Address.

THE EXPANSION OF MEDICINE.[1]

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WHEN that most intelligent observer of human affairs, Benjamin Disraeli, greeted a deputation of medical men with the clever paraphrase, "Sanitas sanitatum omnia sanitas," he was, perhaps, wiser than he thought.

The growth of the field of medicine has been great and is still increasing. From the fetich man, the priests at the temple, the writers of medical aphorisms and dogma there has developed in the course of the centuries a profession of practitioners of medicine and the beginning of a science. This expansion is certain to continue with the growth of knowledge. Perhaps the court in the next century, whose decree "Thou shalt not" will be obeyed without compulsion, is that which transcribes with accepted authority the immutable laws of disease.

Is the profession prepared for added responsibilities? An examination of the past record is pertinent in attempting an answer to this query.

The practice of medicine even in the early days of the American Colonies seems to have attracted to it men of capability. The settlers brought none of the traditions of feudalism, which made the leech and barber surgeon a servant of the chief. The profession was early regarded as a desirable one. In the Dutch Colony of New Amsterdam the doctor was an official and in New England almost as much respect was paid to the physician as to the clergyman. Distinction was granted to those who were regarded as educated men. The doctor trained his son to follow in his footsteps and educated him for the purpose as thoroughly as was possible. From the year 1631 to 1805 there always was a Dr. John Clark in Boston for the citizens of Boston to consult. The title was almost hereditary, and there are physicians in the city of Boston to-day whose direct ancestors were practising here a hundred years ago (Warren, Hayward, Bigelow, Shattuck, Homans, Townsend, Cheever, Jeffries, Channing, Reynolds).

Dr. Holmes writes ("The Medical Profession in Massachusetts"): "Many names in the catalogue of the early physicians have been associated in the late period with the practice of the profession, among them Boylston, Clark, Danforth, Homans, Jeffries, Kittredge, Oliver, Peaslee, Randall, Shattuck, Thacher, Wellington, Williams, Woodward."

The public accorded prominence to the physician. The Medical-Chirurgical Faculty of Maryland a hundred years ago proudly claimed as its motto the line of Homer:

Ἴητρος γὰρ ἄνηρ
πολλῶν ἀντάξιος ἄλλων.

In turn, character, broad education, force and high purpose was demanded of the leaders of the profession. Nathan Smith, Gerhard, Elisha Bartlett, Warren, Bigelow, Alonzo Clark, Ware, Austin Flint, Bowditch, and their peers maintained the standard and passed their example to posterity. There has been no lack of achievement from a want in the character of the medical profession.

The education of medical men in America was dependent upon the conditions of American life. In the early provincial days and in a large country with a sparse population, with imperfect means of travel, students were, following the English custom, apprenticed to the prominent physician of the neighboring town. They read medicine in the physician's office and performed subordinate work. They lacked schooling, but they had the best of training in graded and increasing experience under the eyes of exacting criticism. As the communities grew the number of these students increased and the physicians could neither find room nor time for their classes. Schools were formed by the association of several physicians and their following. Energetic and ambitious physicians called themselves professors or induced a struggling neighboring college, ambitious to obtain the distinction of a university with many faculties, to appoint them to chairs. The prominent positions were assigned to the most influential physicians; the younger men hoping for preferment trained themselves by lecturing on the less popular subjects. Nathan Smith, who founded three medical colleges, was professor of several faculties in each, not finding sufficiently worthy colleagues.

The public was not aware that there was need of rich endowments of medical schools, as the best of practitioners had been bred without laboratories or perfected schools, and as a result, few of our medical schools have endowments for scientific work; consequently a large number of students were and are in many localities obliged to attend foreign schools, if desirous of learning the medical sciences. "Pertransiunt multi et crescit scientia."

The condition of our leading medical school thirty years ago is well described by a recent writer in a statement which older physicians know is not exaggerated:

"In 1869 President Eliot found the (Harvard) Medical School little more than an irresponsible commercial venture. There were no requirements for admission; attendance was required for two courses of lectures only, brief in themselves, and still further abbreviated by the failure of the great majority of students to attend during the summer term. A student who passed successfully five out of nine oral examinations of five minutes' duration each received a diploma, although he might not know the limit of safety in the administration of morphine, and one had actually killed two early patients in consequence."

As the President said, "Under this system young men might receive the degree of Doctor of Medicine who had had no academic training whatever, and who were ignorant of four out of nine fundamental subjects."[2]

All this has fortunately been changed and our schools now, as a rule, furnish satisfactory preparation for practice and degrees of value. But the system of medical education is still defective and does not tend either to economy of administration or to the production of the best and most scientific work. There are one hundred and thirty medical schools in this country which are recognized as worthy to issue accepted diplomas. There are ten in the city of Philadelphia; there are ten in the city of New York; there are eight in Baltimore, and four in Boston. There are sixteen in Chicago whose diplomas are recognized and seven unrecognized. There are nine in St Louis. In com-

[1] The Annual Discourse before the Massachusetts Medical Society, June 14, 1899.

[2] President Eliot as an Educational Reformer: President W. D. Hyde, Atlantic, March 1899, p. 531.

parison with this it will be found that in the German Empire twenty universities are sufficient; in Austria and Hungary, including Croatia, there are eleven. Manifestly many of the American medical schools could be spared. This is so evident that the medical schools in St. Louis are attempting to combine their energies and to form a consolidated institution. If there is an economy of administration in the union of small railroad corporations, the same principle can be applied to professorships of physiology, anatomy and pathology.

As there is practically no check on the number of medical schools, beyond the good nature of the community, the title of professor is not uncommon and its prevalence weakens its authority. The decision of a judge has weight, but the opinion of a professor may not excite even curiosity. Nor can it be said that the country lacks doctors. There are in England 28,000 medical men, in France 17,738 practising medicine. In the United States there are said to be 116,000, or about one to every 600 inhabitants.

This congestion naturally develops competition, which in an intelligent community trains excellent practitioners. England develops great lawyers in spite of a system of education in law so defective as to admit of no defence. It can certainly be said with truth that the medical practitioners in this country will stand comparison with those of any nation. The profession in America is a highly developed one in all that relates to the practical application of medical science. Our hospitals are, perhaps, the best appointed and administered in the world. And it is not only in the larger centres that well-equipped hospitals are to be found. In Massachusetts almost every city or town of enterprise has a hospital furnished and supported in a way to meet all requirements. It is doubtful if the medical needs of a population in so large an area of the world's surface are anywhere so carefully attended to as within the confines of our Republic.[3]

American contributions to practical medicine are well known. Anæsthesia, the introduction of abdominal surgery, the surgery of the appendix, reduction of dislocation of the hip, litholapaxy paracentesis, the development of gynecology, orthopedic surgery, dentistry, the study of fevers and enteric disorders, and the classified studies of functional and nervous diseases hardly need comment.

