operation in the United States and two more were opened in 1776: William and Mary (1693), Yale (1701), University of Pennsylvania (1740), Princeton (1746), Washington and Lee (1749), Brown (1764), Dartmouth (1769), College of Charleston (1770), Dickinson (1773), Columbia (1774), Hampden-Sydney (1776), Savannah State (1776).

In the early part of the founding of our nation, courses in natural history began to spring up in various colleges in North America. Until the middle of the nineteenth century, however, such courses not only were meager but also were mostly theoretical and classificatory in their scope. The mode of presentation was chiefly lecture, accompanied with an occasional demonstration, but with little or no field work or laboratory work. Louis Agassiz, at Howard, was the first teacher in zoology to break away from this practice and introduce laboratory methods in teaching. It was not until the publication of *Origin of Species*, however, that an upsurge of inquiry began. This was followed by the teaching of science at Cornell and Johns Hopkins and by the establishment of the land-grant college (1862-Morrill Act of Congress).

In closing, it seems that we may, from these few remarks, consider biology of 1776 as an embryonic science—for it had not yet truly been born.

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**MEDICINE IN 1776**

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**General State of American Medicine in 1776**

Medicine in the American Colonies was basically an extension of 18th century European medical thought and practice. Less than 10% of physicians in Colonial America had obtained medical training in Europe, but these formed an influential group. They retained close contact with their former teachers, often some of the most eminent physicians of Europe, and were aware of the latest developments in medicine. But whether educated in Europe or not, the Colonial physician read the same books and journals and attempted to practice in the same way as his European colleagues.

This transfer of European medicine to the British American Colonies was facilitated by the lack of native American diseases (only “milk sickness” might be considered an American disease, and it did not appear until the early 1800s). The American Indians were the group most vulnerable to diseases brought by the Europeans. The most common diseases so imported were at first measles, smallpox and malaria; later came tuberculosis, typhoid and typhus fevers. The result was catastrophic: entire tribal groups were wiped out. Such unintentional biological warfare was more effective in “clearing the woods” of Indians than were military operations. Opposition to European colonization was greatly reduced through this decimation of native population. With the introduction of slaves to the Colonies, African diseases were to present new dangers to the settlers, especially in the warmer southern colonies. The most widespread of these African diseases were hookworm, dengue, and yellow fever.

But American Colonial medicine was not exactly the same as European medicine in at least two respects. First, there were limited opportunities for medical education, since the American Colonies lacked the capacity to duplicate European resources for medical schools, hospital experience, and publication of medical books and journals. Second, the rapid westward expansion populated new areas and created an urgent need for more physicians and medical institutions. These conditions tended to modify European medicine: the less educated American physician tended to become more dogmatic than his European counterpart and to extend therapeutic methods to irrational extremes through oversimplification of sophisticated European theory. These tendencies toward dogmatism and simplification became more pronounced as the distance from urban centers increased—often resulting in the rise of irregular schools of medical thought or even blatant quackery, especially when blended with folk medicine. Moreover, the rigorous separation of medicine and surgery, especially as seen in Britain, did not cross the Atlantic. From the beginning, physician and surgeon were one; this unification continued until the era of specialization entered in the late 19th century.

