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THE PUBLIC HEALTH WORK OF PROFESSOR SEDGWICK[1]

WILLIAM THOMPSON SEDGWICK, son of William and Anne Thompson Sedgwick, was born at West Hartford, Connecticut, December 29, 1855. His colonial ancestor was Robert Sedgwick, who settled in Boston in 1636. He studied at the Sheffield Scientific School, the Yale Medical School, and Johns Hopkins University. On his twenty-sixth birthday he married Mary Katrine Rice, at New Haven, Connecticut. In 1883 he came to Boston and the Massachusetts Institute of Technology, where for thirty-eight years he was professor of biology and public health. He died at Boston, January 25, 1921, at the age of sixty-five.

These simple facts tell who Professor Sedgwick was. But what he was and what his life meant to the people of Boston, to hundreds of young students, to the science of public health, and to the Commonwealth of Massachusetts can not yet be told or even estimated. His death is too recent and our thoughts are still so touched with sadness that one can not adequately picture his manifold activities or form a just appreciation of his life or his place in history. But in the various eulogies already written a few words stand out prominently and must be regarded as characteristic of the man. The words are service, public service, kindliness, serenity, inspiration, buoyant optimism, love of young men. Let these suffice. They are eulogy enough for any man.

I can not write about Professor Sedgwick's work in public health without saying more about my own relations to it than is becoming on such an occasion—but it is characteristic of his work that it was not done in the seclusion

[1] A memorial address delivered at Unity House, Boston, February 6, 1921, by Professor George C. Whipple, of Harvard University. Professor Sedgwick was to have spoken at this meeting on the subject of Child Welfare.

of his study and laboratory, but involved all those with whom he came in contact.

I first knew Professor Sedgwick when I was a student of engineering and he professor of biology at the Institute of Technology. He was thirty-three and I was twenty-two. For the first time (1888–89) he was giving a course of lectures in bacteriology to civil engineers. It was an innovation. Until then sanitary engineering had leaned for its support on chemistry, but here was a new science coming to its aid. I have in my study the notes which I took of Professor Sedgwick's weekly lectures. They began as follows: "The sanitarian needs a proper working theory." Then he proceeded to develop the germ theory of disease as he had learned it from Pasteur and other European scientists who were laying the foundations of that science which has done so much for the health of the world. He showed how physicians and engineers had been wrong, how they had groped in the dark, and how, by applying the recently discovered principles of biology, it was possible to give to sanitary engineering new life. Of course, Sedgwick was not the only American to take up with the new ideas. There was Dr. Welch at Johns Hopkins, Dr. Biggs in New York, and others who were doing the same thing. But these other men were in medical schools; Sedgwick was in the Institute of Technology where the engineering sciences predominated and therefore his influence on sanitary engineering was the greatest. Nor would it be right to ignore the work of his colleagues in chemistry, such as Professor William Ripley Nichols and Dr. Thomas M. Drown. It was the combination of chemistry and biology with engineering which made the profession of sanitary engineering what it is—a profession which we are proud to think has become more highly developed in America than in any other country.

It is important to keep in mind certain dates in connection with the work of these Massachusetts scientists. Louis Pasteur's pioneer work in bacteriology was done in the seventies. In 1876 Robert Koch discovered the germ of anthrax. In 1882 he suggested the use of solid culture media and thus made it possible to consider bacteria in a quantitative way. In 1880, Eberth found the bacillus of typhoid fever. In the same year Laveran had discovered the malarial parasite. In 1883–84 Klebs and Löffler found the germ of diphtheria. In 1883 Koch found the cholera spirillum. And it was in 1883 that Sedgwick undertook his work in Boston. No wonder that he saw a great future for his beloved science of biology; no wonder that he gave up his intention of being a physician.

