PAPERS AND ADDRESSES

By

WILLIAM W. KEEN, M.D.

SELECTED PAPERS AND ADDRESSES

BY

WILLIAM WILLIAMS KEEN, M.D., LL.D.

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To

JOHN CHALMERS DA COSTA, M.D.,

S. D. Gross Professor of Surgery Jefferson Medical College,

Philadelphia.

Pupil, Assistant, Colleague, Successor.

A token of admiration and affection.

PREFACE

The papers and addresses included in this volume appeared originally in various periodicals during a number of years. They are reprinted here for ready reference and for permanence, instead of being lost in the immense mass of periodical literature.

They appeal to several different classes of readers, medical, missionary, military, historical, educational and to the general lay public.

There are some reiterations in different papers and addresses. They were addressed to wholly different audiences, at different dates. Only by constant insistence on facts can one drive them home into the minds and hearts of his hearers or readers. Moreover, in a book they can easily be skipped—an advantage the reader enjoys over an auditor.

They should be read, keeping carefully in mind the *dates* when they were written. Constant progress in knowledge and in technic in many directions materially change our views.

William W. Keen.

Philadelphia.
November, 1922

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THE GRADUATION CEREMONY

WITH AN ACCOUNT OF SOME MODERN SURGICAL CELEBRATIONS [1]

Having been present within the last five years at several rather unusual surgical functions, it has occurred to me that it might be of interest to the members of the Keen Surgical Society to learn something about the graduation ceremonies and other similar special functions at other institutions than our own, and not only in our own time, but in the more formal and ceremonial middle ages.

My principal source of information as to the latter is an admirable address delivered to the graduates in medicine of the University of Edinburgh in July, 1904, by Prof. D. J. Cunningham, the distinguished Professor of Anatomy in that University. It is called "The Evolution of the Graduation Ceremony" and is a mine of information in reference to this subject. It deals not only with the ancient medical customs, but with the graduation ceremonies as observed at present in the chief European Universities.

In the middle ages there were many thousands of students in some of the most distinguished Universities. For example, Bologna, (which in 1888

[1] Address delivered before the W. W. Keen Surgical Society of the Jefferson Medical College. Dec. 11, 1905. From the Medical Library and Historical Journal, March, 1906.

celebrated the 800th anniversary of its founding,) in the 14th century, had as many as 13,000 students, and Paris at one time had as many as 30,000.[2]

Very few of the students, however, took the degree of doctor, either in law (which was divided into civil law and canon law), medicine or theology. None of our other modern degrees existed. Every graduate was a "Doctor," i. e., an educated or learned man, in one of these three faculties. The few who did take the degree, expected to enter faculties as teachers. Hence, there being so few, of course the ceremony was one of much greater individual importance and was carried out with all the formality and symbolism which commended themselves peculiarly to the scholastic medieval mind. The candidate or graduand[3] was presented for the degree by one of the faculty, usually the Dean, who was and is still called the "Promoter." He stands technically in the position of a Godfather or sponsor for the person upon whom the degree is to be conferred. Even to-day, at the graduation ceremony of the University of Dublin, the Promoter says, "I present to you these my *sons,* etc."

I cannot, perhaps, better indicate the importance of such an occasion than by quoting a paragraph from Prof. Cunningham's address: "A love of pomp and pageantry was a leading characteristic

[2] How times have changed since 1905 when these figures astonished us! They are equalled and in a few cases even exceeded by the number of students in American Universities in 1922.

[3] Changed to "graduate" after receiving his degree.

of the medieval mind, and the graduation ceremony afforded the most abundant opportunity and the most ample scope for the indulgence of this propensity. For several days before the celebration elaborate preparations were made. Attended by the University Bedells [beadles], with their insignia and maces, and often also accompanied by trumpeters and pipers, the candidates, mounted on horseback, paraded the streets and gave formal invitations to their friends and to all notables of the district to attend the ceremony. At last the eventful day arrived and the whole town was in a state of expectancy. It was a holiday: the shops and booths were shut, the artisans had stopped work and the streets were thronged with people eager to witness the procession. This, as a rule, started from the house of the candidate, but in certain cases it was formed at the school buildings. Preceded by mace-bearers, the Bedells, the trumpeters, and the players on the fife, the graduand, mounted on a richly caparisoned horse, was conducted to the Cathedral. The entire University, teachers and scholars, in their appropriate robes, followed in the wake of the candidate, and as the procession moved through the town, the air was filled with the din of music and trumpets, mixed with the harsher sounds of clanging bells."

Even in my own day, when I was graduated from Brown University in 1859, Commencement Day, though then already fading in importance in our busy hustling age, still convulsed the State of Rhode Island—not a very big one it is true—almost to its very borders. Business was largely suspended and the day was a holiday in Providence: the sheriff of the county then, as now, preceded the president and other dignitaries of the University in entering the church, wearing a broad blue sash crossing his breast diagonally and carrying his official sword, which I suppose represents the mace, which one sees in such ceremonies abroad. His function was to preserve order and in the early days it was evidently an active function. (See the "Early days of Brown University," p. 107.)

We have also a description of such a pageant from the pen of John Locke, the celebrated philosopher, who also studied medicine. In Dr. John Brown's essay on "Locke and Sydenham," he quotes an account of the ceremony at Montpellier, France,[4] as described by Locke: In 1675 Locke went abroad for his health, and remained some time at Montpellier. He kept a diary, and large extracts are given by Lord King. The following is his account of the annual "capping" at Montpellier: "The manner of making a Doctor of Physic is this: First a procession in scarlet robes and black caps—the Professor took his seat—and after a company of fiddlers had played a certain time, he made them a sign to hold, that *he* might have an opportunity to entertain the company, which he did in a speech against innovations—the musicians then had their turn. The inceptor or candidate then began his speech, wherein I found

[4] "Montpellier," says Gosse, in his life of Sir Thomas Browne, who was also a student there in 1630, "was almost indispensable in those days to foreign students who could get no training like it anywhere else in Europe."

little edification, being chiefly complimentary to the chancellor and the professors who were present. The doctor then put on his head the cap that had marched on the Bedells staff, the sign of his doctorship, put a ring on his finger, girt him about the loins with a gold chain—made him sit down beside him—that having taken pains he might now take his ease, and kissed and embraced him in token of the friendship which *ought* to be amongst them."

The ceremony was usually held in the Cathedral, which, as you know, is so named from the "cathedra" or chair of the Bishop. Westminster Abbey has no Bishop's throne or chair because it is not a Cathedral in the legal sense, but is an Abbey church. The Dean of Westminster, who is, of course, the head of the ecclesiastical corporation, is not responsible to the Bishop of London or any other Bishop, but he is directly under the jurisdiction of the Archbishop of Canterbury. Where no Cathedral was available, the degrees were conferred as a rule in the principal church of the city. Now, however, even in Europe they are very frequently conferred in an academic rather than an ecclesiastical building.

The various symbols connected with the graduation in medieval times were as follows. You will see in our modern "commencements," there is left but little of the former gorgeous pageantry.

First, the graduand sat on a *seat below the Faculty* just as you do in the Academy of Music, but on receiving the degree which conferred upon him the rights of a teacher, he assumed a chair on the platform.

Second, an *open book* was handed to the graduand to remind him that his studies must be continued.

Third, a *closed book* was also given him in order that he might understand that wisdom was not to be gained from books alone, and that he must not be bound absolutely by the authority of his predecessors, wise as they may have been.

Fourth, a *cap* was put on his head, and in the Scotch Universities, this cap is still used, as I shall describe later. Hence where the cap is used the graduation is not called the conferring of diplomas, or as we call it "Commencement," but is called "Capping." The students of theology were given a black cap, those of law a red cap, those of medicine, caps of different colors, violet and blue being the commonest.

Fifth, a *ring* was placed upon his left ring finger to indicate he was wedded to science. It also had another significance; namely,—that there was a sort of academic knighthood conferred by the degree.

Sixth, a *kiss,* the "osculum pacis," usually upon both cheeks, was given by the authority conferring the degree. If in these days of women graduates we had co-education at the Jefferson and the kiss of peace still held its place in the graduating ceremony, I tremble to think of the emotions of our honored President, or the Dean.

In some Universities there were additional symbols connected with the graduating ceremony, which were not, however, by any means universal.

In Spain the graduate was invested with a sword, a girdle and spurs of gold. In certain Universities there are traditions that he had to keep a vigil the night before the ceremony, and in Vienna it is stated that, as is the case with a candidate for knighthood, he had to undergo on the previous evening the "ordeal of a bath." It is a little odd to hear this grateful daily boon called an "ordeal." But I fear that many medieval knights had but a slender acquaintance with the virtues of water either internally or externally.

In addition to this the torch-light procession which not uncommonly terminated the festivities was originally symbolical, the lighted torch standing for the torch of learning.

Of course such an elaborate graduation ceremony entailed a large expense which had to be borne by the candidate for the degree of Doctor. In addition to this he was expected to give hats, caps, robes, clothing, and even confectionery to not a few of the persons who took part in the ceremony. Some rather curious details in relation to these gifts are to be found in Prof. Cunningham's address. This expense reminds one of the fact that Lord Roberts, when recently offered the Garter by King Edward, declined the honor because the fees amounted to over $5000, a sum his modest means did not permit him to expend.

The whole ceremony, of course, terminated with a banquet, at which there was not only a lot of eating, but much more drinking than was desirable, much singing and jesting. In fact hilarity went so far in some Universities that statutes were drawn up forbidding the presence of trumpeters, actors, and jesters. Sometimes the students who were not invited as guests gathered around the door of the building and amused themselves by snatching the food and wine from the servants as they were carrying them into the hall. In Spain and Portugal the unfortunate graduate had to provide a bull-fight for the amusement of the University. At Paris, Oxford, and Cambridge, the papal authority was invoked to prevent an expense exceeding what would be equivalent to about $2,500 at the present day.

Little by little all this pomp and display has lessened until to-day only a remnant of it is left. In fact in some Universities, as, for example, at Strasburg and Munich, as soon as the student has passed his examination, he goes home and his diploma is sent to him, so that there is no ceremony whatever. So, too, with the examination of the Royal College of Surgeons of England, there is no graduation ceremony, but the diploma is sent to the successful candidate.

In a few of the European Universities, somewhat of the ancient ritual has been retained. In the University of Rome, the ring, the hood, the chain, and the kiss are all employed at the present time, but Prof. Durante, who received a degree in Edinburgh, came without any academic gown, because, as he informed me, the University of Rome had no official robe.

In Prague a chain is thrown around the neck, a ring placed on the finger, and a book presented. Each of these acts is announced by a blast of trumpets. At the Swedish University of Upsala the ceremony begins with a salvo of artillery, and the whole is attended throughout with fanfares of trumpets and the din of cannon. Not only are there the cannon and the trumpeters, but the Doctor of Philosophy is crowned with a laurel wreath, usually made by his friends, fiancée or his nearest young lady relation. The doctors of theology, law and medicine are capped with a black silk hat having a golden buckle. In Louvain, Belgium, besides the procession, the candidate is capped, ringed, and placed in a magisterial chair.

Dr. M. B. Tinker, of Ithaca, New York, a graduate of the Jefferson who also took his degree at the University of Berlin, has kindly given me the details of the ceremony in that University as follows: "Only one man passes through the ceremony at a time although sometimes there are three or more men who come before the Dean on one day. The candidate with several of his friends, in full evening dress including white tie and white kid gloves, is seated at one side of the great University aula. The Dean of the Faculty with his flowing crimson academic gown of silk and velvet comes in at the great doors and seats himself on the opposite side of the room, just below the platform and stand which is used by the orators and the University authorities on state occasions. The fact that the candidate is in waiting is announced to the Dean and he rises, bows, and states that he is ready to receive any communication from him. The candidate then states in a regular form that is used on such occasions that he has successfully passed the *tentamen* and *rigorosum* examinations and that he is now prepared to present his dissertation for discussion and to defend it, if necessary, before all comers. [You see how valiant a knight he is!] He further asks the privilege of presenting his theses and defending them in the German language. All conversation between the Dean and the candidate up to this stage is carried on in Latin. I need hardly say, I am sure, that most candidates write out their little speech and have it corrected by some of the University instructors in Latin and then commit it to memory. The Dean then rises, bows and grants permission for the candidate to defend certain theses with regard to his dissertation or other medical subjects in German. The candidate states his main contentions and inquires if any one present wishes to take exception to his position. Usually there are at least three opponents, who rise one after the other, and beg leave to dispute with the candidate. The candidate answers their arguments as best he can. The opponents usually express their approval of the arguments offered by the candidate in reply to what they have said and the Dean adds a word or two of criticism or commendation. He then uses the following Promotion Formula: 'Candidate, most distinguished! most worthy! After successfully passing a rigorous examination, you have petitioned the Faculty of Medicine that the highest honors in medicine be conferred upon you. Your Dissertation and Theses having been by you learnedly defended against the arguments of opponents, there remains no impediment to your obtaining the degree of Doctor of Medicine. Before, however, this can be conferred upon you, you must bind yourself by an oath in the words of which you will now most straitly swear.'

(The Doctor at this stage pronounces the following oath):—

" 'I promise and swear that I will not practice the art of healing for my own good, but in order to show forth the glory of God, to protect the health of men, and, as far as lies in my power, to increase knowledge; that I will carry out the work of a physician with the greatest faith and duty, and, as long as I have the power, with care and prudence; that I will come to the assistance of anyone in labor without distinction or preference, with no ambition, but with equal attention to rich and poor; that I will endanger the life of no man by rash experiment; that I will never turn the practice of Medicine away to vain or ignoble ends, but will persevere with unremitting study to fathom and learn the Art; that I will treat my brethren of the Art kindly, amicably, and as the dignity of the Art demands; that I will associate myself with most ready spirit and with no regard for my own ends, with what ability I can with their labors for the health of the sick, and in everything will take pains to raise the Art, which I profess, to the sanctity of a religion. Ita me Deus adjuvet et sacro-sanctum ejus Evangelium.'

(Then the Dean proceeds):

" 'Which matter be blessed and fortunate, and may Almighty God ordain it to be for the good of your country. By the authority and under the auspices of Wilhelm II., Emperor of Germany, King of the Prussians, most powerful, most just, most gracious, and by the Decree of the Medical Faculty, I, * * *, Doctor of Medicine, Public ordinary Professor, presently Dean of the Medical Faculty and Promoter lawfully appointed, create you, * * * , Doctor of Medicine, declare you so created, and proclaim you as so declared. Having fulfilled the requirements which were to be fulfilled, ascend to the higher seat of the Doctors.'

(The young Doctor proceeds from the lower seats to the higher and the Dean gives him the diploma with the following words:)

" 'Hail! most learned sir! most worthy Doctor! I congratulate you on the honours conferred upon you! I hand you your diploma, sealed with the seal of the Medical Faculty. May you carry on worthily and successfully continue the profession you have now begun. Farewell!' [5]

"There is then a great deal of hand-shaking and congratulations from fellow students and friends and the ceremony is completed except that the successful man usually takes his friends out to a restaurant for a banquet.

"I think the University of Berlin adheres more strictly to the old-time manner of conferring its degrees than any of the other Universities. In hardly any other University is it required that the candidate shall use the Latin language. Formerly it was required that he should write his dissertation and defend it in Latin. The defense of the disser-

[5] These formulæ used by the Dean and the oath taken by the candidate I have interpolated from the address of Professor Cunningham, into Dr. Tinker's account.

tation is now a matter of form in most cases, even in Berlin. Notices are posted several days before the exercises are to take place so that if any one cares to enter the debate he has an opportunity to do so. As a rule the candidate meets his so-called opponents the night before at some concert garden and enjoys a very pleasant social evening with them. They tell him what criticism they will offer and it is arranged just what reply he shall make to each and all of these criticisms. Altogether it is a rather pleasant affair."

Only at the Universities of Spain and at Coimbra, in Portugal, does the medieval ceremony survive to its fullest extent.

I have had the pleasure of witnessing three ceremonies which were somewhat analogous to those of graduation. These took place at the Royal College of Surgeons of England, the Royal College of Surgeons of Edinburgh, and the University of Edinburgh. A short account of each may be of interest to you.

The Royal College of Surgeons of England was founded in 1540 by Henry VIII. By a legal technicality they lost their charter in 1799 and a new charter was conferred upon them by George III. in the year 1800. In the year 1900 they celebrated the first centenary of the new charter by a very elaborate ceremony in Burlington House, Piccadilly, London. You will find in our library two photographs, one representing the ceremony when the degrees were conferred, the other the dinner in the evening. The Prince of Wales, now King

Edward VII., was made the first Honorary Fellow in private at Marlborough House. Two days later, on July 26th, Lord Salisbury, the leader of the Conservative Party, and Lord Rosebery, the leader of the Liberal Party, and thirty-two surgeons from various countries in the world were made Honorary Fellows. Not more than four were selected from any one country.

This function was one of the most brilliant that I have ever seen on any academic occasion. The only ones that would compare with it were the recent ones in Edinburgh, which I shall describe in a moment. A procession was formed, the mace bearer leading the way and followed by the officers of the College, the candidates for the Honorary Fellowship, and the Fellows. The President of the College, Sir William MacCormac, in his red robe of office, occupied the center of the stage. On his right and left were the first and second Vice-Presidents of the College, next, on the right, was the Marquis of Salisbury in his robes as Chancellor of the University of Oxford, a robe of heavy black silk elaborately embroidered in gold, and on the left the Earl of Rosebery in his scarlet gown as Doctor of Laws of the University of Edinburgh. All of the thirty-two professional candidates for the honor were grouped in two rows of chairs in a semicircle in front of the President. Nearly all were in academic or military costumes; the Spaniards wore capes of bright yellow, the French wore coats embroidered with green vines and leaves. Of the candidates from other countries some were in uniform and others in the various University gowns of their several countries. A very small number were in full evening dress. The audience was equally brilliant, nearly all present wore academic robes of all colors and especially all varieties of hoods, representing different Faculties and different degrees, while the uniforms of the Army and Navy and the bright summer dresses of a large number of ladies completed a spectacle which was worth travelling a long distance to see.

As his name was called each candidate stepped up in front of the President, and was presented with a diploma. He then bowed and resumed his seat. No robe was put on him at the ceremony. He provided himself with one later if he desired it. The robe is of black alpaca faced with crimson, but has no hood. A few addresses were made by one representative of each of the principal countries from which the Honorary Fellows came. The ceremony was concluded by an historical address by the President. In the evening an elaborate dinner was held at Lincoln's Inn, one of the stateliest halls of the Lawyers of London. At the dinner, after-dinner speeches were made by the Prince of Wales, Lord Salisbury, Lord Rosebery, the Lord High Chancellor, and other distinguished guests.[6]

The Royal College of Surgeons of Edinburgh is the oldest surgical body in the world not connected with a University. It was founded in 1505, antedating both the Royal College of Surgeons and the Royal College of Physicians of England. On July 20th, 1905, they celebrate their 400th anniversary

[6] For a full account of the addresses, etc., see the *Lancet*, 1900, Vol. II, pp. 281 and 339.

by conferring a number of Honorary Fellowships upon surgeons from different parts of the world. The description of the procession with the mace-bearer, the President of the Royal College of Surgeons, Sir Patrick Heron Watson, the gorgeous robes, the uniforms, and the ladies present would be practically a duplicate of the preceding description of the similar function in London five years before.

The ceremony was held in McEwen Hall. The Honorary Fellows were seated in a row in front of the platform, each wearing the dark blue robe of the College with light blue facing and white silk "frogs," but without any hood. The Promoter, Sir Halliday Croom, made a brief address in presenting each candidate for the degree. The candidate then advanced to the platform, was taken by the hand by the President, was presented with the diploma of the College, and the hood was thrown over his shoulders, after which he signed in the Sederunt Book the following oath:

"I hereby promise faithfully to maintain and defend all the rights, liberties, and privileges of the Royal College of Surgeons of Edinburgh, and to promote the interests thereof to the utmost of my power. I also promise faithfully to obey all the laws of the said Royal College, made and to be made."

As soon as all the degrees had been conferred, a large number of congratulatory addresses from various Universities and learned Societies were presented, beautifully engrossed on parchment and enclosed in handsome cases. After this each of the Honorary Graduates spoke for two or three minutes only in returning thanks. In the evening a festival dinner was held, at which addresses were made by M. Paul Cambon, the French Ambassador to Great Britain, Prof. Halsted of John Hopkins, Sir William Turner, the Principal of the University, and a few other distinguished guests.[7]

Two days later occurred a special ceremonial of the University of Edinburgh for conferring Honorary Degrees.

Scotland has four Universities; the oldest is the University of St. Andrews, founded in 1411. Geographically it lies a little to the north and east of Edinburgh. The next in order of time is the University of Glasgow, founded in 1451; the third the University of Aberdeen, founded in 1494, and the fourth the University of Edinburgh, founded in 1582. The Medical Department of the University of Edinburgh was established in 1685.

It has been one of the most distinguished seats of learning in Great Britain. Among the names which have made it illustrious I can only mention the following: Sir Walter Scott, Dugald Stuart, Carlyle, Sir William Hamilton, Darwin, Cullen. Sir James Y. Simpson, Syme, and Lord Lister. What an illustrious galaxy! How it excites our admiration and our envy! In one respect the University and one family occupy a unique relation. "In 1720, more than half a century before our Revolution, Alexander Monro, *primus,* was elected professor of Anatomy at the enormous salary of

[7] For a full account of the proceedings, see the *Lancet,* 1905, Vol. II, p. 307.

£15 per annum. From this time until 1859, the year that I graduated from Brown University, when Monro, *tertius,* died, the history of Anatomy in the University of Edinburgh and that of this astonishing family are almost identical. All of them lived to an old age, Alexander, *primus,* dying at seventy, Alexander, *secundus,* at eighty-four, and Alexander, *tertius,* at eighty-six. All were professors early in life; at twenty-three, twenty-one, and twenty-five, respectively. All of them taught for long periods: thirty-eight, fifty-four, and forty-eight years; and father, son and grandson, they held the anatomical chair in Edinburgh from 1720 till 1846, a period of one hundred and twenty-six years!"[8]

The University of Edinburgh has a peculiar relation to a still older and a much younger University. The older is the Dutch University at Leyden, where Boerhaave, one of the most influential teachers of medicine during the 18th Century on the whole continent of Europe, was the reigning influence and whither Edinburgh men flocked for their medical education. The younger one is the University of Pennsylvania, and through the University of Pennsylvania, the oldest of all our American medical schools, the University of Edinburgh and especially Cullen, its foremost teacher in the latter half of the 18th Century, have influenced the development of early medical teaching, medical manners and medical habits in America to a very notable degree. The head of the University of

[8] See Addresses and Other Papers, by W. W. Keen, p. 13, "Early History of Practical Anatomy."

Pennsylvania, and the head of the City of Edinburgh, are called not President or Mayor, but Provost. The title of our chair of Physiology at the Jefferson, the "Institute of Medicine," is identical with the title of the same chair in the University of Edinburgh.

Almost all of our colonial physicians and surgeons went to Edinburgh to finish their medical education. Physick, our earliest and most distinguished surgeon; Redman, the founder of the College of Physicians of Philadelphia; Benjamin Rush, the great signer of the Declaration and the most influential physician in America during the Revolutionary period, and a host of others were graduated at Edinburgh.

It was, therefore, with very unusual pleasure that I was present at this special ceremonial for the conferring of Honorary Degrees. The procession was headed by the mace-bearer. followed by Sir William Turner, the distinguished anatomist, who is the Principal of the University, in his heavy black silk robe lavishly embroidered with silver. Mr. Chiene, the well-known Professor of Surgery, told me that in conferring the degrees at the regular graduation a few days later, the Principal was compelled to lift the two pounds of silver on the right arm of his robe over 700 times, i. e., he lifted in all over three-quarters of a ton! No mean feat for a man past three score and ten.

Then followed the other University officers, the candidates for the Honorary Degree of Doctor of Laws, the graduates of Edinburgh and other Universities, Army and Navy officers, etc. The robe of the University of Edinburgh is of bright scarlet broad-cloth [9] faced with light blue silk, the hood of black silk lined with blue, and the cap is the four square velvet cap called after John Knox and not the usual "mortar board" hat. The large number of these robes with the brilliant gowns of other Universities, the Lord Provost of the City in his ermine robe and gold chain of office and other official and academic costumes again produced the same kaleidoscopic effect of color described in the former functions. The candidates for the Honorary Degrees again sat in the front seats on the floor of McEwen Hall. The Promoter, Sir Ludovic J. Grant, was most happy in his presentation of the ten candidates, beginning with the French Ambassador, M. Paul Cambon. As the name of each candidate for the degree was announced, he ascended upon the platform, was addressed in a few words by the Principal, Sir William Turner, and then bowing his head, was touched by Sir William with the velvet cap, which has done service for many years, and which with

[9] I discovered in Bower's History of the University of Edinburgh, Vol. I, p. 54, the reason why this bright color was adopted. In 1692, by an ordinance of the University, the red robe was prescribed so that thereby "vaging and vice might be discouraged." Evidently in those more turbulent days than our own, when town and gown were often arrayed against each other, a "vagabond" or "vicious" gentleman radiant in the scarlet robe of the University would be much more readily nabbed by the police than if he wore the ordinary dress of a citizen. Curiously enough I found that this origin of the red robe was practically unknown among the faculty and friends of the University.

characteristic Scotch thrift, is made from an old pair of velvet breeches of George Buchanan, the celebrated Scotch Historian and Poet, who was tutor to King James I. Each candidate already had on the scarlet robe of the University and over his neck was thrown the hood pertaining to his degree. No diploma was presented with the degree. As soon as they had been conferred, Sir William Turner then called upon M. Cambon to respond for the Continental guests and upon myself to respond for the English speaking guests.[10]

In 1911 I was invited to attend the celebration of the 500th anniversary of the founding of the University of St. Andrews in 1411. It was as picturesque and as interesting as any of the preceding celebrations. Lord Rosebery was the Lord Rector and gave in the Rectorial Address a formal historical review of the life and work of this, the oldest of the four Scottish Universities. It was a most scholarly production. Later at the dinner and again at a luncheon he made two other addresses both full of wit and humor without repeating himself or ever for a moment becoming dull, a remarkable performance.

[10] For a full account of the ceremony, see the *Brit. Med. Jour.*, 1905, Vol. II., p. 240.

AN ACCOUNT OF THE FESTIVAL HELD AT UPSALA

BY THE UNIVERSITY OF UPSALA, SWEDEN, IN MAY, 1907, IN COMMEMORATION OF THE 200TH ANNIVERSARY OF THE BIRTH OF CAROLUS LINNAEUS [1]

As your delegate to the Linnaeus Festival of the University of Upsala and of the Royal Academy of Sciences in Stockholm, held from May 23 to 26, 1907, in commemoration of the 200th anniversary of his birth, I have the honor to make the following report:

As the ceremonials—particularly that of the conferring of honorary degrees—differ in many respects from those usually seen in America, I have ventured to describe them in some detail. As I have pointed out in an address on the "Graduation Ceremony," [2] Upsala has preserved more of the medieval customs than any of the European universities except the University of Coimbra in Portugal, from which there was a delegate present wearing the picturesque robe and cap seen only there.

[1] The American Philosophical Society and Harvard University were the only American Institutions invited to send delegates, Harvard having given Linnaeus an honorary degree and Linnaeus having been a member of the American Philosophical Society.

[2] See the preceding address.

Moreover the present is the first occasion on which honorary degrees have been conferred by Upsala on any foreign scholars. Even in 1877 when they celebrated the 400th anniversary of the foundation of the University in 1477 no degrees were given to foreigners.

Never have I seen so well organized a fête. Before his arrival everyone had the number of his room, a numbered check for his baggage, for his seat at every function, for his hat, etc. All baggage was taken in charge at the station; carriages were there for everybody. The delegates and their families were the guests of the University for the two days in Upsala, and all charges for rooms and meals were defrayed by the University. Moreover, the Stockholm Academy of Sciences presented each delegate with four volumes in octavo, one in folio of the works of Linnaeus and a medal as delightful mementos of a remarkable festival.

In front of the railroad station and in front of the "University House" were planted a circle of standards with the flags of all the nations represented, while the town was profusely decorated with flags and evergreens. As the students number 1,800 in a population of only about 25,000 they practically are the town.

When the special train arrived the students were there in procession to greet their guests. As all of them wear white caps (the one hundred women students wearing the same), as the marshals wore long effective, broad sashes of bright yellow and blue (the Swedish colors), and there were over a dozen banners and corps flags grouped in the center, the scene was very picturesque. The singing by the students was the best I have ever heard. A brief Latin salutatory speech ended the proceedings at the station.

As soon as we reached our rooms there appeared a young woman to measure our heads for the hat or wreath and our ring fingers for the ring at the following day's promotion.

At noon on the 23rd, the proceedings were held in the splendid aula of the University House. This hall resembles in general that at Yale. It is very nearly as large and even handsomer. The king's health prevented him from taking part in any of the functions, but he was well represented by the Crown Prince,[3] who is also Prince Regent, a very affable man of about fifty. He and the other members of the royal family mingled with their guests most informally and agreeably. After a cantata by a band and a chorus and an address by Rektor Schuck the various countries were called alphabetically and the addresses from various universities and scientific bodies were presented. Only one delegate from each country spoke—an excellent arrangement, as it shortened the time very acceptably.

In the afternoon the students gave a delightful concert and garden party in the Botanical Garden. At 6:30 the Archbishop and the Rektor entertained one hundred and seventy guests at dinner. The three toasts were proposed by Dr. Schuck in

[3] The present King.

French, Swedish, and faultless English, and I was told that he was equally at home in German, Italian, Spanish and Latin. A reception ended a delightful day.

On May 24th the conferring of degrees took place in the cathedral. This is 360 feet long and a fine example of pure Gothic. It was founded in 1250 and contains tombs of Gustave Vasa and other famous Swedes. In the north aisle lie the bones of Linnaeus and in a chapel near by a dignified simple monument records his birth and death. I was told that there were about 6,000 people present and I hardly think it an exaggeration. In the west gallery besides the large organ was a military band and in the choir an orchestra and an excellent chorus. The procession was led by about a dozen marshals in their white caps and Swedish sashes, and when the delegates in academic robes, uniform or evening dress were seated, the marshals and the bearers of the banners and flags lined each side of the middle aisle while the Prince Regent and the rest of the royal family entered.

After singing a cantata composed in 1877 for the quattro-centenary, honorary degrees were conferred in Theology, Jurisprudence, Medicine and Philosophy. The Promoter in each Faculty first made a short Latin address. Each graduand then advanced into the choir by three steps of the "Parnassus," as the ascent was called in the program. In Theology, Law and Medicine the Promoter placed a top hat on the candidate's head, a ring on his left ring finger, and handed him three diplomas, one, the official one, sealed and stamped with a 100 Kroner

Stamp ($28; this tax was paid by the government), the two others being duplicates, but unsealed and unstamped. The hat was peculiar. In color it was black, but the vertical portion was plaited vertically in plaits about one inch wide; in the front of the band was a small gold shield.

Each graduand in Philosophy, their highest Academic honor, instead of receiving a hat, had pinned on his breast beforehand a laurel wreath. This was unpinned by a marshal on the first step of the Parnassus and was handed to the Promoter, who thereupon crowned the recipient, placed the ring on his finger, gave him his diplomas, and shook hands with him most cordially. The new laureates in descending the Parnassus bowed to the Archbishop, the Rektor and the Crown Prince.

When the first candidate in each Faculty was capped or crowned a battery of artillery on the place in front of the cathedral began firing a salute and continued until the last degree in this Faculty had been conferred, only to break out anew for each succeeding Faculty.

After all the degrees in each Faculty had been conferred the orchestra rendered a musical selection. They were all finely given, but the music chosen amused us. For the Theologs (I presumed they were Lutherans), they gave the "March of the Priests of Baal"; for the lawyers, "See the Conquering Hero Comes"; the doctors were welcomed by Schubert's "Death and the Maiden"; (I concluded, charitably, that she had appendicitis and was rescued from Death by the doctor); while the new Doctors of Philosophy were honored by

Mendelssohn's "Wedding March," which I interpreted as either a reminiscence, an exhortation or a prophecy.

The rings differ for each Faculty, that for Philosophy being engraved outside with the laurel wreath and on the inside with the name of the owner, that of the University, the degree conferred, and the date. In Theology and Law, degrees were only conferred upon Scandinavians. In Medicine, Haeckel of Jena was the most notable among the thirteen foreigners. In Philosophy, Professor Hjelt of Helsingfors, who had received his doctorate in 1847, and eighteen Swedes who graduated in 1857, were made "Jubilee" PH.D's. Fourteen foreigners received this honorary degree, among them two Americans, Professor Farlow of Harvard and your delegate.

The American Philosophical Society and Harvard University were the only American institutions invited to send delegates, Harvard having given Linnaeus an honorary degree and Linnaeus having been a member of the American Philosophical Society.

After the conferring of the degrees followed one of the prettiest and pleasantest features of the day. The newly made doctors all marched in their robes, hats and wreaths to the nearby University House and stood on the ample steps, while the whitecapped students, with songs, banners and flags, marched up and stood in front of the steps. After some fine singing the leader greeted the new doctors, now their brethren, in an admirable Latin speech, to which a reply was made in Swedish by one of the honorary doctors, and the students, after the usual four Swedish "hurrahs," marched off singing, lifting their hats as they passed the guests massed on the steps.

Another official dinner and a ball, ending in that latitude in broad daylight at 3 A. M., concluded the exercises in Upsala.

On the 25th the Academy of Sciences met in Stockholm in the Academy of Music. A cantata was sung, after which Count Morner, the President, delivered an oration and the institutions which had been invited presented addresses, in groups from each country, only the first delegate making a brief presentation speech. Another dinner followed in the evening.

On the 26th an excursion was made in the morning to Hammarby, the home of Linnaeus, and from 4 to 5.30 P. M., the Prince Regent entertained the foreign delegates and a few official Swedes at a tea and garden party at the palace quite informally, and most delightfully.

THE COMMUNITY OF INTEREST OF THE MEDICAL SCHOOL AND THE PUBLIC [1]

My sincere thanks are due for the distinguished honor of an invitation to deliver this important annual address. I also wish to congratulate you, gentlemen of the graduating class, on the admirable instruction that you have had. I have scanned anew the list of your Faculty and your equipment as shown by the annual announcement and I see among the former, friends whom I esteem for their professional and personal eminence, and among the latter facilities for education which far surpass anything which I had as a student.

Among the list of names that stand on your last announcement, however, is one which awakens sad memories of a sudden and tragic death. You have had a great bereavement in the untimely cutting off in the midst of a most promising and brilliant career of John Slade Ely. I am told that his place is to be filled by Dr. Blumer, who has already distinguished himself both in Albany and in California, and so the work of the school will still progress most satisfactorily. The world's work cannot stop. The old order ever gives place to the new.

It is to me an especial pleasure to come from the Jefferson Medical College in Philadelphia to greet

[1] Address at the Commencement of the Medical Department of Yale University, June 25, 1906.

you, because I remember that its great founder, George McClellan, was a graduate of Yale. My scholarly Professor of the Practice of Medicine, Samuel H. Dickson, was another graduate of Yale, and my very highly esteemed personal friend, William H. Welch, the father of modern American pathology, and many other medical friends are also graduates of this venerable and distinguished University.

To you graduates personally, as your names are added to the long roll of faithful and honored graduates of the Medical Department of Yale, I commend the last words ever publicly spoken in Scotland by that devoted missionary, able geographer, and sanctified physician, David Livingstone, as he was leaving for the wilds of Africa, never to return. He was visiting one of his sons at school, and gave the students this sententious advice, "Fear God, and Work Hard."

This counsel you instantly recognize also is in line with that of our well-beloved Osler, when he speaks of Work as "the Master Word in Medicine." Be certain of one thing: do honest work every day, meeting the tasks of each day, no matter how humble or how obscure, with a determination that you will put your best work into them, and you will assuredly meet with your reward in due time. I have yet to see the man who put this spirit into his work fail of attaining his goal. Even if it be not in this world, though in fact usually it is so attained, it will be reached in a better one, where I trust that all of you may be received with a "Well done, good and faithful servant."

The subject that I have chosen is, "The Community of Interest of the Medical School and the Public." Let me put it in a nutshell.

What should the medical school do for the public? Two things: (1) Give the public the best educated practioners in every department of medicine, and (2) increase our knowledge of the science and art of medicine in order to make our profession still more efficient.

On the other hand, what should the public do for the medical school? As I shall show you, the income of a medical school from its students is never adequate to defray the ordinary running expenses of a good medical school, to say nothing of an increase of the plant either in buildings or in teachers. It is the duty of the public, therefore, to provide all the needed facilities for the making of the best doctors and for original research, in order that the medical school may render its best service to the public.

First, The Medical School. In carefully looking over your announcement, I am glad to see that you have provided all of the four means of medical instruction, namely, (1) Didactic Lectures; (2) Recitations; (3) Laboratory Facilities, and (4) Clinical Instruction. I pass very lightly over the first two of these methods (didactic lectures and recitations), not because they are unimportant (though some of our modern schools are disposed to decry them), but because you already have them, and have them, as I look at it, in a proper proportion to the rest of your work. Never, in my opinion, will the didactic lecture pass entirely from the sphere of medical teaching any more than will that of the public speaker in other departments of instruction.

But every member of a Faculty should remember that if he is to give didactic lectures, they should be of the very best and highest quality that he can possibly produce. A very significant remark was made to me in Boston two weeks ago by a gentleman in speaking of his old teacher in medicine, who, he said, was "a first-rate man to sleep under." As soon as any teacher becomes a gentle opiate, the Trustees should seek for his successor as quickly as possible. Give me a man with clear-cut ideas, interested with his very soul in the subject he is teaching, aflame with enthusiasm to plant the knowledge he has to give in the mind of every single student before him, and with a good command of his mother tongue—such a man emphasizing the most important points will impress the facts of medicine indelibly upon the mind of his students vastly better than will any text-book, over which the student often nods assent to every statement.

Recitations, like writing, tend to promote exactness of knowledge and hence I thoroughly believe in them, but like the lecturer, the teacher to whom the student recites is quite as important as the book from which he recites.

The expense of these two methods of teaching can readily be met by the ordinary fees of students: but now, we come to two very different conditions.

The third and fourth methods of teaching are by the laboratory and the clinic. Here we require very expensive plants and a very expensive teaching corps. Moreover, both must grow steadily with the growth of medicine, and so the expense constantly increases. In the Jefferson Medical College we have 14 different laboratories, namely, the dissecting room (the anatomical laboratory), the laboratories of histology, of embryology, of physiology, of chemistry, of physiological chemistry, of pharmacy, of pharmacology, of practical obstetrics and obstetrical operations, of surgical operations, of bandaging and fracture dressings, of morbid anatomy, of bacteriology and hygiene, to which is to be added also a laboratory of clinical medicine. When I was a student, over 40 years ago, no medical school had more than one—the dissecting room.

These many laboratories mean large buildings, as they require large floor space, for each individual student must be accommodated. They must have plenty of ground in order to secure good light. They require an expensive equipment. The equipment of our laboratory of physiology in the Jefferson alone cost over $12,000, and that is but one of the 14. Moreover, a quarter of a century ago we had a Faculty who constituted and who thought themselves the perfect number seven. Each gave his lectures to the entire student body in all the classes *en masse*. I use the words "all the classes" cynically, for there were but two classes until a comparatively few years ago—and they were both taught together, for 18 weeks per annum. Two years—thirty-six weeks—of this meager training and, presto! we were doctors and authorized by law, like Saul, to slay our thousands or even to vie with the more nimble and athletic David.

Now we have graded courses with instruction covering 35 weeks in each year for four years—140 weeks in place of 36—and what is still more costly, personal instruction either to single individuals or to a small group of individuals by instructors who must be paid.

When I began the study of medicine at the Jefferson in 1860, including the janitor himself, there were less than a score of men engaged in teaching us. To-day, we have over 11 score of instructors, an increase, you will observe, of over 1100 per cent., and the 36 weeks of the entire course have been multiplied practically fourfold, yet the fees have increased less than 100 per cent. These changes at the Jefferson have been duplicated in every school which was in existence 40 years ago and which has met the demands of the times. The fees are practically as high as they can be made, otherwise it will be impossible for many an earnest student of the finest fiber and best qualities to pursue the study of medicine, and the profession will be restricted practically to the well-to-do or even to the rich.

The medical school occupies precisely the same position as the college or the technical school. *All of us give instruction at far below cost.* If the community wants the best doctors with the best possible education, the facilities for obtaining such an education must be provided for them by the community. It can never be done through the fees of the students. The deficit, as I shall directly point out to you, must be provided by broadminded, liberal citizens who see the value of such instruction to their own families and to the community.

Moreover, to the laboratories must be added the hospital, and it must not be a hospital where the doctor will simply make his rounds and order this or that medicine or do this or that operation. If it is worthy of its function, it must be a hospital with an up-to date staff, in which all the newest methods of investigation are used, in which hours of time and hours of labor are spent over single patients in studying the secretions, the excretions, the blood and the history as well as the symptoms, and the physical signs. It is a fair statement to say that to-day in our best conducted hospitals tne poorest of the poor get better and more thorough investigation and treatment than many of the well-to-do and even of the wealthy. The facilities for studying a case thoroughly exist only in a well-equipped hospital. No home, however luxurious, can ever provide them all.

You may object that New Haven is too small a place to provide enough clinical patients for such instruction. How, then, about Würzburg, with a population in 1900 of only 75,000; Bonn with 50,000; Heidelberg with 40,000; Göttingen with 30,000; Jena with 20,000; or Tübingen with only 15,000? Every one of these small towns has a University Medical School with clinical professors known all over the world. Little Tübingen with only 15,000 inhabitants, has a medical Faculty of 21 professors, including a Von Bruns, a Döderlein, a Vierordt, and a Heidenhein—and New Haven in 1900 had 108,000 inhabitants.

As I have pointed out elsewhere,[2] the joint work of a college and a teaching hospital is of enormously greater value to the community than simply the care of the sick in an ordinary hospital. "As I look over my work in the Jefferson, I see in the hospital scores of patients, even hundreds of them, every year who go out happy and in comfort, contented and restored to their families and to wage-earning power, and it is no end of pleasure to me to remember such cases. But when I look over the faces of the hundreds of young men that I have the pleasure of teaching, when I remember that I can instil into them high ideals, when I can bring to the birth in their lives, the 'research habit' and the desire to learn, and remember that they will go all over the world and cure hundreds, nay, thousands more than I can, which work is the greater?—the curing of my scores of patients or the teaching of hundreds of young men to go out to cure scores of thousands and to bring the blessing of many an exultant wife and many a poor widow upon their heads for the work that they have learned to do through me?"

The teaching of students is the most important function of a hospital connected with a medical school, and for this reason there should be such an intimate affiliation between college and hospital that the Professor of Surgery in the one, by virtue of his very appointment, shall become the teacher of Clinical Surgery in the other; that the man who is Professor of Medicine in the one shall always be

[2] "The Need for Increased Endowments for Medical Instruction," Keen (Addresses and Other Papers, p. 399).

able to illustrate his lectures and enforce his teaching by the clinical examples he can show in the other.

Again, "who will be least slovenly and careless in his duties: he who prescribes in the solitude of the sick chamber, and operates with two or three assistants only, or he whose every movement is eagerly watched by hundreds of eyes, alert to detect every false step, the omission of an important clinical laboratory investigation, the neglect of the careful examination of the back as well as the front of the chest, the failure to detect any important physical sign or symptom? Who will be most certain to keep up with the progress of medical science: he who works alone with no one to discover his ignorance, or he who is surrounded by a lot of bright young fellows who have read the last *Lancet* or the newest *Annals of Surgery* and can trip him up if he is not abreast of the times? I always feel at the Jefferson Hospital as if I were on the run with a pack of lively dogs at my heels. I cannot afford to have the youngsters familiar with operations, means of investigation, or newer methods of treatment of which I am ignorant. I must perforce study, read, catalog, and remember, or give place to others who will. Students are the best whip and spur I know."[3]

But the function of a medical school and its hospital is not completed by the mere cure of the sick in the latter and the mere education of its students in the former. "Mehr licht," said the

[3] "Duties and Responsibilities of Trustees," Keen (Addresses and Other Papers, p. 384).

dying Goethe, and that is the tocsin cry which calls forth the very best talents of the medical profession. The little oasis of knowledge in which we exist is hemmed in by a great desert of dense ignorance. It is the glory of the human mind that starting from knowing nothing it has achieved the magnificent results which the past centuries have given to this, the best of all. A new idea thrills far more than any libation of champagne; a new discovery is at once a reward for past work and a stimulus to future labor. He who has never felt the thrill of satisfaction from the one or the other knows not one of the highest joys of life. It is, therefore, the duty of the medical school and the hospital to increase our knowledge by invading this surrounding desert of ignorance and make each decade greater, wiser, and better than the one before it. Hence there must be facilities for investigation, experimental as well as clinical. That means again a large increase in the expense of such institutions, an increase which can neither be paid for out of the fees of ordinary students nor the fees of research students themselves, for usually their heads are as full of ideas as their pockets are empty of dollars.

Secondly, The Public. In order to obtain these thoroughly competent physicians and to increase knowledge the public must provide buildings, equipment and endowments in the form of endowed professorships, fellowships, scholarships, and invested funds for the general expenses of the College.