**Medical Systems**

Until the beginning of the 18th century, European medical thought was based on theories handed down from ancient authors, mainly Graeco-Roman, with some additions from Arabic and Persian writers. The Galenic theory of the humors was dominant. With the rise of the scientific method in the 18th century, physicians became concerned with the formulation of scientific medical theories. But humorism hardly disappeared; rather, it was blended into later systems of medical thought. Humorism, with the concept of general diseased states (fevers and fluxes) implying an excess of...
one humor over others, indicated bleeding or other 
depleting procedures to restore the normal balance of 
health. The theoretical foundations of the "system" of 
medicine they espoused influenced on America. 
Prior to and after the Revolution were those of Hoffman 
(Hoffman 1668-1738), Cullen (of Edinburgh, 1710-1790) and Brown 
(of Edinburgh, 1733-1788). Hoffman postulated that 
the nervous system was an other-like system upon which 
the muscles, keeping them in a state of partial contrac 
tion (tonus), thereby maintaining the homeostasis of the body 
in motion and balance. Acute diseases were due to ex 
cessive tone (spasm) and chronic diseases due to in 
debilitate tone (atony). Bowdler was an eclectic 
thinker, drawing upon humoralism in some instances. 
Nervous and vascular states in others. Cullen placed 
more emphasis upon nervous tone and advocated 
remedies supposed to stimulate or relax this tone. John 
Brown, an American internist who practiced in 
Philadelphia in the 1760s. Brown pushed these ideas to an 
absolute limit. He grouped diseases as "heimorrhagic" or "pathic," 
diagnoses consisted in determining the level of "excite 
ment," present, and treatment involved either stimulating 
or depressing the brain stem. Out of this arose the 
Brownian practice of providing "Scotch" or laudanum for 
many patients. Benjamin Rush, a student under 
Cullen and a fellow-student of Brown, based his practice 
in Philadelphia on the theories of Cullen; but after the 
Revolution, he came more and more to the influence 
of Brown. Bowdler's views all are due to a 
spasm of the distal arteries (or capillaries) and adva 
ced blood pressure as effective ways of 
relieving this vascular tension. Eventually, Rush claimed 
that all diseases are due to capillary tension; thus, 
there really is "only one disease in the world," the influence 
of Rush introduced the age of "heroic medicine" in the 
United States after the Revolution: it did not seem 
important after the French-Haitian War. Oliver Wendell 
Holmes summarized his thoughts on such therapeutic 
excesses as follows: 

...I firmly believe that if the whole matter 
medica, as now used, could be sunk to the 
bottom of the sea, it would be the better for mankind, 
and all the worse for the fishes.

Neurology (science of classification of disease) 

As medicine and botany were closely interrelated in the 
18th century, so too was the science of thought between 
effects to classify diseases and the system of an orderly 
grouping of plants. Carl von Linné (Linnaeus, 1707- 
1778), also a botanist, developed his influential 
Systema Naturae in 1735 (10th ed., 1758). He also 
published a classification of disease (Genus morborum 
in 1763). As scientific knowledge of 
causes (etiology) was largely speculative, the most 
useful classifications were based on the symptoms of dis 
ease. Since fever was the major manifestation of disease, a classification of fevers emerged that was widely used in 
the American classification continued to be used until the last half of the 19th century. As scientific research established the basis for an etiological 
and medical technology provided the 
means of precise diagnostic testing. Fevers were 
grouped into three classes: "slight"; "severe"; 
and "unbroken" fevers, as 
well as typhus and typhoid fever. Continued fevers were 
uncommonly occurring in cities, where with the New World. The proposal to open public baths in Philadelphia in 1761 
met with opposition from religious societies on moral 
grounds. However, some baths became available in the early 1770s; by the end of the century, a 
few families had built their own or rented them. Public 
travellers or in wooden huts. In 1799, after taking a sulfur bath, one Quaker lady noted in her diary: "I bore it better than I expected, not having been wet all over 
at once, for 28 years past." If such were the bathing 
habits of the well-to-do, it is best not to attempt to 
describe the state of cleanliness of the rank and 
file.

It is difficult for us to imagine the high mortality of the 
smallpox under the term "measles"; in 1793, a 
yellow fever epidemic caused the death of about 10% 
of the population of Philadelphia. If such an 
epidemic were to occur in 1761 in Philadelphia with the same 
mortality rate, it would mean the death of over 200,000 
persons in the brief period of about 3 months. Compare 
this with all the publicity over the recent mysterious "legionnaires disease" of Philadelphia, during which 29 
persons died. That population increase occurred despite 
the high mortality rate is explained by 1) the high birth 
rate (e.g., Benjamin Franklin was the last of 17 
children) and 2) immigration. The only development in 
medicine that could have improved the mortality rate 
was the introduction of vaccination in 1796 (by Jenner) 
to protect against smallpox. It would be the 
purpose of this paper to discuss further the causes 
of the decline in morbidity and mortality rates in the U.S.