Sedgwick did not study bacteriology in Europe, but I remember hearing him tell how he received what was perhaps the first batch of Dr. Koch's sterilized nutrient gelatine sent to this country. Professor Nichols brought it over and probably had not realized its physical properties, for it had melted, had saturated the cotton plug of the flask, had oozed out, had become infected and nauseating and was about as far from having the required bacterial purity of a culture medium as one could imagine. It was an inauspicious beginning for bacteriology at the Institute. Professor Nichols must have chuckled over it, for at that time he did not share Sedgwick's optimism in regard to the future of bacteriology.

I remember those first lectures of Sedgwick's. He would hold up a glass of water and talk for an hour about what it contained. He would scare us to death by saying that it contained enough germs of typhoid fever to give the disease to a thousand people, and then go on to show how sanitary engineers could make the water safe to drink.

He started his students off on a hunt for bacteria. One of them studied the bacteria found in air—especially the air of hospitals—for he was hunting for big game. Together they devised a method for straining the bacteria from the air—an aerobioscope—a method still used. Another student helped him to study water—not only its bacteria, but its other microscopic organisms—those algæ which recently caused the bad taste in the water supply of Boston, when for a few weeks it was necessary to draw upon the old Lake Cochituate supply. Another new method of study

was devised—the Sedgwick Rafter method—still used to-day.

One of his students took up the study of milk; another that of food; and to-day the Institute has an important department of industrial biology. Several studied sewage and its methods of treatment, and for years this continued to be a fruitful field of research. Another studied the bacteriology of ice; another the bacteriology of soil. Then there were studies of particular species of bacteria—the longevity of the typhoid bacillus, and so on. The reason for mentioning these things is to illustrate the breadth of the investigations and the fact that Sedgwick always worked with and through his students. He did very little scientific work alone and he generally gave to his students more than a fair share of the credit for the work done.

We hear much said to-day about research, about the advantages of organized research. In my opinion there is danger that research may be organized to death. The compilation of facts by committees of learned societies is all very well, tests by competent scientists in government bureaus are desirable, and research conducted by the experts of great corporations are necessary in order that modern science may be applied in the most economical way to human needs—but the highest type of research is that which takes place in a university laboratory where an inspired teacher and his mature students sit down side by side and in quiet study endeavor to search out the secrets of nature and the chemical, biological, and physical laws of God. Let the scientists of America not follow too much the method of organized research—let them give even greater weight to the individual method of Huxley and Pasteur and Sedgwick.

When, after a long experience as a practising engineer, I came to Harvard to teach, I had many talks with Sedgwick about methods of teaching. He was no longer thirty-three years old, but fifty-five. He had been teaching for twenty-five years and he gave from his experience. He said, "I keep three things in mind—the past, the present, and the future. First, I teach by the historical method. That has two advantages: my students learn what has been done, and my lectures don't have to be written over every year. Second, I teach of what is going on now." His present-day students knew well his habit of rushing into the lecture-room with a clipping from the morning paper or a copy of the *Medical Journal* and talking about something which somebody had discovered in Chicago or the Fiji Islands, or about some new engineering project. All kinds of fish were caught in his net, and he believed that the students should study these fish while they were alive. Thirdly, he said, "I try to teach of what is likely to happen in the future. I try to make the students see the problems they will be up against." History, present problems, and research—these were his three principles.

His teaching was far from being exact. Sedgwick did not have a mathematical mind. His lectures were never formally prepared and as he grew older they became less methodical. He cared for general principles more than for details. The opening sentence of his first lecture to engineers, which I have already quoted, shows what he wanted most to impress upon his students. "The sanitarian needs a proper working theory." But it was chiefly his personal magnetism and his inspiration which told on his students, and this never failed him. His optimism was as strong at sixty-five as it was at thirty-five.

Sedgwick will be remembered first and foremost as a great teacher—yes, even as a teacher of teachers—because his enthusiasm was contagious and others followed in his steps. One has only to mention Dr. Calkins, of Columbia; Dr. Jordan, of Chicago; Dr. Winslow, of Yale; Professor Gunn, and other names, now well known, to realize the extent of Sedgwick's influence as a teacher upon teachers. But among his pupils are sanitary engineers, bacteriologists, health officers, laboratory workers in many fields, Red Cross officials, physicians, nurses, manufacturers, teachers of domestic science, housewives—men and women, a great company of enthusiastic followers who recognized him as "Chief."