Let me call especial attention to one fact: that we of the profession of medicine do not say to the public "go," but we say "come." I challenge anyone to contradict the statement that the most unselfish profession which has to do with earthly things is the medical profession. We give of our time, our skill, our labor, not only to those in whom our friends are interested and ask it for them as a matter of favor, but there are few doctors who do not every day of their lives give hours of their time and their very best skill to the poorest without ever thinking of any pecuniary reward; hours of time and degrees of skill for which the wealthy willingly pay large fees.

In "The Gold Headed Cane," Mead says: "I crept over the backs of the poor into the pockets of the rich," but I can assure you that it is no short and easy climb. Moreover, I do not know of any personal friends in the profession, men earning their tens of thousands, who ever turn a deaf ear to the deserving, nay often, to the undeserving poor.

Moreover, it is often forgotten that not only does the doctor give his personal services and even his personal self (for I have known more than one life ruined or sacrificed by infection or exposure while attending the poor), but he gives all the products of his skill in the way of new instruments, new discoveries, new inventions, freely to the public. In other departments of science, men may freely patent these discoveries and make thousands out of them, but it is a thoroughly well-established principle in medical ethics that no such pecuniary advantage shall inure to the physician or surgeon by any similar discovery or invention.

You tell me that this is unjust. I grant it to some extent. But it is precisely this uncommercial spirit which distinguishes a profession from a trade. If I devise an instrument by which lives can be saved, suffering lessened or health restored, it should be just as available for a patient in Tokyo as for a patient in New Haven; for a patient in Egypt as for a patient in Paris. A splendid evidence of the altruism of the profession was their loud protest when Behring patented a remedy, which ought to have been free to every poor consumptive at the lowest possible cost. Had Behring been a Fellow of the College of Physicians of Philadelphia he would have been expelled from our Fellowship for daring to restrict the use and the usefulness of such a remedy—or, rather, he would not have dared to do it. The more valuable the remedy and, therefore, the greater the demand for it, and the larger the gain from its being patented, the more positively does the profession utter its protest against any such selfish gain at the expense of humanity.

If the public, therefore, provides such medical schools and such medical men as I have been describing, the benefit of one is the benefit of all. The discovery of one may be the cure of millions.

The medical situation in America is wholly different from that in Europe. Here we are dependent not upon the Government, but upon private generosity. Let me tell you in a few words what is done in Germany and France for medical education. In 1896 the Universities of France were reorganized and now the State pays the salaries of all the professors and also makes appropriations for other expenses. Through the kindness of Dr. W. T. Harris, the late Commissioner of Education, who has done so much for the cause of education in this country, I am enabled to give you the French statistics for the year 1898, the latest year for which they are available. The appended table shows that in the seven Universities of Paris, Bordeaux, Lille, Lyons, Montpellier, Nancy and Algiers, while the Universities derived from their own resources an income of 528,469 francs, that is, a little over $100,000, the State appropriated in that same year 2,628,290 francs, or nearly $526,000, i. e., more than five times as much as the income from fees and other funds.

UNIVERSITIES OF FRANCE

Faculties of Medicine, 1898 *

	State Appropriation.	From Funds belonging to the Universities.
Paris	Frs. 1,099,170	Frs. 260,593
Bordeaux	330,900	52,216
Lille	262,450	35,900
Lyon	384,850	60,765
Montpellier	251,200	62,797
Nancy	232,550	31,562
Algiers	167,175	24,636
	Frs. 2,628,295	Frs. 528,469
	$525,659	$101,694

So, too, I have taken from Prof. Lexis's (of Göttingen) Report on Public Education in the German Empire, prepared for the Louisiana Purchase Exposition in St. Louis in 1904, the statistics as to the income of the 21 Universities in Germany.

* Compiled from Statistiques de l'Enseignement Supérieur, 1900.

These are with one exception (Freiburg, 1902) for the year 1903. The sum total of the receipts of the Universities from fees and other ordinary sources was 9,774,607 marks (or in round numbers a little less than $2,500,000), whereas the state gave to them 19,032,869 marks (or in round numbers $4,750,000, almost twice their private revenues. In the University of Berlin alone, the receipts were 503,000 marks ($124,750), while the state allowance was 2,904,700 marks ($725,950). In only four of the Universities (Göttingen, Greifswald, Münster and Jena) were the receipts from the State less than the receipts from the University from its own resources, and it is noteworthy that the only one of these four in which the resources of the University materially exceeded the allowance from the State was the University of Münster, which was only founded in 1902.

GERMAN UNIVERSITIES

Name.	Founded	State Allowance	Other Receipts
Berlin,	1809	M.2,904,700	M.503,000
Bonn,	1818	1,157,000	286,000
Breslau,	1702-1811	1,300,000	407,000
Göttingen,	1737	635,000	774,200
Greifswald,	1456	494,000	547,000
Halle,	1694	1,141,000	720,300
Kiel,	1665	944,000	277,000
Königsburg,	1544	1,043,000	197,000
Marburg,	1527	787,000	231,000
Münster,	1786-1902	370,500	1,166,000
Munich,	1472-1826	1,002,216	371,516
Würzburg,	1402-1582	598,600	422,000
Erlangen,	1743	912,700	313,200
Leipzig,	1409	2,008,200	1,361,500
Tübingen,	1477	1,395,000	257,000
Heidelberg,	1386	911,500	653,500
Freiburg,	1457	713,000	101,666
Giessen,	1607	832,100	334,300
Jena,	1558	414,603	561,025

Name.	Founded	State Allowance	Other Receipts
Rostock,	1419	458,000	284,000
Strasburg,	1567-1872	1,010,750	106,400
		M.19,032,869	M.9,774,607
		$4,758,217	$2,443,652

Professor Bardeen in his address entitled "Anatomy in America"[4] gives a table based upon the reports of the Commissioner of Education, in which he contrasts the condition of the Universities, colleges, professional and technical schools in the United States in the sessions 1875-6 and 1901-2. I have extracted only the figures relating to medicine. This table shows certain facts which emphasize what I have before stated as to individual instruction. The number of students in 1875-6 had increased by 1901-2 practically three-fold, but the number of instructors had increased five-fold. The number of students per instructor in 1875-76 was 8.75; the number of students per instructor in 1901-2 was 5.33, and I have no doubt that if in this were included the large number of hospital instructors as well as those in the medical schools, it would mean that there was an instructor for at least every four, and possibly every three students. Meantime, however, the total income from all sources had increased less than four-fold.

TABLE OF THE COMPARATIVE STATUS OF MEDICAL INSTITUTIONS IN 1875-6 AND 1901-2 (BARDEEN)

No. Institutions	Year.	Amount of Productive Funds	Year
80	1875-6	$ 220,266	1875-6
154	1901-2	2,132,568	1901-2

[4] Bulletin of the University of Wisconsin, No. 5, Science Series III, No. 4, September, 1905.

TABLE OF THE COMPARATIVE STATUS OF MEDICAL INSTITUTIONS IN 1875-6 AND 1901-2 (BARDEEN)

No. Instructors	Year
981	1875-6
5,029	1901-2
No. Students	
8,580	1875-6
26,821	1901-2
No. Books in Library	
62,970	1875-6
156,929	1901-2
Est. Value, grounds, buildings, apparatus	
$ 3,154,350	1875-6
12,986,642	1901-2
Income from Productive Funds	
$15,771	1875-6
	1901-2
Income from Tuition and Fees	
$364,552	1875-6
	1901-2
Total Income	
$ 380,323	1875-6
1,356,600	1901-2

In an address in 1900 before the American Medical Association I contrasted the position of theology, which is almost wholly a literary study, requiring no laboratories and no large corps of assistants, and, therefore, conducted at a minimum cost, with that of medicine with its manifold requirements. In 1898 (United States Education Report), "each theological student had the income of an endowment of $2,250 provided for his aid: each medical student the income from $83."[5] I contrasted these two, not with a view of disparaging in the least what has been done for the theological schools, but simply to show that a study which needs a relatively inexpensive plant has been enormously better endowed than a study which requires a plant of very large and ever-growing cost.

That the American public are at last awakening to this need of endowment of medical schools is shown by recent gifts. In answer to letters of inquiry, I find that since January 1, 1900, there have

[5] "The Endowment of Medical Colleges," Keen (Addresses and Other Papers, p. 304).

been given to 10 medical schools in Philadelphia, New York, Chicago, Boston, New Orleans and Baltimore over $7,000,000. Part of this has been given for the hospitals directly connected with the medical schools, but the bulk of it has been for an increase in the medical plant and as endowments to meet deficits in their receipts. Included in these $7,000,000 are the $4,000,000 and over given for the noble buildings of the new Harvard Medical School and for endowment.

Besides this even more encouraging instances of a broad-minded appreciation of the research and the increase of knowledge for the benefit of humanity are the establishment in New York of the Rockefeller Institute for Medical Research with an Endowment of $25,000,000 and in Chicago the Memorial Institute for Infectious Diseases with an endowment of more than $2,000,000. If such gifts for education and research continue to pour in, as they ought to do, then America will make noble contributions to knowledge for the mitigation of the ravages of disease.

But you will say, Why should public-spirited, patriotic citizens give money to endow medical schools? There are several very good reasons: (1) Let me appeal to the self-love of the community. When you are sick is the best doctor any too good for you and for those dear to you? If, then, you want the very best educated, most skilful doctors, by whose services you and your families may be either kept in health or restored to health, you must give liberally for such a school as this very one at Yale.

(2) May I appeal to a better and higher motive, to that altruism which is peculiarly characteristic of a Christian nation? The wrongs and sufferings of the slaves did not directly affect your fathers—the men of my generation—yet a million of lives were willingly laid down by this nation that the bondmen might go free. And shall not the bondmen of disease also be liberated, not by your laying down your lives, but by your laying down your dollars?

(3) And, again selfishly, the money should be given for the increase and diffusion of knowledge not only for our own generation, but for generations to come. It should be given not only for present needs, but for those higher investigations which will make the doctors of your children and your children's children far better than the doctors of today,—present sacrifice for the good of the unborn, upon which Benjamin Kidd has laid such noble stress.

(4) The last reason appeals to selfishness as did the first, and yet, one may say in a most unselfish way. I plead for a Yale endowment for the satisfaction it will give to the donor. The man who has not given away just a little more than he felt he could afford to give has lost one of the sweets of life. I am sure that no gift will be looked back upon at the end of one's life with more gratification than that to a good medical school, even more than to a hospital. "The medical school which trained a Lister, a Pasteur, or a Koch has done more for humanity than all the hospitals of this community combined."

You may challenge this assertion. You may say that the wonderful century, as Wallace has well termed the 19th, has done practically everything and there are no worlds left to conquer. Viewed from the commercial standpoint, will such gifts pay by what they will accomplish? Let me assure you, never before have there been such well-founded reasons for unbounded confidence in the future of medicine. Never have such resources been at our disposal; resources from physics, as in the X-rays, and very possibly future, similar, yet even more remarkable discoveries; resources in chemistry, as shown by the remarkable work of your own Chittenden, whose name is known from the rising to the setting sun. Never before have there been so many means at our disposal for clinical examination as well as for laboratory investigation.

Perhaps it will be of some interest to you to look at a few of the victories of modern medicine. First of all was the extraordinarily useful victory over small-pox by Jenner in 1796. This was entirely the result of clinical observation. Even after 110 years the very germ which probably causes it is not yet ascertained. This is left for the laboratory, and it may be for some of you, young gentlemen.

Look at the magnificent victory over yellow fever; a victory, mark you, achieved almost wholly by laboratory research and without any patients till the clinical test of laboratory results had to be made. Here again the doctor said "come" and not "go." But it cost us the brave life of a Lazear who died that so many other thousands upon thousands might live. For 170 years Cuba had been enthralled summer and winter by this dreadful plague until Leonard Wood, Colonel Gorgas and the three immortal names of the Commission, Reed, Lazear and Carroll, struck off the fetters and ever since we have had a free and healthy Cuba. See what Gorgas is doing on the Isthmus of Panama in vanquishing yellow fever and malaria, both of them mosquito-born diseases—not a single case of yellow fever since last December,[6] and malarial mortality no greater than that of pneumonia. His splendidly successful work is going to make possible the building of the canal, the greatest engineering triumph of the 20th century—an impossibility without his work.

Look at the victory over diphtheria. As your own Welch has eloquently set forth, this again is a victory of the laboratory,—with test tubes and animals, instead of your children and mine. See how it has been confirmed by later clinical observation. In the Trousseau Hospital in Paris before the use of the serum, the mortality of diphtheria was 60 per cent. After the introduction of the serum, it fell to less than 15 per cent. In Geneva the death rate fell from 35.7 per cent. to 9 per cent., and in the table of Bayeux of over 200,000 cases from all parts of the world, the average mortality was 16 per cent. as contrasted with a former mortality of 35 per cent.; in other words, a reduction of more than 50 per cent. In Chicago the decrease in the mortality was 63 per cent. Would not the endowment of a laboratory which would give such

[6] Not a single case of yellow fever has originated on the Isthmus for 16 years! (1922)

results as these pay a dividend on the investment greater than any Western Anaconda or any Eastern Golconda?

Look at the work in tuberculosis, another instance in which the laboratory has furnished the means by which we have learned how to cope with the disease. In 1882, less than a quarter of a century ago, Koch discovered the bacillus of tuberculosis and studied its life history. From that great discovery and the knowledge that tuberculosis is a distinctly contagious disease and that the bacillus does not thrive in the fresh air and the sunlight, has arisen the magnificently successful crusade against the great white plague, which has saved so many lives and which in the future bids fair almost to exterminate this hectic pestilence.

The laboratory studies of Pasteur on fermentation led Lister in the late 60's and early 70's to experiment in the laboratory with test tubes and hay infusion, and convinced him that putrefaction was caused by germs. He had not seen them with mortal eye, but with the clearer and surer vision of the imagination, and then he taught us how to vanquish even an unseen foe. I need not recount to you the triumphs of Antisepsis: with those of Anesthesia they are known of all men. The abolition of pain, the shortening of illness, impossible operations made possible, the saving of untold millions of lives as a containing result.

This brief sketch of what has been done, chiefly within the last thirty years, in only five diseases, is the promise of great improvement in time to come. Already we see the glimmer of a new dawn. He who will discover, as it surely will be discovered, the cause of cancer, will deserve a monument nobler than that of any hero of the battle-field. In time we shall discover the cause and be able to compass the cure, or still better, the prevention of measles, whooping-cough, scarlet fever, chicken-pox, mumps, which are so grimly and absurdly called the "usual diseases of childhood," as if any diseases ever should be "usual" and more especially ever be allowed to ravage our homes and destroy our innocent children.

Do not such achievements as I have described, and such others as I have prophesied, and still others as yet undreamed of, justify a splendid endowment for the medical department of this University, so that upon its shining career shall be shed new luster, and the Sons of Eli be prouder of it than ever because of its achievements in the service of humanity.[7]

[7] Those desiring to read further upon this subject are referred to the following papers:

(1) Welch: "Some of the Advantages of the Union of Medical School and University," *New Englander and Yale Review*, September, 1888.

(2) Welch: "The Relation of Yale to Medicine," *Yale Medical Journal*, November, 1901.

(3) Welch: "Higher Medical Education and the Need for Its Endowment," *Medical News*, July 21, 1894.

(4) Barker: "Medicine and the Universities," *American Medicine*, July 26, 1902, and the *University Record* (Chicago medical number), July, 1902.

(5) Lexis: "A General View of the History and Organization of Public Education in the German Empire," 1904.

(6) Bardeen: "Anatomy in America," Bulletin of the University of Wisconsin, No. 115, Science Series, Vol. III, No. 4.

(7) Keen: "Addresses and Other Papers," especially "The Debt of the Public to the Medical Profession," "The Endowment of Medical Colleges," "The Mission of a Medical College," and "The Need for Increased Endowments for Medical Instruction."

THE SERVICE OF MISSIONS TO SCIENCE AND SOCIETY[1]

Fathers and Brethren: Mr. William A. Munroe, whom you elected your President a year ago passed to his reward August 26, 1905. Death, which treads with equal step in cottage and palace, has robbed us of a noble leader. Those who knew him best loved him most. The Union will give fitting expression to our sorrow, but I cannot refrain in these few words from lamenting the great loss which the Church and the cause of Missions have suffered in his death.

Upon me, therefore, devolves the duty of addressing you at the opening of this, the ninety-second session of the American Baptist Missionary Union. I have chosen as my theme "The Service of Missions to Science and Society." I can only give a very brief outline of a few of the most important services, for the more they are investigated the larger do they loom upon our vision.

Even before the era of modern missions the connection between missions and science was well recognized, for Robert Boyle, the philosopher and founder of the Royal Society in 1660, laid it down as the special object of that institution to propa-

[1] The Presidential Address delivered before the American Baptist Missionary Union, at Dayton, Ohio, May 21, 1906. Reprinted by the kind permission of the Society.

gate Christianity along with and through literature and science. He was also the founder of the first Protestant society for the propagation of the gospel. Leibnitz, in planning the Berlin Academy, included the same idea in its scope, and thence it extended to other similar societies in Halle, Wittenberg, Vienna and St. Petersburg.

AN EVOLUTION IN MISSIONS

The idea in the minds of our first modern missionaries was, naturally, that their duty was solely to preach the gospel.[2] This was, still is, and ever must be their chief aim.

But they were soon compelled by circumstances to broaden their ideas of duty. Who could see dense ignorance all around him without yearning to teach the people so that they might at least read the word of God and be able to communicate with each other in writing? Naturally it would quickly be perceived that the more plastic mind of childhood would profit most by such teaching. Hence the origin of schools, of the printing-press, and of translations of the Bible and of other books. Many of these people had only a spoken language, and to teach reading and writing, the language must be reduced to writing, thus requiring skilled philologists.

The ravages of disease, as a result of ignorance, filth and superstition, inevitably caused attempts to teach the first principles of sanitation often combined with elementary medical treatment, and

[2] Strange that this narrow view should again be advocated in 1922. Well may the heathen protest against it.

hence the medical missionary, the hospital, the trained nurse and other agencies to ameliorate the physical sufferings and suppress the physical vices of the heathen world. In other words, there has been an evolution in missions as inevitable as it is desirable.

Moreover, even the most devoted missionary must have some recreation, for that "all work and no play makes Jack a dull boy" is doubly true of one banished from family, home and country. What was more natural than to write full descriptions of the geography of the country, of the manners and customs of strange peoples and of the curious animal and vegetable forms seen on all sides? Thus literary, scientific and sociological studies are seen to be a normal and indeed unavoidable outgrowth from missions, especially in their later and fuller development—what in commerce would be called important "by-products."

Moreover, the missionaries of today are not simply the pious, devoted enthusiasts of the past. All missionary societies, our own among them, recognize the fact that they must provide men who are *trained experts* as well as earnest Christians, if they would reap the largest harvest. Hence our training schools to fit them for their work. Hence, too, the splendid student volunteer movement which will add in the next four years annually a thousand trained young men and women from our colleges and universities—four full regiments—to the ranks of this devoted army of the Church militant, destined to be also the Church triumphant.

THE MANIFOLD SERVICE OF THE MISSIONARY

You will observe thus that the entire conception of foreign missions has changed from the early days of Carey and Judson. Then, as has been eloquently set forth by Rev. Dr. Sidney L. Gulick, the missionary devoted himself to the individual pagan, now to the community and its entire welfare, as well as to that of the individual; then to preaching the gospel of righteousness alone, now he adds to this the gospel of cleanliness; then he was an expert only in the Scriptures, now he makes all science, philanthropy, literature and learning, in a word, all service to society as well as to religion, his efficient aids in winning souls to our Lord Jesus Christ.

"The missionary," says Dr. Gulick, "is now seen to be not merely saving a few individuals from the general wreck of the pagan world, but planting a new life which will transform that world and bring it into the kingdom of God. . . . Christ must be made King in our organized life as communities, and thus society be saved, even as he has been made Saviour of individuals. . . . The newer well-balanced sociological conception of foreign missions is one which, while it does not forget man's individual nature and value, does emphasize strongly the thought that only as society is transformed with the individual is the individual fully saved.

"Foreign missions in all their activities aim at the double purpose of saving both individuals and society—the establishment of the kingdom of God through the production of children of God."[3]

THE DEVELOPMENT OF MEDICAL MISSIONS

When Benjamin W. Crowninshield objected to granting the charter of the American Board of Commissioners for Foreign Missions on the ground that it "would export religion, whereas there was none to spare among ourselves," he forgot that "religion is a commodity of which the more we export the more we have remaining."[4] But he also, unconsciously, recognized and recorded the fact that in one very proper sense religion is a valuable national product and its export an untold blessing to entire nations who receive it.

Naturally, I am especially interested in the wonderful development of medical missions, not only because it is my chosen profession, but because so many of my own students are doing the Master such good service in Japan, Korea, China, India, Siam, Persia, Syria, Palestine and Egypt.

Our Lord himself was the first medical missionary, for he "went about doing good" during all his ministry, and most of his miracles were for the healing of bodily ailments.

The medical missionary often finds that his professional services open the door to his Christian teaching. Notable instances are the favors extended to missionaries and their hospitals by Li Hung Chang, and the career of Dr. H. N. Allen,

[3] Gulick: "The Modern Conception of Foreign Missions," *The Outlook*, No. 4, 1905, p. 563. *Vide infra,* note 1, p. 86.

[4] Pierson: The Crisis of Missions, p. 191.

whose services to a wounded Korean prince led to the introduction of modern missions into Korea, and to Dr. Allen's being appointed American minister by two Presidents.

Dr. Peter Parker, the first medical missionary of the American Board,[5] "had great difficulty in securing a building, and when it was ready no patients came the first day. On the second, a woman courageously trusted herself in the hands of the foreigner. Next day half a dozen came, encouraged by her success, and soon the street was full. So anxious were they to secure his services that even women of the better class stayed in the street all night, so as to secure an early admission. Long lines of sedan-chairs almost choked up the narrow lane. Great men with their attendants waited their turn to see the foreign doctor. As many as a thousand were waiting at once, and there was danger that people would be injured by the pressure. Sometimes blind people from a far-off village clubbed together to charter a boat to Canton, and then waited four or five days after their arrival till there was a vacancy for new patients." One Chinese transported his blind old mother a thousand miles, nearly twice as far as from here (Dayton, Ohio), to Philadelphia, in a wheelbarrow to consult one of my own students.[6]

The medical development of missions, it is interesting for us to note, is especially British and

[5] Ely Volume: Missions and Science, p. 411

[6] Dennis: Christian Missions and Social Progress, ii, 193. (In later references to "Dennis," this work is meant unless his other work is specified).

American. In 1899 Dr. Dennis[7] states that exclusive of the physicians of the Countess of Dufferin's fund, a philanthropic but not strictly a missionary agency, there were "338 American, 288 British and 27 Canadian medical missionaries in the various fields, as compared with 20, the total number for all the societies of Continental Europe, and 7 for Australasia. . . . The admirable services, moreover, rendered by skilled nurses sent out from some of the European societies, especially by the Kaiserswerth Deaconesses, should be carefully noted here as contributing much to the efficiency of medical and surgical practise in the hospitals."

These medical missionaries have introduced anesthetics which abolish pain, vaccination which banishes smallpox, and the intelligent treatment of other epidemics (for example, the plague and cholera which make such awful havoc in the teeming centers of oriental life), and antiseptic surgery which saves thousands of lives and untold suffering.

But the West as well as the East owes not a little to the medical missionary. Perhaps the one most useful drug in medicine is quinine, and the world owes it to the Jesuit missionaries of South America. Before the chemists extracted its active principle it was originally administered as the pulverized bark of the cinchona tree, and was popularly known as "Jesuits' bark"; while Calabar bean, the Kola nut, and Strophanthus, valuable modern remedies, we

[7] Ibid. ii. 402.

owe to Dr. Nassau, an American missionary in Africa. Much of our knowledge of cataract, lithotomy, elephantiasis, leprosy, and many other tropical diseases, come from medical missionaries, since these disorders are either peculiar to the tropics or are very prevalent there.

THE GOSPEL OF CLEANLINESS

That godliness is profitable for the life that now is as well as that which is to come was most evident to me in Nellore. Dr. Downie did not need to point out to us that this house was that of a Christian convert, and that of an unconverted native, for one look was enough to distinguish them. The former was clean and neat, free from accumulation of filth, and showed every evidence of thrift and orderly comfort, while the latter was its unsanitary counterpart. That today the greatest physical need of India and Burma is decent sanitation was most evident when we smelled the decayed fish diet of the native Burmese, and in India saw hundreds of pilgrims drinking the green scum-covered water of many a temple tank. We also saw hundreds of others standing in the river, waist-deep, drinking the foul water of the Ganges at Benares, while other hundreds at their elbows were washing themselves and their clothing in the river, with decaying bodies of animals floating on the tide, and a large sewer delivering its filth into the same stream less than three hundred feet away. Is not the preaching of cleanliness in such a community as truly missionary work as preaching the gospel?

Dr. Dennis [8] again sums up the results in 1902, when there were 379 hospitals and 783 dispensaries ministering to 6,500,000 patients annually in Asia, Africa and Oceanica, and 67 medical and nurses' training schools, with 631 pupils. What do not these figures represent in lives, in comfort, in happiness and hope for this world and often for the next!

Under the influence of missionary societies and the Lady Dufferin Association, the attitude of the people of India toward the education of women, and especially their medical education, is rapidly changing. The Lady Dufferin Association in 1898 had 240 native women students, and the North India School of Medicine for Christian Women, in which my friend and former student, Dr. Anna M. Fullerton, is so active, is doing a similar work.

CHRISTIANITY A PRACTICAL FORCE

Christian altruism is a new idea to the heathen world. An eye for an eye and a tooth for a tooth, neglect and often abandonment of the suffering and the unfortunate, is the rule of conduct. Service to others for Christ's sake and because every man, being a child of the same Heavenly Father, is a brother, is to them a startling anomaly. What a deep and lasting impression then must be made upon their minds by the 533 orphanages, foundling asylums, homes for infants, leper hospitals, schools for the blind, the deaf and dumb, opium refuges, homes for widows and orphans, and asylums for the insane carried on by self-sacrificing and devoted

[8] Centennial Survey of Foreign Missions.

men and women who give up their time, their labor, their talents, and often their health, and even their lives in the service of suffering fellow human beings! Whatever the people may think of Christianity as a system of religion, these beautiful, bountiful and unselfish ministries for the sick, the suffering and the unfortunate must appeal strongly and constantly to their common humanity. Where has heathenism a similar altruistic roll of honor?

Says Giddings.[9] "The successive world-empires of Persia, Macedonia and Rome prepared the way for the Christian conception of universal brotherhood. So long as this conception was nothing more than an esoteric affirmation that all men are brothers, because they are children of one Father, it made but little impression upon the social mind; but when by the genius of St. Paul it was converted into an ideal, into the doctrine that all men through a spiritual renewing may become brothers, the new faith underwent a transformation like that which converted the ethnic into the civic conception of the state, and *Christianity became the most tremendous power in history.* Gradually it has been realizing its ideal, until, *today, a Christian philanthropy and a Christian missionary enterprise, rapidly outgrowing the esoteric sentimentalism of their youth, and devoting themselves to the diffusion of knowledge, to the improvement of conditions, and to the upbuilding of character, are uniting the classes and races of men in a spiritual humanity.*"[10]

[9] Principles of Sociology, p. 360.

[10] Italics my own.—W. W. K.

Well may Sir Charles Aitchison, a former lieutenant-governor of the Punjab, say: [11] "Apart from the strictly Christian aspect of the question, I should, *from a purely administrative point of view,* deplore the drying up of Christian liberality to missions as a most lamentable check to social and moral progress and a serious injury to the best interests of the people"; or Sir Charles Warren, governor of Natal: "For the preservation of peace between the colonists and the natives one missionary is worth a battalion of soldiers." [12]

Besides his strictly evangelistic efforts, the missionary will and, indeed, must inculcate the plain social virtues, honesty, sobriety, frugality, and industry so lauded by Franklin. They are as foreign to the heathen world as is the Christian altruism, of which I have above spoken. But without them there can be little social progress. One of the greatest services missionaries have rendered has been in demonstrating these virtues in their own lives and enforcing them upon their converts. It is a service to society of simply untold value. Listen, for instance, to the testimony of Alfred Russell Wallace, Darwin's great compeer:

"The missionaries have much to be proud of in this country [the Celebes]. They have assisted the government in changing a savage into a civilized community in a wonderfully short space of time. Forty years ago the country was a wilderness, the people naked savages, garnishing their rude houses with human heads. Now it is a garden,

[11] Dennis, ii. 407.

[12] *Vide infra,* note 2, p. 86.

worthy of its sweet native name of 'Minahasa.' Good roads and paths traverse it in every direction; some of the finest coffee plantations in the world surround the villages, interspersed with extensive rice-fields, more than sufficient for the support of the population. The people are now the most industrious, peaceable, and civilized in the whole archipelago. They are the best clothed, the best housed, the best fed, and the best educated; and they have made some progress toward a higher social state." [13]

Or to the testimony of a cold, official British Blue Book: "Insensibly a higher standard of moral conduct is becoming familiar to the people." [14]

Is not this an enviable record of service to his fellow men—a record repeated in scores of savage communities?

VICES COMMON ON HEATHEN SOIL

Moreover, the Christian missionary is engaged in a ceaseless endeavor to uplift the nations from the vices which flourish so vigorously on heathen soil. Review only a few of these evils and see what a gigantic task confronts him.

Intemperance exists practically in every part of the world, but its worst phases are seen by the missionary. It neutralizes much of his best efforts.

The opium habit exists in a large part of Asia. Not only the missionary, but the strong hand of

[13] Wallace: The Malay Archipelago, i. 397.

[14] New York *Tribune,* July 25, 1886.

the government is enlisted in the warfare against it, yet how deadly is its influence and how fearful its ravages in spite of both these forces leagued together, largely, alas, due to the attitude of Christian Great Britain!

Gambling in its many forms is so universal and so difficult to destroy that in our own and other civilized lands, its mischiefs, I fear, are today upon the increase. The missionaries doing their best to eradicate it in heathen lands are not to be blamed if they are discouraged, when American women clothe themselves from their winnings, and pawn their jewels to pay their losses at bridge. Are the Chinese who ruin themselves at fan-tan, or the Filipino who bets on his game-cock, any worse?

Immorality, polygamy, concubinage, infanticide, and divorce are allied gigantic evils which the missionary has to contend with on every hand. That the same evils exist here is true; but here they exist more or less surreptitiously and under protest, whereas in heathen lands they are open and legal.

FAMILY LIFE

In most heathen lands, while the love of father or mother for the children, it may be, is as strong as elsewere, yet *family life,* as we know it, scarcely exists in most of heathendom. Quoting in part from Marshall's Principles of Economics, [15] Kidd [16] says: "The religious movement of the sixteenth

[15] Vol. i. 34, 35.
[16] Social Evolution, p. 297.

century deepened the character of the people, 're-acted on their habits of life, and gave a tone to their industry.' Family life was intensified, so much so, that 'the family relations of those races which have adopted the reformed religion are the richest and fullest of earthly feeling; there never has been before any material of texture at once so strong and so fine with which to build up a noble fabric of social life.' "

The object lesson of the daily home life of a Christian family in its tender care, especially for the feeble and the suffering, its pervading courtesy and love, its purity and moral example, can never be lost upon a heathen people often practically destitute of such ideals.

No better testimony could be given than that of the *Japan Gazette*,[17] which said, as Dr. and Mrs. Hepburn were leaving Japan, and with an imperial decoration, after thirty-three years of residence there:

"We may rest quite assured that it was the daily life of Dr. Hepburn and his fellow workers in the early days which moved Japan first to tolerate and then to welcome missionaries to these shores, and it is to the missionaries that Japan owes the greater part of her present advancement. The missionary has been Japan's instructor, an influence wholly for enlightenment and good."

And the *Japan Mail* [18] said:

"No single person has done so much to bring foreigners and Japanese into close intercourse.

[17] October 19, 1902.
[18] October 18, 1902.

His dictionary was the first book that gave access to the language of the country and remains to this day the best available interpreter of that language; but even more than his dictionary has helped to facilitate mutual acquaintance has his life assisted to break down the old barriers of racial prejudice and distrust."

THE DEGRADATION OF WOMEN

The position of woman in the East and in Africa has always excited the sympathy and philanthropic labors of the missionary. Practically she is largely an article of barter and sale, often a slave, and never the one companion of her husband, the one mother of his children, his comforter and counsellor, his good angel. That she is entitled to equal property rights, to loyal affection, to an education, and, if necessary, that this education should give her an honorable support, has never been dreamed of. Yet exactly this position in the social fabric is what Christian missions claim for her and in many ways are securing for her. "If the missionaries had done nothing else for China," says Colonel Denby, for thirteen years American minister there, "the amelioration of the condition of the women would be glory enough." [19]

The needle of a missionary's wife opened the zenanas of India to Christian missions.[20]

We all know something of the dreadful cruelties of child marriage. The medical women of India know these far better than any others, and even for

[19] Denby: China and Her People, p. 228.
[20] Pierson's Crisis in Missions, pp. 170-1 and 183.

very shame's sake, they cannot depict them in plain speech. We know, too, something of the former cruelties of Indian suttee and the existing dismal state of Hindu widows, many of them mere children; but we do not appreciate how dreadful are these daily tortures, nor that, according to Dubois,[21] there are not less than 25,000,000 of these poor unfortunates—a number nearly equal to one-third of the entire population of the United States! (1906) Here are gigantic evils in society which the missionary is doing his best to abolish; and, thank God, he is making increasing headway.

SLAVERY AND THE SLAVE TRADE

In Africa, slavery and the slave trade are partly things of the past, due largely to the exertions and influence of Livingstone and other missionaries. What crimes that cried to heaven for vengeance were committed while they lasted, it is impossible to describe. Society owes a large debt of gratitude to the strong men and women who by their protests and appeals finally achieved these results. John Howard, William Wilberforce and Elizabeth Fry are names hallowed in the annals of English philanthropy, and justly so. Their counterparts, found in many an African mission station, have received their reward in blessings from liberated slaves and from their Heavenly Father.

But this work is not yet finished. The "open sore of the world" still exists on the Congo. Oppression, cruelty, murder, and nameless outrages are still perpetrated there upon the poor blacks

[21] Hindu Manners, Customs, and Ceremonies, ii, 356.

who have no powerful friends at court, no Hebrew rabbis, no American ambassadors like Straus, and no English premiers like Gladstone, as Russian Jews, Armenians and Bulgarians have had. Who has stirred the blood of Christendom to protest against these outrages? Brave missionaries, who, having witnessed them, cry aloud without ceasing. Were they to hold their peace, the very stones would utter a protest. Misrepresentation, abuse, and callous indifference in many high quarters have stood in their way, but so sure as there is a just God in heaven, so surely will their cry at last be heard, and Leopold of Belgium will cease to hoard up gold, every piece of which is besmeared with the life-blood of some poor African.[22]

Cruel and barbarous punishments, human sacrifices and cannibalism have been largely, and in many places completely, abandoned as a result of missionary efforts, and Christian peace and civilization have replaced them. Witness Fiji, Samoa, Hawaii, Africa, and many another mission field.

Charles Darwin,[23] certainly an impartial observer, says: "The success of the Tierra del Fuego

[22] Even as this address was read came the news of a law recently enacted on the Congo, by which any person (and whom could this mean but the missionaries?) convicted of slandering an official (how easy such a conviction by interested judges!) could be condemned to five years in an African jail under the Equator—a sentence equivalent to death to a European. Under its provisions one missionary had already been arrested, a thousand miles from those who could serve as witnesses in his behalf!

[23] Life and Letters, ii. 307.

Mission is most wonderful, and shames me, as I always prophesied utter failure. It is a grand success." Again in his Voyage of the Beagle, he says:[24] "The lesson of the missionary is the enchanter's wand";[25] a sentiment which finds an echo from Max Müller, "I know of no nobler life than that of a true missionary,"[26] and from the king of Siam, who declared, "American missionaries have done more to advance the welfare of my country and people than any other foreign influence."

EDUCATION: THE RESULT OF EVANGELIZATION

I have already pointed out how inevitable it was that education, especially of the young, would soon be engrafted upon the early evangelistic efforts of the missionaries.

Ignorance is the handmaid of superstition and vice. What Tuskegee and Hampton and Shaw University are doing for the black race in our country must be done still more in heathen lands if the people are to be elevated and civilized. Not only must the masses be taught to read and write in order that the truths of the Bible and their literature may be available, but educated native teachers and preachers also must be provided for them. It is impossible to send American and other missionaries in sufficient numbers to do all the great work needed among the many millions of Asia, Africa

[24] P. 452.

[25] See also Voyage of the Beagle, American Edition, pp. 437, 439, 441, 448, 452, 454-8, for further testimonies.

[26] Chips from a German Workshop, iv. 316.

and Oceanica. Native teachers in large numbers must be educated. They, more than foreigners, can get close to the people and thoroughly understand them.

Twenty years ago Pierson [27] stated that in sixty years, from a totally illiterate nation 300,000 of the inhabitants of Madagascar had learned to read.

Especially is this educational progress necessary at present, when the whole East is entering upon a new life. China is a giant awakening from a long sleep. Within a year her escape from the educational thraldom of thirteen centuries has been announced by the abolition of the old examinations of her literati and the institution of examinations in Western learning in its place. Shall Christendom allow such an opportunity to escape? The soil has been upturned; shall we neglect to sow the seed? Never again will such a door be opened to us, and God will surely hold us accountable if we neglect this golden opportunity.

Japan is advancing by leaps and bounds, and if, as is within an easy probability, she abandons her native tongue and adopts English as her national language, Great Britain and America will incur a new and almost staggering responsibility.

The present movement in our own Church for a great advance along higher educational lines is eminently justified by the needs of the millions of the East and of Africa, by the intellectual awakening just noted, by the signal success of past efforts,

[27] Crisis in Missions, p. 263.

and by the fine example of other churches in discharging this urgent duty.

At Rangoon I saw the splendid work of the late Dr. Cushing, and his colleagues, where now there are 800 students eager to learn and later to teach. At Beirut I have seen the Syrian Protestant College doing a superb work in education. In medicine alone they will supply educated physicians for all the Arabic- and Turkish-speaking countries to replace the present barbarous medicine from which the people suffer so sadly. I have seen Robert College at Constantinople, from whose halls have issued the makers of modern Bulgaria. We need not three such colleges, but three hundred, if we would do the work of the Lord as it ought to be done. Oh, that our consecrated wealth could be poured into the coffers of God till they should be filled to overflowing!

It is significant that the emperor of Korea has suggested as a name for a Methodist institution of higher learning in that benighted land, *Pai Chai Hak Fong,*—"Hall for Rearing Useful Men," —a name after "Poor Richard's" own heart.

Moreover, as in our own land, industrial training is often as useful as the more intellectual. This is given in many places.[28] Alexander M. Mackay is known on the Victoria Nyanza as the "industrial missionary," who has won his way by his carpentering quite as much as by his teaching. Every time you see a soldier clad in *khaki,* it should remind you that this fast-brown dye was dis-

[28] See Noble's Redemption of Africa, ii, 562, and Dennis, ii. 152.

covered by Haller of the Basel African Mission, who, by his industrial education, as Dennis finely expresses it, has changed a "pagan liability" into a "Christian asset."

In Dennis' Centennial Survey of Foreign Missions there are catalogued 94 missionary universities and colleges with 36,000 students, 179 industrial training schools with over 9,000 students, 879 high schools and seminaries with 85,000 pupils and nearly 19,000 day schools with almost a million students! Surely James Bryce is right when he says, "The gospel and the mission schools are at present the most truly civilizing influences which work upon the natives, and upon these influences, more than on any other agency, does the progress of the colored race depend."[29]

PHILOLOGY LINKED WITH EDUCATION

Inextricably interwoven with education is the science of language. Existing languages in highly developed form like Chinese, Japanese, Hindustani and Arabic had to be learned by the missionaries. That this is no light task we all can well believe. Indeed we can almost agree with Milne when he epigrammatically describes learning Chinese as "work for men with bodies of brass, lungs of steel, heads of oak, hands of spring steel, eyes of eagles, hearts of apostles, memories of angels, and lives of Methuselah."[30]

But bad as is this situation, many missionaries

[29] Impressions of South Africa, p. 393. And yet there are some who wish to stop this splendid work. (1922)

[30] Dennis, iii. p. 413.

are confronted with a far worse one; that is, with languages which are only spoken and have no written alphabet whatever. Imagine yourself set down in France, Germany, or Italy without any written language and obliged to devise a written alphabet to represent these spoken languages; or still worse, that you lived among African tribes with sounds and gurgles utterly foreign to your ear and tongue—how think you would you succeed in giving them not only a written language, but a literature? Is it any wonder that it took Judson twenty-seven years to translate the Bible into Burmese?

Listen to the predicament of Mr. Richards of Mozambique, who writes:[31] "These people had never heard of ink till we brought it to them. There was no history, no book, no dictionary, no alphabet, not a single idea as to how thought and words could be transferred to paper and from paper into the comprehension of one who had never heard the words before they were transferred to paper. They could not tell what paper was, but called it a 'leaf.'"[32]

Yet in the face of these difficulties, apparently almost insurmountable, of the 600 spoken languages and dialects of Africa, 200 have been reduced to writing. Many of them were on the point

[31] Dennis, iii. 419.

[32] Any one wishing to realize the prodigious difficulty of reducing spoken to written speech should read the amusing as well as instructive account given by Rev. Henry Richards in Pentecost on the Congo, page 6, published by the American Baptist Missionary Union, Boston, Mass.

of extinction and have since become extinct. They would have been utterly lost to philology had it not been for the missionaries. Perhaps half as many more languages in other parts of the world, that is, 300 languages in all, have been reduced to writing and preserved. "No other motive is conceivable," says Dr. Cust, the celebrated philologist,[33] "to induce men of scholarship and industry to run the risk of disease and death, for the purpose of reducing to writing the form of speech of downright savages, *except for the one purpose of religious instruction.*"[34] Is it any wonder, then, that he says, "The missionary appears to me to be the highest type of human exellence in the nineteenth century, and his profession to be the noblest?"[35]

The debt of philologists to missionary labors has been repeatedly acknowledged by many of the leading linguists of all lands. The late Professor Whitney of Yale, the distinguished Orientalist, says: "I have a strong realization of the value of missionary labors to science. The American Oriental Society has been much dependent on them for its usefulness. *There would hardly be occasion for the society, at all, but for them.*"[36]

Few missionary languages, even those most developed, had even a dictionary. We owe to missionary philologists nearly 150 dictionaries, includ-

[33] Dennis, iii. 422.

[34] Italics my own.—W. W. K.

[35] Pierson: Crisis in Missions, p. 254.

[36] Liggins: The Great Value and Success of Foreign Missions, pp. 223-4. Italics my own.—W. W. K.

ing the earliest ones of Ulfilas for the Goths, Cyril for the Slavs, our own Eliot for the American Indians, Hepburn for the Japanese, Morrison and S. Wells Williams for the Chinese, Jäschke and Heyde for the Tibetans, Judson and Stevens for the Burmese, Brown for the Telugus, etc. The oldest inscription in Phœnician characters and one of the most important philological discoveries of modern times (second only perhaps to that of the Rosetta stone and the celebrated Nestorian tablet [37] discovered by Bridgman, in China), was the finding of the Moabite stone by Rev. F. A. Klein, the missionary, in 1868. The letters of Rev. W. K. Eddy to the *London Times* first called attention to the superb sarcophagi at Sidon, now among the priceless treasures of the museum in Constantinople.[38]

Up to 1901, the Bible itself has been translated into 475 languages, of which 432 translations were made in the nineteenth century, an unparalleled series of philological achievements. Well may we call it, after St. Chrysostom, "The" Book. No other can compare with it in number of copies, in universality of circulation or in the worth of its contents.

GEOGRAPHY AND NATURAL HISTORY

That geography owes a large debt to missionaries no American can doubt when he remembers the early Jesuit missionaries whose names are so

[37] Ely Volume, p. 172.
[38] Dennis, iii. 429.

familiar to us: Père Marquette, Hennepin, La Salle, Le Jeune and others. The great Northwest and its lakes and the Mississippi are redolent with their memories. The thrilling story of how Oregon and the whole northwest Pacific coast was saved to the United States by the heroic midwinter ride of Rev. Marcus Whitman, and his interviews with Daniel Webster, then secretary of state, and with President Tyler, is well told in the *Missionary Herald* [39] and the Ely Volume.[40]

When starting on one of his journeys, Livingstone wrote: "Cannot the love of Christ carry the missionary where the slave-trade carries the trader? . . . I shall open up a path to the interior or perish. I have never had the shadow of a shade of doubt as to the propriety of my course." And, at a later period, when almost dying for want of food, "Took my belt up three holes to relieve hunger" is the pathetic note in his journal.

Africa in the nineteenth century is the counterpart of America in the sixteenth, and Livingstone has been well called the "Columbus of Africa." Numberless have been both the travelers and the missionaries who have explored its interior, which, when I studied geography, was labeled *"terra incognita,"* and the then current maps showed the "Mountains of the Moon." Now these mountains are known to be myths, but the sources of the Nile have been at last discovered, and the whole continent mapped largely by missionaries. Livingstone

[39] 1869, pp. 76-80.
[40] Pp. 13-15.

alone traveled 29,000 miles in its interior and added one million square miles, or one-twelfth of its area, to the known regions of the globe. Even Speke, who discovered the great lakes, Tanganyika and Victoria, said: "The missionaries were the prime and first promoters of that expedition." The Victoria Falls on the Zambesi, the greatest in the world, far exceeding our own Niagara, were first seen by Livingstone of all civilized men, and Mounts Kilimanjaro and Kenia, worthy rivals of Mont Blanc, were first discovered by Krapf and Rebman.