Education of the American Colonial Physician 

It is estimated that in 1775 about 3,500 physicians 
were practicing in the British Colonies. Fewer than 400 of these practitioners 
were graduates of one of the 4 medical 
colleges. These colleges 
constituted the elite class of "regular" physicians. The term "regular" connoted a combination of formal 
medical study in accordance with a system of 
medical ethics, and demonstrated success in medical 
practice. The term "irregular" physicians had M.D. degrees from Edinburgh, Leyden, or 
Leiden, the next group were those who had attended a course of medical 
education, but had not taken the degree; the lowest 
were those who had served only a preceptorship under 
a well-known "regular" physician. Regular physicians 
were more likely to be in scientific, organized 
medical societies, often for the purpose of estab 
lishing a right to medical care (as was the Royal 
College of Physicians in London). The influential Philadelphia 
Medical Society was started in 1766; the first state 
medicinal society in the New Jersey Medical Society, 
was also organized in 1766; and next comes the Litchfield 
County (Conn.) Medical Society in 1767. 

The first medical education available in 1776 con 
sisted of: 

1. a college education (devoted to classical subjects 
with little or no emphasis on science) 
2. three years or more as an apprentice to a learned 
and reputable physician for the purpose of acquir 
ing a practical knowledge of medicine, beginning with 
menial tasks and ending with assumption of 
completeness for patient care 
3. attendance at and graduation from a medical co 
lege, to provide a theoretical basis for medical 
diagnosis and therapy; followed by a postgraduate 
tour of study in London, Leyden, Paris, or Vienna

Favored Medical Colleges of the American 
Medical Students 

EDINBURGH: During the period 1750-1800, a total 
of 117 Americans took an M.D. degree from Edinburgh 
(15 during the period 1750-1765). There were many more 
who did not take a degree. The Medical Faculty of Edinburgh 
consisted of six professors: Chemistry, Anatomy, 
Botany, Practice, Theory, and Materia Medica. The 
most eminent professors in 1776 were Dr. Black, 
estimated as one of the first chemists of Europe; Dr. 
Monro (Alexander Monro, secondis, probably the most 
talented of the three Monros who held the chair of 
atonomy at Edinburgh for 126 years); and Dr. Cullen, 
whose medical system has been referred to previously. 
There were also the Edinburgh Royal 
open to medical students. George Logan, an American medical student, wrote in 1778, "I have the honor of being a Member of these Three Societies from which I 
assure you I have received as much improvement at 
from any one Professor." At society meetings the 
diffent doctrines and opinions of the Great Men 
were presented and discussed with candor; students 
often wore red and read their papers aloud.

Study in London was frequently a part of the Edin 
burgh experience. Between terms, students migrated to 
London for dissertation work under an eminent phy 
ician or surgeon. The hospitals of London offered clinical 
Opportunity to study disease in the light of new science. 

LEYDEN, Boerhaave (the "medical teacher of all 
"Europe") established the reputation of the medical 
faculty at Leyden and was probably the most 
successful medical student. The methods of instruction that Boer 
haave introduced at Leyden became a model for all 
European medical schools. He was a founder of modern clinical teaching. Although Boerhaave died in 1738, his reputation continued in the 
continental European medical schools. Next to Edinburgh, Leyden attracted the largest number of 
American medical students before and immediately fol 
lowing the Revolution.

PHILADELPHIA: A few American students, the 
fortunate recipients of the best medical education 
possible, could return to the Colonies imbued with the 
High Idea of establishing a medical school,
John Morgan, who received an M.D. in 1763 from Edinburgh, returned to Philadelphia in 1765; within a fortnight, he was elected professor of anatomy and practice at the Medical College of Philadelphia (founded in 1767). A month later, Dr. Morgan delivered his memorable Discourse Upon Medical Schools in America. Morgan had written his address while in Paris and submitted the manuscript to the criticism of several eminent teachers. In it, he called for standards of medical education so high that they could not be lowered. He argued that the instruction gained during the Revolutionary War, and after the War the school was reorganized under the name of Medical College of Philadelphia, continued and continues now as the College of Physicians and Surgeons of Columbia University.

