. By precept and example, his mother had instilled in him a high regard for the station of minister—it was more than a means of livelihood, more than a mere profession. He believed that to undertake its duties thoughtlessly, or without due regard for the sacredness of the office, would be criminal, and would merit all the woes pronounced by Christ against the hypocritical Pharisees.128

An absolute prerequisite for a clergyman was to "have an experimental acquaintance with the religion of the cross."129 (Years later, Olmsted was to decry the deplorable state of affairs in England, which countenanced Anglican bishops, serving without piety.)130 Such an "experimental religion" was not to be obtained solely at the whim of the potential recipient. It was a commonly taught doctrine that conversion was an experience to be waited for—when, where, and to whom it came was at the discretion of God's Spirit.131 When, and if this experience came, it was commonly followed by joining the church. But young Denison, though a senior at Yale, that citadel of Congregationalism, was not a church member, a fact that Eunice Olmsted presumably knew. Nevertheless, she doubtless chose to believe the best regarding her son. Therefore, one can well imagine her reaction to Denison's letter home, in which he confessed, "I have never
experienced the new birth." Though she might have already known, certainly should have suspected, these words from his own pen pierced her heart. Sleep left her; her mind was filled with the image of her son, "without hope and without God. . . ." In her reply is revealed the conflict, the tension of a mother—a desire to see her own hopes fulfilled, mingled with regard for the cause of religion, and a resignation to the sovereign will of God. "You conclude," she wrote, "it would be most pleasing to me to have you study divinity. I do not wish you to be a blind leader of the blind. If you realized the worth of souls, that would be my choice. But I have no choice, only that Providence would direct you." 132

Denison's senior year included further study of the sciences—Professor Day lectured twice a week on natural philosophy and Professor Silliman lectured on chemistry. In addition, there was a continuation of the weekly forensic disputations of the previous year. But perhaps one of the highest privileges of the seniors, one to which they looked forward with eager anticipation, was that of being taught by President Dwight himself. Under his personal direction, they studied Rhetoric, Ethics, Logic and Metaphysics, all subjects in which Dwight delighted. In addition, Dwight spoke informally on theology to the class as a whole once each week. In keeping with his own interests, Dwight's instruction included the practical as well as the abstract. 133
It was during Denison's senior year that another revival began at Yale. The previous revival, in 1808, had owed much to the personal effort of Timothy Dwight. In contrast, this one began as a student movement. Several of the seniors began to make the spiritual interest of the college a subject of prayer. They prayed especially for Elias Cornelius, a senior whom they thought most likely to oppose their efforts. Cornelius had spent his time at Yale, largely absorbed in the study of Natural History. He had not been "openly vicious," but thoughtless on matters of religion. Soon after the prayers on his behalf were begun, he stopped associating with his former companions, ceased his swearing, and procured a Bible which he studied diligently for some weeks. These activities culminated in his conversion, an event which made a profound impression on the students. Elias Cornelius sought to bring his fellow-students to a knowledge of Christ.  

The news traveled swiftly. One senior wrote home that an unusual degree of seriousness was prevailing in college, especially in "our class." A considerable number were "alarmed" and "conferences" were being held by the students several times each week. With what inexpressible joy did Eunice Olmsted read a letter from Denison, announcing the happy news that his mind was becoming increasingly exercised on questions of religion. Dared she to hope that he would soon send word that he was a
"subject of the revival." There were several considerations in her favor. In the first place, her son had recently delivered an oration to the Moral Society, and as Society librarian, he remained an active member; it was the Moral Society itself which had been instrumental in initiating the current revival. In the second place, Eunice had given her son ample instruction in religion, without which an increased hardness of heart might likely follow this time of peculiar religious interest.

Concurrent with the revival was an unusual amount of sickness at Yale. Eunice wrote to her son, inquiring about his health; she continued, "But my greatest anxiety is for your soul." Well might she be anxious. In April, in the midst of this revival, Denison left Yale to take charge of Union School, a select grammar school at New London, replacing his cousin, Professor Kellogg.

It is not unlikely that financial considerations played a significant part in Denison's decision to leave Yale at this time. Since there was a three week vacation at Yale in May, and since the seniors typically concluded their studies some six weeks before the other classes, his departure from Yale in April would not jeopardize his chances of graduation with his class.

There was one consideration which could act both as a source of consolation to his mother and a source of rationalization for himself. Union School had enjoyed the instruction of a series
of eminent men, including the celebrated Nathan Hale. Denison's new responsibilities at New London would put him in the preferred segment of society. There were only two classes of people in society, said Timothy Dwight in his closing lecture to the senior class of 1812-1813. Those employed merely to obtain sustenance and those employed to regulate affairs. Of the second group, none excepting the minister had a higher station than the instructor. 140

When Denison Olmsted took over Union School, he boarded at a public house, but the constant interruption from stage passengers, and the crowded conditions were not to his liking. Before long, a more serious condition arose. The war of 1812 was in progress, and a British squadron forced an American squadron into New London harbor. It seemed that a battle was inevitable and it was feared that New London would be destroyed. Union School broke up, and Denison returned to his classes at Yale. However, the anticipated dangers soon passed by and Denison was called back to New London. He sought a boarding place more consonant with ideals set forth by Timothy Dwight, who had recommended in such matters a private place with company of worth, respectability, good morals, and (if possible) religion. At the suggestion of a friend, Denison made application at the Allyn boarding house. Here he soon made the acquaintance of several young ladies,
among them Eliza Allyn. Little did he realize that this frail young lady would become his wife.

In September of 1813, Denison returned to Yale to graduate with high honors in his class. His commencement oration, "On the Causes of Intellectual Greatness," was a fitting discourse for such an occasion. But, as his mother had feared, on account of his absence during the final term, he had missed out on the important religious developments at Yale. Elias Cornelius had decided to devote his life to mission service. Nearly 20 seniors had experienced a marked change in attitude. The impact of the recent revival was attested by Ralph Gridley, secretary of the Moral Society.

The year past, the society has flourished in a manner superior to all other years. The number has been great. The members have been spirited, peace-full, and done honour to the society. No member has been expelled or even corrected. The last term ought ever to be remem-bered by the society, in which a great part of the Senior Class were awakened to their eternal interests as well as a number from the other classes, which greatly increased the society. May the Society still continue an ornament to the institution, a friend to sound morals and an encourager to all those who behave in that manner with which God is delighted.141

Despite (or perhaps because of) the fact that Denison had missed the greater part of these blessings, in the providence of God, he was given yet another opportunity. At the church meeting of the senior class held just prior to commencement the seniors made a solemn vow--they promised to pray for each other, for the
college, and for their absent friends on the first day of every month at sunset. Shortly after graduation, a member of the class of 1813 died. Denison was significantly affected, since the victim was his former roommate. Impressed with a feeling of urgency concerning his own soul's salvation, Denison commenced a careful scrutiny of the doctrines as taught by the church. Satisfied that he could agree in general with all, he joined the Congregational Church at New London in the summer of 1814. 142

Denison was not the only member welcomed by Reverend Abel McEwen into his church that day. Several of the Allyn sisters likewise received church membership. Before long, Denison was becoming conscious of an increasing interest in Miss Eliza Allyn. Having no immediate prospects of a settled employment, he attempted to check this developing relationship, but to no avail. Becoming convinced that it was the design of Providence, his "declarations were made and duly reciprocated" in the autumn of 1814. In the hopes of improving the prospects for an early consummation, Denison proposed to the "leading friends of education" in New London that they organize a high school according to a plan which he submitted, offering to serve as a permanent teacher. Fortunately (as he thought afterwards), the plans did not materialize. 143
Upon receiving word that Denison had joined the church, his mother expressed her elation at the privilege of addressing him as a "Christian and fellow heir of the grace of God." But it was one thing to make a public profession of religion, resolving to follow God's will; it was quite another to discern God's will regarding one's own profession (i.e., the choice of lifework). And Denison was still troubled by this latter concern.

Eunice Olmsted did her best to advise him, but (as noted before) it was impossible for her to maintain a disinterested objectivity. "You are in my mind by night and by day," she wrote. She recommended Reverend John Newton's "five letters to a young student," hoping that they would lead her son to the path of duty. "If you desire to be a minister, I doubt not that you'll be convinced," she said, "but if your inclinations are otherwise--it's hard to fight inclinations." "There's not much to flatter you into the ministry," she added, "but you have as much as did the apostles."

The anxieties with respect to his future, coupled with his exhausting labors at Union School resulted in a decline in Denison's health. For a time, he was concerned that he might become an early victim of consumption. A brief excursion, including a visit to New York, a steamboat ride (from New York to New Haven--his first!) and a visit with his family at Farmington restored his
health, but he dreaded the thought of returning to New London, where it seemed that anxieties would surely reduce his health again.

Since his term of service at Union School had expired, he resolved to go to Andover and commence a course of study in preparation for the ministry. When the Trustees at Union School heard of his plans, they sent him an urgent letter, pleading with him to return to New London, at least for the summer. A number of boys at Union School were hoping to enter Yale in the fall, and Denison was asked to oversee their final preparation. He agreed to postpone his anticipated move to Andover. As commencement-time approached, Denison made plans to accompany his pupils to Yale. Parting with Eliza was difficult, with little prospect of seeing her regularly during the three years he expected to be at Andover.

At New Haven, good fortune awaited him. All five of his pupils were admitted to Yale; and unexpectedly, Denison was elected a tutor at Yale. Of the tutors elected at this time, all five had given "Orations" at the Commencement in 1813. Alexander Fisher thought that Denison, "next to Spalding [who had given the Valedictory at Yale in 1813], the best qualified for the place [of tutor]; and [one who] perfectly coincides with me as to the best
Besides being a mark of distinction, a tutorship offered a welcome means of financial support.

As tutor, Olmsted was responsible for hearing the recitations of a specified portion of the freshman class in all their subjects, and could expect to perform a similar function for the same group as they advanced through their sophomore and junior years. The subjects and books of the first two years were probably much the same as he had encountered as a student. He heard three recitations four days of the week, and two recitations two days of the week. In his spare time, he could still pursue his study of theology.

Though the program for resident graduates preparing for the ministry at Yale was less formal than at Andover (e.g., there were no specific time requirements), Yale students studied under President Dwight himself. Dwight had been one of the prime movers in the founding of Andover, had played a prominent role in the appointment of its faculty, and the establishment of its curriculum, and even now was on its Governing Board; and had plans for a Theological Department at Yale (although these did not materialize until 1822). At Yale each pupil was allowed to set his own pace, and had opportunity to write essays and read the works of Jonathan Edwards and Samuel Hopkins, et al. There was a weekly
meeting with Dwight whose own series of theological sermons were also available in written form.  

At this point, Eunice Olmsted could well view her son's course with a degree of personal satisfaction. She had inspired him to acquire a liberal education. He had done so, graduating from Yale, a center of religious orthodoxy. There, he had done well scholastically, and, more importantly, had witnessed a revival which had eventually led to his own religious conversion. After a period of uncertainty at New London, he was now back at Yale, embarking upon the very course of action his mother had chosen for him. "I feel it to be a great undertaking for you to go into the ministry," she wrote. "I hope it is your chief care to prepare yourself for so great a work."  

Denison now applied himself diligently to the study of theology. He occasionally presented his mother with theological questions to see how one so familiar with the Bible would respond. Eunice Olmsted responded as best she could, but made it clear that her answers were just her own opinions. She was painfully aware of her own lack of formal learning, and was willing to concede that her son might likely come to very different opinions as a result of careful study. That was all right; that, of course, was his work. "But I believe the greatest work we have to do is to keep our
hearts, " she offered. "Let us maintain secret and intimate communion with God and then we need fear nothing." 

In the fall of 1816, Olmsted was awarded his M.A. degree. The degree itself implied little more than a three-year interval of time since completing his undergraduate education. Nonetheless, perhaps such a state of affairs allowed him to pursue at some length a subject ever after dear to his heart. His oration for the commencement was entitled the "State of Education in Connecticut."

His remarks were the result of his personal experience, not mere abstract speculation. While preparing for Yale, he had tended a small village school. Later at Union School in New London, he had further opportunity to observe the effects of a traditional education. Union School had comprised a small group of students, no more than 30, whose families desired for their sons a "superior training for business or college." The variety of ages and interests had given rise to an unusual range of studies. Olmsted had there observed a sharp contrast between those students who were preparing for college and those whose time was largely occupied with elementary studies. The former group, although they spent far less time and effort on the rudiments, actually excelled their classmates who had concentrated their attention on these very topics. Denison inferred that an extended
course of studies was actually highly favorable to the acquisition of elementary knowledge and that the level of all common schools could be greatly elevated, given competent teachers and the necessary books. Attributing the generally low state of common schools to "the ignorance and incompetency of schoolmasters," he proposed an "Academy for Schoolmasters," to be established at the expense of the state.\(^{152}\) Once in operation, he envisioned the system to be self-improving, so that better teachers would result in better students, some of whom would become even better teachers, ad infinitum. Olmsted was so taken with his idea that he laid out a scheme for an extended series of newspaper essays on the subject, designed to engage the support of the public for his enterprise. Even while those plans were being formulated, an event occurred which was to have far-reaching consequences for his own life.

The previous February, President Dwight had been attacked by a severe and painful disease. By April it was believed that his case was hopeless. But he rallied and with "surgical aid" gained a partial relief from his pain. Nevertheless, he was unable to preach until June, when he delivered to the students a sermon composed during his recent illness. Dwight used as his text Psalms 94:17-; "Unless the Lord had been my help, my soul had almost dwelt in silence..." After alluding to his recent illness,
he stressed the thought that worldly pleasures and goals fade into insignificance as death approaches and urged his listeners to rest their confidence upon the only true foundation—the Rock of Ages. The drastic change in his appearance from his former robust health added a solemnity to his remarks. 153

During the summer his health deteriorated, though he presided at commencement. In early November, he preached what was to be his last public sermon, using as his text Matthew 5:16—"Let your light so shine before men, that they may see your good works, and glorify your Father who is in heaven." In late November, he caught a cold and did not go out again, but continued to hear the theological class (of which Denison was a member) at his house until a week before his death on 11 January 1817.

The news of Dwight's death reached the Reverend Lyman Beecher in the pulpit as he was concluding the Sabbath services. Beecher said, "Dr. Dwight is gone." He then exclaimed, as he burst into tears, "My father, my father! the chariots of Israel and the horsemen thereof!" 154 The Yale Corporation voted an unprecedented 30-day period of public mourning; business was suspended and the shops in New Haven were closed during the funeral. Professor Silliman presented an extended eulogy of President Dwight before the Corporation. Numerous sketches of Dwight's life made their appearance in the papers. Of those
sketches, two were decidedly superior to the rest, according to a
tutor then at Yale; one of these was written by Denison Olmsted.\textsuperscript{155}

As a senior at Yale, Denison had been inspired by Dwight, who heard recitations from Blair's \textit{Rhetoric} and Locke's \textit{Human Understanding}, and Paley's \textit{Moral Philosophy}. But, as Olmsted later reminisced, "the great value of senior year consisted not so much in the lessons learned and recited, as in the vast amount of instruction which fell from the lips of the instructor."\textsuperscript{156} There was something awe-inspiring about the very bearing of the President. Denison had often felt the force of Dwight's decisions on a host of topics--on Christianity: it has clearly been a temporal benefit to man; on motivation of students: "Emulation I condemn ... I wish to see all actuated by this desire: to do the best they can for the glory of their Creator"; on a national university, "And where would be our security, if an irreligious national university were once established?"; on the future: "I believe that Christianity will gain ground. . . the Millennium. . . is to alleviate the evils of mankind by degree. . . knowledge will be the handmaid of improvement. . . ."\textsuperscript{157} And with what solemnity must Dwight have concluded his Farewell Address to the class of 1813 with these words: "I need not--cannot tell you what our feelings must be, if, at the final day, we should all be found on one side!"\textsuperscript{158} With the commencement of his tutorship at Yale, Denison had had further
opportunity to work with Dwight (in a new and different relationship), while at the same time, by joining a select class in theology, he had enjoyed increased opportunities to form a close friendship.

But even at that, Olmsted was awed by Dwight. "In approaching this great character," he wrote, "I feel like the traveller, who draws near to some stupendous temple or palace, whose loftiness makes him giddy and whose amplitude bewilders." In Dwight's presidency, Olmsted saw the will of Providence. At a time...

...when infidelity had already erected a standard, and... stalked through our land, threatening to erase every vestige of Christianity...[Dwight] rallied the slumbering soldiers of the cross; and clad in impenetrable armour, he led the way to the field of combat. The enemy, so feeble were his weapons, spent them idly on the victors, deserted the ground, and returned no more. 159

To Denison, Dwight was the "Great Model Teacher," without a peer. As such, Dwight had encouraged his students to observe carefully, he had showed them ways to organize their store of knowledge so as to be readily recalled. Possessed with a boundless love for knowledge, which embraced the entire spectrum of human endeavor, from the most abstract to the most practical, Dwight nevertheless had taken a personal interest in people, reclaiming numbers from vice. He had elevated the whole tone of education.

The day following Dwight's death, Denison had the "melancholy satisfaction" of watching over the body. Upon leaving this
scene he penned these lines:

Where, among all the records of the many great and good, who have devoted themselves to the same dignified employment, can a man be found, who united in his own person a more wonderful 'assemblage' of those qualities which fit one for forming the characters of youth? Who has ever united in a higher degree, the dignity that commands respect, the accuracy that inspires confidence, the ardour that kindles animation, the kindness that wins affection, and has been able at the same time, to exhibit before his pupils the fruits of long and profound research, of an extensive and profitable intercourse with the world, and of great experience in the business of instruction? These powers, rare as they may seem in the same individual are still but a part of those which so eminently qualified President Dwight for the station he filled. 160

Such lauditory sentiments on the part of a devoted pupil and personal friend one might plausibly view with suspicion. But the fact remains that the Reverend Dr. Timothy Dwight was a hard man to replace. Ultimately, his duties were divided among three men. Professor Jeremiah Day, Dwight's personal choice, accepted the Presidency. Reverend Eleazer T. Fitch became Professor of Divinity, an office which Dwight had also held. Reverend Chauncey A. Goodrich was appointed to the Professorship of Rhetoric. (This latter chair was a new creation, though Dwight had essentially performed its duties.) 161

As has been noted, Denison had finished his collegiate studies at Yale without having settled upon a profession. Though pressed by his friends to make some choice, the habits of four years had rendered study more agreeable than action. His
indecision had left him in a gloomy state of mind. It was then that the opportunity of taking charge of Union School had come, but that in itself was a mixed blessing. Although it provided immediate employment, it also enabled him to postpone a decision regarding his future.

It was during the final months of President Dwight's illness that Denison's mind was apparently stimulated once more on the subject of his lifework. In reflecting upon his own indecision, he concluded that it had resulted from a failure to be thoroughly convinced of the importance of several principles (some of which were contained in letters which he had received from his mother). In the hope that these principles would benefit young students who might find themselves in a similar state of indecision, Olmsted wrote a short article, entitled "Thoughts on the Clerical Profession." Without a doubt, the article is a mirror of Denison's personal ideals and values, not only at this time but throughout the rest of his life. 162

At the outset, Olmsted sets forth four "plain principles." The purpose of life is to do good and one is under obligation to do all the good possible. From this, it follows that the profession which will render one's life most useful is the correct choice. In estimating the potential good to be accomplished, the nature of the specific employment is not as important as the attitude of the one
so employed. If, after a deliberate exploration of several spheres of usefulness, the correct choice is still not clear, that in itself is an indication that much good remains to be done in each. Let the choice be made without further delay, lest valuable time be lost!

For anyone who is sincerely religious, the "Clerical Profession" is an employment fraught with obvious potential for doing good. But Denison cautions his readers that there are several views of this calling which require correction. First, it is no ordinary profession. Woe to the person who fails to recognize that indispensable qualifications of a minister include a personal religious experience, an ardent love for religious exercise and a strong desire for the salvation of others. It is likewise important to have an enlarged view of the work of the minister, recognizing both its inherent discouragements and its unique prospects for happiness.

The bulk of Olmsted's article is taken up with considerations of the various discouragements and encouragements to be expected in this sacred profession. It is almost as if Denison is attempting to bring about (in himself?) a correct attitude toward the profession, with his third principle in mind. Finally, he briefly enumerates the inducements to the ministry:

...the consciousness of being eminently useful in the glorious service of the Redeemer; the hope of having been instrumental in winning souls to Christ; the frequent opportunities they have to engage in service of Him, whose
praise is the joy and rapture of their souls; and a thousand similar enjoyments smooth their rugged way, and crown their lives with the highest of sublunary bliss.

It sounds convincing but there is reason to believe that Denison has failed to convince himself. In fact, in an earlier part of the same article he admits, "It is not the duty of every pious young man of education to devote himself to the ministry." Using a mode of argument reminiscent of his mother's, he notes that the physician, the lawyer, the merchant—all these have opportunity to render service to religion. It is likely that such was the state of Olmsted's mind in April 1817, when he received an invitation to join the faculty at the University of North Carolina in Chapel Hill.
III. YEARS OF EXPECTANCY

The Young Professor (1818-1825)

"...we shall be able in the course of a few years, to prosecute more at large this useful and practical subject..." 165

In December 1816, the Reverend Joseph Caldwell had been promoted from the position of Professor of Mathematics at the University of North Carolina to the Presidency. This, of course, left his previous position vacant. In the course of the next several months, the Committee of Appointment on behalf of the Board of Trustees made several unsuccessful attempts at filling the vacant professorship. 166

President Caldwell, a Princeton graduate, had in mind several criteria that he thought a candidate should meet. In regards to one name suggested, he asked, "...are we enough acquainted with his literary attainments...? where was he educated? ...The only way in which we can proceed with safety is to inquire... It is safest to find a man who has been brought up in a college, and who is known to have liberality not only of education but of manners and mind." 167

Among the names suggested was that of Sereno E. Dwight, son of the late President Dwight, who was serving as chaplain of the Senate in Washington.
William Gaston, then a Representative in Congress from North Carolina and a Trustee of the University of North Carolina, talked with Dwight, who in turn suggested Olmsted for the post. President Caldwell's personal choice had been Dutton (probably Matthew R. Dutton, a Yale graduate). But there is reason to believe that Caldwell was satisfied with Olmsted who was a Yale graduate as well. Presumably, the faculty at Yale recommended Denison, a fact which would carry weight with Caldwell. Several years later, concerning the appointment of another faculty member, Caldwell was to write, "... the Faculty of Yale College, are to be relied upon as much perhaps, as any body of the same number, any where to be found. They are not men of imagination and liable to extravagance; but men of matter of fact."168

It was not long after Olmsted's article "Thoughts on the Clerical Profession" appeared that he was offered the Professorship of Mathematics. Undoubtedly, this threw his mind into a state of turmoil. What should he do? His duties in the new post would probably include instruction in Natural Philosophy and Astronomy, as well as a smattering of Chemistry and, of course, Mathematics. He had had no advanced training in these subjects, and his tutoring duties at Yale had been confined to the lower classes.169 Such an array of topics seemed, on the surface at least, rather remotely related to the work of a clergyman. The latter had been
his goal when he had returned to Yale. Yet since returning, he had derived no small satisfaction from the teaching duties of his tutorship and his commencement oration in 1816 bore witness to his interest in education. Perhaps it was not such a large step from a clergyman to a teacher of science. There was one thing about it. As a teacher of science, he would be drawing attention to the works of God. In his senior year at Yale, he had hastily written these notes on the Natural Philosophy Lectures of Jeremiah Day.

... he who gives himself the study of nature may find unceasing beauties in the starry firmament and in the cloud that curtains the setting sun—in the gay plumage and soft notes of birds—in the verdant foliage that clothes the forest, in the ever varying flowers that deck the fields. These all challenge the keenest inspection and invite the minutest criticism—nay the more they are seen and the more minutely they are observed, the more do their [___?] unfold—To him only who looks with such eye does the sky disclose (display) all its grandeur and sublimity, the face of creation disclose its fairest forms and brightest hues. Such expressions of beauty were never lavished on the works of God in vain—calculated to elevate the feelings and refine the taste—intended as sources of enjoyment—But there is another class of pleasures to which I would more particularly invite your attention, which belong more peculiarly to the philosophers—They are those which flow from reasoning and the operations of nature... 170

Nevertheless, Chapel Hill was not New Haven. When Joseph Caldwell had come to Chapel Hill from Princeton in 1796, he had immediately noted the contrast. In New Jersey, religion had public support and respect. In North Carolina, he reported
"'every one believes that the way of rising to respectability is to
disavow as often and as publicly as possible the leading doctrines
of the Scriptures.'" But, of course that was 20 years prior. And
even then, Caldwell had concluded that if religion "'could be
regularly taught by men of prudence, real piety and improved
talents it would claim the support of the people.'"\textsuperscript{171}

By early June, Olmsted had decided to accept the position.
In typical Puritan fashion, he wrote to his mother, asking her
consent.

Dear Son [she replied]. I have received your letter with
pleasure and read it with trembling. But why should I
tremble? I ought to commit myself and every enjoyment
to the disposal of infinite wisdom. . . . We ought . . .
quire in what way we can best glorify God. If God has
given you talents, in what way can you best improve them
for His glory? . . . Can you be willing to. . . . deny your-
self that you may do good to poor souls? If that is the
chief end you have in view, I believe you ought to go.\textsuperscript{172}

However, sometime before September, the Committee of
Appointment at the University of North Carolina took bold action.
Convinced that the University had suffered from the "want of a
Faculty composed of a greater number of professors," the
Committee proceeded to fill a Professorship of Chemistry, a pro-
fessorship of their own creation. They averred that this professor-
ship would not only "enhance the fame" of the University, but would
also greatly benefit the community at large, especially the "agri-
culturalist[s] of our Country." Upon learning of the new
professorship, Olmsted apparently expressed a preference for it over that of mathematics (thereby exhibiting what was to be a characteristic aversion for mathematics), and suggested a fellow tutor at Yale for the post Olmsted had originally accepted. At the meeting of the Board of Trustees of the University of North Carolina held in December of 1817, the Committee of Appointment announced for the professorship of mathematics, Mr. Elisha Mitchell, "a gentleman every way qualified"; for the professorship of chemistry, they had appointed "Mr. Dennison Olmstead, ... being satisfied of his competency and fitness." 173

In these appointments, we have one more indication of the state of science at the time. There is little evidence to suggest that either Olmsted or Mitchell had received any special training in the subjects they were to teach. Both candidates were Yale graduates, had been in charge of academies in New London, were tutors at Yale, and were studying for the ministry at the time of their appointments. Mitchell began his professorship in January of 1818, and when, a few months later, he took some time off, it was not to obtain further training in mathematics or natural philosophy, but to get his preaching license at Andover!

In their report, the Committee of Appointment assured the Board of Trustees that a "mere theorist" in Chemistry would not do. They needed someone who had practical experience. With
that end in view, the Committee had (after "some hesitation") agreed that during Olmsted's study under Silliman, he would be considered "a member of our Faculty; and shall be entitled to pay or salary as such." To the Board, the Committee stressed the value of having a "finished Professor," casting themselves "upon its liberality in those instances in which it may be supposed they have exceeded their proper and legitimate authority." Happily, the Board "taking the foregoing report into consideration resolved that they do concur therewith." 174

Olmsted was well pleased with his own appointment, but undoubtedly felt the need for additional training. It was probably at his suggestion that the Committee agreed that he should remain for a year under the instruction of Benjamin Silliman, where he could become "skilled and expert" in performing chemical experiments. In his letter of acceptance, Olmsted assured the Committee that he had been assigned "the most convenient room this college affords" so that he might devote himself "wholly to Chemistry and Mineralogy." 175

An additional year at Yale (with full salary!) though not a circumstance without precedent, was certainly a golden opportunity for Olmsted. Here he could participate in the meetings of the Connecticut Academy of Arts and Sciences (CAAS). Olmsted, along with several others had been recently elected to membership
It was a fitting organization for men of a liberal education who thought it important "to promote, diffuse and preserve the knowledge of these Arts and Sciences, which are the support of Agriculture, Manufactures and Commerce, and to advance the dignity, virtue and happiness of a people."  

The Academy, incorporated in 1799, had provided valuable stimulus on a wide range of topics. Under President Dwight's energetic leadership, it had listened to descriptive reports on such matters as the mineralogy of New Haven and auroral displays. Impetus was provided for collection of useful data: a record of local weather conditions was kept, and a statistical account of Connecticut was begun. Opportunity for intellectual stimulation was also provided on more speculative subjects such as the origin of springs, the origin of mythology and the nature of light.

The CAAS included such members as Benjamin Silliman. The Academy had published his report on the Weston meteorite of 1807. Silliman's chemical analysis of this meteorite had received international notice, his account being read in London at the Philosophical Society, and in Paris at the Academy. His experiments on minerals with the blow-pipe had been, likewise, published by the CAAS and had attracted considerable attention. Silliman was especially interested in the budding sciences of mineralogy and geology. It had been largely through his influence
that the finest mineral collection in America was located at Yale. In November of 1817, the CAAS listened to a report from a committee appointed the previous month to inquire into the ways in which the Academy might extend its patronage to geological science. As a member of that committee Silliman recommended an examination of the geology of the state of Connecticut, and the formation of a geological map. Such recommendations were of special interest to Olmsted, whose duties at the University of North Carolina would include the teaching of mineralogy and geology. 

During Olmsted's additional year at Yale, another significant enterprise was initiated. In March of 1818, he wrote to his friend, Elisha Mitchell who was already at Chapel Hill. Silliman wants me to solicit your name, said Denison, as a contributor to his new "Scientific Journal." Subscriptions for it "flow in sweetly--twill be a great work." In June of the same year the first issue was printed. Entitled, "The American Journal of Science, more especially of mineralogy, and the other branches of natural history, including also agriculture and the ornamental as well as useful arts," its express intent was "to embrace the circle of the physical sciences. . . ." 

So, at Yale, fast becoming a leading center in America for training in chemistry, mineralogy and geology, and under the instruction of Benjamin Silliman, a leading promoter of American
science, Olmsted spent a year of intense preparation. In anticipa-
tion of his future duties at the University of North Carolina, Olmsted
inquired about developments at Chapel Hill. "Hope they will not build
the laboratory before I come on," he wrote to Mitchell--"As to
apparatus, 700 dollars worth would enable us to make a respectable
beginning." Olmsted seriously considered sending "2 or 3 hundred
dollars at my own risk," with a Mr. Griscom of New York who was
leaving for England, to be spent on the purchase of equipment,
saying, "I never shall have such a chance again." 182

In accepting the Professorship, Olmsted had expressed the
"hope that by researches of my own in the neighboring country,
and by collections... we shall be able in the course of a few
years to prosecute more at large this useful and practical subject
[mineralogy]." 183 By his mother, he had been taught the impor-
tance of usefulness, and under Silliman's tutelage he had imbied
similar sentiments. Not even a year had elapsed after Olmsted
took up his duties at Chapel Hill before he was on the way to ful-
filling his promise. In June of 1819, he donated his small collec-
tion of minerals to the University of North Carolina "with the hope
that, by furnishing specimens for illustrations, and standards of
comparison, they might contribute to diffuse the knowledge of
mineralogy, and to elucidate the hitherto unexplored mineral
formations of this part of our country. . . " The Board of Trustees thanked Olmsted for "his great liberality, zeal and ability. . . "

He enlarged this cabinet of minerals over the next several years, in conjunction with various mineralogical excursions he undertook. In 1821, he suggested a plan for a state geological and mineralogical survey to the board of internal improvements, agreeing to undertake the survey gratuitously. Although his proposal was rejected, by 1822 he optimistically confided to Silliman that, since geology "is all the rage here, " he would probably be able to get some financial assistance for his project. 185 In fact, the following year, the General Assembly did authorize such a survey, which was under the auspices of the newly-created Board of Agriculture. As might be expected, the Geologist (Olmsted) was asked to "direct his attention chiefly to such objects as were of practical utility." For this reason, Olmsted's subsequent report took the "form rather of a Statistical Memoir, on the useful minerals. . . than of a scientific Geological Survey. . . . " Nevertheless, it was a beginning, the first geological survey to be prosecuted in America under the auspices of a state. 186

Olmsted also initiated research along a different line. Cotton was an important crop in the South, but no important use had yet been found for the quantity of seed produced each year. Although unaware that oleaginous seeds had ever been used as a source of
illuminating gas, Olmsted conducted a series of experiments with that end in view. He found that the quality of the gas produced was "fine," and on the basis of his results estimated that the supply of seeds available annually could produce enough gas to satisfy the needs of seven cities the size of London, thus providing "an abundant resource for gas illumination, in the United States."

His report in the AJS included a description of his technique, along with quantitative data. Olmsted repeated his experiments several years later at Yale College for B. Silliman, who had received reports that "a very inferior gas had been obtained" from such seeds. Silliman pronounced Olmsted's result "entirely satisfactory--the gas was easily and abundantly obtained, and afforded a degree of illumination quite equal to that of oil gas, ... and superior to most varieties of the bituminous coals."

In the classroom, Olmsted's instruction was confined to the seniors, whose curricular requirements included Chemistry, Mineralogy and Geology. In keeping with the times, he taught mineralogy and geology principally in conjunction with his course on chemistry, i.e., in a chemical context. He had an outline of his lecture published in 1819, "For the use of the Students," in which he conveniently included at appropriate junctures, references to those authorities which might be consulted on the relevant points. These authorities included such names as Joseph Black,
Antoine Lavoisier, and Sir Humphry Davy, John Murray, Thomas Thomson and William Henry, and the Americans Thomas Cooper and John Gorham, authorities (naturally enough) whose works Olmsted had undoubtedly studied under Benjamin Silliman. In addition, Olmsted referred his students to the *Encyclopedia Britannica* and Aikin's *Dictionary*, as well as periodicals such as the *Annals of Philosophy*, and the *American Journal of Science*.  

Though Olmsted's course of chemical lectures was probably not as extensive or as elaborate as that of his former teacher (who by this time had had well over a decade of experience), it is likely that it was otherwise similar in content. Olmsted's course was divided up into two main portions, the first dealing with general principles, the second treating the chemical properties and relations of specific substances. He prefaced this course with the customary introductory lecture in which he sketched the history of chemistry, noted some practical applications of the subject, and brought forth considerations designed to motivate study on the part of the students. Among the "general doctrines" discussed were those dealing with attraction, light, heat (caloric), and electricity (galvanism). On every one of these topics, Olmsted's outlines display a willingness to consider alternative theories. In the case of chemical attraction, Bergmann's tables of affinities were presented, but Berthollet's contrary opinion relating to the importance
of quantity of reactants was also noted. In the discussion of caloric, the two leading theories concerning its nature were given. The action of the voltaic apparatus was covered with a discussion of two theories purported to explain its operation—one based on electrical principles, the other based on chemical principles, a theory proposed by Robert Hare just a few months before. On the subject of light, once again two opposing theories were considered. The lack of dogmatism which apparently pervaded Olmsted's lectures suggests, in the first place, the tentative nature of science at this period. At the same time, it gives an illuminating portrait of Olmsted's lack of self-confidence and his reluctance to hypothesize upon such fundamental aspects of nature as light, heat, and electricity. This reluctance he was to make more explicit a few years later, in a controversy with Robert Hare. 191

Of course, the first portion of the course also dealt with more phenomenological matters, such as the observed action of light upon plants, the expansion of heated bodies, their conduction of heat, and melting, boiling, and evaporative processes. The latter portion of the course was the longer portion and treated the composition and properties of air, water, alkalies, earths, acids, metals, and salts, with appropriate comments as to practical applications. It was when dealing with the "earths" that mineralogy and geology were treated. The concluding lectures of the
course dealt with vegetable chemistry, animal chemistry, and agricultural chemistry.

To what extent his lectures embraced the "useful" subject of natural theology is not clear. One student notebook contains some 30 handwritten pages of notes on Olmsted's lectures. At the conclusion of these notes the following passage occurs:

There is no science so instructive and at the same time arresting[?] as Chemistry. It leads the mind to a consistent method of analyzing not only external matter--but also all aspects[?] of a literary-poetical[?] and practical nature. By withdrawing the mind from the consideration of abstract subjects and giving it a placid train of thinking it--may probably--lead us to the contemplation of nature's works--and nature's God. 192

Unfortunately, it is not clear whether this passage is merely an added comment by the writer, or an indication of sentiments expressed by Olmsted in his classes. In the published Outline of Olmsted's lectures, under the Introductory Lecture is a section dealing with motives to study chemistry. Included therein are these: "1. Explanation of natural phenomena. 2. Moral and intellectual advantages arising from the study of the works of Nature." When Olmsted had been a senior at Yale, he had written the following notes on Jeremiah Day's lectures.

Moral Tendency--New displays of divine wisdom and goodness--these observed by other philosophers in the other parts of creation but the chemist pursues nature into her most secret recesses and perceives there the same wise benevolent almighty hand. 193
Be that as it may, Olmsted had scarcely yet been able to satisfy his sense of obligations of service to God. Even some months after he had accepted the professorship at Chapel Hill, he was wondering if there was a convenient way to obtain a preaching license. If his own zeal in this direction ever wavered, his mother was more than happy to provide continued stimulus. "You expect soon to enter into the ministry," she wrote, "whether you go to North Carolina, or settle in some parish nigh your friends, is not my anxious concern, but my own prayer is that you may be prepared for the great work you are about to undertake." She further admonished:

No doubt your mind is much taken up with thoughts of Chapel Hill; but how much more animating to think of Mt. Zion the city of our God! You expect to be united to an earthly friend; but how much more animating to be united to the King of Kings, and Lord of glory! And how much higher the dignity! 194

Perhaps for her own peace of mind, Eunice Olmsted looked on her son's role in North Carolina as that of a missionary. And yet, she was scarcely pleased with the course he was pursuing.

We hear much about the hopeful prospects in heathen lands of all countries [she wrote], but we hear nothing of it from you. I think it must vex you as it did righteous Lot to live among such a people; but who can tell what mercy God may have in store for you and your people... when your long vacation takes place, I hope you will find opportunity to search out [and] instruct the ignorant. God is doing wonderful things; will you have no part nor lot in that matter? 195
Early in 1821, a revival swept the region around Farmington. Denison's older brother, Nathaniel, became a "subject of grace." After relaying the joyous tidings to Denison, his mother confessed: "I have greatly feared lest your profession and lectures are not so much calculated to... produce the humbling doctrines of the cross. I do not remember [that] you have written [that] you have been the means under God of converting one soul." Anticipating his probable objection that circumstances at Chapel Hill were difficult, she continued, "Have you often met the officers of the college for prayer and rightly considered the importance of the case? I think you have not been laborious and active in the cause. It is high time to be up and doing. You have lost much time..." 196

Shortly after this letter, Olmsted visited his mother, planning to take her to visit her daughter in Vermont. As they traveled toward Vermont, Eunice's inquiry at each stop concerned the state of religion--had the "blessed revival" reached there? Denison carried along a geological hammer and frequently stopped along the way to collect mineralogical samples. Finally, his mother exclaimed, "My son, how can you take so much pleasure in these dumb objects, when we are hearing at every place we come to, of the wonderful works of God?" 197

Some months after Olmsted had returned to Chapel Hill, his young son, Frank had a serious attack of tonsilitis or some such
thing. Olmsted wrote to his mother, asking her advice. In her reply, after specifying what she thought was best, she reverted to her favorite subject—religion. After expressing her elation with the news of another revival, she continued

I have often thought my prayers have been answered in everything I have made a subject of prayer, but one. That was that you might appear more active in the cause of religion. And as that has been the request I have made for you, I wait to have my prayer answered. But let God glorify himself in his own way. 198

Such forthright admonitions to Denison could scarcely fail to have an effect. Coming from "such a mother," given in love, they doubtless gave him cause for reflection. In 1825, another event occurred at Yale which was, once more, to change the future for Olmsted.

By this time, Olmsted was certainly a bona fide member of the community of American scientists. He had collected a cabinet of minerals for the instruction of his students. He had exerted his personal influence to obtain state support for a geological survey of North Carolina, and had devoted many, long hours to prosecuting this survey. In addition to his report to the state, he had presented before his fellow members of the American Geological Society his conjectures as to the origin of the gold deposits found in North Carolina. He had initiated research designed to utilize the oil of cotton seed as a source of illumination. In short, he had taught, promoted, and advanced science in his state. Nevertheless,
if his mother's letters are a valid indication, his preoccupation
with science had lessened his zeal for religion. And, thanks to her
insistence, the resulting tension was not something that he could
readily ignore.

A New Career (1826-1830)

". . .[my studies] are now to take a different
direction. . ." 199

When Jeremiah Day had ascended to the presidency of Yale in
1817, his post as Professor of Mathematics and Natural Philosophy
had been filled by Alexander M. Fisher. Fisher undertook his new
post with an unrelenting zeal. He began a systematic examination
of current European writings on Natural Philosophy and prepared a
full course of lectures on the subject. He not only contributed
articles to the fledging American Journal of Science, but in the
interest of promoting science, provided valuable editorial assis-
tance. In fact, editor Silliman looked upon him as his potential
successor in this important work. 200

In 1822, Fisher sailed for Europe in an effort to acquire
a firsthand knowledge of the teaching techniques used in foreign
universities. The Albion, the packet on which he sailed, was ship-
wrecked off the coast of Ireland and Fisher (with almost everyone
else on board) drowned. The loss of this promising young scientist
was felt keenly at Yale. In his eulogy delivered in the College Chapel, after alluding to the high hopes entertained for Fisher, Professor Kingsley concluded: "But he is gone: and it becomes us to submit without murmuring, to this severe, and to us mysterious dispensation, of a righteous providence." Benjamin Silliman wrote: ". . . I looked forward with high raised hopes and expectations, . . . But it pleased the Almighty to dash him upon the rocks, and to overwhelm him in the ocean, at the moment when Europe, so long and so ardently desired, had just broke on his view!" 201

Olmsted, in Chapel Hill, was overcome when he received the news. For two days and nights his thoughts dwelt on Fisher, until he became "sick and enfeebled." They had gone through Yale together. Later, as fellow tutors, they had formed an intimate friendship. It had been Olmsted (in 1817) who had conveyed to Fisher the happy news that he (Fisher) had been appointed Adjunct Professor of Mathematics and Natural Philosophy. "You know how I loved him," Olmsted wrote to Kingsley. Olmsted wrote out his "Reminiscences" of Fisher and often times, in later years, thought of composing a full-scale biography of his friend. A few months after Fisher died, the Olmsted's had a baby boy, whom they named Alexander Fisher Olmsted. 202

At Yale, Fisher's place was taken by Matthew R. Dutton. Dutton was a Yale graduate and former tutor. He had joined the
College Church, during the revival of 1807, which had been sparked by Timothy Dwight's sermon on the "Youth of Nain." For several years just prior to this new appointment, Dutton had pastored the church in Stratford, Connecticut. Dutton worked conscientiously at his new job at Yale, and even authored a work on "Conics and Spherics," intended to be "a continuation of President Day's (excellent) System of Mathematics." But his health was poor and gradually declined. He died in July of 1825. Once again Jeremiah Day, as president of Yale, was faced with the task of finding a Professor of Mathematics and Natural Philosophy.

Back in 1801, when President Dwight had replaced Josiah Meigs with Jeremiah Day as Professor of Mathematics and Natural Philosophy, it is probable that the orthodoxy of Day's religious beliefs was a significant factor in that choice. About the time that Jeremiah Day became President of Yale, there was a notable liberalization in the Corporation policy as to what constituted an acceptable religious attitude on the part of the officers of Yale. In 1823, the religious oath formerly required, was entirely dropped. Nevertheless, this act did not imply a decline in religious sentiment at Yale. The relaxation of religious requirements was well in keeping with the times, during which the disestablishment of Congregationalism in Connecticut took place. Indeed, a contemporary account of the abrogation of the "religious test for the Officers
of Yale" goes on to remark that, as a result, "scientific gentlemen, of various Christian denominations, have been elected to academic offices." The word Christian is significant. Yale did not easily lose its image, acquired during Dwight's presidency, when it was held up as the principal source of science, the principal source of the blessings of Connecticut, the glory of Connecticut, and the barrier against heresy and infidelity. Furthermore, Yale still viewed itself as a religious institution. "The faculty struggled constantly to retain the religious atmosphere of the college." To obtain entrance, the student was required to provide "testimonials of good moral character." As for religious services, "Prayers are attended in the College Chapel every morning and evening, with the reading of Scripture, when one of the faculty officiates, and all the students are required to be present. They are also required to attend public worship in the Chapel on the Sabbath, except such as have permission to attend the Episcopal, or other congregations in town." In an era when religion was a prominent concern, requests for teachers included such phrases as "...we should prefer a man of piety. ...", "...I need not say that we should prefer a person of piety. ...", "...piety we make an indispensable qualification. ..." And collegiate education was no exception. To a large degree, it was in colleges that the characters of thousands of young
men would be formed. "Let all who proceed from our Colleges be men of piety," announced a circular signed on behalf of the Church of Christ in Yale College and the Students of the Theological Department. And how would such a thing occur, except the professors be men of piety?

Shortly after Fisher had been elected as tutor at Yale, he acknowledged in his private journal that devotion to God would assure him of the esteem of those around him. And when he joined Jeremiah Day as Adjunct Professor of Mathematics and Natural Philosophy he recognized that the most important qualifications for his office were "personal accomplishments, knowledge of the world and especially a religious profession." It was no mere coincidence that Fisher, as well as his successor, Matthew Dutton, were both religious men. Both had studied theology under Dwight and both had attended Andover Theological Seminary. Both were fitted to engage in the "imperative demand of a public course of instruction. . . the bringing of the whole, as far as practicable, under the guidance of moral and religious principle. . . training the soul for heaven. . . ."