Moreover, wherever missionary geographers went, they naturally described the people and the flora and fauna of the land, thus making important contributions to natural history, to comparative anatomy, to the industrial resources of the world, and, in one way or another, to nearly every science. Thus, to name only a few notable examples, we owe to missionaries the introduction in the West of sorghum, of African rubber, and of the silkworm,[41] at present of such enormous commercial value. The jinrikisha was devised by Jonathan Goble, and the strange discovery of that before practically unknown animal, the gorilla, was due to a missionary.

In 1847 the great comparative anatomist, Richard Owen, for the first time gave a scientific description of the gorilla. It was based upon a skull sent from Africa by Dr. Savage, a missionary, and Professor Owen named it after him

[41] Ely Volume, p. 143.

(Troglodytes, or Gorilla Savagei). A year earlier Dr. Leighton Wilson, another missionary,[42] had sent a skull to the Boston Society of Natural History, and still later the complete skeleton of a gorilla, now in the Academy of Natural Sciences of Philadelphia, was obtained from Dr. Nassau.

Robinson and Smith's Researches in Palestine, Mt. Sinai, and Arabia Petræa, and Thomson's The Land and the Book are well known to every one. They completely revolutionized the former ideas of the geography of Palestine; and the more modern Palestine explorations both by the British and the American societies owe a large debt to missionary labors.

The *Princeton Review*[43] says: "Our missionaries have rendered more real service to geography than all the geographical societies of the world."

Mr. G. M. Powell, of the Oriental Topographical Corps, in a paper read before the American Institute, says:[44] "Probably no source of knowledge in this department has been so vast, varied, and prolific as the investigations and contributions of missionaries. They have patiently collected and truthfully transmitted much exact and valuable geographical knowledge, and all without money and without price, though it would have cost millions to secure it in any other way."[45]

[42] Whitney: Oriental and Linguistic Studies, Second Series, p. 101.

[43] Vol. xxxviii. p. 622.

[44] *Missionary Herald,* 1875, p. 120.

[45] Ely Volume, pp. 3-5.

DIPLOMACY

The intimate acquaintance of the missionaries with the habits, modes of thought of the people, and their languages has made them very frequently of great value, especially to British and American diplomatists, as is frequently noted by Hon. John W. Foster, lately American secretary of state, in his American Diplomacy in the Orient:

"The well-known English missionary and Chinese interpreter, Dr. Robert Morrison, was the chief interpreter of the Amherst Embassy in 1816, and he acted as the official interpreter and trusted adviser of the British Government and the East India Company at Canton for twenty-five years. During the Opium War, and in the peace negotiations, Dr. Gutzlaff, the German missionary and historian, was in the employ of the British Government, as interpreter and adviser, and was most useful in the negotiations. He was also of service to the government of the United States in a similar capacity. . . . When Mr. Roberts was sent by the American Government to negotiate treaties with Siam and other oriental countries, he first went to Canton and there engaged the services as interpreter of Mr. J. R. Morrison, the son of Dr. Morrison. . . .

"These instances are cited to show what an important part the missionaries have borne in the international relations of the Pacific. The instances might be multiplied, and a detailed examination of these relations will disclose that up to the middle of the last century the Christian missionaries were an absolute necessity to diplomatic intercourse." [46]. . .

"Minister Denby, who, from his long official residence in China, was the most competent judge, in a despatch to the Department of State, said of the missionaries, 'that their influence is beneficial to the natives; that the arts and sciences and civilization are greatly spread by their efforts; that many useful Western books are translated by them into Chinese; and that they are the leaders in all charitable work. . . . In the interest, therefore, of civilization, missionaries ought not only to be tolerated, but ought to receive protection';" [47] and again, "Believe nobody when he sneers at missionaries. The man is simply not posted on the work." [48]

Dr. Peter Parker and Rev. E. C. Bridgman, missionaries in China, were made the Chinese secretaries of Caleb Cushing's Embassy in 1844. Dr. Parker twice served as *chargé d'affaires* in China. He was made full commissioner to negotiate with the Chinese Government in 1856.

Rev. Dr. S. Wells Williams accompanied Commodore Perry in 1853 on his first visit to Japan as his chief interpreter. Hon. William B. Reed, our minister to China, later made him secretary of legation upon the promotion of Dr. Peter Parker. Dr. W. A. P. Martin, a Presbyterian missionary, also was one of Mr. Reed's most zealous assistants. Dr. Williams' Middle Kingdom and his Chinese

[46] American Diplomacy in the Orient, by John W. Foster, pp. 110, 111.

[47] Foster, loc. cit. p. 412.

[48] Liggins, p. 27.

Dictionary are enduring monuments of his linguistic attainments. For over twenty years he acted as secretary and often as *chargé d'affaires* of the American legation in China.

Hon. William B. Reed, our minister to China, with whom Dr. Williams had served, says of him: "He is the most learned man in his varied information I have ever met. . . . He is the most habitually religious man I have ever seen." [49]

To this Minister Reed elsewhere adds: "I went to the East with no enthusiasm as to missionary enterprise. I came back with the fixed conviction that missionaries are the great agents of civilization. I could not have advanced one step in the discharge of my duties, could not have read or written or understood one word of correspondence on treaty stipulations, but for the missionaries." [50]

The diplomatic services of Dr. Judson are too well known to be described, and the present British ambassador to the United States, Sir Mortimer Durand, has lately given him full credit.

But time fails me even to sketch in barest outline the manifold services of missionaries to geology, meteorology, anthropology, ethnography, folk-lore, numismatics, music, history, and many philanthropic agencies for the betterment of mankind. For these I must refer you to the copious literature of missions, and especially to the Ely Volume on Missions and Science, edited by Rev. Thomas Laurie, D.D.; The Great Value and Suc-

[49] Foster, pp. 273-4.

[50] The Envelope Series, April, 1905, p. 21.

cess of Foreign Missions, by Rev. John Liggins; Are Foreign Missions Doing any Good? (London, 1894); and to Christian Missions and Social Progress, by Rev. Dr. James S. Dennis, and the same author's Centennial Survey of Foreign Missions.

To give a general idea, however, of the wide scope of the missionary contribution to science, I asked my friend, Rev. Frank S. Dobbins,[51] to go over the Royal Society's catalogue of scientific papers, Silliman's Journal, and other scientific periodicals, the Journal and Proceedings of the Royal Geographical Society and the various Asiatic societies, in order to discover with some approach to completeness to what an extent the missionaries had distinctly contributed to scientific literature as such.

To these statistics are to be added a considerable number of papers unavoidably overlooked in such a rapid search, and the numerous papers of a scientific character in the *Missionary Herald,* which Carl Ritter, "the prince of geographers," says, "is the repository to which the reader must look to find the most valuable documents that have ever been sent over by any society, and where a rich store of scientific, historical, and antiquarian details may be seen." [52]

[51] Throughout the preparation of this paper I have had the hearty and most intelligent assistance of Mr. Dobbins. I also wish to acknowledge the valuable coöperation of Miss M. E. Emerson, the reference librarian of the Providence Public Library, and of Mr. Herbert Putnam, the accomplished librarian of the Library of Congress.

[52] Ely Volume, p. 3.

Mr. Dobbins has found 520 scientific papers, of which

108 concern geography,
89 geology,
56 botany,
48 philology,
44 sociology,
18 numismatology,
18 comparative religion,
19 archæology,
10 meteorology,

and the remaining 110 have to deal with almost every other branch of science.

Of 130 separate articles in the first volume of the Asiatic Society Journal (North China branch), 52 are by Protestant missionaries, and out of the 2,936 pages in the first six volumes of the Journal of the American Oriental Society, 1,215, almost one half, are by missionaries.

Morever, when the Council of the Asiatic Society (North China branch) seeks for scientific information by circular letters of inquiry on such subjects as "Inland Communications in China," "Coins, Measures, and Weights," "Tenure of Land," "Infanticide," etc., they always send letters to the missionaries, and the replies from missionaries frequently outweigh both in number and importance those received from others.

The extent to which the labors of the missionaries, both evangelistic, scientific, and sociological, have been recognized by officials, scientists and travelers, as I have investigated the subject, has been a matter of gratification and surprise. I cannot possibly take the time to quote more than a very few of the most important. Even of their names, I can mention but a few, but these few are of weight since they represent a *non-missionary constituency* who as a rule at least would not be prejudiced in favor of missions, including as it does (see Bibliography, p. 87):

Scientists, like Charles Darwin (1), Alfred Russell Wallace (2), Benjamin Silliman (3), Louis Agassiz (4), Lewis H. Morgan (5), Prof. J. D. Dana (6);

Officers of the Army and Navy, such as General Sir Herbert B. Edwards (7), Admiral Wilkes (8), Admiral Belknap (9), Captain Younghusband (10), Major MacDonald (11), Captain Manning (12);

Travelers, such as Mrs. Isabella Bird Bishop (13), Miss Gordon Cumming (14), William E. Curtis (15), and Hon. Richard H. Dana (16);

Viceroys of India, such as Lord Northbrook (17), Lord Lawrence (18), and Lord Dufferin (19);

Lieutenant-Governors of various Indian Provinces, such as Lord Napier and Ettick (20), Sir Augustus Thompson (21), Sir William Muir (22), Sir Bartle Frere (23), Sir Charles Elliott (24), Sir Charles Aitchison (25), Sir Richard Temple (26), and Sir William W. Hunter (27), two of the greatest of many great Anglo-Indian administrators;

Ambassadors and Ministers in the Diplomatic Service, such as George P. Marsh (28), General Lew Wallace (29), E. F. Noyes (30), S. G. W.

Benjamin (31), D. B. Sickles (32), Lord Stratford de Redcliffe (33), Col. Alfred E. Buck (34), Hon. William B. Reed (35), Sir Philip Currie (36), Col. Charles Denby (37), John W. Foster (38), Sir Ernest Satow (39), Edward H. Conger (40), Sir Mortimer Durand (41), and James B. Angell (42);

Statesmen, such as Lord Palmerston (43), Hon. James Bryce (44), the Marquis of Salisbury (45), Count Okuma (46), and President McKinley (47);

Philologists, such as Max Müller (48), Robert N. Cust (49), and W. D. Whitney (50);

Explorers, such as Elisha Kent Kane (51), and Sir Henry M. Stanley (52);

Writers, such as Robert Louis Stevenson (53), Julian Hawthorne (54), Sir Edwin Arnold (55), and William T. Stead (56);

And, finally, *Representatives of the Nations to Whom Missionaries are Sent,* such as the Chinese Commissioners only lately in New York, who said: "We take pleasure this evening in bearing testimony to the part taken by American Missionaries in promoting the progress of the Chinese people. They have borne the light of Western civilization into every nook and corner of the empire. They have rendered inestimable service to China by the laborious task of translating into the Chinese language religious and scientific works of the West. They help us to bring happiness and comfort to the poor and the suffering by the establishment of hospitals and schools. The awakening of China, which now seems to be at hand, may be traced in no small measure to the hand of the missionary.

For this service you will find China not ungrateful" (57).

Such is the story of nearly a century of missionary effort. Is it not a cheering report of wonderful progress? Karen and Telegu, Shan and Indian, Chinese and Burman, African and Terra del Fuegian, all are bowing the knee in loving adoration of the Lord Christ, and all advancing in civilization, in social progress, in the arts and comforts of life, in freedom from disease, in happiness and in purity of living.

May the time soon come when all the nations of the earth may join with us in the stately chorus, "Hallelujah! Hallelujah! For the Lord God Omnipotent Reigneth!"

NOTES

Note 1. In his preface to the History of the English People, which is undoubtedly the best English history of the century, John Richard Green says: "If some of the conventional figures of military and political history occupy in my pages less than the space usually given to them, it is because I have had to find a place for figures little heeded in common history, the figures of the *missionary*, the poet, the printer, the merchant and the philosopher."

Note 2. "In 1822 the Chief Justice, Honorable E. Fitzgerald, stated that while in ten years the population had *increased* from 4,000 to 16,000 the number of criminal cases . . . had *fallen* from forty to six, and that of the six not one was from any of the villages under a missionary or a schoolmaster." (Are Foreign Missions Doing any Good? p. 45.)

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CHARLES DARWIN AS A MODEL STUDENT OF NATURE[1]

Fifty years ago next September—for Commencement was still held in September in those medieval days—my class graduated from Brown University. I well remember my own attitude at the commencement in 1855, (the first I ever attended,) towards the semi-centenarians who had graduated in 1805—men whose birth almost reached back to the Revolution itself. I considered that they were taking up room and using up oxygen that belonged to us young fellows, and that they ought to hurry up, or rather hurry down, into the hospitable graves that were yawning for them. Yet Theron Metcalf of this very class of 1805, who was born only three years after Yorktown, actually had the audacity to live till 1875—two years after I had been deemed mature enough to become a member of the Corporation and his colleague! I have no doubt that the freshmen of to-day look upon us of '59 as almost the contemporaries of the ichthyosaurus, but I can assure them that that is absolutely a fish story.

But in truth we must recognize the fact that our lives are fast ebbing away and that though the

[1] An after-dinner address on Commencement Day at Brown University, June 16, 1909, when the class of 1859 celebrated our semi-centenary. Reprinted for the *Brown Alumni Monthly* for July 1909 by the kind permission of the Editor.

average human life is far longer that it was fifty years ago, we cannot expect an indefinite prolongation of existence. You remember the story told by Baron Rothschild—the founder of the house—whose physician was called to see him when he fell ill at 90 years of age. He assured the doctor that he could not survive. "Not a bit of it, Herr Baron," was the cheerful reply, "You'll live to be 100." "No, no," replied the veteran banker, I suspect with a twinkle in his eye, "do you suppose that when the Lord can get me at 90 he's going to wait till I go to par?"

But old as we unquestionably are, we still remember our college days with enthusiasm and have eagerly watched the growth of the University in numbers and in power. In 1859 the faculty numbered only 10 and the students 225; now they number 112 and 993 respectively.[2] The courses of instruction were few in number compared with the wealth of choice now provided. But the very meagerness of the number made our instruction more individual and, perhaps, more lasting, and our memories are still stocked with the facts learned in the classrooms of Lincoln and Harkness, Gammell and Chace, and their peers. We would even be willing, if it be not made too minute, to be quizzed offhand on the topography of Athens. I hope we would not find ourselves in the position of the lady who, after hearing a lecture on the Parthenon, enthusiastically thanked the speaker, adding "I am so much obliged to you for settling one ques-

[2] In 1922 they number respectively 90 and 3,149 besides the Administrative officers.

tion that has long perplexed me—whether the Parthenon was on the Acropolis or the Acropolis on the Parthenon."

That the Providence girls of 50 years ago were the sweetest, best and prettiest mortal man ever saw is indisputable—the class of 1909 to the contrary notwithstanding. How well I recall the skating parties, the sailing parties, when the propitious breezes often becalmed our boat and Cupid bestirred our hearts, the combined search for the stealthy fragrant arbutus and the brighter-hued laurel, and the occasional mildly extravagant drives into the surrounding country. On one of these I saw a wayside sign—but memory after over a half century is often a sad traitor and it may be that I only heard of it—with the legend "Coffins made and *repaired.*" Whether this was grim humor to attract custom or an exaggerated instance of New England thrift intended to establish the custom of bequeathing so inevitable a final luxury along with the family plate and jewels I know not. But the bizarre idea long lingered in my mind until finally I beheld its realization in the museum at Constantinople. A sacrilegious wretch named Tabnit had opened an old sarcophagus, had incontinently tossed out the remains of his predecessor and provided that his own should be replaced in this second-hand coffin. He had not even directed the inscription recording the virtues of his predecessor to be erased, but his own name was inscribed below the first with the added caution, "Do not open this sarcophagus as you will find nothing valuable in it." Suspecting, however, that one who thus besmirched his own bones would also lie, later explorers lifted the lid and found many jewels and much other pelf.

That Annus Mirabilis—1859—was remarkable for two things. (1) We graduated and (2) the "Origin of Species" was published. You may smile but I assure you that there is a subtle connection between the two events which does not appear on the surface. The struggle for existence and the survival of the fittest were two doctrines which occupy many pages in that memorable book. See now the final irrefutable proof of the truth of these doctrines after half a century! We have struggled to exist and lo! here we are! The fittest have survived! Naturally then we are all enthusiastic Darwinians.

But badinage aside, the past half-century has seen a wonderful thing. One book, scarcely larger than an ordinary novel, has changed the mental attitude of the whole race, not only in science, but practically in almost every realm of human thought. On its appearance it was greeted with scorn, vehement invective, fierce criticism and even with the thunder of ecclesiastical anathemas. Only those who lived, say from 1860 to 1875, can ever realize the extent and the violence of the controversy on the platform, in the pulpit, at the dinner-table—everywhere. Yet behold a miracle! After fifty years, though there are still a few feeble vioces raised from time to time in protest and dissent, its doctrines are now the common truths of practically all thoughtful and intelligent men and the semi-centenary of its publication has been made the occasion of scores of celebrations in Europe and America—a tribute to the work and genius of one man which has no parallel in scientific annals. The addresses so far as I have read them have traced the influence of Darwin upon various phases of human knowledge and human thought, but few, if any of them, have pointed to him as a model student of nature.[3]

I propose, therefore, to ask you to look very briefly at this aspect of Darwin's life and to appreciate the lessons we may learn from it.

1. The first feature of his character was his infinite pains in collecting and verifying an immense mass of facts. No one can read the "Origin" without being deeply impressed with this. Portfolio after portfolio, 30 to 40 he says, of data on the many subjects he was investigating were his capital in trade—a "huge pile of notes," as he well calls those relating only to the "Transmutation of Species." "I worked," he says "on true Baconian principles and without any theory"—observe these words "without any theory"—"collected facts on a wholesale scale . . . by printed enquiries, by conversation . . . and by extensive reading. . . . I have bought many books and at their ends I made an index of the facts that concern my work, or, if the book is not my own, wrote out a separate abstract, and of such abstracts I have a larger drawer full."

He was fortunate in inheriting means suffi-

[3] A strange phenomenon has occurred in the last 2 or 3 years—a recurrence of this bitter controversy. But like the earlier one it will assuredly fail.

cient for his personal and scientific needs, but *per contra* he lost years of his laborious life from ill health. His persistent industry in spite of almost constant daily suffering for 40 years may well amaze us all.

2. He was never content only to read, to inquire or even only to observe, but when possible always put everything to the test of experiment. Hence the constantly recurring experiments in plants, the evidence from breeders of animals, of pigeons, and other birds in which the experimental method could be used. No scientist should ever accept any new statement without thus verifying it by experiment if that is possible. In the last half-century the experimental method has done more to forward science and to make it exact than all the speculations since the days of Aristotle.

3. Darwin's was an "open mind." While always challenging alleged new facts and requiring the most conclusive evidence of observation and experiment before accepting them, yet, even though they controverted his previous opinions and apparently well-established theories, he was not hostile to them because they were new. They must win a sure victory over former notions, but he would see that they had fair play.

I do not know any better illustration of this influence of scientific study on the minds of savants in general than our former and our present notions as to the constitution of matter.

The twentieth century has opened most auspiciously with a great and fundamental discovery—that of radio-activity. For the first time also in the history of science a woman—Madame Curie—has been foremost in the work. This discovery has thrown into confusion our fundamental concepts as to matter and the more we know, the more are we puzzled. The idea that there may be only one primordial substance has recently received a notable impulse in the apparent conversion of radium into helium and by the still later observations which seem to show that other substances have been transmuted into carbon so that the chemists and physicists seem to have discovered at least a fragment of the Philosopher's Stone.

This openness of mind, this willingness to give up a cherished theory should be one of the chief virtues of scientific men. Of course there are always conservatives "dyed in the wool" who reject every new idea simply because it is new. But the great bulk of savants may be said always to append to their statements of facts other than self-evident propositions a large interrogation mark, enclosed though it be in a bracket. That is to say there is no postulate so firmly established but that it may be modified or overturned by later discoveries. "By doubt they are established," says Huxley, "and open inquiry is their bosom friend." Honest doubts once solved are the foundation-stones of robust faith. Experiment then. Take nothing on faith, except, of course, in the higher realms of thought. Love knows no "instruments of precision." Test everything else by the balance and the yard stick!

4. This openness of mind was especially shown by Darwin by his mental attitude towards his own

theories. Most of us are quite content for other fellows' ideas to be upset, but few like Darwin welcome criticism of our own ideas or are willing that our own intellectual children shall be declared other than the smartest and best-looking. "Darwin," says Huxley, "may be trusted always to state the case against himself as strongly as possible." Listen to what he himself says: "During many years I had followed a golden rule, namely, that whenever a published fact, a new observation or thought came across me, which was opposed to my general results, to make a memorandum of it without fail and at once; for I had found by experience that such facts and thoughts were far more apt to escape from the memory than favorable ones. Owing to this habit very few objections were raised against my views which I had not at least noticed and attempted to answer."

Well may he call this "a golden rule," too often, I fear, more honored in the breach than the observance. Well would it be if it were observed not only in science but in every other department of thought.

Moreover he not only noted these unfavorable observations for his own private consideration and reflection, but fearlessly published them. The "Origin" is full of such instances. Never have I known a man so fair in discussions, a man of so limpid and transparent a mind.

5. Having collected, arranged, and digested his facts, then came the brilliant generalizations, the statement of great principles. While minutely observant, he never limited his vision to the dative

case or the enclitic de. He saw not only the trees but the great forests. Reflecting upon his marshaled facts, seeking for the explanation of the often bewildering diversity of his observations, he was many times baffled, but never dismayed or discouraged. Who does not share his delight when he writes of one problem, "I can remember the very spot in the road whilst in my carriage when to my joy the solution occurred to me." Who of us who have been teachers—a title beyond all other titles—cannot remember how our nerves have been set a-tingle to the very finger-tips, when by some happy phrase or apt illustration suddenly flashing into our minds, we have been able to explain to our pupils, or even to ourselves, a difficult problem, or have discovered a new truth. The joy of the miser at discovering a hidden treasure of gold shrinks into utter insignificance beside such a delight.

But these generalizations were never formulated in haste. Though flashes of deep insight sometimes came to him early, he waited and waited, patiently accumulating more evidence, and constantly reflecting, till he felt sure of his ground and then he published. Even after he believed he had really discovered the method by which new species were formed, he says, "I was so anxious to avoid prejudice that I determined for some time not to write even the briefest sketch of it." The first brief sketch of 35 pages was not written till after four more busy thoughtful years had passed! The "Origin" was not printed till 22 years after his first note-book was opened and till he had written two condensed sketches and a third bulky work, of which the "Origin" as published was a condensation—and all this laboriously written out by hand. The "Descent of Man" was the result of 24 years of labor; the "Expression of the Emotions" of 33 years, and the work on "Earthworms" of more than 40 years of thought. Were everyone as patient and self-restrained, I warrant that yonder John Hay Memorial Library would suffice for scores of years longer than we now anticipate.

6. One more trait in Darwin, unhappily not common among scientists, was his deliberate decision not to engage in controversy. Like Gamaliel, he believed that "if this work be of men it will come to naught, but if it be of God [that is to say of the truth,] ye cannot overthrow it." Time has vindicated his wisdom and his work, and his beautiful character is not besmirched by controversy, and the heated and unwise words which controversy begets.

7. One serious warning he gives us. "Up to the age of 30 or beyond it, poetry of many kinds, such as the works of Milton, Gray, Byron, Wordsworth, Coleridge and Shelley, gave me great pleasure and even as a schoolboy, I took intense delight in Shakespeare." The same was true of pictures and of music. "But now," he goes on, "for many years, I cannot endure to read a line of poetry; I have tried lately Shakespeare and found it so intolerably dull that to read it nauseated me" and he had almost lost his taste for pictures and music. Well may he call this a "curious and lamentable loss of the higher æsthetic tastes," and say, "If I had to live my life again I would have made it a rule to read some

poetry and listen to some music at least once every week."

Looking back on the brief sketch I have drawn, how impressive is the noble character of this scientific giant. Humbly may we walk in his footsteps and copy his splendid example!

Mr. Bryan and many others, especially the so-called "Fundamentalists" confuse Evolution with Darwinism. They believe them to be identical. On the contrary, Evolution long antedated Darwinism. I cannot state the distinction between them better than in the words of Prof. James H. Robinson (Science, July 28, 1922, p. 95) as follows:

"Recently a serious misunderstanding has resulted from the report that men of science are giving up 'Darwinism,' that 'Darwinism is dead.' This has puzzled those who supposed that Evolution was a well substantiated assumption, and has filled with a somewhat malicious joy those who have always denounced the notion as wicked and opposed to Scripture.

"But to the biologist, Darwinism does not mean the theory of man's animal descent, which was formulated long before the publication of the 'Origin of Species,' but is confined to the ingenious theories which Darwin so patiently worked out to account for the facts of Evolution. The statement that Darwinism is dead does not mean that the evidence for the evolutionary hypothesis has in any way been weakened so that any really competent man of science doubts our animal derivation. It only means Darwin's explanations of how one species may have been derived from another, has proved, as a result of increasing knowledge, to be mistaken or wholly inadequate."

Or again in the words of Prof. H. E. Walter, of Brown, "as the analysis of the living world gradually came to shift from species to individuals it was shown that individuals may be regarded as simply aggregates of *unit characters* which may combine so variously that it becomes more and more difficult to maintain constant barriers of any kind between the groups of individuals arbitrarily called 'species.' " [1922]

"AN IMPOSSIBLE WAR" [1]

The Chairman and other Speakers have all very naturally and very rightly referred to the captivating idea that we should celebrate the completion of 100 years of Peace between Great Britain and America. But there is an earlier instance of the splendid magnanimity of Great Britain to which no one has alluded to-night and to which scant justice has been done by any one in the past. In 1876, we celebrated 100 years of our national independence by an extensive and most successful Universal Exposition in which all nations joined. Each nation erected a building to house its Commissioners. Among the foremost in the extent and value of its exhibits and the importance of its official building was Great Britain. Without British aid the Exhibition would have been shorn of most of its luster. At the close of the Exhibition this "British Building" was presented to the City of Philadelphia. It still stands in full view from the Belmont Drive in Fairmount Park, a mute but eloquent witness to the magnanimity of a great nation.

To assist not grudgingly but heartily in making

[1] Address at the Banquet to the Foreign Delegates (British and Belgian) to Arrange for the Celebration of the 100th Anniversary of Peace between Great Britain and America in 1914-1915, at Philadelphia, May 13th, 1913.

such a celebration by another nation a great success is an incident unique in history.

Recall the startling facts: We were celebrating a war which began at Bunker Hill and was ended by the surrender of Cornwallis at Yorktown; we were the victors and the British were the vanquished; at the end of a century they joined with us in celebrating our victory and their defeat. I challenge you to find a parallel event in the world's international relations.

A war with a nation so magnanimous as to celebrate in 1876 their own defeat and to treat us not as foreigners, but as trans-Atlantic brethren ought to be and *is* "An Impossible War."

Think, gentlemen of the British Delegation, of the great gifts you have bestowed upon us!—Chaucer and Bacon, Shakespeare and Milton, Hampden and Burke, Jenner and Lister! How many memories cluster around each name! Recall too what we in turn have given to you—Washington and Lincoln; Longfellow and Emerson, Henry C. Lea and Horace Howard Furness; and the blessed sleep of Ether!

It is not unbecoming in me on this occasion to vaunt my own profession. The three boons, vaccination, anesthesia, and antisepsis—an ever blessed Trinity of Benedictions, and all three, thank God! sprung from Anglo-Saxon loins—have already done more to mitigate suffering, prolong life and promote human happiness than all the warriors, from Genghis Khan to Napoleon, have done to produce suffering, destroy human life and make the earth a desert.

Your Civil Liberty and orderly processes of Law, gentlemen, have found a congenial soil in America, and we have even bettered your Religious Liberty by totally severing all relations between Church and State.

I repeat then my assertion that a war between two such kindred nations is impossible—unthinkable. It would be a crime against Humanity!

I have spoken of the actions of Great Britain in 1876 as an unparallelled instance of magnanimity. But it is to remain without a fellow for only a few weeks.

Six weeks from now on the field of Gettysburg, hallowed by the blood of heroes and by Lincoln's immortal address, the soldiers of the Blue and the Gray—all who after 50 years are still living and still active—will meet again. There, on the very spot where they did their utmost to slay each other a half century ago, with clasped hands will they bow their heads over the graves of their brave comrades and breathe a prayer of thanksgiving for Peace! Show me if you can another such meeting on any other battlefield!

But, while there never has been such an one before, permit me to express the fervent hope that there *may* be yet another.

A few days ago, as President of the American Philosophical Society, I signed a remarkable address. Its signers consist of the Presidents of fifty-five Scientific, Educational, and Philanthropic Institutions in the United States. The address is beautifully engrossed on vellum and is to be presented to the German Emperor on June 15th,

1913. It extends to His Imperial Majesty our collective congratulations upon the fact that on that day he completes a reign of 25 years and especially that it has been a reign of unbroken Peace.

I cast a forward glance and in the near future —only eight years away—I see the year 1921 exactly half a century after 1871! What a glorious augury it would be for the Peace of the world—for the Golden Age that is sometime sure to come!—if France and Germany could then again meet on the field of Sedan, not in armed conflict, but to celebrate a Liberté, Egalité, et Fraternité which should never again disappear from the earth.[2]

Then would we be able to sing not "Peace hath her Victories no less renowned than those of War," but "Peace hath her Victories *far more* renowned than those of War!"

Since the above was written the Great War has ratified and emphasized the sentiments I here expressed. *The great hope of the world lies in the amity, coöperation and solidarity of all the English speaking peoples.*

Those who would make trouble between us I regard as enemies of the Human Race. Especially those, who, in responsible public office, in Congress and elsewhere endeavor to divide us into hostile camps.—[October, 1922.]

[2] What a comment on this hope is the fact recently disclosed by the chief of staff of the Austrian army, that he and Von Moltke chief of staff of the German army planned in 1909 that the next war should be launched by Austria in 1914!

THE EARLY YEARS OF BROWN UNIVERSITY
1764–1770 [1]

Infancy always appeals to us. The confiding helplessness of a young life arouses our chivalry. The many and constant perils besetting especially its early years excite our sympathy. The splendid possibilities enwrapped in it kindle our imagination. If we live long enough to see its weakness change to strength; its abilities develop; its character unfold, and its influence grow so that it becomes a power in the land, well may we rejoice over the strong man that he is, and review with absorbing interest the early days of the child that he was.

[1]Address delivered in the Baptist Church at Warren, October 13, 1914, as a part of the celebration of the Sesqui-Centenary of Brown University. Reprinted by the kind permission of the University.

Rhode Island College was incorporated in 1764, and located at Warren. The Baptist Church in Warren, of which James Manning, the first President of the college, was also minister, was founded at the same time. The College was removed to Providence in 1770. In 1804 the name was changed to Brown University.

In my references I have often quoted Mr. Guild's volumes because they are widely accessible, instead of the University archives, which can only be consulted in Providence. Mr. Guild's *Brown University and Manning* must not be confounded with his *Manning and Brown University.*

This is my pleasant task to-day—to recount the history of the first six years in the life of Brown University.[2a]

It is peculiarly congenial to me, for in 1762 the "first mover" in the enterprise, as he rightly calls himself, was Morgan Edwards, the pastor of my own church, the First Baptist Church of Philadelphia. The first student of the University, William Rogers, became pastor of my own church, and married my grandparents in 1788. In 1790 Thomas Ustick, of the third class (1771), while our pastor, baptized my grandfather. Henry Holcombe, of the class of 1800 (hon.), while pastor of our church, married my parents in 1823. William T. Brantly, of the class of 1831 (hon.), another pastor of our church, baptized my parents in that same year. George Dana Boardman, of the class of 1852, and George Hooper Ferris, of the class of 1891, have been my pastors and warm personal friends.

In Brown University I obtained my own education and inspiration, for which I owe a debt of gratitude that I can never repay. Up College Hill fifty-five years ago proudly marched my classmates and I singing our "Song of Degrees." Forty-one years ago I was honored by an election

[2a] When I was preparing this address Professor Bronson's *History of Brown University* had not been published, but by his kindness I saw and profited greatly by the manuscript of the early part relating to the history of the University while in Warren. Since the celebration I have had the great pleasure of reading the entire book since published, and have added a few footnotes referring to his text.

to the Corporation of the University. Since then I have taken part in the election of one hundred members of the Corporation, including all (forty-six) of the present members of the Corporation, excepting myself and one other, and fifty-four others who have all passed away save one, who resigned. I have known all its presidents save the first three. Is it any wonder that I feel so deeply an hereditary and personal interest in this ancient University?

In view of the fact that Professor Bronson's new History of the University deals at length with the Charter, the removal to Providence, and other questions which aroused much controversy in their day, and as our distinguished alumnus, Mr. Justice Hughes, is to give the principal Historical Address, I shall only make allusions to these other well-known historical events. My chief endeavor will be to set forth the local conditions, manners, and customs existing in Warren and Providence from the beginning of the University, including 1770 the date of the second commencement. I include this second commencement, although it was held in Providence, because practically all the work of that class was done in Warren.

I must disarm criticism, and especially from a Warren audience, by disclaiming in advance any desire to expose and emphasize the faults and foibles of our predecessors. But conditions one hundred and fifty years ago were very different from those of to-day, and they are a necessary frame for the picture. I have drawn a similar picture in the Bicentenary History of my own

Philadelphia church [2b] without offense, and I feel sure that here, too, I shall find the same friendly forbearance. The failings which I mention were the faults of the times. The individuals were only a few examples out of many. I have ventured to introduce an occasional touch of humor to lighten what would otherwise be a dull recital of mere historical facts.

The nascent years of the University were filled with the increasing mutterings of political discontent which soon found expression in the Revolutionary War, and each recurring semi-centenary, strange to say, has been similarly marked by war. Our first, in 1814, occurred before the end of the War of 1812; in 1864, our full century arrived during the bloody crisis of the Civil War. In both these emergencies Brown loyally bore its part. In 1914, at our third half-century, peace in Mexico is still trembling in the balance, and war has "raised its horrid front" in Europe in more terrible form than ever before in history. Thank God that the healing wounds of my own guild are for the saving of human lives and not for their destruction.

Chronologically Brown ranks the seventh of the nine colleges established prior to the Revolution, viz.:

1. Harvard University	1636	Congregational
2. College of William and Mary	1692	Episcopalian

[2b] *Vide, e. g., Letters of John Gano and Others*, pp. 34, 58, 62, 66; *Manners and Customs*, pp. 149, 180, in the *Bicentenary History of the First Baptist Church of Philadelphia*, 1898, edited by W. W. Keen.

3. Yale University	1701	Congregational
4. University of Pennsylvania	1740	Episcopalian
5. Princeton University	1746	Presbyterian
6. Columbia University	1754	Episcopalian
7. Brown University	1764	Chiefly Baptist
8. Rutgers College	1766	Dutch Reformed
9. Dartmouth College	1769 [3]	Episcopalian

Morgan Edwards, pastor of the First Baptist Church of Philadelphia, the "first mover" in the matter, was born in Wales in 1722. He was "bred a Churchman," but became a Baptist in 1738. He reached Philadelphia May 23, 1761.[4] He was one of those men whose arrival anywhere meant that the "wheels began to go round," and things began to be done. In our own church he started the "Minute Book" in his copperplate handwriting; and also our "Marriage Book," which contains a complete record of all the marriages by our ministers for one hundred and fifty-three years.[5] He was very influential in the Philadelphia Baptist Association and other church activities. When moderator of the Association he was not only the first to propose, in 1762, the founding of a college, but later was active in obtaining the charter; procured more funds for the college when it sorely needed them than any one else; served on the original Board of Fellows for twenty-five years; and preached at the first commencement (1769). He

[3] The Seal of Dartmouth is dated 1770.

[4] *Vide* his Autobiography, in his *Materials for a History of the Baptists in Pennsylvania,* 1770, vol. i, pp. 47-49.

[5] For these and other details, see my *Bicentenary History of the First Baptist Church.*

published "Materials towards a History of the American Baptists," [6] four volumes of a series of twelve, which he projected but never completed.

Most fitting is it, therefore, that our Philadelphia alumni will honor his name by establishing the "Morgan Edwards Fellowship" by a gift of over $10,000 on this the one hundred and fiftieth anniversary of the University which owes its birth to him.

Like all the early American colleges, Brown arose especially from the need and the desire for an educated ministry. In England, out of two hundred Baptist ministers only thirty or forty could read the Greek Testament, and only seven or eight in all America were liberally educated.[7] Among those were Morgan Edwards and James Manning. The mass of the Baptists were indifferent or hostile to ministerial education. "The Baptists of the Philadelphia Association had long since taken the lead in all that pertained to the elevation of the character and dignity of the denomination, and their influence had been profoundly felt in New England and the South." [8] As early as 1722 Rev. Abel Morgan, in that Association, was the leader in a movement for an academy—a proposal that

[6] Vol. i, Philadelphia, 1770; vol. ii, Philadelphia, 1792; vol. iii, "Delaware," in the *Pennsylvania Magazine of History and Biography;* vol. ix, pp. 45 and 197, reprinted also by Lippincott & Co., Philadelphia, 1885; vol. iv, "Rhode Island," in the *Collections of the Rhode Island Historical Society;* vol. vi.

[7] Sears, *Centennial Discourse,* 1864, p. 8.

[8] Newman, *History of Baptist Churches in the United States,* p. 380.

failed owing to Morgan's death. In 1756 the Association founded the academy at Hopewell, New Jersey. James Manning, Hezekiah Smith, Samuel Stillman, Samuel Jones, and John Gano, all so actively indentified with the founding of Brown; David Howell, the second professor at Brown; and Charles Thompson and William Williams, of the first graduating class were all educated at Hopewell Academy.

In 1762 there were but sixty Baptist churches and only five thousand members in all the colonies. In 1770, in Rhode Island, the books used in the schools were the Bible, the spelling book, and the primer. "When one had learned to read, write, and do a sum in the rule of three he was fit for business."[9] So vague and naïve was the knowledge of geography that Rhode Island was once described as located "in the West Indies in America."[10] The minister especially needed to be educated, for he was by far the foremost man in the community, the doctor and the lawyer, his near neighbors, yielding him the pas.[11]

The meticulous exactness of theological *belief* which was then deemed a test of orthodoxy is shown, for example, in a circular letter preserved among

[9] Reminiscences of Samuel Thurber, in Staples's *Annals of Providence*, pp. 600-607.

[10] Tolman, "History of Higher Education in Rhode Island," in *United States Bureau of Education, Circular No.* 1 1893, p. 24.

[11] For a graphic account of the minister, see McMaster, *History of the People of the United States*, vol. i, pp. 31 *seqq.*

the archives of the First Baptist Church in Philadelphia, which begins thus:

"The Church of Christ meeting in Upperfreehold, in the County of Monmouth, New Jersey. Holding Eternal Election, particular Redemption Irresistable grace in Effectual Calling, and final perseverance in grace, (also the Baptism of professing Believers only, by immersion only,)" etc. It is curious that "the baptism of professing believers only" and the method "by immersion only" seem, by their parenthetical position, to be quite subordinate to the other theological dogmas announced in this paragraph.[12]

On the other hand, orthodox *conduct* was less common. Tustin[13] notes the painful fact that in the first eighty years of the life of the Warren church ten per cent of the whole membership had been permanently excluded! In the History of my own church (1698-1898) I also noted the large number of exclusions of both men and women for drunkenness, profanity, and immorality. In Warren, in 1769, to curb profanity and other evil practices, the town ordered two pillories, one of which at least was set up on the sidewalk, so that no one could miss seeing it and its occupant.[14]

Conditions were very primitive. In 1775 there were only thirty-seven newspapers in the whole

[12] Keen, *Bicentenary History,* p. 34.

[13] *Discourse at the Dedication of the New Church Edifice of the Baptist Church and Society, Warren,* by Josiah P. Tustin, Pastor, Providence, 1845, pp. 140, 141.

[14] Fessenden, *History of Warren, Rhode Island,* p. 89, in the Supplement to Tustin's *Discourse.*

country: fourteen in New England, four in New York, nine in Pennsylvania, leaving only ten for all the other colonies.[15] Women still rode on pillions. Letters were often sent by hand even after the post-office passed into Franklin's charge; they were "to be left at Mr. Westcott's," or "care of John Holmes at the Sign of George Washington," a tavern, for the recipient. It was so well known that the post-riders read the letters that, for a long time after the Revolution, letters were often written in cipher.[16]

When Morgan Edwards first proposed a college he was laughed at as a visionary, but after the college was actually started, the Philadelphia Association, in 1764, 1774, and 1782[17] warmly recommended it to the support of the Baptist churches. They appealed not only to Baptists, but "to all the friends of literature in every denomination."

Morever, the Association aided early Philadelphia students. In 1767 a Mrs. Hobbs left a legacy of £350 to the Association, and immediately the Association directed that £14 should be paid toward the education of Charles Thompson, of the class of 1769, the second pastor of the Warren church. Usually (1767, 1769, 1771, 1773) the grant was made on condition that the beneficiary give what seems now a frank, but unusual, bond "to return the money in case the Association should

[15] McMaster, *op. cit.*, vol. i, p. 27.

[16] McMaster, *op. cit.*, vol. i, p. 40.

[17] Gillette, *Minutes of the Philadelphia Baptist Association*, pp. 91, 135, and 181.

be disappointed in him!" In 1769 the sum of £14 was voted for Thomas Ustick, of the class of 1771, later pastor of my own church. The next year application was made by both Ustick and Vanhorn, but Vanhorn was preferred.

After carefully weighing the desirability of various colonies, especially South Carolina and Rhode Island, as a location for the proposed college, the latter was selected on account of the absolute liberty of conscience which obtained there, and of the large proportion of Baptists in the colony and in its government.

The charter was not obtained "In February, 1764," as is often stated. The General Assembly, it is true, met by adjournment in East Greenwich upon "the last Monday of February, 1764," but the charter passed the lower house on March 2, the upper house on March 3, 1764, and was ordered to be signed, sealed, and registered. The governor did not actually sign it until October 24, 1765.[18] Meantime, however, the Corporation met in Newport on September 5, 1764, and again on September 4, 1765. On this date (before the governor had actually signed the charter. What a robust faith our fathers had!) the President was elected, and a Faculty, consisting solely of the President, was chosen to guide the student body which had already existed for twenty-four hours in the person of William Rogers, a boy of fourteen years of age. The President was James Manning, who had graduated at Princeton three years before (1762), and was not yet twenty-seven years of age.

[18] *Charter of Brown University,* with Index, p. 12.

The fundamental liberality of the charter, which, though written in the middle of the eighteenth century, breathes the spirit of the twentieth, is shown by a number of its provisions: (1) By the inclusion of four denominations, instead of making the Corporation consist only of Baptists. The prescribing of the exact number allotted to each denomination was evidently intended not only to prevent the non-Baptists from ousting the Baptists, but also to prevent any effort of the Baptists to oust the non-Baptists, either of which might easily have been feared in that age of bitter sectarianism. The number of each denomination was approximately in proportion to their respective size; hence no Presbyterians and no Methodists were named for there were almost none of them in Rhode Island in 1764. (2) By what is quite as striking, the opening of the positions of all grades of teachers, with the sole exception of the President, to all denominations, and the absolute and total exclusion of any religious test. (3) By what, as professor Bronson has pointed out, is an especially marked peculiarity of Brown, the exclusion from the *courses of public instruction* of all teaching of "sectarian differences of opinion," and that "youth of all religious denominations" shall be on an equal footing in every respect. [19]

[19] This fundamental difference in the studies at Brown and at Yale (an excellent type of the early colleges) is well shown by the following extracts from Dexter's *Yale Biographies and Annals,* the reference to which was kindly furnished me by Dr. Anson Phelps Stokes. (See also his just published *Memorials of Eminent Yale Men.*) The study of Divinity,

Specific instances showing how Brown lived up to these fine promises in the Charter are most instructive. September 6, 1770, the Corporation voted "that the children of Jews may be admitted into this institution and entirely enjoy the freedom of their religion without any constraint or imposi-

of Hebrew, the "repeating of sermons" [let us hope that "repeating" indicates that the sermons were not their own] the reciting of Wolebius's and Ames's *Theology* and the shorter catechism, etc., show that the teaching of "sectarian differences of opinion," which was absolutely banished from the class-rooms at Brown, was then required at Yale—a condition long since abolished. The stress laid upon Hebrew, as well as Latin and Greek, may explain the fact that President Stiles at Yale once delivered an oration in Hebrew, Chaldaic, and Arabic (Sears, *loc. cit.*, p. 27). Undoubtedly it was a rather startling exhibition of learning. Whether it profited the audience Dr. Sears does not venture to state.

The following is the course of study at Yale in 1714, as given by Benjamin Lord:

"Books of the Languages and Sciences recited in my Day were Tully and Virgil, but without any notes: Burgersdicius and Ramus's Logick, also Heerebord's set Logic, &c.; Pierson's manuscript of Physicks, &c., I have no copy of. We recited the Greek Testament; knew not Homer, &c.; recited the Psalms in Hebrew: . . . We recited Ames' Medulla on Saturdays, and also his cases of Conscience sometimes; the two upper classes used to dispute syllogistically twice or thrice a week. . . . As for the Mathematicks, we recited and studied but little more than the rudiments of it, some of y^e plainest things in it." [This included surveying.] Dexter, *Yale Biographies and Annals,* vol. i, pp. 115, 116.