Both of the pre-Revolutionary American medical colleges were based either served only a brief preceptory under another practitioner (usually located in the same community), or were self-taught. As there were no licensure laws, anyone could offer medical assistance. The practice of medicine for most of these individuals was not a full-time occupation. Medical assistance was offered by many persons having other occupations, most frequently persons who were well educated, intellectually curious, and in a position to relate to people. Thus college presidents, ministers, teachers, governors, planters, and lawyers sought to practice medicine on a limited scale. Colonial medical often benefitted greatly from the contributions of these well-read and intelligent physicians. An outstanding example of this type of "physician" is Benjamin Franklin. Bell has written a thoughtful essay on "Benjamin Franklin and the Practice of Medicine." Franklin was closely associated with medicine both in his experimental studies and in his public career. Many of his personal friends were outstanding physicians of America and Europe; medical societies in London, Paris, and Edinburgh elected him. In 1750, Franklin encouraged the local medical societies to form a society and guided a whole generation of American medical students in their studies abroad. As a printer, Franklin published numerous medical texts. Franklin was an early advocate of smallpox inoculation and, despite the acrimonious debate, he never wavered in his support. Revealing to new medical ideas, Franklin was ever willing to experiment and wrote about his experiences and compiled medical statistics. Franklin was a great advocate of fresh air, exercise, and temperance as the basic measures in preventing disease, recognizing clearly the precarious state of medical practice at this time. Franklin practiced medicine by prescribing and treating the sick—often in his own home. Naturally, his passion for finding ways to counteract being interested in electricity, Franklin became a pioneer in the use of electricity in the treatment of disease. Franklin played a major role in the establishment of the Pennsylvania Hospital in 1751. In all that Franklin did, both as avowed and as father of medicine, he revealed an inquiring intelligence, a broad understanding, and sound sense in assessing medical theories and practices.

But it should also be mentioned that others in this category were not well-educated; whatever medical knowledge they possessed, they received from readily available books on domestic medicine such as John Tennent's Every Man his own Doctor, or, The poor Man's Guide, 1st ed. (1734, 1736, 1740, 1751, Ben). Franklin published the 4th ed. (Phil., 1736).

John Wesley's Primitive physic: or, An early and natural method of curing most diseases, 12th ed. (1771). William Buchan's Domestic Medicine: or, The family physician ... (Phil., 1771. Also printed 1772, 1774. (One of the most popular and influential of all medical books.

These domestic medicines represent an early do-it-yourself effort that became necessary as the population increased. In the late 18th century, and rural doctors had no physicians at all. The books were, for the most part, well written and offered sound advice; undoubtedly, they provided much comfort and reassurance to the head of a household or the irregular practitioner in need of council and guidance. Another group, largely self-taught, was the quacks. Quacks could be recognized by these characteristics: usually they were itinerant practitioners, they locate new techniques (for example, unmasking of their false claims of cures), their specialization was limited to one organ (for example, the eye), or to one or more diseases (for example, venereal diseases, kidney disease, etc.), and they widely advertised their extravagant claims for cures (in newspapers, handbills, etc.). Quackery is still with us, and false and undocumented claims for cures is still major characteristic. The persistence of quackery in spite of laws against it suggests that society has yet not resolved the question of whether the public has the right to choose but medical care.