The American medical profession is certainly characterized by a great readiness to learn and an eagerness for practical knowledge. If the French poet is correct in claiming that the great evil of our time is due to inertia and the great virtue is enthusiasm,[4] certainly much is to be expected of the American profession, for its enthusiasm is without limit.

The Autocrat has said: "Nothing sheds such light on the superstitions of an age as the prevailing interpretation and treatment of disease," and it may be added that nothing is a better measure of the worth of a profession than its literature. American medical literature was thoroughly provincial for a long period; eagerness for the teaching of others, however, and a knowledge of personal defects are commendable traits and furnish a good foundation for wisdom. American medical text-books, until recently, were chiefly translations or American issues of foreign books, sometimes with commentaries by the American editor.

An examination of the catalogue of the Harvard Medical School for the year 1875–1876 shows in a list of books recommended to students for text-books and for collateral reading:

	Foreign.	American.
Anatomy and histology	9	1[5]
Physiology	8	2
Medical chemistry	7	0
Materia medica	0	3[6]
Pathological anatomy	4	1[7]
Therapeutics	2	2
Obstetrics	2	2
Obstetrics	3	0
Theory and practice of medicine	2	2
Surgery	7	0
Total	44	13

In the year 1898–1899 it will be found that there are eighty-five American text-books and seventy-one foreign.

	Foreign.	American.
Anatomy	9	8
Histology	4	3
Physiology	9	2
Chemistry	6	5
Hygiene	1	2
Bacteriology	3	3
Therapeutics	1	1
Pathology	4	2
Obstetrics	4	2
Theory, and practice	3	6
Clinical medicines	5	8
Surgery	2	9
Gynecology	3	5
Pediatrics	0	5
Ophthalmology	4	4
Otology	2	2
Neurology	1	5
Psychiatry	4	6
Legal medicine	1	1
Clinical microscopy	0	1
Dermatology	5	5
Total	71	85

The growth has been greater than would appear from these lists.

At the beginning of the Revolutionary War there were only one book, three reprints and twenty pamphlets by American authors. To-day there are 7,000 books and reprints and a large number of pamphlets. There are 300 books and pamphlets written by American authors annually, and 5,000 journal articles. In 1879–1880, 10,334 books and journal articles were written in the United States in comparison with 7,476 written in England at the same time.[8] The Americans are probably the greatest consumers of medical literature, and in medical libraries are foremost. The development of medical journals has been remarkable.

Since the latter part of the last century the medical profession has organized medical associations, and there is no healthier sign of the times in American medicine than the growth and excellence of our medical societies. They have raised the standard of education, promoted legislation against quackery; but as the training of the doctor is largely that of a particularist, he is frequently a defective organizer, and our societies often lack in influence which other interests possess. It would be difficult for a State medical society to obtain from a legislature a grant for the investigation of malaria, but the agriculturists have secured considerable grants for the extermination of the gypsy moth. It is not difficult to raise a large sum for experiments in a new process in the manufacture of steel, or a new application of force, but a doctor would be long a beggar before he could collect

[3] Hospitals are to be found in thirty-four cities and towns of this Commonwealth, besides the abundant hospital accommodations in Boston.

[4] La Princesse Lointaine: Rostand. "La grande vice, c' est l' inertie, et la vertue, c' est l' enthusiasme.

[5] A guide for dissection.

[6] One United States Dispensary.

[7] A guide for autopsies.

[8] Journal American Medical Association, June 6, 1899, p. 1,214.

funds for a research for the antitoxin of influenza. Our medical societies are too apt to organize more for the relation of personal experience or achievement than for the advancement of an idea. As Dr. Senn has suggested, our societies should become great graduate universities, stimulating and rewarding the highest professional work and influencing the whole body politic.

At the beginning of the century our medical societies were few and small. To-day, besides the active special societies and their triennial congress, each State and territory, with but one exception, has its organized society. The national society has probably greater opportunities for influence than any medical association in the world, and with its membership of ten thousand is perhaps the largest of existing medical associations, and the Massachusetts Medical Society, with its large and increasing membership, has always been a power in the State.

The most distinguished accomplishment of the medical profession in America is the development of the army medical department, which may be regarded not only as a product of our national existence but of the profession from whose ranks the army medical department is recruited.

When the embattled farmers were gathered at Cambridge in an army which ushered in the Revolution, the Second Provincial Congress of Massachusetts Bay, in preparation for the better care of the sick and wounded, in an enactment provided for the thorough examination of all persons asking appointments as surgeons. Thacher, in his military journal during the Revolutionary War from 1775 to 1783, states that the examination which he himself passed occupied about four hours. The subjects were anatomy, physiology, surgery and medicine. A number of the applicants were rejected, and the examination, he says, "was in a considerable degree close and severe, which occasioned not a little agitation in our ranks." The standard which was established was, however, much weakened by the vicious privilege which persists to the present day in our militia, allowing soldiers to choose their own officers and giving the officers in turn the nomination of the surgeon. In the stress of the times the evils of this could not be obviated by any attempts at thorough examinations. The Continental Congress at this time was a body without experience in general legislation, with a fear of centralized authority, and the result was that the Continental Army was absolutely without organization, and suffered from a lack of proper support from the commissary and quartermaster's departments. This chaos was worse confounded by a contest between the regimental and general hospitals, which became so bitter as to prevent any proper administration.

The difficulties were well described in a letter of General Washington to John Hancock, speaking of the improvement required for the hospital department: "No less attention should be paid to the choice of surgeons than of other officers of the army. They should undergo a regular examination, and if not appointed by the director-general they should be subordinate to, and governed by, his directions. The regimental surgeons I am speaking of, many of whom are very great rascals, countenance the men in sham complaints to exempt them from duty, and even receiving bribes to certify indispositions, with a view to secure discharges or furloughs." "We had better trust to the forces of nature and our constitutions than to suffer persons entirely ignorant of medicine to destroy us by ill-directed applications."

The infant nation was, as has been said, "nursed by great men with empires in their brains," and soon the medical department received the careful attention of Washington and eventually seems to have been brought into as an efficient condition as was possible. The exigencies of the service bred a group of unusual medical men whose histories we should be more familiar with. The first in prominence is John Morgan, the first director-general; of him Benj. Rush writes, "As a student he was laborious and painstaking; as a physician learned far beyond most of his contemporaries. As a young surgeon in the British Army he acquired both knowledge and reputation. He may be said to have been the father of medical education in America, for while abroad he elaborated a plan for the institution of medical colleges in the Colonies, and he sustained his views in an elegant and scholarly discourse on the subject at the Commencement of the College of Philadelphia on the 31st of May, 1765, and it was by his efforts, aided by Shippen and others, that the college was induced to establish a medical department. The historian who shall hereafter relate the progress of medical science in America will be deficient in candor and justice if he does not connect the name of Dr. Morgan with that auspicious era in which medicine got studied as a science in this country."