The course of study as copied from the [Yale] College Rules by a Freshman in November, 1726, is as follows:

"All undergraduates except freshmen, who shall Read english into Greek, shall Read some part of y^e old testament out of Hebrew into Greek In y^e morning, and shall turn some part tion whatever." In 1774 the Seventh Day Baptists were exempted from the law requiring attendance at Church on Sunday. The Quakers were also exempted from the law which prohibited the

of y^e new testament out of y^e english or lattin into y^e Greek att evening att y^e time of Recitation before they begin to Recite y^e original tongues.

"All undergraduates shall publickly Repeat sermons in y^e hall in their Course, and also batchellors, and be Constantly examined on sabbaths at evening prayer.

"All students shall after they have Done resciting Rhetorick and ethicks on fridays recite Wolebius' theology and on saturday morning they shall Rescite Ames theologie thesis in his Medulla, and on Saturday evening y^e Assemblies shorter Chatechism in Lattin and on Sabbath Day attend y^e explication of Ames's Cases of Conscience.

"In y^e first year after admission on y^e four first days of y^e week all students shall be exercised in y^e Greek and Hebrew tongues, onely beginning logick in y^e morning att y^e latter end of y^e year unless their tutors see cause by Reason of their Ripeness in y^e tongues to Read logick to them sooner; they shall spend y^e second year in logick with y^e exercise of themselves in y^e tongues. y^e third year principally in physicks: and y^e fourth year in metaphisicks and mathematicks still Carrying on y^e former studies: but in all Classes y^e last Days of y^e week are allowed perpetually for Rhetorick, oratory and Divinity and in teaching of both tongues, and Arts, and such authors are to be used as shall be approved of by y^e Rector and tutors. . . .

"No scholar shall use y^e english tongue in y^e Colledge with his fellow scholars unless he be called to publick exercise proper to be attended in y^e English tongue but scholars in their Chambers and when they are together shall talk Lattin." Dexter, *loc. cit.*, vol. i, p. 348.

[The 36th law of Rhode Island College in 1774 reads: "In the hours of study [*i.e.* nearly all day] no one shall speak to another in the College or the College yard except in Latin." Guild, *Brown University and Manning*, p. 270.]

Entrance Examinations and Course of Study at Yale in students from wearing their hats within the college walls.[20]

In 1769 the Faculty was enlarged by the addition of David Howell (already for three years a tutor) as "Professor of Natural Philosophy." He taught until the war closed the college.[21] The third member of the Faculty was Joseph Brown,

1745: "In the first Year They Shall principally Study the Tongues & Logic, and Shall in Some measure pursue the Study of the Tongues the Two next Years. In the Second Year They Shall Recite Rhetoric, Geometry and Geography. In the Third Year Natural Philosophy, Astronomy and Other Parts of the Mathematicks. In the Fourh Year Metaphysics and Ethics, but every Saturday shall Especially be allotted to the Study of Divinity, and the Classes Shall dureing the whole Term recite the Westminster Confession of Faith . . . and on Friday Each Undergraduate in his Order about Six at a Time Shall Declaim in the Hall in Latin, Greek, or Hebrew." Dexter, *loc. cit.*, vol. ii, p. 5. [Surely we should pause and drop a tear of sympathy for our suffering predecessors.]

At the College of William and Mary the ecclesiastical influence was still more marked. The President was a salaried "Commissary of the bishop of London," and most of the early professors were "incumbents of neighboring churches." One decree even so late as 1769 was almost monastic. "The privileges of a wife and family were accorded to the President alone. . . . Entering into marriage . . . *ipso facto* vacated the office of any Professor." *Address* of President Lyon G. Tyler, December 5, 1904, before the Phi Beta Kappa Society at William and Mary College.

[20] Guild, *Brown University and Manning*, pp. 265-267.

[21] Professor Goddard in his *Memoir of President Manning* (p. 6) says of Howell:

"Except however as a tutor we have never heard that he participated in the ordinary duties of academical instruction." That Howell never delivered any lectures on law during the

Howell's successor, who resumed the teaching of Natural Philosophy in 1784, shortly after the war ended. The fourth was the celebrated Benjamin Waterhouse, M. D., who taught Natural History from 1781 to 1791.

Waterhouse was a Newport boy, a nephew of Dr. John Fothergill, of London, who, as will soon be seen, was an early benefactor of the college through Morgan Edwards. Waterhouse was perhaps the most highly educated physician of his day in this country. With John Warren and Aaron Dexter he founded the Harvard Medical School in 1782-83,[22] and was noted as the first to introduce vaccination into America. He served on the Board of Fellows of Brown for thirteen years (1782-95).[23]

This insistence on Science was in accordance with the charter, which decreed that "the public

thirty-four years he held the professorship (1790-1824) is generally admitted, but in his letter of resignation, dated March 11, 1779 (Guild, *Brown University and Manning,* p. 311), he says: "Although experimental philosophy was the direct object of my profession, yet "other branches of learning were devolved upon me." Guild (p. 68) says that these "other Branches" were French, German, and Hebrew. Moreover, in his letter of resignation, he declares that he is unwilling to receive "the emoluments of office without discharging its duties," and the records of the Corporation show (pp. 57, 60, 62, 66) that he received a salary when tutor of from £25 to £72, which was increased to £90, and later (1774) to £100 (all lawful money), during his professorship.

[22] See Oliver Wendell Holmes's delightful *Address* at the Centenary of the Harvard Medical School.

[23] In the John Carter Brown Library is an undated broadside of a syllabus of his lectures at Brown and Harvard.

teaching shall in general respect the sciences." The scientific subjects actually taught are not exactly known, but probably they differed somewhat, by subtraction, from those taught in 1783 (when "science" included geography, arithmetic, algebra, Euclid, trigonometry, surveying, navigation, and astronomy), and by addition also, under Waterhouse at least. At that time the college spent about £700 "lawful money" on the philosophical apparatus and the library, one-half of which was given by John Brown.[24] Even with this addition, however, the philosophical and astronomical apparatus could hardly have been compared with the fine collections at Harvard (destroyed by fire in 1764), Yale, and especially at William and Mary.[25]

The meeting of the Corporation was held on Wednesday, September 5, 1764, in Newport. Of the forty-seven members of the Corporation named in the charter (one place was purposely left vacant

[24] Guild, *Brown University and Manning,* p. 347.

[25] I had collected considerable material towards a comparison of the teaching of science in the nine American colleges founded before the Revolution, but greatly to my regret I am obliged to omit it on account of the great length of time and space required for even a partially adequate treatment of the subject. Those interested will find in the histories of the individual colleges a great deal of information. To these I would add the valuable series of *Circulars of Information on Higher Education,* issued by the United States Bureau of Education under the editorship of Herbert B. Adams. Each State is considered by itself, and each college individually. Also, much information is included in Cahori's *Teaching and History of Mathematics in the United States,* and other similar publications of the Bureau of Education.

for the future President), only twenty-eight had qualified.[26] Of the twenty-eight, twenty-four were present; certainly a very good attendance, especially in view of the then difficulties of travel. They were a distinguished company,[27] headed by the Chancellor, Hon. Stephen Hopkins, chief justice, governor, member of the Continental Congress, and signer of the Declaration of Independence. One-fourth were university men: from Harvard four, from Yale two, from Princeton one.

The most urgent need was money to meet immediate expenses. Accordingly sixty-nine gentlemen were appointed to receive subscriptions, not only in the New England colonies, but "in the Western part of this Continent." It is curious at this day to find that the "wild and woolly West" of 1764 included Baltimore, Philadelphia, and New York! Twenty-three other places were specified by name. With prophetic vision, Oyster Bay was one.

Rev. Hezekiah Smith, of Haverhill, collected in 1769 about $2500 in the southern colonies, but the largest amount was obtained by Morgan Edwards.

On February 2, 1767, I find the following note in the records of our Philadelphia church: "Mr. Edwards applied to the Church for leave to go to Europe to execute a commission he hath received

[26] Three qualified the next year, and to three of those who never qualified, honorary degrees were generously given in later years. Was this as a reward or as a means of heaping coals of fire on their heads?

[27] Cf. Newman, *loc. cit.*, p. 263.

from the College in Rhode Island; he also informed the Church that he had wrote to twelve ministers to supply his place in his absence, ten of whom had agreed to his proposal; each to officiate a month in his turn, and to be allowed each five pounds a month out of Mr. Edwards's salary. The Church granted Mr. Edwards leave to go to Europe and wished him all success." He carried with him a letter, undated, but evidently written early in 1767, signed by the President and the Chancellor. The signature of Stephen Hopkins at this date was quite firm. Two years later the lines began to waver, and in 1776, nine years before his death, his well-known signature of the Declaration was extremely tremulous.

Edwards, as was his wont, lost no time. "*Detto, fatto*" was his motto. Two weeks after this vote he sailed, and in less than two years had collected £888 10*s.* 2*d.* sterling. As he says, he "succeeded pretty well considering how angry the Mother country then was with the Colonies for opposing the Stamp Act."

The manuscript list of the subscribers is in our archives. The largest subscribers were the First and Second Presbyterian Churches in Belfast (£13 9*s.* 0*d.* and £14 15*s.* 4*d.*). It is interesting to note among the subscribers Thomas Penn, £20, Benjamin Franklin, £10, Thomas Hollis, £10 Dr. John Fothergill, esteemed by all doctors, £5 5*s.* The lowest amounts named are one and two shillings.

Encouraged by these collections, the permanent location of the college and the erection of suitable buildings were now actively discussed. After much rivalry and not a little hard feeling, the matter was finally settled. The college and Manning both moved to Providence in May, 1770.

Why had little Warren ever been selected as the first home of the college?

The town was named after Admiral Sir Peter Warren, who had cleared the coast of French ships of war and thus rendered a great service to Warren, which depended chiefly on its maritime commerce. In 1746 it had been definitely assigned by the King in Council to Rhode Island instead of to Massachusetts. Its population even in 1770 was only 979, while Providence had 2958, and Newport could boast of 11,000. Newport was the leading town in Rhode Island in commerce and culture as well as in inhabitants, was next in size to Boston, and had two Baptist churches.

Swansea was a small inland town about three miles from Warren. Here was a Baptist Church, founded for over a century (1663). The Swansea, the two Newport, and the Providence Baptist churches were all supplied with pastors. In Warren there were about sixty Baptists. They were not organized into a church, but evidently the desire for such a church was in their hearts, and they had already taken active steps towards founding it before the plan for a college was first mooted in Philadelphia. This intention to found a separate church in Warren was doubtless known to the Philadelphia Baptists. It was therefore very natural, as the projected college had absolutely no funds, that, whatever might be its permanent site, it should begin in Warren, where the president could be supported by his salary as minister of the church and also by opening a Latin school.

The two enterprises—the church and the college—went hand in hand. The first step had to do with the erection of the meeting-house; the second and third with the college; the next two with the church; the sixth with the college; the seventh with both church and college; the eighth with the college; the ninth to the twelfth with the church, and finally the thirteenth with the college.

The chronological order of events in detail is as follows:

1*st.* February, 1762. The collection of building materials for a "Meeten house" was begun, as shown by bills in the archives of the Warren church. This was eight months before Morgan Edwards proposed that a college should be founded, a year and eight months before the first payment on the lot was made, a year and nine months before the Warren church was constituted, and almost three years before the date of the deed for the lot. Surely they were "forehanded."

2*nd.* October, 1762. In the Philadelphia Baptist Association, the only Association then in existence, Morgan Edwards first mooted the question of a college.

3*rd.* July, 1763. James Manning, representing a committee of the Philadelphia Association, [28]

[28] Sears, *Centennial Discourse,* pp. 11, 12, and Appendix B, p. 62.

visited Newport on his way to Halifax, and took the first definite steps toward a charter for the proposed college.

4*th.* October 21, 1763. The first payment to the "widow Rachel Luen for a Lot of Land for to set meten house on." The deed for this lot is dated January 29, 1765. The lot was not fully paid for until 1783, twenty years after the first payment and eighteen years after date of the deed.[29]

5*th.* February 17, 1764. "The Congregation" (observe it is not "the Church") "at Warren gave Rev. James Manning a call to come over from New Jersey and settle amongst them."[30]

6*th.* March 2 and 3, 1764. The charter of the college was granted.

7*th.* April 13 or 14, 1764. James and Mrs. Manning (they had been married March 23, 1763) arrived at Warren. He began at once to preach to the as yet unorganized Baptists and also opened a Latin school.[31]

8*th.* September 5, 1764. First meeting of the Corporation of the college.

9*th.* September, 1764. It was agreed to draw up a covenant and organize a church.

10*th.* October 4, 1764. The Swansea church dismissed twenty-five members to the proposed Warren church.

11*th.* November 15, 1764. The Warren church

[29] Archives of the Warren church.

[30] Warren archives.

[31] Sears, *op. cit.*, p. 17, and Appendix E, p. 71.

was solemnly constituted [32] with fifty-eight members, [33] all of whom assented to the covenant by a rising vote.

Three of the members then presented a formal call [34] from the now organized "Church" to Mr. Manning. He accepted, and was at once installed. The provision for his salary is naïvely indefinite: "As we are of opinion that they who preach the Gospel should live by the Gospel we do here declare our intention to render your life as happily by our brotherly conduct towards you and communicating our temporal things to your necessities so long as God . . . shall continue us together." Tustin (pp. 121, 122) says that the church "appears to have given him a liberal support."

12*th.* November 25, 1764. Manning was dismissed from the Scotch Plains church, New Jersey, to the Warren church "of the same faith and order." [35] It should be observed, however, that the Scotch Plains church still clung to the "Laying on of Hands," whereas the Warren church in its original covenant boldly and expressly declared

[32] Bound volume of Warren Church Minutes, p. 1; Spalding, *Centennial Discourse* at Warren, November 15, 1864, pp. 13, 14. The original minutes were destroyed when the church was burned by the British, May 25, 1778. Fortunately a complete copy down to November 30, 1869, had been made by Mr. John Throop and was copied into the Minute Book.

[33] The Church Minutes say twenty-five from Swansea. Tustin, p. 118, says thirty-five, but both agree on fifty-eight as a total number.

[34] Tustin, pp. 171-173, gives the full text.

[35] Tustin, p. 168, gives the letter in full.

"That the Imposition or Non-Imposition of Hands upon believers after Baptism is *not* essential to Church Communion."[36] This petty controversy was a serious bone of contention between the "Five Principle" and the "Six Principle" Baptists, and later involved Manning and the Providence church in trouble. In the Warren records, June 28, 1765, is a charmingly frank and very charitable note that Sister R. B. had been "baptized and come under the *Imposition of Hands* and has since walked circumspectly *human frailties excepted.*"

13*th.* September 4, 1765. At the second meeting of the Corporation, again held in Newport, James Manning was formally elected President.

Both enterprises were now completely organized, with James Manning at the head of each. This harmonious coöperation continued until the question of the permanent location of the college arose. For the details of this rather violent struggle I must refer you to Professor Bronson's History. Suffice it to say that Providence finally won the day, and on May 3, 1770, Manning went with the college to Providence.

Let us now look at a few details of conditions at Warren during the period from 1764 to 1770.

The size of the first meeting-house is variously given. In a subscription list of 1765 it is described as "sixty one feat, width forty fore feat." This would seem to be more reliable than the spelling.

[36] Tustin, p. 171.

Tustin says it was about forty-four feet square, and Guild, following Morgan Edwards, says it was forty-four by fifty-two feet.[37] It had pews, galleries, a turret containing a little bell, called the "tobacco bell," as it was paid for by this means, and a porch.[38] The pulpit was not built until May, 1765. The "gallories" were not finished nor all the "pues" placed possibly until 1774, for on February 3, 1772,[39] a contract was awarded for finishing the "gallories" and for putting in thirty-six "pues." For doing this work the contractors were allowed two years—a liberal allowance.

In this contract, and therefore presumably in the earlier ones, the contractors were given the right to sell the pews. On April 24, 1765, the proprietors of the pews, who had believed that the total sum thus realized would be sufficient to complete the building, fearing that it would not be enough, agreed that if this sum was insufficient they should pay proportionately such sums as would complete it or forfeit their pews. This "syndicate" for "underwriting" the entire cost, as we might now call it, was signed by twenty-three persons.[40]

There does not seem to have been any stove. In

[37] *Collections of the Rhode Island Historical Society*, vol. vi, p. 342.

[38] Tustin, p. 173, and Guild, following him, say there was no porch, but this is presumably wrong, as I found a bill dated May, 1765, in the Warren church archives, with an item, "To horse hire and time for going to look for stuff to build a porch for the Metenhouse £6.10.0."

[39] Warren archives.

[40] Warren archives.

Morgan Edwards' various volumes the presence or absence of a stove in almost every case is carefully noted; e. g., Pennepek had one, but the Philadelphia church had not. McMaster [41] thus vividly describes the situation in the winter: "Not a meeting house was warmed, not a chimney, not a fireplace, not a stove was to be seen."

The Third Church, Newport, is described by Edwards as having pews, galleries, and a "clock," the only mention I have seen of this useful monitor. Usually an hour-glass was on the pulpit, and its third turning marked the minister's final lap. Possibly in Newport they thought that the more aggressive suggestiveness of the clock, added to the frigidity of the air, might shorten the sermon by at least one turn of the hour-glass in very cold weather. One minister, says McMaster, [42] "preached in a great coat and mittens and complained that his voice was drowned by persons stamping . . . their feet to keep warm."

For Dr. Manning and the prospective students [43] a parsonage had to be built. This was a large building, costing £2534 17*s.*—an apparently formidable sum, but Professor Bronson informs me that it was "old tenor," and so was equivalent to only $600. Even that was a large sum in those days.

While examining the old bills and other docu-

[41] McMaster, ii, 568.

[42] *Ibid.*

[43] This is conclusively shown in one bill, April 18, 1768, which mentions "the College chamber." It is also shown by the lottery of 1767, referred to later.

ments in the archives of the Warren church I chanced upon some orthographical gems which I must share with you. Our forbears, who luckily escaped the many birchings visited upon their descendents by Noah Webster and Lindley Murray, were not satisfied with the dull uniformity of a single spelling, but exhibited the vivacity which accompanied an unexpected and often startlingly variegated orthography. Contemporaneous documents of the other early colleges showed an equally liberal charity. If political independence was desirable, why not also orthographical independence? If "Liberty of Unlicensed Printing" was good for John Milton, why was not "Liberty of Unlicensed Spelling" good for John Gano?[44] Accordingly they cut their teeth, as it were, upon such simple beginnings as "winder fraims," "dores," and "meten hous." These latter provided only a few possible variants. When it came to "Parsonage," however, they found a rich field for their coöperative fertility of invention, and then went "ganz los." I discovered thirteen new, but all different, ways of spelling this one word, from "passeenage" to "posneg." The following will suffice: "Parseenage, parsnige, pasanage, passeage, paisonnag, parsinig, pasneg hous, parsing hous, personage, personog, pasonage, posneg, par-

[44] See my *History of the First Baptist Church, Philadelphia,* p. 64. Even the punctuation, capitalization, and spelling of John Quincy Adams were corrected by his colleague, Jonathan Russell, a graduate of Brown in 1791, when the Treaty of Ghent was being negotiated. (Frederick Trevor Hill, *Atlantic Monthly,* August, 1914, p. 236.)

snig." Had I made a thorough search, I might possibly have enlarged the list to a score, unless indeed their positive genius in cacography had exhausted itself.

Possibly an English annex to the "Latin School" might have been useful.

The prevalence of the unwarranted soft "g" in the above list is even more marked in a long itemized memorandum of the losses of Rev. Charles Thompson, of the class of 1769 (who had followed Manning in the pastorate at Warren), for his effects which had been destroyed when the parsonage and the church were burned by the British. Among many "go as you please" spellings I find one mysterious "black gug" and two "ginn gugs." He does not add the comment "wore some" or "half wore," as he does to his shirts and "stockens." [45]

One Martin Luther, however, who emulated his namesake of the sixteenth century in overturning established usages, not content with a revolution in spelling, made additional assaults upon grammar and sobriety. In a bill dated July 3, 1764, he provided a new past participle for the verb "disburse." It reads:

Disbusted by Martin Luther to Wordes bulding the meeting house

960 feete of pine bordes	£96.
106 gallons of rum	£254.

Eroors excepted.
Paid,
Martin Luther.

As they paid for rum two and a half times as much as for "bordes" it is perhaps too much to hope that

[45] *History of Warren, Rhode Island, in the War of the Revolution*, by Virginia Baker, Warren, 1901.

there were no "Eroors" in conduct as well as in the account which were "excepted."

The members had not only to wrestle with the problem of how to spell as well as to build the parsonage, but also how to finance it, for it differed from the church in not having any pews which could be sold. In 1767 they therefore inaugurated a lottery for raising £150 "lawful money" toward finishing the parsonage house, as the students "cannot be accommodated in said house in its present condition." Those who bought the tickets were very properly called "adventurers." To us such a scheme, especially in connection with a church, seems very extraordinary. But at this time in England as well as in the colonies, and in Rhode Island during exactly a century (from 1744 to 1844),[46] there was a rage for lotteries for almost every purpose—to build meeting-houses, wharves, bridges (e. g., the old Weybosset bridge in Providence), for opening of streets, for colleges, etc.

Thus the First Baptist Church in Providence in 1774 asked for a lottery to raise £2000; in 1830 and 1837 there were two lotteries for the Rhode Island Historical Society; in 1793 the Corporation of Rhode Island College petitioned the General Assembly for the grant of a lottery of $4000 for purchasing Dr. Forbes's orrery and other articles of philosophical apparatus and for the college library, etc.;[47] in 1796 another was asked by Brown

[46] See a most interesting paper by the late Judge Stiness, entitled, "A Century of Lotteries in Rhode Island," *Rhode Island Historical Tracts,* 2d Series, No. 3, 1896.

[47] Newman, *loc. cit.,* pp. 264, 265.

University for $25,000, and in 1811 another for $20,000. Harvard and Princeton also were aided by lotteries.

In the archives of the Warren church is the full printed proposal for such a lottery, dated November 28, 1794, and signed by our old friend Martin Luther (who had "disbusted" certain monies for the meeting-house thirty years before) and two others. I have no doubt that Martin Luther and his fellow members would have stoutly maintained as a theological dogma that "ye cannot serve God and Mammon" but when it came to the practical work of building a new meeting-house to replace the one burned by the British, they clearly combined the two, for the proposal reads as follows:

"As this lottery was granted for promoting *public worship* and the advancement of *religion* we flatter ourselves that every well wisher to Society and good order will become cheerful adventurers." So far for piety, but Mammon now has its inning: "For those who adventure from motives of gain the *scheme* is advantageously calculated, there being less than two *Blanks* to a *Prize*." The italics are in the original.

As already stated, Manning was elected President at the second meeting of the Corporation, September 4, 1765. His official title exceeded even Holmes's famous "settee of professorships," for he was not only President but "Professor of Languages and other Branches of Learning." It is significant of the feeling that the location of the college at Warren was only temporary, that this vote continued, "with full power to act immediately in these capacities at Warren, *or elsewhere.*" In 1769, when Howell was elected "Professor of Natural Philosophy," the President's title was abridged to Professor of Moral Philosophy.

One day before there was any President or Faculty, the first student was inscribed on the roll of the college—the first in the long and honored roll which now numbers 7748 names. This first student, whose career we shall subsequently follow, was William Rogers, a boy of fourteen. For nine months and seventeen days he was the only student. On June 20, 1766, Richard Stites increased the "students"—a plural is now proper—to two, while four others entered during November, 1766. In 1768 a seventh student completed the first class, who were graduated in 1769. The charge for tuition was twelve dollars per annum. On August 11, 1766, there is a receipt in Manning's handwriting for "three Spanish milled dollars," being one quarter's tuition.[48] Boarding cost a dollar and a quarter a week, single meals six cents.

Manning's salary as president was much less in evidence than that as pastor. The income from the funds collected by Morgan Edwards in 1767-68 was pledged for this salary. Notwithstanding this, a committee of the Corporation, on September 17, 1769, reported that the President had served the college for three years and had received *no* compensation, so the sum of £50 "lawful money"[49]

[48] Guild, *Brown University and Manning,* p. 52.

[49] Professor McMaster has kindly epitomized for me the monetary conditions as follows: "The Spanish milled dollar

was ordered to be paid to him. This would be equivalent to $166.66 in Spanish milled dollars.

The committee very properly stated that in their opinion this sum was quite inadequate, and that he should not be debarred "from being recompensed in a more ample manner whenever it should be in the power of the Corporation to do the same." Fortunately the church and the Latin school eked out his living expenses. In 1772, in a letter to Rev. John Ryland, Manning states that his salary was £67 13*s.* 4*d.* sterling, or about $338. So scrupulous was he that he had always included as a part of this meager salary the five guineas sent to him annually by Ryland from England. [50]

The first mention of any library was at the meeting of the Corporation in 1768, when the President was requested to write to Morgan Edwards, then in London, to bring "such books as he shall think necessary at this time, not exceeding £20 value." [51] Several of the subscribers secured by Edwards gave some books. The University still has the pine

prior to 1640 was rated at four shillings and six pence sterling. Later different colonies rated it variously from six shillings to eight shillings, so that while in New England the 'pound' was worth $3.33, in some of the other colonies it was worth as little as $2.50. In 1704 Queen Anne issued a proclamation fixing the value of the Spanish milled dollar at six shillings. This was 'Proclamation Money' or 'Lawful Money.' Between 1710 and 1740 Rhode Island issued paper money to be received and paid as of the same value as current coin. This was 'Old tenor' money. In 1740 'New tenor' bills were issued at six shillings and six pence, and were made equivalent to twenty-seven shillings in 'Old tenor.' "

[50] Guild, *Brown University and Manning,* p. 192.

[51] Sears, *loc. cit.,* p. 94.

table of William Williams, the drawers of which held the entire library while the college was in Warren.

In 1769 the first commencement was held in Warren. On August 10, 1769, doubtless in preparation for this notable event, a subscription list, headed by Manning with twelve shillings, was circulated for repainting the meeting-house "both outside and inside," "providing the business be immediately prosecuted." On the day before this commencement the Corporation voted "That the Meeting House in Warren be fitted up at the charge of the Corporation in the best manner the shortness of time will permit."

It was a great day. "Tradition says that a Company of Baptist preachers from Georgia rode over a month on horseback to be there!"[52] Apparently the governor did not attend this, the only commencement held in Warren.

John Howland[53] gives a very vivid account of the stateliness of the first five commencements in Providence: The Commencements in Providence for the first five years were held in Mr. Snow's meeting house, that being then the largest in town. Governor Wanton always attended from Newport. . . . Escorted by the company of Cadets in showy uniforms, he headed the procession with the President. The Governor's wig, which had been

[52] Bronson, *History of Brown University,* p. 40.

[53] *Life and Recollections of John Howland,* class of 1835 (hon.), who died in 1854, aet. 97, by E. M. Stone, Providence, 1857, p. 159, quoted by Guild, *Brown University and Manning,* p. 143.

made in England, was the size and pattern of that of the speaker of the House of Commons, and so large that the shallow crowned hat could not be placed on his head without disturbing the curls. He therefore placed it under his left arm, and held his umbrella in his right hand. This was the first umbrella ever seen carried by a gentleman in Providence, though they had been some time in use by Ladies on a sunny day. Governor Wanton was the most dignified and respectable looking man we had ever seen. The white wig of President Manning was of the largest dimensions usually worn in this country."

For sixty years to my own knowledge the sheriff of the county of Providence, with his cockade, his broad blue sash, and his sword of state, without any deputies, has been amply sufficient to preserve "civil peace, good order and decorum at Commencement." [54]

The first commencement foreshadowed 1775, only six years away, for "not only the Candidates but even the President was dressed in American manufactures." There were both a morning and

[54] I inquired of Mr. Stephen O. Edwards as to whether the attendance of the sheriff was directed by statute or only resulted from custom. His reply is as follows:

"I find in the laws of 1798 the following provision: 'And be it further enacted that it shall be the duty of the Sheriff of the County of Providence to attend the celebration of the Commencement of the University or College in this state annually, and to preserve the civil peace, good order and decorum, during the same.'

"In the laws of 1882 this provision reads as follows: 'It shall be the duty of the Sheriff of the County of Providence, an afternoon session, and all the seven in the graduating class pronounced orations. Such was the avidity for oratory that Morgan Edwards also preached them a sermon in the evening. Two of the class debated the question whether the Americans could "affect to become an independent State." In this "Disputatio forensica" Varnum was a warm advocate of American freedom. "Doubtless," he says, "we should long since have obtained redress had we not been tormented by Worms in our own Bowels" (i.e., "Torys").[55] Though warmly in favor of our independence, his conclusion was that Great Britain could overwhelm us, and that the attempt to form an independent state would end in disaster. William Williams,

with so many of his deputies as may be necessary (at least four), to attend the celebration of the annual commencement of Brown University in this State and to preserve peace and good order and decorum during the same.'

"The provision stands as follows in our present laws: 'The sheriff of the county of Providence, with as many of his deputies as he may deem necessary, shall attend the celebration of the annual commencement of Brown University and shall preserve peace and good order and decorum during the same.'"

Since my text and Mr. Edwards's letter were written I have had the pleasure of reading Professor Bronson's *History of Brown University*. On pages 87 and 139-142 will be found interesting details of the disorders at commencement between 1788 and 1798, owing chiefly to the booths, etc., set up on the grounds of the Baptist Meeting-House for the sale of intoxicants, etc. The votes of the Corporation found expression in the laws above cited.

[55] Guild, *Collections of the Rhode Island Historical Society*, vol. vii, pp. 267-298. We hardly appreciate how many "Tories" there were. On page 280 Guild states that over

however, believed that we could successfully resist Great Britain, and ended his speech with the words, in capital letters, "AMERICA SHALL BE FREE."[56] The Salutatory and the "Syllogistic Disputation" were in Latin. (In 1776 one oration was in Hebrew.) Charles Thompson, the valedictorian, "took a most affectionate leave of his classmates," and the reporter adds, "the scene was tender, the Subject felt and the Audience affected."

Of these first seven graduates, one died in 1775. Four entered the patriot army. Richard Stites was a captain and died of wounds in 1776. James M. Varnum became distinguished as a major-general in the army, and later at the bar and as a member of Congress. He was able to converse in Latin with Blanchard, the quartermaster-general of the French forces in Providence. Charles Thompson was Manning's successor in the Warren church. In 1778, while on leave from the army, he was captured by the British in their raid upon Warren and held a prisoner for some weeks.

William Rogers had a noteworthy career. He was pastor of my own church 1772-75, chaplain

1100 Loyalists, or, as they were commonly called, "Torys," left Boston with the British army; and in 1783, when the British army left New York, over 30,000 accompanied them. On the other hand, of the 3200 biographies of Baptists in Cathcart's *Baptist Encyclopædia,* all save one were patriots, and this one recanted at a later date (Guild, *Brown University and Manning,* p. 16).

[56] Quoted by Guild, *Brown University and Manning,* pp. 83-85. See also a most interesting account, with a reproduction of the broadside of 1769, by Winship, *Brown Alumni Monthly,* May, 1913.

and later brigade chaplain in the army 1776-81, professor of oratory and belles-lettres in the University of Pennsylvania for twenty-two years, and a laureate of the University of Pennsylvania, of Yale, and of Princeton. In this same History (page 58) I note that among his publications is "The prayer delivered on Saturday the 22nd of February, 1800, in the German Reformed Church, Philadelphia, before the Pennsylvania Society of the Cincinnate, published by particular request, 8vo. pp. 12." I must confess that the patience of the "Cincinnate" may well have been exhausted by twelve pages of prayer.

One probably unique incident in his life is thus recorded.[57] It is an extract from the records of King's Church (now St. John's), Providence, and relates to Sunday, June 19, 1782: "At the request of the wardens, the Rev. Mr. William Rogers, a *Baptist* clergyman, preached in the Church this and the following Sunday, and on the 30th of the same month he again preached, and the wardens were requested to wait upon and thank him for this day's service, and present him with the contribution, and ask him to officiate in Church next Sunday *in his way,* provided he cannot conform to our liturgy, but if he will conform, the congregation invite him further to serve them." The italics are in the original.

Of the other two members of this first class, one was a Fellow of the University for twenty-nine

[57] Updike, *History of the Episcopal Church in Narragansett, Rhode Island,* etc., 1st ed., 1847, 2d ed., 1907, vol. ii, pp. 188, 189.

years, a teacher, and a pastor. The seventh died about 1785.

But if the graduating class was small, the number of honorary degrees—twenty-two—was large, over three times the number of degrees in course. Of these, seven are curiously stated to have received their degree "at their own request." They were all college men, three from Harvard, two from Princeton, and one each from Yale and the University of Pennsylvania. Fourteen were "well recommended by the Faculty for literary merit"; four of these were college men. One of the twenty-two, Henry Ward was accidentally omitted from both lists by the reporter. Six of the twenty-two were clergymen in Great Britain. Among the Americans were David Howell, the second member of the Faculty, Joseph Wanton, the deputy governor, and four clergymen, staunch early friends of the college, Morgan Edwards, Samuel Jones, Hezekiah Smith, and Samuel Stillman.

Master of Arts was the only honorary degree conferred until 1784, when Stephen Hopkins was given an LL.D. In 1786 Granville Sharp, the philanthropist and founder of the Society for the Abolition of Slavery, was similarly honored. The next year the same degree was given to Jefferson; in 1790, to Washington; in 1792, to Hamilton; and in 1797, to John Adams. In 1840 Benjamin Franklin—not the original philosopher but an Episcopal clergyman—was graduated with an A.B.

In the broadside or programme of the first commencement one very significant sentence appears, but in small type: "Nomina alphabetice disposita sunt." In older colleges a different practice had prevailed. "In all the Harvard College catalogs previous to 1773," says Sibley, "the graduates . . . are arranged not in alphabetical order, but according to their social position or family rank.[58] Judge Wingate, writing to Librarian Peirce respecting the excitement which was generally called up when a class in college was 'placed,' says 'the scholars were often enraged beyond bounds for their disappointment, and it was some time before a class could be settled down to an acquiescence in the allotment.' The higher part of the class, those whose names came first in the earlier catalogs, generally had the most influential friends; and they commonly had the best chambers in college assigned them. They also had a right to help themselves first at the table of commons. 'I think,' Judge Wingate concludes, 'that the government of the college, in my day, was a complete aristocracy.'" [59]

[58] See W. C. Lane, *The Rebellion of 1766, in Harvard College,* p. 41, footnote; *Publications of the Colonial Society of Massachusetts,* 1906, vol. x. Kingsley, in his *History of Yale College,* vol. i, pp. 95, 96, says, "In 1768 the names were for the first time arranged in alphabetical order. Before this the names had been arranged according to the rank in society which it was supposed their fathers held; and according to Dr. Woolsey, one of the most severe punishments consisted in placing a student on the list, in consequence of some offence, below the rank to which his father's condition would assign him, thus declaring that he had disgraced his family. Dr. Woolsey tells the story of a shoemaker's son who, when questioned as to the quality of his father, replied that he was 'upon the bench,' which gave him of course a high place."

[59] Guild, *Brown University and Manning* pp. 89, 90.

A practice similar to this prevailed when families were seated in church. In the list of scholars at Harrow in the eighteenth century, "Mister" always signified the son of a peer.[60] Democratic, liberty-loving Rhode Island in this simple and inconspicuous word, "alphabetice" reëchoed the new note for democracy and liberty sounded by Yale a year earlier. But we took this stand at our very first possible opportunity, that is, at the very first commencement.

The date of the annual meeting of the Corporation was fixed by the charter on the first Wednesday in September, "at which or at any other time the Public Commencement may be held and celebrated." Commencement from the beginning until 1870, eleven years after I graduated, was always held on the first Wednesday in September. This was most inconvenient for the students, and a severe tax on the resources of not a few. The college work ended in June, and to compel men to come back three months later simply to receive their "sheepskins" was a hardship. Morever, it was equally inconvenient for the people of Providence, especially as the summer vacations grew longer and longer and people returned to the city later and later. Finally, in 1870, the date of commencement was changed to the third Wednesday in June.[61]

At the second meeting of the Corporation (1765) it was directed that a seal be prepared, but

[60] Bruce, *William and Mary College Quarterly Historical Magazine,* April, 1914, p. 249.

[61] In 1851 commencement was held in July, but after two

a copperplate for diplomas was not ordered until September, 1773. Possibly this was partly due to the odious Stamp Act, for, said Senator La Fayette S. Foster, speaking at the centennial dinner: "Lord Grenville, the Chancellor of the Exchequer, in March, 1764, . . . gave notice in Parliament that he would apply the stamp act to the colonies, and that stamp act imposed a tax even upon college diplomas."[62] Meantime the diplomas were evidently written, for Manning, in a letter to Rev. John Ryland on November 12, 1772, says that the college had conferred an A.M. on Ryland's son, "but through my hurry and absence from home since Commencement I have not got his diploma written."[63]

When the college was moved to Providence,

years' trial was again held in September until 1870, when it was permanently changed to June. (Guild, *Brown University and Manning,* p. 347.)

At Harvard the first commencement was held on October 22, 1642, the second in September, 1643. During the rest of the seventeenth and most of the eighteenth centuries it was held on the second Saturday in August. For the first half of the nineteenth century the date was the last Wednesday in August. In 1849 it was changed to July, and in 1869 to the fourth Wednesday in June.

At Yale the date was the second or third Wednesday in September down to 1831; from 1832 to 1850 in August, usually the third Wednesday or Thursday; from 1851 to 1872 in July; from 1873 to 1880 on the Thursday after the last Wednesday in June; from 1880 to 1908 on the last Wednesday in June. In 1909 the date was fixed on the next to the last Wednesday in June.

[62] *Centennial Celebration,* p. 168.

[63] Guild, *Brown University and Manning,* p. 191.

Manning reopened his Latin school, which later became the University Grammar School. He was immediately invited to preach for the First Baptist Church and soon after became its pastor.

The second commencement (1770) was held in Mr. Snow's meeting-house, and notwithstanding the reported "decorum" that prevailed, the Corporation were obliged to pay for breakages of windows, etc., owing to the throng. "The members of the Grammar School joined in the procession. Before the Assembly broke up a piece from Homer was pronounced by Master Billy Edwards [son of Morgan Edwards], one of the Grammar School boys not nine years old." [64]

Poor Billy Edwards! [65]

Four students only were graduated, one of whom, Theodore Foster, attained prominence as a United States Senator, judge, and antiquary. But the Fellows kept up the pace set for the year before in the matter of honorary degrees. This ratio in 1769 was three for one, and in 1770, with four graduates, they gave the honorary A.M. to twelve men, of whom seven were Englishmen. Only one of the twelve (Benjamin West) achieved any distinction.

[64] Guild, *Brown University and Manning,* pp. 164, 165.

[65] Ryland (Guild, *Brown University and Manning,* p. 173) states that his son "rendered his Greek Testament into English all through before he was nine years old and at nineteen is very ready at Hebrew, Latin and French." What cruel drudgery for children! It may well have disgusted them with the Bible.

In the bill of Nicholas Brown & Co.[66] for the expenses incurred in building University Hall and the President's house in 1770, several items are of interest.

At the meeting of the Corporation (held, be it observed, at 7 A. M.), at the time of the very successful first commencement in September, 1769, a committee was appointed to buy a site in Bristol county (in which Warren was situated) and erect a building. This aroused a lively opposition in other counties against Warren as the permanent location.

A special meeting of the Corporation was held at Newport, November 14 to 16. Professor Bronson's History gives the details. Suffice it to say that the Corporation rescinded the vote in favor of Warren, and directed that the building committee "do not proceed to procure any other materials . . . excepting such as may easily be transported to any other place," if such place be selected before January 1, 1770. It was then explicitly voted "that the College edifice be at Providence," upon the condition that the subscription of Providence be larger than that of Newport or of any other county.

Another special meeting for final action was called in Warren for February 7, 1770. The debate on the location was evidently conducted in public, for it was before "a crowded audience." It was also very long and very heated. The discussion lasted from ten o'clock Wednesday morn-

[66] Guild, *Brown University and Manning,* pp. 153-155, quotes a number of items from this bill.

ing until ten o'clock Thursday night, when finally Providence won over Newport by twenty-one to fourteen votes. The decision turned upon the amount of the respective subscriptions. Moses Brown [67] confesses that, as at first computed, Newport exceeded the subscriptions of Providence "land and all."

The word "land" throws light on certain items in the bill of Nicholas Brown & Co., for on January 1, 1770 (over a month before the final vote in favor of Providence was taken), are the following items: (1) Three persons (only one of whom, Joseph Brown, was a member of the Corporation) were sent to Cambridge *"to view the* Colleges." Their total expenses were £7 3s. 8½d. (2) Five shillings and three pence were voted for the hire of horses to go seven miles *"to purchase the lot* for the College"; and (3) three shillings and seven pence were paid for a horse and ferriage in going to Rehoboth *"to contract for brick."* While the entries are all dated January 1, 1779, they were clearly for services rendered at various times before that date. Evidently, therefore, the Providence people had faith that the ultimate decision would be in their favor.

As an illustration of the habits of the time, some other items also in this bill are of interest. On June 19, 1770, an entry reads one shilling and six pence "for one pail to carry water to drink in." This pail, however, I fear did not suffer from overuse, for from that same date, June 19, to July 18, just twenty-six days excluding Sundays, thirty-

[67] Guild, *Brown University and Manning,* p. 123.

six[68] items appear for "West India rum," "good rum," "very good rum," or "old rum." When the president's house was "raised" the rum was sweetened with sugar. The laying of each floor of University Hall and the raising of the roof were rewarded by sweetened rum. The well-diggers were especially favored, for twenty-four of the thirty-six items were for them, and when they actually "found the spring" the Chancellor, Stephen Hopkins, himself ordered an extra half gallon.

But I have lingered too long over the details of this interesting though brief period of our history. Looking back over all these six years of almost disheartening struggle, what lesson should we learn?

The honored, yea, revered founders of this University were men of heroic mold. Undaunted by the many obstacles blocking their pathway, they fearlessly grappled with them all and overcame them all. They builded into meeting-house and parsonage, and Latin school and College, their own rugged character and determination to succeed, and what is more they did succeed. They have been splendidly seconded by their successors. Witness the fair "Collége sur la Colline," and witness its worthy fruitage in private culture and character, in public service to church and state, to industry and invention, to literature, education, theology, medicine, and law, and to honorable commercial life.

[68] See original bill in the University archives.

The little seed planted by Morgan Edwards, watered and watched over by James Manning, has grown to be a stately tree, whose branches have sheltered every creed, whose fruit has nourished six generations of brave men and women who have helped to build, to preserve, to instruct, and to develop this nation; who have carried the Gospel to the ends of the earth; who have taught us to live not by bread alone, but by the things of the spirit. These are the things that elevate and ennoble character, and Brown University has ever set on high these real and eternal verities of God.

"AULD LANG SYNE"[1]

I heard recently the story of a man who owned a circus with which of course went a menagerie. Sometimes he indulged a little too freely in the flowing bowl and had suffered for it. On this occasion he was rather more frazzled than usual, but was sober enough to know what to expect if he showed himself to his not over-indulgent spouse. Instead, therefore, of seeking his own bed he finally unlocked the lions' cage and lay down there. In the morning his wife, after much searching, at last found him in the cage. Her only greeting was two words and a double gesture. Shaking both fists at him, she exclaimed, "You coward!"

Now, on the contrary, I have boldly ventured in here facing even a whole battalion of women without any fear, for I know by nearly thirty-five years of experience in the Woman's Medical College of Pennsylvania how good and friendly you have been and, I am sure, still are towards myself. In 1880 I accepted the post of lecturer in the College and in 1884 I became full Professor of Surgery. After five years I was obliged to resign, as other duties became too urgent and absorbing, but I have never lost my interest in the College and am glad

[1] After Dinner Speech in reply to the Toast of "Auld Lang Syne," at the anniversary dinner of the Woman's Medical College of Pennsylvania, May 4, 1915.

to attest it by my presence on this festal occasion.

Your genial Dean gave me my marching orders in advance. I was to tell you, first, how I liked you when I was with you; second, how I like you now, and third, what I hope for you in the future.

When I was with you I found you—or rather the predecessors of most of those before me—a body of enthusiastic, hard working, intelligent students who were daunted by no task, were equal to any emergency and were ever faithful to your duties.

Two, or rather three, of my students stand out in an individualized way from among the large number I had the pleasure of teaching at the Woman's Medical College of Pennsylvania.

First, Mrs. Joshee and her friend Ramabai who was occasionally a hearer though not an enrolled student. They were the first two in a long line of Oriental students,—a line still persisting, for one from Ramabai's school in India and her husband are our fellow guests to-night. No women in the whole Far East have done finer and more valuable work than that inaugurated and still carried on by Ramabai for her fellow countrywomen, and the work of our many graduates in the Orient.

A third student who lives vividly in my recollection furnished me in May, 1887, wholly unique surgical experience—unique, I fancy, even in the annals of Surgery. The student referred to sought my advice for a number of tuberculous glands in the neck. As they were on the point of becoming abcesses I advised their removal. To this she immediately consented but added "upon one condition." "And what is that?" "That I shall not take ether or chloroform." "But, my dear child," I said, "surely you do not understand. This operation will last probably an hour and a half. I must make an incision from your ear to the breast bone and then along the clavicle nearly to the shoulder, raise both flaps over a large area and dissect the glands most carefully from the jugular vein, carotid artery, probably the great subclavian vessels and certainly from all the numerous large nerves in the neck. If you jump from sudden pain I do not know where the point of my knife may go."