Soon after Sedgwick came to Boston the

Massachusetts State Board of Health began to apply the new ideas in biology and chemistry to the purification of water and sewage under the leadership of Dr. Henry P. Walcott, who for a quarter of a century was chairman of the board, and Mr. Hiram F. Mills, a hydraulic engineer, who for an equally long time gave most valuable service to the commonwealth. A small station for making experiments with sewage and water was built at Lawrence, Mass. Professor Sedgwick was consulting biologist of the State Board of Health and Dr. Drown was consulting chemist. For many years, even up to this day, the Lawrence Experiment Station has been a center of scientific activity. Some of the leading sanitary engineers of the country began their work there.

While this scientific study of the chemistry and biology of water and sewage was in full blast (1890), a notable epidemic of typhoid fever swept down the Merrimac Valley. Professor Sedgwick made a thorough study of this catastrophe and developed methods of investigation which have been followed by American epidemiologists ever since. Although not a mathematician, he marshalled statistics and used them with telling force and drew from them logical conclusions which could not be upset. As a result of the epidemic and the research at the experiment station, the first scientifically designed municipal water filter in America was built at Lawrence. This filter, with additions and modifications, is still in use and although outgrown in size and ideas is to-day protecting the people of Lawrence against the recurrence of an epidemic like that of 1890. In this matter one can not give the credit to Sedgwick alone, for it was the entire group of scientists who deserve the credit—Mills, Stearns, Drown, Sedgwick, Hazen, Fuller, and others, most of all perhaps to Mr. Mills. Through them America gave to the world scientific ideas in regard to the disposal of sewage which revolutionized methods of treatment and stimulated the construction of disposal works in scores, perhaps hundreds of cities, in this country and abroad.

Sedgwick become a great interpreter of this scientific work. He joined the New England Water Works Association in 1890, but as early as 1888 he had contributed a paper on the Biological Examination of Water. He was chosen president of the association in 1906, having already (in 1904) been made an honorary member. His last address before the association was delivered on September 11, 1918, on a subject appropriate to the times, "From Peace to War, from War to Victory, from Victory to Just Judgment." Those who heard it will never forget the stirring words in which he called for stern justice for Germany and appealed to a higher ideal of God than that held by the Kaiser—the ideal of Christianity, the ideal of civilization. Sedgwick never separated his science from his patriotism or his religion. He could make science popular and he could take subjects of popular interest and clothe them in the language of science.

The American Public Health Association also claimed Sedgwick's attention. He became a member in 1902 and its president in 1915. He was a member of many committees, was a frequent speaker, most of his addresses having relation to the broader aspects of public-health work. It is hardly worth while at this time to recite the long list of scientific societies to which he belonged, but mention should be made of the Society of American Bacteriologists, which he helped to found and of which he was president in 1900, of the American Society of Naturalists, over which he presided in 1901, and the American Academy of Arts and Sciences, of which he was a Fellow and to which he gave much time and thought. Society memberships measure the breadth of a man's interest and give him opportunities for bringing his ideas before the scientific world. Some men are merely "belongers"—others, like Sedgwick, do their full part in promoting the objects of the societies which they join. As Professor Sedgwick advanced in life, his interest changed from one scientific society to another and his scientific papers shifted from the record of detailed studies to educational and philosoph-

ical problems. That change marked the normal development of an active, broadening mind. So we may add to Sedgwick's fame as a great teacher that of interpreter of science.