During his years at Chapel Hill, Olmsted kept in touch with Yale. He had continued to correspond with influential members of the faculty, including Benjamin Silliman and James L. Kingsley. While these faculty members did not have an official voice in the
appointment of new professors, their wishes were not without weight. At least by 1822, Olmsted was a member of the American Geological Society. This society was largely a Yale organization with meetings and activities held in New Haven. Olmsted had contributed mineralogical specimens to this Society and had given a paper before the Society on the gold of North Carolina in 1824, at which time he was elected a vice-president. He had also retained his membership in the CAAS, reading an essay before that body in 1824.  

In view of precedent set in the cases of Alexander Fisher and Matthew Dutton at Yale, not to mention Elisha Mitchell at the University of North Carolina, Olmsted's lack of specific training in Natural Philosophy was not an important consideration. Of more importance, no doubt, was his previous association at Yale as a student and tutor and his obvious piety. So it is not a great surprise that Olmsted was offered the position as Professor of Mathematics and Natural Philosophy at Yale.

Upon receiving the offer, Olmsted's first reaction was negative. He lacked confidence in his ability to fill the place. Several factors changed his mind. First, he received encouragement from a colleague, Ethan A. Andrews, himself a graduate of Yale. Andrews probably brought forth reasons supporting the change which had special force to a fellow New Englander. It was not many years
later that Andrews, dissatisfied with things at Chapel Hill, returned to Connecticut. Secondly, due to a series of misunderstandings, there existed an atmosphere of disharmony between Olmsted and another faculty member at the University of North Carolina. Thirdly, Olmsted had left Yale reluctantly. How pleasant was the thought of once more living close to his dearest relatives (whose affections were less subject to the vicissitudes of life). Finally, Olmsted perceived in the offer from Yale a chance to begin again.

Though he had not solicited the appointment, once he had decided to accept it, he was glad. He submitted his resignation to the Trustees and endorsed Elisha Mitchell, who apparently preferred geology to mathematics, as his successor. Anxious to get to his new post, Olmsted reported that he had begun his course of instruction "earlier than usual and I had more opportunity with the senior class on account of the illness of the President, I have been enabled to go through all the general doctrines of Chemistry, and to give more lectures on Mineralogy to this than to any preceding class." "

Olmsted left Chapel Hill with mixed emotions. He was exchanging Chapel Hill for New Haven, a place of dreary desolation for the loveliest spot on earth, a region countenancing slavery, ignorance and vice for an enlightened society, refined and virtuous.
Nevertheless, even such an exchange necessitated change, and change was not something to which Olmsted looked forward. He was to be separated from his wife and children; it would be spring before they could join him. Furthermore, the uncertainties and anxieties of a new career weighed heavily upon his mind, but he took comfort in the thought that "Providence had often been better to us than our fears and apprehensions." The day of parting was rainy and cold—all the better to ease the difficulty of leaving.

A trip from North Carolina to Connecticut in the middle of winter was no small thing in 1825. Olmsted stopped briefly in Raleigh on business, where he was encouraged by various expressions of regret at his leaving the state and several gratifying testimonials. The steamboat which he took from Norfolk was turned back by ice blocks ten miles from Baltimore, and returned to Annapolis. After finally reaching Baltimore, Olmsted proceeded by stage to Philadelphia, the entire ride passed in apprehension of thieves who had recently been frequenting the route. During the last leg of the journey by steamboat (from New York to New Haven) a gale arose. A wave swept away the long boat and Olmsted feared that the will of Providence would seal his fate. Nevertheless, he arrived safely and was taken in by Benjamin Silliman, in whose home he recuperated from his long and arduous journey.
Classes were to begin in a week (or so) and Olmsted was almost overwhelmed by the thought of the important duties to devolve upon him. To occupy the place of A.M. Fisher and M.R. Dutton, what an awesome responsibility! Feelings of inadequacy flooded over Olmsted, and, almost in desperation, he set down a series of rules ("Some of which have long been in mind") to guide him in his new situation.216

The rules fell into three categories: the first group was rules of study. In his own estimation, Denison fell far short of the mathematical prowess of his predecessor, A.M. Fisher. But he did have one talent which he planned to use to best advantage and that was the talent of time. He vowed "to be diligent," to make the best use of his time. This must include selectivity in the objects of his labor. "Let me waste no time upon what is unprofitable either in reading, thinking, or conversation, but let me endeavor to make each conduce to some valuable purpose." A commendable ideal, difficult in practice! In later years, Olmsted was to battle periods of languor, during which he seemed incapable of accomplishing anything. And though he recognized the value of mathematics, his aversion to the subject would allow him to rationalize a relegation of his time to other pursuits until, years later, he would exclaim "too late!!" There was a final rule which Olmsted kept with more success. He resolved "to secure present
acquisitions." To this end, as taught by his revered teacher Dwight, he spent frequent periods in summing up the day's activities and reflecting upon his accomplishments. As one means of achieving this goal, he kept a private journal and after 1838, he seldom missed a weekly entry in his "Saturday Night Journal."

In a second category, Olmsted jotted down some rules of health. He resolved to get adequate exercise (chopping wood was reputed to be a particularly efficient form which he promised himself he would try). Next, he determined to conceal his infirmities and speak little of his health ("It is of little advantage to pass for an invalid.") By this time, he had already experienced some periods of poor health and in the years to come, he had frequent occasion to refer in his personal journals to periods of illness. Lastly, he purposed to eat sparingly. Subsequent journal entries indicate his limited success on this point.

Olmsted's final category was one that he often left until last: "Rules of Moral and Religious Conduct." Among the virtues that he aimed to cultivate were modesty and courtesy. Among the vices he intended to shun were back-biting and telling all he knew about the University at Chapel Hill! As to the latter subject, he thought it best to stick to a generally favorable account, stating facts, not opinions, and then only in response to questioning. He feared that during his stay at Chapel Hill, he had acquired habits
offensive to the "good people" at Yale. "I must take care," he wrote, "about expressing sentiments which differ from the accepted ones" for the "importance of being sound in the faith is so strongly felt by the religious friends of the college." Resolving to be strict in religion, he noted: "In the observance of the Sabbath also, I must be more particular than I have been, not only because a due regard for the day requires it, but also on account of the importance of my example to the students."

At the University of North Carolina, his mineralogical excursions and geological activities had found him "rarely" within the college walls. He had had little contact with the students in general, his instruction being almost totally confined to the seniors, a group especially "sifted and purified." Furthermore, his previous courses of instruction—Chemistry, Mineralogy, and Geology—were more popular than mathematical subjects. To be sure, Elisha Mitchell, who had taught the latter subjects at Chapel Hill welcomed the opportunity to take Olmsted's post when Olmsted went to Yale. Professor Olmsted's duties at Yale, on the other hand, would involve the instruction of juniors as well as seniors. Furthermore, mathematical subjects were definitely not popular. In 1825, shortly before he had taken up his duties as Professor of Mathematics and Natural Philosophy at Yale, there was a revolt among the students because of unexpected examination questions on
conic sections. Several years later, a more substantial rebellion, again relating to conic sections, was to occur, which was to result in the expulsion of nearly half the sophomore class. 217

Olmsted's premonitions of his changed circumstances involving him much more in disciplinary problems than before, were in some measure fulfilled. Anticipating his share of resentments and insults, he resolved not to shirk his duty, not to be intimidated by wall writings, not to be deterred by insult or abuse. Don't take these things personally, he advised himself; in pursuing a course involving discipline, personal considerations must give place to upholding the principles of Yale.

Such a course was particularly difficult for a person of his temperament. He lacked self-esteem and craved approval of his actions. Several examples will illustrate these traits of his character. In 1820 he had sent Benjamin Silliman an account of a man struck by lightning for possible insertion in the AJS. Half apologetic, Olmsted submitted his report along with instruction to burn it, if Silliman judged it appropriate. When he had visited Raleigh on his way to Yale, in 1825, he had received several testimonies of approbation from members of the legislature, but in his journal he noted that they "exceeded what I deserved." The strong testimonials on his behalf by the older faculty at Yale (probably) concerning his suitability for an appointment there, he likewise characterized as indicating an undeserved measure of popularity. 218
Even when he was successful, he was reluctant to accept this gratification. To give the flavor of his sentiments, consider the passage from his journal written shortly after he arrived at his new post.

On Thursday I gave my seventh lecture being the third on electricity. Besides the junior class, a great number of the seniors and some strangers including several ladies were present. Such a tribunal puts my confidence to a severe trial. But my experiments have hitherto been successful. Much more so as I am informed than were those of my predecessor. Should this comparison, which I knew would be instituted, result in my favor, it is more than I anticipated and affords an encouraging hope that it is the intention of Providence to prosper me in my new career. Yet, feeling my claims to excellence in the department I have undertaken to fill are so low, I ought to receive any tokens of approbation with thankfulness, and still to view them as testimonials which, however undeserved they may be, I will nevertheless do my best to merit.219

Despite (or perhaps because of) such a temperament, he conscientiously did what he thought would advance learning at Yale. He had an exalted opinion of his station at Yale, and resolved, with God's help, to let nothing interfere with the performance of his duties there. One innovation involved the tutoring system. According to one account, before he took office each tutor sat upon the same floor with his pupils, comfortably or rather luxuriously seated in an elegant chair, the gift of the division, and beginning the recitation with some person he might chance to select, followed the line in a regular succession, so that each student could very easily anticipate the passage or the problem which was awaiting him, and prepare himself accordingly. No record was made of the student's performance, only his absence from exercise. The innovation for which Professor
Olmsted had the credit, or rather the very serious dis- 
credit among the students, was the transfer of the tutor 
to an elevated post of observation behind a very ugly 
table, with a box before him, from which he drew the 
ballots which called up the students; and not long after a 
marking book in which was entered his estimate of their 
work.220

Not all of Olmsted's innovations were so unpopular. Though 
he gave the customary experimental lectures in Natural Philosophy 
to the juniors, he proposed the improvement of the usual teaching 
methods in Natural Philosophy by combining experiments with 
recitations, followed immediately with discussions termed 
"theoretical." Perhaps in recognition of his competency as a 
lecturer, the medical students at Yale expressed a desire to hear 
his lectures on natural philosophy. He proposed to give them not 
less than 40 lectures for a fee of five dollars per student. Unfor-
unately, the students pled poverty and Olmsted was unwilling to 
"degrade" the lectures by giving a "partial" course.

For his professional improvement, Olmsted began a systema-
tic review of "the whole course of mathematics studied in college" 
hoping to finish this project "except perhaps fluxions" by the end of 
the term. He hoped to study the higher branches of mathematics 
and compile a course of lectures in Natural Philosophy for the 
next term. Though the subject matter was relatively new to him, 
learning was not--he encouraged himself with the thought that 
familiarity renders easy what at first seems difficult.
Nevertheless, he was somewhat mortified to be struggling through materials on the freshman and sophomore level and at the same time occupying such an elevated position at Yale. 221

Reading the biographies of famous men in Natural Philosophy was no encouragement.

When I read the lives of such men as Euler, La Grange and Newton and compare my slow pace with their rapid flight, I feel slight discouragement stealing over me; but then I reflect that I may successfully and ably teach mathematics and philosophy, although I should never extend the boundaries of either. It is no small merit to one thus situated to acquire the reputation of a good teacher and a sound philosopher; and I have full confidence in my ability to become both the one and the other.

In view of recurrent indications of a lack of self-confidence, one might wonder if the phrase ("I have full confidence...")) is not an attempt to convince himself. While his complete confidence might be suspect, his subsequent behavior is completely consistent with his "new" goals: to be a good teacher and sound philosopher. It is also in keeping with his mother's admonition, "I want you to be not great, but do good." How could one do more good than by directing young lives? And where could one direct more lives than at Yale? 222

At two successive meetings of the CAAS (August and September of 1826), Olmsted exhibited his desire to be a sound philosopher. The substance of his presentations was subsequently published in the AJS under the title "On the Present State of Chemical
Science." At the outset, his genuine interest in teaching is manifest by his criterion for a satisfactory definition of chemistry, viz., a definition which conveys "to the learner the clearest views of the peculiar province of the chemist." Olmsted began with a discussion of the nature of explanation in chemistry. Water, he noted, has a higher affinity for alcohol than camphor does. The proof (the only proof) of this fact is that if water is added to a solution of camphor in alcohol, the camphor precipitates out. But some chemists are not satisfied to state this fact. They want to explain it; they say that the precipitation occurs because water has a stronger affinity for alcohol than camphor does. Such reasoning is manifestly circular. By means of this and several other examples, he exhibited that "something remains to be done to improve the logic of chemistry." He cited the ongoing controversy regarding the nature of caloric as an example of "how idle it is to reason respecting chemical phenomena upon mechanical principles." He suggested that "the fundamental principles of the science of chemistry consist in the laws of attraction, heat, light and electricity. . . that the true ground of reasoning. . . is to trace every effort to one or the other of these laws and arrange it under that law in a class with similar facts." He was not wholly against the use of theory in chemistry. In his brief synopsis of "present" chemical
science, he thought that the atomic theory was likely "founded on truth," because of the agreement between "independent" chemical calculations of atomic weights. Still he preferred to distinguish between the laws of definite proportion, "a class of facts established by rigorous experiments" and the atomic theory, designed to "account for those facts." 

After a brief discussion of recent progress in heat and galvanism, the paper concluded with the words, in parentheses, "to be continued." However, Olmsted's only subsequent published mention of this topic was in answer to an attack by that master of scientific controversy, Robert Hare. Hare, an outspoken proponent of the caloric theory objected to Olmsted's remarks on the "idleness" of such speculations. In his reply, Olmsted reiterated his previous general conclusion, viz., "that, in my view, our reasoning on physical subjects must stop when we arrive at one of those principles denominated ultimate agents, namely, attraction, heat, light, electricity and magnetism. . . ." 

The most likely reason for Olmsted's subsequent silence on this general topic was his new duties at Yale. Though still interested in chemistry, mineralogy and geology, he now began to concentrate his efforts in the areas of meteorology and astronomy. He took over the responsibility of keeping the records for the CAAS, which entailed recording the temperature, barometric
pressure and wind direction three times daily, at sunrise, at two p.m. and at ten p.m. In addition the weather was noted (clear, broken, cloudy, or stormy) and the daily rainfall indicated. It is probable that Olmsted was largely responsible for encouraging the publication of an annual report on behalf of the CAAS which first appeared in the AJS in 1828 for the purpose of "ascertaining the true character of our climate, by comparing it with the climates of other countries."\(^{228}\)

Olmsted's report was not the first meteorological report to appear in the AJS. Edward Hitchcock had submitted one in 1822, and subsequently several other reports had appeared.\(^{229}\) At this period, meteorology was a field "in transition from folklore to science," and observations still lacked the degree of completeness and standardization desirable, as was recognized by contemporaries.\(^{230}\) As late as 1825, when the Regents of the University of the State of New York voted to begin a systematic survey of weather patterns throughout the state, the only instrumentation mentioned was thermometers and rain gauges.\(^{231}\)

Olmsted's first report found in the AJS was as detailed and as quantitative as any reports previously published there. Indeed, he even made reference to the date at which vegetation such as the elms, peach trees, strawberries and peas flourished. It is interesting to note that he was a member of a committee of the
CAAS which recommended that a floral calendar be incorporated into the subsequent meteorological records. Additionally, it was voted that a record be kept of prevailing clouds and humidity. Thus, Olmsted's involvement with the meteorological records of the CAAS was not solely perfunctory, but he made a serious attempt to improve the usefulness and enlarge the scope of these records.

Only two such annual meteorological reports were published in the AJS. In December of 1830, at Olmsted's request, he was excused from keeping the meteorological journal, this duty being passed on to E.A. Andrews who had recently returned to New Haven from Chapel Hill. Several circumstances probably conspired to make Olmsted seek to be relieved of his task. First, the death of his wife in the summer of 1829 pressed upon him the unexpected task of arranging for the care of his children. Second, the dearth of suitable textbooks on Natural Philosophy set him to commence preparing one for his students at Yale. Finally, his own professional interests were becoming more specialized.

He had included in his meteorological report for 1828 two accounts of lightning strikes within New Haven, together with an analysis of the defects he had found in the lightning rod protection, allegedly afforded in each case. In mid-1830, a letter was sent to Silliman, requesting instructions regarding the adjustment of
lightning rods. "At the Editor's request," Olmsted wrote the reply which was inserted in the AJS.\(^{233}\)

There is another indication that he was shouldering more professional responsibility at Yale. As early as 1827 (according to Olmsted's account) Mr. Sheldon Clarke had proposed to purchase a telescope for Yale. Apparently, Benjamin Silliman was responsible for obtaining the donation, but Olmsted was put in charge of purchasing the telescope and accordingly engaged in "much inquiry" so as to use the money wisely. Upon the advice of Captain Basel Hall, application was made to Dolland of London, who promised to supply a telescope in about a year. Numerous delays associated with perfecting the objective lens resulted in an elapse of more than three years from when the proposal was first made before the telescope arrived in November 1830. Olmsted was elated with the "magnificent piece of apparatus," the best in America.\(^{234}\)

In his meteorological report of 1827, Olmsted had mentioned yet another phenomenon, one which was to hold his life-long interest. He wrote: "the occurrence which rendered August more particularly memorable, was the great Auroral arch, which was seen on the evening of the 28th, between the hours of nine and eleven. An account of this phenomenon, written at the time for one of the city papers, is herewith submitted. . . ."\(^{235}\)
The two meteorological reports written by Olmsted were largely descriptive. In contrast to these, he launched into a bold, theoretical venture in 1830, with a short paper entitled "Of the Phenomena and Causes of Hail Storms." To account for hailstorms was "one of the most difficult problems of meteorology," as he well knew. After comparing "a great number" of descriptions of hailstorms, he listed the following propositions as embracing, in his judgment, the "most important facts." Hailstorms (when violent) were accompanied by all the elements of storms, viz., black, swiftly moving clouds, high winds and terrific thunder and lightning; they were chiefly confined to the temperate zones, were most frequent during the hottest months, and were often followed by cooler weather. The stones themselves were smaller on mountains than in adjacent plains (during a given storm) and frequently exhibited a white, porous nucleus, surrounded with concentric layers of ice. 236

Olmsted thought it quite evident that the immediate cause of the hail stones was "a sudden and extraordinary cold in the region of the clouds, where the hailstones begin to form." The central question was, then, "what is the origin of this cold itself?" Of the various current explanations, he thought only two were worthy of consideration, one proposing electricity as the agent; the other invoking the "region of perpetual congelation." Though convinced
that many arguments supporting the former cause were based on "whimsical reasons" or "gratuitous assumptions," he did cite several plausible arguments in favor of an electrical origin. "It is a known property of electricity," he wrote, "to rarefy air, and rarefaction produces cold." Still, he concluded, "the possibility of an event is but slight evidence of its reality." The lack of independent evidences for an actual rarefaction, he thought an important weakness of such a theory. The fact that hail was often absent during electrical storms, he took as further evidence against the electrical hypothesis, citing in particular the dearth of hailstorms in the torrid zone where the electricity of the atmosphere "is most abundant." 237

He cited one other argument that had been advanced in favor of electricity being the source of hailstorms. Near the close of the eighteenth century, certain "men of science" in France had advocated the use of "Hailrods" as a means of "drawing off the electricity which was supposed to cause" the hailstorms. Renewed interest in these devices had been encouraged in 1821 by the Linnaean Society of Paris, with the promotion of "numerous experiments" which allegedly demonstrated their effectiveness. Indeed, a detailed description of their construction was given in the *AJS* as late as 1826. Nevertheless, Olmsted was skeptical as to their true effectiveness and pointed to the establishment of Hail Insurance
Companies in 1829 as an indication that in practice there still existed a lack of confidence in hail rods. He contrasted this state of affairs with that of lightning rods in which case "no such companies are needed."

The preceding paragraph illustrates several points with regard to science in general and Olmsted in particular. First, it accentuates the rather primitive state of knowledge at the time, with its attendant opportunities for charlatans, etc. Secondly, it indicates the unreliability of contemporary reports. Thirdly, it exemplifies a typical case of a scientist trying to thread his way through a labyrinth of testimony and solve a question for which the data supply was too sparse! Nevertheless, as a philosopher of science, Olmsted believed it was his duty to seek out the causes of natural occurrences.

After rejecting electricity as the agent, Olmsted proceeded to argue in favor of the alternative. "We assign the cause of hailstorms," he wrote "[to] the congelation of the watery vapor of a body of warm and humid air, by its suddenly mixing with an exceedingly cold wind, in the higher regions of the atmosphere." For illustrative purposes, he postulated two parcels of air, traveling towards each other along a line of constant longitude. He believed such conditions would result in black clouds with attendant thunder and lightning. He included a graphical representation of
the "line of perpetual congelation" (i.e., the point at which water freezes) plotted versus the latitude, which has a shape qualitatively similar to a cosine curve, centered on 0° latitude where it is maximum, with a minimum at 90° latitude. From this graph, he then demonstrated that in the temperate zones, one would get a maximum temperature difference between two parcels of air approaching each other; thus, hailstorms would be most prevalent in the temperate zones, though he admitted that accounting for this prevalence was a "point of great difficulty." The cooler weather following hailstorms he perceived as the result of the extension of the cold blast which produced the storm down to the surface of the earth. As for the stones themselves, they were smaller on mountains simply because they had less distance in which to accumulate successive layers of the watery vapor. The white, porous nucleus indicated that the "congelations began in highly rarefied air, such being precisely the appearance of a drop of water frozen under the exhausted receiver of an air pump." They fell with small momentum, because they grew by the addition of water vapor which was at rest and hence which slowed their flight. Although he included some elementary calculations, his theory was largely qualitative.239

His paper was republished in the New Edinburgh Philosophical Journal, and subsequently, Dr. A.T. Christie cited in the same journal the occurrence of hailstorms in India (torrid zone, of
course) as evidence contraverting Olmsted's theory. In his reply to Dr. Christie, Olmsted reiterated his belief that hailstorms "result from a mixture of blasts of hot and cold air, and not from any agencies of electricity, to which they have been more commonly ascribed." He explained that the prevalence of such storms in the temperate zones did not exclude storms from the torrid regions, and further noted that the fact mentioned by Dr. Christie in his account of the Indian storm (namely, sultry weather with hot blasts of wind prior to the hailstorm and disagreeably cold weather following the storm) "implies the meeting of just such elements as the theory demands." By this time, at least two alternate theories of hail had been published in the AJS, but happily, as Olmsted thought, both had involved a "mixture of blasts of hot and cold air," with no mention of electricity.240

Olmsted's theoretical effort is not without significance. It suggests an awareness of an area of current interest as well as an attempt to make a contribution to the field. As a matter of fact, the very year that his original paper on the subject was published, the Paris Academy offered a prize for the best complete theory of hail. None of the contestants that year, or in 1832, when the offer was renewed, satisfied the commissioners in charge of the competition, however.241
Meanwhile, Olmsted was also exerting himself for the cause of science in general. In fact, within several months of his arrival at Yale, in March of 1826, he was placed on a committee of the CAAS designed to explore ways to increase the patronage of the American Journal of Science. The following month he presented a detailed report on behalf of the committee, recommending that an address, setting forth the "utility of the Journal to the cause of science in our country" be given to the CAAS and then published. He was pleased with the reception of this report, his first chance of addressing a "private circle of literates" since returning to Yale. 242

Showing the value of the AJS to the advancement of science was one thing. Exhibiting the value of science itself was something else, but a task which Olmsted also welcomed. He discussed with Benjamin Silliman the possibility of renewing the annual oration of the CAAS. The last such oration had been delivered by Olmsted's predecessor, A.M. Fisher, in 1818, and in agreeing to speak in public, Olmsted saw a chance not only to promote science, but also "to confirm public confidence in my ability to discharge the duties of my station." He proposed to present a subject on which he had "reflected considerably"; planning to controvert the gloomy doctrine that the important discoveries had already been made, thereby bringing encouragement to scholars and philanthropists. 243
His oration given to the φβΚ society in the fall of 1827, entailed a sweeping view of progress in the various fields of science and the arts since the turn of the century. The research of Laplace showed that "all the apparent discord in the movement of the planets proves to be only the tuning of a mighty organ." The laws of definite proportions demonstrated that chemistry is governed by laws no less precise than those governing the planets. The secret caverns yielded their records of the flood to Buckland. Even more astonishing were the accomplishments in the arts: steam and its attendant revolutionization of navigation, the grand canal, the railways, the cotton gin, and many more. Coupled with like exhibits of advancements in the causes of liberty, education, morality and religion, what a formidable array of evidence he presented! 244

Still, "compared with the intellectual and moral culture which it is one day to exhibit, the world is yet a waste," he averred.

Sober reason... tells us that no heathen poet, nor visionary alchemist, no infidel philosopher ever made the grand discovery, that the happy age was to be brought about by the united powers of the works and the word of God; that before such an age could arrive, not only must the intellect of men be exalted by science, and his feeble arm achieve a perfect dominion over all creation, but the Bible must also exert its universal sway over the hearts of men. Who first announced, that this union of all that science could achieve, with all that the Christian religion could bestow on man, would restore to earth the happy age? Isaiah's hallowed lips first proclaimed it. It was to be a union of 'the spirit of wisdom and understanding, the spirit of counsel and might, the spirit of knowledge, and -- THE FEAR OF THE LORD!'
To such a union all things are tending--every new principle discovered in science proclaims it--every new trophy of art proclaims it--every nation released from bondage proclaims it--every race of idolators converted to christianity proclaims it. Let us, my brethen, all take courage, and rise to new and nobler efforts, when we reflect that each of us, whether engaged in advancing the cause of science, or of education, or of liberty, or of morality and religion, is bearing some humble part in hastening onward this glorious consummation.

So, Olmsted promoted science, but not simply for its own sake. He shared Silliman's view that "science is only embodied and systematized truth. . .it tells the thoughts of God". And only the Christian could read those thoughts with the fullest appreciation.

In 1826, the first American edition of The Christian Philosopher; or the Connexion of Science and Philosophy with Religion had been published. The author, Thomas Dick of Scotland, was a preacher-turned-teacher and an advocate of the value of science for the common man. To substantiate the importance of a study of nature, he had quoted the late President Dwight. Soon after the book appeared, Olmsted wrote an essay review of it.

Anyone well-acquainted with President Dwight, said Olmsted, knew how much that great man had insisted that the study of nature was a Christian's duty. Numerous examples from the Bible--green pastures and still waters, the rose of Sharon and the lily of the valley--testified to the familiarity of the sacred poets with God's works. Those poets recognized their Creator too in the more "solemn and awful forms," the storm, tempest, and the volcano. Not even the fading leaf or the withering grass escaped their notice.
In general, Olmsted found The Christian Philosopher an acceptable work, promoting a desirable union of the "admiration of nature with piety towards its Author." He admitted that the book would more likely edify the Christian than convince the infidel, but this was not necessarily a criticism, since he did not consider the purpose of the present work to be a presentation of "irresistible" arguments in the manner of William Paley. Nonetheless, he found it necessary to criticize rather severely the chapter entitled "Scriptural Facts Illustrated from the System of Nature."^248

To the initial proposition, that scientific knowledge may often be used to interpret the Bible, he would readily consent. Nor did he doubt that there would be complete agreement between "true interpretation of scripture" and "well-authenticated facts." But Olmsted was diametrically opposed to the second proposition of the chapter, viz., "that the system of nature confirms and illustrates the scriptural doctrine of the depravity of man." Olmsted countered: "we are of the opinion that all the laws of nature are benevolent in their design, and entirely benevolent. . . ." As examples of purported evidences of divine displeasure, Thomas Dick had cited the disruptions and dislocations of strata of the earth's crust, tornadoes, and volcanoes. Olmsted pronounced the first case a most fortunate circumstance. First, man is thereby able to study the earth's interior, an occupation otherwise
impossible. Second, vast mineral riches are thereby rendered accessible to man. Third, the "revolutions" which gave rise to the present positions of the strata were designed "to prepare the earth" for the habitation of man! As for the tornado, it is the case of a potentially "fatal" disturbance from equilibrium being circumvented by a less harmful phenomenon, and should be hailed as a "messenger of mercy...hurrying to prevent a direful catastrophe." In the case of the volcano, Olmsted was content to rest his case on analogy, convinced that it would prove to be beneficial, when all the facts were in. He reiterated his previous position: "no part of creation, no laws of nature, will be found on close inspection, to warrant..." the belief that they indicate God's displeasure. On the contrary, "his tender mercies are over all his works." After several less extended criticisms, he cordially recommended the book as a work "replete with valuable information respecting the creation, and radiant with devout and pious sentiments towards the Creator." 249

These themes, of God's benevolence, and of the advantage of the Christian life, are themes to which Olmsted returned again and again. They helped give purpose and meaning to his life. Again in 1830, he returned to the subject of the Christian and his relationship to nature.

...the mere poet, or the mere philosopher, or even one who united the spirit of both [he wrote], ...has never known the full amount of enjoyment to be derived from the
study and contemplation of nature; a superior class of pleasure lie beyond him, which it requires another sense to perceive. . . the poet and naturalist can accompany our Saviour in his admiration of the fowls of the air and of the lilies of the field. . . but they cannot accompany him, as the Christian can, in the more delightful and instructive application, nor awake from the transient ecstasy to which they have been suddenly raised. . . , to a settled and joyful trust in him who thus feeds the ravens, and clothes the grass of the field.\textsuperscript{250}

These remarks were occasioned by his review of Sir Humphry Davy's \textit{Salmonia}, which had been composed by Davy during his final illness. Olmsted also wrote a "Review of the Scientific Labors and Character of Sir Hymphry Davy" which appeared in the \textit{AJS}. In this paper, several significant characteristics of Olmsted may be discerned. The importance which Olmsted attached to the careful instruction and judicious guidance of youth is especially evident at one point. In writing of Davy's choice of profession, Olmsted admitted his ignorance as to what might have diverted Davy from his earlier aspiration towards the study of medicine; still, he conjectured that it might well have been an admiration for the achievement of Scheele, Black, Priestley and Lavoisier.

Referring to Tycho Brahe, whose devotion to astronomy arose from witnessing a solar eclipse as a child, Olmsted then likened the "genius of childhood or youth," to those meteors which are said to be wandering in the regions of space, that have never yet found a resting place, but are liable to have their orbits determined by any grand luminary near which they happen to pass,
around which they forever afterwards revolve. The impressions of admiration produced by any incident that strongly arrests the attention of a child, are to be sedulously guarded against when the object is dangerous, and as sedulously cherished when the object is elevated and good. While many a child of genius has had its ambition turned into a noble channel by strong examples of the rewards of virtue, many others, like Hannibal, have burned through life with unhallowed fire that was kindled in the bosom of the child. 251

Olmsted’s belief in the beneficence of science is clearly seen in several passages. With reference to Davy’s experimentation in agricultural chemistry, he noted that "there is no loss of dignity in the performance of any duties that are necessary to the promotion of the happiness of our fellow man. To do good [words he would repeat to one of his classes years later] is a work of inherent dignity." He also cited Davy’s Safety Lamp as an instance illustrating the benefits of science upon society. 252

More specifically, Olmsted used this latter example to promote the value of "purely philosophical" principles. Most inventions, he admitted, were largely the result of accident, but in this case, Davy "commenced, not with constructing a lamp, but with inquiring into the nature and properties of the agent which he had to control." He analyzed this "fire-damp," which exploded so readily when mixed with air and ignited with a lamp flame; he experimented to determine the precise conditions under which such explosive burning might be circumvented; he designed a device that not only disarmed "the foe; he made him his slave.[!]" 253
Olmsted also noted Davy's contributions to the science of chemistry per se: his skill in chemical analysis, as demonstrated by his work on nitrous oxide and other compounds; his discovery of potassium, and its importance as a tool for analysis; and his theory regarding the nature of chlorine. Earlier in his article, Olmsted had expressed his approval of Davy for his recognition that "'chemistry, in its present state, is simply a partial history of phenomena, consisting of many series, more or less extensive, of accurately connected facts'." Davy's remarks on the "'folly of hasty generalizations'," demonstrated "how early he [Davy] had imbibed the love of truth, and formed the determination to surrender himself to her guidance."254

Olmsted gave a fairly detailed sketch of several aspects of Davy's controversy with Murray over the nature of chlorine. It was fortunate, he thought, that these two gentlemen were so evenly matched, else error might have triumphed and "led the world astray," or truth would not have been bolstered by "such a panoply of arguments" as resulted from the sustained controversy. As for the controversy as it was in progress, in the opinion of "lookers-on," each party seemed at times "to have fairly laid his adversary; but to their surprise, the latter soon returned to the attack only invigorated by the blow."

It is hardly possible to review the history of the foregoing controversy[he urged], without being strongly impressed
with the delusive nature of hypotheses in general, if by hypotheses we understand a supposition of which there is no other proof, then that it explains all the phenomena to which it is applied. The two hypotheses of electricity as well as those respecting oxy-muriatic acid, applying as they respectively do to a great multitude of facts, while we know that one or the other of them must be false, prove the danger of relying on such a conformity of our suppositions with facts, as a criterion of their truth. 255

These comments are reminiscent of Olmsted's distrust in hypotheses exhibited in his earlier paper on the "Present State of Chemical Science." They are all the more interesting in view of his subsequent theory of meteoric showers, in which he fell into the very trap he here cautioned against. Such an apparent inconsistency demonstrates the peculiar attachment commonly manifest by scientists when they are dealing with their personal theory. It also accentuates the importance of distinguishing between what a scientist says and what he does.

Olmsted took issue with Davy over the latter's "explanation which is generally received in meteorology as the true theory of Mists." Davy's erroneous explanation, said Olmsted, was as follows. The air over a river, through the influence of the water, remains warmer than the air on the adjacent land. The mixing of the colder and warmer portions of the air results in the production of fog. Not so, continued Olmsted, because fog is likewise produced over rivulets much too narrow to appreciably alter the temperature of the air above them. The actual case, then, as he
envisioned it, was that the air over the land cooled at night, the river sending off a rather constant quantity of vapor. This vapor, coming in contact with the colder air, condensed as fog. Since returning to teach at Yale, Olmsted's duties had included lectures in meteorology. His criticism of Davy's explanation of mists indicates that he was not simply a popularizer of science, but believed himself capable of making a contribution to man's quest for truth.

Additional insights into Olmsted's thinking during this time period are furnished by several domestic incidents. When he and his new wife had left for Chapel Hill in 1818, the future had looked bright indeed. During the years at Chapel Hill, their family had grown and by the time he was appointed at Yale, the Olmsteds had six children. The responsibility of caring for "so numerous a family" weighed heavily upon him and he dreaded the long trek from Chapel Hill to New Haven. When they left Chapel Hill in May of 1826, their youngest (Eliza) was already ill. The excessively hot weather, coupled with the several unfortunate delays accentuated the suffering of the child. During a portion of the journey, little Eliza grew so ill that her parents feared for her life. Though she survived the ordeal, she grew progressively worse, dying in October of 1826. Her parents were grief stricken, but bowed to what they believed to be the will of an over-ruling Providence.
They had always thought that their little girl had manifest an unusual sweetness of temper, with scarcely a trace of depravity. Perhaps, mused Olmsted, God saw fit to take her, afflicting her with such sore distress, in order that her parents' presumption might be rebuked and they might be impressed with the sinfulness of all human nature.256

Such a theology--attributing apparent misfortune to God--crops up repeatedly in Olmsted's writings. It was a prevalent belief shared by other prominent Christians at Yale such as Professors Silliman and Kingsley, as evidenced by their comments at the death of A.M. Fisher in 1822. But such a belief was by no means a recent innovation. One can cite, for example, the case of Joseph's response to misfortune recorded in Genesis 45:5.

Shortly after little Eliza's death, the rest of the children contracted whooping cough and chicken pox, the former affliction lasting until May. In addition to the sickness in the family, Olmsted continued to be oppressed with feelings of inadequacy. With such "slight qualifications" it was only by extraordinary effort that he was able to fulfill his duties at Yale. But these exertions produced

. . . nervous sufferings so intense and alarming as to threaten a total disqualification. . . for duties so arduous as those of my profession. The thought that I shall be forced to retire from a place requiring powers of body and mind of so superior an order, has more than taken pretty
full possession of my mind. But I would humbly and cheerfully submit the whole to God.  

Less than two years from the time Olmsted penned these lines, an even greater trial befell him. With what bitter emotions he wrote: "My dear wife is no more." For the first time in his life, he experienced a sadness beyond tears. In painful detail he recorded his last conversation with this "wife of my youth." The exchange between them conveys the overriding importance which was attached to these final scenes--the compulsion--the utter need-to-know that the dying one was "ready to go." It is probable that, had proper steps been taken by the physicians attending his wife--steps urged by Olmsted himself--his wife would not have died. This realization made the trial particularly difficult to bear.  

The graveside scene was touching, the small children, with their tears and crying, trying to call their mother back from the grave. But young children forget quickly. A few days after the funeral, their father took them for a ride where every familiar scene brought him memories of his dear wife. Yet their happy chatter cheered him somewhat. He spent several succeeding Saturday nights perusing letters written to him by his wife (the joy of his heart), but the renewed sorrow this activity elicited forced him to discontinue the practice.
Cares engulfed him now. What would he do with his "orphans?" How could he care for them and at the same time discharge his duties at Yale? Characteristically, even at the height of his troubles, Olmsted thought of God. "God has for the most part given me power which I have never known before of controlling the current of my mind," he wrote.

I would indeed praise him for the numerous alleviations which have been afforded me from various sources some of which seem so manifestly decided towards my present circumstances that I cannot help recognizing them as extraordinary marks of the goodness and mercy of my heavenly father.

He saw God's hand in the fact that most of his children were sons, "not so deeply and constantly affected by the loss of their mother as daughters so young would be." Yet God had given him one daughter "who now becomes peculiarly interesting and dear to me as the representative of her mother." Because of her "solitary situation," there were several generous offers from friends to take care of her. She spent several weeks with President Day, who had recently lost a little girl about her age. Recently, Denison's brother, Nathaniel and his family had moved to New Haven, and this too, was providential. They took the smallest child, Lucius, under their care, which relieved Olmsted of any "peculiar solicitude" on his account. "Providentially," Eliza's sister, had just closed her "engagement" in North Carolina, where she had been teaching. She was well-acquainted with the children and upon
learning the dreadful news, she agreed to come to New Haven and
care for them.²⁵⁹ In all these circumstances, Olmsted saw the
hand of God.

He had begun to give weekly lectures to the seniors in a few
select topics in astronomy the summer after his daughter had
died (in 1827). Now with a special need to occupy his mind, he
busied himself with writing lectures in astronomy. The week after
Eliza’s death, he wrote and gave lectures on the Planets. During
the next two weeks he lectured to the seniors on the Asteroids,
on Saturn’s rings and on Comets. He personally heard "the
recitations on astronomy in the junior class..." He "...did
not feel bound to..." do so because of custom "but believing that
my labors contributed to raise the tone of study which had been
falling for several years to the great prejudices of this branch of
education, I have had no reason to regret the efforts I made."²⁶⁰

The next Annual Catalogue contained a new entry. In place of the
senior course in "Principles of Natural Philosophy" was "Select
Subjects of Natural Philosophy and Astronomy," no doubt in
reference to his expanded lectures on Meteorology and Astronomy.

When Olmsted, at the age of 35, returned to teach at Yale,
he had already devoted eight years to the subjects of chemistry,
mineralogy and geology. The fact that Yale selected him to fill the
vacant Professorship of Mathematics and Natural Philosophy
suggests that his performance at Chapel Hill was satisfactory at
the very least, and implies a confidence on the part of Yale in his
ability to fulfill the new duties which included the providing of
moral guidance to the students.

By 1830, there was evidence that Yale's confidence in Olmsted
had not been misplaced. As an active member of the CAAS, Olmsted
had zealously promoted the AJS and the cause of science. He had
published scientific papers, some devoted principally to the report
of data, others commenting on and contributing to scientific theory.
He had expanded his classroom lectures and was contemplating the
writing of a textbook to replace one long outdated.

On the basis of what little evidence exists, any religious zeal
that Olmsted may have exhibited at Chapel Hill had been over-
shadowed by his scientific activities. Back at Yale, the general
religious atmosphere was conducive to piety. It is probable that
this was one of the factors that encouraged Olmsted to review
Thomas Dick's book and to resoundingly endorse natural theology.
The particular light in which Olmsted viewed nature--viz., all
designed for the best--was a part of a more general, religious view-
point which was also manifest when personal calamity struck. The
death of a daughter, the death of a beloved wife, and the attending
circumstances--these were all perceived by Olmsted as part of the
divine plan--all things "working together for good." During such
times of sorrow, it is significant that Olmsted turned to science, not alone as a ready source of diversion for his mind, but (as will be stressed later), as a source of consolation, a less personal data-field from which he could readily draw that data which reinforced the picture of God he desperately sought to maintain--that of a loving father, in control of all.
IV. YEARS OF MATURITY

Building a Reputation (1831-1836)

"...believing that my labors contributed to raise the tone of study..." 262

In 1820, Olmsted had written to Benjamin Silliman, expressing a fearful reluctance to submit even writing to "that august and awful personage, the public." 263 During the course of a decade, Olmsted's fears had subsided. During that interval, he had submitted a report on the geology of North Carolina; he had reviewed a work on a popular topic (natural theology) and had ventured to write upon the "Scientific Labors and Character" of the dashing British scientist, Sir Humphry Davy. He had even gone so far as to deliver (at his own suggestion) an oration promoting science.

In February of 1830, the New Haven County Temperance Society was formed. 264 In October, Olmsted recorded the following question in his journal: "Is it the duty of all the friends of temperance to subscribe the constitution of the temperance society?" followed by a short outline of his thoughts on the subject. He listed several objections to signing, following each with a rebuttal. Among the reasons for signing he included: "a good rule in morals when one side is known to be safe and the other doubtful, always take the safe side." Furthermore, "when a religious
man refuses to subscribe, his example is used to the prejudice of the cause."

Olmsted was no stranger to the effects of intemperance. In 1823 at the University of North Carolina, a majority of the senior class had celebrated the completion of their final examinations by consuming a large quantity of whiskey and brandy. For the resulting disturbance, they were called before the faculty and required to make "proper concessions and acknowledgements." The following year, two students armed with a pistol and a club and loaded with whiskey, committed such "violent outrages" that they were expelled.

Signing a pledge of temperance was a voluntary, self-imposed restriction on matters of diet— an agreement to let the intellect rule the desires; and Olmsted had ample personal experience with this sort of thing. Among his rules of conduct which he had set down upon returning to Yale was this one: "To eat sparingly and by no means to indulge in an article which I have reason to think will do me the least harm." So the rule stated. But keeping such a rule was not easy for Olmsted. Within two months he was obliged to admit, "the early part of this week I suffered greatly from dyspepsia, owing...to imprudence of diet. I know of no temptation which besets me so often as this..." Convinced that pastries and apples were especially harmful to him, he resolved to
eat neither "till the end of the vacation." Yet one week later he found it necessary to renew his resolve: "to eat no pastry and not [more than one apple a day] for the ensuing term, say to January vacation." In his journal, the words in brackets have been crossed out and in their place Olmsted has put the one word "apples" (sic). Certainly he was well acquainted with the struggle against appetite. Significantly, it was at this very time (when struggling against pastries and apples) that he wrote in his journal concerning temperance.267

The temperance movement in Connecticut had taken hold about the time that Olmsted had returned to Yale. President Day had lent it his personal support, and by mid-1830, there were some 170 subsiding organizations to support the Connecticut Temperance Society, which had been organized in 1829. Statistics suggest that the movement had a pronounced effect upon the sale of liquor in the state.268 On New Year's Day of 1831, Olmsted noted in his journal the "wonderful progress" made by the temperance movement, asserting that ardent spirits had "almost disappeared from among the respectable class of society." Significantly, Olmsted connected this progress with an unprecedented prosperity of religious organizations, mentioning plans "to furnish every destitute family in the Union with a Bible," and to cover the Mississippi Valley with "instruction of religion and education."269
It was clearly for religious reasons that Olmsted took an active part in the temperance movement lecturing to audiences in West Haven, Fair Haven, N. Bradford, and other towns. He was even able to make use of his background in chemistry, giving on one occasion an extended discussion of the chemical constitution of various fermented drinks in an effort to resolve the question as to whether wines should also be included in the temperance pledge of abstinence. Nevertheless, his lecture was sparsely attended and he feared that his effort had given little impetus to the cause of temperance. The evening following this performance, he lectured to the Mechanical Society on comets—to a full and attentive audience. Even when considered scientifically, temperance could not compete with so popular a subject as comets!