"Yes," she replied, "I quite understand. I will stand any amount of pain without budging, but I will not take either ether or chloroform." "Why not?" "Because I have already had two operations for similar glands elsewhere, both done by Prof. Henry B. Sands of New York, one with ether and the other chloroform, and I suffered so intensely from the after effects that I prefer to endure the pain of the operation. If I can not have the glands removed without the anesthetic, I will not have the operation performed." "Well," said I seeing her absolutely fixed determination, "only within a few days I have seen an account of a new local anesthetic called *cocain,* and if you are willing I will try that, but I can't promise how much it will dull the pain as I have never used it." "Anything except ether or chloroform," was the quiet but decided answer. A few days later I operated. I am well aware that the cocain was but partially effective but she never so much as winced.

Now, however, comes the additional and unique surprise. I had made my incisions and had begun to dissect the flaps when she said to me, "Would you mind if one of the residents (the operation was done in the Woman's Hospital and the residents, of course, were women) were to get me her hand glass and let me watch the operation?" For a moment I confess I was—if I may venture to use the word—"flabbergasted." But I instantly made up my mind that any one who could face fearlessly an hour and a half of pain without any anesthetic would be able to watch the operation without flinching. And so it proved. For over an hour she held the glass and watched every stroke of my knife, and even when I was separating the glands from the great jugular vein she did not make a single movement of head, hand or foot.

Her later history is interesting, instructive, and worthy of her. She was sent to Seoul, Korea, as a medical missionary. There (for Cupid flings his darts in Korea as elsewhere) she married a doctor. After the battle of Pyang Yong in the Japanese War of 1895, they went up to attend the wounded. There her husband fell a victim of typhus. She at once came home on furlough and her second child was born in the United States; her first had died in Korea. Later she returned to Korea, and for some time she has worked in a fine large hospital built for the Mission by the late Mr. L. H. Severance of Cleveland. Some years ago she established the first school for the blind and later the first school for the deaf and dumb ever founded in Korea. About three years ago she called to see me and I was proud of her work, as well I might be. The

Woman's Medical College of Pennsylvania, also, may well count such a woman as one of many who have conferred honor upon the College and benefits untold upon humanity.

The second command of Dr. Marshall was to tell you how I like you now. The answer shall be short, sharp and decisive. If I didn't like you now, I wouldn't be here!

And, third, what do I hope for your future? I believe in you "up to the hilt." There *is* a place for an exclusively woman's medical college in this country. Your splendid record for sixty-five years is one to be proud of. That you will not only be sure to equal it in the future but will surpass it I have not the slightest doubt. May your most ardent hopes be more than fulfilled!

BEFORE AND AFTER LISTER[1]

LECTURE I. "BEFORE LISTER"

On July 1, 1861, I entered the service of the State of Massachusetts as assistant surgeon, and on July 4 was sworn into the service of the United States in the shadow of yonder capitol. On August 1, I was honorably discharged and resumed my medical studies at the Jefferson Medical College. Strange as it now seems, when assistant surgeon I was not yet a graduate in medicine. As an evidence of the loose way in which medical and military matters were then conducted, I was actually appointed without any examination whatever.

After graduating in March, 1862, I again entered the service in May, after an examination, and was ordered to the Eckington Hospital then in the outskirts of Washington. Shortly afterwards I was ordered to fit up two churches as hospitals and to have them ready in five days. It was 5 P. M., on a Saturday afternoon.

People sometimes imagine that a practising physician can be transformed into an army surgeon merely by putting a uniform on him. I was not lacking in ordinary

[1] Two lectures before the U. S. Army Medical School, Washington, D. C., April 27 and 28, 1915. They were written before Godlee's Life of Lister was published.

intelligence and was willing to work, but I was utterly without training. To get those two churches ready as hospitals I had to have beds, mattresses, sheets, pillow-cases, chairs, tables, kitchen utensils, knives, forks, spoons, peppers and salts, all sorts of crockery and other necessities for a dining-room, all the drugs, appliances and instruments needed for two hundred sick and wounded men; I needed orderlies, cooks and the endless odds and ends of things which go to make up a well-organized hospital. I did not know how to get a single one of these requisites. As to drugs, I did not know whether to order six ounces or a gallon of laudanum, an ounce or two or a pound or two of opium, and I was in utter darkness as to the mode of getting any of the other things from a tea-spoon to a cook. However, I inquired and as soon as I learned how, I set myself to work. For two nights I slept only about three hours each, and I had the satisfaction of reporting to Dr. Letterman, the remarkable Medical Director of the Army of the Potomac at the end of three days, instead of five, that I was ready. On the fourth day I had one hundred wounded men in each hospital.[2]

I congratulate you in this more enlightened age and as students in this fine school where you are trained and drilled in matters which we had to cope with in our stumbling way, by dint of desperately hard work, without guidance, often learning only by our bitter mistakes.

We, the few surgeons still surviving those momentous four years, may well say to you *Morituri salutamus.*

I have been so very fortunate as to live during the whole period of the greatest revolution surgery

[2] Keen, "Addresses and Other Papers," 1905, p. 424.

has ever passed through. How strange seem these words of Erichsen, then the foremost London surgeon and Lister's early chief at University College Hospital, uttered in 1874, just as surgery was on the eve of its very greatest triumph.

> Surgery in its mechanical and manipulative processes, in its art in fact, is approaching, if it has not already attained to, something like finality of perfection.[3]

Anesthesia in 1846 and 1847 had robbed operations of the terror of agonizing pain. Quick "slap-dash surgery"—a necessity before the days of anesthesia—then gave way to delicate, painstaking, artistic surgery. Antiseptics thirty years later relieved the patients from the terrors of death and gave to the surgeon restful nights and joyous days.

Hence when I received the kind invitation to address you it seemed to me that I could possibly render you some service by describing the state of surgery "Before and After Lister," since my testimony would be that of an eye witness.

When the Apostle Paul was about to be bound and scourged you remember that he claimed immunity as a Roman. "With a great sum obtained I this freedom," explained the chief captain. "But I," said the Apostle, with justifiable pride, "was free born." "With a great sum" of the most strenuous labor the men of my generation acquired the knowledge and the skill and the immense satisfaction of the antiseptic and aseptic era—but you, you

[3] Wrench, "Lister's Life and Work," p. 281.

are "free born" and have entered into a rightful heritage from your fathers. "Before Lister" and "After Lister" in the surgical calendar are the equivalents of "B. C." and "A. D." of our common chronology.

Modern military surgery may be said to begin with Ambroise Paré in the middle of the sixteenth century. Gunpowder, though long known, had been used in warfare to any large extent for only a few decades. The belief, shared fully by Paré himself, that such wounds were "poisoned," was universal. Treatment was directed to the destruction of the supposed poison by pouring boiling oil and hot pitch into such wounds. In the heat of his anger at the inhumanity of the new weapons he says in his preface to Book XI, "Of wounds made by gunshot and other fiery Engines and all sorts of Weapons":[4]

> I think the deviser of this deadly Engin hath this for his recompense that his name should be hidden by the darkness of perpetual ignorance as not meriting for this his most pernitious Invention Any Mention from Posterity.

Yet with a curious inconsistency he immediately gives the name of a German monk as the "deviser."

Listen to his quaint story of how he discovered that gunshot wounds were *not* poisoned. In 1536

> it chanced on a time that by reason of the multitude that were hurt I wanted this Oil ["oyl of Elders Scalding hot

[4] "The Works of that Famous Chirurgeon Ambrose Parey," translated by Th. Johnson, London, 1678, p. 270.

with a little Treacle mixed therewith"]. Now because there were some few left to be dressed I was forced . . . that I might not leave them undrest to apply a digestive made of the yolk of an egg, Oil of Roses and Turpentine. I could not sleep all that night for I was troubled in mind, and the dressing of the precedent day (which I judged unfit), troubled my thoughts; and I feared that the next day I should find them dead, or at the point of death by the poison of the wounds. . . . Therefore I rose early in the morning. I visited my Patients and beyond expectation I found such as I had dressed with a digestive only, free from vehemency of pain, to have had a good rest and that their wounds were not inflamed . . . but . . . the others that were burnt with the Scalding Oyl were feverish tormented with much pain . . . and swoln. When I had many times tried this in divers others, I thought this much, that neither I nor any other should ever cauterize any wounded with Gunshot.[5]

But he still advocated the actual cautery for arresting hemorrhage even down to early in 1522. But later in that same year he changed his practise and thus describes his introduction of the ligature—a famous advance.

I confess here freely and with great regret that heretofore my practise has been entirely different from that which I describe at present after amputations. . . . I advise the young surgeon to abandon such cruelty and inhumanity and follow this better method. . . . Having several times seen the suture of veins and arteries for recent wounds which were attended by hemorrhage I have thought that it might be well to do the same after the amputation of a limb. Having consulted in reference to

[5] Johnson's "Paré," p. 272.

this matter with Etienne de la Rivière, Ordinary Surgeon to the King, and other surgeons sworn of Paris, and having declared my opinion to them, they advised that we should make the experiment [espreuve] on the first patient that we had, but [note his cautious uncertainty] we would have the cautery all ready in case of any failure of the ligature. I have done this on the person of a postilion named Pirou Garbier, whose right leg I cut off . . . following a fracture.[6]

At the Siege of Danvilliers[7] also in 1552 he records the amputation of the leg of a gentleman in the suite of M. de Rohan "without applying the actual cautery." In another place[8] Paré says that he was taught this new method "by the special favor of the Sacred Deity." He also refers to Galen's advocacy of the ligature. After many trials, Paré definitely adopted the ligature and "bid eternal adieu to all hot Irons and Cauteries."

He does not seem to have lost sleep over the ligature as he did sixteen years before when he abandoned the boiling oil and the hot pitch. Both were experiments on human beings. "Human vivisection" would have been the outcry of a sixteenth-century antivivisection society. But had he or some successor not made these experiments we should still be filling gunshot wounds with boiling oil and hot pitch and searing amputation flaps with the actual cautery. How much greater a boon to humanity it would have been if years earlier instead

[6] Malgaigne's "Paré," Chap. XXVI., pp. 227, 230.

[7] Malgaigne's "Paré," III., 698.

[8] Johnson's "Paré," London, 1678, Book XII., Chap. XXIV., p. 305.

of experimenting in both cases on human beings first, Paré had experimented on a few animals to determine whether gunshot wounds *were* poisoned and whether the ligature or the cautery *was* the best means of arresting hemorrhage!

We can also incidently learn how the doctrine of euthanasia was applied in Paré's time in the case of the desperately wounded by the following incident.

In his first campaign, entering a stable where he expected to put up his own and his man's horses, Paré

"found four dead soldiers and three propped against the wall, their features all changed, and they neither saw, heard nor spake, and their clothes were still smouldering where the gun-powder had burnt them. As I was looking at them with pity there came an old soldier who asked me if there was any way to cure them. I said no, and then he went up to them and cut their throats gently and without ill will toward them."[9]

Leaping over three and a half centuries of only moderate progress, let us next consider the state of surgery one hundred years ago. No better representative perhaps could be chosen than John Bell, the professor of surgery in Edinburgh, whose "Discourses on the Nature and Cure of Wounds" had reached a third edition in 1812, and his "Principles of Surgery" a new edition in 1826, to which his brother, Sir Charles Bell, also contributed.

In the former he states that tents or setons were much in use and the surgeons "were quite delighted

[9] Paget's "Ambroise Paré," p. 31.

with seeing prodigious quantities of matter spouting out when they drew their spigot away" (p. 299).

As to the abdominal wounds he says.

"Having put it down as a prognostic, which is but too well confirmed, by much melancholy experience, that wounds of the belly are mortal, there is no reason why we should, in recording our cases, take any note of a man having died after such a wound. Death from such a wound is a daily and expected occurrence and, therefore, is not marked; but if we find that a man has escaped, are we not to record every such escape?" (p. 313).

Per contra, to-day recovery has been achieved after 19 wounds of the abdominal viscera!

He considers wounds of the joints also as mortal. Amputations even in the most favorable circumstances did not heal under four, five or six months!

In his "Principles of Surgery" [10] he pictures the wards of a hospital as follows: You look

"upon limbs variously wounded, but all of them lying out, swollen, suppurating, fistulous, rotting in their own filth, having carious bones, bleeding arteries and a profusion of matter; the patients exhausted in the meanwhile, with diarrhea, fever and pain."

Again he refers to a wounded limb as "soaking in suppuration" and again, of its "lying in a slush of matter and foul poultices."

He relates the case of an officer under the care of Guérin, a French surgeon. He was wounded

[10] John Bell's "Principles of Surgery," new edition, with comments by Charles Bell, London, 1826, p. 86.

by a ball which had broken the fifth rib twice and traversed the entire chest. After dilating the wounds, Guérin introduced a seton ["a great strap of coarse linen"],

> "which, of course, went across the breast as a bow-string crosses a bow, and this seton he continued to draw [to and fro] with a perseverance which is truly wonderful from the first day to the thirty-eighth day of the wound; during all of which time the patient's sufferings were dreadful" (p. 458).

In fifteen days the patient was bled twenty-six times. After the removal on the thirty-third day of a splinter of bone, which had been imbedded in the lung, the patient, strange to say, recovered both from the wound and from the surgeon. It is not to be wondered at that Bell condemns such treatment. But at that time it existed in the practise of the most reputable surgeons.

Erysipelas, tetanus, pyemia, septicemia were rife. Hospital gangrene was endemic in many if not most hospitals, due to inevitable infection in practically every wound. Veritable epidemics were frequent. Is it any wonder that it had always been present for nearly two hundred years in the Hôtel Dieu in Paris when there were often from two to six patients (and such patients!) in one bed? Passing along the streets of Paris even during the Crimean War [11] "one could recognize at a distance a surgical hospital owing to the stench of the human putridity it contained." In the surgical wards, "no matter how well ventilated, there was a fetid

[11] Wrench's "Life of Lord Lister," p. 239.

sickening odor" up to the days of Lister himself, wrote Sir Hector Cameron, Lister's house surgeon in Glasgow. Death always stalked grimly behind the surgeon.

> "Secondary hemorrhage, tetanus, erysipelas, septicema, pyemia and hospital gangrene were never all absent . . . and at times pyemia and hospital gangrene became alarmingly epidemic." [12]

After vividly describing the ravages of hospital gangrene Bell then vehemently asks:

> "What, then, is the surgeon to do? Is he to try experiments with ointments and plasters while the men are dying around him? Is he to seek for washes and dressings to cure such a disease as this? Is he to expend butts of wine contending, as it were, against the elements? No! Let him bear this always in mind, that no dressings have ever been found to stop this ulcer, that no quantities of wine or bark which a man can bear have ever retarded this gangrene; let him bear in mind that this is a hospital disease, that without the circle of the infected walls the men are safe; let him, therefore, hurry them out of this house of death; let him change the wards, let him take possession of some empty house and so carry his patients into good air; let him lay them in a schoolroom, a church, on a dunghill, or in a stable; let him carry them anywhere but to their graves." [13]

To-day we do not even know the bacteriology of this foul disease. I saw many cases of it during the Civil War, but since 1865 I have never seen a single case. There has been no opportunity to dis-

[12] Cameron, *British Medical Jour.*, Dec. 13, 1902, p. 1844.

[13] Bell, "Principles of Surgery," 1826, I., p. 149.

cover its germ if, as is probable, it is a germ disease. Lister made its return impossible.

But let us come down to the next period immediately before Lister's work.

You can do no better than read that remarkable and revolutionary paper entitled "Hospitalism" by Sir James Y. Simpson, of Edinburgh, published in 1867.[14] It was a bombshell whose explosion aroused the profession as hardly any other paper in my lifetime. The controversy was bitter and widespread. Fortunately, antisepsis came close upon its heels and has forever done away with such a disgrace.

Simpson collected the statistics of the obstetrical mortality in hospitals and in homes with the following startling result.

Of 888,302 women delivered in hospitals, 30,394 died or 1 in 29—3.4 per cent.

Of 934,781 delivered at home, 4,045 died, or 1 in 212—0.47 per cent.

The reason for the greatly increased mortality in maternity hospitals—over seven times greater than in individual homes—was chiefly puerperal fever. After Oliver Wendell Holmes (1843) and Semmelweiss (1861) had attacked the evil, Pasteur finally in 1879 showed its bacteriological cause and gave it the *coup de grâce.*

The 0.47 per cent. of Simpson's home cases has been reduced to 0.15 per cent. and even 0.08 per cent. in the maternity hospitals of to-day.

But his chief assault was upon the surgeons. He

[14] Simpson's Works, Vol. II., p. 345.

analyzed the four main amputations—arms, forearm, thigh and leg—and excluded amputations at joints and all the minor amputations (fingers, toes, etc.).

Of 2,089 such amputations in hospitals, 855 died, or 41 per cent.
Of 2,098 in country practise, 222 died, or 10.8 per cent.

The latter were collected from 374 country practitioners, thus eliminating the personal equation. The difference was clearly due to the crowding and lack of sanitation in the hospitals of that day.

He gives two very interesting tables. The first is most instructive in showing the results in the then unsanitary state of all hospitals.

Mortality After the Four Selected Amputations in Proportion to the Number of Beds in the Hospitals.

In the large Parisian hospitals	62 in 100 die
In British hospitals with 300 to 600 beds .	41 in 100 die
In British hospitals with 300 to 201 beds .	30 in 100 die
In British hospitals with 200 to 101 beds .	23 in 100 die
In British hospitals with 100 to 26 beds .	18 in 100 die
In British hospitals with 25 beds or less .	14 in 100 die
In isolated rooms in country practise . . .	11 in 100 die

In the second he tabulates the mortality according to the experience of the operator.

Death Rate After the same Four Amputations in Accordance with the Experience of the 374 Operators

Those who had done less than 6 amputations	lost 1 in 7
Those who had done from 6 to 12 amputations	lost 1 in 9
Those who had done 12 or more amputations	lost 1 in 12

What an argument for the necessity for a year in a hospital for the recent graduate before allowing him full liberty of action!

In France matters were as bad if not even worse. T. Holmes and Bristowe in 1861 had found that in Paris, of 102 of the four amputations in question, 67 died, a mortality of 65.7 per cent., or two out of every three. Out of 1,656 amputations in the Paris hospitals collected by Malgaigne and Trélat 803 died, 48.5 per cent., almost one in every two (Simpson, p. 291).

To-day, how entirely changed is all this. Listerism has transformed what Bell well called "Houses of death" into "Havens of safety." No home, however wealthy its inmate, can be as sanitary, as surgically clean or give as good results as a modern hospital.

The best evidence of the truth of this statement I can give you is the statistics of Dr. W. L. Estes, [15] of South Bethlehem, Pennsylvania Surgeon to the Bethlehem Steel works. They are of especial value in that they are the statistics of the same surgeon in the same hospital and on the same class of patients. He reports the result in 724 major amputations. In 616 single amputations there were 28 deaths, a mortality rate of 4.54 per cent. Of 469 of the four selected amputations, 25 died, a mortality of 5.3 per cent. Of synchronous double, triple and one quadruple amputation, many of them complicated with other wounds and operations, there were 108, with 19 deaths, a mortality of only

[15] *Annals of Surgery*, July, 1913.

18 per cent. It is very noticeable that in an earlier paper in 1894 in which he had reported the first 46 cases of synchronous double, triple and quadruple and complicated amputations, there were 13 deaths, 28.3 per cent., whereas from 1894 to 1913 in the last 62 such cases there were only six deaths, a mortality of 9.6 per cent., showing again the value of still larger experience even to an already experienced surgeon. In the second series there was no quadruple amputation.

But as officers of the Medical Corps of the Army you will be especially interested in the facts as to military surgery before and after Lister. Capt. Louis C. Duncan of our corps published a very interesting and comprehensive article [16] just before the present European war broke out.

He states that in Motley's "Rise of the Dutch Republic" in three volumes covering "30 years of almost constant sanguinary warfare" in the sixteenth century he "never once alludes to an army surgeon or an army hospital"! The surgeons were undoubtedly not officially attached to the army, but were in the suites of kings, princes or great nobles, as was Paré, in the same century.

To Sir James McGrigor in the Peninsular Campaign (1808-11) only fifty years before our Civil War, is given the credit by Duncan of first collecting accurate military medical statistics.

One hundred and fifty years ago 25 per cent. or more of the wounded died. In the Civil War and in the Franco-Prussian War of 1870-1 the rate

[16] *Journal of the Military Service Institutions of the United States,* March-April, 1914.

had fallen to about 15 per cent., while to-day up to the present war not over 5 or 6 per cent. die of wounds.

The Crimean War will always be an example of utter inefficiency in the English and of even worse in the French army. Its one bright spot is the splendid epoch-making work of a woman, Florence Nightingale, whose labors were unceasing and effective. Every later war has seen less sickness and fewer deaths because of what she then accomplished.

Chenu, the French medical historian of that war, has made one curious and interesting calculation, partly official, partly estimated. The number of projectiles of all kinds actually fired he gives as 89,595,363. The total number of killed and wounded was 175,057. This would show that it took 512 projectiles to kill or wound one man. Such a disproportion would more than justify a cartoon during our Civil War. Two soldiers were surprised by a hundred of the enemy. One proposed to the other to run for it. "No," was the cool reply, "there's no danger, for they say only one ball in 200 ever hits and there are only one hundred of those fellows."

Duncan's figures give 82,901 British soldiers sent to the Crimea, but the average strength was only 34,559, or only about 40 per cent., of effectives. The killed (2,755) and the deaths from wounds (2,019) gave a battle death rate of 69 per 1,000 per annum, while the disease death rate rose to 230 per 1,000 per annum. In all, 300 men out of each 1,000 perished each year!

But the French statistics are still worse. While 315,000 were sent out, the average strength was less than 104,000 effectives, or only 33 per cent. The killed numbered 7,607 and the deaths from wounds 8,813. The battle death rate was 70, the disease death rate 341, per 1,000 per annum. Over 6,000 died from typhus alone.

Could there be a nobler example of the altruism of our profession—an altruism often tested and never in vain—than that shown by Drs. Richard P. Strong, Thomas W. Jackson, and many other doctors and trained nurses, and now finally by the chief of our corps—that friend of humanity—Major General William C. Gorgas in hastening, regardless of danger, to the relief of Serbia, sorely smitten by the deadly typhus fever?

Chenu's report gives a summary of the English as well as the French losses. Comparing it with Simpson's civil statistics eleven years later the mortality of the four selected amputations (arm, forearm, thigh and leg) was as follows: Of 2,089 of these four amputations in civil hospitals the mortality in Simpson's table was 41 per cent. In the Crimean War among the British there were 460 such amputations and 183 deaths, or 40 per cent. In the French army there were 5,972 such amputations with 4,023 deaths, a mortality of 67.4 per cent. In both armies disarticulation at the hip-joint had a mortality of 100 per cent., i. e., every case died. It is instructive also to compare the fate of those who had an amputation of the thigh (1,666 French cases) with a mortality of 92 per cent., and 48 cases treated conservatively, i. e., without amputation, with a mortality of only 70 per cent.!

In our Civil War Duncan quotes the figures of Fox, which are "the latest revised statistics and are all larger than those of the Medical and Surgical History of the War." The average strength of the Union Armies was 806,755, and the deaths 359,528, of whom 67,058 were killed in battle and 43,012 died of wounds. This gives a battle death rate of 33 per 1,000 per annum. The disease death rate was 65 per 1,000 per annum. The case death rate from disease was only 3.4 per cent., a very low figure.

I can testify to the excellent condition of the Civil War hospitals, of which I saw many, but only in the East. When I say "excellent condition" it must be with the reserve that we knew nothing as to bacteriology, which did not exist, nor of infection, which was utterly unkown as to its causes and prevention. The general sanitary conditions, and by this I mean shelter, ventilation, cleanliness, good food, as good nursing as intelligent orderlies could give, etc., were all excellent. But the surgical conditions as we *now* know were simply dreadful. Practically every wound suppurated, and in summer I have seen many wounds swarming with squirming maggots as large as chestnut worms—disgusting, but fortunately, not especially dangerous.

In my Surgical Reminiscences of the Civil War"[17] I have given many statistics taken from the official Medical and Surgical History of the

[17] Keen, "Addresses and Other Papers," 1905, p. 420.

War, a few of which I will reproduce that you may see what blessed conditions you "free born" men have inherited. Pymeia (blood-poisoning) was one of our worst scourges. There were 2,818 cases, and of these only 71 recovered, a death rate of 97.4 per cent. Few of you probably have seen even one such case. I have given a matter-of-fact description of it in my "Surgical Reminiscences," but if you wish to see it sketched by a master's hand read that most touching and beautiful of all medical stories I know—"Rab and his friends," by dear old Dr. John Brown, of Edinburgh. He vividly paints the sudden change in the wound, the pulse, the eye, the mind, on and on, worse and worse, until "that *animula, blandula, vagula, hospes comesque* was about to flee."

Tetanus had a mortality of 89.3 per cent. Of amputations at the hip-joint 83.3 per cent. died. Trephining had a mortality of 61 per cent. Even of ligations of the femoral artery, 374 in number, 281 died, or over 75 per cent. Of 2,235 cases of secondary hemorrhage, 61.7 per cent. died. Hospital gangrene, of which there were several hundred cases, had only a mortality of about 25 per cent., because we early learned the correct though empirical treatment, viz., the application of the actual cautery, pure bromine, strong nitric acid or similar destructive agents which killed the germ, whatever it was, and arrested the disease.

The Franco-Prussian War of 1870-71 was marked by notable progress in military sanitation in the German army, yet in spite of this there were

74,205 cases of typhoid fever, almost 10 per cent. of the entire average strength (788,213) and 8,904 deaths, a mortality of 11.3 per cent.

Surgically the results were nothing to boast of. Listerism had as yet made but little progress in the profession. Carbolic acid was used to some extent, but there was no thorough antiseptic system, for the germ theory was as yet neither understood nor accepted.

Of tetanus there were 294 cases, and 268 died, a mortality of 91.1 per cent.

The total of the four selected amputations was 2,194 with 1,196 deaths, a mortality of 54.5 per cent.—over one half.

Disarticulation at joints showed an average mortality of 56 per cent. Fifteen amputations at the hip-joint gave a mortality of 100 per cent., and resections claimed 40.2 per cent. of deaths. Even at the knee-joint Stromeyer amputated 36 times with 36 deaths and Nussbaum 34 times with 34 deaths. [18]

The French results were naturally worse, for their armies were constantly being defeated and retreating, and, especially in the latter part of the war, they consisted largely of volunteers, while the Germans were mostly veterans of the Schleswig-Holstein and Austro-Prussian wars.

Of the Boer War (1899-1901) only two features need be noticed. First, that typhoid attacked 57,684 men and killed 8,022, while the Boers only killed 7,781. Bacteria were more deadly than bullets, as Osler has said.

[18] Wrench's "Lister," p. 236.

Secondly, the modern missile was for the first time in general use, with the result that instead of about 15 per cent. of the wounded losing their lives, only about 8.8 per cent. died. The wounds from the new missile were much less severe and healed more quickly than ever before. The first aid packet also had come to the help of the soldier.

The Spanish American War, surgically speaking, was of little moment, as the numbers killed and wounded were too small to make the statistics of any great value, but it is gratifying to find that only 4.6 per cent. of the wounded died.

Typhoid, however, held high carnival. It caused 86.24 per cent. of all the deaths! Happily we can say that hereafter—thanks chiefly to the anti-typhoid inoculations—there will never be another such holocaust. (Vide Lecture II.)

The statistics of the Russo-Japanese War also need detain us only a moment. I shall only quote the Japanese official statistics, as given by Major Lynch, of our army.[19] There were 47,387 killed. Of 173,425 wounded 11,500 died, a mortality of 6.7 per cent. The killed and those who died of wounds numbered in all 58,887, while the deaths from disease numbered only 27,158, a remarkable showing.

The present war naturally has yielded so far very few statistics. These can only be collected and tabulated after some years of peace. So far as I can judge, I fear that, while the mortality

[19] "Reports of Military Observers attached to the Armies in Manchuria during the Russo-Japanese War," Part IV., p. 399.

from disease (except perhaps from typhus, especially in Serbia) will be less than in former wars, the military conditions are such that the larger number of artillery wounds, the unavoidable delay in gathering the wounded into hospitals, the apparent absence of any truce for collecting the wounded and burying the dead, and the virulent infection from the soil may result in a large mortality rate and possibly a larger percentage than in previous wars in spite of the benefits of Listerism. But were the first aid-packet and the Listerism treatment not available the mortality ratio in this present horrible war unquestionably would be far greater than that which will be recorded.

This short résumé gives us some idea of surgical conditions preceding the great revolution inaugurated by Lister to which we will next proceed.

LECTURE II. AFTER LISTER

Yesterday the dominant note was one of despair and defeat. To-day the dominant note shall be one of joy and victory.

Instead of hospitals reeking with pus and emptied by death, of operation after operation, when the roll was called, reporting a mortality of 40 per cent., 50, 75, 90, and even 100 per cent.—we have hospitals of immaculate whiteness and emptied by quick recovery, while the roll-call of operations reveals very few mortalities exceeding 10 per cent.; most of them having fallen to 5 per cent., 2 per cent., 1 per cent., and even small fractions of 1 per cent.

The story of Lister's work as recorded in his successive papers [1] is one of the most fascinating in all surgery. His earliest studies, from 1853 to 1863, were in physiology and pathology. Next he took up his researches on putrefaction (or as we should now say infection and suppuration) which led to his devising the antiseptic system. He was influenced to make these observations and experiments, which he applied with such signal success to surgical problems, by Pasteur's earlier researches. He always cheerfully acknowledged his debt to the eminent Frenchman. When a student in Paris in 1865 I knew Pouchet fils and was an interested spectator in the fight between Pasteur and Pouchet's father as to spontaneous generation. Lemaire's book on "Acide Phénique" (carbolic acid) was published that same year.

Bacteriology did not exist as a science, but Pasteur, Lister and a few of the elect in the upper realms of imagination saw the "germs" or "microbes and firmly believed them to be the cause of infection. In 1900, at the age of seventy-three, Lister restated his earlier work [2] and illuminated it by many observations, experiments and drawings made in these early years, but first published fifty years after they were made.

If you wish to know the man, his fertility in devising new and convincing experiments, and his mental acumen in interpreting them "read, mark, learn and inwardly digest" that paper and use it as a model.

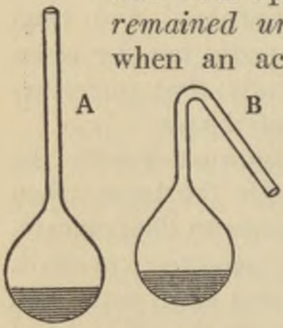
[1] Lister's Collected Papers, 2 vols., Oxford, 1909.

[2] *Brit. Med. Jour.*, 1900, II., 969.

Paré in his naïve way tells us that he sought various applications which might "mitigate the pains [of his patients] and happily"—mark the word *"happily"*— "bring them to suppuration." That is the "laudable pus" of the pre-Listerian days. Lister, on the contrary, believing that infection and suppuration were evils, and avoidable evils, sought by various means to prevent them. But he says "all my efforts [during his work in Glasgow, 1860–69] proved abortive," and then adds significantly "as I could hardly wonder when I believed with chemists generally that putrefaction was caused by the oxygen of the air."

They and he were deeply impressed with the absence of putrefaction in simple fractures when the air and its oxygen had *no* access to the fracture. In my own lectures, as I often used to express it, "The very best antiseptic dressing is an unbroken skin." In compound fractures on the other hand when the air and its oxygen *had* access to the lesion, putrefaction always took place and caused a frightful mortality.

To test this supposed noxious influence of oxygen he devised many experiments, and among them one which may be well called an "experimentum crucis." He filled four flasks one third full of urine (a quickly putrescible liquid) and drew out the necks to tubes one twelfth of an inch in diameter. *All* these tubes were *left open.* Three of these long necks he bent at various angles downwards (B); the fourth (A) was left vertical and also open. He then boiled all four flasks and awaited the result. The air and its oxygen had free access to the urine, being slowly drawn in during the colder night hours and driven out in the warmer daytime in all four flasks. Any supposed "germs" floating in the air, he reasoned, being heavier than air, could not climb up the slanting necks and fall into the liquid. In a short time the urine in the flask with the vertical open neck was decomposed, but the other three flasks, also with open necks but bent downward, *remained undecomposed for ten years!*, when an accidental fire destroyed them.



Could there be a more convincing proof that the oxygen had no influence whatever in producing putrefaction, but that it was due to living matter, "germs," in the air? It was a fine instance of the "scientific use of the imagination." "Germs" had been observed from time to time, but had not been generally accepted as the *vera causa* of putrefaction. The experiment just related was tried about 1867. The commonest, all-pervading germs, the staphylococcus and streptococcus, were not identified and proved to be the chief pyogenic (pus-producing) organisms until 1881, fourteen years after Lister had seen them so clearly with his mind's eye! Even in 1898 when I published my "Surgical Complications and Sequels of Typhoid Fever" I had to prove by elaborate citations of experimental and clinical evidence that the typhoid bacillus itself could cause suppuration, and that it had actually been observed in the circulating blood—for the past ten years or more a work of supererogation.

From Glasgow Lister went to Edinburgh (1869) as the successor of his father-in-law, Syme, and continued to experiment, to practise and to publish, but only a few were convinced, among them being Syme himself.

On the continent in the early 70's Saxtorph in Copenhagen, Thiersch in Leipzig, Volkmann in Halle, Nussbaum in Munich, and Championnière in Paris were among Lister's earliest and most enthusiastic disciples. In America not much attention was paid to his work until he visited Philadelphia in September, 1876, to attend the International Medical Congress held in connection with the Centennial Exhibition. He was made president of the Section on Surgery and read a paper on the antiseptic method.

At that time I heard him and became fully convinced of the truth of the "germ theory" and of the value of his antiseptic method. When I went on duty at St. Mary's Hospital, October 1, 1876, I adopted the system (and was the first surgeon in Philadelphia to do so) and have never abandoned it. For me it changed surgery from Purgatory to Paradise.

But the reception given to his paper at our congress was anything but enthusiastic. The only surgeon who practically accepted Lister's method was that excellent St. Louis surgeon, John A. Hodgen. But so hazy were the general ideas of bacteria that in his own paper Hodgen speaks only of "germs" and "germinal matter" and had no idea of bacteriology as we now know it, for the science, and even its name, did not yet exist.

In the discussion of Hodgen's paper Hewson advocated his then well-known views on the value of dry earth as an "antiseptic." Frank Hamilton, of New York, while claiming extraordinarily good results from the open-air treatment and the warm-water treatment and other rival methods, "damned with faint praise" the antiseptic method. Kinloch, of Charleston, took the same attitude; Carpenter, of Pottsville, a Civil War surgeon, advocated chlorine in septic cases. Others sang pæans in praise of "perfect cleanliness" and said they "used both carbolic and salicylic acids, but *not* for the purpose of excluding germs." In the discussion on Lister's paper, Van Buren, of New York, doubted the safety of the spray of hernia and abdominal sections and Satterthwaite, of New York, rejected the germ theory of putrefaction.

In 1877 Girard, of the U. S. Army,[3] became the enthusiastic supporter of Listerism.

In 1880 Markoe, of New York, while admitting the fine results of Listerism, spoke of "its somewhat arrogant pretension to be the true and only gospel of the surgery of wounds."[4]

In 1882 Listerism was again discussed in the American Surgical Association. Briggs, of Nashville, endorsed Lister's method as "an epoch in surgery." Yet so limited was our knowledge of "germs" even then that warfare was waged only

[3] Circular No. 3, Surgeon General's Office, August 20, 1877.
[4] *Amer. Jour. Med. Sci.*, LXXIX., 1880, p. 305.

upon those "in the air." When these could be excluded he said "putrefaction . . . fails to occur." Yet Briggs qualifies his endorsement by saying that the

"supremacy [of the antiseptic method as contrasted with other methods of treatment] . . . can not be demonstrated by statistics . . . and the present unsettled opinion concerning the proper status of his [Lister's] method is due in great measure to that fact."

He emphatically dissented from the germ theory, and added

"Carbolic acid is the keystone of the Listerian wound treatment. . . . The germ theory is at fault and furnishes a very unstable foundation for a system of wound treatment."

Moore, of Rochester, N. Y., proposed to exclude the air

"by passing carbonic acid gas directly into the place where the operation is to be performed. In consequence of its being heavier than the atmosphere it preoccupies the space"(!).

Campbell, of Georgia, "did not believe that bacteria . . . are the cause of that condition [suppuration]." The various men named were among our foremost American surgeons.

Lister's opponents entirely missed the great fundamental facts underlying the germ theory and Lister's antiseptic method, viz., that infection in all its various forms was always of bacterial origin—a wholly novel and momentous idea. Each form of infection, e. g. tetanus, tuberculosis, typhoid, etc., it was soon proved, arose invariably and solely from its own specific kind of germ. Whether carbolic acid or any other germicide was the best was a mere matter of detail and not of principle.

In commenting on this discussion in which one prominent speaker is said to have asserted that Listerism "is now dead"—a remark I do not find in the *Transactions*—*The Lancet,* a belated, but then, and ever since, a real convert, truly said

> "Surely it is too late in the day to contest the truth of the germ theory."[5]

Yet even a year later (1883) at the American Surgical Association while B. A. Watson, of Jersey City, fully accepted Listerism, other prominent surgeons of Philadelphia, New York, New Orleans, Mobile, and other cities even declared in the discussion that no surgeon in their cities or states used the method. McGraw, of Detroit; Dawson, of Cincinnati; Campbell, of Georgia; Prince, of Illinois, were "doubting Thomases," while Kinloch, of Charleston, and Nancrede, then of Philadelphia, advocated it.

But if its progress was obstructed in the United States, its foes in Great Britain were even more strenuous and for a season more successful.

In spite of the striking results in Glasgow and in Edinburgh Lister was looked at askance as "unorthodox."

1875 *The Lancet*[6] had said

[5] July 1, 1882, p. 1088.
[6] October 16, 1875, p. 565.

"there is less antiseptic surgery practised in the metropolitan hospitals than ever there was."

At the Clinical Society[7] in a debate on antiseptic surgery in 1875, Mr. Maunder said with a fine, but, as the event showed, a too precipitate sarcasm:

"Mr. Lister expects to prevent traumatic fever and . . . suppuration."

Timothy Holmes, while professing to have used antiseptics "for some years," declared his disbelief in Mr. Lister's theory with regard to "germs." *The Lancet's* editorial on the debate said it was "evident that few of the speakers either place faith in Lister's theory or carry out his practise in full."

After eight years in Edinburgh Lister was chosen professor of surgery in King's College, London, in 1877. This was the last stand of his opponents. The *British Medical Journal,* however, heartily urged the appointment of "the great surgeon of Edinburgh."

October 1, Lister gave his first lecture. He took as his subject "Bacteriology," though not using that title for, as Stewart said, "as yet the science had not a name."[8]

Stewart[9] gives a vivid account of the dreary days during which he and the other assistants whom Lister had brought with him from Edinburgh wandered in wards of other hospitals

[7] *Lancet,* October 30, 1875. p. 628.

[8] The earliest instance of the use of the word "bacteriology" I have found is a quotation dated 1884 in the Oxford Dictionary.

[9] Wrench, p. 274 *et seqq.*

"heavy with the odor of suppuration" while Lister's own small wards were filled with empty beds. Instead of the Edinburgh crowds of "500 eager listeners" their "hearts were chilled by the listless air of the 12 or 20 students who lounged into lecture at King's"—only 12 or 20 students!

But a month later the tide turned.[10] A case of fractured patella was admitted and in violation of all surgical precedent, for in that septic era to open a knee-joint meant too often the loss of limb or even life, Lister boldly opened the joint, but with every antiseptic precaution, and wired the two fragments together. This elicited the remark from a distinguished London surgeon:

> "When this poor fellow dies, someone ought to proceed against that man for mal-practise."

But the man *got well.* Soon after this a case with an enormous malignant tumor of the thigh, which had been declined by other surgeons, came to Lister. He amputated the limb and,

> "the members of the staff and students visiting this interesting patient were astonished to find him in a day or two sitting up in bed and reading a paper, being free from pain and free from fever."

A little later Paget and Hewitt both refused to operate on a lady of social importance with a large tumor of the shoulder-blade. Lister operated in the presence of Paget and Hewitt and she recovered without suppuration, fever or pain.

Yet two years later still (1879) Savory, Thomas

[10] Wrench, p. 278 *et seqq.*

Bryant, Tait and Spence, while claiming to practise antiseptic surgery so far as strict cleanliness was concerned, declined to subscribe to Lister's doctrines or to practise his method.

But the enthusiastic acclaim of the International Medical Congress in Amsterdam in that same year set the seal of approval of the profession at large. This may be said to be the date of the general acceptance of Lister's theory and Lister's method. London then capitulated.

In 1902, twenty-three years later, London made ample amends for its persistent early skeptism by a most generous outburst. The Royal Society, of which Lister had been president and from which he had received two medals, gave a banquet in honor of the jubilee of his doctorate. It was a most distinguished occasion, and was made preëminent by a happy sentiment by Mr. Bayard the American Ambassador. Said he, addressing Lister:

> "My Lord, it is not a Profession, it is not a Nation, it is Humanity itself which, with uncovered head, salutes you."

Better, far better, such a eulogium than the peerage which had been already bestowed upon him.

Having now traced so imperfectly the fortunes of the germ theory, let us see the results of Lister's labours. The first results are his own, especially in Glasgow. There the horrible conditions he has so startlingly portrayed [11] should have made his wards a charnal house.

[11] *Lancet,* 1870, I., pp. 4, 40, and quoted in my "Animal Experimentation and Medical Progress," pp. 216-18.

The mortality in the other accident ward was so excessive that it had to be closed. But in Lister's ward, separated from the other only by a corridor twelve feet wide, for the nine months "in which his antiseptic system had been fairly in operation . . . not a single case of pyemia, erysipelas or hospital gangrene had occurred."

The reason for the first attempt to apply the antiseptic system to man is well stated in his very first paper on the antiseptic method in 1867.[12] He wrote

> "The frequency of disastrous consequences in compound fracture, contrasted with the complete immunity from danger to life or limb in simple fracture, is one of the most striking as well as melancholy facts in surgical practise."

Well might he say this, for while simple fractures had practically no mortality, the mortality of compound fractures at that time was from 28 to 68 per cent! In this, his first paper, he reported in detail eleven cases, with one death, an unheard of mortality of only 9 per cent.!

Thus encouraged, he attacked with an equally happy outcome abscesses, especially that bane of surgery in those septic days, abscesses of the spine. Be it observed too that fifteen long years were to elapse before the tubercle bacillus, the cause of such abscesses, was discovered by Koch (1882).

From accidental wounds it was but a step to de-

[12] *Lancet*, 1867, I., p. 326 *et seqq.* and II., p. 95, and Lister's "Collected Papers," II., p. 1.

liberately infect wounds, i e., surgical operations. Here too preventive antisepsis gave equally valuable results.

Lister, however, was much more given to establishing principles and methods than to statistics, but some of his early disciples published striking proofs of the value of his method by contrasting their former results with those which followed the acceptance of the germ theory and the adoption of Lister's antiseptic treatment.

Thus Dennis [13] (1890) says that

> "The time is within my own recollection when, in Bellevue Hospital, amputation was immediately performed as a routine treatment to prevent blood poisoning, upon the admittance of a compound fracture; and this operation was considered by surgeons as offering to the patient the only chance of recovery."

This corroborates what Syme had already said in Edinburgh, that on the whole he was inclined to think

> "it would be better if in every case of compound fracture of the leg amputation were done without any attempt to save the limb." [14]

Dennis in his paper reported 681 cases of compound fracture, with only 19 deaths, a mortality of only 2.8 per cent., and only one of these 19 deaths was from sepsis, or 1/7 of 1 per cent.!

In Nussbaum's insanitary hospital in Munich,

[13] *Medical News,* April 19, 1890, p. 423.

[14] Cameron, *Brit. Med. Jour.,* December 13, 1902, pp. 1844-45.

which Lister visited in the summer or autumn of 1875, he states [15] that pyemia had been

"very frequent and hospital gangrene which made its appearance in 1872, had become annually a more and more frightful scourge until in 1874 it had reached the astounding proportion of 80 per cent. of all wounds that occurred in the hospital, whether accidental or inflicted by the surgeon!"

After trying every possible different method of treatment and still being unable to combat hospital gangrene and pyemia, Nussbaum finally adopted Lister's full antiseptic treatment and from the beginning of 1875 they had "not had one single case of hospital gangrene . . . and were doubtful whether they had had one case of pyemia"; and

"the convalescent wards—which previously had been filled and overflowing constantly—Lister saw standing one after another empty, because patients, no longer affected with hospital gangrene, recovered much more rapidly."

In Halle, Volkmann [16] was operating in an extremely unhealthy hospital in small, overcrowded wards, with the toilet rooms opening directly into them and a large drain running directly underneath. It was so bad that it had been condemned to demolition. In the two years after his introduction of the antiseptic method in 1872, no single patient suffering from compound fracture had died

[15] *Brit. Med. Jour.*, 1875, II., p. 769, and "Lister's Works," Vol. II., p. 248.