Succeeding Morgan as director-general was Dr. William Shippen, Jr., a graduate of Princeton, a pupil of John and William Hunter; he was said by a contemporary to have been "a graceful person of polished manners, and with the tones of his voice singularly sweet and conciliatory. In his intercourse with society he was gay without levity and dignified without harshness and austerity." Under the direction of these men was developed an organization which is noteworthy. The first attempt to check disease in military service by proper attention and ventilation appears to have been devised by Dr. James Tilton, of Delaware, who was in charge of the General Hospital at Trenton, N. J., and who succeeded by a new system of hospital construction in diminishing the sickness resulting from the poisoning of the patients by the crowding of hospitals. He did away with the hospital tents and private houses then in use, and caused the construction of a large number of log huts, built roughly, so that the air could freely penetrate the crevices. There were no floors, the ground was hardened or baked by heat, and each hut accommodated from five to six men. The fireplace was in the centre and a hole was left at the ridge, permitting the exit of the smoke. The mortality of typhus diminished decidedly in cases treated in this manner. It is also interesting to note that Shippen and Cochran, endorsed by Washington, recommended to Congress a plan of hospital organization, among the provisions of which was the establishment of female nurses in the military hospitals.

Trained in the arduous service of these memorable years were a number of men whose names should not be forgotten: Cochran, Philip Turner, said by Shippen to have been the equal of any operating surgeon in Europe and America; John Jones, afterwards professor of surgery of King's College, N. Y.; James Craik, surgeon in the campaign under Braddock and afterwards the physician to Washington in his last illness; Eustis, later Governor of his State, Secretary of

War and Minister to Holland; Brooks, Warren — afterwards professor of anatomy and surgery; Townsend, Hayward, Adams, Homans and many others who left to their descendants a title to hereditary distinction in a plain, printed commission as surgeon in the army, countersigned in the clear, strong signature of George Washington.

The twilight of these surgical demi-gods was devoted after their broadened experience to practice and to the establishment, through teaching, of an American medical profession on the ruins of the destroyed provincial one. They helped to found medical schools and left a tradition of devoted service which has not been lost.

After the establishment of peace, the army medical service was disbanded and as a result of the lack of preparation in military medicine there was great suffering in the War of 1812, that after-clap of the storm of the Revolutionary War. From the confusion which followed there was developed for the first time an organized medical department under the direction of one who should not remain without honor in his own country. Dr. Joseph Lovell, a native of Charlestown, Mass., a graduate of Harvard, entered the army as an assistant surgeon in 1812. Through his abilities he arose to the direction of the army medical department, being the first surgeon-general, as the office was created with his appointment. He served as surgeon-general for thirty years and died in the service, with the respect and love of the whole command. He impressed upon the army medical department scholarship, thoroughness and efficiency. His report on the diseases incident to camp and campaigning bears the hand-mark of a great medical writer, and was the forerunner of the classical reports issued later from the Surgeon-General's Office.

General Lawson, the successor of General Lovell, was trained in the Mexican War, and a man of different mould. He added to the organization great energy and a sense of official dignity which brought the army medical service into the prominence it deserved. It may be remembered that even in the early days, scientific work was carried on by the surgeons of the army. Beaumont's contribution to the study of digestion is too familiar to need quotation. The meteorological reports conducted under General Lawson are perhaps to be regarded as the foundation of the modern science of meteorology. The first observations on the employment of quinine in large doses in malaria also came from the army medical department. The Seminole War, the Black Hawk War, with its cholera campaign, the Mexican War, with its confusion, and the trying frontier experiences, all furnished an excellent school for military surgery. But the whole record of the army medical department from its beginning may be regarded as a preparation for the enormous achievement in the Civil War, that political Krakatoa which shook the continent and sent confusion around the world.

The expansion in two years of a service from the work for a little body of 15,000 men to the greatest medical organization in history for an army of 2,000,000 in a campaign embracing a continent needed the efforts of so many that it is difficult to select the names of the most important. One of the most forceful influences in the perfection of the service was, in all probability, that greatest of organizers, Stanton. It is difficult to realize the enormous extent of the medical work of that time. But the medical historian will be attracted by two features: (1) The utilization of the enormous experience for the benefit of scientific knowledge; (2) the establishment of trained services and organizations of relief for wounded and sick.

Woodward's investigations upon the intestinal disorders of the war is one of the great contributions in clinical medicine. The tabulation of the examination of a million recruits is one of the most important contributions in anthropology ever made, and the "Medical and Surgical History of the War," with its records of cases by the thousands, may be regarded with the army museum and the medical library as national monuments testifying for all time to the devotion and thoroughness and high quality of the army medical service in those terrible years.

The medical department was called upon to expend in the four years of war over $45,000,000, exclusive of salaries, for the benefit of the sick and wounded soldiers. Two hundred and one general hospitals were in operation, and a hospital transport service of four sea-going steamers and supplies for 5,000 beds, besides a large number of hospital river boats, hospital railway trains, etc., over 2,000 regimental surgeons, and 85 contract surgeons and 5,500 assistant surgeons. Of these, 32 were killed in battle, 83 died of wounds, four died in prison, seven of yellow fever, three of cholera, and 271 of other diseases, making a death-roll of 400 names as the profession's life offering in the Civil War.

The enormous number of wounded following the most determined battle of history paralyzed all service, and indescribable suffering followed, but from the chaos, as in the Indian myth of the water-lily rising in the circles of troubled waters from above the pool of decay, there was perfected the greatest organization for the relief of human suffering the world has seen. The establishment of a trained ambulance corps under a system which has served as a model copied by other nations is an achievement sufficient to place Major Letterman on the list of the great benefactors to the race. The Sanitary Commission was the great forerunner of the Red Cross Association, now recognized universally as one of the beneficent associations which relieves war from barbarism.

When the war against Spain came upon the country suddenly it was generally believed by a community ignorant of war that the great efficiency of the medical department in the Civil War could be immediately continued after a lapse of thirty years. It was after the list of sick in the summer camps, and the terrible condition of the Fifth Army Corps at Santiago, and the confusion of the first week at Montauk, that an excited people, inexperienced in the actualities of campaigning, hastily condemned the medical department. Not till the campaigns of this much-photographed and much-written war have been placed fully in the possession of the community, and the mistakes fully shown, can a critical analysis be made. This will be found to show that the work of the army medical department was not only not culpable, but, considering the difficulties under which it labored, of almost incomparable excellence. It will be found that previous experiences in war were lost upon legislators, and that the army medical department was cut down to the smallest possible point for our small army. It is beyond the possibility of any system to suddenly develop trained and experienced medical officers, and the proper selection of surgeons for an army of two hundred thousand men was im-

possible. It may be remembered that Surgeon-General Lovell, in 1817, wrote as follows: "An officer of the line may soon learn the duties of the field, and a surgeon be amply qualified for his profession, and both of them be worse than useless in the army. It is from a knowledge of minutiæ, which depend neither upon general regulations nor specific orders, that the experienced officer and surgeon becomes so much superior to the undisciplined recruit. It is almost entirely in order to acquire this kind of knowledge that a military establishment is kept up in time of peace, and it is an undoubted fact that in no department of the army is it so slowly acquired and, therefore, so deficient as in the medical. How severely this was felt during the greater part of the last war (1812) is too well and too publicly known to need comment."