With Olmsted's lectures on temperance, began what proved to be a life-long involvement with public lectures. He put together an outline for a popular series on water. Though there is no evidence that he ever gave this series, its projected content indicates the scope of his plan. This included a discussion of the external and chemical characteristics of water. Under the latter head, he would include short histories of hydrogen and oxygen and considerations of water as a solvent, as an acidifier, and as a decomposing agent. In presenting the various states of water, he would have occasion to discuss the laws of hydrostatics and hydrodynamics, the
properties of ice and the process of freezing, and the properties and usefulness of steam. Meteorological considerations could be introduced in conjunction with the forms exhibited by water under various conditions of weather, viz., dew, rain, snow, and hail. A discussion of geography would include ideas of the water cycle and the role of oceans, lakes, and rivers. Physiological aspects of water would lead to a discussion of plants and animals and the topic of mineral waters and their medicinal effects might conclude the series. Thus, a popular series on water might well embrace virtually all fields of natural science.²⁷⁰

By this time (around 1830), Connecticut was partaking of the movement toward self-improvement that was sweeping the eastern part of America. In a sense, the movement owed a debt to Yale. It was there that Josiah Holbrook had imbibed a strong interest in science from Benjamin Silliman. Holbrook went on to initiate the lyceum in 1826, which laid emphasis upon the popularization of science.²⁷¹

In 1831, with the hearty support of Professors Silliman and Olmsted, Mr. James Brewster, a carriage manufacturer of New Haven, set aside two stories of a large building for the purpose of popular lectures. The facilities included a lecture hall with a capacity of 300, an adjacent "laboratory" furnished with apparatus for demonstration purposes, a cabinet of natural history, and even lodging rooms for the use of those giving a course of lectures.
The enterprise was named the Franklin Institution. The expectation was that "nearly every week of the year" some "mental entertainment" would be provided for the citizens (and strangers) of New Haven. The charges were to be limited to an amount sufficient to meet the expenses of the undertaking; should there be any surplus, it was to be used in building up a library for the institution.272

In October 1831, the Franklin Institute was officially opened, and Olmsted lent his support with an introductory lecture on natural philosophy, which included a discussion of the nature, scope and historical background of the subject as well as practical applications. Thereafter, he gave nine or ten more lectures, at the rate of one lecture in two weeks, alternating with Benjamin Silliman. The following year Olmsted presented a popular course in astronomy at the Franklin Institute. The introductory lecture was published in two of the city papers, and extracts appeared in various other papers. The lectures were held twice a week and tickets sold for two dollars for the series of 12 lectures. Olmsted was pleased to clear nearly 200 dollars, after expenses. Although the compensation was far less than he was to receive in later years for a lecture series of comparable length, at a time when Yale professors were receiving a yearly salary of only 1100 dollars, the additional income which these popular lectures afforded was certainly one important inducement for the lecturer. Another incentive was
the sense of satisfaction "of having contributed something to disseminate knowledge over the community."²⁷³

Although revivals had come to Yale in past years, the school year 1831-1832 was a time of an extraordinary revival at Yale. Olmsted estimated that the total number of new converts probably exceeded one-third of the whole student body. "The fruits of religion appeared in all their loveliness—in brotherly love, in an unexampled quietness and removal of all occasion for discipline." One of the early converts was a Mr. Amos Pettingill, one of the tutors, who accordingly changed his field of study from law to theology. Unhappily, he acquired an "affection of the lungs" and died shortly. Olmsted commented: "I have seldom regretted more the death of an acquaintance. I had formed high hopes of his future eminence and usefulness in the church. Truly, God's ways are not our ways."²⁷⁴

Towards the close of the school year a European vessel arrived in Canada with cases of cholera aboard. Within a short time, there were reports of 1500 deaths in Montreal, out of a population of 35,000 and the strongest apprehensions were entertained that the epidemic would spread to the United States. Early in July, several cases of cholera were reported in New York City and subsequently the number of cases increased on successive days to 7, 14, 20, 37, at least half of these terminating in death! The
city was thrown into an uproar, and a great exodus began, many of the people coming to New Haven. This state of affairs increased the alarm in New Haven. The students at Yale petitioned that college be dismissed. Though their petition was not granted, individuals were given permission to leave, if they felt it necessary. At least half of the students went home, but not a single case of cholera was reported in the institution.

Olmsted had some reason for hope. He cited a newspaper account from Montreal which stated that among the 350 members of the Temperance Society in that city, only two deaths had occurred and there were few other instances of the disease.

In such an exigency as the present, calmness and composure of mind are not only to be cultivated as a part of Christian duty... but as the greatest of all precautions against the disease itself. Fear, next to intemperance and uncleanness has... been found to be the greatest of all pre-disposing causes of the disease [Olmsted noted].

Still, his own state of health was precarious and he experienced portentous symptoms for a number of weeks. "There are we trust many righteous people in this city," he wrote.

There are certainly many who pray without ceasing but that God will spare us for their sakes is more than we have a right to presume, although this is the chief ground of our hopes... If ever I had peculiar reason to cast myself upon the mercy of God with a disposition to confide wholly in his all-wise allottments, it is at the present moment.

Years later, in 1849, another epidemic of cholera was to visit New Haven and produce much greater ravages among its
inhabitants. It was to elicit a similar response from Olmsted. This later epidemic would also come in the summer, at a time when Olmsted would be in "danger of growing vain at the admiration of passersby that stop to gaze at our grounds and flowers." Yet, he would note that "the approach of that dreadful scourge, the cholera, . . . ought to make us feel unusually serious and thoughtful and to consider earthly vanities in their true light." The churches of New Haven would observe a day of prayer and fasting; this would be followed by another, some weeks later, the latter at the recommendation of the President of the United States! Olmsted would report that "In the failure of all human means to baffle the dreadful pestilence, a disposition has been manifested to bow humbly before Him who only has power to bid the destroying angel sheath his sword." Surrounded by death, Olmsted would exclaim: "I desire to offer special thanksgiving to God that my family are still in health."\(^{276}\)

The character of Olmsted's response to the cholera epidemic (both in 1832 and in 1849) was not an unusual one. During those times, "Pestilence, like war and famine, was assumed by most theologians to be a 'rod in the hand of God,' a final resort of the Diety, an appeal to man's fears when there seemed no recourse in appealing to his gratitude or hope." At the same time, "the pestilence was an inevitable result of man's failure to observe the laws
of nature, laws which had been established by God for man's own
benefit. This disposition to attribute misfortune to the hand
of God, and yet at the same time see in this fact a vindication of
both the justice and mercy of God was characteristic of a general
religious atmosphere which permeated the lives of many Americans.

It was during the cholera epidemic of 1832 that Olmsted, in
spite of severe physical suffering, directed the completion of his
two-volume work on Natural Philosophy. In the summer of 1830,
he had devoted considerable time to the perusal of the treatise by
Bridge on Mechanics and had been so impressed with this work,
that he had resolved to publish one of his own based largely upon
it. In the course of doing so, he concluded that "his" book would
sell much better if it included the other branches of Natural
Philosophy, such as hydrostatics, pneumatics, electricity,
magnetism, and optics. He completed the manuscripts in August
of 1832, the work having occupied his "leisure time" for two years.
At a time when there were almost no American texts on natural
philosophy, Olmsted's work was a major accomplishment. His
was the "first to be extensively illustrated and to contain many
numerical problems, both as examples and as exercises." 278

By this time his health was so poor that he was unable to
attend commencement exercises. Dr. Ives (visiting from New
York) examined him, expressing an opinion that nothing short of a
12-month journey and strict rest from study would restore him to health. Such news was particularly discouraging to Olmsted, but that same day also brought a happy event, the birth of a daughter, whom he named Julia. Soon after Olmsted's first wife had died, he had met Julia Mason, little realizing at the time "the intimate and endearing relationship which Providence designed should exist" between them. In May of 1831, he attended a meeting in New York concerning the forming of a National Lyceum. After the meeting, he remained in New York, partly because of the Religious Anniversaries meeting there, but also much occupied with thoughts of finding a new wife. Through some friends, he arranged a meeting with Julia and they were married in August 1831.

With a wife of scarcely a year, and now a new daughter, Olmsted was in no position to take a year's vacation. About this time a series of articles in the New York Observer caught his eye. They were on the Oneida Institute, a school in New York stressing manual labor. The seriousness of his illness, coupled with the extreme pressure of his obligations at Yale (where he believed "severe and continued study. . .is indispensable to success and respectability") well nigh persuaded him to seek a position at Oneida, where he might still "be the means of great good to the pupils." However, his wife would not hear to such a plan. As cool weather came on, his dyspeptic complaints lessened; and by the
following summer he was able to study more and with greater comfort than at any similar period since returning from Chapel Hill. Unfortunately, however, he began to be troubled with a certain lameness in his right leg. In the fall of 1833, he spent two weeks at Saratoga Springs, where he experienced slight but temporary relief. With the beginning of the new school year, he was much occupied with his lectures on Astronomy, which took his mind off his complaints. Nonetheless, his rheumatic pains were so severe that he found it necessary to lecture to his classes from a chair. In May of 1834, he obtained a leave from Yale until commencement, with the intent of resorting to Virginia Springs. He left reluctantly, "I love home," he wrote. "My wife (the best of wives) and my children bind me here." In contemplating the financial prospects of his family, he continued, "I must look to Him that feedeth the ravens, and heareth the young ravens when they cry." 279

Despite personal efforts against it, he could not banish from his mind a certain premonition that he would not return. In such a frame of mind he wrote:

I pray God to take these lambs in his arms and save them from the wolves that may prowl around them, should they be soon deprived of a father's restraining counsel and authority. As they successively leave the paternal roof where such constant watchfulness has been exerted to preserve them from bad principles and vicious practices, and to train them in the path of virtue, I feel that nothing but a change of heart can furnish any certain security against
the dangers that will environ them. My constant prayer to
God is and will be while I live, that they may be subjects
of the renewing and sanctifying grace; and should I return
to them no more, my last counsel would be—Little
children, Love one another—Be always respectful and
dutiful to your mother—and seek first the kingdom of God
and his righteousness, and all things needful shall be
added unto you.280

Thus, once again we find Olmsted, when threatened with
circumstances beyond his control, turning to God for consolation,
trusting the future to God's goodness and care, and admonishing
those dearest to his own heart to make their peace with God.

Despite his illnesses, Olmsted was not neglecting his obliga-
tions as a professor at Yale. With the opening of fall term, in
1832, he began a course of daily lectures to the seniors on the
subject of astronomy lasting for six weeks. His lectures excited a
deep interest among the students and at the close of the series, a
committee "on behalf of the unanimous wishes of the class"
requested him to sit for his portrait, to be added to the collection
in the Trumbull Gallery, the expense to be borne by the class. This
token of esteem was gratifying to Olmsted, though, characteristi-
cally, he felt "undeserving."281

It was less than a year later that an event occurred that was
to enlarge Olmsted's reputation at home and abroad. On the night
of 12/13 November, 1833, there occurred a magnificent spectacle of
"shooting stars." The fiery meteors caught the attention of some
observers as early as 9 or 10 p.m. After midnight their number
rapidly increased, until the entire sky seemed filled, with stars falling "half as thick" as the flakes of snow in a common New England snowfall. Some of the meteors were scarcely more than points of light; others blazed with a splendor excelling that of the brightest planets. At the height of the display, people were awakened from sleep by the brilliant flashes of light. The extraordinary activity gradually faded from view with the advance of daylight.282

The event attracted wide-spread interest, "A phenomenon so rare, so brilliant and so sublime could not fail to strike with wonder and with awe, its numerous beholders."

One scientist (Edward Hitchcock) delayed the sending of his account to the AJS, expecting "so many accounts would be sent you (or inserted in the public papers). . . . that anything from this place would be unnecessary."284 For some time afterwards it was the "principal topic of conversation in every circle."285 Some supposed it to be a "miraculous occurrence intended to warn the inhabitants of the earth of some great impending calamity."286 Even a scientist (Alexander Twining) could readily extract a religious moral from the event.

After alluding to the one body whose size and speed he had been able to calculate, he continued:

. . . that Almighty Being who made the world, and knew its dangers, gave it also its armature [the atmosphere] . . . and considered as one of the rare and wonderful displays of the Creator's preserving care, as well as the terrible
magnitude and power of his agencies, it is not meet that such occurrences as those of November 13th should leave no more solid and permanent effect upon the human mind, than the impression of a splendid scene.\textsuperscript{287}

Thanks to a friend, Olmsted was awakened in time to witness this remarkable display. The meteors appeared to emanate from a single point, which seemed to move with respect to the zenith. Noting the position of this "radiant" point in the constellation Leo, Olmsted followed its progress and, in the course of an hour, it did indeed move with the stars. The meteors resembled sky rockets, their paths terminating with a sudden explosiveness, but, though he listened intently, Olmsted detected no sound. He immediately wrote a report of his observations, which appeared in the *New Haven Daily Herald* that same day. In his report, he requested information from other observers.

The next few weeks were busy ones for Olmsted; so busy in fact, that there was apparently no time to make entries in his journal. His article had been copied in various other newspapers and he soon began receiving reports from places as far away as North Carolina. He collected other newspaper accounts from Virginia, Ohio, and Georgia. In addition, he had access to information sent directly to the *AJS*. In true Baconian style, he was beginning his inquiry into this phenomenon by a collection of the data.
To be sure, he was not the only scientist interested in this event. Professor Joseph Henry at Princeton, had likewise witnessed the shower of meteors, and that very day he had sent a letter to his brother James in Albany, requesting him to "collect every account which may appear concerning this meteor [sic]...and cut from the papers all you may find." But Henry seemed to think that a collection of the data was all that could be done at present, leaving to a "future generation" the discovery of a suitable theory. At best, he hoped to determine the geographical extent of the shower. 288

Olmsted believed that it would be a service to science to collect, classify and record the facts of the case, though admittedly incomplete, as soon as possible in a publication less "ephemeral" than newspapers, etc. At the least, this would afford materials for those "better qualified" than himself to use in rendering an explanation. Perhaps he himself might at least explore the possibility of an explanation. By December, he had formulated several definite ideas concerning the meteoric showers. He wrote to Professor Twining at West Point, sketching some of the main points, and found that Twining had come to similar conclusions. During December, Olmsted presented the subject of the meteoric showers before the CAAS, intimating some connection with a nebulous body, or comet. 289 Olmsted's paper was published in two parts,
appearing in the two volumes of the *AJS*, issued in January and July of 1834. The first part was largely descriptive, containing some dozen separate accounts of the meteoric shower, followed by an extended "Synopsis of the Facts," suitably classified. Near the end of a "Review of the Foregoing Facts," he mentioned at least four hypotheses already put forward to account for the facts. These were "Electricity, Magnetism, the Combustion of Hydrogen Gas and some of its compounds and Terrestrial Comets." He ended by saying that additional facts, expected before the last part of his paper would be published, "will either correct or strengthen our present opinions, and add greatly to our means of arriving at the truth."²⁹⁰

Even when Olmsted had formulated his own theory and had become convinced of its correctness, he nevertheless shrank from publishing it, for fear of ridicule. Indeed, this fear was strengthened by a "very cold reply by another hand" to a letter he had written to Dr. Bowditch, in which he had presented several of his ideas. Olmsted asked the advice of his colleagues at Yale. Jeremiah Day and J.L. Kingsley, with characteristic caution, told him that if he was certain of his calculations and willing to stake his reputation on it, they would not fear for the reputation of the college. Silliman, more optimistically, related a relevant anecdote and advised, "Let Drive."²⁹¹
In the second part of his paper, after a brief historical survey of sightings of meteors, Olmsted "with much diffidence," offered his views as to the causes of the recent meteoric shower. He set forth what appeared to him to be the principal questions in conjunction with the meteors: their point of origin, their velocities, their composition, their size, and the causes of the light and heat.

Prior to 1800, with some notable exceptions, the prevailing opinion had been that meteors had a terrestrial origin. Around the turn of the century researchers had measured meteoric velocities, finding them to be surprisingly high, and had analyzed the chemical composition of meteoric stones, finding it substantially different from terrestrial products. Both results seemed incongruent with a theory of terrestrial origin. Laplace proposed a lunar origin for meteors; others suggested a cosmical origin. Nevertheless, no theory seemed capable of explaining all the evidence satisfactorily. One of Olmsted's most important contributions to the problem was the manner in which he marshalled the evidence for a cosmical origin of the meteors. He, as well as other observers, had noted that the stars appeared to radiate out in all directions from a well-defined "radiant point" in the heavens. As Olmsted recognized, this appearance was in fact an optical illusion; the actual situation being that the meteors were all falling in the same direction with respect to the axis of the earth. More striking was the fact that
this radiant point retained a constant position with respect to the fixed stars, being located in the constellation Leo. The inference he drew from this fact was that the source of the meteors was beyond the earth's atmosphere and unaffected by the earth's diurnal motion.

Reports of the shower were numerous, but the competency and details of these reports covered a wide range. Any attempt to generalize as to the time at which the shower had commenced was virtually a hopeless task, in light of the myriad of specific circumstances that might call the phenomenon to the attention of different observers. The onset of the phenomenon was undoubtedly gradual, and Olmsted hit upon the brilliant idea of ascertaining, instead, the time of maximum activity. Quite remarkably, the time of the maximum seemed to be quite independent of observer longitude (and latitude), occurring at about four o'clock on the morning of November 13th. Such a striking result could be readily accounted for by Olmsted's cosmical theory of origin.

Having concluded that the meteoric source was beyond the earth's atmosphere, Olmsted proceeded to other matters. Using simple trigonometric ideas and data admittedly imprecise (but the best available), he estimated the apparent height of the radiant point above the earth. His answer (over 2000 miles) likewise suggested an extra-terrestrial source. Postulating that the meteors
fell under the influence of gravity, he then calculated that they entered the atmosphere (which for simplicity he took to extend 50 miles above the earth), at a speed of about four miles per second. He suggested that the meteors were composed of combustible material which ignited due to the high velocity and subsequent compression of the air, and included calculations intended to render this idea plausible. From the facts that the meteors did not reach the ground and disturbed the atmospheric equilibrium very little, he concluded that their density was small; since they were invisible before they fell, he believed them to be transparent.

Finally, he inquired as to the relation of the source with respect to the earth. He demonstrated by calculation that the source could not have been an earth satellite, and concluded that it must instead be orbiting about the sun. He calculated its probable period and diagrammed its orbit in relation to that of the earth. In summary he concluded

\[ \ldots \text{that the Meteors of November 13th, consisted of portions of the extreme parts of a nebulous body, which revolves around the sun in an orbit interior to that of the earth, but little inclined to the plane of the ecliptic, having its aphelion near the earth's path, and having a periodic time of 182 days, nearly}^{294} \]

The data which Olmsted had used to construct his theory included the fact that meteoric showers had been observed in November of 1831 and 1832. An obvious inference, then might be that a similar shower would be expected in November of 1834, but
he avoided making this prediction in his paper, since a light nebulous body of the type he envisioned might be subject to large perturbations. 295 Near the end of his paper, he also intimated his belief that the zodiacal light might have an intimate connection, if not an identity, with the nebulous body he had postulated. As November 1834 approached, Olmsted's attention was attracted by the zodiacal light, which manifest an appearance consistent with his previous ideas. He mentioned to his students the possibility of a recurrence of the meteoric showers, inserted an article in the local paper suggesting the same idea, and talked several of his students into watching carefully for such a recurrence. Although a rather full moon inhibited their efforts, Olmsted reported a slight recurrence on the morning of November 13, counting some 155 meteors in the eastern part of the sky in the course of three hours, a number "evidently much above the common average." As before, they appeared "to radiate from a common center, and that center was again in the Constellation Leo, . . . more unequivocal evidence of the identity of the phenomenon with that of last year." Tutor Loomis specifically concentrated his attention on a determination of this position, which did not move with respect to the fixed stars for at least three hours, indicating (as before) a source extrinsic to the earth's atmosphere. 296

A more cautious report came from A.C. Twining at West Point, who could form no "decided opinion" on the topic, though he
judged that the unusual number of meteors he observed after the moon went down presented the "same general character" of the last year shower. On the other hand, A.D. Bache felt warranted in concluding that there was "no remarkable display of meteors" such as in 1833. Thus, began a minor controversy between Bache and Olmsted, regarding the uniqueness of the showers of 1833, Bache and his observers finding "ordinary" numbers of meteors on the anniversary date while Olmsted and his friends insisted that the annual showers had characteristics implying a recurrence of the 1833 shower. Olmsted found it necessary to correct various "erroneous impressions" regarding his theory, one in particular being that a recurrence of the showers was essential to it, but despite such disclaimers, his name was becoming closely linked with these annual recurrences, especially in the eyes of the public.

Furthermore, the phenomenon was beginning to attract international attention among astronomers. In his instructions to the ship Bonita in 1835, Arago requested that special attention be directed to possible meteoric showers in November; however, Arago made no mention of Olmsted. The following year, Arago issued a circular to European observatories, asking them to send him their findings regarding the anticipated meteoric shower in November. He collated this information and presented it to the
French Academy. Biot prepared an elaborate paper on the subject which he read to the Academy in December of 1836, recognizing clearly the priority of Olmsted in the investigations of "position, direction and periodicity peculiar to the meteors of the 13th of November." 299

Meanwhile, in mid-1835, another event had brought honor to Yale. The return of Halley's comet was near; one prominent astronomer suggested it might become visible as early as February. In the early morning hours of 31 August, Professor Olmsted and Tutor Loomis, using the most powerful telescope in America (the five-inch refractor donated to Yale by Sheldon Clarke), discovered an object that they suspected to be the comet. They impatiently awaited the next night, found that the object had indeed moved and promptly announced their discovery, thus being the first in America to see it. "New Haveners lined up outside the Athenaeum to get a glimpse of the faint and distant comet while newspapers and colleges across the land hailed Yale's astronomers and her telescope." 300 Olmsted and Loomis continued to observe the comet over a period of weeks. In less than a month, it was visible to the naked eye. In mid-October, they noted "a peculiar emanation of light" on the side of the comet, as viewed through their telescope. This observation preceded by several days similar European reports. The unusual appearance of this train excited
much interest among European astronomers, since it was thought to have a direct bearing on the alleged perishable nature of the comet. With Olmsted's encouragement and help, Loomis continued his observations on the comet until April, publishing his results in the *AJS*. 301

As we have seen, the early 1830's were extremely important years for Olmsted. In domestic matters, his marriage to Julia Mason undoubtedly had a therapeutic effect, mitigating to some degree the intensity of his grief over the loss of his first wife, Eliza. His reaction to the cholera epidemic was characteristic of the times. He regarded it as a judgment from God, alternately hoping to be spared and despairing to hope. In a similar way, his responses to his rheumatic complaints and the death of Tutor Pettingill display an attitude of submission to the Almighty's decrees. Nonetheless, he did not look upon contemplative resignation as comprising the whole duty of the Christian. His religiously motivated participation in the temperance movement suggests a propensity toward active involvement to help change the world.

As for his reputation, it was clearly on the ascendancy, as evidenced by his popular courses of lectures at the Franklin Institute. At Yale, he had undertaken to raise the tone of study in astronomy by hearing the junior recitations in the subject himself instead of relegating the responsibility of these recitations to the...
tutor as was then customary. His popularity among the students is
evidenced by their gift of his portrait to the Trumbull Gallery.
During the same time, Olmsted had completed the task of writing a
textbook on natural philosophy, a service A.M. Fisher had not taken
time to perform, though even by that time (circa 1820), the text in
use was outdated. In terms of original scientific contributions,
Olmsted could point to a theory of hail, published in 1830 and the
distinction of being the first in America to sight the return of
Halley's comet, using the best telescope in America. Yet Olmsted's
most significant contribution, the one with which his name was most
often linked in the popular press and the scientific world, the one
for which he was already receiving international acknowledgement,
was his collation and use of the data from the meteoric shower in
1833 to demonstrate the cosmical origin of meteors.

Activities of an Established Professor (1837-1845)

"My desire is to retire upon my present
acquisitions and to turn them to as good
account as possible."302

When Olmsted had left for Virginia Springs in May of 1834,
he had desired, above all, that his children might be "subjects of
the renewing and sanctifying grace" of God.303 Now, almost three
years later, his fondest hopes for his children were to be realized.
In the spring of 1837, once again New Haven experienced a season
of refreshing—a new and powerful revival. In an attempt to controvert an objection commonly raised by convicted sinners, Reverend Henry G. Ludlow preached on the text "They hold a lie in their right hand." The lie thus held by sinners he identified as the following: Since a sovereign God has made me, I cannot be blamed for what I am. Reverend Ludlow's sermon was designed to demonstrate that it is neither reasonable nor correct to charge God with our sins. God made the soul, to be sure, but the sinner himself has made his own wicked heart (i.e., his affections), and has been given the power to choose whether or not to accept God's gift of eternal life. The Olmsted family was present as Reverend Ludlow implored the sinner to give in to God. After the regular meeting, there followed a meeting of "inquiry" (attended by some 200 persons) at which Dr. Nathaniel Taylor attacked every possible objection a sinner might urge. More meetings of inquiry, coupled with prayer meetings and time for private conversations with Dr. Taylor resulted in the conversion of at least 24 souls. Among the first was Olmsted's son, Denison Jr., just 13 years old. After one meeting, he returned home to find a young theological student laboring with his brother and sister, Howard and Cornelia. They, too, took their stand. Their brother, Fisher soon joined them.

Denison, Jr., and Fisher were especially enthusiastic, holding private prayer meetings with a few of their friends two or
three times per week. They procured various tracts: for the sincere inquirer, there was one entitled, "What is it to believe on Christ?," for the careless, a sterner one headed, "Prepare to meet thy God!" These they carefully distributed, breathing a prayer of blessing with each tract. Denison, Jr. resolved "to preach the gospel, if God spares my life. . . ." His brother Fisher made a similar pledge. 305 During a good part of the following summer, Howard (with his father's permission) held prayer meetings in Olmsted's college room with some of the fellow-converts of his class. He encouraged his older brother Frank, to "think of the importance of religion." During the earlier part of the period under review, Frank was unmoved. To the pleas of his friends, he had but one reply--"I am ready and waiting for the Holy Spirit to exert its sovereign influence over me." At length his dogged fatalism vanished and he joined his brothers and sister in becoming a subject of grace. Throughout the summer of 1837, he taught a Sunday School class. 306 The first Sunday in June of 1837 was "the happy day." On that day, Olmsted and his wife "enjoyed the unexpressible satisfaction" of seeing four sons and one daughter join the college church. 307

The foregoing narrative illustrates several important features of nineteenth century America. It is true, of course, that an anti-clerical sentiment existed in the early part of the century; in
Connecticut, this led to the disestablishment of Congregationalism in government in 1818. But such sentiment "had little to do with the spiritual power of local churches. That hostility was directed against the worldly privileges of Congregationalism, and not against religion in general. It was a temporary prejudice that declined immediately upon the removal of the conditions which brought it about." For many, religion continued to be the dominant concern of life. And revivalism played a prominent role in maintaining this dominance, even in such conservative strongholds as Connecticut. Furthermore, the Calvinistic concept of a sovereign God and a deterministic universe, though not an "accepted" belief, was still prevalent enough to merit explicit rebuttal by revivalist preachers. Such a Calvinistic tendency also pervaded natural theology, a point to which we shall return.

In the fall of 1837 (perhaps as a result of the revival of the preceding spring), meetings were initiated, to be held each Sunday evening. Though not official college functions, they were held in college buildings, attended by college students, and supervised by college professors. Professor Olmsted and Goodrich were the most common speakers, with occasional help from President Day. Typically, one of the deacons of one of the four classes at Yale took the lead in the meeting. After a short prayer by one of the students and a few songs, a professor would give a 10 to 20 minute
presentation of something "of a purely practical character often founded on one of the sermons of the day." Olmsted presented such topics as: "The cultivation of the Affections along with the Intellect," "On Doing Good," "On the Influence of the State of Health on Our Religious Feelings," "What Christian Members of the Same Church Owe to One Another," "What Members of the Church in College Owe to their Fellow Students who are not Members," "On Sobermindedness." Such involvement was one way of complying with his self-imposed rule on coming to Yale to "be a good example. . . ." With a considerable sense of satisfaction, he noted that "no religious meetings of college have been so uniformly well-attended and there is much reason to believe that they have proved very useful to the moral and religious interests of the college."

On at least two occasions, Olmsted addressed the Yale College Bible Society. In both instances he dealt with the relationship between science and religion. Of the first address, only the title has survived: "The Obligation of Men of Science to the Bible." On the other occasion, he was the last speaker of the evening, and, promising to be brief, "made but two points: 1. That, according to Pres. Edwards' views of the last end of God in the creation, the great discoveries in the arts and sciences, had tended to promote the multiplication and circulation of the bible; 2. To inform the duty of Christians."
At the daily college chapel services, President Day usually officiated in the morning. At the evening sessions, one of the college professors would preside. Often, when the duty fell to Professor Olmsted, he would read the 12th chapter of Ecclesiastes, a significant choice. Verse 12 reads: "... of making many books, there is no end; and much study is a weariness of the flesh." Yale students could readily identify with such sentiment!

Verse 8 asserts: "Vanity of vanities, saith the preacher; all is vanity." Still, the underlying attitude in chapter 12 is not a secular cynicism; rather, its focus is upon the overriding importance of religion in the life. "Remember now thy Creator in the days of thy youth..." (verse 1). The chapter ends, as it began, with an admonition: "Let us hear the conclusion of the whole matter: Fear God, and keep his commandments: for this is the whole duty of man. For God shall bring every work into judgment, with every secret thing, whether it be good, or whether it be evil" (verses 13, 14). Thus, in reading this chapter, Olmsted was epitomizing his own views of his role at Yale and the importance of religion.

When he had returned to teach at Yale, he had resolved to perform his duty regardless of possible damage to his own popularity. As mentioned before, in view of his own need for approbation, such a course was not easy for him. An example of his dedication
to what he viewed as the best interests of the college and students occurred in 1840.

Even before Olmsted was a student at Yale, disputes between the "town boys" and the students had resulted in the formation of a "Bully Club." This student organization chose as its leader a 'Bully,' one who seemed especially well-fitted to lead out in case of attack by the town boys. In later years, it was customary for each class to elect its "Bully," who came to preside at class meetings as well as act as class leader on public occasions. In the eyes of some of the seniors (several years prior to 1840), the office of "Bully" was often filled without sufficient regard for scholarship or morals, so they proposed substituting a "Chairman." Their idea caught on with the other classes and soon a rather competitive "two-party system" had developed.

In direct violation of a faculty directive, a noisy disturbance by the Bully Club took place around the State House in 1840. It was quelled with difficulty, and then almost single-handedly by Professor Olmsted, who went among the students, urging them to stop. He was appalled at the apathy manifest by the other faculty members. At the next faculty meeting, the question of what should be done about the two-party system was discussed at length. Since it was in general the religious segment of students who had instituted the "Chairman" system, it was suggested that it would be best to
disband that later system and return to the one-party Bully Club.
It was supposed that such measures would result in the religious students exerting a greater influence over their less pious fellows.
With this suggestion, virtually all the faculty agreed.

Olmsted had listened to the faculty discussion in silence. Finally, he was asked his opinion. With but little hope of changing the sentiments of the faculty, he nevertheless launched into an eloquent speech in defense of the religious students. He characterized the Bully Club as a potential rival to faculty authority. He pointed out the impropriety of forcing the "religious and sober-minded" to follow the "dissipated and vicious," the "better" to succumb to the "worse," the "scholarly" bowing to those with "inferior qualities." After his remarks, Professor Silliman admitted that his initial sentiments had been similar to Olmsted's but that he had been influenced by subsequent statements made by other faculty members. It was clear (at least to Olmsted) that President Day, as well as the older faculty members, had voted against their convictions. Apparently no action was taken, for at the following commencement, the party rivalries led to "disgraceful occurrences." As a result, the faculty who had lately been opposed to Olmsted's views, now embraced them, adopting a resolution which prohibited the election of class leaders, except
such as preside at class meetings for the transaction of necessary
business. 314

Several years later there occurred another incident involving
discipline of students. One night, while attempting to settle a
disturbance involving several students, a tutor (Mr. John B.
Dwight) was stabbed. This was the first time blood had ever been
drawn on an officer of the college. A large part of the ensuing
week was spent in faculty meetings, investigating the incident. The
assailant was soon discovered and promptly expelled. Four others
who had participated in the disturbance were either suspended or
warned. The assailant (Lewis Fassett) left town to avoid the civil
authorities. The question arose among the faculty as to what
measures should be taken.

Most members favored prosecuting Fassett via the civil
authorities. Olmsted spoke out, in spite of his differing opinion.
He thought the suggested prosecution was inconsistent with "that
parental relation in which we stand to the students," that it would
arouse sympathy in the other students for the assailant, and add
little to his punishment. His remarks successfully brought the
majority of the faculty to his side.

Though the wounds were deep, Tutor Dwight was able to
hobble around within several days of the assault, even attending a
faculty meeting; nevertheless, he was sent home to recover.
Therefore, quite a sensation was caused at Yale when it was learned that he had died. The students passed resolutions of condolence to the family and against the carrying of deadly weapons. The faculty passed resolutions of sympathy for the family and high regard for the deceased. As Olmsted had feared, the publicity attending the incident conveyed an unfavorable impression of the state of morals at Yale. He noted that such a state of affairs was particularly unfortunate because religious sentiment on campus had seldom been more prevalent. Indeed, the prayer meetings of the senior class had exhibited an unusually spiritual aura, and there were expectations of a revival. By the time of Tutor Dwight's funeral, Fassett had been arrested in Philadelphia and was being brought to New Haven for trial. Olmsted viewed this turn of events with apprehension, fearing that the publicity of a public trial would excite student sentiment against Tutor Dwight, who would certainly be represented as brutal. This in turn would further increase public sentiment against Yale.

The two episodes mentioned above (viz., the "Bully" affair and Tutor Dwight's stabbing) illustrate several interesting aspects of Olmsted's character. First, as a man of principle, he was willing to defend what he deemed the correct course of action, regardless of personal popularity. Of paramount significance for him in judging the correct course were the religious principles in
which he believed. Second, one can detect an "old school" tendency to uphold established authority. The marked class distinction between elders and youth, teacher and students, leader and followers was to be maintained. This is likewise seen in his reaction to the "new" custom introduced into Connecticut from New York. The custom required the men to call upon all the ladies of their acquaintance on New Year's Day, bringing them an appropriate season's greeting. The practice was taken up by young and old, bringing both classes into close contact. Olmsted objected to the practice which "has a tendency to prostrate the distinctions of age which are already set aside to an alarming degree in our country." "Nothing is more unfavorable to the respect which ought to be paid to age and even to parents than the practice now very general of old and young, parents and children, meeting at the same parties and indiscriminately enjoying the same frivolities." 316

Nevertheless, there were more important reasons for sustaining the distinction between the aged and the youth than simply a matter of tradition. The aged, the teacher, the leader possessed a knowledge whereby the youth, the student, the follower could well profit; and Olmsted's concept of this role of the teacher, a parental role espoused by Timothy Dwight, is also apparent in the above incidents. As a teacher, Olmsted thought of the sons of
Yale as his sons. Even as a tutor, he had exhibited a striking parental concern in his valedictory address to his class before leaving for North Carolina. F. A. P. Barnard (one of his students) testified that Olmsted treated him more like a son than a student. "I am happy to learn," Olmsted had written a former student in 1831, "that the few words of encouragement which I spoke to you at our last interview proved so useful to you. The knowledge of the fact will furnish a new motive for me to attempt to aid others who may need similar encouragement."  

At Yale, Olmsted had received various tokens of recognition from his students. The class of 1833 had arranged for his portrait to be hung in the Trumbull Gallery. By yet another, he was elected a life member of the Bible Society. In 1838, he was elected an honorary member of the Board of Commissioners for Foreign Missions. This entailed a contribution of $100.00 (he had given $40.00; the additional $60.00 was raised by the students). These honors have at least a triple significance. First, of course, they indicate a measure of the esteem with which he was viewed by the students. Second, they say something about the spirit of the times—certainly a time when religion permeated society to an extent not easily visualized in the twentieth century. Third, they bespeak a recognition by the students themselves of the prominent importance of religion in the life of Professor Olmsted.
When Olmsted had begun his professorship at Yale, the juniors recited from "Enfield's Philosophy" and "Enfield's Astronomy." Both texts were already outdated and unsatisfactory. By 1830, Olmsted had begun his own work in Natural Philosophy. Even before this work was completed, he had initiated an effort to "raise the tone of study" in astronomy. When Sir John Herschel's work on the Elements of Astronomy became available, Olmsted tried it for several years, but was unsatisfied. Thus, he began to formulate plans for a text of his own. In 1836 or 1837 (there is some ambiguity in Olmsted's journals with regard to the date) he began writing. 319

His "premature" work on Natural Philosophy had been a compilation, but such a work in astronomy would not do. In his opinion nearly all available texts on astronomy erred in one of two ways. They were either technical and abstruse or diffuse and superficial. The former errors occurred in those texts written by those whose attainments in astronomy were profound, but who lacked that essential qualification--the experience of a teacher. The latter errors were committed by those popularizers of science whose acquaintance with science was entirely second-handed. 320 He looked upon his work "with the impression....that there is nothing in our language, or indeed in the French which is so well adapted to convey to the college students a clear knowledge of astronomy...."
Instead of the "obscure, indefinite" ideas usually presented, his students would get "accurate, adequate" notions as in Natural Philosophy or Chemistry.\footnote{321}

Ill health and professional duties conspired to slow progress on the text, but by the close of 1838, the work was well underway, and in fact the printing had begun, though much writing remained to be done. Therefore, it was with feelings of surprise and chagrin in early 1839, that Olmsted inspected the text by William Norton, just published, which achieved a middle ground between obscurity and superficiality, the very goal Olmsted had in mind for his own text. Olmsted was particularly impressed by the section of Norton's book dealing with practical astronomy and in view of his own limited mathematical ability sought to arrange for the use of that portion of his book. However, these plans did not materialize so he was forced to make other arrangements.\footnote{322}

Fortunately, one of Olmsted's students had both the ability and the inclination to provide him with the desired treatise on practical astronomy. Ebenezer Porter Mason had first gained Professor Olmsted's attention by his performance on his entrance exam in 1835. As a sophomore, Mason (along with Hamilton L. Smith) had constructed his own telescope, and with it had made careful observations. Olmsted had been impressed with the potential of Mason as an astronomer, and had encouraged him in
various ways. During one period of time, when Olmsted's health had been poor, he had put Mason in charge of the Clarke telescope. Mason had also helped in the proof-reading of the third edition of Olmsted's text on Natural Philosophy and he was now engaged to write "Practical Astronomy" as a supplement to Olmsted's Astronomy. Mason was enthusiastic, but his health broke and it was with some difficulty that he completed his task.\(^\text{323}\) It was in the summer of 1839 that Olmsted used his textbook for the first time. He was encouraged by the "prospect of learning much more of the science [with his text] than from the books heretofore used. . . ." Enthusiastically, he declared the study of astronomy to be "on the ascendant."\(^\text{324}\)

Having incorporated much of the material of his astronomical lectures into his new text, he decided to revise completely his lectures to the seniors. His plan was to make the new lectures largely historical, expounding the leading discoveries in the science in proper chronological order, with sketches of the great astronomers who had made them. Such a series of lectures exhibiting the "literature" of astronomy would complement the "science" of the subject as contained in his textbook. In view of his own interest in biography, such a plan certainly had personal appeal. The results of implementing this plan were encouraging. No doubt his own enthusiasm helped to augment interest among the students and his
audience included "a larger number than usual of miscellaneous hearers." Nevertheless, Professor Olmsted was not content. A sense of duty inspired further efforts. 325

From the outset of his professorship at Yale, he had felt keenly his lack of mathematical competence. At his request his professorship was divided in 1836. Anthony D. Stanley, a former student and tutor at Yale, was appointed Professor of Mathematics. However, at the same time, rather than merely dropping "Mathematics" from Olmsted's title, it was changed to read "Professor of Natural Philosophy and Astronomy." Doubtless, this was an improvement even from his viewpoint, but it did add to his official responsibilities in a way contrary to his wishes, and he probably regarded the addition with characteristic feelings of unworthiness. Though he had voluntarily undertaken the task of "raising the tone" in astronomy upon coming to Yale, he thought of himself primarily as a teacher, not an astronomer. 326

Nevertheless, as he often noted, "the path of duty is the path of peace." Hence, he rearranged his lecture schedule so as to allow time for hearing a voluntary class of seniors in the elements of practical astronomy, which included such activities as the calculation of eclipses. When Mason's Supplement was printed, Olmsted (with its help) led his voluntary group through a calculation of the lunar eclipse, to occur several years hence. Further study
with the group, on solar eclipses and occultations, convinced him that the subject was "one of considerable difficulty, both to them [the students] and to me." He resolved to be better prepared for the next class, but thought Mason's Supplement was probably "too hard for beginners." Though, after this time, Olmsted made repeated efforts to master the mathematical calculations of astronomy, he seemed to be fighting a losing battle, until at last he concluded in dismay: "It is too late." 327

Difficulty with mathematics was not the only obstacle. Ill health continued to plague him at intervals. Dyspepsia, "nervous sensations of the head, drowsiness, languor and numbness of the limbs" combined to sap his strength and ambition, and he often found himself with little energy left to study. Moreover, a couple of hours in the yard viewing Jupiter through the telescope was sufficient exposure to aggravate his rheumatism. Exposure while viewing the Comet of 1843 gave rise to sleepless nights, accompanied by a peculiar sensation of the skin, as if being stung by a thousand wasps. 328

It was just about the time that his title as Professor at Yale was changed, that Olmsted first noticed a decay in eyesight. "Mending a pen," he found, required a "stronger light than usual." Within several years, he found it necessary to use eyeglasses and by mid-1841, he could not read the "plainest subscription of a letter"
By then, his right eye was exhibiting a marked decrease in power. He became alarmed when his left eye began manifesting symptoms not unlike "amaurosis," a disease thought to result from "paralysis of the retina, usually attended with paralysis...of the iris." The immediate prospect of losing his sight was, as he put it, "not fitted to raise my spirits." Still, the attitude which he manifest in the face of a probable blindness, which would almost inevitably lead to a forced retirement is characteristic of his spirit. "It is my earnest prayer," he wrote, "that I may be enabled to say in view of this affliction as of others that threaten my future peace, 'Thy will be done.'" Although subsequent events show that his self-diagnosis was incorrect, fears of blindness continued to haunt him for a number of years.

With these facts in mind, it is hardly surprising that Olmsted made early attempts to procure an assistant. Soon after Professor Stanley joined the faculty, Olmsted tried, with dubious success, to get Stanley to agree to take responsibility for "practical astronomy." Olmsted noted with particular interest the progress of young E.P. Mason, who entered Yale in 1835. Hoping to get him for the post of assistant astronomer, Olmsted had even planned to relinquish a portion ($100.00) of his own salary for the purpose. Unhappily, Mason's health failed and he died scarcely a year after graduating from Yale.
In the summer of 1845, Professor Olmsted appealed to the Prudential Committee. After enumerating his current, "customary" instructional efforts in astronomy, viz., a recitation for the juniors, a lecture series for the seniors, and a voluntary class in practical astronomy for a select group of seniors, he outlined additional activities which, in his judgment, were essential. It was desirable that the students acquire a familiarity with the constellations and notable stars, a familiarity which could be obtained only by numerous naked-eye sessions at various seasons of the year. It was important that each student get repeated telescopic views of such sights as solar spots, the topography of the moon, the planetary phases, the moons of Jupiter and the rings of Saturn. Such observations, coupled with an opportunity to inspect double stars and nebulae, would gratify the student's curiosity, while adding to his knowledge and stimulating his interest. Finally, a "select few who may wish it," should receive instruction in the practical use of astronomical instruments. As for the reputation of Yale, it would be enhanced if it could be among the first in announcing astronomical events which excited public interest, such as the appearance of comets and the occurrence of meteoric showers. Furthermore, accurate observations of these phenomena, as well as transits of the inferior planets, could contribute to the advancement of science. After alluding to the substantial investment of time which these
additional activities entailed, Olmsted acknowledged that he was
"wholly unable to perform the foregoing duties..." At two
different periods, he had made an effort to do so, but in each case
his health broke. His "settled conviction" was that a further effort
on his part would have more permanent consequences. In view of
this, he had seriously considered resigning, but on further con-
sideration, had concluded that it would be "very difficult, if not
impossible to find any man" capable of successfully performing all
these "multifarious" duties so "imperiously demanded" by the
interests of the Institution.

His elaboration of this last point offers an additional glimpse
of his concept of a teacher and his image of his own role at Yale.

I have never known or heard of an instance [he asserted],
where the same individual was at once a faithful and
accomplished teacher of Natural Philosophy and Astronomy,
and at the same time an ardent devotee to practical astronomy.
I have [in fact] heard of instances where the acquisition of
a high enthusiasm for the pursuits of the observatory was
actually attended with a marked decline of interest in the
ordinary duties of instruction and government.

Having thus established the "facts of the case," Olmsted
recommended that Mr. Francis Bradley be appointed as "Assistant
in Practical Astronomy." Bradley, Olmsted pointed out, had been
trained under "that extraordinary youth, the late E.P. Mason," who
had thought highly of Bradley's powers of observation. Further-
more, Bradley was willing to undertake the duties of such an office
largely for his own "entertainment and improvement"; his services could be obtained for a paltry two hundred dollars per year.

Apparently, Olmsted presented a convincing case. The next Yale catalogue contained several new entries. The name of Francis Bradley appeared among the "Faculty and Instructors" as "Assistant in Practical Astronomy." Included in the Course of Instruction for the second term of senior year was: "Practical Astronomy," as an option for the students. It is likely that one reason for Olmsted's success in acquiring an assistant was the sympathetic ear of President Day. Day knew from personal experience the frustrations of a professor of science, spread too thin.

During the early years of the period under review, Olmsted had continued to watch for the meteoric showers of November. Back in 1835, he had observed "nothing uncommon... at New Haven," but testimony from "the most respectable sources" suggested that elsewhere in the United States an unusual number of shooting stars were observed. By this time, Olmsted had somewhat of a vested interest in the phenomenon, and the following year, he asserted that the "Meteoric Shower reappeared on the morning of the 13th of November, 1836." This he documented by his own observations of "unusual numbers" of meteors, proceeding as expected from the "eye of Leo"; but he also included observational
data from various places, all the way from Maine to South Carolina. Mentioning that it had long been known that the aurora borealis appears unusually frequent and magnificent for a few years, and then is scarcely seen for a long time, he thought it probable that a continued recurrence of the annual meteoric shower was unlikely. But the recurrence for six successive years, on the same date and at the same time of day, he believed, plainly pointed to a connection with the earth's orbital and rotational motion. And a body in space, such as he had previously postulated, would clearly satisfy both these conditions. He expressed disappointment, however, that so little attention had been paid to the remarkable changes in the zodiacal light, changes consistent with his hypothesis that this light was intimately related to the source of the meteoric showers.

It was doubtless with a measure of local pride that the following issue of the AJS (published in New Haven, the home of Yale, and edited by Olmsted's colleague, Benjamin Silliman) reported that observations "by the astronomers of Europe, [have] . . . resulted in a full conviction of the periodical nature of this phenomenon [meteoric showers], in accordance with the views of Professor Olmsted, as expressed in preceding numbers of this Journal." The same issue contained a brief paper by Olmsted on the aurora borealis. After a description of the recent occurrence, he concluded, "Nor can I add at present anything respecting the origin of
the Aurora Borealis, except to declare my conviction, that it is not satisfactorily accounted for by any existing theory." Its origin, "I believe is to be sought for in a source extrinsic to the earth." 338 So we see Olmsted, who had put forth his theory of meteoric shower "with much diffidence," several years before, now declaring, with uncharacteristic boldness, his belief that the cause of the aurora borealis was extra-terrestrial.