[16] "Lister's Works," II., pp. 249-51, *Brit. Med. Jour.*, 1875 II., p. 769, and Lindpainter (Volkmann's assistant), *Deutsch., Zeit. f. Chir.*, October, 1876, p. 187.

either from the fracture or from a necessary amputation, nor was there a single death from secondary hemorrhage or gangrene. No case of blood poisoning had occurred for a year and a half, though sixty amputations had been done. Just before Lister's method had been introduced, of 17 amputations 11 had died from pyemia alone, a mortality of 65 per cent. Just after adopting Listerism the death rate of his amputations fell to 4 or 5 per cent.[17]

Hospital gangrene had been as it were "blown away" by a puff ("weggeblasen"); not a single case occurred. In Lindpainter's extensive tables of Nussbaum's cases one is struck, on glancing over them, to see how before the antiseptic method was adopted case after case is marked "died," "died," "died," and in the later tables, after its adoption, almost a uniform "recovered," "recovered," "recovered."

But the most striking testimony to the value of Lister's services to suffering humanity is not the statistics of the mortality in amputations, compound fractures, puerperal fever [18] or in any single disease or operation, but in the enormous and successful enlargement of the beneficent field of surgery. In my own early days "before Lister" the common operations were

1. Amputations.
2. Ligation of arteries.
3. Removal of external tumors.

[17] *Lancet*, 1881, II., p. 281.

[18] See the extraordinarily interesting paper by J. Whitridge Williams, *Jour. Am. Med. Ass.*, April 22, 1911.

4. Lithotomy.

5. Tracheotomy, chiefly for Diphtheria and foreign bodies. A few resections, colostomies, trephining (when unavoidable) and herniotomies (for strangulation) were done. Ovariotomy was never done until the tumor had become so large as to threaten life, and then operation was denounced by many as wholly unjustifiable, for it had a mortality as high as two out of every three cases. The head, the chest, the abdomen were ticketed *"Noli me tangere"* except in the rare cases when operation was absolutely unavoidable.

I used to wonder why the students in "Rab and His Friends" rushed to the amphitheater to get the best seats to see Syme amputate a breast—a so very common operation nowadays. But then I recalled the fact that even in my student days, when anesthesia was the rule, capital operations were rare. But in the preanesthetic days operations were far rarer. In the *five years* preceding the introduction of ether at the Massachusetts General Hospital (Boston) the *entire staff* only performed in all 184 *operations* or *three operations a month!* When operations had become not only painless, but safe, then the number performed increased almost at a geometrical ratio, so that at present the numbers even of single operations by single surgeons—e. g., of ovariotomies, appendectomies, goiters—mount into the thousands. What is still more gratifying, the usual death rates of most capital operations in the pre-Listerian days of one patient in four, in three, or in two, or even two out of the three (!) have been changed to one in twenty, thirty, fifty, or to even less than one life lost in one hundred or even one in two hundred operations!

It is impressive—most impressive—to call the list of only the most frequent and the most important of our present operations. Were Mott, Bigelow or Pancoast—all of whom I remember well—to come to life again they would wonder whether we were not stark crazy.

The following list I have made—*currente calamo*—on the instant.

Amputations are far *less* frequent. After a single battle in the Russian campaign, Larrey, Napoleon's great surgeon, performed not less than 200 amputations. To-day of 200 similar cases, sometimes even with wounds involving joints, the great majority would recover without amputation.

Formal ligations are far fewer.

External tumors of any size are now removed from all parts of the body without fear of erysipelas, which so worried Sir Astley Cooper before he operated on the king for a simple wen. The mere fact that any tumor is internal—inside the head, the chest, the abdomen, or the pelvis—has practically no influence on the decision whether it should or should not be removed.

Martin of Berlin, has done over 1,000 ovariotomies, with a mortality of less than 2 per cent., and the Mayos from 1905 to 1914, inclusive (the only period for which I had the annual reports at hand), reported 609 cases with 5 deaths, or eight tenths of 1 per cent. Colostomy and enterostomy are frequent. Many thousands of simple hernias have been cured by operation, with practically no mortality; and if done in strangulation, with slight mortality.

The new surgery of the head attacks tumors even of the hypophysis, punctures the lateral and the fourth ventricles with impunity, successfully extracts foreign bodies and in some cases relieves epilepsy and mental derangements.

Trephining—even for exploration—is frequent and *per se* involves slight danger, as in decompression.

In the neck simple goiters even of large size are removed, with a mortality of 1 and 2 per cent.; and laryngectomy is common.

In the chest, that very citadel of life, the heart itself is sutured for gunshot and stab wounds, saving one life out of two; the esophagus is attacked for cancer and the removal of foreign bodies; large portions of the chest wall are removed for old empyemas, and the lungs can now be operated on at leisure, thanks to insufflation anesthesia.

In the abdomen, the various operations on the stomach, even to its total extirpation, are too many to name in detail; and with a success that is truly marvellous. We play with the intestines at will, opening them for foreign bodies and for drainage of the contents, removing what we wish, anastomosing them and short circuiting their contents. Tumors of the liver unless malignant are extirpated with a very low mortality and wounds of its substance are treated with success; gall stones and gall bladders are removed every day; the spleen is anchored, sutured or removed as we find best; the pancreas is no longer inaccessible; the kidney and the ureter, like the stomach, have their own list of operations far too long to rehearse.

In the pelvis the bladder is opened and partly or even wholly extirpated; the prostate removed; the uterus, the ovary, the tubes, the parovaria have a long list of life-saving, comfort-giving operations to their credit.

We suture and anastomose nerves; we suture and anastomose blood vessels even in the new-born, we criss-cross the circulating blood to prevent gangrene, and endoaneurismorrhaphy has practically banished the Hunterian operation for aneurism and saved many a limb and life. We transplant skin and bones and joints, and even half joints, with success. To all these we have added the X-rays, the serum and vaccine treatment of many surgical disorders and are gradually throttling disease, sometimes at its very birth.

It almost takes one's breath away! Yet it is an incomplete and ever-lengthening list! As Mumford[19] well says:

> "Daring has become conservatism; rashness has become common sense."

Practically our ability to do all these life-saving operations is the result of the researches, the experiments, and the achievements of Lister and his followers. Had antisepsis not made all operations, including the opening of the head, the chest, the abdomen, and the pelvis, safe, we should still be practising the very limited surgery of the 60's.

[19] Keen's "Surgery," I., p. 76.

Every year thousands whom now we restore to life and health would still be dying.

What now are the prospects of Listerism in the present horrible war? I have so far used the term "antisepsis." Asepsis is a later and a natural development of antisepsis and in civil life is of course preferable. The underlying and enduring principle of Listerism—*the germ theory*—is the same in both. There is no fundamental antagonism, but really a fundamental agreement between the two methods.

In the present war the surgeons whose papers I have so far read are almost a unit in favor of the antiseptic rather than the aseptic treatment of the wounded. They are right in my opinion, and the reason is plain. Comparatively few of the wounded reach hospitals with uninfected wounds. Mild wounds, and even in some cases severe ones, if they can be dressed soon after being inflicted, heal readily.

Sir Anthony Bowlby's [20] striking description of the conditions in the trenches shows the difficulties very clearly:

"In this trench warfare, if a man is hit, he often falls into filthy mud and water, which may be three feet deep or more. The trench is only two and a half feet wide. It is night, you can only grope about in the dark and can do no dressing of any kind, for you can't even get any clothes off in the dark, and in so cramped a space, and you must try to get the man away to a "dressing station" half a mile distant, and thence to a field ambulance. If it is daylight, you can't get the man out of the trench at

[20] *Jour. Am. Med. Ass.*, April 10, 1915, p. 1257.

all, and he may have to be kept there for many hours, because he would certainly be killed if he were got out of the trench. And the water in the trenches is hopelessly polluted and soaks his clothes and his wound. Large lacerated wounds, and especially bad bone smashes, are so contaminated that it can never be possible to render them aseptic."

There is a noteworthy difference between the results of the wounds in the case of the trench-inhabiting soldiers and the wounds of sailors.

The latter escapes the dangers of the soil-infected trenches.

"Sailors with the most severe type of wound, ragged, irregular, with uneven surface produced by herniated muscle and retracted severed fibers, usually have recovered promptly. Soldiers suffering from slight wounds have often had them contaminated with bacilli from the soil; particularly the anaërobes."

Hypertonic salt solutions like sea water are actually remedial by promoting the flow of lymph in the wounded tissues.

But in a very large number of wounded soldiers, possibly the majority, hours and sometimes even days of delay ensure infection and then the surgeon is face to face with the one overwhelming surgical problem which has so far baffled all our efforts, viz., *how to transform a septic wound into an aseptic wound and keep it so, and at the same time how to combat the toxins already diffused throughout the body, but without doing harm to the patient himself.* Cheyne,[21] Ehrlich, Wright

[21] *Lancet*, February 27, 1915, p. 419.

and Carrel are all at work and it may be that the happy day when this, the most pressing and urgent problem in surgery, shall be solved, may come through this devastating war.[22]

Meantime Souttar[23] extols plenty of fresh air or better still of oxygen (our old supposed enemies in the 60's) and says

"Men with wounds so foul that their presence in the wards could not be permitted, were placed, suitably protected, in the open air, the wounds being left exposed to the winds of heaven, covered only with a thin piece of gauze. The results were almost magical, for in two or three days the wounds lost their odor and began to look clean, while the patient lost all signs of the poisoning which had been so marked before."

Of tetanus in our Civil War there were in the Union army in all 505 cases and 451 deaths, 89.3 per cent. In the War of 1870-1 in the German army there were 294 cases and 268 deaths, or 91.1 per cent. In the present war there have been many cases in the allied armies in the west, but I have seen no numbers or percentages. In the German army, however, Czerny[24] says that

[22] In the *British Medical Journal* of April 10, 1915, a most important article by Sir Almoth E. Wright on "Wound Infections" is begun. This should be very carefully read. On pp. 735-38 of the same *Journal* for April 24, 1915, is another very important paper giving full directions for treatment. See also an interesting editorial in the *Journal American Medical Association,* May 23, 1915, p. 1765. [See Keen's Surgery, Vols. VII & VIII *passive* for the final lessons of the War.—W. W. K., 1922.]

[23] *Brit. Med. Jour.,* March 20, 1915, p. 504.

[24] *Brit. Med. Jour.,* March 20, 1915, p. 521.

"the greatest danger to the wounded had been tetanus. Of 60,000 wounded Bavarians, 420 developed tetanus, which proved fatal in 240 cases (57.1 per cent.). The prophylactic value of the tetanus serum had been established, but its extensive employment was not always feasible."

This is a far larger percentage of cases than in our Civil War, or the Franco-Prussian War, but the mortality is far less—probably due to the even partial employment of the serum. [Later tetanus was almost wiped out by the immediate use of large doses of the antitoxin.—W. W. K., 1922.]

During the Civil War I never saw a case of "gas-gangrene" which has been so prevalent and dangerous in the present war. The soil of Belgium and France, which has been cultivated and roamed over by animals for more than twenty centuries, is highly infected. Over ten different gas-producing bacteria have been found.

Sidney Rowland's experiment [25] well shows the virulent infection of the soil. Shaking up some of the soil from the trenches with some water, he injected a few drops into a guinea pig and the animal was dead in eighteen hours with widely diffused gas gangrene. Soldiers have died from the disease in thirty-six hours.

Delorme has advised, as the germ is anaërobic, the injection of peroxide of hydrogen. Hartmann believes it needful to open the wounds freely and employ thorough irrigation with the peroxide [26]—a most important procedure. *Early* treat-

[25] *Brit. Med. Jour.*, November 28, 1914, p. 913.

[26] *Jour. Am. Med. Ass.*, Jan. 16, 1915, p. 259. See also Lawson and Whitehouse, *Brit. Jour. Surg.*, Jan. 9, 1915. p. 444.

ment of infected wounds even in cases of gas gangrene results favorably in the hands of Cazin. Of 158 cases received even up to forty-eight hours after battle all recovered in spite of their serious nature. Among those received after four or five days' transportation the mortality reached 10 and even 20 per cent.[27]

[Finally practically every wound was treated by débridement and épluchage—free incision to open the entire wound, removal of all dead and dying tissue, and the Carrel-Dakin treatment followed by early closing of the wound after all infection has been overcome. The results were marvellously good. See Keen's Surgery, Vols. VII and VIII.]

I have related the terrible mortality from typhoid in the Boer and the Spanish-American wars. One bright spot in the present war is the conquest of typhoid. In spite of greatly increased numbers and of most unfavorably sanitary conditions in the trenches as I have shown, conditions which in former wars would have given rise to dreadful epidemics of typhoid, the following statistics in the British army officially given to Parliament on March 4, 1915,[28] show emphatically how well this scourge of every past campaign has been conquered. There had been only 606 cases in all: 247 among the partially (136) and fully (111) inoculated, with two deaths (0.81 per cent.) and 359 among the unprotected, with 48 deaths (7.47 per cent.), over nine times as many deaths propor-

[27] *Jour. Am. Med. Ass.*, January 16, 1915, p. 259.
[28] *Brit. Med. Jour.*, March 13, 1915. p. 485.

tionately! The one reason for this splendid showing is the use of the antityphoid inoculation. If instead of its being only voluntary in the British army it had been compulsory as in our own army, the results would have been even better. And yet a blatant band of men and women both in England and our own country are doing all they can to oppose the use of this life-preserving remedy!

Let us now in conclusion take a general review of the surgical progress I have so inadequately sketched.

During the horrible days of Paré, Bell, Simpson, and our own Civil War there was still gradual improvement, but no *fundamental* change occurred for three centuries after Paré introduced the ligature and banished the boiling oil.

But about the middle of the nineteenth century, and especially in its last quarter, experimental research took the field. Everything that could be put to the test of accurate experiment in medicine and surgery was thoroughly investigated physically, physiologically, chemically, microscopically, biologically, bacteriologically. Laboratories were found and research workers vied with each other in countless investigations. A flood of light was thrown upon every problem. And see the result I have just read to you! Medicine proper, obstetrics, all the specialties, sanitation and hygiene, furnish equally impressive calendars of progress—principally the result of experimental research.

Chief among these experimental researches were those of Pasteur (of whom I have said far too little for want of time) and of Lister. They inaugurated a wholly *new era* in surgery.

Then followed the battle for the germ theory and antiseptic surgery, ending in final victory. Meantime a new science, bacteriology, was born.

Next came the wide extension and application of the new surgery to almost all the surgical ills that flesh is heir to. The wonderful results to both life and limb that I have recounted have naturally followed.

Even amid the disabilities and obstacles of war itself Lister's work has been a boon beyond price.

While the soldier and the scientist have been busy devising ever more frightful engines of destruction to maim and to kill, we surgeons have been equally busy devising means for saving thousands of lives and limbs in civil life, and even amid the carnage and savagery of war.

Surely our hearts should be lifted in gratitude to God for giving us such splendid powers of reasoning, experiment and research—all for the service of our fellow men.

THE DANGERS OF ETHER AS AN ANESTHETIC[1]

It is a great pleasure to tender my thanks to the Trusties and the Committee for their kind invitation to deliver an Ether Day Address.

In this historic place, 69 years ago this very day, occurred the first public use of ether as an anesthetic. We, who are accustomed to anesthesia, can hardly appreciate the courage of Warren and Morton on that memorable sixteenth of October, 1846. Surely also the bravery of the patient himself should not be over-looked, The name of Gilbert Abbott should always be held in remembrance.

I have often called the attention of my classes to a patient lying limp and apparently almost lifeless on the operating table. Lift the arm and it falls as if it were that of a corpse, touch the sensitive eye and the lids do not move. Cut the tender skin and it elicts no response. "Will he ever wake up?" "May not the flickering flame of life gradually fade away forever?" "Have I not unwittingly killed this man?" Such must have

[1] Address delivered at the Massachusetts General Hospital, on the sixty-ninth anniversary of Ether Day, October 16, 1915. Reprinted by the kind permission of the Editor from the Boston Medical and Surgical Journal of December 9, 1915.

been the insistent questions in the minds of those intrepid adventurers on that momentous occasion. How eagerly must they have welcomed the first faint evidences of returning consciousness! Had that young man died then and there, for how many years would the blessings of anesthesia have been withholden from the human race? Only eleven years earlier (1835) Père Velpeau, the great French surgeon, had said, "Eviter la douleur dans les opérations est un chimère qu'il n'est pas permis de poursuivre aujourd'hui." Who would have dared to repeat the dangerous experiment? For an experiment and a most hazardous experiment on a human being, it certainly was. Happily the result justified their temerity and millions have been blessed by the bravery of the surgeon, the anesthetist, and the patient.

In Berlin where I was a student in 1865-6 the story ran—and I believe it was authentic—that a short time earlier Henry B. Sands, then the leading surgeon of New York, urging the greater safety of ether upon Langenbeck, at his request, gave ether for him in his clinic. The patient died on the table from the anesthetic before the operation was ever begun. Naturally this deferred the use of ether in Germany for years and cost many lives.

In this city and this hospital my topic--The Dangers of Ether as an Anesthetic—may at the first blush seem ungracious. But our profession ever seeks the unvarnished and untarnished truth. To recognize that there *are* dangers is the first step in eliminating them. When life is at stake ignorance is not bliss. Forewarned is forearmed.

When I accepted the invitation and selected my topic, which had not been considered in any of the former Ether Day Addresses, I thought I had chosen an easy task. But I had hardly begun my work when I found that great progress had been made, as to much of which I was inadequately informed.

While I have had a large experience during a long and active surgical life, yet, in consequence of my retirement from active practice in 1907, I have had little or no personal experience with a number of the newest anesthetics and the latest modes of their administration. Accordingly, to make up for this lack, I devoted the past summer to the diligent study of the recent work on anesthetics and anesthesia by reading the extensive literature (especially the valuable physiological literature) of the last ten years, to a considerable correspondence (as the friends whom I persecuted will testify,) and in the early autumn through some careful observations of the administration of anesthetics in Boston, New York, and Philadelphia. It has had all the fascination of novelty and the exhilaration of success.

When I began my medical studies in 1860 there were but two anesthetics in use, ether and chloroform. Now the many anesthetic drugs, the different methods of using them, by inhalation, by insufflation, by arterial or venous infusion, by different routes,—the mouth, the nose, the rectum, the colon—by local anesthesia, by spinal anesthesia, by one drug alone or by two or more, together, or in varying sequences, by simple or complicated apparatuses, or costly and elaborate chambers for differential pressure, have almost reached the classical "57 varieties."

During the last 10 years especially, the administration of anesthetics has been rapidly changing. It is becoming more and more an exact science instead of a mass of only empirical knowledge gained by practise and at the cost of danger or sometimes even of life. The multiplicity of valuable papers, the many set discussions in our medical societies, the exhaustive studies in our laboratories of research on the physics, the physiology and the chemistry of respiration and of anesthetics, the pathological changes observed in animals after intentional or accidental deaths from various anesthetics, and after similar accidental deaths in human beings, the accumulated large statistics all demonstrate the deep interest, the scientific activity and the happy results of this new outburst of work in anesthesia.

One of the happiest results of this restless search for improvement is the rise of the *professional anesthetist,* an expert who by mastery of the subject and knowledge and prescience of danger, is able to avert or to remedy the danger—an expert who is more and more definitely coming to be recognized as comparable to the expert specialist in other departments of medicine and surgery. Says Bloodgood,[1] "Accumulated experience and reading . . . impress me more and more that anesthesia is an art in every sense of the word. *Specially*

[1] Prog. Méd., December, 1905, p. 173.

trained anesthetists are necessary for safety."

The recent organization of the American Association of Anesthetists is another welcome evidence of progress. That professional specialists in anesthesia are greatly needed is strikingly shown by the frank reply to my questionnaire by the chief anesthetist of one of our best American hospitals. "To what do you attribute the deaths from ether?" was my question, and his reply began "Lack of skill in its administration."

That such experts are especially needed in America is shown by the fact that Gwathmey's American statistics [2] compared with those of Hewitt in England show that in this country our percentage of mortality from ether is *over three times as great as in Great Britain.*

Lest the general public who may read this may take alarm and exaggerate the dangers of ether, let me say at once that the deaths are estimated in various statistics as being only one death in 4533 administrations in America (Gwathmey), one in 5112 in Germany, [3] one in 16,302 in Great Britain,[4] and even only one in 50,000 (Rovsing).[5] But even if it be only one in 50,000 yet if that one is *your* boy, it is a sorry consolation to know that 49,999 others escaped.

As soon as I fixed upon my topic I sent out to the members of the American Surgical Association

[2] Anesthetics, p. 855.

[3] Gurlt, Arch. klin. Chir., 1897, lv, 473.

[4] Hewitt and Robinson, Anesthetics, London, 1912, p. 139.

[5] Abdominal Surgery, Edited by Pilcher, p. 76. See second footnote, page 236 of this address.

a questionnaire as to immediate and delayed ether deaths, requesting exact figures if they were available, and estimated figures if they were not. I received 67 replies, for which I tender my sincere thanks to my correspondents, a number of whom took also much pains in compiling their statistics.

In 20 replies the figures were exact, though those of several active surgeons covered only a very few years. These returns showed

Exact number of etherizations	262,002
Number of deaths	34
Or 1 death in 7,706 cases.	

This is an improvement over Gwathmey's statistics, but the 34 deaths do not include some delayed deaths from pneumonia, nephritis, etc., which would probably bring the proportion down to about Gwathmey's figures or possibly worse. The 47 others—including, I regret to say, myself—could only estimate the number of their cases and deaths. The approximation to former statistics is gratifying as showing that the estimates were reasonably accurate and not too seriously optimistic.

Estimated number of etherizations	356,500
Estimated number of deaths	73
Or 1 death in 4,884 cases.	

Both the estimated and the exact numbers show that we have still over three times the proportional number of deaths as in Great Britain—a serious blot on our methods and results. This calls loudly for reform. The systematic use of duplicate charts, if collected from all available sources at intervals of five years, would show whether our results were improving or growing worse.

Compared with chloroform the dangers of ether are almost negligible. In Great Britain from 1910 to 1913 there were 700 inquests on deaths from anesthetics.[6] Of these, chloroform and its mixtures were responsible for 478 and ether for only 28. What is the relative *percentage* of fatalities of each, however, we do not know.

Personally I was brought up by the elder Gross in the Chloroform School, and I generally used it in my earlier cases. But I was soon convinced of my error, and for the last forty years I have used chloroform very, very rarely. I regard it either alone or in mixtures as a most dangerous anesthetic. With Bevan[7] and the Committee on Anesthesia of the American Medical Association,[8] I would urge that it should be discarded, excepting in a few special cases, also in the tropics and in the military surgery on or near the battlefield, and on naval vessels during action.[9] In base hospitals and on hospital ships ether should be used.*

What we want is such an anesthetic and such anesthetists that there shall be *no deaths at all.* The search for this ideal anesthetic must be vig-

[6] Editorial, Jour. Amer. Med. Assn., April 4, 1914, p. 1098.

[7] Trans. Amer. Surg. Assn., 1915, and Journal American Medical Association, October 23, 1915, p. 1418.

[8] Jour. Amer. Med. Assn., June 11, 1910, p. 1987.

[9] McCullough, Jour. Amer. Med. Assn., Sept. 25, 1915, p. 1090.

* The papers and discussions on Anesthesia in the American Surgical Association in 1911 and 1915 will well repay perusal by every surgeon and every anesthetist.

orously continued by experimenting first upon animals. It has not yet been found, for every anesthetic known has its own dangers. I fear that even the best future anesthetic may not be wholly free from this possibility. As I have more than once pointed out, the ideal anesthetic should not preserve the consciousness of the patient, who would easily be terribly frightened at the least suspicion of danger, dangers which the surgeon has often encountered and easily vanquished. His fears would not only alarm the patient, but would often provoke uncontrollable physical movements which would cause serious dangers or entirely prevent the operation. This ideal anesthetic must also, if possible, be pleasant to administer, efficacious in abolishing all pain, free from noxious after-effects, and, if possible, without danger to life.

Our commonest anesthetic—ether—is to me, personally, both as surgeon and as patient, so little repulsive, and has such very slight danger in competent hands, that after having used it thousands of times with patients, and taken it myself on six different occasions, so far as any feeling of apprehension or repugnance is concerned, I would as lief lie down on the table and take ether as I would sit down at my table and eat my breakfast. No one, however, except by *force majeure* shall ever again give it to me as on the first occasion, in 1863, from a closed cone saturated with ether, in advance, which almost suffocated me. By the open drop method on a mask or the Allis inhaler,* which are

* The ether should be dropped on the Allis inhaler just as on a mask, slowly at first, faster and faster in a few minutes,

practically equivalent, I have five other times been most pleasantly and efficaciously anesthetized. Not once have I had the least nausea. The long-continued ether taste and once some gas pains were the only unpleasant aftermaths. *Haud inexpertus loquor.*

"If patients could be educated to be as pleased when they are told that a surgical operation is necessary as they are when given a tonic, Utopia would be reached," says Bloodgood.

I had such an Utopian case some years ago when a young girl burst into tears upon my telling her that an operation for appendicitis was necessary. I tried to comfort her, but to my surprise she replied between her sobs that she was weeping for joy, for she had feared I would decide *not* to operate. Such Utopias, however, are not yet common, but I have found them gradually growing more frequent as the public are more and more convinced of the safety of modern operations and the danger of delay.

The students in our medical schools see a great many anesthetized patients, but their attention is given chiefly to the operation. Too often they receive little and in some schools no careful instruction in anesthesia. Far too frequently the function of the etherizer is delegated to the ever-changing junior residents, as if, forsooth, it were of minor importance. Next to the surgeon and even before his first operative assistant, in my opinion, stands the anesthetist, holding the scales of

but never poured in. Moderate rebreathing can be obtained by covering the upper surface by the hand.

Life and Death. Happily, at least in the use of ether, the margin of safety is so wide that even inexperience and inattention are rarely harmful.

It should be the duty of our medical schools and their hospitals *to instruct all students in anesthesia and to give them experience* by having them administer anesthetics under the supervision of their experts. In view of the constant and necessary change of internes there should be on the staff of each division one permanent expert. In small hospitals at least one of the staff should make it his business to become an expert by constant study and practice.

The anesthetist if possible should always see the patient beforehand. He can thus establish an "*entente cordiale*" which will do much to prevent fear and other psychic elements of danger.

Gerster says that long ago he learned in Billroth's clinic to be careful with patients who exhibited fear but that he never understood the reasons until Crile and Yandell Henderson explained them.

The most striking instance of the *physical results of fear* I have ever known personally was a little girl of nine in my ward at the Jefferson Hospital. A year earlier and before she entered the hospital, her clothing had caught fire and she had been so dreadfully burned that I was compelled to amputate the left arm at the shoulder joint. She made an excellent recovery *per primam,* but had not been discharged because an old ulcer on the deltoid flap had not yet quite healed. Four weeks after the amputation she was suddenly awakened in the middle of the night by a nearby fire. The ward was high studded, the windows many. It was no wonder, therefore, that remembering her own dreadful experience and seeing the flames and the brightly illuminated ward, she should think the ward itself afire and become terrified. A thoughtful nurse took her temperature, which had long been normal, and found it 105.4°. The next morning it was 99°.

A similar but less striking instance is recorded by Crile and Lower [10] in which simple fear raised the temperature to 101.2° and the pulse to 150. Bloodgood [11] reports a case in which fear alone caused the blood pressure to fall in ten minutes from 140 to 80mm. In some cases even death has resulted from fear before an anesthetic has been given.

Crile is none too insistent upon the psychic as well as the physical conditions, which are so conductive to smooth recovery.

The *condition of the blood* should be ascertained beforehand in all serious operations, especially in anemic patients. Da Costa [12] and Da Costa and Kalteyer [13] and others have demonstrated the diminution of hemoglobin due to ether. While Mikulicz advised against any general anesthetic in case the hemoglobin was below 30% Da Costa and Kalteyer represent a better present opinion by drawing the line at 50%.

[10] Anoci-Association, p. 97.

[11] Prog. Méd., December, 1912, p. 218.

[12] Med. News, March 2, 1895, p. 125.

[13] Annals of Surgery, 1901, Vol. xxxiv, p. 329.

Observation and charting of the blood pressure not only beforehand, but at frequent and regular intervals during every important or prolonged operation, especially as a guide to the degree of shock, is admitted to be important by all anesthetists.

The anesthetist should give quick warning of any serious fall in the blood pressure, which will enable the surgeon to decide for or against transfusion, for or against attempted extirpation of a brain tumor, for continuing or quickly terminating an operation. This decision can thus be made with scientific accuracy far more surely than by observation of the general physical appearance of the patient. Accurately known blood pressure is of greater value than the rate or quality of the pulse, and as pointed out by Harmer, gives warning from 5 to 20 minutes earlier than the pulse. Moreover, in the doubtful cases it is the most useful.

Prior to operations the anesthetist as well as surgeon should make himself familiar with the condition of the heart, kidneys, blood pressure, hemoglobin, and any unusual condition; should see that the mouth, tongue, teeth and tonsils are in proper condition and that provision be made to prevent chilling of the patient,—an important point never to be overlooked. Chilling and hemorrhage are the most potent factors in producing shock. Chilling by cold solutions and by alcohol used in pre-operative preparations are injurious as demonstrated by Harmer.

The anesthetist should provide against certain dangers common to all anesthesias, such as false teeth and other foreign bodies in the mouth, the prevention of paralysis of the musculo-spiral and other nerves from pressure or from abnormal positions of the arm or leg. I have had one non-fatal case of hemiplegia occurring a few hours after etherization. It is possible but not certain that this was a direct result of the increased blood pressure. Several other similar and sometimes fatal cases have been reported. It is to be remembered that in a few cases a hemiplegia has occurred shortly before the time set for operation. Had the hemiplegia occurred only a few hours or days later it might have occurred during the operation and have been (erroneously) attributed to the ether.

During operation the anesthetist should attend strictly to his own business and especially remember that the first half hour is the period of greatest danger. He should glance at the operation only from time to time, not to study the operation, but in order to anticipate the need for lighter or deeper anesthesia and when the anesthetic may be stopped. Of course he should keep himself constantly informed of the general condition of the patient by observation of the respiration, the most important function of all, of the blood pressure, pulse, pupil, color, and condition of the skin as to sweating.

I believe that an *anesthesia chart* should be kept in every case—even for a brief etherization. How elaborate this should be is a debatable question. The American Surgical Association could do good service, as Lilienthal has suggested in a letter to me, if through a committee it should prepare a standard chart adapted to most hospitals and most anesthetists. I am persuaded that a chart tends to concentrate the attention of the anesthetist upon his "job" and make him more careful. In a few years such charts would also furnish us with very valuable and extensive exact statistics. The form should be full enough to make it valuable and to compel the average anesthetist to make close and continuous observation, yet not so elaborate and detailed as to defeat its own object. Some especially expert anesthetists would prefer a more elaborate chart for more detailed observations. The American Surgical Association might also prepare this fuller form and each anesthetist could make his choice.

On first seeing the charts used by Boothby,[14] I was staggered by their apparent complexity. When analyzed, however, I found there was *less than one observation per minute.* In practice, as I have observed, Boothby easily records them all himself in a quiet leisurely fashion. Instead of distracting attention from the patient, these records fix the anesthetist's attention much more closely upon the patient's condition than if no chart is used. The occasional anesthetist will hardly be able to utilize any but the simplest chart.

If it be objected that a chart, and especially a full one, is a great deal of trouble, I answer: "Giving ether is a serious business, always attended by possibility of danger. Life may depend

[14] Jour. Pharmacol. and Exp. Therap., March, 1914, p. 329.

on the carefulness of the anesthetist, and this is surely worth any amount of trouble."

One feature of the chart of the Massachusetts General Hospital is exceedingly valuable, viz.:—that there is a first or pre-operative part to be filled in by the house officer (surgical or medical), who has had charge of the patient, giving most of the data which the anesthetist should know beforehand; a second part relating to the data and conditions during operation to be filled in by the anesthetist; and a third post-operative part to be filled in by the nurse in charge of the case immediately after operation. A *duplicate carbon copy* should be made, the original to be filed with the notes of the case; the copy filed with the consolidated "Anesthesia Records."

Here the question arises whether a doctor or a woman nurse is in general the more desirable anesthetist. No hard and fast rule can be laid down. surely no legislative action is called for, though it has been actually proposed. If one has an Alice Magaw (Kessel) or a Florence Henderson of the Mayo Clinic* or a Sister Ethelrida of Murphy's Clinic the decision is easily in favor of the trained nurse. If, however, one has such skilled doctors for anesthetist as we find especially here in Boston and other of our large cities the decision may be reversed.

* For two admirable and practical papers see Alice Magaw, Surg., Gynecol. and Obst., 1906, Vol. III, p. 795, and Collected Papers, Mayo Clinic, 1905-09, p. 567; and Florence Henderson, St. Paul Med. Jour., February, 1914, p. 74, and Collected Papers, Mayo Clinic, 1913, p. 701.

The nurse lives in the hospital and can see the patient at all times. She can soothe the timid patient, who is more often of her own sex, better than most men. She is more vigilant in observing small details. She will be less likely to be lured away from the rôle of the professional anesthetist than a man, who too often uses anesthesia merely as a stepping-stone to private surgical practice. A doctor, however, because he has studied medicine, is more thoroughly equipped than a nurse (until her experience runs into hundreds of cases) to appreciate possible or even impending dangers. Moreover, the doctor is less apt to be upset and "flustered" by a sudden perilous emergency. The best solution of all perhaps is an intelligent and alert woman doctor, such as Dr. Isabella C. Herb in Bevan's Clinic. Such Herbs, however, do not grow in every surgical garden. Personality, intelligence, zeal and quick wit may easily be worth more than greater knowledge.

In order that medical men and women shall devote themselves to anesthesia as a specialty, the public must be taught that safety lies in having an expert anesthetist, and that like any other expert, if he is to obtain a living as such, he must be well paid, otherwise he cannot devote his whole time to this specialty.

I might add also that the profession itself does not yet sufficiently appreciate this same point. Roberts [15] cordially endorses this view. The peril he so valiantly attacked is gradually passing away.

One of the real but infrequent dangers of ether

[15] The Anesthesia Peril, Therap. Gaz., Feb. 15, 1908.

is its *inflammability.* I should probably omit this because of its infrequency had I not had personally what might have been a very serious accident.

Nearly everybody thinks that the vapor from a *volatile* substance of course rises upwards. The etherizer must never forget that the vapor of ether is *heavier* than air and falls downwards. Saturate a bit of gauze with ether. Hold the back of the hand first *above* the gauze and then *below* it and you will never forget that ether vapor falls. In 1863, after Gettysburg, in a large military hospital of 3000 beds in pavilions built wholly of wood, I was trying to secure a large bleeding vessel just above the inner end of the clavicle. The only available light was five candles stuck in five augur holes in a square block of wood and held necessarily very near the ether cone. Suddenly the ether flashed afire, the etherizer flung the glass bottle of ether (it was before the days of our present tin cans) in one direction and the blazing cone fortunately in another. We narrowly escaped a serious conflagration. Why did I not use chloroform, which is non-inflammable, in conditions well known before I began to operate? I fear I must admit gross thoughtlessness. My only consolation is that the patient suffered no harm. Neither he nor I was burned and he recovered without further incident.

So happy an outcome does not always occur, for there are on record number of cases of more or less serious burns of both patient and surgeon. In one case, when the switch of an electric hand light was turned on to observe the color of the face (the patient being prone) the spark ignited the ether.

"Inflammability of the patient" might also be mentioned as a possible danger to the surgeon. Here again I speak from two personal experiences. In one, the patient in his early frenzy, disengaged himself suddenly from the etherizer, scattered the assistants and was about to assault me, when fortunately, a strong Irish orderly who, again fortunately, was standing behind him, so that the dazed patient was not aware of his presence, seized him around the waist and held him till the stage of excitement quickly passed away. Though bound like Samson with many withes, four strong men and the etherizer a few minutes later scarcely prevented his reducing the table to firewood in a second attempt to "get" me.

The other case I relate especially as a warning that no one should *ever* give ether without the presence of another person, except in emergencies when such help *cannot* possibly be obtained.

Many years ago I had to open an abscess in a young man. The etherizer did not appear, and as the patient was suffering I unwisely gave him the ether alone. He had taken only a few inhalations when he was seized with the delusion that I was about to do him harm. With one sweep he threw the ether cone away, leaped up, seized a chair and swinging high above his head was ready, nay determined, to brain me. As he was an athletic six-footer, and as he stood between myself and the door, fight and flight were equally impossible. I lost no time, you may be sure, in entering what I believe the lawyers call a plea of "confession and avoidance"; a confession of my folly, and a lively avoidance of my enemy. I have always accepted the axiom that two bodies cannot occupy the same space at the same time, but ever since that "episode," as Artemus Ward would have called it, I have been equally convinced that one body *can* be in two places at the same time. The only refuge I did not seek, was under the bed, and the evident reason for my not achieving that ignominious retreat was that my legs would have broken before I could have attained its friendly protection. Don't hint at a *"mauvais quatre d'heure."* Less than two such "bad minutes" more than satisfied me and I am sure would have fully satisfied you.

The incident, which I can now blithely portray as a comedy thus perhaps making its lesson less quickly forgotten, came perilously near to ending as a tragedy. Had the uplifted chair not been an impediment as well as a weapon, and had I not been forty years younger and forty pounds lighter, you would probably be listening to some other orator today.

In the case of women patients the rule *never* to give ether alone should be *absolute,* for delusional dreams do occasionally occur during anesthesia and are honestly believed after recovery. A charge of assault may easily follow either as a result of this sincere belief, or as a means of blackmail. If no witness was present the only evidence can be the positive assertion by A and the equally positive denial by B. How *can* the most intelligent jury be sure to decide aright? Morever, if sudden death should occur, a third person as a witness would evidently be most desirable.

Unfortunately I have to confess my own delinquency in not keeping any record of my etherizations. I must, therefore, rely upon my own and my assistants' memories as to any fatalities. Two deaths from chloroform stand out very clearly in my memory, and had I had any from ether I feel quite certain that I should not have forgotten so deplorable an event. I have had several very narrow escapes, but after a most careful review of my cases and conferring with Drs. DaCosta, Taylor and Spencer, who have etherized at least 75% of all my cases, we are all four so fortunate as not to be able to recall a single case of death, either immediate or remote, from ether.

Three of my patients have almost been drowned by an *"inundation of mucus."* One was a boy three or four years old whose mouth, shortly after the operation was begun, looked as if he were blowing soap bubbles. The loud bubbling respiration and his cyanosis could not be misinterpreted. He was saved by the simple expedient of holding him upside down by his heels. Frothy watery mucus poured in a stream from his mouth and nose. In a few moments the operation could be resumed and was completed without any further trouble. The second was a man who was similarly rescued by Dr. Taylor's mounting the table, placing the man's legs over his shoulders and thus almost completely inverting him. The third case—a woman—was fortunately in a hospital and on a suitable table. She was at once placed in the extreme Trendelenburg position and quickly relieved. I mention these because I have seen reports of several deaths during operation, which, so far as I could judge might have been prevented by a similar simple method, which is always available.

This "drowning" by mucus, as Connell has pointed out, is most likely to occur in the narrow zone between a light subconscious anesthesia and a profound and asphyxial anesthesia. In that same zone also vomiting and consequent aspiration pneumonia are serious dangers.

The dangers on the cardiac side I need not dedescribe in detail as Dr. Finney [16] considered them fully in 1901 and I have little to add. I may be allowed a moment only to say that I would far rather operate on a case with a bad heart than with bad kidneys. Finney also called attention to the infrequency of deaths from heart disease under ether as compared with their great frequency in the general community. Patients with any cardiac disease of course run greater risks than those with healthy hearts, but as Ochsner has well said, such cases "are safe because they are considered especially unsafe" and therefore extra care is given them.

The chief danger is from myocardial rather than from valvular disease. I may cite a single case as evidence that valvular disease may not be so great a danger as is sometimes believed.

The worst case of valvular disease I have ever seen I operated on in January, 1888,—a woman

[16] Trans. Coll. Phys. Phila., 1901, 13.

then 62 years of age with marked tricuspid and mitral regurgitation. I resected the inferior dental nerve for unbearable tic. Ether was very carefully given and no trouble arose. In 1895 at nearly 70 years of age, she required a second operation for a recurrence. Had I not done the first operation myself I might almost have doubted whether the jaw had ever been touched, so perfectly normal did the bone appear and so apparently normal were the nerve and its canal. Her valvular disease had become far worse. Prof. H. A. Hare kindly took charge of the ether. In both operations the Allis inhaler was used. During the second operation the external jugulars were enormously distended and the blood from the wound was very dark, especially toward the end of the operation. Hare writes me: "It was the most serious case of valvular disease that I have seen take an anesthetic. Neither have I ever seen such marked tricuspid regurgitation nor such extraordinary pulsation of the liver in any case, much less in a patient who has been anesthetized. It is interesting to note that the administration of just enough ether to keep her under, acted as a stimulant to her heart so that her pulse improved. It was only toward the latter part of the operation that the regurgitation became so great that intense cyanosis developed." Yet she was out of bed on the third day and went home on the sixth. She died two and a half years later. She was a patient of Drs. S. Weir and John K. Mitchell. The latter made the *post mortem* and reported that the right auricle itself was as large as a good sized heart and held the entire fist. The mitral orifice admitted the tips of four fingers, the tricuspid the thumb and three fingers. The pericardial sac was entirely obliterated.

The *respiratory dangers* are even more to be feared than the cardiac. During anesthesia the chief danger is paralysis of the respiratory center; after anesthesia a post-operative pneumonia.

The studies of Haldane, Priestly, Poulton and others in England and of several observers, notably Yandell Henderson of Yale, in this country have brought prominently before the profession the danger of Acapnia, i. e. the lack of carbon dioxid.* This gas, formerly regarded only as a noxious waste product, is now believed to be the irritant which calls into activity the extremely sensitive respiratory center.†

Poulton [17] by forced breathing for two and a half minutes before the British Physiological Society, produced such a dangerous acapnia in himself that several of the physiologists expressed

* Henderson has a series of valuable papers in the Amer. Jour. Physiol., 1908-1911, Vols. xxi-xxvii. That on Acapnia and Anesthetics, is in Vol. xxvi, p. 260.

† As noted by Campbell, Douglas, Haldane and Hobson (Jour. Physiology, 1913, Vol. xlvi, p. 301) the facts recently brought forward by Hesselbalch point clearly to the conclusion that what the respiratory center really responds to, when it responds to CO, is the balance of H-ion concentration in the blood; and as an increase of 2mm. of CO_2 pressure corresponds to a scarcely measureable increase in the H-ion concentration of blood, it follows that the respiratory center is extremely sensitive to changes in the H-ion concentration. (See also Douglas and Haldane, Jour. Physiol., 1909, Vol. xxxviii, p. 420.)

[17] Johns Hopkins Hosp. Rpts., August, 1910, p. 235.

alarm for his life and one had to leave the room.

When a patient struggles or screams while being etherized, thus over-ventilating the lungs and dangerously diminishing the carbon dioxid, if the etherizer becomes nervous and gives the ether intermittently, and especially if in these conditions any considerable amount of ether be suddenly poured on the inhaler, it may easily be enough to cause death by reason of its concentration. It must be clearly understood that not the *amount* of ether inhaled, but its *concentration* in the respired air, is the chief danger. Even two or three deep inspirations in such conditions are fraught with danger not only to the respiration but to the heart.[18] Herein lies one of the chief merits of the Connell anesthetometer, as such a sudden concentration is impossible.*

In the acapnic cases Henderson suggests a very simple means of temporary re-breathing in order to supply the needed carbon dioxid by holding a (grocer's) paper bag over the mouth and nose for a time. In an emergency the two hands could be placed over the patient's mouth.

It is also possible that not only may there be an insufficiency of the stimulating carbon dioxid but in certain conditions there may be a reduction in the irritability of the respiratory center itself which

[18] Henderson, Trans. Amer. Surg. Assn., 1911, p. 234.

* The foregoing and some other later statements seem simpler and more easily understood by others than physiologists than if they were in every detail more technically exact.

may add to the danger.* Future experimental research may reveal more clearly these causative conditions and also the means of avoiding them.

"The great hyperpnea produced by a rapid fall in the oxygen pressure of the inspired or alveolar air is not due to the direct effect of want of oxygen on the respiratory center, but to that of the carbon dioxid present . . . in the blood. The action of this carbon dioxid is reinforced by the acid or other products produced by the want of oxygen, so that the threshold pressure at which the carbon dioxid excites the center is lowered.[19]

But besides its effect on the respiratory center, an excessive loss of carbon dioxid, it is claimed,[20] produces paresis of all unstriped muscular fibers, including those of the vascular system. The blood then accumulates in the internal vessels, and so is followed by facial pallor instead of normal pinkness. To guard against the paresis and consequent pallor Bryant and Henderson,[21] who regard acapnia and anoxemia as "the anesthetist's Scylla and Charybdis," propose that his "sailing orders" should be "keep the patient pink." Whether this theory

* See the admirable paper by Peabody, "Studies on Acidosis and Dyspnea in Renal and Cardiac Disease," with references to other papers. Arch. Int. Med., August, 1914, Vol. xiv, p. 236.

[19] Haldane and Poulton, "Effects of Want of Oxygen on Respiration," Jour. Physiol., 1908, Vol. xxvii, p. 390.

[20] Henderson, Amer. Jour. Phys., 1909, Vol. xxiv. p. 66; and Hooker, Amer. Jour. Phys., 1911, Vol. xxiii, p. 361, and Vol. xxxi, p. 47.