We must next look upon him as a councilor in public health. In 1914 when the State Board of Health was replaced by a health commissioner and public health council, Sedgwick was appointed as a member of the council and served in that capacity until his death. Together the commissioner and council constitute the State Department of Public Health. Its work is done partly through committees and Sedgwick served on the committee on sanitary engineering and was chairman of the committee on food and drugs. It is difficult to pick out from the many-sided activities of the State Department any particular work which was his, for in one way or another he has been in all of them. He was an ideal councilor. His scientific knowledge, his ripe experience, his grasp of fundamental principles made his advice respected by us all. His facility in writing clear and simple English was most useful to the council in the preparation of reports. I remember once that a certain sentence in a letter of advice to some city had been so phrased as to mean just exactly what it was not intended to mean. The commissioner and council had approved it. Sedgwick came in late, looked at the report, and immediately spotted the false phrase and thought it a great joke. He said, "Folks laugh at the sleepy old professors, but you see they have their uses." Sedgwick's graceful yet forceful manner of speaking caused him to be chosen on many occasions to represent the Department and whether he spoke before a legislative committee or a large public meeting he was always effective. Many a fight he has had at the State House with anti-vivisectionists, anti-vaccinationists, and various other kinds of antis—but Sedgwick's method of fighting was merely to state his side of the case, simply and forcefully, letting his opponent have a monopoly of the fireworks. It was perhaps one of his faults that he was not aggressive enough. But on occasion Sedgwick became eloquent. Last year at the Brussels conference of public health officers representatives of various nations, gorgeously arrayed in uniform and regalia, had been droning out weary speeches, the audience being visibly bored, when Sedgwick's turn came. He was there to represent the American Public Health Association, Harvard University, the Massachusetts Institute of Technology, and the U. S. Public Health Service. Simply dressed in his academic robes, he arose and spoke for ten minutes. He praised brave little Belgium and faithful France for saving the world, he gave to England the credit of being the father of public health administration, and then spoke for America. I do not know what he said—I was not there—but I have been told that the audience went wild in applause and that scores of people, including our own Ambassador, went forward after the meeting to shake his hand. It was the climax of the convention.

Professor Sedgwick of late had been keenly interested in the engineering study now being carried on jointly by the State Department of Public Health and the Metropolitan District Commission which looks forward to an extension of the water supply of the eastern part of the state, by the construction of a great reservoir in the Swift River Valley. Once in about twenty-five years every growing city or district has to enlarge its water supply, because it does not pay to construct works for a longer period ahead. It was in 1895 that the Wachusett Reservoir was recommended and a few years later put in use—and the time has now come when we of this generation must build a water supply for the next. It will be an expensive investment for the state, but not an unreasonable one, because it will be an income-producing investment. The project is one which appeals to the imagination. An abundant supply of pure water is one of the essentials of life. No community can prosper if it outgrows its water supply. Sedgwick, with his faith in Massachusetts, was therefore keenly alive to the importance of this new project, of which much will be heard during the coming year.

As early as 1882 Professor Sedgwick was elected a member of the Advisory Committee of the U. S. Public Health Service, and for nearly twenty years he maintained this connection with national public health affairs. When after the war a reserve organization was created in this service, Sedgwick was commissioned as assistant surgeon general. A few years ago he was made a member of the International Health Board, supported by the Rockefeller Foundation, and thus his interests became world-wide in their scope. Last year he went to England as exchange professor from the Massachusetts Institute of Technology to the Universities of Cambridge and Leeds—and on the eve of his departure a newspaper headline very fittingly characterized him as "Ambassador of Health."

During the past few days I have been reading over a list of the titles of the books and most important scientific papers which Sedgwick wrote between the years 1883 and 1921—about a hundred in number. If his minor writings had been included, the list would have been several times as long. Towards the end of his life he wrote less. Only a few weeks before his death he said to me, "I sometimes get sick of talking about health; every Tom, Dick and Harry is now talking about it, and most of what they say is so exaggerated that it casts discredit on all of us who are trying to speak within the bounds of sanitary science."