It is in all probability largely due to the neglect of this common-sense principle that the deaths and the sickness in the summer camps were so great. For the evidence is clear that the sanitation and policing were neglected in the volunteer camp, both by the officers in charge and by the regimental surgeons, those regiments with efficient officers and discipline necessarily suffering from contiguity with ill-disciplined troops. When it is remembered that the marines at Guantanamo suffered no sickness, and that ten thousand troops were encamped at South Framingham without sickness at a time when typhoid and camp disorders were prevalent at Camp Alger, Camp Mead and Camp Thomas, it is clear that an unnecessary amount of sickness and death is to be laid to the score of some one. It would appear to be clear that it is not the army medical department which is to blame.

The campaign at Santiago will probably be recorded by the historian as a modern counterpart of the capture of Louisburg. There was the same gallantry on the part of the men; there was the same successful achievement of the impossible; there was comparatively, judging from the difference in the advance of the science of war, the same confusion. As we now read Parkman's pages, we condemn the mistakes and are proud of the gallantry of the troops, and it is probable that in a century from now, when war has become an exact science, and the art of keeping men efficient, the chief factor in war, has been perfected, the historian will be surprised at the blunders and incompetency shown by a War Department inexperienced in the perfected science of war.

"Inter arma silent leges," and this is certainly true of the sanitary laws in the hurriedly-prepared campaign of Santiago. We should be led to believe then the American Republic of to-day was incompetent to wage efficient war; but an assertion like this is met by a record strange even in this land of contrasts, namely, the remarkable efficiency of the Philippine expedition, conducted under the same War Department and with volunteer troops. It may be said that after the second week in September order was brought about, well-organized hospitals were established, and medical service brought to a high stage of efficiency, which the profession can well be proud of. It is to be remembered, to the credit of the medical department, that if the army was supplied with out-of-date weapons, first-aid packages were furnished to the troops; they were drilled in their application and their beneficent efficiency thoroughly demonstrated.

The country will pardon the sufferings at Santiago as, perhaps, a military necessity, and even condone the bad equipment of the transports and the week of confusion at Montauk. The confusion may be regarded as the result of haste and changed plans, difficult to avoid in war. The mortality statistics show, however, an undue mortality in the training camps. The chief mortality was in August and September, after practical cessation of campaigning, and occurred chiefly in the camps of troops never sent to the front.

Comparison of Monthly Death-rates (per 1,000) from Disease.

Months.	1861–1862. Mean strength.	Number of deaths.	Ratio per 1,000 of M. S.	1898–1899. Ratio per 1,000 of M. S.	Number of deaths.	Mean strength.
May	16,161	18	1.11	.26	42	163,726
June	66,950	55	.82	.44	90	202,526
July	71,126	106	1.49	1.72	451	362,613
August	112,359	242	2.15	5.21	1,400	268,507
September	165,126	365	2 21	5.89	1,541	261,824
October	256,884	725	2.82	3.17	809	255,000
November	301,818	1,145	3.79	1.51	365	242,000
December	343,181	1,471	4.29	.84	201	240,000
January	352,760	1,593	4.52	.85	180	211,000
February	327,734	1,346	4.11	.87	156	180,000
March	328,878	1,575	4.79	.90	123	136,000
April	410,416	1,881	4.58	.71	80	113,000
Annual	229,452	10,522	45.86	25.73	5,438	211,360

But the two thousand deaths in the summer camps will remain as a blot in American history. In explanation many excuses are offered. Training camps badly placed; general officers ignorant or negligent of sanitary laws; appointment of medical officers not sufficiently experienced for their undertaking to important positions; incompetent regimental officers and surgeons appointed by State governors, regiments sent to the camp equipped for war only in their brass bands, ill-disciplined soldiers unacquainted with the elements of sanitary decency, are all mentioned and perhaps all are true. The American people have learned another lesson of the need of thorough preparation, which it is to be hoped will not be forgotten. The experience of the war has shown the great general ignorance of the elements of sanitation. The medical profession has certainly a large field of endeavor in preaching what has been called the "Evangile of hygienic righteousness."

It is somewhat singular that a nation whose energies have been enlisted chiefly in the pursuits of peace should have contributed so much to the science of war. The rifle was first used in battle by American soldiers at the battle of New Orleans. The open order of attack, hasty intrenchment by the advancing attacking column were productions of American frontier life and are developments of American arms, making war less destructive to human life. If war is, as Shakespeare says, "God's besom" to sweep away the refuse of the world, it will always be needed, and it will be the part of civilization to develop and humanize it. War was originally brute force. Napoleon made it the science of positions, and it should be the duty of our nation, which has done so much to humanize war, to make of it a perfected science of sanitation — the art of keeping men efficient — and the preparation for it a long study of the laws of health.

If the work in the army medical department is more than commendable, that of the navy is superlatively good. In the navy in the last war perfection seems to have been reached; the men not only were as

healthy in war as in peace, but in all probability healthier than in the general run of city life. The marines at Guantanamo were kept in perfect discipline, the springs were guarded and no water was drunk except when sterilized, and although they were exposed to the same influences which overcame the soldiers, there was no sickness. The report of the Surgeon-General of the Navy for the year of the Spanish War shows even better health than in time of peace.

To show what an advance this means, it is only necessary to compare the account of the sickness of the British fleet in the West Indies in 1726: out of a force which never exceeded 4,750 persons, two flag officers, seven captains, 50 lieutenants, 4,000 men died in one year of various forms of sickness.

A statistical comparison of the Spanish War with other wars would be of interest.

The accompanying table prepared by Dr. Mosher, of Boston, of the principal wars of the century shows the relative position of the war in the mortality from disease in the list of other wars. The table shows the percentage of mortality in campaigns by the French and English and Americans in tropical countries.

DEATHS FROM DISEASE.

Walcherian (E.), 1809	23.33
West Coast Africa (E.), 1824	69.00
Mexican (U. S.), 1846	10.00
Mexican (U. S.), 1848	10.00
Crimea (E.), 1854	23.00
China (F.), 1862	11.80
Civil War (U. S.), 1862	4.00
Civil War (U. S.), 1863	6.00
Franco-Prussian (G.), 1870-71	1.43
Cape Coast (E.), 1873	17.30
Afghanistan (E.), 1878-80	9.37
Egypt (E), 1882	7.21
Soudan (E.), 1883-86	28.00
Madagascar (F.), 1895	30.00
Chino-Japanese (J.), 1895	1.48
Spanish-American (U. S.), 1898-99	2.50
Manila Expedition (U. S.), 1899	.80

TABLE OF MORTALITY FROM DISEASE IN CAMPAIGNS IN TROPICAL COUNTRIES.