From the beginning, Olmsted had been rather reluctant to make any predictions concerning possible recurrence of meteoric showers. Certainly, by 1836 he had anticipated a decreased annual activity. There had been an increased activity in 1832 over that of 1831 and, of course, the activity in 1833 was unprecedented; since that time a gradually decreasing activity had occurred. Long range fluctuations in the magnificence and frequency of the aurora borealis had been pointed out long ago, and, by analogy, Olmsted expected a similar thing to occur with respect to the meteoric showers. Nevertheless, he continued his yearly observations with increasing care. In 1837, he utilized eight observers, each set of two being responsible for one-quarter of the heavens. He carefully reported the number of meteors sighted during each hour of observation in each quarter of the heavens. The entire number over a period of six hours was 230, from which four were meticulously subtracted after a comparison of notes suggested these "had
been counted twice." The rate of meteors was well above what might be expected under ordinary circumstances, and all but a dozen of the meteors "proceeded in lines of direction which diverged from the constellation Leo." These dozen "unconformable meteors generally exhibited slower apparent motion. From these results, he concluded that the annual meteoric shower did return.339 The following November, at least a dozen students at Yale kept an all-night vigil. However, this time Olmsted decided "there was no extra-ordinary appearance of shooting stars..." At the end of his report, he remarked wryly,

As several of the most eminent astronomers of Europe, are now occupying themselves with the 'Theory of Shooting Stars,' (which some of our own astronomers have supposed beneath their attention), we may hope that, before long, the difficulties which attend the explanation of the 'origin of shooting stars' will be completely removed, and we shall know whether to regard them as atmospheric concretions, or as visitants from another sphere.340

Olmsted had succeeded in transmitting his enthusiasm for the subject to his students. In 1839, E. P. Mason, who had observed the showers with Olmsted in 1837, executed the first telescopic observations of meteors. Though Mason's primary purpose was a telescopic study of nebulae, he deemed observations on the meteors important as "'the subject of meteors is now attracting so much attention in Europe.'" Mason concluded that the meteors probably had an elevation of at least 4,000 miles, thus
corroborating his professor's arguments that their source lay beyond the atmosphere. 341

Actually, by this time many astronomers were convinced of the truth of the cosmical theory of the origin of the meteoric showers, but another set of observations made the pursuit of a complete theory complex. In August of 1837, there was a meteoric shower which displayed several of the general characteristics of the annual showers of November, viz., a common center of radiation and trains of unusual length and duration. Furthermore, the coincidence of this date (i.e., 9 August) to a previous date on which an unusually large shower had occurred (10 August 1823) naturally suggested the possibility of a periodicity commensurate with the earth's orbital period. M. Quetelet, the directory of the astronomical observatory in Brussels and Edward C. Herrick, a resident of New Haven and a friend of Olmsted, simultaneously announced such a periodicity. Both Herrick and Quetelet began an extensive search for records of past occurrences of showers, Herrick eventually uncovering accounts going as far back as 1768 B.C. 342

In 1839, Professor Erman, Jr. of Berlin made the first "full and systematic" inquiry into what deductions were warranted by the observed facts with respect to meteoric showers, concluding that the bodies were of cosmical origin and occupied a ring (or rings) of
specified dimensions and orientation. This sparked an elaborate paper by Sears C. Walker which was read in January 1841. Walker agreed with Erman's general conclusions, offering various analogies in the solar system as confirmatory.\(^{343}\) In 1843, Benjamin Peirce, the leading mathematical astronomer in America, reviewed Walker's paper. He admitted that the proponents of the cosmical theory now included many of the most distinguished astronomers in Europe, such as Arago, Biot, Bessel, and Olbers. Nevertheless, he found the theory "at the utmost, merely an uncertain approximation to the truth."\(^{344}\) Peirce's pronouncement was based upon a degree of mathematical sophistication and statistical analysis which was beyond Olmsted's ability. Though he retained an interest in the subject, Olmsted did not publish further scientific papers on it after 1841. At that date, he still thought in terms of his "cometary body."\(^{345}\)

Early in 1843, Professor Olmsted, for the first time presented to his class a frank and open personal account of what he perceived as the just claims that he (and Yale) could make with regard to the theory of meteoric showers.\(^{346}\) Before that time, he had feared that such a presentation might be misconstrued as being motivated by a spirit of vanity or self-conceit.\(^{347}\) There is no suggestion as to what prompted Olmsted's more liberal view in 1843, but at the conclusion of his lectures on meteorology (the final
two lectures were devoted to meteoric showers), he set before the class his claims. These included the assignment of a cosmical origin, the identification and location of a radiant point, together with an explanation of that fact, a new explanation of meteoric combustion, a recognition of the periodical nature of the showers and an explanation of this periodicity in terms of a localized body orbiting the sun. He followed this impressive recital with a short sketch of subsequent events. It was no doubt gratifying to be able to point, in particular, to the recognition which he had received from the French scientist Biot.

There is little doubt but that Olmsted had some cause to be defensive about his theory. He was not, after all, a first ranking research scientist, and shrank from controversy. Therefore, it is quite understandable that, in some cases, he was not given due credit. For example, when Alexander von Humboldt wrote his Cosmos, he credited the astronomer Encke with recognizing that the radiant point in Leo indicated the direction of motion of the earth in its orbit at the time of the meteoric showers. Olmsted lamented: "This inference. . . was stated in my original paper in the 26th v. of Silliman's Journal several years before it was proposed by Encke."348 In any event, it is clear that Olmsted's scientific reputation was largely due to his theory of meteoric showers.

In 1844 when a biographical sketch of Olmsted appeared in the Yale
Literary Magazine together with a portrait, he complained:

"...they made an imperfect summary of my publications, making no mention of my papers in the American Journal of Science on the Meteors of November, which papers have contributed most to my reputation." 349

Olmsted had given public lectures even before the meteoric showers of 1833. But, now, some years later, as an established professor at Yale and with a growing reputation, his lecture commitments were more extensive. In January of 1839, he lectured on Meteoric Showers before the Young Men's Institute at Hartford. The audience was large and included the President of Washington College and several professors of science. Olmsted was gratified that these men, including Professor Davis of West Point, expressed their approbation of this theory. Several days later, he saw a paper originating from Vienna, on "Periodic Meteors of Olmstedt." He commented: "They're all coming to my view now!" Later that year, he was invited back to Hartford, where he lectured on Comets. 350

In 1842, he was invited to Farmington, the scene of his childhood, to lecture before the local lyceum. Patterning his lecture after one given by his colleague, Professor Silliman ("On the Structure of the Earth"), Olmsted took as his theme: "On the Structure of the Universe." His object was to "give a single view
of the system of the world, considering 1. The different orders of
bodies that compose the universe [viz., planets, comets, stars,
and nebulae]; 2. Their arrangements; 3. Their motions." His
lecture, given to a full audience, must have been a success, for he
frequently employed the same topic afterwards. 351

The following year, he presented two lectures on astronomy
in Clinton Hall for the annual series sponsored by the Mercantile
Library Association of New York. Simultaneously, he engaged to
give six lectures on astronomy for the Brooklyn Institute. In the
latter case, he offered to give (gratis) an additional lecture "On the
Pleasures and Advantages of the Study of Astronomy." In this
lecture, he presented "A new theory now brought forward for the
first time, viz., --'That, at the beginning of the world, God made
many things prospectively, which were to be kept in reserve to be
brought out at successive stages of society corresponding to its
different degrees of advancement'." Few things were created in
readiness for man, he said, and many things yet remain to be
revealed both in the realms of utility and beauty. 352

His concluding lecture at the Brooklyn Institute was on the
"Structure of the Universe." He spoke of the various planets and
how their resemblance to the earth implied their habitability. In
defense of his assertion, he cited the moons of Jupiter and Saturn
as special contrivances designed for the beings there. Finally, he
referred to the view that the Creator himself had taken of his works, when he pronounced them "very good." He could scarcely help descending from the "cold regions of science" and exclaimed with the Psalmist, "Great and marvelous are thy works. . . ." 353

The audience "testified more than ordinary" interest. The officials of the Brooklyn Institute "individually expressed themselves with much kindness." The Reverend Samuel Cox, who had been responsible for engaging Olmsted's services for the series of lectures, and had treated him with "great friendship" throughout the series was especially pleased. The New York Evangelist expressed strong approbation. Olmsted had lectured weekly for seven consecutive weeks, amidst personal ill health and other serious difficulties, but he had done his best. Now he could return to a less harried schedule. A few months afterwards, Professor Olmsted received a letter from Reverend Cox, informing him that a petition was being circulated among the influential gentlemen of Brooklyn and New York, to have the LL. D. degree conferred upon Olmsted by the University of the City of New York. The committee rules required a waiting period, or (said Cox) they would have conferred it at the recent commencement. As it turned out, Olmsted got the degree in July of 1845. He was gratified as to the circumstances which initiated this action. 354
The success of his popular lectures on astronomy can be attributed to at least three factors. In the first place, he had acquired a reputation as an American scientist as a result of his theory of meteoric showers. As an "authority," he might be expected to command interest and respect. Secondly, Americans of the time seem to have been especially attracted to the "sublime" in nature and lectures delineating the marvels of the solar system had a particular appeal. Finally, as is especially evident in his lectures at the Brooklyn Institute, his lectures exhibited an integration of the religious with the scientific, an attribute which held a special attraction for the audiences.

As a prominent citizen of New Haven, Olmsted could expect to be called upon to promote various causes. On one occasion, he was requested to lecture on Russell's Planetarium, the proceeds to go for the orphan asylum. In his introductory remarks, he announced his intention to discuss three points: the purpose of the apparatus, difficulties of construction, and how these difficulties were overcome. But, having discussed these points, as a Christian astronomer he could scarcely stop here! The proprietor will not, he said, "think it any disparagement to his beautiful machine, if I represent the mechanism of the sun and planets as the system came from the hand of the divine artificer as infinitely more admirable."

After briefly describing the various planets with "no columns to
support them, no wheels—no friction—no wear and tear self-regulating and eternal," Olmsted exclaimed, "These are thy glorious works, Almighty Parent! This thy universal frame, thus wondrous fair. Thyself how wondrous then!" 355

The great comet of 1843 attracted wide-spread public interest. Initial newspaper reports of its observation on February 28 were (according to Olmsted's account) discredited by "most of our scientific men." Olmsted thought it unlikely that so many independent testimonials were in error and therefore searched for it, but was not successful until March 6. With Francis Bradley, he observed it carefully, publishing an account for the papers at a time when some reports were insisting that it was only the zodiacal light. Olmsted, of course, was intimately acquainted with the zodiacal light, having carefully observed it for many years in an effort to establish a connection between it and the meteoric showers. Therefore, he published an additional note, describing the zodiacal light, and predicting that, as soon as the moon was absent, the distinction between the zodiacal light and the comet would be apparent to all. 356 After "various requests," Olmsted gave a public lecture on the subject of comets.

His public lectures were not confined solely to astronomy. Indeed, in 1839 he gave two extended series on meteorology, one at
New London, the other at New York. In New York, in fact, he got involved with Mr. Espy in a controversy over the laws of storms. It is clear that both these topics (astronomy and meteorology) were viewed with a certain fascination by the public. In popular lectures, it was obviously necessary to be in tune with public interest. For example, the response to Olmsted's lecture on the "Remarkable Properties of Water," given at Hartford, led him to write: "the lecture I think was but moderately popular, brilliant themes being received by popular audiences with more favor than such as are simply useful." 357

At times, it was possible to combine the brilliant with the useful, if not in lectures, at least for the papers. On several occasions, Olmsted wrote a series on "Protection from Lightning," for this purpose, "to render a useful service to the public," urging the importance of lightning rods and giving instructions for their construction. 358 In a sense, by his newspaper articles, Olmsted was performing a service to the community--the public at large. As an officer of Yale he felt an obligation to do so. And as a philosopher, he made an effort to ensure that the public was not misinformed. A striking opportunity to do so presented itself in April of 1842.

Two gentlemen, a Dr. Bonneville and a Mr. Haughton, aroused the curiosity of the citizens of New Haven by conducting a series of
demonstrations on animal magnetism. Accompanying them was a boy about 15 years old, whom Bonneville would put into a state of "magnetic sleep." In this state when any person from the audience joined hands with the boy, the boy was purported to be able to read that person's thoughts. The person could then take a mental journey to some place familiar to him, and the boy could allegedly describe the scene in detail. Professor Olmsted attended one such exhibition, where, during the course of the evening the lad was examined by several persons. His descriptions were so often correct that the spectators were quite impressed. However, it seemed obvious to Olmsted that the boy's success depended upon his general familiarity with the scenes which he described. By request, Olmsted examined the boy. He "took him" (mentally) to the college observatory, the apparatus room and the lecture room. In each case, the boy's descriptions were "as wide of the truth as possible." In fact, Olmsted thought most persons could have made better guesses!

At the suggestion of Dr. Bonneville, a further examination was scheduled for Professor Olmsted's home. Here was a striking opportunity to illustrate the methods of a true scientist, and Olmsted intended not to let it pass. Before the boy arrived, Olmsted carefully inspected all the objects in another room so as to have "a distinct impression of each." He proposed to "take"
(mentally) the boy into the room and have him describe in detail the contents. Then after the examination, he would open the door, and all present would be able "to compare the reality with the description." The results? A total disagreement between the boy's description and reality, with the exception of his description of a looking glass such as "is very common in family rooms in the city." It was apparent to all who were present that the boy's performance was a total failure.\textsuperscript{359}

Olmsted did not confine his community services to activities directly related to his professional competence. Some of his first public lectures had been in the area of temperance, and to this cause he returned in 1841. At a rally of the newly-formed Washington Temperance Society, held on the 4th of July, an invitation was given to subscribe to its pledge, which imposed the total abstinence from "all intoxicating liquors." Convinced that "promptness and alacrity" in such matters was essential to their success, Olmsted immediately stepped forward and signed his name. Though this subscription imposed no new restrictions on his own habits, he was pleased to see that his example was followed by numerous others and was encouraged in the hope that at least some "reformed drunkards" would thereby be rescued from the "degradation into which they had fallen."\textsuperscript{360}
Temperance reform was closely allied with the cause of religion. At the various temperance rallies, it was not unusual for Olmsted to find himself on the platform, surrounded by clergymen. On one occasion, the Sunday Schools and the Washington Temperance Society united to stage a huge procession, comprising a "cold water Army with groups of children, ladies, and clergymen marching under appropriate banners." There is no question, but that Olmsted's own involvement in the temperance movement was motivated by his religious interests. In an address to the Martha Washington Temperance Society, he reminded the listening mothers of the importance of their God-given role—to train young minds. A simple "horror of drunkenness," he said, was not an adequate deterrent for youth exposed to the dangers of alcohol. Religious training (the fear of the Lord is the beginning of Wisdom), a worthy example (total abstinence must be practiced if it is to be successfully preached), a mother's prayers (Olmsted could give personal testimony as to their effectiveness, as related to his student days at Yale)—these were honorable means to employ in instilling the desired attitude in the youth. When in 1845, the Connecticut legislature passed a law restricting the liquor traffic, Olmsted took advantage of the opportunity to register his support, speaking for over an hour on the immorality of the practice of selling liquor. For him, the temperance reform was merely one means to an
end—and that end was the improvement of society, but an improvement which was inexorably linked, in his eyes, with religion.

Back in 1833, when the citizens of New Haven had organized the Society for Architectural and Rural Improvements, Olmsted had been chosen as an officer. 363 In 1839 a committee was appointed to investigate the state of the city cemetery which was in a "dilapidated" condition, enclosed by only an open rail fence. Olmsted's election as chairman of the committee indicates the esteem in which he was held by the citizens of New Haven. He played a prominent role in conceiving and executing the plan for improvement which developed. In his report to the citizens, he recommended the construction of a strong, durable fence to surround the cemetery, complete with entrance gates. Citing a custom going back to Biblical times, he advocated other measures to beautify the cemetery, including the planting of numerous trees. Commending the citizenry for their past financial support of church buildings, and several projects undertaken at Yale, he appealed to their sense of civic pride with the words,

In numbers and wealth our city is small, but as a place of education, its influence is wide as our country. Every addition we make to its attractions as a nursery of knowledge, refinement, morals, and religion, is adding to its prosperity, its reputation, and its influence. The young minds gathered here for nurture, are imbibing...those tastes and feelings, and principles, which will operate...not upon themselves only, but upon the great nation, whose destinies are to be controlled by its educated mind.
as surely as there is truth in the axiom that 'knowledge is power'.

The citizens rallied to the occasion and by the time that the Cornerstone of the Gateway for the Cemetery was laid (in 1845), they had contributed some $9,000.00. Olmsted gave the dedicatory address, surrounded, as on many other occasions, by the clergy of the city. Scarcely a year before, he had laid a son to rest in this very cemetery. Thus it was with a measure of personal feeling that he concluded:

Hither let us come at eventide--not to wrap the mind in gloom, or to indulge in corroding grief, but to read sober lessons of life and death, of time and eternity. . . . May we here learn, in the light of Christian hope, . . . to contemplate it [the grave] as a refuge from the storm--as the gate of heaven--. . . .

Olmsted's original report on the cemetery was designed to elicit financial support, and one might expect him to appeal to generally accepted values. Still, on the basis of other biographical details, it is reasonable to suggest that his characterization of New Haven as an influential educational center in the nation, offering religion and morality as well as refinement and intellectual advancement, expressed his own ideal. He sincerely believed that knowledge was power and that knowledge was incomplete, unless it encompassed religion. In his dedicatory speech, he unashamedly expressed his personal, religious hope--a distinctly Christian hope, a hope undoubtedly shared by the majority of his listeners.
When he had come back to Yale in 1826, he had determined to use his time to best advantage. When, by a single activity, he could accomplish several things, he was probably pleased. His willingness to serve on a committee for the Horticultural Society of New Haven is a case in point. He accepted the appointment because:

1. he could obtain needed exercise while on his tours of inspecting gardens; 2. he had the opportunity of learning the most effective methods of gardening; 3. he could promote the reputation of Yale.

"It is part of the qualification of a good instructor to be a good and useful citizen," he said. "The respectability of the profession has been much impaired by the notion that schoolmasters of every grade have but little common sense and of course are little qualified to take part in public affairs." In his written report on gardens, published in the proceedings of the Agricultural Fair, he included several "new principles," thereby rendering a useful service. In addition, he addressed the Agricultural and Horticultural Societies at the North Church, while his colleague, Benjamin Silliman, presided. Olmsted also prepared an address on the "Use and Abuse of Laboring Animals" which he delivered the following year.

Olmsted was also involved in an organization more closely linked with Yale. He had been elected to membership in the φβΚ society before he had graduated in 1813. In 1831, he had been elected president, but declined. Again in 1838 he was elected to the
same office. This time he accepted, albeit reluctantly. To head a society based on the three principles of Fraternity, Morality and Literature, with its motto--Love of Wisdom, the helmsman of life--was surely in harmony with his own beliefs. But he was troubled with doubts about the utility of φβK, and discontented by the distinction the society created between members of the same class, a distinction often times unjust, and altogether too permanent. The result, he believed, was an alienation of a portion of the alumni from Yale. Another probable reason for his doubts was his view (expressed much later) that such artificial distinctions were contrary to the principles of Christianity. The classification recognized in the Bible was, as he put it, "not into nobles and plebians, but into the righteous and the wicked." Again in 1840, he was elected President; whereupon, he openly expressed his doubts to the members present and declined the nomination. With this declaration before them, the members voted a second time, again choosing Olmsted. At that, he accepted the honor, but believed he had a mandate for a change. He actively promoted a plan to rotate the annual celebrations at Commencement among the three general societies at Yale on successive years, each society in turn acting as host for the other two. There is no evidence that the plan was adopted. The following year, he was asked to address the society. A man of strong conviction, he agreed to do so with the stipulation
that the "riotous entertainment" customarily following the celebra-
tion be omitted.

Back in 1827, a Society of Alumni had been formed as one
measure to raise money for Yale. Subsequently, the organization
had died. In 1842, a revitalized alumni association sponsored their
first annual meeting at commencement; Professor Olmsted was
placed in charge of the program arrangements. Professor Silliman
delivered an address—"Yale College, as it has been—as it is—as it
may be," which Olmsted thought "one of his happiest efforts...
and forming an auspicious beginning of a series of discourses which
I hope will be delivered to future meetings of the alumni." That
evening, Dr. S.H. Dickson gave an address sponsored by the φβ Κ
society on the "Tendency of Knowledge to Promote Virtue."

Olmsted was not entirely pleased, recording that Professor Dickson
had ascribed "too much to the bare diffusion of knowledge without
religion."369

Commencement in 1843 was a time of special interest for
Olmsted, as it marked the 30-year reunion of his class. The
years had produced gray hair, wrinkles, and poor eyesight among
the former classmates, and it was with some difficulty that any two
members who had remained apart during the interval recognized
each other. Olmsted and Mr. Davies were the only members of the
class who were living in New Haven, so the group spent a pleasant
evening at each of these two homes, reminiscing and inquiring concerning absent members. Some who could not be present had sent letters of regret, which were shared with the group. At the first evening meeting, Olmsted was nominated to the chair, and T.W. Dwight appointed secretary. "In conformity with the evident wish of all," Olmsted recorded, "we knelt before the mercy seat and Dwight offered a feeling and fervent prayer." In the official report of this meeting, later compiled by Olmsted and Davies, it was remarked with probable satisfaction: "With few exceptions, the members of the class have become members of the church of Christ." The remark is just one more indication of the importance of religion to Olmsted's generation.

In 1816, at his master's oration, Olmsted had first publicly broached the subject of the improvement of education. By the early twenties, Governor Wolcott was exerting his influence to the same end, but with little result. In 1827, a Society for the Improvement of Common Schools was founded, but it was 1838 before a state board of commissioners was established. The moving force on this board was Henry Barnard, a Yale graduate of 1830, who was to retain a life-long interest in the cause of education.

During the intervening years since his master's oration, Olmsted had not lost his interest in that important cause. As late as 1858 he lectured at the Connecticut State School Convention on the
best method of teaching Natural Philosophy and Astronomy in common schools. For the meeting of the American Institute of Instruction held in 1838, he prepared a paper entitled "Observations on the School System of Connecticut." He readily admitted that, despite the common school fund (which had been promoted by his friend John Treadwell), the "tone" of common school education remained in a deplorable state. Returning to the theme of his master's oration, he asserted that the reason for the small benefits derived from the fund was that it had not improved the teachers. Recognizing the need for more efficient methods of instruction, he stressed that one of the best means of elevating the present system would be to provide a seminary for teachers. Referring to the recent legislative act, which had provided for the appointing of a Board of Commissioners of Common Schools to investigate the condition of common schools in Connecticut, Olmsted expressed optimism for the future. The following year, he was elected a member of that Board, a post which he held for several years. He prepared the second Annual Report of the Commissioners, presented in May of 1840, wherein he stressed again the need for "a supply of able teachers," reiterating the importance of the establishment of normal schools. He also urged a more extensive employment of female teachers, whom "heaven has plainly appointed... as the natural instructors of young children, and
endowed them with those qualities of mind and disposition which pre-eminently fit for such a task." He returned to the general subject in 1845, writing out his views at the request of Mr. Albert Picket, President of the Western College of Teachers at Cincinnati. Olmsted reiterated his belief in the necessity of an elevated system of education in the common schools, especially in the United States where wealth, respectability, influence is "open to all." The "high intellectual culture demanded by our situation" required that students be taught more than the "mere rudiments." The "principal difficulty" he still perceived to be the finding of "competent teachers."

Of course, good textbooks were another important requirement. By this time, Olmsted had a fair amount of personal experience when it came to writing textbooks. His first effort had been stimulated when he returned to teach at Yale and found no suitable textbook in Natural Philosophy. His own book first came out in 1831; by 1840 it had gone through three editions and was being used in more than 40 colleges. One measure of its popularity is that the fourth edition contained a full catalogue of "Philosophical and Chemical Apparatus by Mr. N. Chamberlain of Boston."

Chamberlain bore the printing expense associated with this catalogue for the benefit he hoped to derive from the wide circulation of Olmsted's text. In addition, in 1839 Olmsted's text on astronomy
had come out and within two years, its sales had exceeded his
"highest expectations." Authoring successful textbooks provided
a welcome supplement to the salary of a Yale professor. Nor did
Olmsted neglect the pre-college market. His Compendium of
Natural Philosophy (issued in 1833) and his Compendium of
Astronomy (issued in 1839) were both adapted from the respec-
tive college texts with a view of serving schools, academies and
the general reader.

In 1843, Olmsted conceived a small volume which he entitled
"Rudiments of Natural Philosophy and Astronomy: designed for the
younger classes in academies, and for common schools." He
hoped it would "take well in the schools." In that he was not dis-
appointed; it turned out to be his "most profitable publication."
In 1844, it was adopted at the county convention in Syracuse,
New York and subsequently by the entire state. In New York City
alone, an order was placed for 2,000 copies at once, with prospects
of 5,000 needed annually thereafter. Dr. S.G. Howe, Principal of
the Massachusetts Institute for the Blind ordered a "raised
edition" of the work to be printed in 1845. The following year,
Olmsted negotiated a settlement with his publisher which gave him
two thousand dollars a year for five years, the publisher entitled to
print as many copies as he pleased. Such a financial arrangement
must have been very attractive, since his salary at Yale was still
less than twelve hundred dollars. 379

What was his response to his unparalleled good fortune? "I
sometime think that a kind Providence put me upon writing . . . on
purpose. . .," he mused. It was a "special favor of Providence at
a time when extraordinary expenses of our family require great
exertions." "What have I rendered unto the Lord for all his
benefits," he asked himself. 380

Even before he had completed writing his college text on
astronomy, he engaged to write a volume for the Massachusetts
School Library on "Lectures in Astronomy." It was to be a
"popular work" on Astronomy and he planned to enlarge on the
history of the subject as well as its applications to natural theology.
He hit upon a plan of writing it in the form of letters, which would
not only give it a freedom of style, but also except it from the stigma
of being nothing but a compilation of old classroom lectures. For
material for the book, he drew heavily on his Compendium of
Astronomy (published by this time), but also incorporated "much
that is new." 381 He entitled his book, Letters on Astronomy,
adressed to a lady; in which the elements of the science are
familiarly explained in connexion with its literary history (hereafter
to be designated simply Letters. . .). 382

In early October, when he was, perhaps three-fourths done
with the Letters. . . he was asked to write in an "Album" circulated
by the Reverend L. A. Sawyer. Sawyer had been pastoring in
New Haven for several years and, in anticipation of a move to Ohio,
had left his Album with his friends that they might write personal
comments as mementos of friendship. President Day had inscribed
in it a passage in Latin; Noah Webster had reminisced upon his
student years at Yale before the revolutionary war; Olmsted wrote
as follows:

I have often wondered why ministers and other Christians
of the present day do not cultivate a more familiar acquain-
tance with the truths of astronomy. I do not pretend that
this science, or indeed any other, has power of itself
either to renew or to purify the heart; but I do believe that
when the heart is already purified, and imbued with the
principles of the gospel, the habitual contemplation of
these glorious works is favorable to spiritual improvement,
and is sometimes attended with exalted feelings of devo-
tion. ... The study of the laws of astronomy, also,
appears to me eminently favorable to inspiring a love for
truth in its native simplicity. ... 383

Scarcely two weeks after transcribing this passage into his
own Journal, Olmsted completed writing the Letters... The final
"Letter" (number 31) opened with the promise: "... I shall
conclude with suggesting a few of those moral and religious
reflections, which ought always to follow in the train of such a
survey of the heavenly bodies as we have now taken." 384 In this
chapter, Olmsted pronounced the discoveries of astronomy
"admirably adapted" to play precisely the role assigned to them by
the Psalmist, when he had exclaimed, "The heavens declare the
glory of God, and the firmament showeth his handiwork." These
discoveries "are peculiarly fitted--more so, perhaps, than any other... to exhibit the unity, power, and wisdom, of the Creator." As for the unity of God, Olmsted averred it to be amply displayed by recent observational evidence (which he noted analogy had long predicted) that the distant stars were governed by the same gravitational law which applied to the solar system. Marks of an even higher organization discovered in the structure of clusters and nebulae pointed, likewise, to a single, grand design. As for the power displayed in the heavens, he thought it was sufficient to simply point out the magnitude of stellar dimensions and motions which literally defied the attempts of the human mind to grasp it.  

Having dealt with these two attributes of God in scarcely more than a page, Olmsted devoted five pages to the third attribute, God's wisdom. He exhibited the remarkable circumstance of the earth in its relation to the solar system--the optimum distance from the sun, the useful inclination of the axis, the pleasant division of night and day, the provision for moonlight in winter. He noted the multiple purposes which a single object served--the sun regulating planetary motion and likewise supplying light and heat. He remarked on the stability of the "universe," mathematically demonstrated by Laplace. "With this hasty glance," he concluded, "enough has been said to vindicate the sentiment that called 'Devotion, daughter of Astronomy',' and expressed the hope that especially the "youth of our country" would profit by sharing in
the high degree of pleasure originating from a study of the elevating truths of astronomy. 386

Professor Olmsted was pleased with his Letters... He dedicated it to the wife of the Reverend Cyrus Mason (Cyrus Mason was the brother of Julia Mason Olmsted, Professor Olmsted's second wife), and distributed complimentary copies of the book among his colleagues at Yale, as well as among the clergy of New Haven. It is not intended for astronomers, he wrote to his former pupil Elias Loomis, and it won't gain me a reputation among them, but they will not disapprove my effort "to render their science intelligible and attractive to the public at large. . . ." 387

Several years later he urged Loomis to write a review of the Letters... "Our clergy," he complained, "read nothing better than Dick's works--Architecture of the Heavens and Lardner's lectures, exported by the New York[?][?] (full of gross errors). Indeed, the clergy know nothing of the late discoveries among the stars." 388

There are several significant points to be made about Olmsted's Letters... First of all, it is virtually certain that one strong motivation for writing it was the financial benefits he expected to get. He had already reaped substantial financial rewards from his college texts, but recognized that a popular work would probably pay richer dividends. Soon after completing the
Letters... he wrote to Elias Loomis, suggesting that he (Loomis) write a popular, scientific work for the Massachusetts School Library, which would (Olmsted pointed out) at least help Loomis eke out a living. Later, he broached the subject again, saying that one could be sure of readers and pay with a popular scientific work, which was not necessarily the case for college texts. He had also advised Loomis, that if he expected to make money by writing books, the books would have to be read! (Perhaps he should have said bought!) The point is that Olmsted did want to make money on his venture and the fact that he included a chapter on natural theology suggests that he sensed a certain popular demand for such material. That he was sensitive to such matters is substantiated by the fact that several years later, when he was looking for a publisher for another of his books, he rejected one who was a "universalist," because he believed such a publisher would injure his sales among the religious. This is not to discredit the sincerity of his chapter on natural theology. There is substantial biographical evidence to contravert such an idea. But it is nevertheless probable that he wrote with the desires of his audience clearly in mind.

It is not surprising that the predominant portion of the chapter on natural theology was devoted to the wisdom of God. His unity could best be illustrated by generalities, inherently small in number. Evidences of his power could easily lead to pantheistic
tendencies and produce tension with the idea of inexorable, natural laws. It was in connection with the wisdom of God, that one could produce endless examples. None of the ideas in the chapter was new, a fact that he undoubtedly recognized. After all, his was a popular work, designed especially for the youth, and a much more important consideration than the novelty of his ideas was their truth. The significant point from a present day perspective is to realize that Olmsted was setting down ideas, that he believed to be true, not new! And he was doing so as a respectable, contemporary, scientific authority.

As a concerned Christian scientist, he was also anxious that the clergy have their scientific facts straight. His complimentary copies to them were not to show them new arguments for religion, but to update their knowledge of science. Doubtless, he was also seeking their approval and a similar motive probably prompted the copies given to his colleagues at Yale.

Not long after he had finished the Letters... E.P. Mason spent a few days at the Olmsted home finishing the work on practical astronomy which he had agreed to furnish as a supplement to Olmsted's recent college text. Mason was in the last stages of consumption, and he wrote the concluding paragraphs of his work with difficulty. As he bade his young friend goodbye, Olmsted was "under the full conviction that it was the last interview..."
thought it most fitting that the time should be occupied solely with
the subject of religion." Many times before, he had endeavored to
lead Mason's mind to "this all-important subject," but whenever he
had "urged the importance of an immediate surrender of himself
and consecration of his powers to the service of his Maker, the
most that he could elicit from Mason was a promise to "seek
earnestly... that preparation for another world." On this
occasion, once more, Olmsted remained unsatisfied by Mason's
response. Mason died just three weeks later. At the urging of one
of Mason's friends, Olmsted consented to write a memoir.

Biographical writing was, by no means new to him. He had
written a sketch of Timothy Dwight shortly after the death of that
famous President of Yale. After the disastrous wreck of the Albion
in 1822, he had sent his "Reminiscences" of his former classmate,
A.M. Fisher, to Professor Kingsley. In addition, although he did
not know him personally, Olmsted had reviewed the scientific work
and character of Sir Humphry Davy in 1830. Then in 1832, Olmsted
had written a memoir on the life of Eli Whitney, which had cost
him "great labor and research." There were several reasons why a memoir of Mason needed
to be written. Even in his brief career, he had made significant
contributions to astronomy. His meticulous, telescopic examina-
tion of nebulae coupled with careful, detailed drawings, had uncovered
a connection previously unsuspected, exhibiting even more forcefully the marvelous arrangements in the heavens. During this program of research, he had also, on account of the interest in the subject, made the first telescopic observation of the meteoric showers of November, in an effort to throw additional light upon their nature and origin. Not merely a good observer, Mason was also adept at mathematical calculations, and, sympathizing with young aspirants, was able to lead them along the path he had so recently trod. Furthermore, Mason possessed the intellect, as well as the inclination toward the theoretical branches of astronomy, searching for connections between such phenomena as the zodiacal light and nebulae.

As Olmsted perused Mason's manuscripts and personal letters, he concluded that the proposed memoir should be published in book form. Mason's struggle against poverty and disease exhibited a character with the "finest elements." His childhood training and subsequent education contained elements worthy of emulation as well as tendencies to be avoided. To the memory of Mason, a devoted student and helper—for the benefit of Yale and Mason's numerous friends, who were anxious to know, not only by what steps Mason so rapidly acquired his rare combination of powers, but "all that related to his personal welfare, and all that indicated the attributes of the heart as well as the endowments of the mind,"
Olmsted decided to write the book, promising Mason's father at least half of the profits, should the book be successful. 395

In an effort to render the book most useful, Olmsted interspersed it with "hints to parents and instructors on the training and education of a child of genius." 396 The book contained many extracts from Mason's writing including several lengthy poems. He included Mason's last letter to indicate "the state of his mind and feelings." The portrait that Olmsted painted was of a rare person, "uniting... in the finest proportions, the qualities of the artist, the mathematician, and the poet... each is important to form the great astronomer." "If Mason had lived," asserted his former professor, "he would have resembled Galileo." 397

Olmsted took the manuscript to New York in search of a publisher. One publisher took it home overnight, but brought it back, declining to publish it, saying "nothing would sell now." Several other publishers regarded the matter "indifferently" so Olmsted resolved to be his own publisher! He read portions of the manuscript to Professors Kingsley and Goodrich, who expressed their approval. He arranged to have a thousand copies of the book printed, expecting to dispose of nearly half that number in New Haven alone. The flyleaf bore these words: "To the Sons of Yale, this tribute to the memory of one of the most gifted of their number, is respectfully inscribed." Alas, it was a mistake. His colleagues
at Yale took their share, but Mason's class, who had individually promised to take several copies apiece, took less than one dozen!  

Even as Olmsted was writing the concluding pages of his Memoir of Mason, he received a request from the Secretary of the American Education Association to prepare a memoir on the late Governor Treadwell. As a youth, Olmsted had spent a number of months in the Treadwell home in Farmington. This would be a chance to pay a tribute to his early friend and, agreeing to write the memoir, he went to Farmington to look over Treadwell's papers. He found the scenes where he had spent two years of his childhood both pleasant and mournful.

While visiting Farmington, by "urgent request," Olmsted addressed the youth on Sunday evening. He spoke for close to an hour, earnestly imploring them to take advantage of their improved inducements for a virtuous life. The temperance reformation, the Sabbath School, the lyceum—all these had been largely unknown in Olmsted's childhood—offered a freedom from temptation, a chance for improvement worthy of gratitude. In recent times, there had been an enlightenment, a distinctly Christian enlightenment!

The memoir of John Treadwell appeared in February of 1843. Rather than an account of military achievements, literary eminence, or romantic adventures, Olmsted was pleased to present a portrayal of simple goodness, acceptable because of its "inherent charms."
Treadwell's history was also "intimately connected with the rise of those great efforts. . . now in progress, for the propagation of the gospel, and the conversion of the world. . . ." At the end of the memoir, Olmsted again alluded to its purpose, viz., to display by an example "seldom seen in colors equally vivid, " the "power of the Christian religion, when its dominion over the heart and life is supreme," to exalt the understanding, to ennoble the affections, to inspire a love for truth, and to impart a serenity of outlook.

From a consideration of the events in Olmsted's life during the decade centered around 1840, there emerges the portrait of an established professor at Yale, engaged in a variety of activities. He is a professor genuinely interested in teaching his field—if he cannot find a suitable textbook, he writes one; if he finds himself incompetent at mathematics, he pushes for a division of his chair; if he senses a need for more extensive instruction in astronomy, he institutes new courses, renovates his classroom lectures, and is willing to donate part of his own salary to procure an assistant. By no means oblivious to current research problems in his field, he devotes time and energy toward a theory of meteoric showers and involves his students in the collection of data, inspiring them with a measure of his own enthusiasm.

As a result of his reputation as a scientist in America, he is called upon to give popular lectures on science, a duty he is pleased
to perform, and one which he performs well, uniting with science a religious outlook characteristic of his day and expressive of his own sentiments. His reputation also enhances his opportunities to author textbooks on science designed for the less sophisticated mind, popular books which increase his finances as well as his reputation. In particular, his *Letters*... includes a chapter on natural theology, not with new ideas, but with *true* ideas.

As an alumnus, former tutor and professor at Yale, he exhibits an understandable interest in its affairs, and his election to influential positions in the Phi Beta Kappa society and the Alumni association demonstrates the esteem of his peers. As a professor at Yale, he feels an obligation to serve his community, sometimes in a semi-professional role exposing the imposters promoting "animal magnetism," other times in a moral and religious role with lectures on temperance, and yet other times in a civic role, improving the cemetery and beautifying the city. On a more personal level, but still in the role of a teacher, he administers discipline at Yale, tempering justice with mercy. A parental attitude toward his students leads him to speak to their hearts as well as their heads, to seek to impart wisdom as well as knowledge, to treat them as sons and entreat them to seek first God's kingdom. His influence will extend beyond Yale, through his popular books and his active interest in common schools. He recognizes that the future of his
country rests with the next generation and via biographies tries to direct that generation toward the important values of science, of knowledge, of religion. In short, religion is not something he thinks about once a week, but a force which underlies, motivates, and permeates much of what he says, what he does, and what he is.

The Hand of the Lord (1844-1846)

"...same hand that smites has power to uphold..."402

In some ways, the years 1844-1846 were good years for Denison Olmsted. During this time, the Yale Literary Magazine published a brief biographical notice of Olmsted, complete with an engraving; he received an honorary LL.D. degree from New York University, and was even asked if he was interested in the Chancellorship. There was an encouraging increased demand for his textbooks. Nevertheless, all these tokens of God's favor were totally eclipsed by a series of tragic events, during which time Olmsted laid to rest his mother and three of his dear sons.403

It had been at Chapel Hill that Denison and his wife Eliza had first experienced the peculiar feelings of tender regard known only to parents. By the time they had returned to New Haven in May 1826, their family had grown to a considerable size: Francis Allyn ("Frank") almost 7; John Howard ("Howard"), not quite 6; Cornelia,
about 5; Alexander Fisher ("Fisher"), almost 3 1/2; Denison, Jr., scarcely 2; and Eliza ("Lilly"), not yet a year. Back at Yale, they lost little "Lilly" and Lucius Duncan ("Lucius") was born the next year. Then, in the fateful summer of 1829, when Frank, the oldest child was but 10 years old, the family sorrowfully laid their mother to rest. Olmsted was at a loss to know what to do with "so numerous a family." With the duties of his professorship crowding in on him, he had to adopt some measures of expediency. The family was temporarily split up. Nathaniel (his brother) agreed to care for Lucius, the youngest; Fisher, although only four years of age, began attending school; Cornelia was sent to live with her aunt, Nancy Allyn, in New London, and the older boys, Frank and Howard were sent to Farmington to Mr. Hart’s school. Nonetheless, Olmsted’s children remained the object of his "chief interest," and he wrote frequent letters to the absent ones, with as much admonition as he thought appropriate. What a happy event, when he married Julia Mason; once more the family could be together!

When the children had been small, Olmsted had been pained by the thought that if (in view of his precarious health) he were to be removed from them, they would be subject to "want and beggary." Then as they were growing up, his fears were directed toward the "snares and temptations" to which they would be exposed.
if left without a father's care. For the older ones, his fears subsided (at least temporarily) in the spring of 1837, when they were "hopefully converted" and joined the college church.

By this time, both Frank and Howard were attending Yale, but neither was entirely well. Howard, convinced that his "pulmonary tendencies" were aggravated by the sedentary life of a student, determined not to continue at Yale and took a position as a clerk in Philadelphia in the fall of 1837. His health did not improve, and in the summer of 1838, he experienced several attacks of lung hemorrhage. Howard, accompanied by Frank, went on a short sea voyage to Maine, and both boys returned much improved. At the time voyages seem to be much prescribed and in vogue—and perhaps not the least of their merits was that one was thus isolated from the physicians and their array of drugs, such as strychnine and calomel. During his senior year, Frank was suddenly taken with a violent spasm in the pit of his stomach. The doctor prescribed generous doses of strychnine and nux vomica, which produced attacks of fever. After Frank's graduation in 1839, these attacks of fever recurred with such violence that it was suggested that a long sea voyage would be his only hope.

At the time, Professor Olmsted was giving a series of public lectures at New London, and inquired there among his friends as to the expediency of such a voyage. The North American, a vessel
owned by several of his relatives, was about to undertake a whaling voyage which would take it to the South Sea Islands, and it was decided that Frank should go with it. They received assurances that the passage around Cape Horn "was less formidable than was generally supposed." It was no small comfort that the captain was "of the best moral character...with a crew containing several professors of religion and all temperance men." The expense of "fitting" for the voyage came very close to the amount that Olmsted was to receive for his series of lectures, but he was happy to pay this amount and more, if only his son might regain his health.  

He provided his son with various letters of introduction, including a general letter from Professor Silliman. Olmsted himself wrote an open letter urging all his personal friends, friends of Yale, and all benevolent persons to bestow on his son "their friendly regards, to succor him in distress and to furnish him with all needful aid..." Finally, he stayed home from church on the eve of Frank's departure, to compose a letter to Frank himself, to be opened at sea.

What does one include in a letter which could be the last communication to a first-born son? In anticipation of a separation which must leave the son without a father's strong arm to lean upon, without his restraining influence, is there time or space for the trivial, the nonessential? Rather, would not one's words of parting
counsel dwell upon vital concerns, the important values of life?
The portrait of Olmsted which emerges from this letter is largely a familiar one.

This voyage will occasion a severe test of your character, especially your religious character, cautioned the father. Should you cease to follow the religious path of your former training, I think you will not do so by a sudden renunciation. Rather, little by little, you will grow lax in your secret devotions, gradually will the Sabbath lose its sacredness for you and through your association with profane men, you will come to countenance what you at first abhor. In a special sense, beware of forming hasty intimacies with Americans you may meet. In your joy as seeing a countryman, use prudence and discretion in choosing to whom you will confide your happiness and character. Take copious notes, he advised, of all you see. It may well be that a well-written account of your travel would make an interesting narrative for the public. I have not encouraged you to take along many books, for I want you to study things. You can use your drawing ability to good advantage in representing the southern constellations, and remarkable meteorological phenomena, such as storms and water spouts. I have reason to hope, continued Olmsted, that you may return a "much more decided Christian than you go out."

On the mighty deep, there are sublime manifestations of the omnipotence and omnipresence of
God; and special circumstances give opportunities for your sense of dependence upon God to be strengthened. Write to us often, Olmsted admonished. As you see the miseries of the heathen world, may your estimate of the religion of Jesus Christ become far higher; as you witness, as well you may, the self-denying labors of missionaries, may your own zeal for the promotion of God's kingdom be enlarged. We will implore God to return you to us in health. Nothing could be more in keeping with our wishes than to have you settle near us, for kindred friends are especially dear. Finally, if we should meet no more here, may we both be found on the same side of the judgment seat, whichever of us should be summoned first.

As the time of parting drew near, Olmsted's apprehensions increased and he would have been happy if Frank had changed his mind. With a degree of "self command" that astonished himself the father led out in that final family worship, reading a passage of scripture filled with positive assurance concerning God's protective power (Psalm 91), and praying for his safe-keeping. Several days after Frank had left, the Olmsted's invited Reverend Henry Ludlow to a special prayer meeting at their house, where again Frank was commended to the care of Providence.