[21] Jour. Amer. Med. Assn., July 3, 1915, p. 1.

is correct or not, the order is well worth obeying. Under the Equator, however, and in our equatorial fellow citizens I fear that it would hardly be an attainable tint.

In the intestines, it is claimed that this paresis of the unstriped muscle halts peristalsis, thus causing the gas pains which sometimes are a post-operative complaint and may be a serious danger.* But if acapnia is prevented by a preliminary dose of morphin and atropin and by moderate rebreathing during etherization, normal peristalsis, it is claimed, will persist at the end of a laparotomy.

The greatest respiratory danger of ether is *post operative pneumonia.* While ether itself is, I believe, a moderate irritant to the air passages (in spite of Rovsing's assertion), undoubtedly the principal cause of such post-operative pneumonia is aspiration of the contents of the mouth. Kelly [22] of Liverpool and Hölcher [23] by putting coloring matters in the mouth have placed the fact of such aspirations beyond doubt. Kelly has shown equally clearly that one of the great advantages of endotracheal insufflation is that this aspiration practically does not occur.

The aspirated matter will consist of the oral mucus (not seldom, be it remembered, laden with the pneumococcus), the discharges from any lingual, oral, dental or tonsillar ulcer or abscess, and the contents of the stomach, which have been vom-

* Such "gas pains" have not been very common in my own experience and observation.

[22] Brit. Med. Jour., 1912, Vol. ii, p. 17.

[23] Arch. klin. Chir., 1898, Vol. lvii, p. 175.

ited but not wholly ejected. Hence the necessity too little appreciated both by surgeons and anesthetists of getting the mouth, tongue, teeth and tonsils in proper condition before operation.*

Besides this, the utmost care should be used by the anesthetist to prevent vomiting if possible. "If on minimal [not, observe, maximal] dosage, the breathing becomes shallow with an occasional deep breath," vomiting is impending. (Connell.) Should it occur, the anesthetist should promote the speedy and complete escape of the vomitus by turning the head sidewise in extension and thus prevent or diminish aspiration. The prevention of aspiration pneumonia lies largely in the hands of the anesthetist. One of my correspondents confesses to have had *two deaths* on the table from inhalation of the vomitus during recovery from the ether.

But we must not attribute all the pneumonias which follow ether to the irritation of the ether itself, to its mode of administration or even to aspiration. Armstrong [24] has shown that pneumonias are especially frequent in cases of septic foci existing at the time of operation and attributes these pneumonias largely to septic emboli, an opinion re-enforced by Beckman [25] of the Mayo Clinic. In operations in the upper abdomen such emboli are especially to be feared. This is due partly to

* I have seen foul roots of old teeth which should have been removed some days before the operation extracted by the surgeon at the end of an operation.

[24] Brit. Med. Jour., May 19, 1906, p. 1141.

[25] Annals of Surgery, 1913, Vol. lvii, p. 718.

the natural inhibition of diaphragmatic breathing and therefore of full expansion of the lower part of the lungs by reason of the pain.

Pneumonias may also follow local anesthesia, in which there can be no question of aspiration. Gottstein [26] and Mikulicz [27] both report larger percentages of pneumonias after local anesthesia than after general anesthesia. The experience in the Mayo Clinic confirms this observation. The probable reason is that the weaker and more serious cases have had local anesthesia. "Most of the lung complications have developed in patients who have been operated on for carcinoma, especially of the stomach, and the autopsy has shown fine metastic growths in serial sections of the lungs.*

Anuria fortunately is not a very frequent sequel of ether, but is a very serious one. Ether as a rule decreases the urine for a day or sometimes longer. I always watch the bedside chart with anxiety for the first two or three days to ascertain the urinary output. As a rule after 24 or 48 hours there is a moderate increase. I have lost two patients from anuria. The first was a case of nephro-lithiasis, occurring unfortunately just a year before the discovery of the *X-rays*. I knew of course of the moderate frequency of bilateral renal calculus, and that temporary suppression sometimes followed unilateral nephrotomy. In this case during the first 28 hours after the nephro-lithotomy only

[26] Arch. klin. Chir., 1898, Vol. lvii, p. 409.

[27] Verhandl. Deutsch. Gesellsch. Chir., 1901, Part ii, p. 560.

* Letter from Miss Henderson.

eleven ounces of urine in all were secreted; in the next four days only twenty-five to twenty-eight ounces daily. In spite of vigorous treatment, the amount fell to fourteen, and then to three and a half ounces with absolute suppression for the last 36 hours. She died on the eighth day. I had anxiously considered *the question of an exploratory operation on the other kidney,* but there was absolutely no clinical evidence of any stone there. If no stone were found at a second operation and she had died, I should forever have had a burden on my conscience. The *X-rays* would have decided the question and might have saved her life, for a calculus in the other kidney was found at the *post mortem.*

The other case had a large sarcoma of the shoulder. Removal of the entire half shoulder girdle was the only possible operation. He died in 31 hours, never having secreted a drop of urine.

Chace [28] reports the examination of the urine in 125 consecutive cases. Two cases—with no albuminuria before operation—died from suppression on the seventh day. In the great majority both of normal and abnormal kidneys there is happily only a temporary diminution, but the amount of the urine should always be most carefully recorded and vigilantly watched.

At present it is impossible to predict such suppression. The remedies, such as they are, are well known but may easily be of no avail.

Glycosuria also may follow etherization, as was

[28] Postgraduate, N. Y., 1904, Vol. xix, p. 302.

first shown in dogs by Hawk [29] in 1904. As a rule it is only temporary. Hawk and his associates have shown that this glycosuria, at least in dogs, is especially dependent on diet. A carbohydrate-free diet always was followed by glycosuria while after a mixed diet there was none. That this glycosuria is not wholly the result of etherization (at least in cats) but may be in part an "emotional glycosuria," caused by the excitement attending operation, was first pointed out by Cannon,* and has since been confirmed by others both in this country and in Germany. Henderson and Underhill [30] attribute the glycosuria to acapnia. Higgins and Ogden [31] have shown that injuries of the head were followed by glycosuria in nearly 10% of the cases.

In diabetics it would therefore be advisable to use nitrous oxid and oxygen or, if possible, local anesthesia, since ether might precipitate a fatal diabetic coma.

Acidosis. Recently the dramatic fatal cases reported by Brewer, Beesly and Bevan and the researches of Crile, Hawk, Bevan and Favill; of your Boston men, Ladd and Osgood, Peabody, Kelly, Brackett, Stone and Low, and numerous others, have focussed attention upon acidosis and its various results, especially acetonuria.

Could anything be more distressing than such

[29] Arch. Int. Med., July, 1911, Vol. viii, p. 39.

* Proc. Amer. Philosophy Soc., 1911, p. 227, and Amer. Jour. Physiol., 1911-12, Vol. xxix, p. 261.

[30] Amer. Jour. Physiol., 1911, Vol. xxviii, p. 275.

[31] Boston Med. and Surg. Jour., Feb. 21, 1895, p. 197.

a case of Brewer's?[32] A boy of 12—a successful operation for appendicitis—everything practically normal till the third night after the operation. Then pulse, temperature, and wound all being normal, sudden attacks of terror awaking him from sleep, his screams heard all over the building, increasing somnolence in the intervals, next a sweetish breath, repeated vomiting, acetone and diacetic acid found in the urine and death in 32 hours after the first piercing scream! Such a case breaks a surgeon's heart.

The pathological changes in acidosis are especially pronounced in the liver, so much so that Bevan and Favill call it an "hepatic toxemia." Crile * and others have shown that this is a local pathological instance of a more widely distributed normal process. All the activities of the body, every "transformation of energy" produces acid by-products, which in turn must be neutralized if life is to be sustained. The kidney, as pointed out by L. J. Henderson,[33] separates the non-volatile acid from the base of these acid by-products of metabolism, excretes the acids in solution and returns the bases to the blood to be used over again in neutralizing additional acid. The volatile acid—carbon dioxid—escapes by the lungs. The H-ion concentration of the blood (PH) is an index of the

[32] Annals of Surgery, 1902, Vol. xxxvi, p. 481.

* Influence of Inhalation Anesthesia on Acidity of Blood, etc., Annals of Surgery, January, 1915. p. 6; Phenomena of Acidosis, etc., Trans. Amer. Surg. Assn., 1915, both by Crile.

[33] Jour. Biol. Chem., 1911, Vol. ix, p. 403.

acidity of the blood and of its carbon dioxid[34] content. This carbon dioxid stimulates the respiratory center and also causes an increased output of adrenalin. Crile claims that his histologic and chemical studies have shown that the changes in acidosis are limited to the brain, the adrenals and the liver. Certainly these organs and especially the liver do show marked changes. "While in acidosis the H-ion concentration of the blood is not altered, its *reserve alkalinity* (i. e. the ability to retain normal reaction despite the addition of acid) is decreased to a measurable amount.[35] Carbohydrate starvation especially favors acetonuria.

Kelly[36] examined the urine in 400 cases in the Boston City Hospital and found 46 which showed acid intoxication in 17 different disease conditions. Ladd and Osgood[37] in their important paper showed that in 120 patients etherized with the Blake cone, acetonuria was found in varying degrees and in proportion to the length of the etherization in 106 (88%), whereas in 162 by the open method this percentage fell to 26%, or less than one third as many as when the cone was employed—a

[34] Peabody: "Studies on Acidosis and Dyspnea in Renal and Cardiac Disease," Arch. Int. Med., August, 1914, Vol. xiv, p. 236.

[35] Van Slyke, Stillman and Cullen, Proc. Soc. Exp. Med. and Biol., 1914-1915, Vol. xii, p. 165.

[36] Annals of Surg., 1905, Vol. xli, p. 161.

[37] Annals of Surgery, 1907, Vol. xlvi, p. 460.

Since the delivery of this address an interesting statistical paper on the "Examination of the Urine in 214 Consecutive Cases in Deaver's Clinic" by Bradner and Reismann has been published in the Amer. Jour. Med. Sci. Nov., 1915, p. 727.

very serious indictment of the cone method. Gatch[38] has emphasized this danger and I think explained the reason for it.

In some cases the symptoms,—persistent vomiting, sweetish (acetone) odor of the breath, peculiarly pink lips, dry tongue and mouth, give us warning. Examination of the blood and urine will convert suspicion into certainty.

The administration of water, glucose and sodium bicarbonate, the lessening of all physical and psychical conditions which increase the transformation of energy are the best preventive remedies. If there is no manifest and speedy improvement no general anesthetic should be given. Local anesthesia should be employed.

But in not a few cases no symptoms whatever betray its approach until the storm bursts in all its fury. Future studies and experiments on animals it is to be hoped may furnish us with warning signals that may enable us to prevent or vanquish this not very common but terrible danger.

What now is the conclusion of the whole matter? In my opinion "straight ether" by the open drop method on an Allis inhaler or a simple mask is by far the best and safest routine anesthetic. I am glad that such staunch upholders of more elaborate and accurately scientific methods of administration, as Boothby and Connell, both uphold this dictum. Because the margin of safety with ether is so wide, this is especially the method of choice for doctors who only occasionally give an anesthetic.

In some clinics from which I have replies in ex-

[38] Trans. Amer. Surg. Assn., 1911, p. 198.

act figures, many thousands of patients have been etherized especially by this method without a death. Alice Magaw (Kessel) and Florence Henderson have to their credit respectively 22,000 and 20,000 administrations without a death. But other clinics have a mortality of one in 5,000, one in 3,000 to one in 451,* thus bringing the average mortality down to 1 in 7706. Inclusion of the late deaths would make the proportion still less favorable.†

Evidently we ought to and must attain better results, especially when the British surgeons and anesthetists have shown us that they can be realized. To attain these better results we need in my opinion:

1. Many professional anesthetists.
2. The use of an anesthesia chart in all cases.
3. The collection of statistics, best by the American Surgical Association at intervals of five years.
4. Instruction of all medical students in the theory and practice of anesthesia.

* As to this report from one of the ablest of American surgeons, it is but just to state that he only recently began to keep systematic anesthesia records. It is evident from the details he gives that very exceptional cases happened to be operated on during the short period since he began his records. We must all admire his honesty in giving the exact figures.

† All the British and American figures as well as Gurlt's and Rovsing's (See reference No. 5, p. 207) are to some extent a matter of definition of what is a "death from ether." One surgeon (or anesthetist) would admit and another reject the late pneumonias and alleged "status lymphaticus" (Henderson, Trans. Amer. Surg. Assn., 1911, p. 230), those from intercranial pressure, suppression of urine, etc.

5. Straight ether by the open drop method as a routine method instead of mixtures and sequences. I believe all of the latter to be more dangerous than ether.

6. More accurate dosage of the ether by the anesthetometer as a gas on the basis of its anesthetic tension, i. e. the partial pressure of the ether vapor in the respired air.

Meyer and Gottlieb [39] frankly attribute the great majority of accidents to "faulty management and incautious dosage of the anesthetic" and again (pp. 74-5) to "the administration of too high concentrations of the anesthetic." A knowledge of this concentration or "anesthetic tension" cannot be obtained by observation. It must be by exact measurement in millimeters of mercury.

In spite, therefore, of the splendid results in certain most competent hands, I believe that others less skilled would achieve better results by some such "instrument of precision," and the most skilled and successful would find great comfort in this more exact knowledge.

Science began with the substitution of the balance, the yardstick and the clock, for even the most accurate guesses as to weight, dimension and time. In anesthesia the same I feel *must* hold good.

Of all the apparatuses I am acquainted with, the Connell anesthetometer appeals to me as the best. It deals with ether in the form in which it actually reaches the patient's lungs, that is as a gas and not as a liquid. The tension is easily and quickly reg-

[39] Pharmacol. Clinical and Exp., Translated by Hasley, Lippincott, 1914, p. 68.

ulated according to the needs of the patient. The alcoholic, the child, and the adult all require to be saturated to the same ether tension in order to saturate their tissues up to the point of anesthesia.

Inquiry as to whether any deaths had occurred in cases in which the anesthetometer had been used disclosed only one, a patient at the Brigham Hospital operated on by Dr. Harvey Cushing. Dr. Walter M. Boothby, than whom no one could be more careful or more skilful, gave the anesthetic. The patient was a man with a very large cerebellar tumor pressing upon the medulla. He died from respiratory failure eight minutes after the beginning of the anesthesia. It is very clear I think, that neither anesthetist, the anesthetic, nor the apparatus was responsible for the fatal result. It was due to the situation and size of the tumor.

I have never seen so smooth an etherization as one by Boothby with the anesthetometer for nearly two hours in one of Cushing's brain cases. The patient's breathing was inaudible throughout, in sharp contrast to the moderately stertorous breathing and coughing of another patient anesthetized elsewhere a few days later by the Roth-Dräger apparatus. The anesthetometer looks complicated, but its management is easily mastered and it then fulfils exactly the requirements just quoted. In fact, I think it is the only apparatus that does. It will be useful only to those who can afford the expense and who are constantly engaged in giving ether, especially in hospitals. It will not supplant the open drop method as a routine method to be used by the great majority. The very accuracy of the apparatus is a temptation to place too implicit reliance upon it, forgetful of the fact that the reaction of the patient and the disease cannot be accurately predicted.

EVERY CASE OF ANESTHESIA IRRESPECTIVE OF THE METHOD EMPLOYED REQUIRES UNREMITTING WATCHFULNESS FROM FIRST TO LAST.

Endotracheal and endopharyngeal [40] insufflation are most valuable additions to our methods. *

Thoracic surgery, which for years had lagged behind all other departments of regional surgery, has suddenly broadened and improved by leaps and bounds, as a result first of the differential pressure chambers and later of insufflation methods, so that now all the organs in the chest are freely accessible. One important note of caution sounded by Cotton and Boothby I must repeat and loudly,—there must always be provided a *safety valve* to prevent excessive pressure and serious damage to the lung and the right heart.

What of the future? New anesthetics and improvements in our present methods, possibly even the discovery of the ideal anesthetic, will give us, I hope, a new, a safe and an agreeable anesthetic ere the centenary of anesthesia occurs on October 16, 1946.

[40] Boston Med. and Surg. Jour., March 28, 1912, p. 486.

* The hybrid Latin and Greek terms "intra-tracheal," "intra-pharyngeal," etc., should be discarded for "endotracheal," "endopharyngeal," etc., derived wholly from Greek. Trachea, pharynx, etc., are not Latin words, but simply Greek terms transferred into Latin as we have transferred menu, chauffeur, etc., into English. Imagine our writing "intra-carditis" or "intra-metrium"!

Finally: In glorious, yea inspiring, contrast to the work of destruction promoted by other departments of Science, as shown in the present horrible war, is the blessed work of our Guild. In war as in peace, winning victory after victory over disease and death, we devote all our knowledge, skill, and ingenuity, century after century, to the solace and service of Humanity.

THE STORY OF THE THREE TABLETS [1]

Listen to the enthralling story of three memorial tablets.

1. On the wall of the library of the Naval Medical School is a bronze tablet. The inscription closes with the eloquent and thrilling motto, "Duty Stronger than Love of Life." What is the story of which this is the flower and epitome? [2]

On June 12, 1881, the Arctic exploring steamer *Jeannette,* after drifting hopelessly for twenty-two months in the grip of the relentless ice-pack, was crushed by the ice off the bleak shore of Siberia. The leader of the expedition was Lieutenant Commander George W. DeLong. The medical

[1] Reprinted by the kind permission of the Editor of *The Military Surgeon,* for January, 1918.

[2] This incident particularly interests me as I knew Admiral Melville for a number of years, especially in the American Philosophical Society. I seem to have been favored in knowing Polar explorers, for Dr. Elisha Kent Kane, another of the Medical Corps of our Navy, one of the early Arctic explorers, was a fellow-townsman in whose exploits, as a young lad, I felt a pride though I never knew him personally. I well remember with what avidity I devoured his book.

During the Civil War for some months under Dr. Isaac I. Hayes, Dr. Kane's surgeon and successor in the Arctic adventure, I served as the Assistant Executive Officer, while Hayes was the Surgeon-in-Chief of the Satterlee Hospital and the late John S. Billings was the Executive Officer.

officer was Passed Assistant Surgeon James Markham Ambler. Both were officers of the United States Navy.

On June 17, the officers and crew, thirty-three in all, began their perilous retreat over ice and water and land, dragging three boats and five sleds weighing respectively from 2,300 to 6,000 pounds. Often they had to traverse 13 miles to drag the whole outfit only one mile. In a gale the cutter in which were DeLong and Ambler with twelve others became seperated from the other two boats and on September 17 reached land, with provisions for just six days! Had they known it, only 25 miles away was a village and safety, but alas, it was not shown on any map! Oh, the pity of it!

Occasionally a little game was obtained, but finally matters grew so desperate that on October 9, when the only food left was 2 ounces of alcohol per man, two of the party, at Ambler's suggestion, were sent ahead in the forlorn hope of finding succor. On October 22, when these two in turn had become too weak to travel farther, a wandering native found and rescued them.

The other twelve crawled on steadily, losing one after another from death by starvation until on October 30 DeLong, Ambler and the Chinese cook alone were left alive. These three "struggled along a few hundred yards farther and laid

Admiral Peary, again of our own Navy, has long been a friend and was once a surgical patient. Sir Ernest Shackleton I have met repeatedly in Edinburgh and in this country. I have also met Amundsen. Happily I escaped meeting Dr. Cook.

themselves down on the snow for the last time."

On March 23, 1882, Chief Engineer (later Admiral) George W. Melville, also of our Navy, who with the whaleboat party had found help, after long search discovered their bodies frozen by the cruel ice which then, having sated its vengeance, seemed to relent and preserved them for reverent burial at home.

The commander, DeLong, had offered Ambler the chance of life by being one of the two sent ahead, but in his pathetic and noble journal he says, "I thought my duty required me with him and the main body for the present!" "Duty" was indeed "stronger than love of life."

"Certainly," says Medical Director Gatewood, "that party never lost its trust in God. While perishing there was divine service. Day by day trembling lips uttered the Creed and the Lord's Prayer." Discipline was maintained. Personal as well as official rights were recognized. The strong helped the weak. "There was never even a disregard for the proprieties!" They were American gentlemen, members of that corps of the United States Navy which knows not only how to live but how to die. Even the Chinese cook was worthy of equal praise and honor.

2. In the Johns Hopkins Hospital is another bronze tablet to the memory of Jesse W. Lazear, Acting Assistant Surgeon in our Corps in the United States Army, one of the Yellow Fever Commission, who died of yellow fever contracted in the line of duty. The fine inscription written by President Eliot reads as follows:

WITH MORE THAN THE COURAGE AND DEVOTION OF THE SOLDIER HE RISKED AND LOST HIS LIFE TO SHOW HOW A FEARFUL PESTILENCE IS COMMUNICATED AND HOW ITS RAVAGES MAY BE PREVENTED.

He knew well the risk he ran, for the way in which yellow fever was transmitted, though then unproved, was more than suspected. He, a non-immune, undertook the especially dangerous work with the mosquitos themselves. Like Ricketts he accepted the challenge of death and lost. No! No! Not so! They both *won* Immortal Life! Happily there was no suffering of months in Lazear's case. The disease—yellow fever—laid its heavy hand upon him, and his noble, gentle spirit soon took its flight to the bosom of God and rests there forever.

3. In far-away Ecuador in the outskirts of Guayaquil, you will find the third tablet no less inspiring than the other two. It records the heroic conduct of Passed Assistant Surgeon William M. Wightman of the Public Health Service, who died of yellow fever on May 16, 1909. It is of enduring bronze—*"aere perennius"*—and was erected by his appreciative fellow officers of the Public Health Service to commemorate his sacrifice to duty.

In the absence of Surgeon General Blue, Acting Surgeon General A. H. Glennon writes for me the brief but pathetic story of his illness. "Although suffering from an attack of dysentery, he persisted in staying at his post. On the evening of May 11, he had the chill which marks the onset of yellow fever, but knowing that his immediate superior was out of town, he got up to conduct the preventive measures for which he was detailed to Ecuador. When he was finally forced to give up, the disease ran a short period and terminated fatally."

Far from country and friends, faithful to the duty entrusted to him, faithful even unto death this simple record, brief but eloquent, reads as follows:

"WILLIAM M. WIGHTMAN, PASSED ASSISTANT SURGEON, U. S. PUBLIC HEALTH AND MARINE HOSPITAL SERVICE
MAY 18, 1857—MAY 16, 1909.
"GREATER LOVE HATH NO MAN THAN THIS THAT HE LAY DOWN HIS LIFE FOR HIS FRIEND."

God grant that we, of these three noble associated medical services, especially in these terrible yet noble days of a war for world freedom, for Civilization over Barbarism, for right over brutal might, may be enabled to equal these three men in the splendor of their devotion to their corps, to their country and to humanity.

When the editor of *The Military Surgeon* asked me to write a few words addressed especially to the young medical men now flocking by thousands to the help of our dear country, men who are necessarily ignorant of the traditions and examples of the three Goverment Medical Services, I first intended to give a brief résumé of the scientific services of the three corps.

In the army I would have recalled the name of

William Shippen, who during the Revolutionary War anticipated the celebrated "Flying Ambulance" of Larrey; the work of the first physiologist in America, Beaumont, and his patience and generosity, as well as his professional skill with his unruly patient, Alexis St. Martin; of the splendid scientific work done by Weir Mitchell and many others during the Civil War; of Letterman, my old chief in the Army of the Potomac; the bacteriological work of Sternberg; the splendid record of Hoff in stamping out smallpox in Porto Rico; the yellow fever services of Reed and his colleagues in Cuba and of Gorgas in Panama, the typhoid work of F. F. Russell, and many other achievements in the Army.

In the Navy I had in mind to relate the heroic death of William Longshaw, whose gallantry was twice recounted on the deck of sixty ships of war. He was killed in the assault on Fort Fisher, January 15, 1865, while binding up the wounds of a dying comrade. Their dead bodies were found lying side by side the next morning.

I had in mind also to relate the fine scientific work of Rixey, Gibson, Bell, Gatewood, Stitt, Beyer, Braisted, and others.

In the public Health Service, I would have shown how the health of the whole nation and especially our protection from the ravages aforetime of yellow fever, of cholera, plague, and typhus and still (for shame) of smallpox, resulted from the confident audacity of Waterhouse, Professor at Harvard and at Brown, and Surgeon in charge of our very first U. S. Marine Hospital at Boston

Mass. (only two months after Jenner's announcement of the efficiency of vaccination he obtained the virus from England, vaccinated his own children and then exposed them to infection without harm). I should here recount their life-saving researches in typhoid, hook-worm disease, measles, pellagra and rocky mountain spotted fever; fearlessly facing death, deliberately selecting the places where disease was *most* ruthless. Some of them are known by reason of valuable researches, many of them are the silent faithful modest heroes known only to the Recording Angel who has writ their names high in the roll of fame.

But Col. C. C. McCulloch has done this far more completely and authoritatively than I could do it for the Army. The scientific achievements of the Navy and of the Public Health Service await a similar historian. I hope before long to see such histories published in *The Military Surgeon.* They would foster an *esprit de corps* which would thrill all men new to the service and make them proud to wear the uniform of their several corps.

This task is too large for a simple paper like this. I am obliged, therefore, to be content with the touching "Story of the Three Tablets."

Meantime the Great War is telling anew the old unselfish devotion to duty of our predecessors in the sacrifices of our present heroes.

Never before have there been so many casualties in the medical service. In this war, surgeons, while presumably classed as "non-combatants," share danger equally with the line officers. And they are not a whit behind the latter in bravery and devotion.

My own first commission is dated July 1, 1861, as first lieutenant in the Massachusetts Fifth Infantry. I was sworn into the service of the United States in July 4, 1861, on the east front of the Capitol at Washington. After a long intermission in civil life, my present commission is dated April 11, 1917. As one of the oldest men in service it is a great joy to assure these thousands of younger men—God bless them!—that they are joining services with a goodly heritage of glorious traditions. I am sure that they will never allow them to be tarnished.

A WORLD OF BILLIONS [1]

Occasionally it is a great relief to turn away for a season from a review of the Great War with all its horrors, atrocities, and sorrows, and think about some wholly detached subject. Our passions are stilled, our emotions subdued, and our minds are freshened for a time.

"Does my title suggest the Liberty Loans?" you ask. No, not that. "Then the number of bushels of various grains in our harvests?" No, not that. "Then it must be the number of dollars spent every year or month or day by the various belligerents," No, not even that. You will hardly guess it. It came to my mind in this wise.

Not long since, one morning as I was shaving, it suddenly occurred to me that there were only two means by which we could actually *measure* the growth of any part of the human body from day to day—the finger nails and the hair. During the Civil War, S. Weir Mitchell, George R. Morehouse, and I often compared the rate of growth, especially of the finger nails, for example, in cases of gunshot wounds of the great nerves of an arm, or of paralysis of one half of the body. We stained one or more corresponding nails and both hands (or

[1] Reprinted by kind permission of the Editor from The American Museum Journal, now entitled "Natural History," Vol. XVIII, No. 8, 1918.

feet) with nitric acid or nitrate of silver. The new growth of the nails would be free from stain and would show the relative rate of growth on the two hands at a glance. But the growth of the nails is too slow to be a satisfactory index of *daily* growth. On the contrary, the hair, and especially the beard, grow so rapidly that in twenty-four hours the stubby outgrowth of each hair is long enough to be easily seen. It gives one an untidy appearance. "Unshaven" is equivalent to neglect of the proprieties, one might almost say, of the decencies of life. As I thought of it while my razor was rasping away the hair, I reflected that it introduced me into "a world of billions."

But this immediately brought to my mind another instance of multiplied billions, not the billions of cells in solid substances like the hairs, but the billions of cells in that life-giving fluid—the blood.

As is well known, the blood consists of a liquid in which float the red blood cells or blood "corpuscles." These are round, disklike cells about 1/3000 of an inch in diameter. Besides these red cells there are other cells called the "white cells" or "leucocytes." These number several thousand in a cubic millimeter, but though of great importance, physiologically and pathologically, we may disregard them in our census of the blood cells.

My friend, Prof. John C. Da Costa, Jr. of the Jefferson Medical College, at my request has furnished me with the following estimates:

The total amount of blood in a man weighing 144 lbs. and in good health is about 12 pints. The number of red blood cells in each cube of blood measuring only one millimeter (1/25 of an inch) on each side is about 5,000,000. Sometimes this rises to 6,000,000, 7,000,000, or even 8,000,000 in a cubic millimeter. The number of red blood cells in one pint is, therefore, on the lowest basis, approximately 10,240,000,000,000, that is, ten thousand, two hundred and forty billions.

I

Remarkable Activity in the World of Billions

The number of these red blood cells destroyed and renewed every day in the ordinary activities of life cannot be accurately estimated. But we can get an approximate idea.

No physical or mental process can be accomplished without the destruction and regeneration of these blood cells in bringing oxygen from the lungs to burn up waste tissue and to aid in building up new cells and new tissues.

You lift an arm, you eat a meal, you reason about everything—every one of these actions means the using up of the cells in the muscles of the arm, or of the muscular cells of the walls of the stomach, and the cells of the glands producing gastric juice, or of the cells of the brain. The blood is one of the agents in effecting these various processes, and billions upon billions of its cells are used up every day.

The loss of blood in accidents, wounds, and operations must be made up quickly in order to keep us in good health. In an accident or in any serious operation the loss of blood may easily amount to a half tumblerful, a tumblerful, or even more. A tumbler holds six ounces. A loss of half a pint, eight ounces, is not very uncommon. In a serious accident, such as a shell wound in France, attended with great hemorrhage, the loss might amount to as much as three pints—about one fourth of the estimated total amount in the body. Bierfreund estimates that such a loss may be made good in four weeks. In three pints of blood there would be about 30,720,000,000,000, that is, thirty thousand, seven hundred and twenty billions of blood cells. In every hour of the four weeks then there would be a regeneration of more than 45,000,000,000 of cells, or more than 750,000,000 cells every minute, day and night, for four weeks!

Not only are the blood cells destroyed and regenerated at this enormous rate, but all the tissue cells which make up the muscles, the bones, the brain and the nerves, the liver, pancreas, spleen, kidneys, all the bodily organs are being destroyed and regenerated day by day.

Confessedly these figures are only approximate, but even if they are, the impression of the *enormous* cellular activity of the entire body is justified. Is it not a wonder that the body does not get tired of doing such hard and never-ceasing work?

But to return to the beard and the growth of each hair, which introduced us to the world of billions. The amount of daily growth of the beard may vary possibly from man to man, with health and illness, with the seasons, with the quantity and quality of the food, possibly from race to race, or with different latitudes from the poles to the equator. Even different parts of the beard grow at different rates—toward the margin of the beard near the eyes the growth is less rapid than on the cheeks and the upper lip.

The number of hairs in the beard it is impossible to count, but let us assume that it would probably be say 5000 on an average face. Then we must remember that the beard is only a small portion of the hair on the human body. Besides the hair on the face there are hairs on the head, in the eye-brows and eye-lashes, and finally the fine lanugo or soft hairs which overspread the entire body, growing to groups of long hairs in the armpits and other parts of the body, but disappearing entirely on the palms of the hands and the soles of the feet. With age, we men at least, usually lose the hair on the top of the head which becomes bald over a smaller or larger area. On the ears the hair often increases markedly in length after the middle life. Even in women a mustache not uncommonly develops sometimes to an almost disfiguring degree. I have seen in some male patients the ordinarily fine hairs over the body, arms, and legs develop into a hairy coat over nearly the whole body, quite comparable with that of the lower animals.

My problem was: How much does each hair of the beard grow every twenty-four hours; how many new cells are thus produced in each hair; and finally, what is approximately the total number of new cells produced in the beard each day?

Recently I collected the fragments of hair which

I shaved from my face and asked professor Aller G. Ellis, of the Jefferson Medical College, to measure them and if possible give me an estimate of the number of cells per hair which must have grown on my face in twenty-four hours. He found that each hair had grown about one millimeter (1/25 of an inch) in the twenty-four hours, and that the number of cells in that length of one hair would be about 10,835. This would indicate a growth of more than 450 cells every hour, day in and day out. This, remember, is for the new growth of only *one* of the hairs shaved off. If now we accept 5000 as the number of hairs on my face alone, that would mean 54,175,000 new cells had grown every twenty-four hours, or 2,257,292 cells every hour, or 37,621 cells every minute in the *beard alone.* Cut the figures in half if you wish, the fact is just as marvelous.

If we broaden the calculation to the hair all over the body, growing on the head at probably a somewhat slower rate and still more slowly all over the rest of the body, we should have a world of billions upon billions of hair cells, as of blood cells, produced every day.

The same enormous activity is seen in the destruction and restoration of the cells in many glands such as those that secrete the saliva which flows so abundantly when we chew our food; in the glands of the stomach, for its share in the digestive processes; in the glands lining the entire twenty-five feet of the intestine, producing the intestinal juice (*succus entericus*) so important in digestion. To these are to be added the enormous activity of the accessory organs of digestion, such as the liver, which secretes about twenty-five ounces (about 1½ pints) of bile every day, and the pancreas, which pours out a large quantity of pancreatic juice to aid in digestion. To these must again be added the activity of the kidneys and of the millions of sweat glands. These two—the kidneys and the sweat glands—curiously enough are much alike. The skin might be called a kidney unrolled and spread out over the surface of the body, and conversely, the kidneys two portions of rolled-up skin placed within the abdomen.

In emergencies the skin may actually perform the function of the kidney. When I was a medical student—in the long, long ago, now verging upon sixty years!—I had in my own person a striking example of this "vicarious" action of the skin when my kidneys "struck work." I was very ill with a violent tonsillitis and a high fever—how high I do not know, for it was before the days of the clinical thermometer (!), but I should judge that it must have been 104° to 105° F. Lying in bed, I perceived a most disagreeable urinary odor. I first thought it was due to the neglect of the maid. But this proved not to be the case. I soon observed whenever I brought my hands near to my face as in taking a drink of water or using my pocket handkerchief that a whiff of this disagreeable odor was instantly perceived. Then I deliberately investigated the condition of my skin and found that it was doing nearly all the work of the kidneys—a most dangerous condition, which might easily be followed by uremic coma and speedy death. Prof. J. M. Da Costa, who was attending me, at once took the most vigorous means to stimulate the kidneys. These remedies, with hot drinks, a sharp purgative, and abundant drinking of water soon averted the danger. In the case of some patients the urea excreted by the skin has actually formed crystals on its surface

How many billions, trillions, and quadrillions of cells in the blood, the hair, the innumerable glands of the intestines, in the liver, the pancreas, the kidneys, the brain, and the skin perish and are replaced every day no one can possibly estimate. That such huge armies of cells serve us every day, every hour, every minute of our lives day and night in sickness and in health, and as a rule in orderly sequence so that the balance of health is maintained, or in case of illness is restored, gives one an idea of the wonderful mechanism of the human body—nay, of the whole animal and even of the vegetable kingdom, for only by the same nice adjustment of number and function of cells to the needs of the body of the man or the animal or the plant can health be maintained.

Moreover, the great strength of these minute cells is wonderful. We are all familiar with the bricks or even the heavy flagstones around the trunks of trees on our sidewalks which are lifted and tilted by these same little cells growing slowly but inexorably. I well remember seeing in the old churchyard at Jamestown, Virginia, a full-grown sycamore tree which had split a great bowlder in two. The little tree had found a chink into which it had insinuated the tip of its slender stem. Then these myriad Lilliputian cells, slowly but steadily increasing in number, had gradually thickened the tree trunk as a wedge and finally had rent the stone asunder.

II

The Organization of the World of Billions

Every plant and every animal, including man himself, starts from one microscopic cell which multiplies indefinitely until the number mounts to millions and billions. The rapidity of this growth in some instances is almost inconceivable. The cholera bacillus multiplies from one to two; these two divide into four; these four into eight, sixteen, and so on *every twenty minutes.* In seven hours, provided it has room enough and food aplenty, *one* single cholera bacillus would have more than 2,000,000 descendants, and three hours later more than 1,000,000,000, and so on. These 1,000,000,000 in twenty minutes would become 2,000,000,000; in twenty minutes more 4,000,000,000. In twelve hours after the first single cell with which we started had begun to multiply, its descendants would number about 64,000,000,000,000, sixty-four thousand billions of cells. What *would* the number be in a week or a month!

Or again, consider the silkworm. In thirty days after being hatched from the egg it increases in weight 15,000 times; that is 500 times its original weight every day. We can get a more impressive idea of what this means by comparing it with a human baby. Were the same rule to hold, a baby weighing seven pounds at birth would weigh 3500 pounds the very next day, and when a month old would weigh 105,000, or more than fifty short tons, which, however, could hardly be called "short weight." If you will pardon the abominable but expressive argot of the street, that would be "some baby." But we may be somewhat consoled by remembering that both mother and nurse would be of corresponding elephantine bulk—made to "fit the job" as the exponents of efficiency would say.

But this is a gross, unimaginative way of looking at such a phenomenon. When we analyze it seriously, what a wonder world we enter upon! How these little silkworms must feed, feed, feed! Think of the abounding life of each microscopic cell. Every one has to multiply itself five hundred times in every twenty-four hours. Yet all goes on in an orderly manner, according to the law of its being, but with incredible swiftness, day after day.

In the development of a human or an animal body the increase is far more, however, than a mere numerical increase, although that in itself is a wonderful phenomenon. Among these multitudinous cells a wholly new factor soon comes into view. They do not all continue merely as multiplied duplicates of their predecessors but they begin to differentiate among themselves. Some will become first cartilage, that is, gristle cells, and later, when the blood carries to these cartilage cells lime and phosphorus and other mineral ingredients, these cells bathed in the liquid portion of the blood will pick out each its own required mineral compounds and will turn from soft, flexible cartilage to stiff, yet elastic bones—the skeleton of the animal.

Other cells will remain soft but will select those ingredients which are necessary to form the muscles—that is, the red flesh of animals or the white and dark meat of birds. These muscles acting on the bones as levers will move them so that we can lift the ribs and by the diaphram depress the floor of the chest and thus aid further in expanding the lungs for inspiration; then we reverse the action, depress the ribs, compress the abdominal viscera, and so push up the diaphragm, thus compressing the lungs for expiration. Thus the alternate processes of breathing—a continuous function essential to life—are carried on. We are also enabled to regulate our breathing and our vocal chords in such a manner that we can speak or laugh, swallow or sing.

Still other muscles attached to our jaws permit us to eat, others attached to our leg-bones allow us to move about, others to our arms and fingers fit them for labor or other useful functions.

But these muscles do not move of themselves. They require a stimulus connected with the center for our mental organization. Thus then the need for a nervous system—in fact, as I shall show, for two interdependent and correlated nervous systems. The first of these two systems is composed of the brain, the spinal cord, the nerves emerging from the latter, and the special end-organs in which the nerves terminate. From the skin by means of these special organs at the ends of the nerve fibers, impulses start and are carried to the brain. In the brain they are appreciated, for instance that the finger is in contact with a source of too great heat. The brain quickly decides that the finger must be withdrawn, and sends down to the proper muscles the order to retract at once. In such a case, long before the whole of this brief description has been read, the muscles have executed the order. This is but one example of a voluntary movement resulting from a sensation.

The second nervous system consists of the sympathetic system. At certain important points collections of nerve cells are gathered into small bodies called ganglia. These ganglia are connected with one another by a large number of nerves. The familiar "solar plexus" just in front of the spine at the level of the "pit of the stomach" is the largest and most notable collection of such ganglia.

The nerves of the sympathetic system are distributed to the muscular cells in the walls of every artery in the body. This muscular coat consists chiefly of circular fibers, which, by their contraction and relaxation change the caliber of the arteries and thus regulate the supply of blood to all parts of the body according to its needs.

For example, the eye is a very familiar instance. When a cinder gets into the eye, in a short time the white of the eye becomes very red or "bloodshot," but returns to its normal whiteness as soon as the foreign body is removed. The sudden redness of a young girl's "blushing" cheek is caused in the same way.

Again, when we have eaten a meal, the stomach needs a very large and sudden increase in its supply of blood to elaborate the large quantity of gastric juice required for digestion. Instead of a rather dirty looking brownish yellow appearance, as when it is empty, the stomach (like the eye) at once becomes of a bright red color from the dilated blood vessels. As soon as the meal has been digested, the nerves stimulate the circular muscles of the arteries. By their contraction these immediately lessen the caliber of the blood vessels, and less and less blood reaches the stomach until at length the supply is only enough for the ordinary demands of the stomach in its period of inactivity, and it has reverted to its original brownish yellow color.

These sympathetic nerves are distributed not only to the muscular coat of the blood vessels but to many other muscular fibers which are involuntary, that is, not controlled by the will. We have an excellent illustration of this in the iris, the circular colored disk in the eye with a hole in the center which we call the pupil. This is constructed like a wheel with a circular hub and radiating spokes. The "hub" consists of circular muscles which, by contracting, narrow the pupil to a pin point. The spokes are radiating muscular fibers which pull the pupil wide open. We go out into blinding blazing sunlight. For a moment we wink and blink, or have to shade the eyes by the hand or by closing the eyelids. But in a few seconds the muscular fibers of the hub contract strongly, the pupil narrows down to a pin point, and the eye is automatically protected from the injury which it would otherwise suffer. On the contrary, we go into a darkened room. At first we may stumble over the furniture which we cannot see on account of the small amount of light entering the eye through the minute pupil. In a few minutes the pupil has been dilated by the "spokes," or radiating fibers, to a maximum, and we can see everything with perfect clearness.

All these changes, be it observed, are perfectly involuntary. They are accomplished for us, and in fact, in spite of ourselves. We do not order the blood vessels to dilate when a meal is eaten, or order them to contract when it is digested. We do not order the pupil to contract or dilate according to the brightness or the dimness of the light. In fact we cannot by any possibility control the caliber of the blood vessels of the stomach, or the size of the pupil. It is all done for us whether we wish it or not. And it is most fortunate that this is so. Suppose it had to depend on our conscious volition. Suppose, tired out and hungry, we ate a hearty meal and fell asleep! The stomach would get no increase of blood, there would be little or no gastric juice secreted, no digestion would take place. What endless confusion there would be! Before long we should surely perish! In the case of the pupil, the bright light might easily seriously damage the eye, or we could never see in a dimly lighted room.

In this rather long discussion we have almost forgotten that we were considering the differentiation of the rapidly multiplying cells into bone cells, muscle cells, and cells forming the brain, spinal cord, nerves to control the voluntary muscles, and the sympathetic nerves to control the involuntary muscles.

If we examine a chicken embryo, we shall find even as early as the third day the well-recognized and differentiated parts of the organs of sight, of hearing, etc. When we remember the ultimate excessive complexity of these organs, especially of the eye and the ear in man, this faculty of differentiation causes our wonder and astonishment to become intense. By it cells that at first could not be distinguished from one another eventually develop into cornea, iris and pupil, lens, and retina—the retina alone having ten different layers!—and the strong and tough outer protecting fibrous envelope of the eye; the three bony semicircular canals of the internal ear lined with their soft membrane, the wonderful spiral cochlea in which are distributed the nerve filaments forming the ultimate organ of hearing; the three little bones of the ear attached to one another and by flexible membranes to the internal ear, and externally also to the drum of the ear.

And as if all this were not enough, there are certain other cells which become segregated—shall we say segregate themselves?—from the others and develop on an entirely different plan from any of the others. Some of them form a long hollow tube, the esophagus, followed by a dilated part, the stomach, and then the intestines. The stomach has a wholly different function from all the rest of this long tube, which is about twenty-five feet long in man and far longer in some of the lower animals. The stomach portion of the tube suddenly narrows again at the pylorus, the outlet from the stomach into the small intestines, and finally widens anew into the large intestine. Throughout its length this digestive tube is lined with different sorts of glands to aid the different stages of digestion. Connected with this long digestive tube are two large accessory solid organs—the liver to secrete bile, the pancreas (the "sweetbread" in animals) to furnish a juice to aid digestion.

At the same time other cells are segregated at one point to form the spleen. Its function is still, in part, as yet obscure. Its presence is not essential to life for many times it has been removed, and the patients get along without it, as they do also without any gall bladder or appendix.

Still other cells are segregated into two masses of cells which form the two kidneys. The character and function of these become wholly changed. Their secretion is wholly different from that of the glands in connection with the mouth (for saliva), in the stomach (for gastric juice), in the liver (for bile), in the pancreas (for pancreatic juice), in the intestine (for the intestinal juice) all aiding in digestion, that is, in the nourishment of the body. The cells of the kidney select from the blood such of the waste products as otherwise would accumulate in the blood and quickly threaten life. Hence their enormous importance. As a surgeon I would far rather operate on a patient with very grave heart disease, than on one whose kidneys were seriously out of order. The sweat glands of the skin as I have already pointed out are analogous to the kidneys, and supplement, or may even replace them.

All the stages of development of all these different tissues have been diligently worked out, chiefly in the fertilized egg of the hen. One can abstract an egg from an incubator at any definite time, one hour, two, three, four hours, or on the second, third, fourth, fifth day and so on, carefully open the egg shell, harden the embryo chick in certain fluids and then cut it into very thin slices which are kept in their serial order. These "serial sections" are so thin that the light easily passes through them. This enables us to study each one in detail. They can be cut also lengthwise, crosswise, or obliquely. By these means the embryologist can examine each section, each system, each organ, or even a part of any organ. By suitable stains one can differentiate and study the individual cells of the various tissues.