British army. Name and date of campaign.	Died of disease. Percentage of strength.	French army. Name and date of campaign.	Died of disease. Percentage of strength.
Soudan, 1889	0 06	Tonkin, 1884	6.0
Mashonaland, 1876-97	0.20	Tunis, 1881	6.1
Suakin, 1885	0.22	Mexico, 1862-63	7 1
Soudan, 1885-86	0.41	Tonkin, 1885	7.5
China (Talienwan), 1860	0.54	Dahomey, 1893	8.7
Ashanti, 1895-96	0.56	Tonkin, 1886	9.9
Egypt, 1882	0.57	Tonkin, 1887	10.6
*Manila Expedition, 1899, U. S. A.	0.80	Cochin China, 1863	10.7
Abyssinia, 1867-68	1.21	Soudan, 1887-88	11.6
Galeika Gaika, 1877-78	1.40	Cochin China, 1862	11.7
China Field Force, 1860	1.49	China, 1862	11.8
Matabeleland, 1896	1.65	Tonkin, 1888	13.3
Ashanti, 1874	1.74	Cochin China	14.0
Zululand, 1879	2.48	Soudan, 1885-86	20.0
Spanish-American, 1898-99,	2.50	" 1886-87	22.0
Chitral, 1895	2.51	" 1884-85	22.5
Nile, 1884-85	3.64	" 1883-84	28.0
Dongola, 1896	4.66	Madagascar, 1895	30.2
Afghanistan, 1878-80	9.37		

The English campaigns show figures (Table II) that are better and figures that are worse than those of the Manila campaign. Their mortality in one tropical campaign was down to 0.06 per cent. In contrast to this the English mortality in the Afghanistan War ran up to 9.37 per cent. and to-day averages in India 4 to 6 per cent. at a time of peace. Kitchener's Soudan campaign would seem to offer the most recent chance for comparison. When, however, the conditions of the two, the Soudan campaign of Kitchener and our Santiago campaign, are examined, they are found not to be comparable. For instance, the English troops were mostly seasoned natives, plus a small acclimated European contingent. Our men were green troops, not veterans, and anything but acclimated. The English had the same heat to contend with that our troops had, but they did not have the tropical rains — nor did they fight in a yellow-fever country. Notwithstanding all the advantages on the side of the English, typhoid broke out among them and followed them, and "the mortality during the campaign from enteric fever . . . will probably be found, when full reports are in, to be excessive."[9] One battalion lost 16 per cent., "a formidable percentage, fully equalling that of some of our green volunteer regiments on their return from Cuba, where they had the special disorders of malaria and yellow fever also to combat."

So far in the Manila expedition the losses from disease are 0.8 per cent. In 1824 the English lost from disease on the West Coast of Africa 69 per cent. of their men, "so that it became necessary to enumerate the strength each quarter, as the troops were cut off with such rapidity that few lived to complete one year in the command." At most one per cent. of our men died of disease in 1898, while during the years 1862–1865 4 to 6 per cent. died. In other words, to quote from Department Surgeon-General Smart: "Thirty-seven years ago the flower of the manhood of this country, after months of deadly losses, suffered in April, 1862, more than twice the loss incurred in August last (our worst month), and, instead of going home on sick furlough, girded up their loins for the attack on Richmond by way of the Peninsula."

The other noteworthy figures of the tables are the figures of the American wars by themselves. There is a steady decline in the loss of death by disease. Ten per cent. died of disease in the Mexican War; 5 and 6 per cent. in the Civil War, and 2.5 per cent. in the Spanish-American War, and 0.8 per cent. in the Manila expedition. The mortality and sickness in the Austro-Prussian War was high, but the small loss in the Franco-Prussian War, 1.42 per cent., is noteworthy, though it should be remembered that the campaign was not one of great hardship; but especially striking are the tremendous losses of the French in the Soudan campaign, 28 per cent., and in the Madagascar campaign, 30 per cent. These figures of the French losses were taken from a table comparing the losses of the French and English troops in recent campaigns in tropical countries. The table showed that with the exception of the Afghanistan campaign of the English, which had a mortality of 9 per cent., due to an outbreak of cholera, the most unhealthy of eighteen English campaigns was healthier than the healthiest of eighteen French campaigns.

The most unhealthy English was Dongola, 4.66 per cent., and the healthiest French campaign was the Tonkin campaign, with a mortality from disease of 6 per cent. This fact and the tremendous mortality of the Madagascar campaign, 30 per cent., led to an investigation.

This table shows, then, that the losses from disease in the Santiago campaign were relatively small, and that the losses of the Manila expedition will compare with the best. Our losses from disease in the field are

[9] Journal of American Medical Association, December 10, 1898, p. 1,426.

open to but little criticism. Men, however, died from disease not only in the field but in the camps. Is our mortality open to criticism? The commission appointed by Surgeon-General Sternberg to examine this point reports that it is. The words of Dr. Vaughan are, "a mortality of 7 per cent. in camps which should be hygienic is rather high." "This could have been prevented had the Government been more careful in the selection of volunteer surgeons."

Further on in his paper on typhoid in our army camps he says: "I meant that the average volunteer surgeon was better than the average doctor in civil life. The point of the whole matter is that the medical officer is powerless unless the line officer will uphold him and follow his directions. . . . I think it is a shame and a crime that the line officers of our regular army have no education as to sanitary knowledge.

"How did the disease (typhoid) spread? There is no evidence that the water supply in the larger camps was infected. . . . It may be said truthfully that the spread of this disease was caused by the improper disposal of excreta. The epidemic was not due to sending northern men to a southern climate; it was not due to the locality or to the massing of men in one place, but it was brought about by camp pollution. The men's feet carried the excreta, flies carried it to food, and thus it was spread." [10]

The high mortality of our summer camps was due to poor policing and poor hygiene; one the fault of the army, the other the fault of defective sanitary education. The mortality of war does not depend upon missiles so much as upon neglect in sanitary care. The rifle of the enemy is not as deadly as neglected sinks and foul hospital bed-pans.

In comparison with this the mortality of the Spanish Army in Cuba, 1897, is important.[11] The following figures are approximately correct for this year, 1897.

Deaths from yellow fever	6,034
Deaths from enteric fever	2,500
Enteritis and dysentery	12,000
Malarial fevers	7,000
All other diseases	5,000
	32,534

"I can safely say that 10 per cent. of the 30,000 invalided home were destined to certain and early death. These enormous death-rates, it must be remembered, occurred in an army which at no time was properly cared for, and was always badly clothed and badly fed; exposed to all the dangers of a tropical climate, they succumbed easily."