And I wish to take this occasion to express my own views that just as there is danger that scientific research may be organized to death, so there is danger that public health may be organized and legislated, propagandized and commercialized to the point of nullification. There is danger that over striving for the welfare of particular classes of people may result in misfortune to the people as a whole. Sensible education in the principles of healthy living should be universal, but neither the state nor the nation should embark upon programs of socialization of medicine, socialization of nursing or the paternalistic or maternalistic care of the health of individuals without first looking ahead to see where such policies lead, socially, financially and politically. The police power of the state should be used severely to prevent crimes against the public health; the advisory powers of health departments should be freely used, but the treasury of the state should not be drawn upon to pay for personal benefits or class benefits even in the name of health. Public health and private health are not the same, and governments may do for the one what they ought not to do for the other.

We Americans can not boast of the success of our governments, especially the governments of our cities. We can not boast of our governmental methods of public health administration—and unfortunately our local governments are not becoming more efficient as they become larger. Let us not therefore make the mistake of turning too many of our health activities over to the governments. In one thing, however, America has excelled and that is its voluntary cooperative undertakings. Let these continue to use their influence for improving personal health, leaving to the governments only those matters which legitimately belong to the health of the people as a whole. The time is rapidly approaching when the financial problems of our cities and states will overtop all others—sanitary and public health problems included—when appropriations of all kinds will be cut to the bone to ward off insolvency or repudiation of debts. Let us not make our people too dependent on their governments for health protection, but let us by education seek to make them protect their own health, for what they pay for they will value most.

There is one other aspect of health activities which I can not refrain from mentioning in this connection. Too much thinking about one's health makes a person morbid. It is possible for communities to get into the same condition. After all, there is more health in the world than there is sickness. I tell my students that while as professional health officials they must study death-rates, as individuals they must look well to the life rates, for except in old age the chance of living is far greater than the chance of dying

and we can sepnd our time best by living and not trying to stay alive. Fortunately, health is a positive quality which can be cultivated in ways that are pleasant, and with reasonable understanding and moderate care we can protect ourselves against those diseases which are preventable.

I am personally out of sympathy with injecting the propaganda and the slogans of public health into the services of the churches, although I am most heartily in favor of church people doing all that they can to mitigate human suffering by methods of prevention as well as those of relief. This concerted movement of the women of Boston to improve the health of our children strikes a responsive chord in all of us. We know that Professor Sedgwick's voice would have been lifted up in favor of this weeks' crusade. His very heart went out to the refugee children of France, and one of the most beautiful episodes of his life was associated with Château Lafayette, which he and Mrs. Sedgwick visited last summer and to which they hoped to return.

We come finally to Sedgwick's last great work in connection with the School of Public Health of Harvard University and the Massachusetts Institute of Technology. This school he helped to establish in 1913 and served as chairman of the administrative board until his death. He delighted to see it grow, he delighted to see students coming to it from foreign countries—from Italy, from China, from South America, from India and Siam, from Czecho-Slovakia, and from Mexico. Few people of Boston realize how solidly this little school has taken its place as a center of public-health education, or how its example has been followed by other universities in America.

Nearly twenty years ago when Sedgwick joined the American Public Health Association, he was made a member of a committee on the Teaching of Hygiene and the Granting of the Degree of Doctor of Public Health. He always held the view that the public health service was different from the medical service, that a man could be an efficient health executive without being a doctor. His last important address, given at the 100th anniversary of the medical school of the University of Cincinnati, was devoted to the subject of the education of health executives. He advocated what he called the Y plan, by which medical schools should have two programs, alike during the first two years, but afterwards diverging, one towards the degree of doctor of medicine and one towards the degree of doctor of public health.

His last act as a member of the administrative board of the School of Public Health, held December 19, 1920, was to assist in preparing a statement relative to the future of the school, planning for a reorganization of its government and doing so at the sacrifice of his own position as chairman and having in mind only the future good of the cause of public health education. In time to come Sedgwick's part in the organization of this school, which seems destined to take its place side by side with the Harvard Medical School, will stand forth as one of his most constructive works. May it not be possible that in the near future some friend or group of friends will contribute a fund big enough to endow a William Thompson Sedgwick professorship in this School of Public Health of Harvard University and the Massachusetts Institute of Technology which he loved so well. What finer memorial could be given than one which would tend to make his name and teaching known to the students of the coming years!