It was slightly more than a year later when Frank returned, "with health and spirits much improved." Reverend Ludlow shared
with the family their joyous occasion, and offered a prayer "full of devout gratitude." To this special blessing of Providence, Olmsted responded thus: "Bless the Lord, Oh our Souls, and forget not all his benefits." 409

During Frank's absence, Howard had suffered now and then from his old complaints of "weakness" in the chest, but was enjoying unusually good health when Frank returned. However, within a few months, his lung hemorrhaging returned and it became apparent that drastic action was necessary. After wavering between a journey to Missouri and a voyage to the Mediterranean, Howard finally decided upon the latter and engaged to go on a vessel owned by Mr. Hurlbut, a former student of Olmsted's. He took with him various letters, including one from Reverend Ludlow. As the vessel was to leave in a day or so, Professor Olmsted was unable to find time for more than a quick letter to his son. In view of Frank's recent successful voyage, the prospects for Howard's were more encouraging.

About the time that Howard was due to return, a run of boisterous weather with reports of several gales on the Atlantic increased the apprehension of his family for his safety. One particularly stormy night, they held a special prayer service for Howard during which Olmsted read the 91st Psalm. Even after they learned of his safe arrival at New York, he seemed destined
to ill fortune. The "Belle," on which Howard was coming from New York to New Haven, ran aground and the rumor was spread that it had gone to pieces with most of the passengers drowned. As it turned out the rumor was false and soon Howard was home again after an absence of some six months. After his return, Howard secured a position as assistant editor of the *New York Journal of Commerce*, but the rigors of late hours and deadlines proved too much for him, and he was forced to resign, after less than a year. After a period of uncertainty, he determined to return to college.

Meanwhile, Olmsted had helped Frank with the publication of a book "Incidents of a Whaling Voyage" and had encouraged him to give public lectures of his experiences at sea. Frank had determined to become a physician and began preparing himself to that end. Various financial losses sustained by his father induced Frank in the fall of 1842, to take a position as apothecary in the Hartford Retreat for the Insane. While there he began to develop "alarming" symptoms, and in July of 1843 coughed up a considerable quantity of blood. As he seemed to recover from this episode with little permanent effect, he renewed his professional studies. He was elected president of his class, but it was soon apparent that his health was failing. In a heart-rending poem, called "Ode to Disappointment," Frank expressed his feelings of frustration. He made inquiries in New York regarding the possibility of another sea voyage, but without success.
He was too ill to attend the medical examinations, so the examiners came to the house. They pronounced his performance among the best.

Within a few days, passage was secured on a vessel bound for the West Indies. With breaking heart, his father bade him good-bye saying "a pleasant voyage to you Doctor." With little hope of Frank's recovery, the prayers of the Olmsted family for Frank took on a new and urgent theme: Make him ready, Lord! Early letters from Frank spoke of an improved health (to which Olmsted's response was: I bless God), but later news was not so encouraging. The family anxiously awaited Frank's return, which took place in June 1844, but his "emaciated frame and altered features" banished all lingerings of hope for his recovery. The final days were spent at home. Frank himself apparently still cherished some small hope of recovery "intended by Providence to support such protracted sufferings. . . ." For more than a month, Frank hovered between life and death. Then he was gone. The surviving children gathered around, uniting their prayers after the closing scene. They arose with renewed strength and comforted their father. The day of the funeral was clear and delightful, but the father was reminded of the lines: "How can ye bloom so fresh and fair, How can ye chant, ye little birds, And I so weary, full of care. . . ."
Cornelia, Frank's oldest sister, had postponed her plans of marriage because of the uncertainty of Frank's situation. In August, she married Mr. Seymour from Montreal. To a degree, therefore, Olmsted's mind was occupied with a variety of things, leaving little time to dwell on the recent, mournful scenes. Nonetheless, he was deeply affected by the loss: "...the image of my first-born is often before me both by night and by day."414

By the time of Cornelia's marriage, Howard was exhibiting marks of "great debility, a quick pulse, some tendency to cough," shortness of breath, and a pallid hue. After an examination of his lungs with a stethoscope, he was pronounced unfit to continue his studies. This was a keen disappointment to him. About to start his senior year at Yale, he had formed strong attachments to his classmates. Meeting time and again in the same recitation room, the same lecture room and "above all," in the same prayer meetings with mingled sympathies and prayers and scenes of revival, he was loath to leave these memories.415 He passed the winter in the south (Charleston, Lincolnton, etc.), with little improvement. The following July, he sat for the senior examination at Yale, and received an appointment of a "dissertation" for commencement despite his obvious handicaps. By the fall of 1845, he was scarcely strong enough to walk to college and began looking toward another journey south for the winter. He returned to Charleston, subsequently
went to Savannah, and finally to Jacksonville, Florida. By this time, reports of his state of health from his own letters and from friends confirmed the fact that the end was near.

In what was to be the last letter to be read by Howard, his father told him that his younger brother, Denison Jr. was coming to be with him. Professor Olmsted consoled himself with the thought that Howard's heart had been "early changed and sanctified by the grace of God," so that he could look forward to exchanging the present world for the bliss of heaven. "Bitter indeed would be the thought that I might never again see you in this world if I did not indulge a humble hope of another and more glorious union..." wrote the father. His letter concluded with the statement, "I went to see Grandmother last week. She is evidently near her happy home."

This statement was very near the truth, for Olmsted's mother died within two weeks of this letter. 416

Denison, Jr. arrived at Jacksonville less than two weeks before his brother expired. In New Haven, Professor Olmsted had just returned from the concluding lecture of a series he was giving in Hartford, when he received the letter with a black seal—the letter that gave him the long-dreaded news. It was early February when Denison, Jr. arrived in New Haven, accompanying the remains of his brother. Even as he alighted from the carriage, he seemed (to his father) less robust, more pale than when he had left for
Jacksonville. But such was to be expected, in view of his recent selfless service to his brother. Alone with the family, Denison, Jr. recited in detail the final scenes, scenes at once mournful and yet holding a peculiar fascination to the family.

About a month later, Denison, Jr. caught a severe cold, which was followed by "rheumatic complaints." Within two months, the "cold" had gone to his left lung, and he was troubled with a cough "by no means trifling." By this time, his father began to fear "an affection of the lungs," but two physicians (after independent examinations) pronounced them sound. Soon the son was unable to draw a deep breath without coughing. Could it be that this dear boy, too, would be taken from them? "Never was a thought so full of anguish." 417

Professor Olmsted had long entertained high expectations for this boy. Even as a small child, Denison, Jr. had exhibited many marks of a superior mind. Especially adept with arithmetic, the lad had become known among his schoolmates as the "mathematician." Anxious to cultivate his son's mathematical talents, but too poor to hire a competent tutor, Olmsted had taken young Denison, Jr. (then 12 years old) into his room at college, assigning him Day's Logarithms and Trigonometry. During this same time Denison, Jr. was permitted to attend his father's lectures to the senior class on astronomy and meteorology. 418
Nevertheless, Denison, Jr.'s interests were not primarily in mathematics or even mathematical science. Instead, he was fascinated by mineralogy, and was delighted by the lectures of Professor Silliman on the subject. He went on frequent mineralogical excursions, and began to form a mineral cabinet, exchanging specimens with correspondents in Pennsylvania, Ohio, New York, and even Berlin, Germany. He was a good student at college, receiving appointments as "orator" in both his junior and senior years. After graduation, in 1844, he acted as Professor Silliman's assistant in his lectures in "Analytical Chemistry" and worked in his laboratory. In May of 1845, he was appointed a secretary of the "American Geological Association" (i.e., the American Association of Geologists and Naturalists). Not long afterwards, with Professor Silliman's recommendation, he was appointed to participate in a tour of the copper mines of Lake Superior. On his return, he resumed his work in the Analytical Lab, devoting his chief interest to the specimens he had collected in Vermont. It was in the midst of this work that he had volunteered to go to his brother Howard.

In several ways, Denison, Jr. was much like his father. After his conversion in the spring of 1837, he was among the most zealous of the family in promoting religion. His letters to his younger brother Lucius describing the revival meetings are overflowing with a religious concern beyond his years. He had begun keeping a
private journal in January of 1837. His thoughts recorded there exhibit his introspective nature and the severity with which he judged his own heart. While attending Yale, he recorded a number of personal rules of conduct reminiscent of another set made earlier by his father. Even in his senior oration, "The Limit of Human Knowledge Still Distant," many of his sentiments coincide with those of his father in the latter's own creation, "The Progressive State of the Present Age." 420

Soon after Denison, Jr. had returned from Jacksonville, he had accepted an offer to join Professor C.B. Adams, head of the geological survey of Vermont, in some field work to be undertaken the coming summer. In March, he was encouraged to become a candidate for the position of chemist in the geological survey of the Canadas. The opportunity for advancement with possible study in Europe attracted him, and he applied for the job. 421 Now, in the midst of these encouraging tokens of professional success, his health was not good. Worse—there were substantial reasons to fear that he was falling victim to consumption—that dread enemy which had already taken Olmsted's father, his sister, and (lately) two of his sons. Like Jacob of old, Professor Olmsted could well say, Francis is not, Howard is not, and ye will take away Denison, Jr.: all these things are against me! (see Genesis 42:36).
In an effort to allay their son's growing discomfort, the Olmsted family agreed on an excursion. The day that Mrs. Olmsted left with Denison, Jr., a letter arrived from the youngest son, Lucius. It told of a recurring pain in the side, of a chronic sore throat, of the physician's advice that Lucius withdraw from business for a time. Olmsted was alone. The sleepless nights, the recent deaths of his mother and of Howard, the unfavorable news from Lucius, the "aggravation of all these sorrows by the unlooked for illness of a son on whom I have fixed so many hopes..."; all these circumstances conspired to close upon him until he feared a breakdown of mind and body. In agony of soul, he cried out: Is God designing to blot my family from the earth?! "But I forget," he wrote, "that the same hand that inflicts the chastisement has power to sustain me." Even in this dark hour, he prayed for strength to bear the load—for trust which would enable him to say: "It is the Lord, let him do what seemeth him good!" 422

In spite of repeated pronouncements by some of the best physicians of the day that his lungs were sound, Denison, Jr. became progressively worse. Young Denison's coughing at night, a "sound so well known and remembered with such painful emotions drove sleep from our pillow," Olmsted recorded. 423 The last few weeks were painful indeed; Denison, Jr. suffered intensely, in far greater measure than had his brothers. Finally, he was gone.
It was a sad spectacle to view his remains placed beside two graves, so fresh. The SKS society sent resolutions expressing their condolences, and Denison, Jr.'s classmates composed a letter of condolence, addressed to Professor Olmsted.

When Denison, Jr. had selflessly offered to go to his brother in Jacksonville, Dr. Dickson (who had previously attended Howard) urged extreme caution, being of the school which held consumption to be contagious. Ever since the onset of Denison, Jr.'s fatal illness, his father had been tortured with feelings of self-condemnation. Though Denison, Jr. had freely offered to go to his brother, perhaps the father should not have allowed his son to take the risk. After Denison, Jr.'s death, Professor Olmsted requested an autopsy. The substance of the left lung was gone and the right lung contained several sizable cavities. Could the disease have progressed so far in the time since Denison, Jr. had met Howard at Jacksonville, in the space of less than eight months? In the opinion of the doctors, such was not unlikely. Such a conclusion could scarcely give Olmsted much comfort. Where could he go for comfort? "O God!" he cried, "in this day of our calamity we supplicate thy grace. May we not faint in the day of adversity!"

Thus, in scarcely more than two years time, three of Olmsted's sons had been cut down by the "King of Terrors." The mottos that he chose to have inscribed on their tombstones symbolize
his complex response to their deaths. The inscription above
Frank's tombstone is heavy with emotional content: "The feeble
wrap the athletic in his shroud and Weeping fathers build their
children's tomb." A certain stoicism is evident in the motto above
Howard's grave: "Lovely and pleasant in their lives. In their
death they were not divided." The unexpectedness, the suddenness,
the tragedy of the death of Denison, Jr. called forth such depths of
despair that Olmsted contemplated the following mournful passage
for the third stone: "The shaft flew thrice, and thrice my peace
was slain." But in the end, assurance triumphed over despair, and
the third stone bore this simple phrase: "These all died in
faith." 425

Shortly after Denison, Jr.'s funeral, Denison, Sr., his wife,
and their son Fisher left for an excursion in the White Mountains.
At worship on Sunday at the hotel, Mr. Dawes spoke on the text;
"In the day of prosperity, be joyful; but in the day of adversity
consider; God also hath set the one over against the other
..." (Ecclesiastes 7:14), words well adapted to the particular
circumstances of the Olmsteds. Following the sermon, Professor
Olmsted added some remarks, showing how the devotional feelings
of the Christian enhance the natural scenery of the mountains above
the interest found for a mere naturalist or poet. 426 Upon returning
to New Haven, various activities crowded in to occupy his mind,
and relieve him of the sadness to which he was prone. He moved to
his new college room (#101), leaving #150 Atheneum which he had occupied since his return to Yale. He also moved his residence to "York Square," and was soon busy remodeling and repairing his new home, organizing a board of Trustees for "York Square" and initiating plans for a fence enclosing numerous trees of the "York Square Park."

Nonetheless, the succeeding months were difficult ones. Olmsted, so accustomed to thinking of his sons, mused: "I hardly expect to pass a waking hour for the rest of my life without having them in mind."

"It tinges life with sadness, although I think no one will suppose me melancholy." He reflected on the lines: "Friends beloved in happier days, Dear companions of my ways, Descend around me to the tomb." As the anniversary of Denison, Jr.'s final illness came, his father seemed "again to see the meek sufferer breathing out his life, or rather, the triumphant Christian entering the gates of heaven." Feeling his loss more strongly with each passing day, Olmsted said: "I would almost forsake my day, Before my summons comes, And pray and wish myself away, to my eternal home."

In regard for the memory of his deceased wife and children, he planned improvements of the family grave yard plot, complete with an enclosing fence and tombstones. A short time later, he began a "Family Biography," in which he recorded a biographical
sketch of each deceased member of his immediate family. Such a task gave him a "melancholy pleasure." As he perused the relevant documents, and contemplated the sequence of events connected with the death of Denison, Jr., he was particularly struck with his son's genuine piety. Indeed, he sincerely hated to see "so instructive an example" as that provided by his son's biography sink into oblivion. Except for the impropriety of writing thus about his own son, he would have been strongly inclined to publish a small "Sunday School volume," exhibiting his son's character, "for the benefit of the young."  

In the last few pages, we have glimpsed Olmsted in the context of adversity. To virtually anyone, the loss of three sons in their prime, and an aged mother within a period of less than three years, would be a personal disaster. To Olmsted, the trial was especially traumatic. Perhaps because of the early death of his own father and an unhappy relationship with his stepfather, Olmsted had long displayed an unusual fervor regarding family ties. His journals contain frequent references to the personal satisfaction he derived from his children. Olmsted perceived God as good, loving, benevolent, and kind; he found plenty of evidence for these attributes in the circumstances of life. Just at the time that Frank's voyage had necessitated unexpected expense, Olmsted's new book (the Rudiments) had proved a tremendous success; he thanked God for timing
could preferentially concentrate on the good, the harmonious; there, in short, he could verify and reinforce his belief in a benevolent, loving God. Therefore, an understanding of his writings on natural theology, in general, and their characteristic, preferential concentration on the good in nature, in particular involves a consideration of two elements. First, looking at nature (because of its impersonality), Olmsted could more readily ignore evidence of imperfection and disharmony that would conflict with his personal belief in a benevolent God. More importantly, such a view of nature was "a natural one" for Olmsted because he was in the habit of finding the good in all circumstances.
V. THE CONTEMPLATIVE YEARS

Philosopher, Poet, Christian (1846-1859)

"To imitate Jehovah, as one might humbly and reverently presume to do, in... a comprehensive review of his great creation, would require the united powers of the philosopher, the poet, and the Christian." 430

During the 1840's, Olmsted published very little indicative of original, scientific research. By the beginning of the decade, the cosmical nature of meteoric showers was a hypothesis generally treated with favor by scientists. Olmsted's last paper dealing specifically with this topic appeared in December of 1840; by then he recognized that his "book concern" would occupy a large share of his interest and time for the rest of his life. During the first half of the succeeding decade, he published several textbooks, as well as the biography of Mason. In the mid-forties, his strength was sapped and his nerves frayed by the circumstances involving the death of three sons and his mother. The latter part of the decade found him increasingly involved in "contemplative writing," turning his previous achievements "to as good account as possible." 431

Commencement at Yale in 1850 was anticipated with special interest. It was the 150th year since the founding of Yale, and a special celebration was planned for this Year of Jubilee. In addition, the meetings of the AAAS were going to be held in New
Haven the week following Commencement. Since the reorganization of the alumni association in 1842, Olmsted had been chief manager of the alumni meetings. This year, however, he steadfastly declined to serve. Feeling that his standing and influence as a man of science had declined "of late years," he spent the weeks prior to Commencement preparing several papers for the AAAS meeting. He was concerned lest "so humble an individual" as he, amidst the "eminent professors in Natural Philosophy and Astronomy," bring dishonor upon his department. He was to be its sole representative, while the Department of Chemistry and Mineralogy would be represented by the Professors Silliman (Senior and Junior), Professor Dana, and Professor Norton, as well as several young men from the analytical laboratory. As it turned out, Olmsted, a member of the standing committee of the AAAS which directed the daily proceedings, was appointed to lead off with the first paper, which he devoted primarily to remarks on lightning. As his first point, he related that, in 1843, when inspecting a house that had been struck by lightning, his attention had been directed to evidence indicating a "sudden and violent expansion" of the air. Since that time, he had often noted similar evidence, and now he suggested that such a violent expansion might explain the sudden movement of heavy bodies, a circumstance often accompanying lightning strikes.
His next point concerned the conducting power of a rod as affected by its mass. Notwithstanding Faraday's experiments on this subject, "some have hastily concluded" from the known tendency of electricity to distribute itself on the surface, that "it is of little importance whether a lightning rod is a solid cylinder or a hollow tube." Citing a case where the effect of lightning had borne out Faraday's results, Olmsted suggested that it was necessary, especially in a silicious soil, that any lightning rod be in contact with some good conductor, such as a well. 434

Next, Olmsted proceeded to illustrate a fact, noted by Joseph Henry, "that even the best constructed rods, when transmitting heavy charges of electricity, readily part with portions of the charge to neighboring conductors." Olmsted mentioned that in several instances a house allegedly protected by a lightning rod had nevertheless sustained a strike of lightning via the kitchen chimney, with its ascending column of smoke acting as a conductor. He believed special precautions were required to protect houses in this case. He further noted that New Haven was a place "peculiarly liable to be struck by lightning," a fact he attributed to the poor conductivity of its soil, which would render small bodies of water, or places habitually damp, especially liable to invite an electric discharge. 435

After a brief discussion of what he judged as inconclusive evidence for an alleged return stroke of lightning, he made a few
remarks on trees. A popular impression in the southern United States, he said, was that pines were the trees most apt to be struck. From their "resinous character," one might expect them to be least likely to be struck. He believed the paradox could be resolved by the "fact" that, though less frequently struck, the pine more frequently exhibited the effects precisely because it was a poor conductor.

Olmsted was gratified by the discussion which his remarks generated, involving "some of the most distinguished men present," including Joseph Henry, Alexander D. Bache, William Redfield, B. A. Gould, and Elias Loomis. For example, Professor Henry mentioned that his inspection of a similar case had led him to entertain the same opinion regarding the expansion of air and lightning. Henry had made a series of experiments which convinced him of the truth of his hypothesis. In this respect, Henry's conduct is in rather sharp contrast with that of Olmsted, who was apparently content to suggest the hypothesis without testing it. In fact, the whole tenor of Olmsted's paper is indicative of his own preoccupation with teaching as opposed to research, his remarks being either illustrative of accepted principles or merely suggestive of possible causes.

The following day, Olmsted opened the section on physics, mathematics, and chemistry with a paper on the properties of a mixture of lard and rosin. He apologized for the "plainness" of
the subject, but expressed the hope that it would be consistent with "the great practical object of this Association to promote the useful arts, and advance the welfare of society." He had originally been led to investigate the properties of this compound quite by accident. He had mixed a small quantity of rosin with lard, expecting to achieve a "greater hardness" of the mixture which he planned to use to seal an old air pump more effectively. He was surprised to find that the lard was rendered more fluid. Subsequent experiments indicated that the melting point could be lowered to 90° (from 97°) with the addition of one part (by weight) of rosin to three parts of lard. This he thought the more remarkable as the melting point of rosin was 300°. On the basis of his results, he proceeded to experiment with small amounts of rosin dissolved in lard oil, hoping that the combination would be more "suitable for burning in solar lamps" than simply lard oil. Indeed, he discovered that the flame possessed a "peculiar richness," but unfortunately, after two hours, it degenerated, presumably due to a clogged wick. His apparent ignorance of the "general law" afterwards mentioned by Bache, viz., "that the fusing point of compounds is lower than that of either ingredient," does not present him in a very flattering light in this case. Nonetheless, Olmsted was apparently satisfied, noting that his efforts seemed "favorably received." In a third paper, "On the Ice of Lake Champlain," Olmsted suggested a cause
for the sudden disappearance of the ice in the spring. His explanation was warmly opposed by "two high authorities," Dr. Hare and Professor W.B. Rogers. Olmsted was overly defensive, afterwards (in his journal) admitting that he had "stated the case too absolutely." As a matter of fact, he had conducted some experiments with ice-water mixtures, but his suggested explanation involved an unwarranted extrapolation beyond the actual experimental results. He promised himself that he would refine and extend the experiments that coming winter. In yet another paper, he presented his views on the aurora borealis, views which he knew to be "totally different" to those entertained by several prominent scientists, including Joseph Henry and Robert Hare. Therefore, he felt fortunate that no time for discussion was allowed, knowing full well that, should the opportunity have presented itself, Hare would have pounced upon him "like a tiger, a contest for which I am not well-adapted by nature." One of the highlights of the meeting for Olmsted was a chance to meet many "distinguished scholars" that he had previously known only by reputation or correspondence. Two papers he had contemplated giving: "On a Remark of Laplace Respecting the Moon," and "Nehemiah Strong's series on the Numerical Relations of the Planets," he withdrew, in deference to others. He had done his best, but the excitement of the past two weeks rendered the following
one "a time of peculiar languor and inefficiency." "My reputation has seemed to be declining," he lamented, "and old friends to be growing cold... Would that I could subdue my natural ambition and thirst for human applause." 440

Undoubtedly, his own reputation rested primarily on his cosmical theory of meteoric showers. In his first papers on the subject he had intimated a possible connection between the meteoric showers and the zodiacal light. At the meeting of the AAAS held in Albany in 1851, Olmsted gave a paper in which he proposed to inquire "whether or not the zodiacal light is the origin of the meteoric showers of November and August, and especially those of November." 441 Professor Olmsted first recited several circumstances, which "conspire to interrupt the continuity of a series of observations on the zodiacal light." The feebleness of the light rendered its observation easily obscured by clouds, lack of atmospheric clarity, or the light of the moon, and even (at times) Venus and Jupiter. He admitted that ill health and other causes had also been factors, but his observations during the period of 1833 to 1839 had been sufficient to convince him of the shortcomings of his previous knowledge on the subject. He asserted that "most or all of the descriptions and graphic representations of it [the zodiacal light] given in works of science" were "very erroneous." In particular, he thought that British writers (at relatively high
latitudes, where the zodiacal light was scarcely visible except near equinoctial periods) had usually described it in a "vague and inaccurate manner."

His first task then, was to present "an accurate description and representation" of the zodiacal light. During the summer months, the zodiacal light was seldom observed at New Haven. At the beginning of autumn, it could be observed in the morning sky, say an hour and a half before daybreak (about four a.m.!). From his comments regarding the necessary atmospheric conditions and special visual techniques to insure optimum observability, it is evident that he was speaking from personal experience. Though his friend Edward C. Herrick had observed the zodiacal light as early as August, Olmsted stated that it "will hardly be obvious to common observation before the latter part of September." At that time it presented itself as a "feeble, diffuse, and scarcely visible light" of a pyramidal shape, with base on the horizon and vertex near Gemini. For about two months, the vertex moved through the order of the signs, keeping pace with the sun, after which it slowed, became stationary and then retrograded, gradually fading and contracting until it vanished from sight in January. Meanwhile, by late November, it was becoming visible in the evening sky in the west after sunset, where the vertex advanced rather rapidly through the signs until January, when it became almost stationary. In
February and March, it moved slowly forward again, and by May had faded from view.

Based on his observations from 1833 through 1839 as well as the paper of Cassini (who had first directed the attention of astronomers to the zodiacal light), and the work of de Mairan, Olmsted believed that the phenomena had remained essentially unchanged during a period of almost two centuries. In a postscript in his published paper, he included observational data taken in the months immediately following the AAAS meeting of 1851. Accompanied by "a few students of the senior class of Yale College," Olmsted carefully observed the zodiacal light; after these observations were taken, he compared them with those of Cassini, extracts of which he placed in the postscript to further substantiate his stated belief that the zodiacal light exhibited a long-term constancy.

At the time of the meteoric shower in 1833, Olmsted had read neither Cassini nor de Mairan, and did not even know that the zodiacal light was visible during November. But now, almost two decades later, with ample opportunity for observation and reflection, he was convinced of a significant connection between the two phenomena. In his paper on the meteoric showers, he had suggested a period for his "cometary body" of a year or six months. But at the time, he said now, he had had "inadequate notions" as to the size
of that body. He was now willing to entertain a period for that body "as short as a third of a year, or even less." Thereby, he hoped to explain not only the November showers, but the August showers, and, of course, the zodiacal light itself.444

In his paper given at Albany, Olmsted proposed five "pre-sumptions" in favor of his opinion that the zodiacal light was, in fact, the "veritable body" producing the meteoric showers. The first "presumption" was that the zodiacal light "is a nebulous body." His argument for this was from analogy.

In its visible form, in its direction with respect to the sun, in its very shade and color, in its increasing density towards the sun, in its transparency which, as in comets, is such as to permit small stars to be seen through almost every part of it; in all these respects, we recognize a great resemblance between the zodiacal light and the tails of comets.

His use of analogy here was certainly consistent with what his contemporaries were doing.445

Next, he stated that this nebulous body had a revolution around the sun. He based this assertion upon the observations that the zodiacal light sometimes moved through the signs with the sun, sometimes retrograded, and was sometimes stationary. He could hardly imagine such a situation arising, except from the motions of revolutions. On this point, he could appeal to no less an authority than Laplace, who had intimated a similar idea. At times, the zodiacal light exhibited an elongation from the sun of at least $120^\circ$, 
and from this fact, Olmsted concluded that the body extended beyond the orbital path of the earth. From the annual periodicity of the appearance of the zodiacal light, he inferred a period for the body commensurable with the earth's year. Finally, he suggested that in the meteoric showers of November and August, the meteors came from the extreme portions of the zodiacal light.

In summary, Professor Olmsted "presumed" that the zodiacal light was a nebulous body, revolving around the sun, of dimensions reaching beyond the earth's orbit, with period commensurable to the earth's year, and that the meteoric showers came from the same location as the zodiacal light. It is of special interest that, having presented these ideas, he stated; "These five propositions I offer as so many facts established by observation."

He stressed the desirability of precise, continued observations to test his hypothesis, but insisted that his theory of meteoric showers stood independent of this later hypothesis.

In May of 1855, the Astronomical Journal published excerpts from Reverend George Jones, Chaplain of the U.S. Navy. Based upon extensive recent observations he had made while on a worldwide cruise, Jones had concluded that the zodiacal light had its origin in a ring of nebular matter orbiting the earth. He was elected a member of the AAAS at the meeting in Providence that fall, and presented before the Association a paper on the subject
which apparently excited a general interest. Not long afterwards, however, F. A. P. Barnard, Professor of Mathematics and Astronomy at the University of Mississippi (and a former student of Olmsted's) critiqued Jones' hypothesis, concluding that it was untenable and that the "zodiacal light must consequently be regarded as presenting a problem still unsolved." In 1857, Charles Wilkes presented his own explanation of the zodiacal light as the "true and only one which will meet all the facts derived from observations." Wilkes ascribed the phenomenon to the atmospheric reflection of sunlight. Unconvinced, George Jones continued to promote his geocentric ring hypothesis, presenting another paper to the AAAS in 1859.

In actuality, certainty regarding the correct explanation for the zodiacal light was not to come for some time. In 1872, Elias Loomis wrote "It is probable that the zodiacal light is an envelope of very rare matter surrounding the sun, and extending beyond the orbits of Mercury and Venus, and at times even beyond the orbit of the earth." Two decades later, in a popular work on astronomy, Simon Newcomb pronounced the zodiacal light "due to a lens-shaped appendage of some sort surrounding the sun, and extending out a little beyond the earth's orbit," but admitted that the "nature of the substance from which this light emanates is entirely unknown." As for the connection between the zodiacal light and meteors, a recent
author has noted that the relationship "is intriguing—but not entirely clear."

In any case, Olmsted's involvement in the problem demonstrates that he was engaged in serious research on problems of contemporary scientific interest.

Another such problem involved the aurora borealis. In 1827, spectacular displays had engaged the interest of observers worldwide. The *American Journal of Science* carried reports from the United States, Canada, Scotland, France, and Denmark. Olmsted included a description of the phenomenon as seen in New Haven in his meteorological report to the CAAS for the year 1827. This was the beginning of his lifelong interest in the subject.

In April of 1834, shortly after Olmsted had set forth his theory of meteoric showers, he had "first recognized a connexion between the aurora and shooting stars." As early as 1835, the idea of a cosmical origin for the aurora had occurred to him, and he had suggested it to his students. In 1837 he expressed similar ideas in a paper published in the *AJS*. In the following years, he collected more data and became more certain of the correctness of his views concerning the origin of the aurora. At least by 1846, he was presenting the outlines of his theory in his class lectures. He was careful to distinguish between the *site* of the auroral exhibitions, which he admitted to be in the atmosphere, and the *source* of the "matter," which he believed to be "ferruginous vapour" (due to its
magnetic properties) which probably came from aerolites which, in turn, came from beyond the atmosphere. With characteristic caution, however, as late as 1850, he admitted to Loomis that he had classified the principal "facts" of the phenomenon, but "cannot rest satisfied without an effort to explain this... unexplained phenomenon." In mid-1850, at the AAAS meeting at New Haven, he finally presented an abstract of a paper he had "long been preparing," on a cosmical origin of the aurora.

Finally, in 1856, after "vexatious delays," his paper "On the Recent Secular Period of the Aurora Borealis" was published in the Smithsonian Contributions to Knowledge. Olmsted had "enjoyed peculiarly favorable opportunities for observing" the auroral exhibitions since their renewed activity in 1827, and from an "extensive correspondence" as well as contemporary accounts, he believed he had amassed "a greater amount of facts, than... any other person has taken the trouble to accumulate." Since he believed the recent activity of the aurora was "among the most remarkable that have ever occurred since the creation of the world," he felt a duty to record its recent history. His statement of method is characteristic of him as well as the age in which he lived.

I know of no other method of successfully investigating a subject of this kind, than, first to examine all the facts of the case; secondly, to bring together into one view in separate groups, such as are similar, forming a full and accurate classification; thirdly, to inquire what general
truths these facts reveal, since these deductions form the proximate laws of the phenomenon; and, finally, to make the laws the groundwork of a general theory, which shall assign the true cause of all. 457

Olmsted first described six different "forms" of the aurora. These included those routinely observed, such as auroral twilight and auroral clouds. The "most magnificent varieties of forms" were arches, streamers, corona and waves. He divided auroras into classes, I-IV, in order of decreasing magnificence, specifying that "class I," for example, must exhibit at least three of the magnificent varieties of forms. His conclusions in the abstract that he had presented in 1850, were based on data "chiefly gathered from personal observations." 458 The intervening interval before his paper was finally published had given him ample opportunity for a more extensive examination of both contemporary and past data. The first portion of his paper was occupied not only with his personal minute descriptions of several "class I" aurora, but with independent accounts of the same displays, observed from other locations. This was followed by a two-page tabular summary of recent auroral activity: for data before 1832, he relied principally on results tabulated in Dalton's Meteorological Essays; for the period 1832-1848, he drew on the Regents' Reports which by that time contained a complete catalogue of auroras for the state of New York. In his tabular summary, he analyzed auroral frequency as to months, seasons, and years, as well as class. Not many patterns emerged.
He found "no apparent connection between number and intensity, " but did note that the numbers in the respective classes increased in an approximately geometric fashion, a circumstance which presumably increased his own confidence in his scheme of classification. 459

With the foregoing data before him, Olmsted proceeded to "classifying the leading facts appertaining to this mysterious phenomenon, with the view of ascertaining its laws." An aurora of the "first class," usually began near the end of evening twilight, not suddenly, but gradually, at the same local time at points widely separated in longitude; the maximum occurred at about 11 p.m. with a secondary maximum (sometimes) some hours later; the aurora often continued most of the night. The dimensions of a first class aurora were huge, having a width (longitude) of up to 150°, with a length (latitude) of probably less than 60°, and it was accompanied with remarkable magnetic phenomena. Only the first class aurora descended much below a latitude of 40°, lower on the western than on the eastern continent. 460

A point of long-standing controversy was the sounds which allegedly accompanied auroral phenomena. Olmsted's treatment of this point indicates that he was a careful investigator, that he recognized the possibilities of psychological bias, and even demonstrated such bias on one occasion. Over the years, he had
"listened attentively, during the greater exhibitions especially" but had never detected the alleged sound, which had variously been likened to "the rustling of the wind through dry leaves, or to a distant waterfall." On several occasions, he had heard a sound which he had at the time attributed to the aurora, but had subsequently found that it "proceeded from other sources." Once, a company of his pupils were "strongly impressed with the belief" that they heard sounds associated with an aurora. Professor Olmsted took them out again on the next clear night and after listening intently they were forced to admit that they heard the same sounds as before! 461

Another controversial point pertained to the height of auroras above the earth. Here again, Olmsted was inclined to ascribe reports of very low auroras to psychological factors and/or inexperience. Relying on "the sure principles of trigonometry" and observed parallax which various observers had measured, he believed that auroral manifestations were "usually" (if not invariably) at great heights, say between 70 and 150 miles. 462

The periodicity of auroral phenomena was of crucial importance to his theory of aurora. The evidence for a diurnal periodicity, namely, an almost invariable maximum around 11 p.m. for the higher class aurora, he judged to be conclusive. As for an annual periodicity, the evidence was much more ambiguous, as he
demonstrated by a comparison of recent data, derived from the
Regents' Reports, with the scantier data from Europe derived
from de Mairan, Delisle, and the London Philosophical Transac-
tions. Nevertheless, he expressed the hope that, as a result of
accurate records of current auroras, as kept for example by his
friend E.C. Herrick, "we shall soon have the means of determining
more accurately than at present the nature of the annual
periodicity." Concerning the secular periodicity, Olmsted was
more confident. "It is, in general, an acknowledged fact," he wrote,
"that there are long intervals during which great auroras are
seldom seen, and other periods of less duration during which they
occur with remarkable frequency and magnificence." He declared it
"a problem of much interest" to determine the length of these
long-term cycles. Drawing on historical cases of auroral phenomena
dating back to Pliny (which had been catalogued by de Mairan),
Olmsted found the secular period to be about 65 years. The dura-
tion, during this cycle, of unusual auroral activity, he guessed to be
"from 21 to 25 years," a guess he substantiated by contemporary
and historical cases. He was well aware of the pitfalls inherent in
his undertaking, as he clearly expressed in the following cautious
statement.

Philosophers justly regard with some distrust attempts to
trace numerical relations, in natural phenomena, since
these coincidences are often entirely imaginary. Examples
of this are familiar to all who are conversant with the biography of Kepler; but that such attempts sometimes conduct to valuable discoveries, is also evinced in the labors of the same illustrious astronomer. 464

The last fifth of his paper treated the "Origin and Cause of the Aurora Borealis." He discussed very briefly the "leading hypotheses" previously advanced, finding them all "inadequate and unsatisfactory." He then restated a distinction he had made earlier in the paper between an hypothesis ("a principle assumed to account for a class of facts, and having no other claims to be considered the true cause except that it explains the facts") and a theory ("a deduction from the facts themselves made in accordance with the established laws of nature"). He hoped his explanation would, in fact, unite the desirable characteristics of both an hypothesis and a theory. 465

"The origin of the Aurora Borealis is cosmical, the matter of which it is composed being derived from the planetary spaces," Olmsted wrote. To substantiate his opinion he appealed to four different lines of evidence: the great physical extent of a first class aurora, the occurrence of a given aurora in widely differing longitudes at the same hour of the night, the apparent high velocity of the motions, and its periodicity, "especially its secular periodicity." In 1850, he had admitted "a great analogy in the origin" between the aurora and meteoric showers. It is significant therefore that all four of the lines of evidence mentioned in his paper in 1856, he
had utilized more than two decades before, in his theory of meteoric showers. 466

Olmsted thought it improbable that the great extent of a given auroral display could be caused by any alleged "auroral vapor" emitted from the earth, or "precipitated from the atmosphere," especially in view of the immense heights involved, viz., up to a hundred miles. The "very extent" of the phenomena led him to seek its cause beyond the earth, in the "nebulous matter, which is known from the zodiacal light, and from meteoric showers, to exist in the planetary spaces. . . ." 467 By the phrase "which is known. . . ." he probably intended to imply that his assertion rested on a firmer basis than mere hypothesis, as he had previously defined the term. If so, the remark exhibits a not uncommon blindness of a scientist to assumptions of his own previous theories, for it is a fact that his theory of meteoric showers postulated the existence of a cometary body in a manner very close (if not identical) to what he would have ordinarily expected as being characteristic of an hypothesis.

With reference to the attainment of a maximum of auroral activity at the same local time for a given episode (he gave as an example the aurora of 17 November 1848 seen in points as widely separated as New York and London), his argument for the cosmical origin was implicitly based on a principle of simplicity, whereby the fact could be accounted for by the diurnal rotation of the earth.
His third line of evidence concerned the "velocity of the motions" of the aurora, a velocity too small to be that of light, or electricity, or magnetism, yet, "too great for any terrestrial matter." To the objection that these auroral waves might simply be "undulatory and not progressive," he replied that "their appearance is wholly unearthly, and unlike to any other undulations with which we are acquainted." He firmly believed that it was the "auroral matter" itself that was moving and that its movements (too rapid to be accounted for in terms of terrestrial forces) originated as a result of motion derived from the orbital velocity inherent in the nebulous body revolving around the sun. Still he was content to let the argument remain qualitative, making no attempt to demonstrate that the various motions could in fact be accounted for by his scheme.

Finally, he inferred a cosmical origin from the periodicity of the phenomena. Even if he were incorrect in his estimate of the precise numerical value of the periodicity (viz., 65 years), he thought that the "general fact cannot be doubted" of the existence of notable periods of excessive auroral activity separated by periods of relative inactivity. The most delicate instruments indicated, he asserted, "no corresponding long periods of activity and repose in the case of terrestrial agents, such as electricity and magnetism." On the other hand, he could readily conceive how a nebulous body,
revolving about the sun, might have its period so nearly com-
mensurable with that of the earth's as to render the two bodies, in
the vicinity of each other for a relatively long time, followed by a
time of separation, with a long-term periodicity.469

As Olmsted readily acknowledged, as early as 1733, de
Mairan had, in his treatise on the aurora, linked it with the zodiacal
light, which he imagined to be the sun's atmosphere. Since that
time, of course, advances in knowledge had shown certain facets of
de Mairan's theory untenable. After the identification of lightning
with electricity, "there was almost a universal conviction among
philosophers," said Olmsted, "that electricity is the true cause of
the aurora." As a result, further investigations on the subject
largely ceased. Nonetheless, Olmsted did not think that the fact
justified an electrical cause, and he thought it not "improbable that
the zodiacal light is, indeed, the body which affords, at once, the
material of the aurora borealis and of meteoric showers."470

In this paper, published by the Smithsonian Institution,
Olmsted was not permitted to discuss the "opinions of others."
Therefore he presented a paper at the meeting of the AAAS in 1857
held in Montreal, in which he endeavored to show the inadequacies
of hypotheses ascribing electricity or magnetism responsible for
the aurorae.471

Again, he complained that "after the discovery of the identity
between electricity and lightning, and the consequent connection of
electricity and thunderstorms, it became the practice of the interpreters of nature to ascribe everything mysterious and not otherwise accounted for, to this wonderful agent. Priestley had merely asserted an electrical explanation for the aurora, with "scarcely an argument in support." Other scientists had attached undue importance (Olmsted thought) to the similarity in appearance of the aurora and electrical discharges in rarefied air. "It is unsafe to predicate upon such incidental resemblances an identity of origin," he cautioned, reminding his listeners of the absurd conclusion to which such analogous reasoning had led Newton's teacher (Wallis), when he had explained thunder as the accidental coming together of the elements of gunpowder! He admitted that more recent theorizers had not relied upon such tenuous analogies, but, nonetheless, they had assumed, at the outset "that the Aurora Borealis is, in some way or other, caused by electricity." He then discussed three specific theories put forth respectively, by M. Biot, Robert Hare, and M. de la Rive, offering penetrating criticisms of each theory in turn. Turning to alleged magnetic explanations, Olmsted freely admitted that "magnetism has some connection or other with the Aurora" as evidenced by disturbances in the magnetic needle during auroral displays as well as certain spatial symmetry of these displays with respect to the earth's magnetic field. He insisted, however, that this evidence proved
nothing respecting the origin of the aurora. Scarcely any hypothesis is "so poor not to explain some portion of the facts," he concluded, reiterating his own conviction that a cosmical hypothesis explained certain of the facts which were otherwise inexplicable. This paper was his final "scientific" effort.

Olmsted presented one other scientific paper to the AAAS in the fifties. At the meeting held in Providence in 1855, he reported on a gunpowder explosion which had taken place the preceding year. Three wagons, each loaded with 150 kegs of powder (totaling nearly 12,000 pounds of explosives) were transporting their cargo through Wilmington, Delaware when the powder was ignited, demolishing the wagons as well as the surrounding buildings. Olmsted deemed it worthwhile to bring this episode to "the attention of men of science" in that it was accompanied by a number of "extraordinary phenomena," illustrating the power and unusual modes of action of pneumatic forces which might possibly shed light on "certain obscure phenomena of tornadoes." After a brief description of the effects of the explosion, Olmsted drew his parallels. A splinter of soft pine, driven across the room and penetrating completely an inch board of pine--how similar to the incident in the New Haven tornado of 1839, where a piece of board was found to have penetrated through a thick plank! In that storm, hinges and bolts had been wrenched from doors, shoes torn
from horses' hoofs—as in the case of the explosion. After the explosion, a piano was found which gave evidence of having burst from within—as likewise houses had been apparently burst outward by storms.

In this paper, we see Olmsted in a familiar role—collecting facts, pointing out interesting analogies, confident that they would prove useful. In this case, even his mode of collecting the facts is characteristic. When the meteoric showers of 1833 occurred, his data came largely from correspondents. So now, to obtain a "more correct and precise statement" of the facts of the explosion, he requested information from one of the victims who had escaped the disaster.

This is not to suggest that Olmsted was merely a collector of facts. Indeed, he engaged in his share of hypothesizing. The unified theory he developed to explain the aurora borealis, the zodiacal light and the meteoric showers demonstrates his own strong interest in the advancement of scientific knowledge. Nevertheless, the fact remains that he viewed his own special endowment to be that of a teacher, and his active participation in contemporary problems of scientific interest was motivated, in part, by his belief that such involvement was a necessary requisite of a teacher.
On two different occasions, in 1845, before the American Institute of Instruction and a decade later before a teacher's convention at Cheshire, Connecticut, he set forth his views on teaching. A good teacher must have a "true zeal for knowledge," he maintained, and must possess a "love of truth to a hair's breadth." His knowledge must be accurate, because he is a "profound dispenser of truth." At the same time, it must be extensive, so that, when a "pupil has read his textbook. . .he has not sounded the whole depth of his teacher's erudition." With such a personal ideal before him, is it any wonder that he found it necessary to devote a portion of his energy to original scientific investigation?

To confine one's activities to such research might gain a scientist "fame and distinction," enable him to "make original discoveries," and increase his chances of adding to the "sum of truth," but it would not (Olmsted insisted) make him an ideal teacher. Such a course would make that scientist a "man of one idea," whereas a teacher must "pay attention to kindred subjects." "No one can teach well any branch of science or literature, unless he is a general scholar," he asserted. "Power to investigate truth is one thing; power to expound truth is another. The former is the gift of science; the latter, of literature. The accomplished teacher requires both."
There is a mode of delivering instructions on such subjects as philosophy and astronomy, which interests the feelings, while it enlightens the understanding; which commends itself to the taste as well as to the intellect; which affects, at the same time, the head and the heart.  

It is clear that Professor Olmsted made every effort to practice these principles.

At the time he had written his work on Astronomy, he had thoroughly revised his lectures to deal largely with the historical and biographical aspects of astronomy. Within a few years, he detected a growing dislike for historical lectures, which were seemingly regarded by the students as containing information anyone could find out for oneself. Aware that to be useful, his lectures must not be regarded with prejudice, he proceeded to make them more "purely scientific." He was pleased to find his own interest quickened, and resting the interest of the course on the "inherent charm that belongs to truth," he was gratified at the response of the students. He incorporated into his lectures a discussion of the lectures on planets given by the first Professor of Natural Philosophy at Yale, Nehemiah Strong. Presumably, solving the very problems posed by Strong, added an antiquarian fascination to the students' efforts. Strong's mistaken notions regarding gravity and his quaint terms such as "tardity" and "levity," allowed Olmsted to stress the current "truths" of astronomy.
Not all aspects of teaching came easy for Olmsted. For example, he did not have a natural knack for classroom demonstrations. One student noted the contrast with Professor Silliman. "Perfectly at home he [Silliman] dashes on talking every moment and yet almost infallibly comes out with brilliant success. Professor Olmsted goes to work, most deliberately and carefully, scarcely daring to breathe and almost always fails of a striking result." Yet several weeks later, the same student wrote, "My respect for Professor Olmsted increases daily. Although not by any means a man of brilliant talent, he is one of unwearied application and industry...what he does know...he knows thoroughly."484

An interesting anecdote illustrates Olmsted's sense of humor in the classroom. During the course of one series of lectures, he was much bothered by a chronic toothache. In spite of his discomfort, he proceeded with his lectures and often times the pain subsided as he warmed to his subject. Near the close of the course, he mentioned this fact to his students, and recommended a course of lectures in astronomy (with an attractive and attentive audience) as a remedy to be preferred over pills and nostrums. "Upon this," he wrote, "we parted in very good humor." Whether the humor manifest by the class was genuine is open to question.