Sick percentages of the United States Army from 1840 to 1899 show marked improvement in the development of sanitary science:[12]

1840-1854	8.9 per cent.
1862-1866	20.0 "
1887-1897	4.5 "
1898 (entire army),	3.5 "
1899 (Manila),	8.9 "

In regard to the health of the troops in Manila, General Otis writes in April: [13]

"I think that the health of the command will compare favorably with the British troops in India, there being only about 8 or 9 per cent. on *sick report* from all causes. The *mortality* of the British Army in India averages from 4 to 6 per cent., so that the percentage of sickness must equal, if not exceed, the percentage of sickness in our troops in Manila."

The philosopher of Chicago, viewing this country from behind his bar, shows contentment when he pronounces that "This is a great country, and the best of it is that we know it," but that the medical profession may not fall into that condition of self-congratulatory complacency which is often the initial stage of degeneration, our sanitary statistics may serve as a corrective.

In 1896 75,000 deaths occurred in this country from typhoid. In 1898 1,713 deaths from typhoid occurred in three months in Philadelphia.

Typhoid fever is, as is well known, not only a preventable disease, but it is prevented, as is shown by the statistics of Munich and Hamburg; and Berlin, formerly the abode of filth, now the cleanest city in the world, is now almost free from typhoid. A few statistics will make the facts of our sanitary deficiencies more clear.

DEATH-RATE FROM TYPHOID FEVER PER 100,000 POPULATION PER ANNUM, 1890-1895.[14]

	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.
Albany	60	108	50	59	52	165		
Amsterdam	19	11	15	16	8			
Atlanta	149	119	87	66	43			
Baltimore	57	34	42	47	49	28		
Berlin	9	10	8	9	4			
Boston	32	33	25	26	23	32	33	32
Brooklyn	21	21	18	18	16	16		
Brussels	26	41	23	27	14			
Buffalo	44	56	38	37	62	28		
Cambridge	16	21	20	21	30	15	36	15
Chicago	83	160	103	42	31	32		
Cincinnati	67	62	40	43	50	36		
Cleveland	66	52	54	47	27	36		
Copenhagen	9	8	7	9	7			
Detroit	18	13	51	61	26	24		
Edinburgh	19	18	13	14	15			
Fall River	53	66	38	20	33	33	30	45
Glasgow	26	31	18	20	24			
Hamburg	28	23	34	18	6			
Hartford	60	73	82	80	51	58		
Lawrence	134	119	105	80	47	31	19	16
Liverpool	24	25	25	53	58			
London	16	15	11	16	15			
Lowell	160	96	90	62	60	39	40	19
Montreal				20	20	23		
Munich	8	7	3	15	2			
New Haven	28	20	29	31	26	34		
New Orleans	20	23	21	15	28	41		
New York	21	22	14	20	17	17		
Paris	30	20	28	25	29			
Philadelphia	64	64	34	41	32			
Pittsburg	131	100	100	111	56	77		
Richmond	88	60	68	53	31	27		
Rome	35	36	26	34	30			
San Francisco	45	34	32	34	37	32		
St. Louis	34	30	37	103	31	19		
Toronto	80	90	40	40	20			
Vienna	9	6	8	7	5			
Venice	44	33	30	26	18			
Washington	89	86	72	72	72	69		
Worcester	17	21	18	33	32	25	16	15

The accompanying diagram showing the death-rate from typhoid fever in Massachusetts indicates how impure water supply is related to the disease:

SUMMARY BY DECADES, 1856-95.

Period.	Death-rate from typhoid fever per 100,000.	Percentage of population not supplied with public water.	Period.	Death-rate from typhoid fever per 100,000.	Percentage of population not supplied with public water.
1856-65	92.9	75.44	1876-85	47.4	31.75
1866-75	80.8	58.94	1886-95	36.4	13.93

It will be seen that Boston is higher in typhoid death-rate than Amsterdam, Berlin, Brussels, Edin-

[10] Medical Record, New York, May 13, p. 683.
[11] Medical News, New York, lxxii, 592; W. F. Brunner, M.D. Sanitary Inspector, report to Surgeon-General.
[12] Journal American Medical Association, April 22, 1899, p. 873.
[13] Loc. cit.; Forum, May, 1899, p. 345.
[14] Prepared by the kindness of the Massachusetts State Board of Health.

burgh, Glasgow, Hamburg, Liverpool, London, Munich, Paris, Vienna, and if this is true of Boston, what is to be said of Philadelphia?

Another means of indicating the medical intelligence of the community is found in the figures of infant mortality.[15]

INFANT MORTALITY IN DIFFERENT COUNTRIES.

DEATHS UNDER ONE PER ONE THOUSAND BIRTHS.

Countries.	Years.	Infant mortality per 1,000 births.	Countries.	Years.	Infant mortality per 1,000 births.
Ireland	1884-88	94	Italy	1884-91	192
Sweden	1881-90	97	Prussia	1886-92	207
Scotland	1885-90	120	Hungary	1884-97	212
England	1885-91	144	Austria	1886-87	246
Belgium	1881-91	159	Saxony	1886-92	281
France	1885-90	165	Bavaria	1879-88	287
Holland	1885-90	179	Massachusetts,	1876-95	161

As Dr. Abbott says, "From this table it appears that the infant mortality of Massachusetts is greater than that of Sweden, Ireland, Scotland, England, and Belgium, but less than that of the other countries named in the table, that of Bavaria being greater than our own by 78 per cent."

State sanitation has been brought in Massachusetts to a high state of excellence through the efforts of Drs. Bowditch, Derby, Folsom, S. W. Abbott and our own former president, Walcott. The work of the Massachusetts State Board of Health is to be compared with the best existing. This is also true of many of the boards of health of our cities, especially that of Boston under Dr. Durgin, but unfortunately only to a limited degree of the State boards, and largely owing to the lack of proper legislative support. In the great State of Pennsylvania, the last grant for the Board of Health was only $8,000, exclusive of salaries of officials, for the coming two years' work. In New York State with its enormous wealth, the last annual appropriation was nearly one half less than that of Massachusetts, only $30,000, and in most of the States the regular appropriation granted is barely sufficient to continue the work of the regulation of the practice of medicine necessarily assumed by the boards of health.

The importance of sanitary work can not be overstated, and as it is clearly owing to a lack of public knowledge of the facts that it is defective in America, it is the duty of the medical profession to call attention to the matter. Obstacles may be imagined in the lack of interest on the part of the spoilsmen politicians —those whom Bismarck classifies as *novarum rerum cupidi*—but only eager for a chance for their own advantage. Politicians, however, even at their worst, are obliging tyrants, for they are certain to yield actively to determined public opinion. It is not difficult to awaken popular interest in improvements in laws relative to industrial hygiene, that is, the health of working people, in their various trades, in which we are behind both Germany and England, in the establishment of contagious hospitals, in which we are not as well supplied as in England, and in sanitaria for phthisis, in which America is less well advanced than Germany.