And so we may sum up Professor Sedgwick's life as that of a great teacher, an interpreter of science, a wise councilor, an ambassador of public health. Friend of young men, loyal supporter of the institute, patriotic citizen, a Christian gentleman, he will be greatly missed by all who were fortunate enough to know him.

On Sunday mornings I like to hear the Harvard student choir sing in Appleton Chapel. Sometimes the music rises and falls in varying melody until at the end it fades away as in a distance. At other times it pursues a simple motif, which grows in volume until it culminates in a burst of song and, on a sudden, ceases. For an instant the air tingles

and is still. But the memory of the glorious chord goes with us through the day "to charm, to strengthen, and to teach." Thus it was that Professor Sedgwick lived and died and stays forever in our hearts

George C. Whipple

OUR DISAPPEARING WILD PLANTS[1]

The destruction of the vast herds of bison on our western plains, the total extinction of the formerly abundant wild pigeon, the extermination of many of the most beautiful of our wild birds, all this is a matter of common knowledge. How many of us, however, realize that the same rapacious spirit of destruction has seriously endangered our wild plant life, until many of our most desirable plants have actually disappeared from wide areas of our country?

The earliest Europeans in America found in the New World a flora marvelously rich in its abundance of species and indescribably beautiful in its display of attractive plants. Since the time of the earliest settlers this wonderful flora has suffered a gradual depletion until at present the flora in many regions is a mere relic of the past with hardly a suggestion of its pristine loveliness. The appreciation of mankind was expressed in an odd manner indeed when he removed the handsomest of the plants, allowing the dull and less attractive species to take their place. This painful tragedy has been enacted right here in the vicinity of Washington, where the formerly luxuriant display of laurel, rhododendron, holly, ground pines, and arbutus has in many places been supplanted by weedy and generally unattractive species. All the plants named are almost extinct within a wide radius of the city and the wild orchids, spring beauties, bluebells, and many other species of rare grace and beauty are vanishing rapidly, and will soon live in memory only unless active steps are taken to save them.

The causes leading to their disappearance are complex, but by far the greatest contributing factor is the unrestricted, indiscriminate, thoughtless picking to which these beauteous plants are subjected. Each spring witnesses the descent of legions of thoughtless flower-gatherers who ravish the flora with hardly a thought that the tearing away of the flowers robs most plants of their only methods of reproduction. These misguided hordes gather huge armfuls and basketfuls of hepatica, anemone, bloodroot and dozens of other rapidly-wilting plants, which are enjoyed for the moment but are soon strewn along the highways and byways in withered, unsightly masses, mute evidence of wanton destruction of nature's most perfect gifts. The process of extermination has of late been largely aided and widely extended by that new enemy of our flora, the automobile, penetrating into regions formerly remote or inaccessible and returning loaded with huge piles of drooping, withered branches of flowering dogwood, redbud, and service berry, torn out by trespassers who had neither moral nor legal justication for such disfiguration. Who has not seen great branches of dogwood and bunches of other wild flowers offered for sale by irresponsible street-merchants? Within a half-hour during an automobile drive while the redbud and flowering dogwood were in bloom, the speaker was accosted twelve times along Conduit Road near Washington, D. C., by boyish flower venders offering their ill-gotten wares. The accumulated destruction of years will be great until it is inevitable that the handsomest of our species will disappear.

Must these wondrous gifts of nature live only in song and story for the countless oncoming generations? Is it fair that we dissipate this great natural heritage, robbing posterity of the pleasures derived from our flowers which we now so fully enjoy? It would seem that the doctrine of the greatest good for the greatest number demands that we accept this rich birthright in guardian spirit, to be safeguarded and preserved for the enjoyment of those who come after us; that each generation act as trustees of the surrounding

[1] An address delivered with illustrations before the Botanical Society of Washington, D. C., October 5, 1920.