On another occasion, a student wrote: "The Professor's jokes are
too bad and the class laugh as if they were of the first order. They are enough to make George Bidwell look sober."\(^{485}\)

In the classroom, Olmsted's conscientious parental concern for the education (and the edification) of his students was apparent. Often, on the day after Thanksgiving, he presented a special lecture to his classes. Thus, the students who were absent, having gone home for Thanksgiving, were not penalized by missing a regular lecture of the course. At the same time, those who were present were (hopefully) profited. The lecture, Olmsted titled variously--"Mental Culture," the "Art of Thinking" or "Mechanical Aids to Knowledge." Whatever the title, the aim was the same. He would begin by remarking that old teachers often had the conviction that, if they could relive their lives, they might do much better, (an obvious reference to himself, in view of frequent journal entries expressing essentially this desire). He would then propose to share with his students hints he had found useful in the investigation, promulgation and recollection of truth. There followed a myriad of helpful suggestions. He stressed the necessity of cultivating habits of study (such as a proper arrangement of reference books within easy reach, etc.) which would ensure the maximum efficiency. He recommended keeping a "Saturday Night Journal" and a "Waste Book" (scrapbook) and suggested methods of note-taking. Likening the mind to the eye, he pointed out the importance of analysis.
Finally, he illustrated his remarks by discoursing extempore on a subject chosen by the students themselves.486

One aid to organization which he found especially useful was the Common Place Book. In fact, he "authored" one, printed in 1838, entitled The Student's Common-Place Book, On a New Plan; Uniting the Advantages of A Note Book and Universal Reference Book. Adapted Alike to the College Student and to the Professional Man. The book was to be used in much the same way as a businessman would use an account book. The student was to "open an account" on a topic of his choice, and enter on that page items bearing on the topic. When the page was full, the "account" was carried forward to the first blank page, with reference numbers referring to the page from which it was posted and the page to which it was carried forward. As an additional help, Olmsted recommended carrying a small pocket notebook from which items which came to mind in the course of the day's activities could be transferred to the larger Common Place Book.487

There was another important consideration involved in Olmsted's personal view of his role as teacher. He had a responsibility to the student of course; but also to the parent, to society, and above all, to God. Certainly, a teacher should appreciate the value of knowledge and have an earnest desire to impart it. But, an attribute of a teacher of even more value, in Olmsted's
estimation, was a "longing desire that the pupil may become a wise and good man." A spirit of benevolence must pervade the teacher's actions, a benevolence "not dependent for its interest upon what it teaches only, but more upon the luxury of doing good." Such a spirit would not go unrewarded; the reward would be the "consciousness of having helped to train so many wise and good men."  

For this reason, it is probable that Olmsted did not think his years studying theology had been wasted. "The study of the Bible is imbibing truth at its foundation," he had said. Nothing was better calculated to prepare one to mold the characters of youth. At his valedictory address to the sophomores when he had resigned his tutorship in 1816, he had admonished, "Let the Bible command a portion of each day. Keep the Sabbath holy. Swear not, I beseech you...." He had concluded his address with the words, "I earnestly recommend you to God and offer my fervent supplication that we may finally meet again approved in his presence...."

Since returning to Yale, Olmsted had let no opportunity pass where he might exert his influence for the cause of truth. At his concluding lecture to one senior class, he left them with this definition: "Wisdom consists in estimating all things according to their true value," which he offered to write in their autograph books. In an effort to render the phrase more practical, he added commentary such as "Wisdom, therefore, allows a certain space to
recreation, but far more to business. ... it can, on proper occasions enjoy mirth, but its habit is serious. ... it prefers the solid to the superficial, the intellectual to the sensual, a future permanent good to a present transient pleasure. ... it is provident for time, but more provident for Eternity." Writing such sentiments 100 times was tedious, but well worth the effort. 491

To another group of seniors, in the midst of his series of lectures on astronomy, he remarked, "That matter attracts all other matter is the first of physical laws. To do as you would be done by is the first of moral laws. The wealth of the world is in its original men. Time is misspent when it is not spent to the best purpose." In bidding this class farewell, he told them: "Doing good is a work of inherent dignity." Their response was to give him a resolution, which concluded as follows: ". . . while we entertain a high appreciation of his fidelity and patient devotion to us as instructor, we especially recognize the deep interest he has ever manifested in our personal welfare, and the uniform kindness and courtesy with which his instructions will ever be appreciated." 493

Such a tribute must have been especially gratifying to Olmsted. It suggested that he had in some measure succeeded in setting the kind of Christian example he thought imperative for a teacher. Several years before, in his address to the teacher's
convention, he had said:

It is required of the instructors of... youth, that they themselves be examples, as far as lies in their power, of all the excellence which they desire or expect from their pupils... If we expect that he will heed our advice, to seek above all things to become a Christian, we must exhibit in our lives and conversation the beauty of holiness.494

In a less formal setting, and in a more unofficial capacity, Olmsted interacted with his students and associates at Yale. Sometimes he brought his scientific expertise to bear as when he addressed a "college gathering" at his home on the subject of the astronomy of Milton’s Paradise Lost. Calling Milton the "most scientific of poets," Olmsted suggested that he was one of the first Englishmen to embrace the Copernican system.495

Presumably, Professor Olmsted maintained his interest in the Friday evening prayer meetings, from the time of their inception in 1837 until his death over 20 years later. Often the topics he presented came from his own personal experience. In one meeting, he expounded upon the importance of habitually maintaining a devotional spirit, not only on formal occasions, such as prayer meetings and family worship, but "in the form of frequent silent communion with God." On another occasion, he made a few remarks on the present Christian warfare, and alluding to his own personal, Christian hope, he recommended it to the students, assuring the
"young brethern" that there was no joy which such a hope could not
enhance and no sorrow which it could not assuage. 496

His commitment to Christianity was well known to the
students. At the annual Fasting and Prayer for Colleges, he
addressed the junior class one year. On another year for the same
occasion, the sophomore class requested him to speak for them.
His topic, again, might well have been written as his personal
motto: He spoke on the value "to this college of a consistent
Christian example," citing several eminent examples of the past,
then sketching the characteristics of a Christian and his influence.

Professor Olmsted's concept of the role of a teacher was
shared, in the main, with the presidents under whom he worked.
In 1846, President Jeremiah Day gave the Address at the inaugura-
tion of his successor. The aspect of your duties which will bring
you the least anxiety, he told President-Elect Woolsey, are those
of instruction. But to store minds with knowledge is not "the
principal object of the undergraduate course. Intellectual disci-
pline is a higher attainment. . . ." He continued:

A still more imperative demand of a public course of
instruction, is the bringing of the whole, as far as is
practicable, under the guidance of moral and religious
principle; rendering the students familiar with inspired
truth; giving vigor to the regulating influence of con-
science. . . .training the soul for heaven. . . . Parents
will not send their sons, at this critical age, to an insti-
tution in which no effectual provision is made for their
moral and religious interests.498
President Day's words did not fall on unreceptive ears. In his response, President-Elect Woolsey averred that the Christian instructor would "value training more than knowledge," that he would study to improve "all parts of the mind," that he would estimate education "by its relation to higher ends," and that he would "lead the minds of his pupils up to God." He pronounced "neutrality" in the sciences on matters of creation and providence "impossible." He concluded: "how elevated then, is the post of a Christian teacher in one of the most frequented and influential places of learning in this great country." 499

At their 30-year class reunion in 1843, Professor Olmsted and Mr. Davies (the two class members still living in New Haven) had been charged with arranging for a similar meeting in 1848. At this latter meeting, 14 class members were present, and each gave a brief account of his activities in the intervening five years. Olmsted had long anticipated "with emotion the painful struggle" he would experience as he told his story. Indeed, when his turn came, he was quite overcome and his tears flowed freely as he began to recount the mournful events surrounding the deaths of his three sons—all of whom had been with him when the meeting had been held in his home five years before. He regained his composure by referring to the more prosperous events in the past years, such as his book sales, returning then to his domestic concerns, adverting "to both the bright and the dark sides of the picture." 500
At the time of this latter reunion, Olmsted still had charge of the arrangements for the annual alumni meetings. On previous occasions, he had experienced no little trouble in procuring a suitable ode to sing for the occasion. Shortly before the 1848 meeting, Olmsted took it upon himself to write one. He composed a five-verse rhyme, to be sung to the tune of "Old Hundred." In characteristic fashion, he took his composition to a colleague, seeking his opinion, being careful not to hint who the author might be. The colleague thought that it was well-done, so it came about that the ode was sung at the alumni meeting that year. In the lines, one can readily see reflected Olmsted's own life, and ideals.

ODE - sung at the meeting of the Alumni of Yale College
August 16th, 1848,
Tune - Old Hundred

Our fathers' God! we, first, will raise
To thee our note of grateful praise,
As, one in heart, we bow our heads
Beneath these venerated shades.

Next, let the mournful tear be shed
In sweet remembrance of the dead,
As through these halls, in vain, we gaze
For friends beloved in happier days.

Blest is the hour, and dear the place,
That here unites, in fond embrace,
Classmate to classmate, friend to friend,
And all Yalensia's noble band.

Hail, honored Alma Mater, hail!
Ne'er may thy duteous children fail,
By works and offerings meet, to prove.
With heart and tongue, their zeal, their love.
Religion, learning, every grace,
Here long shall hold their dwelling place;
And Truth, if driven from all her realms,
Shall reign beneath these sacred elms.

When Olmsted had taken his Professorship at Yale, he had been
assigned the duty of "Inspector of Public Buildings." He found the
job of building inspector an agreeable one, and considered the
100 dollars he got for his services, "the most easily earned of all
my income from college." Nevertheless, he took the job seriously.
It was probably due to his report on the state of these buildings
"exceedingly defiled with tobacco," that he found himself in 1846,
on a committee to investigate the habit of smoking among students
at Yale. 502

In an Olmstedian manner the committee set about, first to
ascertain the facts; second, to determine the effects; third, to
suggest a course of action. In the report made to the faculty,
Olmsted presented the following facts: (1) More than half of the
students were habitual smokers; (2) the proportion of smokers
increased with class rank; (3) the practice even extended to members
of the church; (4) but extended to few good scholars. In substantia-
tion of this last point, it was noted that of the 23 seniors that had
"letters home" (a customary measure of censure) all but one
were habitual smokers. Of the 39 juniors similarly censured, all but
three were known smokers. From these facts, it was inferred that
smoking was chiefly confined to the students "who are the less distinguished, both for intellectual and moral excellence." As to the effects, it was noticed that smoking was usually attended with great want of personal neatness. The rooms of students who smoked were disgustingly filthy. The testimony of several physicians was cited, suggesting that the practice was injurious to one's health. Furthermore, the expense of the evil vice was not insignificant, one student spending 120 dollars in one year (exclusive of vacations). It was thought worth mentioning that the bills of that same student remained unpaid! A conservative estimate was that 5,000 dollars was wasted annually by the students on this evil vice. Finally, the reputation of the college was impaired in the minds of the public, who naturally associated these student smokers with the "low character" of the street-smoker.

For the good of Yale, for the good of education, for the good of morality, smoking should be discouraged, the report concluded. After such an indictment one might expect the recommendation of harsh measures. Yet, in keeping with Olmsted's philosophy of education, the committee suggested, first, an exertion of moral influence by the faculty, with the hope that a full and free explanation of the evils resulting from the use of tobacco, would deter a great many from the practice; second, in the spirit of the temperance movement, a pledge of total abstinence from the use of tobacco was
suggested—again with the professors themselves showing the way by example. At the next annual inspection, Olmsted found the rooms in "much better order" and was gratified at the apparent success of his efforts. 504

On matters of student discipline, Olmsted continued to oppose what he called a "severe and inexorable" spirit among some of the faculty. With his former teacher, Timothy Dwight, Olmsted saw the teacher-student relationship as akin to that of the parent-child. Discipline was to be a means of correcting (i.e., helping) the recipient. At one faculty meeting in particular, the topic of discussion was a certain episode involving the assault of a tutor. As there was much uncertainty as to the identity of the actual perpetrators of the act, some faculty suggested a rather severe punishment to be inflicted upon all who were present. Such a course of action Olmsted thought inappropriate. Not only was such punishment based on insufficient evidence, but seemed motivated by an arbitrary demand for atonement for the crime, even at the expense of bystanders whose only motive may have been curiosity. He was surprised at the tone of severity manifest by several older faculty and disgusted by the arrogance exhibited by some of the younger ones. He vigorously opposed the proposed measures "perhaps exceeding the limits of courtesy." 505
Soon after Olmsted had taken a Professorship at Yale, he had determined that he could and would be a good teacher. He believed (at least for the case of astronomy) one could not, at the same time, be an outstanding researcher. Yet as a teacher he recognized the necessity for careful observations. And one thing still lacking at Yale was a properly equipped observatory where such observations could be made. As early as 1830, when the Clarke telescope had arrived, Olmsted had put forth a plan to house it. But for whatever reasons, the plan had never materialized. In mid-1843, at Olmsted's request, Elias Loomis (a former student) wrote an article on modern astronomy for the *New Englander*. Apparently his remarks about the Observatory at Yale were not complimentary, for Professor Stanley, E. C. Herrick and Olmsted altered them so that Yale would not be an object of ridicule. In mid 1845, when Olmsted had requested the Prudential Committee of Yale to supply him with an Assistant in Practical Astronomy, he had further suggested that, should the trial prove successful, he would submit plans for an observatory.

Almost two years went by and then he noted in his journal a meeting with Enoch Burr, on the subject of an observatory, which Burr apparently agreed to finance, to be built "on York Square," near Olmsted's recently-purchased house. According to the plan, Burr was to become Adjunct Professor of Astronomy at Yale. But
this plan also failed. 509 A year later (in mid-1848) in a meeting of the President and the Professors, Olmsted offered, in the event of an anticipated raise in salaries from $1200.00 to $1500.00, to relinquish his $300.00 during the term of his office in favor of an astronomical department. He urged the need for a Professor of Astronomy, but unfortunately, a movement was afoot to secure the services of Mr. James D. Dana ("far less needed at present than those of Prof. Loomis," Olmsted unhappily commented) and Olmsted relinquished all hopes of succeeding with his plan. 510 Again, in 1849, Olmsted approached the Corporation, this time with a proposal of H.L. Smith for raising money for an observatory, with Smith as director. Olmsted and President Woolsey were appointed as a committee to investigate the feasibility of the plan. A year later, Olmsted reported on behalf of the committee that "it is not expedient at present." 511 The following year Olmsted once more urged the pressing need of an astronomical observatory, but President Woolsey said: We must rise from our extreme poverty, before we can indulge in luxuries." After the meeting, Olmsted remarked to Professor Hadley that much more was spent on chemistry than on Natural Philosophy and, referring to a recent $500.00 given to Professor Silliman for the purchase of apparatus, said "Such was the difference between one man and another." 512 In 1853, a transit telescope and clock were donated to Yale; and a site for an
astronomical observatory was offered by Mrs. C. L. Hillhouse.

For some unknown reason, the land offer was not accepted. 513

By the mid-fifties, astronomical observatories had been established at over a dozen different educational institutions in the United States, and, in addition, there were several fine observatories owned and operated by private individuals. Elias Loomis, then at New York University, was contemplating an article for Harper's on Astronomical Observatories. Olmsted wrote to him:

"The fact is we have no observatory [at Yale] . . . [just a] House of Refuge." In your forthcoming article, give us the "charity of your silence." Don't hold us up for contempt. 514

For whatever reasons, Loomis did not honor his former professor's request. The very first observatory pictured in Loomis' article was the "Yale College Observatory." Loomis noted that the telescope itself was very good, but the mounting was "Not equal to its optical character."

It has an altitude and azimuth movement without graduated circles, and is rolled about the room upon casters. The location of the instrument was peculiarly unfortunate. It was placed in the steeple of one of the college buildings, where the only view afforded of the heavens was through low windows which effectually concealed every object as soon as it attained an altitude of thirty degrees above the horizon.

The accompanying engraving, showing an awkward-appearing converted steeple, was in sharp contrast to the bulk of the other engravings which showed, for the most part, modern-looking domes. 515
Such publicity aggravated the mortification Olmsted already felt with respect to the Observatory at Yale. He immediately wrote to Loomis, upbraiding him for this unnecessary exposure which would "cause merriment" to rival institutions. Loomis had made the further comment that the telescope at Yale had proved less serviceable than anticipated. This prompted Olmsted to launch into an extended defense of its usefulness, citing the inspiration of such astronomers as Loomis, Mason, H. L. Smith, J. Hubbard, and others as evidence. He concluded with a statement which well-summarized his own views on the matter.

...to advance astronomical science by original discoveries is not what college observatories are wanted for... What we want of an observatory is a part of the means of education, as auxiliary to instruction in astronomy, in which point of view it is as important as a cabinet of minerals [to geology]... Such an observatory I trust Yale College will ere long possess... Possibly the exposure of our nakedness may hasten so desirable an event in which case I shall consider you as a great benefactor to Yale... 516

The embarrassment occasioned by the Loomis article stimulated Olmsted to yet another effort to get an observatory. He persuaded President Woolsey to allow him to present his case to the professors at the faculty meeting. He read the description of the Yale Observatory from Harper's Magazine, hoping that the President and professors would thus share his mortification. He reported that from his efforts to raise funds for an observatory only $3000.00 could be depended upon ($1000.00 from his own pocket), and urged
that a portion of the funds lately added to the college resources be earmarked for an observatory. Finally he asked, "What is to be done?" The matter was closed by President Woolsey's reply: "Nothing is to be done." Though such an answer was not unexpected, Olmsted was so upset that he seriously considered resigning. 517

Early that fall, Olmsted attended the AAAS meeting held in Albany. The time of the meetings coincided with the ceremonies of the dedication of the Dudley Observatory. Later contemplation of these events recalled to Olmsted's mind the late Lucius D. Duncan, after whom Olmsted's son, Lucius, had been named. Duncan, a former pupil and personal friend of Olmsted's, was a well-to-do lawyer, and Olmsted had seriously considered approaching him with regards to the possibility of Duncan financing a "Duncan Observatory" at Yale. In fact, he had even written the letter proposing it, but had laid it aside for further consideration! It was then that Duncan had been stricken with paralysis, an event which led to his death not long afterwards. How Olmsted now regretted the lost opportunity! 518

About this same time negotiations were underway with O. M. Mitchel, who had been successful some years before in establishing the Cincinnati Observatory. Mitchel agreed to conduct a series of observations at Yale at his own expense, with the stipulation that suitable facilities be provided. Olmsted wrote out his views on
the matter, but since O.M. Mitchel was primarily concerned with research and not instruction, Olmsted was not optimistic as to the chances of success of the plan. At the faculty meeting at which the matter was discussed, Olmsted found himself a voice crying in the wilderness, and was disappointed yet again. Later the same year, the agent for Yale college called on Olmsted with the encouraging news that two anonymous gentlemen of wealth intended to erect a well-equipped observatory, contingent upon their success in business the ensuing season. Unhappily, nothing came of it. \(^519\)

In late 1858, scarcely six months before his death, Olmsted made what was to be his last effort for an observatory. Professor Loomis had written to his former teacher asking his advice concerning a situation which had been offered to him. Upon learning that Loomis had an independent means of support, wanted to devote the rest of his life to astronomy, and would be willing to work without salary in an observatory at Yale, Olmsted gathered the faculty at his house to present his plan. President Woolsey showed no interest in the plan, and from a personal viewpoint, Olmsted was inclined to let the matter drop. "Still, conviction of its necessity to the respectability and standing of the college, and of the great advantages which would result to it from securing the services of so eminent an astronomer as Professor Loomis leads me to feel a strong interest in carrying the plan into effect," Olmsted wrote. \(^520\)
Alas! Feeling "a strong interest" was simply not enough! A quarter of a century was yet to elapse before Yale would have an adequate astronomical observatory.

Whatever the reasons for Olmsted's failure to obtain an observatory at Yale, his persistence indicates a strong commitment to science, a commitment which was also manifest in his service in the Connecticut Academy of Arts and Sciences. Although in principle the CAAS had been formulated as an organization with a state-wide scope, by the forties, it had become in actuality largely a local group, with very close ties to Yale. In 1840, about half of its 170 nominal members lived in New Haven. Nevertheless, it still served a useful purpose. Its meetings offered a chance for its members to keep abreast of developments outside their particular areas of expertise. Furthermore, by its very informal, local character it served as an ideal place for a preliminary presentation of new ideas. It was there that Olmsted had presented his account of the meteoric shower of 1833—subsequently published in the AJS. There, he had presented his tentative ideas on the cosmical origin of the aurora borealis. There, he had first sketched the character of E. P. Mason, the subject of a subsequent book. There, he reported the discovery of "Le Verrier's Planet." It is not surprising that Olmsted, a professor at Yale and committed to the "promotion of useful knowledge," took an active
interest in the CAAS. As early as 1832, he had suggested increasing the number of communications to the Academy in an effort to make its meetings more useful and interesting. The following year he served on a committee which devised an elaborate (albeit not entirely successful) plan of improvement for the Academy. During the forties, he sat on committees which explored such matters as: more convenient meeting times for the Academy, the propriety of "festive entertainments," and the advisability of a suspension of membership dues. Toward the close of the forties, he served as President of the Academy for two years. 523

In 1856, he submitted a committee report designed to promote the interests of the Academy. The recommendations included a "mutual improvement" of the members, to be accomplished by periodic reports on the state of the various sciences represented and analysis of current issues of the scientific journals. In addition, it was urged that a single paper, with title announced well in advance, form the basis of each meeting. In implementing this plan, James D. Dana (who had been a part of the committee making the recommendations) led the way with a lengthy paper occupying two meetings on the "Unity of the Human Race," as opposed to the well-known views of Professor Agassiz. This was by no means the first time that a topic bearing on religious views had been presented. At various times, the Academy had discussed such subjects as the
Nebular Hypothesis, or Moses and Geology; Olmsted had once given a presentation on the relation of astronomy to the Sabbath. Doubtless, Dana's paper was calculated to stimulate the Academy, and in this it succeeded. Olmsted had been scheduled to report on Dr. Kane's Expedition to the Arctic at the meeting following the conclusion of Dana's paper. But he gladly postponed his report to offer Josiah Gibbs an opportunity to present a reply to Dana's ideas. In his journal, Olmsted noted, happily, "The Academy begins to afford some indications of increasing vitality." 524

However, individual stimulation was not the only function of the CAAS. After the return of the United States Exploring Expedition in 1842, the scientific community in America looked forward eagerly to the publication of the scientific reports, but it was two years before the first volumes were issued. Congress had limited the number of copies to 100, and had provided for the distribution of a portion of these, but some were reserved for later distribution. There was a storm of protest by the scientific community with numerous memorials to Congress. 525 One such protest came from the CAAS. Olmsted was on the committee which drafted the memorial, urging that the editions be enlarged to 500, or even 1000 copies, the added expense being but a trifle compared to the increased benefit. The case of the Military Expedition of the French
to Egypt in 1798 was cited; its military objectives passed away
"like a whirlwind," while the researches of the scientific corps
"are imperishable." In the interest of the progress of science and
of the people of the United States, the draft read, numerous copies
of the report ought to be distributed in public libraries. The moti-
vational language used is significant.

If... copies were distributed among the principal uni-
versities and scientific bodies of the world,...[this]
would do more to secure public respect for the govern-
ment and the people of the United States, to commend our
policy and principles as a nation to the leading minds of
Christendom, and to increase the moral influence of our
government, than could be done by almost any other single
measure.

Such sentiments were, in all probability, sincere. Leonard Bacon
was, apparently, the writer. 526

In an effort to increase the effectiveness of the Academy in
its public function, it was agreed to present a public address under
the auspices of the Academy, during the next session of the legisla-
ture. Olmsted was on the committee that made this proposal, and
he agreed to give the address, choosing as a topic, "The Meteor-
ology of Palestine," His preliminary study of the subject whetted
his own appetite, and he found himself reading the Bible (especially
the "poetical portions") with an unanticipated interest. Indeed, he
began reading it through, and was thrilled with the new, enriched
meanings he found in its allusions and imagery. His lecture was
delivered in the North Church in May, 1858. Despite competing attractions, the house was "tolerably full"; many of the faculty of Yale, most of the clergy of the city and even Governor Buckingham attended. Professor Olmsted had apparently not misjudged the interests of the audience who listened with attention. In fact, within days, the editor of the New Englander, at the request of "several of our clergymen," called on him, asking permission to print the lecture. For the time being, Olmsted refused; after all, he might be called upon to lecture "abroad," and it was wise to have a topic received so well by a popular audience in reserve. 527

His two lectures at the Lowell Institute the preceding winter had been a mixed success. In the first one, he had lectured on meteoric showers and the aurora borealis. It was the largest hall in which he had ever lectured with a seating capacity of 2500 and it was nearly full. "I think," he wrote, "it was one of my most popular lectures." The following evening he lectured on the "Superiority of Modern over Ancient Art"; but did not think that one went over so well. Paradoxically, it was the latter lecture which he had specifically designed to promote science. 528

The circumstances surrounding his choice of topic for this lecture are illuminating. Several months prior to the lecture, Mr. Wendall Phillips of Boston had lectured to the Young Men's Institute
at New Haven on the "Lost Arts." As Mr. Phillips was an excellent speaker, and had once before given the same lecture there, there was an unusually large crowd. Phillips attempted to show "from a few solitary examples" that the ancients knew as much about the arts (fine and useful) as the moderns. "A pleasant fiction founded on fact," was Olmsted's commentary. He was upset, for the impression Phillips "left on the minds of his audience is unjust to modern science, and...he ought to be replied to." "I feel competent to show the futility of his doctrine and the fallacy of his reasoning," Olmsted continued, "and would gladly accept an invitation to give a public lecture in reply, but am unwilling to thrust myself on the public."^\textsuperscript{529}

At about this time, Olmsted had engaged to give two lectures on "Luminous Meteors" at the Lowell Institute. Now, he arranged to devote only one lecture to meteors, leaving the other one for the topic: "Superiority of Modern over Ancient Art." He not only devoted his second lecture at Lowell to this important topic, but he used it as his "Introductory Lecture" to the seniors the same month. In addition, he presented it before the CAAS. A number of his hearers, who had been present at Phillips' lecture some months before, commended Olmsted for his effort, and several suggested that his remarks be published.
Of his public lectures during the years after 1845, a significant fraction were on astronomy. He lectured again and again on the structure of the solar system, and the way the grand machine ran on endlessly. He stressed the uniformity of plan uncovered by "recent" discoveries in astronomy. He described the improvements in telescopes, those magical instruments which extended men's sense of vision, and delineated double stars, nebulae and galaxies. He also traced the historical path leading from Uranus to Neptune, a devious path to be sure, but one ending in triumph.

Olmsted endeavored to make his public lectures appropriate. When requested to address a group on an excursion in the mountains, he spoke of the enhancement of the natural scenery, which comes when the devotional feelings of the Christian are added to the spirit of the naturalist, and the poet. On one occasion, his choice of topic was stimulated by a heavy snowfall; he spoke "On the Provisions of Nature for Mitigating the Rigors of Winter." In particular, he demonstrated the wisdom of Providence in the falling snow, which moderated the air temperature, imprisoned the heat of the earth, increased the light in winter and retarded the advance of summer. All this followed, of course, from the "Remarkable Properties of Water," the topic of yet another lecture he gave to a group of clergymen on a steamer en route to Detroit. But whatever the topic,
he had no sympathy for mere fine-spun sentiment; it was not his intent merely to entertain, but to instruct.\footnote{530}

In some respects, the activities in which Olmsted engaged in his last dozen years were a natural outgrowth of earlier pursuits. As a scientist, he followed up his earlier hypothesis on meteoric showers with a theory which formed a pleasing sequel, explaining three phenomena (meteoric showers, the zodiacal light and the aurora borealis) to which he had devoted much study and observation by a single, unified, theoretical model. He continued to give popular lectures to the public. His two lectures at the Lowell Institute in 1858 typify nicely two important functions of a member of the community of scientists. The first lecture was devoted to an account of his particular area of scientific research (meteoric showers and the aurora borealis); in the second lecture, he more explicitly promoted science, discoursing on its recent advances and its utility for the progress of mankind.

As a teacher, Olmsted continued to exhibit an active interest in what he taught, repeatedly revising his lectures to incorporate new ideas. At the same time, his personal interest in the students continued unabated. A paramount aspect of that interest concerned their religious attitudes--these he endeavored to mold by precept and example, in the classroom and in less formal settings. He
also continued to support the movement to improve education, giving addresses on what he had long considered a vital concern—the improvement of teachers, and spelling out in some detail his own views on what ideal teachers should do and be.

In earlier years he had written textbooks; in his last years he revised them and was in the process of doing so up until the time of his death. He had long been fond of biography. During the last period of his life, he was called upon to write biographical tributes to two younger colleagues at Yale. At the death of William Redfield (first president of the AAAS), Olmsted presented an extended tribute to this friend at the annual meeting of the Association.

As early as 1839, Olmsted had recorded in his journal: "My desire is to retire upon my present acquisitions and to turn them to as good account as possible." Now, in his later years, he had opportunity to do so. In 1843, the first issue of a new quarterly was issued. Entitled The New Engander, it promised to be "a magazine expressing the views of free Christian men, on whatever happens to come up for discussion." Nonetheless, its pages were not to "be open for every man to maintain his own private opinion"; rather, it was to "give utterance to the New England way of thinking." Its influence was to be "on the side of order, of freedom, of progress, of simple and spiritual Christianity, and of the Bible as
the infallible, sufficient and only authority in religion." The gentlemen responsible for its establishment were Yale men (including two future presidents of Yale), it was published in New Haven, and thus, it is not surprising that Professor Olmsted was among its contributors. He contributed at least a dozen articles, some of which were biographical, but the bulk of which dealt with science, seen from a Christian perspective.

The uniting of science and religion was not to be unexpected at Yale. When Theodore D. Woolsey had taken over the presidency in 1846, that point had been made clear. Woolsey's inauguration was preceded by his ordination to the ministry. On the morning of 21 October 1846, the Reverend Leonard Bacon, pastor of the Center Church, preached the Sermon of Ordination, on "the bearing of the Christian revelation on the intellectual progress of mankind." He chose as his text Acts 17:18--"Then certain philosophers of the Epicureans, and of the Stoicks. said. . . He seemeth to be a setter forth of strange gods." These comments were elicited by Paul the Apostle as he preached the "strange" doctrines of Christianity in Athens, that "emporium of art, of letters, and of philosophy." Yet Christianity, Reverend Bacon averred (with its one God, Creator of the Universe, whose perpetual providence seeks the happiness of man, made in his image and seeks to restore him
to his true dignity), was the one system which could give a valid basis to knowledge. "The universe is one; and all knowledge... is related to the knowledge of the one infinite whole." The truth of Christianity put ethics on an absolute basis, it gave government a divine warrant, it made history more than the art of telling a good story, and (significantly) it showed the importance of the observation and analysis of facts in order to know! 535

Alas!, Reverend Bacon exclaimed, the "old blind philosophy" which Paul met at Athens "assumed, in its pride, that the mind must evolve all knowledge from itself," and within a century these ideas had begun to penetrate the church itself. Is it any wonder that a reformation of Christianity preceded the reformation of science? It was not until men

... had fallen back on God's facts in the Bible for the knowledge of... things divine that... the facts of nature began to be sought for, as the only revelation of the ideas and principles of nature... Who does not see the connection between the restoration of true Christianity and the new era of science, when he beholds the inquisition and the Vatican hurling against Copernicus and Galileo the same thunders that had fallen innocuous at the feet of Luther? Who does not feel that the genius of true Christianity is one with the genius of true science, when he reads the lofty yet lowly exultation of Kepler, 'I may well wait a century for a reader if God has waited six thousand years for an observer of his works.' 536

Christianity, Bacon continued, not only spawned modern science, but it also gave it direction. God had created the world for
man and filled it with riches for his use. In the spirit of Christianity, science must seek the welfare of mankind—the many, not the few. It must "explore and possess the utilities of creation."

This was the land of promise viewed from Pisgah by Francis Bacon, that "great prophet and legislator of science." Without Christianity, Leonard Bacon warned, science was prone to two extremes; a "coarse, sensual Epicurean utilitarianism, or a haughty, empty elitism." 537

Olmsted's journal stated:

A sermon of uncommon ability was preached by Reverend Dr. Bacon, showing that Christianity is the basis of education. I have thought much on the sentiment that Christianity is in its very genius favorable to the interests of education, and while the sermon was delivering, I thought I should like to review it; but probably my engagements will prevent.

The very next morning, Olmsted received the news that Le Verrier's planet had been "actually seen with the telescope." This event did serve to usurp his attention and he did not therefore get a chance to review Bacon's sermon. 538

Though Olmsted was prevented from reviewing Bacon's sermon, the New Engander was not. It viewed the sermon with obvious approval, quoting in its entirety the "beautiful passage" in which Bacon considered Christianity as the basis of science. The reviewer commented:
The foundation of the Baconian Induction—that the laws of nature are uniform—is nothing but the doctrine of the universal and unchangeable Providence of God. . . . To hold, as familiar truths, that there is a God—that he is the Creator and upholder of all things—is. . . . to have it [the mind] turned to subjects where it can question and find out the truth. . . . No philosopher with the Bible in his hand and reverently studied, can be a mystic. 539

During the next dozen years, the New Englander gladly published a series of articles by Professor Olmsted which were consonant with such sentiments. 540

Olmsted's essay "The Plurality of Worlds" appeared in 1854. The various ideas contained therein are intimately bound up with several important threads which run through his career, and therefore a detailed review of this essay offers one means of bringing together the multifarious characteristics of his beliefs, thoughts and actions, as well as an opportunity to analyze in particular the characteristics of his natural theology.

The question as to whether the heavenly bodies are inhabited, Olmsted noted, had been considered by the ancient Greeks, the early fathers of the Christian church, and such notable scientists as Galileo and Kepler. Fontenelle's celebrated Plurality of Worlds was published about the time of Newton's Principia and a few years later, "one of the most profound philosophers of the age," Huygens, put forth elaborate arguments in favor of the doctrine. Since that time, astronomers had been rather too busy observing and
measuring—investigating the laws of physical astronomy—to give much attention to the doctrine. Olmsted's essay was sparked by the recent appearance of two works: *The Plurality of Worlds*, in which the author (William Whewell) argued against the doctrine; and *More Worlds Than One*, an extended reply by Sir David Brewster. Olmsted thought it a happy circumstance that these latest combatants entered the arena for discussion of a question of "exalted interest" to the religious and scientific world with such high qualifications—a reverential regard for the Creator and a profound knowledge of his works. This in itself was a welcome contrast with former debates, at times pitting a "sneering freethinker" against a "superficial pretender to science." Now, Olmsted continued, seemed like a favorable time to settle the question, or at least to carefully weigh the evidence on either side.

His introductory remarks are significant. Though he had long been interested in promoting science, and was himself a "popularizer" of science, he did not appreciate the efforts of those whose knowledge of science was merely second-hand. For example, on one occasion, the Phi Kappa oration at Yale was given by a clergyman on the "Nature and Ends of Science." "He exhibited more acquaintance with the popular works of science than is probably common among our clergy—," Olmsted noted. "Still it was easy for me to
see that the knowledge was of that kind which does not imply very profound research." Afterwards, it fell Olmsted's lot to thank the speaker and request a copy of his speech for publication. "I frankly intimated to him," Olmsted wrote, "that it was inaccurate in some of its statements, a suggestion for which he seemed grateful, and desired me to revise and correct it." 542

There were two characteristics of a first-hand knowledge of science that Olmsted valued. The first was a detailed knowledge of a particular field. "General statements," he wrote in an earlier essay, "can never convey so full an impression of the riches of the natural world, as a complete analysis of some one of the productions of nature, exhibited in all its useful properties, and relations." 543 He thought a "happy delusion" accompanied the researcher to whatever department of nature he might choose to study, a delusion which came from a detailed study of that department, a delusion that his own department was the "peculiar favorite of heaven," that in that department, "nature had concealed her choicest treasures." 544 Furthermore, the "traces of order and mathematical precision" became more apparent as nature was studied in greater depth. 545 Such a point of view clearly provided a strong stimulus to Olmsted's own participation in original research, and undoubtedly served as well to stimulate many of his fellow teachers, both to become
specialists in a particular field of science, and to encourage their students to do the same.

Yet, there was another characteristic of firsthand science of perhaps greater value; viz., an enlarged view of nature. It was a comprehensive view of nature which would indicate the "grand design." The "lover of universal nature" alone could form an adequate idea of the riches of the natural world. His broader knowledge would give him ample reason to "fall down in mute astonishment, and pour out his heart in adoration of the Almighty Architect." Only a Christian could adequately encompass this larger vision. Only he could possess the "sagacity and power of generalization" of a philosopher, the "enthusiasm and susceptibilities" of the poet, and the "benevolence and devotional spirit" characteristic of Christianity. Only his perspective had a lasting quality. Only he could "imitate Jehovah, as one might humbly and reverently presume to do." Given an outlook like this, and Olmsted's commitment to religion, is it any wonder that he was a teacher of science?

The logical possibility of being a "believer" and yet not a Christian probably did not occur to Olmsted. He was obviously so caught up in his own Christian world-view that, to him, "believer" meant only one thing--a Christian! Such a tendency on his part is evident in much of what he wrote.
His essay on "The Plurality of Worlds," was not the first time he had found occasion to examine a popular doctrine with roots extending into the distant past. Some years before, he had dealt with the belief that the world was made for man. Concluding that it had often been accepted or rejected on the basis of a general impression, he had undertaken to subject it to "all the lights of modern philosophy." So now he proposed to consider the belief in the Plurality of Worlds, a doctrine which he admitted, had retained a general popularity since Newton's time, primarily due to the efforts of theologians. Professor Olmsted intended to examine the doctrine in the light of scientific and religious considerations. 548

The question, Are the planets inhabited?, was not a new one for Olmsted. As early as 1830, he had answered it in the affirmative in his lectures on astronomy to the seniors at Yale. In his textbook on astronomy, first published in 1839, he had included a section ending thus: "We are thus led, almost inevitably, to the idea of a Plurality of Worlds." In 1842, one of his students had written in his diary: "Prof. Olmsted thinks the Planets are inhabited." Several days later he had added, "I find that Prof. Olmsted favors entirely the doctrine of a plurality of worlds." In his popular lecture series given at the Brooklyn Institute in 1843-44, Olmsted had included a discussion of the question, and in the printed outlines of his lectures on astronomy addressed to the seniors, dated 1847 and 1852, one
entire lecture (out of 16) was devoted to the "Habitability of the Planets." 549

In his essay of 1854, Olmsted prefaced his examination of the doctrine under discussion with a few "principles of reasoning." Recognizing that any conclusion on the matter would be a matter of judgment, he pointed out that there are various degrees of probability. In such cases, several separate lines of evidence should carry more weight than a single line. The human mind, he continued, is prone to attach undue weight to a very little evidence, provided that is all that is available. In no subject, he thought, was such a tendency more apparent than in astronomy. When we leave observation and mathematical reasoning, the "only safe guides," all sorts of wild speculations are possible, he noted, citing the excesses of Kepler as a case in point. 550

Furthermore, the mere possibility of a thing was very small evidence for its reality. The ancient philosophers were never certain that the same laws of motion prevailed in the heavens as on the earth, and consequently, they made no progress in celestial mechanics. It was Newton who first "distinctively assumed and proclaimed" the doctrine that the laws of nature are uniform throughout the universe. Of course, the ancient belief was a "natural fruit" of heathen mythology, whereas Newton's doctrine was a "natural
result" of the distinctive Christian doctrine of the Creator. Indeed, Olmsted had intimated to his students some years before that the very idea of finding laws in the heavens was a Christian idea. In his professional journal, he had written; "Religious motives of Kepler led him to look for laws--truth begets truth and error, error."

He had also emphasized the value of Christianity to science in his essay on the discovery of Neptune. It echoed Leonard Bacon's remarks at the ordination of T. D. Woolsey in 1846, and incidently, it was on the very day that Olmsted had reflected with such admiration on Bacon's address that he also received the news of the discovery of Neptune. In his subsequent essay on this discovery, Olmsted had stressed its significance not only in confirming the truth of the universal law of gravitation but in eliciting a new confidence in the uniformity of the laws of nature. For him this uniformity was not simply a fact to be observed, though it was a fact; it was not merely a convenience of nature to be utilized, though it was to be utilized; it was, above all, a manifestation of the love of truth--God's love of truth. Once again, we find Olmsted caught up in his own world-view, making a leap from the laws of nature to the Lawgiver, a leap required, not by logic, but by his own fervent belief. 551
In his classroom lectures, Olmsted had included several "Laws of Reasoning in Astronomy." Among these was: "3. The argument from analogy explained--its use and abuse in astronomy." Now, in his essay on the Plurality of Worlds, he asserted: "the argument from analogy is apt to be delusive, and is often abused," especially in the case of astronomical speculation. Analogical reasoning was, of course, a tool useful in attempts to infer properties of a thing which are not directly discernible from the inspection of a similar thing whose properties are open to inspection. In such cases, he noted that the strength of the inference must rest upon the number of particulars in which agreement between the two things are ascertained, compared to the number of particulars in which they are found to differ. To illustrate his point, he posed the hypothetical case of a honey bee in the garden and an eagle viewed from afar. In that case, the bee and the eagle are similar in the few points of comparison possible, e.g., they both have wings and fly in the air. But upon closer inspection, say, by viewing the eagle with a telescope, the points of contrast between the two creatures increase much faster than the points of similarity. Therefore, any inference concerning the eagle made on the basis of observation of the honey bee "would evidently betray us into manifold errors." On the other hand, two honey bees resemble each other in such a remarkable
degree that the inference that if one stings, the other might, is entirely justified. Olmsted promised that the relevance of his illustration would be more obvious later on. In assessing his own essay itself, the illustration will also prove useful.

In his classroom lectures, Professor Olmsted had also pointed out the different classes of astronomers. Some, like Pythagoras, were "meditative"; others, like Tycho Brahe, were "mechanical"; still others, like Laplace and Le Verrier, were "mathematical." Rare were those individuals who were "consummate" astronomers, with Kepler, Galileo and Newton qualifying for this latter designation in varying degrees. The authority of each must be judged with respect to his special sphere of competency. So now, he thought such considerations were important, and it was essential to remember "that truths which it required the greatest powers and attainments, either in the field of observation or of mathematical analysis, to discover, are no sooner established than they often fall immediately under the domain of common sense, and require nothing so much as judicious powers of weighing evidence. . . ." Such, he believed, was precisely the case with the doctrine of the Plurality of Worlds.

His point about the distinction between prerequisites for the initial discovery, and for the analysis of truth was one he had long
maintained. Soon after returning to Yale as a professor, he had clearly recognized his own talents as being of a different nature and on a different level from those exhibited by such a remarkable man of science as Newton. He had even despaired of being comparable to his own predecessors, A. M. Fisher and M. R. Dutton; yet he had stated his firm conviction that he could be a sound philosopher and a teacher of science.

His belief in the sufficiency of "common sense" was one which characterized his time. It was a belief very compatible with the Protestant view of the right of every Christian to read and interpret the Bible for himself, a compatibility that Olmsted had pointed out in the Preface of his Letters.:

- to discover the great truths of astronomy has required the highest efforts of the human mind, yet the truths themselves, when once discovered, are easy to be understood, being, in general, characterized by a high degree of simplicity; [they] resemble those of Divine Revelation—so simple as to be intelligible to the ordinary capacity, but so comprehensive as to fill the largest intellect.

Before Olmsted launched into his discussion of the Plurality of Worlds, he had one final caution for his readers. Men readily believe any doctrine which is supposed to be favorable to their religious faith, or to their settled opinions on any other subject, and as readily reject what is subversive of such opinions. When a writer like the author of "More Worlds than One," pronounces the doctrine he is defending to be "the hope of the Christian and to be embalmed in the warmth of the affections," we recognize a state of mind unfavorable to sober augmentation.
With these preliminaries cared for, he immediately entered upon the main question, Are the planets inhabited?, beginning with some facts "unfavorable" to the doctrine. These included the extremes in temperature and light intensity that were undoubtedly encountered at distances so close to the sun as in the case of Mercury, and so far from the sun as in the case of Jupiter. Weight variations on the widely-different planets and the probable absence of water and air were also cited. He summarized his view as to the significance of these facts as follows:

The telescope, it must be acknowledged, has added nothing to the amount of evidence in favor of the doctrine that the planets are inhabited; it has in fact greatly diminished that amount, since the points of dissimilarity to the Earth, which it has revealed to us, have increased faster than the points of resemblance. 557

"But there are some things favorable to a doctrine of a Plurality of Worlds," he insisted. The first "thing" he cited was the "uniformity of plan observable in all the works of nature. . . ." The phrase "of plan" is significant. The chemist, for example, discovers the plan in analyzing the components of water and "confidently asserts," that the same proportions of hydrogen and oxygen exist everywhere water exists. The anatomist expects the mechanism of the eye of every animal to be "similarly adapted" to the properties of light. The same fixed, mathematical laws that govern the earth-moon system likewise apply to Jupiter and its moons, the
solar system at large, and "as we might have anticipated" to binary stars. Indeed, "all analogy" gives strength to the same conclusion: that in the structure of a system near us, say, Jupiter and its satellites, we "actually see the pattern according to which all the systems in the world, and the Universe itself, are framed."