The importance of earnest efforts for the checking of tuberculosis is well expressed in this circular distributed by the German Bureau of Health:[16] "Some estimate may be made of the financial benefit which such public hospitals for consumptives would bring to the people by the following calculations: Assuming that only one-seventh or one-eighth of the 90,800 persons between the ages of fifteen and sixty who die annually in Germany from tuberculosis—or in round numbers, 12,000—were subjected to treatment, and that of these three-fourths, or 9,000, were restored to health or ability to work, and thus remained alive and with their families for three years longer than would be otherwise possible; and estimating the wages of a man (in Germany) to be 600 marks ($150) a year, or say an average of 500 marks ($125) for each person between the ages of fifteen or sixty, then there would be a total gain of 3 x 500 x 9,000, equals 13,500,000 marks ($3,375,000), for those who were thus benefited. To do this would require an expenditure, say, of 400 marks ($100) for each of the 12,000 persons treated, without deducting interest on plant or a total cost of about 5,000,000 marks ($1,250,000.) If now the interest on the estimated capital necessary to maintain 4,000 beds be added to this, or 1,000,000 marks ($250,000) more, there would remain, after subtracting the total cost of 6,000,000 marks ($1,500,000) for the annual treatment of 12,000 patients, a total yearly gain to the public of 7,500,000 marks ($1,875,000). To this should be added the profit to the patients themselves in the pleasure of living, and the protection afforded to the children and families of those restored to health, to whom is thus preserved the support of the working father or care of the devoted mother for perhaps many years to come."

Our position in regard to mortality from phthisis is shown in the accompanying table, and also the need of strenuous endeavor to place ourselves in the front rank of public health. It is true that climate is a factor in the matter of tuberculosis, but rational treatment, proper environment, is probably of greater importance, and already sufficient gain has been shown to stimulate efforts which should place us with our wealth in the highest instead of the lowest place.

DEATHS FROM PHTHISIS AND PULMONARY TUBERCULOSIS PER MILLION INHABITANTS.

AVERAGE FOR YEARS 1887 TO 1893 AND 1894.

Prussia	2,715	2,389
Massachusetts	2,518	2,230
German Empire	2,428	2,363
Ireland	2,124	2,092
Scotland	1,794	1,723
England and Wales	1,568	1,385
Italy	1,340	1,303

DEATHS FROM TYPHOID FEVER PER MILLION INHABITANTS.

AVERAGE FOR YEARS 1887 TO 1893 AND 1894.

Italy	688	442
Massachusetts	380	310
Ireland	228	205
Prussia	215	151
Scotland	194	176
England and Wales	191	166
German Empire	165	131

DEATHS FROM SMALL-POX PER MILLION INHABITANTS.

AVERAGE FOR YEARS 1887 TO 1893 AND 1894.

Italy	293	85
England and Wales	17	27
Prussia	3	2
Ireland	1	16
Massachusetts	2	13
Bavaria	2	0.3
Saxony	2	1
Scotland	5	31
German Empire	3	2

[15] Infant Mortality in Massachusetts, S. W. Abbott, M.D., Journal of the Massachusetts Association of Boards of Health, vol. viii, No. 4, 1898.

[16] From Circular from the Kaiserliches Gesundheitsamt.

DEATHS FROM DIPHTHERIA AND CROUP PER MILLION INHABITANTS.

AVERAGE FOR YEARS 1887 TO 1893 AND 1894.

Prussia	1,456	1,473
German Empire	1,383	1,308
Massachusetts	721	740
Italy	665	566
Scotland	405	443
England and Wales	307	350
Ireland	228	201

In regard to one disease the public sanitary sense appears to be excellent, namely, small-pox, and the marked improvement in mortality from diphtheria and croup in this city indicates sanitary and medical efficiency.[17]

We are told that "righteousness exalteth a nation, but sin is a reproach to a people." Sin can be interpreted as disobedience to the laws governing the universe. Where these laws are known the prevalence of disease becomes both a reproach and a national crime. It is the duty of our profession, of which it may be said, "Altius cæteris Dei patefacit arcana," to study and teach these laws. Is this done in America as it should be? In Germany there is an Imperial Health Office (*Kaiserliches Gesundheitsamt*). In England the Local Government Board regulates matters of health. In France the Council-General of Health (*Conseil générale de Santé*) is consulted on national health. Even in Italy there is a Hygenic Institute for advice. In America there is no national health commission, board or bureau. At the Congress of Tuberculosis, scientific American medicine was represented by a doctor of the Biochemic Department of the Agricultural Bureau at Washington. Should not our National Medical Association or our State societies, which have accomplished so much in improving the standard of the profession and of medical education, address themselves earnestly to the task of removing from our country the reproach of neglect of the highest functions of government, or from being what Dante terms,

"genti dolorose
"ch' hanno perduto 'l ben dello 'ntelletto."[18]

"An unfortunate race, who neglect the help of knowledge in sanitation," as it may be paraphrased.

This suggests an inquiry as to the worth of American contributions to the science of medicine as distinguished from the practical application of knowledge previously obtained. What has America contributed besides confirming, improving, adding to what has been discovered or taught by others?

When the record of this remarkable century which is ending is looked at from a sufficient distance for a proper estimate of values, the achievement most beneficial to humanity will perhaps seem to be the lifting of the art of medicine from the level of an unsatisfactory branch of metaphysics, vivified by empiricism, to the level of the science with the greatest promise to human welfare. Montaigne and Molière were not much in error in their ridicule of the medicine of their day. The empiricism of Chinese and Thibetan medicine, formulated for centuries in aphorisms, loaded with demonology and spirit worship, are not more tedious than the writings and discussions of two centuries ago, are full of discussions as to the humors, the mineral, vegetable and vitalistic theories of disease. The advance from this to the science of disease of to-day is, in the last one hundred years, chiefly the work of France and Germany. The work may be grouped as: Pathological research, by Cruveilhier, Rokitansky, Virchow and his pupils; improved methods of clinical observation and record, introduced by Corvisart, Lænnec, Louis and his followers; the great triumph of Pasteur in his demonstration of the influence of micro-organisms in the causation of disease; and its corollary, the protection and cure by attenuated virus, followed by the discovery of specific germs by Koch, his co-workers and followers; later the study of bacterial poisons and the cure by serum-therapy, developed by Behring, Roux, Ehrlich.

Lister laid humanity under the greatest debt by the application of the germ theory to surgery, and saved to the English-speaking race the credit of a share in the magnificent medical triumph of the century. It is impossible to associate American medicine largely with these achievements. It is difficult to connect an American observer with the discovery and demonstration of the germ of a human disease. In the study of the bacterial poisons, out of eighty-nine observers mentioned in an American text-book on the subject, but six are Americans, Italy contributing twelve and Japan four. Leidy's discovery of the trichinæ in the hog and Jeffries Wyman's confirmation of Pasteur's investigations were of much value, but hardly more than contributory. The discovery of anesthesia was of inestimable value, but although it is a source of national pride, it can hardly be considered an effort of scientific medicine; it was an achievement of magnificent empiricism.