Trans-Appalachian Medicine

The first physicians to enter the region between the Appalachian Mountains as explorers. In 1748, Dr. Thomas Walker joined Col. James Patton and his company for an extensive tour of uncharted territory west of the Allegheny Mountains. Dr. Walker returned in 1750 for the purpose of establishing a new frontier. At this time, Walker was a pioneer and probably the first physician to enter the Kentucky-Tennessee region. A reading of Dr. Walker's journal for the 1750 trip reveals that he was in constant need of medical supplies and knowledge. The Walker expedition had been an educational experience. In 1776, Dr. Patrick Vance was "third surgeon with an assistant" in George Washington's campaign against the Cherokee and had been present at the Battle of Island Flats (Kingsport, Tenn.). Dr. Vance remained with the troops at Long Island of the Holston in 1777 and was there when Frederick Calvett, a soldier in Col. Christian's forces, was shot and bled to death. As J. A. Robertson wrote in his published report of 1806, "Doctor Vance was sent for and staid several days with him. The skull-bone was quite naked, and
began to turn black in places, and, as Doctor Vance was about to leave Calvit, he directed me, as I was stationed in the same fort with him, to bore his skull as it got black, and he bored a few holes himself, to show the manner of doing it."

Biographical information about Dr. Patrick Vance is scanty and sometimes uncertain. He was born either in Scotland or Ireland. Though he claimed to be a medical graduate of Edinburgh, his name does not appear in Edinburgh records. It is possible that he attended medical lectures at Edinburgh but did not graduate; or he may have moved on to Leyden and gotten his degree there. Dr. Vance emigrated to Pennsylvania about 1754, moved on to Virginia, and settled in Bristol, Tennessee. He is considered to be the first physician to practice in Tennessee. It is not certain, however, whether Dr. Vance remained in Tennessee after Col. Christian's 1777 campaign or left Tennessee and did not return to Bristol until after the end of the Revolutionary War. As several descendants of Dr. Patrick Vance practiced in the Bristol area, this is probably Tennessee's oldest medical family.

The method of treatment that Dr. Vance taught James Robertson in 1777 at Long Island of the Holston can be traced back to the 5th century B.C. (where it appears in the Hippocratic treatise, *Injuries of the head*). The concept is still being applied to surgical treatment of loss of portions of the scalp (now usually from accidents or surgical removal because of malignancy). As outlined in a recent paper (1976), the application of this concept involves removing the outer table of the skull and then covering the area with a skin graft. Though it is not known how Dr. Vance learned of the method, perhaps his knowledge came 1) from medical lectures he attended at Edinburgh or Leyden; 2) from reading published versions of Boerhaave (who described the method); or 3) from an itinerant French surgeon in the western territory, who had the idea from Augustin Belloste (who published his verion of the method in 1696). This last suggestion, and all known references to this treatment in surgical books and journals published in the U.S. and Europe in the 19th and 20th centuries, derive from Robertson's paper of 1806.

**Folk and Indian Medicine**

Since the early settlers comprising the Holston Settlements (now the tri-cities area of Tennessee) were without physicians, they relied on the wisdom of folk medicine—on the premise that the natives of an area know the best way of treating diseases of that region. This meant a blending of their own folk medicine with the native medicine of the Cherokees. The Cherokees had an ancient myth that the plant kingdom took pity on man and promised him assistance in counteracting the animal-sent evils, such as disease. This myth implies that there is a plant antidote for every disease. Thus, through knowledge and experience, it is possible to select the appropriate plant to provide the correct remedy for a particular disease. Cherokee herbalists could identify as many as 200 plants in the East Tennessee-North Carolina area believed to have medicinal value, and Tennessee pioneer settlers drew heavily on this Cherokee medical experience. The first medical publications in the area were family or domestic medicines (1810, Richmond, Ky., Ruble's *The American Medical Guide for the use of families*; 1830, Knoxville, Tn., John C. Gunn's *Domestic Medicine, or Poor Man's Friend* ... ) and such books became the best-sellers of that period. These self-help books usually were a sound blend of the best of "regular" medicine with folk medicine and Indian medicine. Thus, the heritage of early Tennessee medicine is rich both in rational concepts derived from Graeco-Roman sources and in the ancient folk component, thereby blending myth and mysticism with scientific thought.

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