Olmsted meant this latter statement in quite a literal sense. In 1846, guided by an analogy with the solar system, the astronomer Johann Heinrick von Madler had published his theory of a "Central Sun," about which all the stellar bodies of the Milky Way Galaxy allegedly revolved. Olmsted lectured on this topic in his classroom that very year. His notes contain the marginal entry: "I have taught this doctrine many years,. . . ." For him, this belief was based principally upon analogy. Though Madler's doctrine of a central sun was soon rejected by other astronomers, the analogical reasoning upon which it was based retained a respectability. For example, the historian of astronomy, Robert Grant, wrote in 1852 that though recent researches had "fully established" that the sun was advancing "towards a determinate point in the heavens, it would be inconsistent with analogy to suppose that the motion will always be directed towards the same point. . . . it is impossible to avoid the conclusion that the path traced out by the sun is in reality curvi-linear."
"Upon such a uniformity of plan," as that exhibited in the various parts of the solar system, Olmsted continued,

we predicate a uniformity of purpose; and can hardly resist the inference that a series of bodies linked together by one and the same bond, (the law of gravitation,) and distributed into families under precisely the same regulations, were designed for the same end. . . we are almost impelled to the conclusion that the other [planets] . . . were designed for the same purpose as the Earth.

A few pages later, he averred that "in the economy of nature, uniformity of plan implies identity of purpose." 560

Although, from the twentieth century, it seems clear enough that his predication of a uniformity of purpose rests strongly upon a metaphysical belief (in his case, almost certainly a religious belief), he himself denied the charge. "Nor is it necessary to build this conclusion on any view we entertain of the wisdom or benevolence of the Creator," he confidently asserted. "The mere naturalist would and does declare his conviction, that Nature, when she links together her productions by mutual bonds, and subjects a certain number composing such a group to the same laws, designs them for the accomplishment of the same ends." 561

Regarding this statement, two points are worth noting. First, he had capitalized the word "nature." Although he himself probably did not attach to that fact any deep significance, it suggests the following comment. "Nature" with a capital "N" would more easily
carry the connotation of personality, and without that connotation, the statement about Nature's designs for specified ends is nonsensical. 562

As for his assertion that his conclusion presupposed nothing with regard to attributes of the Creator, it is an interesting fact that in his classroom lectures in 1829-30, he had cited three sources of evidence to substantiate his belief that the planets are inhabited. The very first one was "The Wisdom of the Creator." He had told his students that the "creation of the greatest possible number and variety of percipient beings, adapted to the various conditions which would be requisite in the different Planets, manifestly exalts our ideas of the Wisdom of the Creator." After that time, he treated the subject in his textbooks, popular lectures, and classroom lectures, but in no other case has it been found that he used the Wisdom of God as an explicit argument in favor of the Plurality of Worlds. In view of his frequent mention of religious matters in his lectures, and his personal religious beliefs, it is unlikely that he omitted this argument because he deemed it invalid. Rather, he apparently judged it unnecessary; confident that the "facts" would speak for themselves. 563

Having insisted that uniformity of plan leads to uniformity of purpose, and with the knowledge that the planets of the solar system are obviously built on the same plan, Olmsted believed that he could
readily determine the purpose of the planets, provided only that the purpose of any one could be certainly ascertained. The obvious choice was the planet which was most available for inspection, viz., the earth.

Professor Olmsted thought the "great object" for which the world was created was "very evident." No matter where on earth one might look, it was teeming with life. A closer inspection (i.e., with a microscope) revealed life abounding on every leaf, in every drop of water, in the air; evidence of its past abundance permeated the strata of the earth itself!

That the geological changes which have taken place on the surface of the earth, resulting in the formation of soils; the diffusion of water so as to be accessible everywhere; the diversified and ample stores laid up and constantly replenishing in the vegetable kingdom; atmospheric air by its elastic properties penetrating every retreat where there are respiratory organs to inhale it; the sun shedding upon all his light and heat; that these all and severally are so many express adaptations for the multiplication, sustenance, and happiness of the animal creation, are facts so obvious as scarcely to require any argument. But the meaning which they express is plainly this—that life and happiness constitute the grand leading objects for which the earth was made. 564

Note that his argument on this particular point consisted largely of an enumeration of the evidence of life on the earth, followed by an assertion as to the undoubtable adaption of each life-form to its particular niche, and then a bold statement of "facts" which hardly "require any argument." There are several reasons for the
remarkable character of the argument on this point. In the first place, he was not writing primarily for infidels. His intent was to settle an issue between Christians. It is probable that his statement of "facts" was readily acceptable to the bulk of his readers without any need for argument. His failure to substantiate these "facts so obvious" simply indicates the extent to which the teleological argument was a part of the prevalent world view. Secondly, there is no logical way to infer the "facts" that he asserted from the evidence alone which he presented. Therefore, he could scarcely do more than assert them. Thirdly, the "facts" he asserted were merely preliminary to a more specific conclusion on which he would place more emphasis, and thus, the bulk of his arguments were reserved for this more important conclusion. An additional point of significance is this: without hesitation, he asserted the meaning of these "facts," that life and happiness were the "leading objects" for which the world was made. This lack of hesitation illustrates his confidence in the legitimacy of inferring meaning from the particulars "found" in nature. In turn, the meaning which he inferred presupposed (with no attempt at justification) that the world was made purposefully.

In Olmsted's opinion, but a single step remained, and the case in favor of the Plurality of Worlds could be made strong indeed.
That step was to demonstrate that the world was made for man. But that very step he had taken in an earlier essay, some five years before. That essay, in turn had roots which can be traced back another five years!

It was in November of 1843 that Professor Olmsted had received a letter inviting him to give a series of six lectures on astronomy at the Brooklyn Institute. He had agreed to do so, prefacing the series with an introductory lecture "On the Pleasures and Advantages of the Study of Astronomy." In this introductory lecture, he had announced "A new theory now brought forward for the first time, viz., 'that at the beginning of the world, God made many things prospectively, which were to be kept in reserve to be brought out at successive stages of society, corresponding to its different degrees of advancement'." Few things, he continued, had been created "in readiness" for man. Unlike other living things, man had played a significant role in choosing his food, clothing, habitation, and medicine. Man alone had been able to harness the powers of nature, and man alone could appreciate the beauty of nature's productions. By implication, the world was made for man, but he did not so assert (at least not in his notes, on which the above comments are based). 565
Little more than a year afterwards, he presented a "new" lecture to his seniors at Yale, embodying "for the first time" in a discourse his thoughts on the "Riches of Nature." Convinced that few persons adequately appreciated either the beauty of nature of the utility of its powers and productions, he presented specific examples of each to his students. Following these examples, he outlined his previous theory of a prospective creation. At the time, he recorded in his journal his judgment that, with a little alteration, the lecture might make a good one for a popular audience. There is no indication that he ever gave it as a popular lecture, but several years later, he agreed to write for the New Englander on the "Riches of the Natural World." Poor health, drowsiness and a prior period of literary inactivity conspired to slow progress on the essay and Olmsted finally terminated it in mid-June with a detailed examination of the "Remarkable Properties of Water"—the substance of yet another lecture he had given to the seniors back in 1843. He promised his readers to return at a later date to the bearing his remarks would have on the sentiment that the world was made for man. 566

It was some four months before Olmsted found time to begin work on the promised sequel. Work on the essay proceeded slowly and engendered "much reflection" on his part, as he wished all points to be settled to his satisfaction. He did "considerable
research," consulting "Pritchard on the Natural History of Man, Buckland's and Lyell's Geologies, Roget and Kidd's Bridgewater Treatises, Agazzis Zoology, Kirby and Spence's Entymology and various other works. . . ." He became so engrossed in the subject that he seriously considered writing a school book to be entitled "The Riches of the Natural World" or "General Views of Nature." On completing his essay, he noted: "I have spent on it a great amount of thought. . . . I suppose it to contain a good many original ideas. . . ." He had 200 copies struck off, which he sent to his friends "in different parts of the country." He was gratified that Dr. (William?) Tully, who had the reputation of being a "pretty severe critic," was favorably impressed by the essay, declaring Olmsted's argument to be "conclusive." 567

In "The Plurality of Worlds," when Olmsted first mentioned his previous essay ("Thoughts on the Sentiment that 'the World was made for Man'"), he insisted that this prior essay had been written "without any view to the bearing" it might have on the "subject now before us." The sequence of events beginning in 1843 which have just been traced give little cause to discredit his assertion; indeed, they tend to substantiate it. Nevertheless, this is not to say that Olmsted did not use a general "world-made-for-man" argument for the Plurality of Worlds before the time of his essay in 1854. Even
in his classroom lecture in 1830, he had argued, "...when we see so small a portion of the Creator's empire as the Earth, teeming with percipient and rational beings, shall we say that his beneficent works stop here; or that they extend to other worlds? Surely they extend to all parts of his dominions." In his popular lecture series at the Brooklyn Institute in 1843-44, where he had first presented his theory of prospective creation, he had also addressed the question of the habitability of the planets. He came out in favor of the doctrine, and his notes sketch arguments which could scarcely be more explicit, viz., "Kind of beings--Rational--this world made for man--... " In the published outlines of his classroom lectures on astronomy with regard to the same topic (dated 1847 and 1852) the following phrase was printed: "...Man the great purpose for which the world was made." In the margin of his personal lecture notes (i.e., his "Professional Journal") for 1847, he had written, "The world man's noble heritage."568

Obviously, the doctrine that the world was made for man was to play a crucial role in the analogical reasoning whence Olmsted was to decide on the question of the Plurality of Worlds. He had spent considerable effort and time in establishing the former doctrine and now in the present essay, he thought it important enough to devote several pages to a sketch of his previous paper, quoting at length one extended paragraph which summarized the argument. A
brief consideration of this earlier paper will provide additional insight into the way in which Olmsted merged his religion with his science.

In this earlier paper, Olmsted had made reference to Professor Buckland, who, in his Bridgewater Treatise, had admitted his own reluctance to suppose that "all the great geological phenomena...were conducted solely and exclusively with a view to the benefit of man. We may rather count the advantages he derives from them as incidental and residuary consequences..." Olmsted had long thought otherwise. Back in 1827, he had referred to these geological revolutions as "designed...to prepare the earth for his [man's] habitation." He strongly believed that the world was made for man, but now he proposed to examine the doctrine in "all the lights of modern philosophy," not satisfied to accept it as a mere "impression," 569

First of all, it was evident to him that the powers of nature (viz., heat, gravity, electricity, magnetism, light) were made principally for man. The animals related to these powers in a merely passive mode, while man kindled fires to warm himself and to drive his engines, harnessed the waterfall to turn his machinery, tamed the lightning to carry his messages, used the compass to navigate the trackless seas, and utilized light to view with microscope and telescope all of God's creation.
In the second place, the productions of nature were made for man. For whom, but man, were the quarries of marble formed, the mines of copper produced, the beds of salt laid down, the deposits of diamonds reserved? Among the specimens found in the vegetable kingdom, man had discovered savory dishes ranging from the lowliest species such as algae to such delightful fruits as apples, cherries, oranges and pineapples. While, of 90,000 species of plants, only grass was provided for cattle and seeds for birds, man had an incomparable variety. Furthermore, to man exclusively, the vegetable kingdom offered cotton for his clothing, timber for his furniture, medicine for his diseases, and spices to gratify his tastes.

The case of the animal kingdom required Olmsted's special attention. While writing the essay, he had thought it "a matter of considerable difficulty to give a satisfactory answer to all the objections" that might be urged against his proposition that animals, too, were made for man. Again, Professor Buckland was among those who had been unwilling to subscribe to such a proposition. But Professor Buckland, Olmsted suggested, had represented "the relation of the animal kingdom to the human family as much slighter than it really is." 570

"...It really is," were Olmsted's words, by which he undoubtedly meant the actual truth, the existent reality, the facts of the case. But his subsequent remarks clearly show that to him, "it
really is," meant not simply the facts already uncovered, but those anticipated by "all analogy." For example, civilized man had chosen, for the most part, to confine himself to the utilization of a small number of animals, but "nature has prescribed no such limits." Nor could any adverse inference be drawn from the fact that wild beasts occupy such a large part of the earth. "They yield the jungle and forests to man as soon as he requires them for his purposes... and many of them, when tamed, not only submit to his authority, but... exhibit for him a strong affection." Who could doubt that man would at last become "the rightful heir and proprietor of all?" 571

More serious objections might be raised, he thought, with reference to the usefulness to man of insects, venomous reptiles, animalcules, and "especially the fossil animals." As for insects and reptiles, a limited view of the economy of nature might regard them as enemies of man. But man, with his current knowledge of these creatures, was in a position not unlike that of the Savage with respect to the powers of nature. With what fearful awe must the Indian have viewed the mighty, roaring Niagara, threatening to hurl him to destruction! Yet, man had learned to harness what at first he mistook for his enemy. A similar progression could be displayed with regard to the relationship of man to lightning. But, of course, better than these arguments of general analogy were the actual
examples of discovered uses for insects, such as their agency in the
disposal of decaying matter. In any event, man's current ignorance
must not be allowed to stand in the way of the belief that all parts of
creation were useful—a belief which had proved its fertility
repeatedly in the past. 572

Turning to the animalcules, Olmsted admitted that present
knowledge of them was indeed small, yet "such is the uniformity of
plan and of purpose in the works of creation," that one could safely
infer the properties of these "... as mathematicians determine the
value of any term, however remote, of an infinite series, by having
ascertained from a few of the first terms the law of the series, and
as astronomers apply the law of gravitation to the remotest
nebulae." 573 His analogies here are interesting. Though the
principal purpose they serve is illustrative, a subsidiary function is
to instill confidence in the legitimacy of inferring properties yet
unobserved from a uniformity of plan in nature. But notice that the
properties to be inferred are not physical properties, but "proper-
ties" of final cause. From that perspective, the illustrative exam-
ples exhibit a striking difference from the case of that which they are
intended to illustrate. Inferences about the value of a term in a
mathematical series from the rules of the series, or about the
applicability of the law of gravitation to the remotest nebulae
presuppose nothing about purpose. An inference about the purpose
of an animalcule is fundamentally different, a difference which Olmsted either failed to recognize or chose to ignore.

As a second consideration with regard to animalcules, Olmsted noted that in the wonderful plan of nature, "each humbler term sustains a higher. . . . Grant that whales were created for the benefit of man, and it follows that the humbler beings on which he feeds were also made for man, . . . and so on to the lowest animalcule." Furthermore, one "manifest design" of the multiplication of animal life was to fertilize the earth. As the soil became richer, vegetable life became more luxuriant and decaying vegetables united with the remains of animals to enrich the soil even more. "That such is the office of insects and animalcules, is an idea strengthened by the fact that certain vegetables are furnished with apparatus expressly designed to entrap insects, and thus to appropriate them to their nourishment and growth." 574

This last example well illustrates the workings of his mind. It is conceivable that by this example, he meant to demonstrate that, from the standpoint of physiology and chemistry, animals could serve as nutriments for plants. He does not elaborate as to his intention, but it is more likely that he was interested in establishing in this case the purpose which animals served. Implicit in the argument is the concept of an all-wise Creator whose plan has been discovered in one instance from which his plan can be easily
inferred in instances yet undiscovered. A more striking illustration of this interdependence of animal and plant life was furnished by the complementary respiratory needs of animals and plants. To maintain a constant proportion of constituents in the atmosphere, said Olmsted, it was necessary to maintain a constant proportion between animals and plants. In a future age, as humans spread over the earth, he predicted a compensatory decrease in the number of inferior animals.

There remained only one difficulty concerning the productions of nature to be discussed, viz., the relevance of fossils--"the most formidable [difficulty] of the whole." In treating this issue, Olmsted invoked his theory of a "prospective" creation. Referring again to such things as steam, magnetism and electricity, he pointed out how these powers (ever latent in nature) had recently been put to use by man. "Nothing is more evident," he wrote, than that God had created many things "to be brought out at different periods of the world as society arrived at different stages of advancement." He suggested three important ways in which fossils had fulfilled their purpose, viz., by forming immense deposits of coal, by contributing to the formation of the soil, and by providing "stores of fossil manures in vast deposits of shells and marl." Having demonstrated to his own satisfaction that the powers and all the productions
of nature were made primarily for man, he proceeded to his next point, which was that the world of beauty was "created exclusively" for man.

Olmsted was a lover of the beautiful. In 1833, as a citizen of New Haven he had served on a committee organized to improve the architecture and scenery of the city and had personally contributed time and energy to the project of beautification of the Grove Street Cemetery. Soon after he moved his residence to York Square, he had submitted a plan of improvement to the "Trustees of York Square" which called for the creation of a little park, with a "pretty" wooden fence enclosing a "rich turf" interspersed with a variety of evergreen and flowering trees. To beautify his own yard, he employed a gardener. An appreciation of such beauties, of course, was not an ultimate end in itself; in these beauties of nature, he discerned the goodness of God. 576

He had often shared with his students the beauties uncovered by science. A substantial fraction of his experimental lectures on optics was devoted to an examination of objects of nature such as a spider, the wing of a fly, and the dust of a fig with the help of a microscope. The intricacies of these objects were in sharp contrast to works of art such as muslin and yarn. He had also displayed to his class the wonders of the solar spectrum inserting in the path of the prismatic beam various combinations of glass tubes and
wine-glasses, which exhibited "new ideas respecting the riches of the solar beam, and new impressions of the boundless resources which nature has in this beam for adorning and diversifying her works." He had even shared these demonstrations with his colleagues at the meeting of the American Association of Geologists and Naturalists in 1844. He told his students at Yale, "Nature reveals new beauties to her votaries," and these beauties he thought inexhaustible. A careful observation of nature would reveal "a thousand beauties" concealed from the "careless observer." Hence, the value of detailed, specialized research. In his essay, "World for Man," he insisted that one might pick an object almost at random and find beauty there, and to prove his point he described the elm outside his window, "not indeed the best example we could find in nature," but nonetheless a worthy specimen. The grace and symmetry of its overall form, the serrated edges of each leaf, even the bark and heartwood exhibited marks of beauty. A closer look at the same leaf with the microscope produced new revelations of beauty.

But the desire of the Creator to make his works interesting to man was not only apparent in a closer view of those works. As one ascended a mountain and surveyed the scenery below, a point was reached at which all became "obscure and indistinct"; beauty was replaced by sublimity. The absence of all beauty elicited in
man a more solemn emotion and a "higher gratification than the finest displays of beauty itself."
Thus, the sublime was another striking evidence of the Creator's purpose! "It is the human mind alone," Olmsted wrote, "that has a set of faculties adjusted to the beautiful and sublime of the external world, and the inference is plain, that it is for man alone that the creation was so highly adorned." What a privilege for man, the sole creature on earth so blessed, to enjoy, with God himself, these exalted pleasures! 578

The world of "art" was his next point of discussion. Many of God's creatures possessed instincts, but man alone exhibited that inventiveness which "forms the groundwork of art." Olmsted gave two examples to display the remarkable fecundity of the productions of art, viz., the manufacture of iron and of glass. The latter substance was, barring a crude approximation found in lava flows, "purely a production of art." The remarkable properties of glass, many of which he enumerated, gave rise to a multitude of uses for glass, ranging from windows to electrical insulators. The former substance (iron) occurred in nature in a rather useless state, and it was only by man's ingenuity that its utility was brought to light, railroads and ships of war being two notable applications. Olmsted thought it remarkable that Providence had so ordered the world that things so essential to man's advancement in the arts and science were
carefully concealed. It was almost as if the Creator had done so "on purpose to stimulate our researches into nature." Such a thought was certainly consistent with his theory of a prospective creation. Man could thus become a "co-worker with God in the natural as in the spiritual world." God had hidden steam in water, gas lights in coal and resin, leaving to man the discovery of these useful facts. The "high prerogative" committed to man" of carrying out the designs of the Creator in establishing the relations of things, in forming new compounds, and in exalting the qualities of the productions of nature," was just one more evidence that the world was made for man. 579

At this point, several incongruities in Olmsted's argument may be noted. In the first place, he exhibits a remarkable agility in accommodating whatever facts he chooses to his own purpose in demonstrating that the world was made for man. Thus, where the beauty of nature is most apparent, i.e., under the powers of the microscope, he contrasts this with the works of art, viewed under the same instrument, concluding from that contrast that God is a lover of the beautiful and has made things beautiful for man. On the other hand, where the beauty of art as produced by man rivals that of nature, he draws the same conclusion, presumably from the inference that God purposed that man use the productions of nature for that end. Where beauty is absent, i.e., where sublimity begins,
man's appreciation of this scene demonstrates God's purpose there. It is hard to imagine any circumstance from which Olmsted could not argue his thesis that the world was made for man!

In the second place, his example of war ships as illustrating the utility of iron and hence the Providence of God is curious. Of course, the question of the morality of war has long been an involved one, even among Christians. Yet Olmsted's willingness to use ships of war in his argument betrays at best a carelessness not in keeping with his earlier comment regarding the care he had bestowed on the essay; at worst, it indicates a willingness to justify what is as being in keeping with God's purpose. Though this latter position is probably not a necessary inference of the Calvinistic doctrine of predestination, it is easily seen how it might be a plausible extension of that doctrine.

There are also problems with Olmsted's assertion that "... if we suppose that all those parts of the natural world which are auxilliary to human art, were expressly designed by Providence for that purpose, this is but to acknowledge that the greater part both of the laws and the productions of nature, were made for man." First, he simply "supposes," with no attempt to justify this supposition, presumably because it is so obvious. Thus, he is again found in the position of asserting at the outset a portion of what he is
attempting to prove. Furthermore, "supposing" the productions of nature so designed by nature leads to examples of speaking for God which (in the light of current knowledge) are nothing short of ludicrous. For examples, "it cannot be doubted," Olmsted declared, "that the Creator designed combustible substances for burning—the trees of the wood and the vast deposits of fossil coal, to supply our fires; . . . . It cannot be doubted that the Creator designed steam for the manifest purposes to which it is now applied—. . . machines. . . steamboats. . . locomotives." In an earlier essay, he had set down the following rules, with an example included:

> Whenever a singular and remarkable property is observed in any substance, natural or artificial, it may be inferred that extraordinary effects will one day be performed with it. Thus it might safely have been asserted that a substance so elastic, so tough, so impervious to air and water, as India Rubber, was never intended by Providence merely to rub out pencil marks, which was the principal use to which it was devoted until within a short period. 581

Another emphasis in Olmsted's article, "World for Man," concerns the uniqueness of man in relation to all other parts of creation. Such an emphasis was perhaps inevitable in a paper designed to establish the doctrine that the world was made for man. Another factor which likely contributed to this emphasis was a response to such developmental theories as that proposed by Robert Chambers, whose _Vestiges of Creation_ is mentioned (though only quite incidentally) in Olmsted's essay. Indeed, one
sentence by Olmsted is too pointed to be misunderstood: "man sustains a totally different relation to the eternal world, from that sustained by all the inferior animals; and he is not to be regarded as the last member of a series—the last link in the chain of development—but as a being wholly severed from all the other beings of this earth, as well in his position here as in his immortal destiny."

The approach that Olmsted chose to substantiate this latter claim further accentuates his own beliefs. He stated that he would not insist upon the "facts": that of all the animal races, man alone consisted of a single species; that, anatomically and physiologically, man was distinct from the other animal tribes. Instead, he would leave such matters to "professed writers" on the natural history of man. Nor would he argue from man's gift of reason, his imagination, his speech capabilities, and the uniqueness of his hand. Rather, he would rest his proposition of the uniqueness of man upon the "facts" which he had already presented, showing man's dominion over the great powers of nature, his pre-eminence with regard to the productions of nature, the prevalence of beauty and the sublime in nature, and man's ingenuity and inventiveness in the world of art.
Olmsted's willingness to leave to those writing on the natural history of man their own pronouncements on its bearing upon an issue which had a marked importance to him betrays an optimistic belief that their conclusions would agree with his own, a trust in the sufficiency of science and its methods to uncover truth. Elsewhere he had exhibited the same belief. "...in science as in morals," he had written, "the pathway of truth is easy and simple, and grows continually plainer and plainer, while that of error is thorny, and, as we advance becomes at every step more and more complicated." 584 To illustrate his point, he had cited the simplification and cancellation that frequently attended the correct solution of a mathematical problem. In his article, "World for Man," he had confidently proclaimed: "Nothing is more evident to the student of nature than that God from the beginning, created many things prospectively, ..." 585 In a later article, he was to report, with assurance:

The inquirers into natural phenomena are learning to think that there is nothing "lawless" in Nature, since whenever she is interrogated with precision, her responses are equally precise; and so often has it appeared that events of the natural world which were deemed the most capricious, are essential parts of an established order of things, that it is as good philosophy as poetry to say, that not a dew drop glistens, or a leaf trembles, but helps to fulfill some grand design. 586

From personal experience, he could say that the "diligent student of Nature, particularly in the department of Chemistry and Natural
Philosophy, will feel...a constantly increasing conviction" of the truth that the world was made for man. Relying on a conviction of the inherent "harmonies of truth," a conviction strengthened by such discoveries as Neptune and undergirded by a belief in the Judeo-Christian Creator-God, he could scarcely believe that "facts" in other areas of science might contravert his own conclusion, even if that conclusion was primarily a religious one. 587

Having completed the extended, digressive discussion of Olmsted's "World for Man," we shall return to "The Plurality of Worlds," at the point where Olmsted had invoked the conclusion of the former essay. With that former conclusion in hand, the inference that "remoter worlds are also the abodes of life and intelligence" was almost irresistible to him. But he pointed out an alternate route leading to the same conclusion, viz., the consideration that "in nature all things have their use." This principle, he noted, had been gaining strength as knowledge progressed, as the fields of anatomy and electricity amply illustrated. By implication, the principle was based on facts apparent to all. He asserted that the truth of the principle was "more striking in respect to systems of bodies, than to individuals," citing the parts of the human body as an example. From the undeniable "system" of the sun and planets, he inferred that each member had a useful function to perform.

Likening the solar system to the American government, Olmsted
mused:

...if the planets are barren wastes where there is no life to animate and no capacity for happiness, the least we can say is, that, in this respect they present to us a totally different view of the economy of Providence from that which is everywhere set before us in this world. They would present the anomaly of cities without inhabitants, ships without sailors, warehouses without merchandise. \[588\]

His argument on this point is very weak. Invoking a resemblance between the American government and the solar system is surely stretching to the limit any just sense of analogy. Perhaps one might grant him the benefit of the doubt and interpret his intent in that case to be merely illustrative, not argumentative. But the only other specific analogy he mentions, that of the human body, is scarcely on a sounder basis. Indeed, one might argue that as the various parts of the human body complement one another by performing different functions, all subservient to the good of the body itself, so the various planets might be expected to have different functions in fulfilling the grand purpose of the solar system, which (one might grant) is the happiness of mankind. Thus, it seems that, depending upon what conclusion one desires, the argument might readily be turned to substantiate that conclusion. In any case, his entire argument from the principle that all things have their use suggests a strong, prior disposition on his part and is not (as he implies) an independent means of reaching the same conclusion.
Instead, the conclusion must be almost built-in at the outset. Furthermore, the line of reasoning is implicitly based upon his previous principle, viz., that uniformity of plan implies a uniformity of purpose. His discussion of the "use" principle implies more than the belief that all things have their use. There is also a confident spirit that that use can be readily discovered and the tool requisite to the task is analogy. Yet it is an especially rigid analogy, arguing from a uniformity of plan to an identity of purpose, not to mention the additional difficulty that the entire argument hinges upon a certainty with regard to the purpose of the earth.

Professor Olmsted was, of course, well aware that direct observational evidence of life on the other planets was far beyond contemporary, telescopic capabilities. Still, he was pleased to be able to cite indirect observational evidence of life on Jupiter in the special contrivance apparent in the arrangement of its moons. The moons were very small, and their orbital plane was such that eclipses were frequent, yet they were arrayed in a "strictly mathematical" configuration which excluded the possibility of the simultaneous eclipse of all of them. The purpose as well as the implication of this arrangement was evident to Olmsted. Arguing from the economy of nature, he stated that "a specific arrangement on the planet Jupiter to husband the light and turn it upon the planet, implies the presence of eyes to behold it." We could hardly be more
certain of the presence of water when we see at a great distance a
ship under sail." 590

As Olmsted well knew, the validity of this argument would
have been denied by Laplace, who would not even admit that the
earth's moon was made to give light at night. Laplace had reasoned
as follows. Under the present arrangement, the earth is often
deprived of light from the moon at night. Had it been the purpose
of the moon to provide light, the end could have been easily achieved
by placing the moon in opposition to the sun at a distance from the
earth approximately one hundredth the earth-sun distance and by
giving the earth and the moon appropriate initial velocities. Pro-
fessor Olmsted had transcribed the relevant passage from Laplace's
System of the World into his own "Professional Journal." He had
included some rough calculations of his own which demonstrated to
his satisfaction that Laplace had not thought through his suggested
improvement very thoroughly. In the first place, placing the moon
where Laplace had suggested (i.e., at roughly four times the
present distance from the earth) would decrease the average light
by a factor of eight. Worse still, the tidal force would be reduced
by a factor of 64, resulting in an altogether-too-small tidal height
to fulfill any of its present valuable purposes, purposes which
Olmsted deemed it unnecessary to enumerate. Finally, no longer
would the lunar method of determining longitude--the great practical
object of Laplace's Mecanique Celeste--be available if the moon were placed where Laplace had suggested. In notes in his "Professional Journal," Olmsted made several additional revealing remarks. "Suppose we make the moon 16 times larger," he speculated. That may take care of the light decrease but will still not entirely solve the tidal problem. The implication, though not stated, seems clear. The world that God made is the best of possible worlds and modern science supports this belief. "We shall still believe, therefore," Olmsted wrote in his 1854 essay, "that the moon was made to rule the night [words, of course, reminiscent of scripture; see Genesis 1:16], and shall think it probable at least that the moons of Jupiter were designed for the same purpose; and if so, that there are eyes there to behold the light."591

Olmsted's astronomy text, included the following passage with reference to the moon's annual variation in position. "This arrangement gives us a great advantage in respect to the amount of light received from the moon; since the full moon is longest above the horizon during the long nights of winter, when her presence is most needed." He included a similar remark in the chapter of his Letters, . . , dealing with the arguments which astronomy afforded to natural theology. Clearly, his entire view of nature was strongly teleological! 592
The "same course of reasoning" from which Olmsted had concluded that, with a "high probability," the planets were inhabited, now led him to the "still higher and grander conclusions, that the stars are centres of other solar systems which, like ours, are filled with sentient beings." This thought, too, he had long entertained.

In his popular lectures and in his classroom lectures he had asked rhetorically: Was the final purpose of the stars to adorn the sky? to guide the mariner? to give light by night? None of these answers were satisfactory for him. From the uniformity of plan, the obvious extension of the law of gravitation to distant binary stars, --"from the study of the heavens themselves, independently of all revelation," he inferred that the stars furnished "abodes of life and happiness."

For us, indeed, who dwell on 'this speck of earth,' this seems a bold and adventurous flight; but it is no more so than if the animalcule that feeds on a leaf of a tree were suddenly endowed with reason, and should conclude that all the leaves of the tree were peopled like his own; and then enlarging his sphere of thought, should entertain the grand idea, that the same was true of all the leaves of the forest.

Olmsted was pleased that such a conclusion was "consonant to our ideas of the greatness and wisdom of Jehovah," but "in candor" he returned to the facts he had formerly enumerated as unfavorable to the doctrine of Plurality of Worlds. He would not ignore them; indeed, "we must not deny," he said, "that heat and cold, light and attraction, water and air, have respectively the same properties in
other worlds as here." But, he continued, our bodies were built
with special reference to the conditions found on earth. "There is
nothing improbable in the idea, no resort to mere possibilities. . ."
that the Creator would make corresponding adjustments for beings of
other worlds. Past generations, he wrote, in their ignorance con-
cluded that life could not exist, but in the temperate zone. They
knew little of the ameliorating effects of trade winds and ocean
currents, of the myriad of adaptive contrivances and countless
other examples of the power of the Creator "to establish new rela-
tions between his creatures and the external world." 594

Let us review briefly Olmsted's arguments in the "Plurality
of Worlds" to this point. He had insisted that a uniformity of plan
was evident "in all the works of nature," and that this implied a
uniformity of purpose irrespective of any opinions of God's wisdom or
benevolence. He had presented "facts" concerning the powers and
production of nature, the beauties permeating the world, along with
man's unique relationship to these, from which he had deduced that
the world was made for man. From these considerations, he had
inferred the truth of the doctrine of the Plurality of Worlds. The
same conclusion had followed, he maintained, from the principle
that all things have their use; on the basis of this principle, he had
pointed to the striking contrivance of the arrangement of Jupiter's
moons as corroborative evidence for his general conclusion. He
had then exhibited examples of the remarkable adaptability of all
creation, to contravert the "unfavorable" facts respecting light and
heat, and the absence of water and air. He followed these arguments
with a remarkable statement.

We have thus endeavored to present the evidence for and
against the doctrine of a Plurality of Worlds, so far as the
evidence or reasoning is purely scientific, without blending it
with those moral and religious considerations which have
entered of late so much into the discussion. (emphasis
supplied) 595

It is logically possible that Olmsted's evidence and reasoning
were (as he maintained) independent of moral and religious con-
siderations, but a study of his prior use of this evidence strongly
suggests that, in actuality, his religious beliefs played a significant
role, not only in motivating his choices of topics, but also in guiding
his choice of evidence. In this regard, several points are rele-
vant. The very brevity of his initial treatment of the telescopic
evidence suggests his strong disposition toward the conclusion he
eventually embraced. Another indication of this disposition is his
comment concerning the consonance of his conclusion with his own
ideas of the attributes of God. Finally, when he did reconsider the
telescopic evidence, his references to the "Almighty Power," the
"power of the Creator," and the "resources [of] Providence"
betray a strong personal commitment on his part to a religious
belief despite his disclaimer of that belief being a basis for his conclusion. 596

Furthermore, his argument is suspect by his own "laws of reasoning." He claimed at the outset that an argument from analogy was weakened if the points of dissimilarity increased faster than the points of similarity as two allegedly analogous objects were subjected to closer inspection. Yet, by his own admission, direct observational data of the planets had presented just such a state of affairs. Nonetheless, he had invoked other considerations which led him to embrace the contrary conclusion. Paramount among these was the belief that uniformity of plan implies identity of purpose, a belief (in his case) undoubtedly linked with his religious convictions. To sustain his conclusion, it was necessary to leave the concept "uniformity of plan" in a rather nebulous state, defined by such generalities as the known applicability of the law of gravitation to the other planets, and the existence of satellites for those planets. If, as he intimated, he induced the uniformity of plan from a careful observation of nature itself, one might argue that he "should" have attached more weight to the telescopic evidence which, as he admitted, increased the points of dissimilarity of the planets, because this evidence itself suggested that there was not a uniformity of plan in that case, thus strengthening the case opposing the doctrine of a Plurality of Worlds.
Having dealt at length with the "purely scientific" aspects of the doctrine of the Plurality of Worlds, Olmsted turned to the moral and religious aspects. Indeed, it was these latter considerations which had prompted the books by William Whewell and David Brewster. It was in conjunction with a discussion of Whewell's arguments that Olmsted expressed, almost incidentally, two ideas, each of which held a place of central importance in his own system of beliefs. The first of these is his belief in the progression of knowledge. "The leaven of knowledge," he wrote, "operating at first on a portion, finally pervades the entire mass, such, we think, is the destiny of the human race."597

Soon after taking up the duties of his professorship at Yale, Olmsted had volunteered to give a speech promoting science. He had spoken before the φβΚ society on the "Progressive State of the Present Age," citing examples from the science and the arts consonant with the theme that tremendous advances in knowledge had occurred since the turn of the century and that more could be expected. He had encouraged his hearers with the happy thought that, through their efforts, they might hasten that "glorious consummation" predicted by the prophet Isaiah. Over the years, he had not lost his vision of what science would do for mankind. He had promoted it in the classroom, in the popular lecture hall, in the newspaper, and in the community. Though among the "privileged
few" who had been admitted to the "inner temple of knowledge, to behold her glories and to feast on her riches," he had no desire to maintain this aristocratic state of affairs. 598

In the ordination sermon for T. D. Woolsey (preached in 1846), Leonard Bacon had said that the "immediate aim of Christianity--...is the recovery of lost degraded men to the knowledge and service of their Maker...it seeks to bless not the few, but the many--..." 599 That was the sermon which Olmsted had wanted to review, for he, along with Bacon, believed that the elevation of the many in contradistinction to the few was a Biblical doctrine. Olmsted thought the work had been begun by Moses and consummated by Jesus Christ; that the spirit and precepts of Christianity, fully carried out, would "produce the highest degree of equality among men that is compatible with the good of the whole, and all that the most ardent philanthropy" could desire. But not only was such a doctrine to be found in the word; it was no less to be found, Olmsted maintained, in the works of God. The "diligent student of Nature" found it to be increasingly evident as he advanced in his knowledge. What all mankind "possess[ed] in common,...[was] more truly noble"; all breathed the vital air and were exposed to the same world of beauty. The sun, the moon, the stars were there for all to see. 600
Likewise, the developments realized by man's cooperation with God would have an equalizing tendency, Olmsted believed. In the fall of 1854, he lectured to the juniors at Yale on the "Democratic Tendencies of Science." He spoke of the equalizing effects of the steamboat, the railroad, the telegraph, and labor-saving devices. But "who invented the steam engine...?" he asked.

Watt, a philosopher, a man of science. Who applied it to steamboats? Robert Fulton, a man thoroughly versed in the science of mechanics. Who applied it to railroads? The scientific engineers of England. Who invented the electric telegraph, by which the country is raised to an equality with the city? It was Morse, a son of Yale. Who invented the cotton-gin, by means of which, not only have the cotton planters been enriched, but every one who wears a cotton garment derives benefit from the invention, in the cheapness of the article? It was Eli Whitney, another son of Yale. 601

Olmsted went on to insist that even those who were pursuing science in the abstract as taught in colleges, contributed to the same end, viz., the elevation of the masses. Behind Mr. Watt was Dr. Black who had investigated the principles of steam; back of Mr. Morse stood Franklin and others who had experimented with electricity; basic to the nautical tables which helped the mariner find his way at sea were the more abstract studies of mathematics and astronomy.

But when Olmsted spoke of science, he had even broader things in mind. Thus, his reference to Morse and Whitney as "sons of Yale" is indicative of more than a mere loyalty to his alma mater; it indicates his loyalty to the educational system for which Yale
stood. Francis Bacon, Olmsted believed, had first pointed out the errors inherent in a narrow education, and the need for a liberal one and Professor Olmsted had long defended this need as legitimate. In 1828, he was part of the faculty committee at Yale whose report to the Corporation resoundingly endorsed the value of a liberal education as the true foundation of a superior education, opposing any "superficial" substitute. Some years later, when it was rumored that a particular class at Yale discounted its importance, he devoted his introductory lecture to the subject, entitling it "On the Great Value of a Liberal Education." He believed such an education was especially useful to the man of mechanical ingenuity and to the businessman, that it was indispensable to the practical man.

In 1850, Olmsted attended Commencement at Brown University in Providence. Afterwards, he was invited to join with the Corporation and the Alumni in a dinner, at which President Wayland outlined his new program of education, designed to supplement (not to replace) the traditional program, with a program for merchants, mechanics and farmers—a program emphasizing flexibility of requirements and practicality of content. After several speeches had been made, Professor Olmsted was asked if Yale would adopt the "new system." Officially, he could only speak for himself, yet he thought he knew well enough the sentiment of Yale. He assured
his audience that anything which would "raise the standards of liberal education and extend the advantage of knowledge to the active professions" would be viewed by Yale with favor. Yale had already organized one department adapted to the wants of farmers and manufacturers. As for his personal sentiments, he had always supported popular education, as any of his students could verify. In fact, it was his "constant endeavor" in his lectures and in his books to "render the principles of science subservient to the arts and purposes of life." 

So, Olmsted believed that "science, in its very nature and in all its forms, . . . tends to equalize the gifts of Heaven, and to produce social equality among men." Nor did he think it accidental that the following associated motives generally influenced those who had endowed colleges: "The cause of useful knowledge, the general elevation of society, [and] the interests of the Redeemer's kingdom." 

The second important (but incidentally mentioned) idea contained in Olmsted's "The Plurality of Worlds" is intimately tied to a predominant characteristic of his writing on natural theology. In opposing an inference that Whewell had drawn from geology, Olmsted wrote: "God saw every thing that he had made, and behold it was very good." Of course, he was quoting the words of the very first chapter of Genesis, where, after six days of creation by God of
light, air, sea, earth, sun, moon, stars, plants, animals, and man, God had pronounced all his created works "very good." 605

Olmsted frequently referred to God's works as "very good." For example, back in 1827, Thomas Dick had written a book on natural theology in which he had asserted that the depravity of man was illustrated in nature by the disordered geological strata, by a host of disruptive phenomena, such as earthquakes, volcanoes and tornadoes, and by the regions of polar ice. Olmsted had objected strongly to this idea, averring that the laws of nature were "entirely benevolent," and were expressly designed for the security and happiness of man. He had found something good to say about virtually all of these items, with special emphasis upon the polar ice, a subject that fell within his area of special competence. Dick's error came from his mistaken notions about ice, Olmsted had pointed out. Rather than being the cause of the cold, the ice in the process of freezing was the means of arresting it. "The shivering Greenlander or Esquimaux ought, therefore, when he hears the forest-trees rending, and the ice groaning around him, to hail with thankful emotions, these agonies of nature as the means which his beneficent Creator, mindful of the lowest of his creatures, has provided to save him from destruction." 606

Olmsted's preoccupation with the good in nature as manifest in his writings on natural theology is understandable, when viewed in the
light of his commitment to religion and the nature of natural theology itself (viz., the study of evidences of the attributes of God as discerned in nature). One of the prominent attributes of God as presented in the Bible is his goodness. In the time of the Israelites, when Moses asked to see God, the answer was given: "I will make all my goodness pass before thee. . . ." "And the Lord passed by before him, and proclaimed, The Lord, the Lord God, merciful and gracious, longsuffering, and abundant in goodness and truth, . . . ." (Exodus 33:19; Exodus 34:6). In the New Testament, God's goodness and his love are treated as virtually synonymous, and surely the dominant theme of Christianity is God's love, particularly as exemplified by the life and teachings of Jesus. With such a Biblical emphasis, it is not surprising to find writings on natural theology preferentially dwelling upon the good.

But there is an even more specific tradition among the Biblical authors emphasizing the good in nature. Thus, after a brief survey of the works of creation, the Psalmist exclaims: "O Lord, how manifold are thy works! in wisdom hast thou made them all: the earth is full of thy riches" (Psalm 104:24). In another passage, he writes: "The heavens declare the glory of God: and the firmament sheweth his handiwork" (Psalm 19:1). Of course, the tenor of such passages of scripture is clearly poetic; the overriding purpose is the glorification and praise of a Creator whose existence and attributes
are never doubted. It is not evidence offered to corroborate an otherwise uncertain conclusion, but an exercise in worship.

In Olmsted's writings on natural theology, there is evidence of a spontaneity which would suggest that his principal motive was also one of praise. Such instances would include the article "Thoughts on the Revelation of the Microscope," (see especially the concluding paragraphs). Likewise, at the conclusion of his class lectures on astronomy (presumably throughout the years 1847-1858), his remarks suggest a similar intent. Nevertheless, such an emphasis upon the "good" in nature produced a concomitant inattention to the "bad" in nature, an inattention somewhat at odds with a Biblical doctrine which is the underlying assumption of Christianity.

Of course, Genesis does record an assessment of creation which includes the words "very good." But within two chapters, there is an acknowledgement of a serious problem—the fall of man. Indeed, without the fall of man the plan of redemption, the good news of salvation (the great theme of the scriptures), largely loses its point. The spiritual side of man is not the only aspect of God's creation to be affected by the fall. The author of Romans insists that the "whole creation groaneth and travaileth in pain. . ." (Romans 8:22). Even in the Genesis account, the ground is cursed; thorns and thistles are among the results (Genesis 3:17, 18).
Instead of continued "dominion" over the animals, after the fall, man must be protected from them by a "dread" and a "fear" put into them by God (Genesis 9:2).

That the effects of the fall upon nature were substantial, was a doctrine taught by the leaders of the Protestant Reformation. John Calvin wrote of the "evidence of the disorder (ataxias) which has sprung from the sinfulness of man." Luther, in commenting on the "very good" creation, wrote: "All these good things have, for the most part, been lost through sin;" Even Olmsted's former teacher, Timothy Dwight, would not have approved entirely of Olmsted's emphasis on the benevolence of God's laws, of their purpose being for the security and happiness of man and his attendant inattention to the effects of sin. Dwight believed that this world was not designed as a place of happiness, but that it served a probationary function, where men were prepared for another, better country. Still, Dwight would hardly have criticized Olmsted's tendency to view all aspects of life from a religious perspective, and it is this tendency itself which is manifest in Olmsted's preoccupation with the good.

To return to "The Plurality of Worlds," Olmsted concluded his article with a delightful, little parable. Suppose there be a man who had only seen one clock, he fantasized. If he were to tour a clock manufactory, the mere sight of numerous dialplates, properly
marked and equipped with pointers would suggest to him that the instruments were time-pieces, irregardless of variations in size, shape, and color. Upon closer inspection, however, he might find reason to doubt his first impression. Finding one structure with no provision for a pendulum, another with a pendulum but no weights, and a third with relatively few wheels, he might conclude they were unfinished products at best. But such a conclusion would be based on his ignorance of the facts that clocks may be designed (unlike his own) to run without pendula, pendula can be driven by springs instead of weights, and time-pieces might be run with far fewer wheels than contained in his own clock. The application of the parable was simple. "To infer that rational beings cannot exist without water, or vegetables, or air, is as erroneous as to infer that a clock cannot go without a pendulum." 613

From a modern perspective, Olmsted's entire paper is permeated with his religious outlook. He is clearly unable to consider the problem from outside his Christian viewpoint. Nevertheless, the foregoing analysis has failed to uncover any instances in which either the evidence he chooses or the mode of reasoning he employs logically necessitates distinctly Christian beliefs. This result underscores the substantial compatibility of science and religion in nineteenth century America. The "versatility" of religious belief is at the same time emphasized by the fact that the controversy on
the Plurality of Worlds was being carried on with Christians on both sides of the issue.