As if to show no absence of true scientific spirit in this country, the work of Welch, Councilman, Sternberg can be mentioned, and of Vaughan, Novy, Chittenden and Minot, Bowditch, Howell, Porter, but especially the fruitful investigation of Theobald Smith. The work on the Texas cattle-plague was conducted under the direction of the Department of Agriculture, but its value to medicine is not limited to cattle.

The demonstration that certain diseases are conveyed by insects, the discovery of the germ, the investigation of the development in the intestine of the insect-carrier and of the transmission of the disease from the insect to a second animal, are achievements of the highest importance, and have been the forerunners of the important work on malaria in man, by Laveran, Ross and Grassi, a work, however, which is largely to the credit of French, Italian and English investigators.

It has been said so often that allowances should be made for us, a young country, that the truth of this has been generally accepted among us, forgetting the underlying fallacy of the statement. The founders of the country were not savages, but selected men, bringing the traditions of advanced civilization. It was said that "The Lord winnowed three kingdoms to plant New England." The early limitations were those of poverty, not of inclination, and poverty has been overcome among us for nearly a century. Our oldest university is nearly three centuries old. It has also been said that the genius of the American people is practical and not theoretical, and that the gift to humanity to be expected of us is to be in contributions to human physical welfare rather than to thought or research — an opinion more calculated to satisfy our national complacency than to add to our national influence; nor does the opinion stand the test of examination.

The growth in material prosperity of the North

[17] The mortality in Boston from croup and diphtheria has been brought through the efficient efforts of the Board of Health to as low a rate as that seen in England.

[18] Inferno III, Canto III.

American Republic has been so extraordinary that it is not strange that it should overshadow advances in other directions. But if material growth has been our only achievement we must admit that our civilization is as yet incomplete or a failure, for "That society," says Emerson, "can never prosper, but must always be bankrupt, until every man does that which he was created to do." Is it true, however, that there has not been remarkable advance in scientific pursuits in this country?

In astronomical investigation the work of this country is in the first rank; the science of meteorology may be almost claimed as a national product; as in America it was first placed on a scientific basis, and it is in this country that its application is most general and most appreciated. Paleontology, geology, ethnology, biology and botany have in our American universities representatives of the highest rank. The archeological work of North America has been naturally more directed toward the archeology of this continent, but the recent researches in Chaldea and Babylon, as well as in Greece, have been of such excellence as to be universally recognized.

It can certainly not be claimed that the country is incapable of scientific effort. And if this is granted, and there is no lack of ability in the medical profession, the lack of achievement in this country in research in the medical sciences is evidently a defect. If the bridge over the Nile at Atbara is given to Americans because they are the best bridge-builders in the world, and if more than half the new stars discovered in this decade have been found by American observers, why is it that in the recent scientific investigations which have revolutionized medicine — the discovery of germs, toxins and antitoxins — America has taken almost no part? It is not that there is lack of energy or of ability in our profession or of wealth in our communities. The difficulty lies simply in the fact that the profession has not yet addressed itself earnestly to the problem of scientific medical research, but has been contented with the training of medical practitioners. So much is this true that the defect has hardly yet been realized, for as common-sense in the practitioner is the ideal striven for by the profession, so scientific research has been left to the efforts of others. Common-sense was of value in the days of theoretical speculation. But of what avail is common-sense as a help to a patient dying of cancer, or tetanus, or hydrophobia? The world to-day is waiting for new research. Is the American profession to remain behind? The remedy for this condition is simple and lies with the profession. The public should be informed of the needs of the time — a public which has never withheld financial support where the want has been shown. Well appointed and well supported laboratories for medical research are needed in every community, at every medical school and every hospital. Our medical schools should be organized for a greater purpose than granting diplomas or licensing young practitioners of medicine.

America is destined to be the great distributor of the world's products — natural and manufactured; it is certain to be blessed with wealth almost beyond limit, but as our great preacher has said, "God's gifts do not measure our worth but our responsibilities," and it is a serious question how our debt to the world is to be paid.

When the fleet at Cavite fired the volleys heard around the world, unexpected anxieties unnumbered came upon the country, but one great benefit will follow if the nation is brought to a sense of responsibility to the highest standards. We are no longer a young country to be judged apart from the rest of the world — we are to be measured by what is expected of us. This, from a land of our resources, will be the greatest gift to human welfare possible in human effort. Nothing less than this will save us from the stigma of shortcoming. There are difficulties in rising to the level of our opportunities, but

"Steep and craggy is the path of the gods,"

and this high standard is held up to us in art, in science, as in commerce and in power.

America has been said to breed

"A race of victors,
A race ready for conflict, the race of the conquering march."

The conflict of the next century will be against ignorance, sorrow and suffering, and in this the medical profession must be foremost in strenuous endeavor.

Original Articles.

THE NON-RETARDING ACTION OF COMBINED HYDROCHLORIC ACID ON STARCH DIGESTION.

BY A. E. AUSTIN, A.M., M.D.,
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I HAVE shown in my previous investigation[1] that different albuminous foods, both of animal and vegetable origin, combine with or neutralize the free hydrochloric acid of gastric juice, and contrary to the usual conception, hydrochloric acid thus combined with albuminous foods has no hindering action on the diastasic digestion of starchy food, and that such state of neutrality exists during a period of one to three hours after eating, which period is proportional to the amount of nitrogenous food eaten; thus, practically the larger part of the starchy food we eat is digested in the stomach by the action of ptyalin of saliva before the free hydrochloric acid of the gastric juice presents its appearance and accumulates to the point where it hinders the salivary digestion of starch food.

The object of this effort is to supplement and confirm the results of my previous experiments in the human stomach. With the usual diet the amount of albuminoid food constitutes approximately one-fourth and the starchy or carbohydrate food constitutes two-thirds; the remainder, one-twelfth, consists of fats and other elements, whether the person is a meat eater or vegetarian. The former derives his albuminous material chiefly from animal food, such as meat, fish, etc., while the latter derives the nitrogeneous matter principally from leguminous food, such as peas and beans. I have observed the fact that all grains and other vegetables contain more or less albuminoid bodies, and they have the same properties of combining with hydrochloric acid as animal, so that the digestion of starchy food occurs in the stomach for the period of one hour, at least, even when one takes vegetable food only.

In carrying out this experiment Mr. McL., a student of mine, who has a rare faculty of being able to evacuate a portion of his stomach contents at his own will, without feeling any inconvenience, volunteered his services. He was in perfectly normal health.

[1] Boston Medical and Surgical Journal, April 6, 1899.