"Versatility" was not confined to religious beliefs, however. We have already seen that Olmsted's "scientific" principles of reasoning also suffered from this difficulty. Let us return to his illustration of the bee and the eagle by which he intended to exemplify the "correct" procedure in analogical reasoning. As initially stated, it takes on the aura of a semi-quantitative statistical argument, entailing a simple matter of the counting of points of similarity and dissimilarity. But such a procedure would, of course, be unfavorable to Olmsted's own predisposition. Therefore, without indicating such to the reader, he (in fact) preferentially "weighted" certain other considerations. Interestingly enough, these other considerations were at a different level than simple, observable facts and were (of course) completely compatible with his religious beliefs. They were undoubtedly picked with the anticipated answer clearly in mind. Therefore, what Olmsted purported to be a conclusion based on scientific evidence and reasoning (there is no reason to doubt his sincerity on this point), was in fact a foregone conclusion by the preferential way in which he chose to emphasize that evidence.

There is yet another way to illustrate the "versatility" of Olmsted's "scientific" reasoning. He had argued at length that the world was made for man, emphasizing the "prospectiveness" of God's creation as exemplified in iron ore, and the potential expansive
power of steam—things designed for man's use as his knowledge increased. Rather than thinking of the planets as empty warehouses if not filled with percipient beings (as Olmsted chose to do), why not view them as buried iron ore, awaiting some future age when man's knowledge would be sufficient to permit his utilization of these planets—made for man? In that case, one would be led to conclude against the doctrine of the Plurality of Worlds.

Turning to more general considerations, there are several characteristics of Olmsted's natural theology that were in the tradition of the writings of the virtuosi in seventeenth century England. His belief in purpose in nature and his confidence in man's ability to discover that purpose, his rose-colored picture of the world and his preferential concentration upon the good, his praise for an order, not merely discovered but anticipated as well, his homocentric view and belief that the world was made for man, his insistence that this world was the best of all possible worlds, --all these attitudes were prevalent among the virtuosi. 614

Yet there was at least one substantial difference. The writings of the virtuosi exhibited a strong polemical element—-they were waging a war against irreligion, against infidelity, against atheism. This element is virtually absent from Olmsted's writings. Enamored by a vision of his former teacher, Timothy Dwight, as a
successful defender of the faith; refreshed by periodic seasons of revival; surrounded by believing colleagues and friends; caught up in the evident progress of the age; Olmsted was optimistic about the future of Christianity. To be sure, there were occasional disquieting signs—a von Humboldt who scarcely ever made reference to the Creator, or some anonymous writer, suggesting that man was not essentially different from an animal—but the prevalent trend in nature, in art, in science (as discerned by Olmsted) pointed toward the triumph of religion; a triumph in which man was to play an increasingly important role. In the seventeenth century, such confidence in man's ability to usher in a better age was just commencing, but by the nineteenth century, it had built to a deafening crescendo.

In January of 1859, Olmsted recapped the events of the preceding year in his private journal.

The Great Awakening which commenced in the spring and spread rapidly over our land, was one of the most extraordinary events of the year. College was not passed by, but the attention to religion in the Institution was greater than I have ever witnessed except in the revival of 1831. One hundred or more were added to our College Church.

The successful laying of the Atlantic Cable in July, the news of which reached us near the beginning of August was the great political event of the year. The announcement made shortly afterwards through the telegraph of treaties between the Allied Powers and the United States, and China, by which the doors of that vast empire were for the first time thrown open to the civilized world was next in importance.
The juxtaposition of religious, scientific, and political events in Olmsted's account is symbolic of his own unified world view. It was in January of 1859 that Professor Olmsted presented a "new" lecture to the seniors as an introduction to his series on meteorology and astronomy. The introductory lecture bore the triumphant title, "On the Victory of Man over the Powers of Nature." Lord Bacon had said, began Olmsted, that man is the servant of nature. But as man learned nature's laws, the maxim was being reversed: nature is the servant of man! Initially, man viewed the great "Powers of Nature" as his enemies; now he knew them to be his slaves. After remarking on the "Manifest design of Providence" in all this, Olmsted proceeded to enumerate the successive conquests of man. Water, wind, steam, heat, light, electricity: all these had yielded to the progress of knowledge; the last foe (electricity) had become man's greatest ally. As a result of these victories, man had increased the speed with which articles could be produced and the quality as well. Furthermore, with rapid means of travel and communication, man had substantially added to his allotment of time. 617

A rosy picture indeed! Yet Professor Olmsted, true to form, and exercising his parental prerogative as a teacher, ended by telling his young friends that, with the increased powers entrusted to them, there came a great responsibility. His parting sentiment
to this same class two months later was: "The narrow and selfish mind is chiefly intent on the advantage it may gain; the noble and generous soul on the happiness it may impart." 618

That very month, he had an opportunity to impart happiness to a crowd of 800 gathered at New London. The topic of his lecture was a familiar one, "The Structure of the Universe." He prefaced his lecture with a few nostalgic remarks with reference to an earlier time 48 years before when he had first come to New London to be in charge of Union School. The intervening years had witnessed many changes but, he said, "I find solace in looking upwards upon the heavens where all seems fixed and changeless. The same sun . . . the same moonbeams. . . the same stars. . . the same God, immutable, eternal, reigns over all. And I rejoice once more in an opportunity to sow the seeds of knowledge. . . ." 619

Shortly after he had given this lecture at New London, he began to be troubled with alarming symptoms of ill health.

O that I had a more lively faith, [he wrote], more of that confidence in the mercy of God through Christ, which I have witnessed in many a humble believer. Unbelief, or a certain incredulity with respect to the things of the spiritual world has ever haunted me and often led me to doubt whether I have any real evangelical faith. 'Lord, increase my faith,' has long made a part of my daily prayer. 620

These words suggest one more motive for his writings in natural theology. Though a Christian, he experienced periods of doubt and writing on such subjects was one means of increasing his own faith.
The direct evidence concerning his possible motivation for writing the articles for the *New Englander* on natural theology is ambiguous. He referred to his essay "Thoughts on the Riches of the Natural World," (of which his "Thoughts on the Sentiment that the World was made for Man" was a continuation) as one he "had promised" to the editor. Nevertheless, in the preceding year and a half he had written two other essays for the same periodical, and no direct evidence has been found that would indicate whether he was complying with a request or volunteering his services. In his essay dealing with the sentiment that the world was made for man, he did make one off-hand reference to the "Vestiges of Creation," and it is plausible that a growing concern about the impact of this work provided a partial stimulus for this "promised essay." The case for such a stimulus is strengthened by the wording of a significant sentence in his essay. After an extended citation of evidence in favor of the doctrine that the world was made for man, he stated that "man. . . is not to be regarded as the last member of a series--the last link in the chain of development--but as a being wholly severed from all the other beings of this earth. . . ." 621

But an equally interesting fact in this connection is that most of the ideas in this essay as well as his others for the *New Englander* were ideas he had long entertained, and had expressed both in public lectures and in the classroom. Indeed, several of his essays
were based upon lectures he had given to his science students at Yale. Thus, although the arguments and their presentation had doubtless been refined in the course of the years, his writings on natural theology were a continuation of ideas which had been a part of his science teaching for years.

Perhaps there is no characteristic of his writings in natural theology so ubiquitous as his emphasis upon the good in nature. Actually, a moment's reflection upon the nature of natural theology itself will indicate one significant reason for this characteristic emphasis. Natural theology is a study of the evidences of God's existence and his attributes as discernable in the natural world. Although at various periods since the birth of Christianity, the concept of God has been colored by visions of God as a vindictive Judge, the prominent concept of God as taught by Jesus was that God is love (and therefore basically good). From this viewpoint, it should come as no surprise that the tendency of writers on natural theology should be to dwell upon the good in nature. But while this viewpoint has a certain validity, it nevertheless gives an erroneous impression, viz., that the unique emphasis on the good was principally an effect of the nature of natural theology itself. A study of Olmsted's life suggests the importance of another consideration. He was obviously deeply affected by the deaths of his sons. In rapid succession, three sons died in scarcely more than two years.
It was after this tragic sequence of events that he did most of his writing in natural theology. In these traumatic personal losses, he could scarcely have found much evidence for the goodness and mercy of God. But he could look to nature; there, because he was less emotionally involved, he could more easily choose his evidence; there he could more readily ignore the bad and concentrate on the good; there he could "verify" his personal religious belief in a good God.

To strengthen this consideration, note his response, occasioned by the death of Jessie, the wife of his son Lucius. The incident brought back to Olmsted a flood of memories associated with the death of his own first wife and subsequent times of sorrow. In the words of his journal:

I hesitated whether to deliver my lecture [to the class]... But I concluded that it was my duty to do so. I prefaced the lecture by saying that I might excuse myself from addressing them, having the day previous received the painful tidings of the death of a beloved daughter-in-law at Chicago, but that, in previous trials of this kind, to which I had been no stranger, I had ever found the path of duty the path of peace, and that I had derived solace from the study and contemplation of the heavenly bodies, where I continually saw wisdom and goodness at the helm, how dark and mysterious so ever the events of this life sometimes appear. 622

But, of course, Olmsted's entire view of life was a religious one. When his books sold well, when revivals swept Yale, when his children joined the church, he praised God. But even in adversity, when his houses would not rent, when he was forced to expend substantial sums on voyages for his sons, when his health was poor, and
when his loved ones died, he still turned to God. For him, God sent prosperity and God sent adversity, and in some unfathomable way, even the bad was for good. Understandably, such an habitual religious viewpoint (seeing and seeking the good in all) was carried over into his writings on natural theology. The "naturalness" of this emphasis upon the good is further exemplified by noting the way in which he employed the "facts" of science. In his articles in the New Englander, it is apparent that he evidently believed that his conclusions were actually induced from an objective consideration of the "facts." Indeed, though a number of his articles in this periodical are written in the vein of natural theology, he explicitly recognized this to be the case only for the one entitled "The Divine Love of Truth and Beauty as Exemplified in the Material Creation," noting in his journal that it "dips a little into natural theology." 623

On April 30, 1859, less than two weeks before his death, Denison Olmsted made his final entry in his private journal.

Being now exercised with great pain appearing in occasional paroxysms which threaten the immediate extinction of life, I desire to record my gratitude to God for all his mercies which this series of Journals (now continued for more than 20 years) records, mercies to myself and to my family. In view of the uncertain issue of this sickness, I desire to humbly cast myself upon God, humbly to implore his forgiveness of my sins through Jesus Christ, and to express a cheerful hope that, should I be called away, it will be to my Heavenly Father's house, where are many mansions, and where, as I humbly trust, the deceased members of my family are already gathered in a certain house and under the Great Captain of our Salvation, having prepared a place for me. 624
These words illustrate the characteristic of Denison Olmsted's life which takes precedence over all others in an assessment of his activities. He was, above all else, a sincere Christian. His religious viewpoint permeated his teaching of science as it permeated all other aspects of his life, and his writings on natural theology, with their emphasis upon the good, were a natural outgrowth of his world view.
VI. CONCLUSION

An examination of the life and career of Denison Olmsted yields the following conclusions. That he was sincerely religious is scarcely a surprise. He grew up in an environment of which religion was an integral part. His home training, the town of his childhood (Farmington), and his early contacts (John Treadwell, Noah Porter)--all of these strengthened his regard for religion.

His mother's influence was substantial. It was she who sparked in him the desire for a "liberal education"; it was she who urged him to be useful, elevating usefulness to the status of a religious duty; it was she who set for him the grand goal of becoming a clergyman; it was she who encouraged him when he advanced, reprimanded him when he faltered.

An influence of equal importance occupied his attention at Yale. Timothy Dwight, the Defender of the Faith, had already vanquished the Foe of Infidelity. Timothy Dwight, the Ideal Teacher, by precept and example upheld the value of knowledge, the importance of discipline, and the paramount significance of religion. Timothy Dwight, the Preacher of Righteousness, pointed the way toward a bright, new millennial hope, indicating the role of the teacher in hastening this goal. In after years, seldom a day went by when Olmsted did not recall some relevant comment of this
remarkable man. When a chance came for Olmsted to teach science, he accepted, despite his lack of prior training. Though he did his best to be useful at Chapel Hill, his mother continued to prod him to accept his higher calling, and when the opportunity arose, he returned to the "land of steady habits," eagerly grasping this chance to begin again, vowing to be a good teacher and a sound philosopher.

Back at Yale, with renewed determination, he recaptured his former religious zeal. Though he had not become a clergyman, as his mother had hoped he might, still he actively promoted religion: in the classroom, with lectures devoted to the wonders of the microscope and with moral maxims, solemnly stated; outside of class, by his participation in voluntary Sunday evening meetings, chapel services, and Bible Society meetings, and by the tedious, repetitious, but worthwhile signing of autograph books; among the faithful, with various articles relating science to religion; to the public, in popular lectures on scientific topics, frequently ending with religious sentiments; in his family, with family worship and Bible study. In a secondary sense, he promoted religion by his community lectures on temperance, by his biographical works on Timothy Dwight and John Treadwell, by his own religious example and his parental role at Yale.
As a teacher of science, as a popularizer of science, as a researcher of science, as a promoter of science, Denison Olmsted believed that he was also promoting religion. He believed this to be true in at least two senses. First, the knowledge of science would result in a deeper appreciation of religious truth. Truly, "the habitual contemplation" of the "truths of astronomy" would be, he believed, "favorable to spiritual improvement." He was speaking, of course, of the case of a Christian; he was well aware that such "contemplation" would not, of itself, "purify the heart." He himself frequently engaged in this "contemplative" activity, as evidenced primarily in his essays in the *New Englander*, but also in his classroom lectures and in his popular lectures.

The second sense in which he believed that the promotion of science would promote religion involved his "new theory" of 1843, viz., that God had created the world "prospectively." To be sure, the world was made for man, but more particularly, it was made with man's future progress clearly in mind. Therefore, man had the lofty privilege of being a coworker with God, of experiencing, in some humble sense, the exhilaration which must have been God's when He created the world. For God had left much in the world unfinished, waiting for the advancement of man, so that man might creatively bring together new relations of things, form new compounds, and even correct "deformities" in nature. As a
By the progressive discoveries of science, the inventions of art, and the achievements and constructions of industry, God is creating a new earth for the habitation of man and the glory of man's Redeemer.  

Thus, Denison Olmsted promoted science for the sake of religion, looking upon science as a means to an end. His writings on natural theology, with their emphasis upon the good in nature, are best understood as a natural outgrowth of his religious outlook, an exercise in worship, an offering from a grateful heart.

The scientific topics on which Olmsted published his most extensive papers and which demanded more of his attention than any others were the meteoric showers, the zodiacal light, and the aurora borealis; yet, his papers on these topics show no direct influence of his religion. Nevertheless, there was probably an indirect link. Olmsted's belief in a connection between the meteoric showers, the zodiacal light, and the aurora borealis rested largely upon analogy, and his confidence in analogy was affiliated closely with his religious belief, a belief in a God of order whose laws were discoverable by man.

Still, it is (at first glance) puzzling that Olmsted's "scientific" papers contain scarcely the slightest allusion to God or religion. Even though some of these papers consist of little more than the report of a comet or a solar eclipse, some reference to moral
considerations would not have been out of place during the time period, as can be verified readily by a perusal of the volumes of the AJS or the Proceedings of the AAAS. One reason for the absence of explicit references to religion in these papers may be that Olmsted was in this case primarily an investigator, not a disseminator, of truth; and it was in this latter role (i.e., as a teacher) that he felt a special obligation to point out moral and religious lessons.

As a science professor at Yale, Denison Olmsted was in a position of influence. There is evidence that he did make an impression upon his students. In a recent dissertation Marc Rothenberg has noted that, of the nine students of Olmsted who were members of the community of American astronomers, the majority "showed many of the same characteristics as their master,"

concentrating on the observational aspects of astronomy, exhibiting broad interests, and serving as college professors. At least two of the nine extended the frontiers of knowledge in the precise problems that had interested their professor. In 1860, Elias Loomis discovered the existence of definite zones in conjunction with the aurora borealis. In 1864, Hubert Newton placed Olmsted's ideas of the periodicity of meteoric showers on a rigorous mathematical basis, which led to an understanding of the meteor swarm known as the Leonids.
Of the nine students of Olmsted mentioned above, at least six also followed their teacher's Christian example, displaying marked evidence of the importance of religion in their own lives. Two became clergymen, and two others gave serious consideration to that particular profession. One of the former two, Enoch Fitch Burr, became somewhat of an apologist for Christianity. He wrote a popular little book entitled Ecce Coelum; or, Parish Astronomy. In Six Lectures, which went through at least 16 editions; he also gave lectures in New York and Boston, and at Yale and Williams on "The Latest Astronomy Against the Latest Atheism." 629

Professor Olmsted's influence on the numerous students who did not choose to pursue science beyond the exposure they received in the required courses at Yale was presumably substantial. His lectures at Yale were permeated with his religious outlook, and he undoubtedly instilled in the religiously inclined a measure of his own optimistic belief that the future progress in science would be one important means of ushering in the triumph of Christianity.

In a larger context, a study of Olmsted suggests that scientific research in antebellum America was stimulated by several religious (Christian) beliefs. An all-wise, benevolent Creator could be expected to create everything for a use--a designed, fore-ordained use. A law-giving Jehovah could be expected to run his universe with law and order. Man, made in the image of God, could be expected to
possess the ability to comprehend nature's laws—to think God's thoughts after him.

In America, a land thought to be especially favored by God, underlying religious beliefs might offer even greater motivation both for research and for teaching of science. As evangelism was to reach all classes, bringing to all the truths of God's word, so science must reach to all classes, giving to "the many" not just "the few," the advantages of increased knowledge of God's works. In democratic America, such arguments for the democratic tendencies of science would have special force, and would be consistent with prevalent, religious beliefs. Olmsted was among those who put forward such arguments.

Another insight into antebellum America which is consistent with this biographical study of Olmsted is that the religious outlook also affected the emphases in the teaching of science. As the moral exceeded the physical in value, so the moral application of scientific discoveries (and useful applications, whereby morals would be strengthened) were more important than the bare scientific knowledge itself. Thus, teaching was not just the transmission of knowledge, but also of wisdom; a teacher of science had a duty to teach more than science and to do so necessarily spent time in activities other than scientific research.

In recent years, Christianity has come under attack for its alleged responsibility in connection with the ecological crisis.
In Olmsted's case, there is no evidence that he was directly involved in an exploitation of nature. Indeed, he cautioned his students that an increased responsibility accompanied the progress of the age. Nevertheless, his own emphasis upon the truth of the doctrine that the world was made for man exhibited a very anthropocentric view of man's place in nature. Undoubtedly such a view was conducive to an exploitation of nature for man's benefit, along with a disregard as to any long-term consequences.

The contemporary religious view of the role of science is suggestive of the state of religion itself. The increased emphasis upon Man and his abilities suggests a decreased emphasis upon man's sinfulness, and need for God. The focus shifted from what a sovereign God must do, to what an able, informed man could do. There existed an optimistic faith that the "facts of nature" collected by anyone, would inevitably result in a harmony of science and religion, and religion itself seemed to look increasingly to those facts as the basis of its belief. For example, we find Olmsted looking to the solar system as a means of strengthening his belief in an all-wise Providence. In addition, the constant theme of the harmony of science and religion led to a (largely unintentional) preferential picking of facts from nature to bolster a (largely implicit) religious viewpoint. In the case of Olmsted, this sort of
biased data-gathering activity is seen most clearly in his articles on natural theology.

A review of Olmsted's life suggests that one of the prominent effects of religion upon science in antebellum America was to act as a motivational force for the promotion of science. A significant fraction of those engaged in its promotion were teachers of science, of whom a large share had a strong theological bent. For such, writing on natural theology was a perfectly normal activity. It was not a case of exploiting religion for scientific ends, but a case of exploiting science for religious ends. However, science in their eyes was just one means to an end, and hence, did not command their undivided attention. They had a "higher" calling, viz., to instill correct moral principles in their students. Thus, their original contributions to the body of scientific knowledge were less than they might have been. On the other hand, it is probable that they themselves would not even have taught science had they not seen it as a means to a religious end. In an age when teachers of science were not easy to find, they performed a useful function by filling that need.

As teachers, they influenced a generation. In an increasingly professionalized role, the new generation of scientists could readily perceive their specialized research and study in terms of the
performance of a religious duty. In a recent publication, Rosenberg has analyzed the social values of the small group of scientists who pioneered as agricultural chemists in America in mid-nineteenth century. He found that "perhaps the most striking similarity. . . [among them was] their religiosity." Though their denominational affiliations varied from Congregationalist to Quaker, they shared a "peculiarly evangelical and intensely pietistic faith." With the majority of their fellow Americans, these men also believed that progress in America had "dimensions both moral and material." It was inconceivable to them that the steam engine and morality were not somehow interconnected. One important source for such values and beliefs was the teachers of science. As a consequence of their influence, not only the new generation of scientists, but all who received a liberal education, as well as those members of society who attended popular lectures, etc., could rest with assurance that science was God-ordained, that it would ever harmonize with religion, that it was indeed a means of hastening the millennial glory.
FOOTNOTES

CHAPTER I


22. Hofstadter and Metzger, Academic Freedom, p. 211.


31. Schwab, "Yale Curriculum" passim.


41. McKeehan, Yale Science, pp. viii, 60.


46. Two main sources have been utilized in identifying members of the American Geological Society. Officer lists occur in AJS 2 (1820):141; AJS 9 (1825):178; AJS 10 (1826):201-202. A partial list of members is found in Merrill, First Hundred Years, p. 62. References to the Society are scattered throughout the first few volumes of AJS.


49. For most members, such information was found in Dictionary of American Biography, ed. Allen Johnson (New York: Charles Scribner's Sons, 1964), henceforth designated DAB.

50. Merrill, First Hundred Years, pp. 139-140; Bates, Scientific Societies, pp. 56, 73-74.

51. Bates, Scientific Societies, p. 51; Merrill, First Hundred Years, pp. 127, 209, 293; George H. Daniels, American Science in the Age of Jackson (New York: Columbia University Press,


55. Quoted in Fulton and Thomson, Silliman, pp. 181-182.

56. Quoted in Ibid., p. 182.


59. Ibid., pp. 145-149.


66. Stanley M. Guralnick, "Geology and Religion before Darwin: The Case of Edward Hitchcock, Theologian and Geologist (1793-1864)," *Isis* 63 (1972):529-543; McElligott, "Before Darwin." It is not the intent of the present dissertation to deny the importance of the element of tension between science and religion in the nineteenth century in America, but rather to focus upon a neglected aspect of the relationship, viz., the essential compatibility of science and religion as perceived by scientists of the time.


68. Daniels, *Age of Jackson*, p. 53.

69. In fairness, it should be noted that, in response to criticisms on this point, Daniels admitted he had made a mistake. See *Isis* 63 (1972):401-402. In his more recent book, Daniels' view of the matter is substantially different. See George H. Daniels, *Science in American Society: A Social History* (New York: Alfred A. Knopf, 1971).

70. Struik, *Yankee Science*, p. 163.


78. Westfall, Science and Religion, p. 117.

79. Guralnick, Ante-bellum College, pp. 167-221; Daniels, Age of Jackson, pp. 201-228.


CHAPTER II

82. This account of Olmsted's early years is based primarily upon his memoir of his mother written in 1848 and found in his "Family Memoirs," Natural Science Manuscripts Group (hereafter designated NSMG), Yale University Library. The memoirs contain Olmsted's transcription of various letters, including some from his mother. These "Family Memoirs" will hereafter be referred to simply as FM, accompanied with appropriate page numbers.

83. In Olmsted's "Journal," vol. 1, p. 151, NSMG, Yale University Library. Yale University Library has four volumes of Olmsted's Journals, covering the following years: volume 1 (1826-1841); volume 2 (1841-1845); volume 3 (1845-1850); volume 5 (1856-1859). Olmsted refers to them as his "Saturday night journals," and they will henceforth be designated: SNJ, with appropriate volumes and pages indicated. For example, the reference cited above would be simply SNJ 1:151.

84. On this New England tradition, see Morgan, Puritan Family, pp. 77, 78.

85. FM 166.

86. This attitude on her part may be reasonably inferred from other instances recorded by Olmsted in FM.

87. FM 171.

88. From the tenor of Olmsted's later references to his stepfather, it is apparent that the relationship between the two was unsatisfactory.

89. To avoid confusion, Olmsted's mother will continue to be referred to as Eunice Olmsted, rather than Eunice (Olmsted) Webster.

90. The following account of Treadwell is based principally upon Denison Olmsted, "Memoir of John Treadwell, LL.D., Late Governor of Connecticut," American Quarterly Register 15 (1843):225-253.


93. Keller, Second Awakening, pp. 95, 236.

94. Quoted in SNJ 5:74.


96. FM 173, 175, 176.

97. Porter was to play an important role in the founding of the American Board of Commissioners for Foreign Missions, which was begun at a meeting in Farmington in September of 1810. Quincy Blakely, "Farmington, One of the Mother Towns of Connecticut," (New Haven: Yale University Press, 1935), pamphlet 38 of a series published for the Tercentenary commission of the state of Connecticut. Committee on historical publications, pp. 21, 22.

98. SNJ 5:74-79.


102. For a biography, see Cuningham, Dwight.


118. In 1855, Olmsted spoke thus of Dwight: "Forty years and more have now elapsed since I sat at the feet of this great teacher; yet hardly a day passes but brings to my recollection some useful saying of his, so fully did his rich and varied

119. FM 178-179.


121. FM 181.

122. Yale University Moral Society Records, Yale University Library.

123. Ibid.


127. FM 185.


129. Ibid., p. 606.

130. SNJ 5:88.


132. FM 181, 189, 190.

133. Cuningham, Dwight, pp. 239, 240, 243.

135. A. M. Fisher to Caleb Fisher, 23 March 1813, Fisher Papers, Beinicke Rare Book and Manuscript Library, Yale University. This location will hereafter be designated as: Beinicke, Yale.

136. FM 190, 191.

137. On the importance of early home training, see Goodrich, "Revivals," p. 301.

138. FM 190.


140. "Dr. Dwight's Farewell Address," Fisher Papers, Beinicke, Yale.

141. Moral Society Records, Yale University Library.


143. FM 13.

144. FM 194.

145. FM 196, 197.


147. Cuningham, Dwight, p. 239.

148. Ibid., pp. 228-232; Dwight, Theology, vol. 1, p. lxii.

149. FM 199.

150. FM 200.

151. For example, see Schmidt, Liberal Arts College, p. 71.


157. Theodore Dwight, Jr., *President Dwight's Decisions of Questions discussed by the Senior Class in Yale College, in 1813 and 1814* (New York: J. Leavitt, 1833), passim.


163. Ibid., p. 670.

164. Ibid., p. 618.
CHAPTER III

165. D. Olmsted to Ernest Haywood, 12 September 1817, The Ernest Haywood Papers, Southern Historical Collection, Manuscripts Department, University Library, University of North Carolina, Chapel Hill, N.C., 27514. Location hereafter cited as: Southern Historical Collection, University of North Carolina.

166. Minutes of the Board of Trustees, vol. 4, p. 90 (typed copy) in the University Archives, Manuscripts Department, University Library, University of North Carolina, Chapel Hill, N.C. 27514. Location hereafter cited as: Archives, University of North Carolina.

167. J. Caldwell to Wm. Polk, 3 February 1817, in The University of North Carolina Papers in the University Archives, Manuscripts Department, University Library, University of North Carolina, Chapel Hill, N.C. 27514. Location hereafter cited as: University of North Carolina Papers.


169. Battle, History, p. 50; "A Valedictory address delivered by D. Olmstead [sic] to the second division of the Sophomore Class Sept 8th 1817," NSMG, Yale University Library.

170. "Notes taken by D. Olmsted on Jeremiah Day's Natural Philosophy Lectures, 1812-1813," in Day Family Papers, Yale University Library.


172. FM 200-201.

173. Minutes of the Board of Trustees, vol. 4, p. 91 (typed copy), Archives, University of North Carolina.

174. Ibid., pp. 92, 93.

175. D. Olmsted to Ernest Haywood, 12 September 1817, The Ernest Haywood Papers, Southern Historical Collection, University of North Carolina.


Records CAAS, Beinicke, Yale.

D. Olmsted to Elisha Mitchell, 11 March 1817, University of North Carolina Papers. This letter is almost certainly mis-dated by one year, on the basis of several lines of evidence. The date should be 11 March 1818.


D. Olmsted to Elisha Mitchell, 11 March 1817, University of North Carolina Papers.

D. Olmsted to J. Haywood, 12 September 1817, The Ernest Haywood Papers, Southern Historical Collection, University of North Carolina.

D. Olmsted to the Honoroble Board of Trustees of the University of North Carolina, 7 June 1819, and acknowledgement by the Board, Archives, University of North Carolina.

D. Olmsted to Benjamin Silliman, 5 May 1822, Silliman Papers, Yale University Library; Battle, History, p. 289.

Denison Olmsted, "Report on the Geology of North Carolina, Conducted under the direction of the Board of Agriculture," in Papers on agricultural subjects (Raleigh: J. Gales and Sons, 1827), vol. 1, part 1, p. 3; Battle, History, p. 289; Merrill, First Hundred Years, pp. 95, 114; FM 23, 24.


190. No record of what textbook was used during Olmsted's years at Chapel Hill has been found. Guralnick has indicated that chemical lectures during this time period generally followed the textbooks quite closely. One popular text of the period was Jane Marcet's Conversations on Chemistry. An inspection of the 1813 edition supports the conjecture that Olmsted's lectures were similar in content to others at the time. Guralnick, Ante-Bellum College, p. 104; [Jane Marcet], Conversations on Chemistry . . . (New Haven: Sidney's Press for Increase Cooke and Co., 1813).


192. "Chemical Lectures: 1819 and 1820," in Ernest Haywood Papers, Southern Historical Collection, University of North Carolina. The notes were taken by Thomas B. Haywood.


194. FM 203. The latter allusion by Eunice Olmsted was in reference to Eliza Allyn, Denison's fiancée. They had been engaged for more than three years, but with his appointment at the University of North Carolina, they had set a definite date; they were married in June 1818.


196. FM 211.

197. FM 213.

198. FM 216.

199. D. Olmsted to Frederick Hall, 3 October 1825, NSMG, Yale University Library.

201. Ibid., pp. 374, 376.

202. D. Olmsted to Professor Kingsley, 10 June 1822, Kingsley Memorial Collection, Yale University Library; Denison Olmsted, "Reminiscences of Alexander Metcalf Fisher, late Professor of Mathematics and Natural Philosophy in Yale College," _New Englander_ 1 (1843):457-469, passim; FM 515-516.


204. Baldwin, _Annals_, p. vi.


206. Kelley, _Yale_, p. 211. This is not to say that the faculty were completely successful in the attempt. Cf. Kelley, _Yale_, pp. 209-211.


208. Wm. T. Gould to Reverend Jeremiah Day, 21 September 1832; E. R. Gilbert to Dear Sir, 28 August 1846; Epaphras Goodman to Reverend and Dear Sir; all in Day Letters, Beinicke, Yale.

209. "Untitled Circular from the Church in Yale College" (New Haven: February 1828), Miscellaneous Pamphlets, Yale University Library.


213. D. Olmsted to His Excellency Gov. Burton, President of the Board of Trustees of the University of North Carolina, 9 October 1825, University of North Carolina Papers.


215. *SNJ* 1:2, 60.


218. *SNJ* 1:2, 9.


221. *SNJ* 1:39, 40, 50.

222. *SNJ* 1:40, 41.


224. Ibid., p. 354.

225. Ibid., p. 358.


227. Denison Olmsted, "Remarks on Dr. Hare's Essay on the question, whether Heat can be ascribed to motion?" *AJS* 12 (1827):363.


238. Ibid., pp. 4, 5; For a description of hail rods, see "Hail-Rod," AJS 10 (1826):196-198.


245. Ibid., pp. 23, 24.


248. Ibid., pp. 156, 151.

249. Ibid., pp. 156-159, 161.


252. Ibid., p. 227.


254. Ibid., p. 221.

255. Ibid., p. 236.

256. FM 4.

257. SNJ 1:102.

258. SNJ 1:111-118.

259. SNJ 1:119-122.


261. Catalogue for 1830-1831, in the Manuscript and Archives Research Room in the Sterling Memorial Library at Yale University.
CHAPTER IV

262. SNJ 1:160.

263. D. Olmsted to Benjamin Silliman, August 1820, Silliman Family Papers, Yale University Library.


265. SNJ 1:142.


267. SNJ 1:8, 48, 137.


269. SNJ 1:163-164.

270. SNJ 1:144.


273. SNJ 1:171, 180, 193; Kelley, Yale, p. 143.


276. SNJ 3:413, 420, 429, 440.


279. SNJ 1:186, 187, 190, 191, 194, 197.

280. SNJ 1:197-198, 199.

281. SNJ 1:193.


295. Ibid., pp. 166-167. Indeed, the likelihood of such perturbations was urged as a reason for rejecting Olmsted's theory.


298. A. D. Bache, "Observations upon the facts recently presented by Prof. Olmsted, in relation to the meteors, seen on the 13th of Nov. 1834," *AJS* 29 (1836):383-386; Olmsted, "Cause of Meteors," p. 382; Denison Olmsted, "Remarks on Shooting Stars, in reply to Rev. W. A. Clarke, with additional observations on the present state of our knowledge respecting the ORIGIN of these meteors," *AJS* 30 (1836):376.


302. SNJ 1:161.

303. SNJ 1:198.

304. FM 398.

305. FM 402, 403, 406.

306. FM 48, 51.

307. FM 263.

308. Morse, *Neglected Period*, p. 120.

309. SNJ 2:305.

311. SNJ 2:305.

312. SNJ 1:417; SNJ 2:112.


314. The preceding account is based largely on SNJ 1:444-447, 472.


316. SNJ 1:383.


318. SNJ 1:227.


320. Olmsted, Introduction to Astronomy, pp. iii, iv.

321. D. Olmsted to Elias Loomis, 7 February 1839, Loomis Papers, Beinicke, Yale.


323. Denison Olmsted, Life and Writings of Ebenezer Porter Mason, interspersed with hints to parents and instructors on the training and education of a child of genius (New York: Dayton and Newman, 1842), passim.

324. D. Olmsted to Elias Loomis, 4 June 1839, Loomis Papers, Beinicke, Yale; SNJ 1:278.

325. SNJ 1:408, 412.

326. SNJ 1:283.

327. SNJ 1:218, 219, 269; SNJ 2:34, 88, 95, 457.

328. SNJ 1:452; SNJ 2:37, 41; D. Olmsted to Elias Loomis, 21 June 1843, Loomis Papers, Beinicke, Yale.
329. SNJ 2:34.


332. D. Olmsted to the Prudential Committee of Yale College, 1 August 1845, NSMG, Yale University Library.


342. For a contemporary summary of theoretical developments regarding meteoric showers in the early part of the nineteenth century, see Sears C. Walker, "Researches concerning the Periodical Meteors of August and November. Read January 15, 1841," American Philosophical Society Transactions n.s. 8 (1843): 87-140.


347. This fear itself is indicative of the religious climate of the time. About this same time, when the Yale Literary Magazine decided to publish biographical notices of the professors at Yale, James L. Kingsley refused to have a sketch of his life published, on the grounds that it would not be consistent with a Christian humility. SNJ 2:417.

348. PJ 217.
349. SNJ 2:423.
350. SNJ 1:246; ibid., 242-245, 381, 382.
351. SNJ 2:118; cf., PJ 361-362.
353. PJ 361-362.
354. SNJ 2:319, 325, 402; SNJ 2:35.
356. PJ 40-41; SNJ 2:230.
357. SNJ 2:225; SNJ 1:311-312, 337-374.
358. SNJ 2:52; ibid., passim.
359. SNJ 2:120-124.
360. SNJ 2:41, 42.
361. SNJ 2:149.
362. SNJ 2:138-139.
366. SNJ 2:146-147.

368. Denison Olmsted, "Thoughts on the Sentiment that 'The World was made for Man'," New Englander 7 (1849):44; SNJ 1:231.

369. SNJ 2:160-162; Kelley, Yale, p. 150.

370. SNJ 2:276.

371. Denison Olmsted and T. F. Davies, Meeting of the Class of 1813, on the 16th and 17th of August, 1843 (New Haven, 1843), p. 16.

372. Morse, Neglected Period, pp. 145-152.

373. SNJ 5:279.


377. SNJ 1:484, 516.


382. Denison Olmsted, Letters on Astronomy, addressed to a lady; in which the elements of the science are familiarly explained in connexion with its literary history, with numerous engravings (Boston: Marsh, Capen, Lyon, and Webb, 1840).

383. SNJ 1:476, 479.


385. Ibid., pp. 407, 408.
386. Ibid., pp. 413, 414.
387. D. Olmsted to Elias Loomis, 27 November 1840, Loomis Papers, Beinicke, Yale.
388. D. Olmsted to Elias Loomis, 21 June 1843, Loomis Papers, Beinicke, Yale.
389. D. Olmsted to Elias Loomis, 6 June 1840, Loomis Papers, Beinicke, Yale.
391. SNJ 2:373.
393. SNJ 1:188.
394. Olmsted, Life of Mason, passim.
395. Ibid., p. 10; SNJ 2:45, 46.
396. Ibid., part of the title; ibid., p. 11.
397. Ibid., pp. 217, 222, 234.
398. SNJ 2:132, 137, 186, 209; D. Olmsted to Elias Loomis, 7 October 1842, Loomis Papers, Beinicke, Yale.
401. Ibid., p. 253.
402. SNJ 2:95.
403. The account of these events is drawn principally from Denison Olmsted, "Family Memoirs," (FM), NSMG, Yale University Library and from Olmsted's "Saturday Night Journals" (SNJ), in the same collection at Yale.
405. SNJ 1:314, 326.
406. SNJ 1:325.
407. FM 66-72.
408. FM 68.
409. SNJ 1:509.
410. FM 121-123.
412. FM 143.
413. FM 160, 161.
414. SNJ 2:217.
415. FM 342-349.
416. FM 376-378.
417. FM 384.
418. FM 390-392.
419. FM 467-474.
420. FM 461-466.
422. SNJ 3:83-86.
423. FM 496.
424. SNJ 3:117.
425. SNJ 3:51, 358, 401. The inscriptions are still visible on the tombstones in the Grove Street Cemetery near the campus of Yale University. The inscription on Howard's tombstone is taken from 2 Samuel 1:23, that on Denison, Jr.'s from Hebrews 11:13.
426. SNJ 3:130.
428. SNJ 2:222, 260, 497.
429. SNJ 2:471, 472, 497.
CHAPTER V


431. SNJ 1:261.

432. SNJ 3:536-542.


434. Ibid., p. 3.

435. Ibid., pp. 4, 5.

436. SNJ 3:543; see the discussion that followed Olmsted's paper in Proc. AAAS 4 (1850):7-10.


438. SNJ 3:544; "Ice of Lake Champlain: why it all disappeares at once," Proc. AAAS 4 (1850):141-142. This paper was "not received" for publication, and the proceedings simply record some points of discussion by Hare and Rogers.

439. SNJ 3:543. For convenience, a discussion in this dissertation of Olmsted's views on the aurora is deferred until later.

440. SNJ 3:543-545.


442. Ibid., pp. 112, 113.

443. Ibid., pp. 126, 127. Since this paper was presented in 1851, it is a source of puzzlement that Olmsted did not report a single, personal observation on the zodical light dated in the 40's! Could this curious circumstance be related to the decay in eyesight that he experienced, which had become marked by 1841? Such a conjecture would be consistent with the postscript in the published version of his remarks at Albany, in which he incidently noted that several of his students were able to trace the light higher than he could, in their observations in 1851. Ibid., p. 126.
444. Ibid., pp. 122, 124.
445. Ibid., pp. 122, 125.
446. Ibid., p. 125.
447. Frederick A. P. Barnard, "On the Theory which attributes the
449. George Jones, "Recent Observations, by various persons, on the
451. See "Notice of the late Aurora Borealis, in a letter from Mr.
Benjamin D. Silliman, to the Editor, dated New York, October
20th, 1827; also in letters from Dr. Holyoke, Professor
Cleveland, and others, and in notices selected from the
452. PJ 219.
453. See PJ, passim.
454. D. Olmsted to Elias Loomis, 11 January 1850, Loomis Papers,
Beinicke, Yale.
455. SNJ 2:543; Denison Olmsted, "On the late Periodical Visitation
of the Aurora Borealis, . . . (Abstract)," Proc. AAAS 4 (1850):
51-56.
456. Denison Olmsted, "On the Recent Secular Period of the Aurora
Borealis," Smithsonian Contributions to Knowledge 8 (1856):
article 3, 52 pp.
457. Ibid., pp. 3-4.
The distinction between hypothesis and theory was one Olmsted had long maintained, as is apparent from his lectures in 1829-1830. See "Lecture Notes by A. Hough," p. 10, NSMG, Yale University Library. The distinction was not uncommonly made by his contemporaries. See Daniels, Age of Jackson, pp. 120-122.


480. Olmsted, "Beau Ideal," pp. 84, 86.

481. Ibid., pp. 87, 88, 92, 93.

482. SNJ 3:298; SNJ 3:61, 63.

483. SNJ 3:164, 181; PJ 79-83.

484. "Diaries (1840-1842)," 24 January 1842 and 15 February 1842, John Pitkin Norton Papers, Yale University Library.

485. Ibid., 9 December 1841; SNJ 1:413.

486. SNJ passim.; PJ 433.


490. "A Valedictory Address delivered by Denison Olmstead [sic] to the second Division of the Sophomore Class, Sept. 8th, 1817," NSMG, Yale University Library.

491. SNJ 5:140-141.

492. Notes by Mary Louise Beebe, signed 25 January 1858, in Denison Olmsted, Outlines of a Course of Lectures on Meteorology and Astronomy, Addressed to the Senior Class in Yale College (New Haven: Thomas J. Stafford, 1858), in the Manuscripts and Archives Research Room at Yale University Library.

493. SNJ 5:222.


495. PJ 337.

496. SNJ 5:245, 247.

497. SNJ 5:123.


500. SNJ 3:345.


503. [Denison Olmsted], "Report made to the Faculty of Yale College, on the Use of Tobacco Among Students," NSMG, Yale University Library.

504. SNJ 3:107.

505. SNJ 5:6-7; SNJ 3:504-505.

506. SNJ 1:152.

507. D. Olmsted to Elias Loomis, 21 June 1843 and 11 December 1843, Loomis Papers, Beinicke, Yale.

508. D. Olmsted to the Prudential Committee of Yale College, 1 August 1845, NSMG, Yale University Library.

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510. SNJ 3:337-338; D. Olmsted to Elias Loomis, 7 July 1848 and 15 July 1848, Loomis Papers, Beinicke, Yale.

511. Denison Olmsted, Committee Report, dated 10 August 1850, NSMG, Yale University Library; SNJ 3:433.

512. Hadley Diary, p. 267, entry of 21 July 1851.


516. D. Olmsted to Elias Loomis, 21 May 1856, Loomis Papers, Beinicke, Yale.


518. SNJ 2:29, 43.
520. SNJ 5:292.
526. "Memorial to Congress on behalf of the Connecticut Academy of Arts and Sciences (Draft)," 10 March 1846, Leonard Bacon Papers, Yale University Library.
527. SNJ 5:231, 243, 244, 250.
528. SNJ 5:211.
529. SNJ 2:198-199; SNJ 5:90.
530. SNJ 2:130, 166, 168, 512-513; SNJ 2:207; PJ 375, 387, 403.
531. SNJ 1:261.
536. Ibid., pp. 28, 29; Ibid., p. 25.
537. Ibid., pp. 27, 30, 33.


540. Since frequent references to these articles will occur in the following pages, the major ones will be listed below, with convenient abbreviations in parentheses. They are (of course) all found in the indicated volumes of the New Englander.


554. See Daniels, Age of Jackson, pp. 198-199.


557. Ibid., p. 578.

558. Ibid., pp. 578, 579.


561. Ibid., p. 579.


565. PJ 350 ff.

566. SNJ 2:478; SNJ 2:328-331; SNJ 2:222, 225.
In reality, Olmsted was asserting something stronger than that all things have their use. He was averring that the principal use of all things was man-directed -- he was avowing a homocentric world.

589. This argument was by no means new. Olmsted himself had used it as early as 1844. See PJ 31, 68, 361. The observational fact had been discovered long ago, and had been explained physically by Laplace in 1784, a fact which Olmsted probably knew but did not allude to in his essay. Cf. Grant, History of Astronomy, p. 91.


591. Ibid., p. 585; PJ 112-114.


595. Ibid., p. 588.

596. Ibid., pp. 586, 587.

597. Ibid., p. 593.


600. Olmsted, "World for Man," p. 44.


603. SNJ 3:546-552, passim.


608. The concluding sentence in his published outlines was: "View which the Creator took of His own works, when He pronounced them 'very good'." Denison Olmsted, Outlines of a Course of Lectures on Meteorology and Astronomy, addressed to the senior class in Yale College (New Haven: Thomas J. Stafford, 1858), p. 32.


615. Ibid., p. 9.

616. SNJ 5:314.

617. SNJ 5:317-318.

618. SNJ 5:328-329.

619. SNJ 5:334.

620. SNJ 5:346.

621. Olmsted, "World for Man," pp. 41, 42; ibid., p. 34.

622. SNJ 5:120-121.

623. SNJ 5:106.

624. SNJ 5:347-348.
CHAPTER VI

625. SNJ 1:476, 479.


Geology, pp. 184-228. For a twentieth century Christian point of view, see Francis Schaeffer, *He is There and He is Not Silent* (Wheaton, Illinois: Tyndale House Publishers, 1972), pp. 43, 76.


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See next entry.


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