Occasionally accident will furnish a human embryo in which similar examinations by similar methods may be made. These absolutely establish the fact that the development, as studied in the chick and the lower animals and in the human ovum and embryo, follows exactly similiar lines. Similar organs develop in similar ways. The whole animal kingdom from the lowest animal consisting of only one cell to man, follows the same general plan although varying in details from animal to animal, and growing more and more complex as we ascend in the scale.

III

The Wonderful Powers Implicit, i. e. Infolded, in the Fertilized Ovum.

Having reviewed the enormous number of cells in the blood and the body—whether of man or other animals—and their orderly development by differentiation in structure and function, it will be of interest to consider the wonderful powers implicit—that is to say, which are infolded—in an ovum. These powers remain latent until fertilization takes place. Then they immediately start up into amazing activity. We can best study it in the development of the chick in the fertilized hen's egg as just indicated. From the moment when the hen begins to sit, hour by hour, there begins and goes on during the whole period of incubation (twenty to twenty-one days) the most marvelous growth and development. Within even the first three days there is developed, in the growth from the one single cell, a mass in which can already be distinguished the front, middle, and hind parts of the brain, the starting points of the eyes and the ears, even the pulsating heart can be seen, divided at first into only two separate halves. There is a beginning of the circulation of the blood. What will become the lungs, the liver, and the pancreas are recognizable. Later the fore and hind limbs of quadrupeds, the wings and legs of birds, or the arms and legs of the human body begin as little buds. The cartilages of the digits (fingers and toes in man) soon follow. Foster and Bayfour [2] say that on the fifth day "the

[2] *Elements of Embryology*, p. 275.

embryo of a bird does not materially differ in its early phases from that of a reptile or a mammal, even in the points of structure which are most distinctively avian" (that is, characteristic of birds). By the sixth day the distinction becomes clear.

In all this apparent "hurly-burly," as when a cell in the silkworm multiplies itself 500 times each day, or less swiftly in the cases of vertebrates, there is an orderly, almost uniform development of each animal after its kind.

For a moment let us limit ourselves to the consideration of the human body and ovum. Look at the symmetrical and asymmetrical organs of the body. We have two ears, and two eyes both placed in front and not at the side of the head as in the fly, the horse, and many other animals, always at a certain distance apart, within a very slight maximum and minimum range; two arms, two legs, two lungs, two kidneys. Even the nose is symmetrical; but the two nostrils are fused into one central organ. The tongue also is composed of two symmetrical halves fused together. The bones of the head are as a rule in pairs, right and left, or if in the middle line, they have originated in two symmetrical halves as in the upper jaws (maxillæ) which are not fused together, while in the lower jaw (the mandible) the two halves are permanently united for its special function of biting and crushing the food. The ribs, right and left, correspond to one another. The complete or ideal vertebra consists of a body and a pair of ribs which are also joined together in front, not directly but indirectly, by means of the sternum or breast-bone. In the neck the ribs are suppressed, but have their representatives in little processes or knobs of bone. In the loins (the lumbar region) there are also no ribs, but their representative vestiges are even more marked than in the neck.

Asymmetry rules chiefly in the internal organs. Most of the heart lies to the left of the mid-line of the body. As already stated it begins as two separate halves, which soon fuse into one heart with four cavities, two auricles and two ventricles. Each of these four chambers has a different function but all four are coördinated into one beautifully regulated organ. The heart is one of the most wonderful pieces of mechanism in the world, more powerful in proportion to its weight than any Baldwin locomotive, more delicately constructed than the finest watch; an organ which must do, and—*mirabile dictu!*—does do its own repairs while busy at its work. It knows no Fourth of July or Christmas or Easter holiday, never even can know the joy and relief of sleep, "tired nature's sweet restorer." It begins its orderly, reiterated contractions and relaxations long before birth, and they cease only at death. It must continue them in health and in sickness, when its function is often sadly disturbed. In mid-career let it stop for but a few moments and death comes swiftly, almost instantly.

Sometimes, oddly enough, by a very early irregular development, asymmetrical organs are transposed, and then, as in *"Le Malade imaginaire," "nous avons changé tout cela"* is literally true. This is very rare, so much so that in a long and active professional life, I personally have never seen a case. When it occurs, the heart, stomach, and spleen lie on the right side, the liver and appendix on the left, and the large bowel reverses its course, running upward on the left side.

In this enormously complex machine, far more complex than any of man's making, a machine, all parts of which, like the heart, must be repaired without the omission of an hour's or even a moment's work, it is not surprising that things sometimes go awry. The wonder is rather that they almost always develop aright. Nature is persistently conservative. To this conservatism we owe it that most people are practically normal. Especially fortunate is this conservatism during the early development of the embryo. Then, every cell is working feverishly and at top speed, and a minute divergence of, it may be, even a single cell, followed by a progressively greater and greater divergence from the normal in its descendants, would produce an arrest of development here, or an error of development there; but only occasionally is there such a failure of orderly or of complete development. The result is a local failure, or even, it may be, multiple failures in normal growth. If there is one deformity, therefore, there are very apt to be others.

The saddest of all these errors of development are those cases in which there has been a defective development of the brain and hence a mentally defective child. How many scores, or I might even say hundreds, of such children have been brought to me with the fond delusion that, "He is naturally an unusually bright child, you know, but with a pressure on the brain." How often have I had to dash unfounded hopes to the ground! The children have been brought to me in the confident expectation that I could cure them by a surgical operation that "would remove the pressure on the brain." An explanation that the defective development was by no possibility to be laid at the door of either the father or the mother, but that the defect was prenatal, and had long preceded birth has often afforded the distressed parents some little comfort, although it can never wholly remove the heartache. The only hope for such children is in educating the more or less blighted faculties; a long continued, expensive business, and often with but a slight improvement as a reward for years of parental devotion. In other cases, such as cleft palate, harelip, and clubfoot, surgery holds out relief by operation.

Let us now go back again to the single cell of the fertilized ovum in which the human or animal body always begins. We have seen its development into many billions of cells which have become differentiated from one another and have formed many different tissues (bone, muscle, or nerve), and many different organs (brain, eye, ear, liver, or kidney), in which the ultimate cells differ enormously from one another, although all have had this common origin in the single cell of the fertilized ovum.

Think for a moment of the enormous powers latent in that single little microscopic, primordial cell! Nothing that I know of can for a moment compare with it. If we know its origin we can foretell its development into a horse, a bird, a fish, or a human being. We can foretell that it will show the racial traits of its parents to a greater or less degree, the white skin, the black skin, the yellow skin; the straight hair or the curly hair; the oblique or the horizontal eye; the racial nose of the Roman, the Greek, the Hebrew, or the Negro; the high-cheek-bone of the American Indian. There are marked physical resemblances in many, if not in most cases, even to the features of the parents and the brothers and sisters which in turn may be transmitted to the next generation. Nay, more, in that tiny cell are contained the forces that make not only for the physical structure and the intellectual characters of his race, but also for those of his nation, and it may be, particular family. In it are contained *in posse,* and if fertilized and developed, *in esse,* the powers of a Newton, a Shakespeare, a Franklin, or an Abraham Lincoln.

Why should the little bud which is to become a human arm develop at exactly the right place and not grow out on the front of the chest or on the back nearer the spine? Why should the human arm grow to its proper length and then stop, instead of growing far longer as it does in our simian ancestors? Why should the two arms (and the two legs) always grow to virtually the same length? Why should the human body grow for about twenty years and then stop growing?

The answer is evident. In that single, primordial cell there existed a force, a law of orderly development which compelled all these phenomena to take place, and to take place at the proper situation and in the proper sequence; and, when the proper time came, the laws enshrined in that primordial cell said to the lengthening arm and the heightening frame, "Stop," and they stopped!

As a rule each tiny egg develops in an orderly normal way the characteristics of its particular breed of ancestors. The sheep's ovum will develop into a timid adult, while that of the lion will be courageous and cruel; in the different breeds of horses one ovum will develop into a powerful draft horse, another into a fleet race horse; if it be a dog's ovum it will develop, it may be, into the swift greyhound, the fierce bulldog, or the fawning spaniel. If this be true of horses, dogs, and cattle, should it not be true of men? I firmly believe in the virtues, and alas, as the Great War has revealed them, in the vices, inherent in different breeds of men and nations. Good blood is a great asset whether in a horse, a cow or a man.

I confess I stand in awe before such manifestations of power packed, one might say, into such a microscopic space. To me there is no other explanation of such a mighty gift save from an Almighty Giver—the Fountain of Life, the ever blessed God. I bow before Him in reverence and also in gratitude that we live in a world of such wonderful order, instead of a world of blind Chance.

THE RED CROSS AND THE ANTI-VIVISECTIONISTS

AN APPEAL TO THE FAMILIES AND FRIENDS OF OUR HEROIC TROOPS AND TO THE COMMON SENSE OF THE AMERICAN PEOPLE[1]

First of all let me make two facts clear.

1. This paper has been written entirely on my own responsibility and not at the suggestion directly or indirectly of the Red Cross. I have been moved to write it solely in the interest of our brave soldiers, and especially because their sufferings and lives are involved in the suit against the Red Cross by the antivivisectionists to prevent the use of $100,000 of the Red Cross funds in such beneficent life-saving researches.

2. The Red Cross as an organization is neither an opponent, nor an advocate, nor a defender of vivisection. It states officially that the *supreme* aim of the Red Cross is to *relieve human suffering* [and it might well be added "and to save thousands of human lives"].

> "The War Council was advised from the ablest sources available that an immediate appropriation for medical research would contribute to that end. The War Council could not disregard such advice."

[1] Reprinted, with slight additions, by the kind permission of the Editor, from *Science* for Feb. 22, 1918.

They then refer to the many unsolved medical and surgical problems that have arisen from wholly new conditions and methods of warfare. Letters from a number of my surgical friends in France emphasize and the medical journals teem with papers on these new problems. They relate to the treatment of the horribly infected wounds—and practically *all* wounds are of this kind—never met with in civil surgery; to the treatment of "trench fever"—a peculiar form of fever never before seen; of "trench heart"; of "trench foot," often followed by lockjaw; of "trench nephritis" (inflammation of the kidneys); gas gangrene; tetanus; shell shock; poisonous gases; fearful compound fractures, especially of the thigh, etc. Every man enabled to return to active duty as a result of solving these problems helps to win the war. Every man who dies, or is permanently disabled because of our ignorance, hinders our winning the war.

It must be remembered that our surgeons, physicians, and physiologists over there are the very flower of the American medical profession. These fine men, under the supervision of the Medical Staff of the United States Army, superintend all the work. Nothing is done that has not the direct approval of Brigadier General A. E. Bradley, Medical Corps, U. S. Army.

Experiments on animals form a necessary but a minor feature of the researches.

"The animals used are principally guinea pigs, rabbits and white rats. If operations causing pain to animals are performed, anesthesia is used."

This certainly does not suggest "cruelty" or "torture."

I appeal to the common sense of the American people and especially to the families and friends of our brave soldier boys: Which do you prefer, (1) That our soldiers shall be protected from attacks of these new (as well as of the familiar) diseases, their sufferings lessened or even prevented, and their lives saved, or (2) will you insist that not a single guinea pig, rabbit, or rat shall suffer the slightest pain or lose its life, in researches to lessen the suffering and save the lives of our soldiers?

Remember, if you choose the second you deliberately condemn your son, brother, or husband to sufferings far beyond any suffering of these animals. In many cases, as I shall show, you will condemn your dear one to death, and in some cases a horribly painful death.

In the "Bill of Complaint" of the antivivisectionists, seven grounds of opposition to vivisection are mentioned. The sixth reads as follows:

> "That although it [vivisection] has been practised for many years, *nothing has been discovered by means of it that is at all beneficial to the human race.*"

This is the crux of the whole matter. If this were true I would vigorously oppose vivisection myself. It is a monstrous falsehood.

I entered upon my medical studies in 1860. I took part in the horrible surgery of the Civil War —as we now know it was. I have taught anatomy and surgery to not far from 10,000 students. I taught and practised the old dirty surgery—the only kind we then had—up to October 1, 1876. Since that date I have practised and taught the new antiseptic surgery, which has been created by researches similar to those now proposed. Since the Great War began I have diligently studied the newest surgery. I submit, therefore, that I may be presumed to be fairly familiar with these stages of surgery. Let me give now a few examples of some of the things that HAVE "been discovered by it [vivisection]" and that *are* "beneficial to the human race."

I may remark in passing that animals themselves have benefited by the same means, almost, and possibly quite as much as the human race.

1. *Typhoid Fever.*—This has been one of the historic scourges of armies. In 1880 the bacillus —the cause of the fever—was discovered. It was soon proved that the disease was spread through infected milk, infected water, and very largely by the house fly. The last, after walking over the excrement of a typhoid patient, and then walking over our food, conveys the disease. Prevention of contamination by these three means—sanitary measures based on the discoveries of bacteriology—prevents the disease to a large extent. But our real triumph over the disease was not achieved until lately.

I may here call attention to the fact that the antivivisectionists entirely reject bacteriology, a science which has disclosed to us the causes of many diseases, and has enabled us to prepare antitoxins to neutralize the poisons developed by these bacteria. Without bacteriology the physician and the surgeon today would be as helpless as a mariner without a compass.

	Cases		Deaths
During the Civil War typhoid fever resulted in	79,462	and	29,336
In the Boer War there were . . .	58,000	"	8,000
(In that war the total number of deaths was 22,000. Typhoid alone, therefore, was responsible for more than one third of all the deaths!)			
In our war with Spain there were	20,738	"	1,580
(Our Army numbered 107,973 men. Therefore every fifth soldier fell ill with typhoid in 1898! Over 86 per cent. of *all* deaths in this war were due to typhoid!!)			

During the Boer War imperfect attempts were made to control typhoid by an antitoxin similar to that against diphtheria, which has saved such multitudes of children. Gradually the method has been improved so that in our army it was at first recommended as a voluntary protection (1909). The results were so favorable that in 1911 it was made compulsory. It has been said that it should still be voluntary. But as every case of typhoid imperils the health and life of multitudes we surely have a right to make it compulsory so as to protect all the rest. All that is necessary to prove its effectiveness is to look at these tables of cases and deaths in our Army and Navy.

TYPHOID FEVER IN THE UNITED STATES ARMY

Year	Cases	Deaths
1906	210	12
1907	124	7
1908	136	11
1909	173	16
1910	142	10
[VACCINATION MADE COMPULSORY]		
1911	70	8
1912	27	4
1913	4	0
1914	7	3
1915	8 [2]	0

TYPHOID FEVER IN THE UNITED STATES NAVY

1909	189	17
1910	193	10
1911	222	15
[VACCINATION MADE COMPULSORY]		
1912	57	2
1913	22	4
1914	13	0
1915	15	1

On the Mexican border, though the fever was rife near the camps, only *one man* out of 20,000 troops, a civilian, who unfortunately escaped vaccination, fell ill with it but recovered.

Now let us see the results in the armies in the present war.

In the British armies, on March 1, 1917, Mr.

[2] Four in the United States; 4 in Hawaii.

Forster, Under Secretary for War, stated in the House of Commons that

> The last weekly returns showed only twenty-four cases in the four British armies in France, Salonica, Egypt and Mesopotamia. He added that the total number of cases of typhoid fever in the British troops in France down to November 1, 1916, was 1,684, of paratyphoid[3] 2,534, and of indefinite cases, 353, making a total of 4,571 of the typhoid group.

Now the English armies numbered at least 5,000,000. If they had suffered as our Army did in 1898 there would have been 1,000,000 cases! In fact there have been less than 4,600! Besides that, the percentage of fatal cases in the inoculated men was 4.7 per cent., in the uninoculated 235 per cent.; and perforation of the bowel the most dangerous complication, occurred *six times more frequently* among the unvaccinated than among those who had been protected. In the British armies the anti-typhoid vaccination is still voluntary but more than 90 per cent. have sought its protection. If it had been compulsory, hundreds of the 4,571 *who died would have been saved!*

In our own Army in more than four months (September 21, 1917, to January 25, 1918), a period one month longer than our war with Spain (the Surgeon General's Office gives me the official figures), we have had an average (i. e., every day of these four months) of 742,626 men in our cantonments and camps. These men have come from all over the country, in many cases from

[3] A form of fever caused by a bacillus somewhat similar to the typhoid bacillus but causing a much milder infection.

places where autumnal typhoid was reaping its annual harvest, in practically all cases unprotected by vaccination. Between these two dates there have been 114 cases of typhoid and 5 of paratyphoid. *Had the conditions of 1898 prevailed there would have been 144,506 cases instead of 199 in all!* The reason is clear. The men were all immediately vaccinated against typhoid, paratyphoid and smallpox.[4]

Besides this as soon as the antityphoid inoculation was completed the number of cases rapidly fell and from December 14 to February 15—9 weeks—there have been only 6 cases of typhoid and one of paratyphoid among probably now nearly 1,000,000 men! Truly marvelous!

Now all this is the *direct result of bacteriological laboratory work.* Was it not worth while? Has it not "benefited the human race"? Are you not glad that *your* son is thus protected?

I may add that the German armies show a similar absence of typhoid. I have seen no figures but only general statements.

Tetanus or "Lock-jaw."—Few people realize what terrible suffering this disease causes. The mind of the patient is perfectly clear, usually to the very end, so that his sufferings are felt in their full intensity. All of my readers have had severe cramps in the sole of the foot or calf of the leg. The pain is sometimes almost unbearable." In tetanus not the muscles of the jaw alone are thus gripped, but the muscles all over the body are in

[4] Of the last disease, there have been only 4 cases, all unvaccinated.

cramps ten or twenty-fold more severe, cramps so horrible that in the worst cases the muscles of the trunk arch the body like a bridge and only the heels and the head touch the bed!

Never shall I foget a fine young soldier during the Civil War who soon after Gettysburg manifested the disease in all its dreadful horror. His body was arched as I have described it. When at intervals he lay relaxed, a heavy footstep in the ward, or the bang of a door, would instantly cause the most frightful spasms all over his now bowed body and he hissed his pitiful groans between tightly clenched teeth. The ward was emptied, a half-moon pad was hung between the two door-knobs to prevent any banging; even the sentry, pacing his monotonous steps just outside the ward, had to be removed beyond earshot. . . . The spasms became more and more severe, the intervals shorter and shorter; it did not need even a footfall now to produce the spontaneous cramps, until finally a cruelly merciful attack seized upon the muscles of his throat and then his body was relaxed once more and forever. He had been choked to death.

Do you wonder at the joy unspeakable which we surgeons have felt of late years as we have conquered this fearful dragon? In 1884 the peculiar germ, shaped like a miniature drumstick, was discovered. Its home is in the intestines of animals, especially of horses. The soil of France and Belgium has been roamed over by animals and manured for over 2,000 years, even before Julius Cæsar conquered and praised the Belgians. The men in the trenches and their clothing are besmeared and bemired with this soil, rich in all kinds of bacteria, including those of tetanus, gas gangrene, etc.

When the flesh is torn open by a shell, ragged bits of the muddy clothing or other similarly infected foreign bodies are usually driven into the depths of the wound. Now the tetanus bacilli and the bacilli of "gas gangrene" are the most virulent of all germs. It takes 225,000,000 of the ordinary pus-producing germs to cause an abscess and 1,000,000,000 to kill, while 1,000 tetanus bacilli are enough to kill. This readily explains the frightful mortality from tetanus during the Civil War. It killed 90 patients out of every hundred attacked.

In the early months of the Great War the armies suddenly placed in the field were so huge that there was not a sufficient supply of the antitoxin of tetanus. Hence a very considerable number of cases of tetanus appeared. Now it is very different. At present every wounded soldier, the moment he reaches a surgeon is given a dose of antitetanic serum. As a result, *tetanus has been almost wiped off the slate.* I say "almost," because to be effective the serum must be given within a few hours. The poor fellows who lie for hours and even days in No Man's Land cannot be reached until too late. All the surgeons on both sides concur in saying that tetanus, while it occurred here and there, has been practically *conquered.*

Every step of this work has been accomplished by the bacteriologists and the surgeons working together in the laboratory and the hospital. Would you seriously advise that no such experimental researches should have been carried on and that your boy should suffer the horrible fate of my own poor Gettysburg boy? Confess honestly, are not these and other similar researches to be described as humane?—as desirable?—nay, as imperative?

Nay, more, "We feel," say forty-one of our medical officers on duty in France, "that any one endeavoring to stop the Red Cross from assisting in its humanitarian and humane desire to prevent American soldiers from being diseased, and protecting them by solving the peculiar new problems of disease with which the Army is confronted is in reality giving aid and comfort to the enemy." But the antivivisectionists declare that bacteriology is false—that such vaccination is "filling the veins with 'scientific filth' called serum or vaccine"! They are doing their best to persuade our soldiers not to submit to any such "vaccination"!

Smallpox.—The word vaccination leads me to say a word about smallpox. I confess that I was amused by a recent paper in an antivivisection journal entitled "Vaccination as a *Cause* of Smallpox"! During the last year hundreds of thousands of soldiers have been vaccinated against smallpox. Surely there should have been *some* cases of that disgusting disease if it were caused by vaccination.

But what are the facts? I have just received the Report of Surgeon General Gorgas for 1917. The section on Smallpox reminds one of the celebrated chapter on "Snakes in Ireland." On p. 81 on Smallpox in the Army in the United States, I read "*No* cases of smallpox occurred within the United States proper during the year." On p. 175, I read "No cases [of smallpox or varioloid] occurred in the islands" [among the American troops in the Philippines]. On p. 188, I read under Smallpox that "nine cases occurred during the year" [among the Philippine Scouts].

My friend and former student, Dr. Victor G. Heiser, as director of health in the Philippine Islands for years, vaccinated over 8,000,000 persons without a death—and with what result? In and around Manila the usual toll of smallpox had been about 25,000 cases and 6000 deaths annually. In the twelve months after his vaccination campaign was finished there was *not one death* from smallpox.

Per contra, in 1885 in Montreal, as stated by Osler, one Pullman porter introduced smallpox into a largely *unvaccinated* city. There followed 3164 deaths and enormous losses to the Montreal merchants.

But why say more? We all know that a single case in any community causes every intelligent person to be protected by vaccination.

Gas Gangrene.—One of the terrible and new surgical diseases developed by this war is called "gas gangrene." It has no relation to the poisonous gases introduced by the barbarous Germans at Ypres. About twenty-five years ago Professor W. H. Welch, of the Johns Hopkins Hospital, discovered a bacterium which produced gas in the interstices between and in the muscles. This bacillus does not occur in Great Britain. I never saw a case of gas gangrene in the Civil War, and but one case since then in civil practice. On the contrary in Belgium and France in the soil and, therefore, on the clothing and on the skin of the soldiers these bacilli abound. From what Bashford calls the "cesspool of the wound" the germs travel up and down in the axis of the limb. If the gas escapes from the puncture it will take fire from a match. Gas has been observed within five hours. An entire limb may become gangrenous within sixteen hours. If the limb is amputated the gas may be so abundant that the limb will float in water! Death is not long delayed.

Now your son in France runs a very serious risk of becoming infected with this deadly germ. Would you be willing positively to forbid any experiments on animals which could teach us how to recognize this infection as early as possible? Would you forbid any experiments which might teach us how to conquer or better still to prevent this virulent infection and save his life? Which would you prefer should suffer and very possibly die, a few minor animals or your own son? If a horse or a dog or even a tiny mouse can help in this sacred crusade for liberty and civilization, if it even suffers and dies, is it not a worthy sacrifice? Should they be spared and our own kith and kin give up their lives?

I need not wait for a reply! I am sure you would say "My boy is worth 10,000 rabbits or guinea pigs or rats! Go on! Hurry, hurry! and find the remedy." That is true humanity which will save human lives even at the expense of some animals' lives.

Now see the result. By careful observation and experiments with different remedies the surgeons have discovered valuable methods of treatment. But very many still die. Prevention is always far better than cure. At the Rockefeller Institute Drs. Bull and Ida W. Pritchett have discovered a serum which in animals prevents this gas gangrene and yet does no harm to the animal. It is now being tried on the soldiers in France.

Again I ask: Is it not our duty even to *insist* on such experiments so that our troops may be spared the dreadful suffering and even death following this virulent infection? If the Bull-Pritchett serum proves ineffective should not our efforts be redoubled? The common sense of the American people will reply: "Yes, by all means. You will be recreant to humanity and to your duty if you do not."

Modern Surgery.—In Howard Marsh's fine phrase, "Lister opened the gates of mercy to mankind." Pasteur and Lister are the two greatest benefactors of the human race in the domain of medicine. I'm not sure but that I might even omit the last five words.

The revolution which Lister produced in surgery is so well known to every intelligent person that I need say only a few words. Forty years ago a wholly new surgical era was inaugurated by Pasteur and Lister. In the Civil War there were recorded 64 wounds of the stomach and only *one* recovered. Otis estimated the mortality at 99 per cent. In more than 650 cases of wounds of the intestines there were only 5 cases of recovery after wounds of the small bowel and 59 from wounds of the large bowel—together out of 650 only 64 recovered, i. e., more than 90 out of every 100 died!

The complete statistics of the present war cannot be tabulated and published for some years. I give, however, the result of one series of abdominal gunshot wounds as a contrast, on a far larger scale and in far worse wounds. Out of 500 such operations, 245 *recovered!* and only 255 died. Contrast 51 per cent. of deaths in these wounds with mutilation and infection unutterably worse than the Civil War, with 99 per cent. of deaths, according to Otis.

Is not this a triumph of bacteriological and surgical research? Would you prohibit similar researches now when your boy's life may be saved by them?

Is not this one of the things that *have* "been discovered" by vivisection and has not such change in surgical treatment been of "*benefit* to the human race"? In all honesty would you be willing to have your son treated as I myself (may God forgive me!) ignorantly treated hundreds during the Civil War?

This advance I not only *think* and BELIEVE, but also I KNOW, is due to Pasteur and Lister and their followers. I know it by personal experience just as you know the high cost of living, the shortage of sugar, and the scarcity of coal.

The bacteriology which the antivivisectionists scorn and reject I KNOW is the CORNER-STONE of modern surgery. Before Lister's day out of 100 cases of compound fracture 66 died from infection. Now the percentage of deaths is *less than one* out of 100. Before Lister my old master in surgery, Dr. Washington L. Atlee, one of the pioneers in practising ovariotomy, lost 2 out of every 3 patients—now only 2 or 3 in 100 die. Before Lister we never dared to open the head, the chest or the abdomen unless they were already opened by the knife, the bullet or other wounding body. Now we open all these great cavities freely and do operations of which the great surgeons of the past never dreamed in the wildest flights of their imagination. Could they return to earth they would think us stark crazy until they found that the mortality was almost negligible and the lives saved numbered hundreds and thousands.

I have given but a few instances of the many wonderful benefits which have resulted from medical research in every department of medicine. But I believe they are sufficiently convincing. I should have been glad to tell the story of tuberculosis, syphilis, the bubonic plague, yellow fever, malaria, the hookworm disease, diphtheria, typhus fever, cerebrospinal meningitis, Malta fever, leprosy, and may other diseases, every one of which has had its progress stayed, its victims rescued, its toll of human lives cut down enormously, sometimes to one half or less, by researches similar to those which will be conducted in France. Most important and life-saving researches on surgical shock already have been made by Porter, Cannon, and others. Ought these to be abandoned and our soldiers left to perish when we can save their lives?

I can sympathize with the deep feelings of those who wish to spare pain to animals, but is it not a higher and more imperative, a holier sympathy that has spared and will spare pain eventually to human beings and also to other animals in uncounted numbers?

Do you wonder that after more than forty years of steady practice, teaching and writing, I assert, conscious of the great responsibility of my words, that "I regard experimental research in medicine as a medical, a moral and a Christian *duty* toward animals, toward my fellow men, and toward God."

There is so much yet to be learned, chiefly by experimental research! So many devoted lives to be saved to our country and to mankind if we only knew how! Do you wonder that I am in dead earnest?

Finally. What have the antivisectionists themselves done to diminish sickness and save life?

A. In animals? Absolutely nothing.

In spite of the enormous ravages of animal diseases causing enormous suffering to animals and costing this country $215,000,000 every year, not a single disease has had its ravages diminished or abolished as a result of anything *they* have done. They have not even tried. But medical research is saving every year thousands of animals from anthrax, hog cholera, chicken cholera, Texas fever, and other diseases.

B. In human beings? Absolutely nothing. I do not know a single disease of human beings which has had its ravages checked, abated or abolished by any work ever done by the antivivisectionists. Again, they have not even tried.

The only thing they *have* done has been to throw as many obstacles as possible in the path of those who are striving to benefit both animals and men.

This present suit is characteristic.

IMMORTAL YOUTH

A MESSAGE TO THOSE WHO LOST THEIR SONS IN THE GREAT WAR

To many of the patriots and loving yet bereaved fathers and mothers whose sons have fallen in the Great War, I have found that one of the most comforting thoughts has been that their "boys" have been thereby endowed with "Immortal Youth."

No matter how long the parents live, their boy will never grow old to them. Had he and they lived together for ten, twenty or forty years, the boy of twenty-odd would have become the man of even sixty-odd with gray hairs and the *pes anserinus* furrowing his temples. Once he has given life itself for Liberty and Civilization, he has passed from the Realm of Time, with its changes and its vicissitudes, its aging and its decrepitude, into the Realm of Immortality. There he will never lose the bloom of youth with his well-remembered inspiring buoyancy, his affection, his ardent, hopeful, cheerful life. Immortality for him and them knows neither Decay nor Decline. Its voice is ever that of vigorous, hopeful, radiant Eternal Youth.

I believe as firmly in Immortality and the Fu-

[1] Reprinted from the *North American Review*, March, 1919, by the kind permission of the Editor.

ture Life as I do in my present existence. Hence I believe that Immortal Youth is the future of our young heroes who have made what is well called the "Supreme Sacrifice."

SOME OF THE THINGS WE SURGEONS AS A PROFESSION STAND FOR [1]

It is trite, but profoundly true, for me to say that the distinguished honor you conferred upon me six long and fateful years ago, in April, 1914, in New York City, is deeply appreciated. How ignorant we were as to what was then "in the lap of the gods"! How little we dreamed that in three months' time the dogs of war would be loosed on faithful Belgium and heroic France; that when Britain's honor was touched, she, too, would spring to arms in defense of the Rights of Humanity, of the sacredness of what the whole civilized world recognized as solemn binding treaties, but which Germany deemed only "scraps of paper"!

The heart of the people of America was with you then and is with you to-day. Many of us tugged at the leash when the Louvain Library was given to the flames, when Rheims was ruined by the representatives of Kultur, and still more when the *Lusitania* was torpedoed without warning and went to the bottom in twenty-one minutes. Eleven hundred and fifty-four men, women, and children, including one whom we all loved—a gracious

[1] The Presidential address at the Fifth International Congress of Surgery, Paris, July 19, 1920. Reprinted from the *Annals of Surgery* for September, 1920, by the kind permission of the Editor.

woman on an errand of mercy—were thus murdered by the pitiless Huns. I have seen the coarse, misdated medal struck by the Germans to commemorate forever this hideous crime.

Many of us are also tugging at the leash to-day, longing to help you in your hour of peril. We resent the sinister influences at work, even in some high places, to create dissension between us and our "Allies," as I love to call you. We would gladly throw in our lot with you all—Belgium, Britain, France, Italy, Portugal, and Japan.

What amazing courage and steadfastness you have shown. What impossible things you have done on plain and on mountain peak, in trench and in hospital, on land, on the sea, under the sea, where you were comrades of the fish, high in the air, where you outstripped and were the envy of the eagle.

We were lost in admiration of your prowess, and suffered with you in your sacrifice of those that were dearest to you. Even in your hours of defeat instead of yielding to despair you showed what the "inspiration of adversity" could do, and plucked victory from the Hun.

Finally, when we Americans were allowed to come to your aid, how exultantly our young men and old men, young women and old women sprang to your help and were at least of some aid, though at the eleventh hour. It will always be a joy to us that Château-Thierry was the nearest approach of the Huns to Paris—a perilous nearness of but half a hundred kilometers. There, with uplifted and forbidding hand our message ran: "Thus far and no further,"—"and it was so," as saith the Scripture of the Creative Week.

How prophetic, though all unconscious, was the presidential address of that noble Belgian, Professor Depage, in April, 1914! How he turned words into deeds of great pith and moment at La Panne! What lessons in the surgery of wounds he taught us!

How splendidly all of you wrought not only for humanity, but for science! In the four years of the war, how you have transformed surgery! A new era dates from 1914 to 1918!

For me to attempt to discuss any surgical subject before *you* would be presumptous. It is for me to sit at your feet and learn how you have acquired your present affluence of surgical knowledge.

In this address, therefore, I venture to recall to your minds some of the things which we as a profession should stand for.

I regret that I can only give a brief paragraph or two to each topic. As to some, you will not all be in accord with me. I can only state my own belief as to what is, or ought to be, the attitude of our guild.

1. *Education.*—I need only to point you to one so lately rapt from us, Osler the scholar, who taught us all what we should study; not only practical medicine in its various branches, among which we may have a chosen one, but the history of medicine, the biographies of our past heroes; nor yet only medicine, but the humanities representing the "Literature of Power" as contrasted with the "Lit-

erature of Knowledge"; not only solid prose, but cadenced poetry, with its wings to lift us towards the stars; not only modern literature, but we should also drink of the old, old fountains of inspiration from Judea, Greece, and Rome. Medical education, strictly so called, has made great strides in the last thirty years due to the persistence of the leaders in medical thought and influence. It must still make progress *semper et ubique.*

2. *Research.*—I need only pronounce the word to awaken in your minds the contrast of the last years of the great war with the first year when you were groping your way to the light. The absolutely proved conquest of typhoid, typhus, tetanus, smallpox, and perhaps above all the victory over unparalleled infection, are eloquent witnesses to the value—the medical, military, economic and humanitarian value—of research. This is the greatest of the great achievements of the war.

The savant in the laboratory and the clinician in the hospital have been wedded at the bedside in the bonds of a scientific fellowship, never before so welcome and never before so fruitful for the good of mankind.

Fortunately, in our medical schools, our institutes of research, and the new Red Cross laboratories at Geneva, this wonderful work will be still further developed.

3. *Professional Uprightness.*—In one respect, I have an exultant pride in the honor and uprightness of our ancient guild. With our women patients, our honor is always at stake. We see them alone and we trust them with that which we hold

dearer than life itself. On the other hand, they give their honor into our hands with many and unusual temptations. Yet, how rare it is that a medical man is even accused of wrongdoing! Among the hundreds of thousands in many lands (and there are black sheep in every flock), the lapses from honorable and upright conduct are so few that even its possibility scarcely ever occurs to any woman as the door of the consulting room is closed.

The wonder is that among woman patients there are not more adventuresses who would endeavor to blackmail us. The community trusts us as no other class of men is trusted, and we, God be thanked, have proved ourselves worthy of their trust.

We are a profession, as distinguished from a trade. In the latter there is always a ready means of fixing values by the pound or the yard or by number. The services of our guild can never be weighed in the balance or be measured by length or breadth or number. We should never lower our standards.

A new remedy, a new splint or brace, or a new method of treatment, therefore, should be as free as the air we breathe, a new splint devised in Philadelphia should be as available in Paris, in Tokio, in Cape Town, or in Buenos Aires as in Philadelphia. A new remedy should be available for all doctors and all patients in all parts of the world. They should not be compelled to wait till they could get either the one or the other from Philadelphia or Paris or London, especially when, as often may be the case, to wait even a day may mean death or disability.

4. *Venereal Diseases.*—Never before has this menace to the health and general welfare of the community been so generally appreciated by the public as well as by our profession as during and because of the war. What injures the individual injures the state. Hence the most extraordinary and extraordinarily successful campaign against venereal diseases inaugurated by the war should be zealously continued, now that the war is over.

Ever since the fifteenth century, increased and disseminated by the war, syphilis has always been a scourge both to armies and to the populations among whom they were encamped. But in the great war the incidence both of syphilis and of gonorrhea immediately dropped to a startling degree the moment that the men came under army discipline and with the safeguards which surrounded each camp. By these same means the health of the community was protected. The incidence of venereal diseases in the Army was far below that in the civil community.

Now that the armies have been demobilized, the lessons taught the men by lectures and especially by the cinema films, it is hoped, will not be forgotten but will still act as deterrents.

But after all, the only sure and permanent deterrent will be a change in our moral attitude, our moral standards. There must be a "change of heart" to make permanent a change of conduct.

Our young men must be convinced that at the marriage altar where a new family is founded, the bridegroom should be as clean and as pure as the bride. He should realize his responsibility in the conservation of his wife's health and in the creation of strong and healthy children.

A single standard of sexual morality is the only righteous and just standard. It should be just as disgraceful in the judgment of the men and women in the community for a man to have a mistress, as for a woman to have a privileged lover. Social ostracism, now visited only upon the woman, should be meted out equally to the man.

We—we doctors, I mean—who especially well know all the evils not only to the husband, but to the wife and to their children—would not willingly give our daughters to men who are victims of gonorrhea or of syphilis. Surely, those of us who have sons would be unwilling for them to marry young women already besmirched. Shall our daughters be less jealously guarded than our sons? You know what it would be for your son or your daughter to have wretched, syphilitic children, doomed to a life of misery, to whom death would be a blessing and the tomb a welcome relief.

In the United States, impressed especially by the gravity of the venereal peril, eleven states of the forty-eight have passed laws to safeguard the community from the perils of transmissible and especially of venereal diseases in the marriage relation, in order to safeguard the health of the wives and children. The requirements vary all the way from a medical certificate, after a physical examination, made shortly before marriage, to a mere affidavit of one or both parties that they are free from any venereal or other communicable disease which would impair the health of the children born of such a union. The penalty is fine or imprisonment or both.

I have made a number of personal inquires from lawyers of the best standing as to how these laws really are working. Some have been enacted too recently to enable any reliable judgment to be formed as to their value; some are ineffective, or ineffectively enforced; some are evaded by marriage in an adjacent state having no such law. Those that are really enforceable and also enforced are of value, in the judgment of health officials and lawyers, partly because their penalties act as deterrents but chiefly because of their moral and educational value.

This movement is sure to grow. I venture the opinion that as the facts as to these diseases and the requirements of the laws become more widely known, especially among young women about to marry, they will be more and more insisted upon by the young women themselves or by their parents. [2]

Proper education in sexual matters should be given to young boys and girls by their parents or by physicians. They should be taught the facts of reproduction in a clean and pure way before they acquire such knowledge by the often filthy

[2] The best two publications to be consulted are, "American Marriage Laws in Their Social Aspects," by Fred. S. Hall and Elizabeth W. Brooke, Russell Sage Foundation, New York, 1919, and a careful study in "Social Hygiene" for April, 1920, 105 West 40th Street, New York City, by Mr. Bernard C. Roloff, Executive Secretary of the Illinois Social Hygiene League.

teaching from boys and girls a little older than themselves.

5. *Our Altruism.*—We are the only *self-destructive* profession. In unselfish devotion to the welfare of the community, in the battle royal against disease, in the fight for pure water and pure milk and wholesome housing—in a word, in preventive medicine, I glory in the fact that we doctors are always the leaders.

Every disease that is abated, such as smallpox, typhoid, typhus, diphtheria, dysentery, and such like, has had its chief adversary in our profession. A single epidemic of smallpox in a single city will bring more actual revenue to the doctors than a quarter of a century of vaccination, but we are the vanguard in insisting upon vaccination in order to stop this procession of death. We lead the fight for pure water and pure milk to prevent epidemics of typhoid—again wholly to our own financial detriment.

This twentieth century will be only a few years older when yellow fever, one of the former great scourges of the Western Hemisphere, will be actually blotted out of existence. This will be the first instance ever known of such a wonderful miracle in the history of the human race. The glory of it belongs to our profession—to Carlos Finlay, to Walter Reed and his associates, and to that prince of sanitarians, Major General William C. Gorgas, of the United States Army, whose world lamented death has occurred since these lines were written.

All honor, then, to the men of our guild for unselfish devotion to the health of the state.

6. *Abstention from Alcohol.*—I have no doubt there will be a greater diversity of opinion on this point than on any other. I can only state my own opinion and give the reasons why I hold it. What I shall say has no relation to the use of alcohol as a medicine but wholly to its use as a beverage.

Without doubt, the least prejudiced conclusion, based upon the results obtained by the most scientific and most rigid experimental investigation, is that of Dr. Raymond Dodge and Dr. Francis G. Benedict, head of the Carnegie Nutrition Laboratory in Boston. His conclusion is tersely stated in these words: "Any use of alcohol, even though it be occasional, must be regarded as contrary to scientific teachings."[3] Miles,[4] experimenting on doses of 30 c. c. of absolute alcohol, suitably diluted, says that 27 cases out of 30, i. e., 90 per cent., showed inferior functioning after this dose. Kraepelin[5] and Mitander[6] demonstrated greater or less losses of efficiency in the target practice of experienced marksmen after small doses, such as 30 to 40 c. c., of alcohol.

While these results are attained by scientific experiments of great accuracy in a small number of men, the result of prohibition in the United States

[3] Scientific Aspects of Moderate Drinking, Boston Med. and Surg. Journal, Feb. 18, 1904.

[4] Effect of Alcohol on Psycho-Physiological Functions, Carnegie Institution Publication No. 216, 1918.

[5] Münch. med. Wochnr., 1899, No. 42.

[6] Bericht des 10. Internat. Kongr. gegen den Alkohol, Budapest, 1905, pp. 193-204.

and later of the adoption of the Prohibition Amendment to the Constitution, demonstrate the extraordinarily beneficial results even within the few months since its adoption, The fact that private stocks of liquor are not yet exhausted, and that machinery for the effective enforcement of the law is at yet incomplete, and therefore that liquor can be obtained if one can pay the higher prices now charged only add to the strength of the argument from these results.

For actual conditions in New York City I have to thank Mr. Bird S. Coler, Commissioner of the Department of Public Welfare, and Dr. John Fitzgerald, temporarily in charge of Mr. Coler's offices. They have most courteously given me complete information covering nine large municipal hospitals, and one even more valuable source of information, a large municipal lodging house.

Of course, I can only epitomize the facts and opinions of the medical officers in charge.

In the lodging house the admissions for January, February, and March, 1919, under license numbered 22,350. In the corresponding months for 1920 under prohibition, they were 4607.[7] Not only were the results so remarkable in numbers, but "the applicants were better, cleaner, and healthier than formerly." Intoxicated applicants were rare, while "formerly we were obliged to call a policeman nightly to have the drunks removed." The employees were giving better care to their

[7] The report for March being rendered on the 26th, I added the average for the remaining five days.

personal appearance and were saving money. "I have met men on the street," writes the superintendent, "who were formerly regular lodgers and was surprised at their neat and clean appearance. They are working steadily and buying clothes instead of drink."

Among the hospitals the general result was a largely decreased number of admissions, especially for intoxication and delirium tremens. Also, again, among the employees there was great improvement. One report says of them that some of the former worst offenders were opening bank accounts.

The Psychopathic Ward at Bellevue Hospital, in New York City, handles more alcoholics of the vagrant and poor class than any other hospital. Dr. M. S. Gregory, the Director of that ward, writes than in January and February, 1920, instead of 400 to 500 cases a month, there were only one or two a day so that the ward was *abolished!* As soon as the lax administration of the law set in, the number increased to five or six or even ten a day. This, however, was a much smaller number than before prohibition.

In Philadelphia, the House of Correction, in which the most of the cases of vegrancy and alcoholism are treated, instead of a population of over 2000 before prohibition, has a population of only about 400 to 500 since prohibition became effective. In the first four months of 1920, the savings by reason of fewer employes, less wages, less food, and other expenditures, were sufficient to pay all the expenses of the entire Department of Public

Welfare for the remaining eight months of the year.[8]

A similar diminution of the number of inmates in the County Prison in Philadelphia has raised the question whether the House of Correction and the County Prison could not be combined with consequent large economies. Four adjoining counties in Massachusetts are about to abolish three jails as the one remaining jail can accommodate all the prisoners of the four counties.

In Philadephia in the first six months of 1919, under license, there were 17,114 arrests for intoxication. In the last six months under war prohibition, the number was 6509, a decrease of 62 per cent.

In the alcoholic department of the Almhouse (Philadelphia City Hospital) the admissions in the last six months of 1917 and 1918, i. e., before war prohibition, were 1470 and 1184, respectively. In the same period in 1919 under war prohibition, there were only 276, a decrease of 77½ per cent.

In Massachusetts, Mr. H. C. Parsons, Deputy Commissioner for Probation for the whole state, as a result of the first year of prohibition, reports that during the first five months of 1919, under license, there were 34,176 arrests for drunkenness. In the corresponding months of 1920, under prohibition, there were only 10,324—a diminution of practically 70 per cent.

Judge Cabot, of the Juvenile Court, states that the family relations are greatly improved. The

[8] Personal statement to me by Hon. E. L. Tustin, Director of Public Welfare, in Philadelphia.

parents, instead of neglecting their homes, are trying to make them attractive to live in, and instead of spending their time and money in the saloons, are taking their children to the cinema ("movies") and to church.

Many rural courts have no culprits before them for days and even weeks.

During the war the great improvement in social conditions following the prohibition of vodka in Russia told the same story.

I need not urge on this audience the argument that alcohol is the most powerful and most frequent cause of sexual immorality and its attendant venereal diseases, to say nothing of the evil effects of the alcohol itself.

Whatever may be the conclusions of scientific experiment on the effects of alcohol, the huge experiments on the millions of human beings in the United States as shown above and in Russia seem to me to be conclusive that total abstention from alcohol results in less drunkenness, less poverty, less crime, less disease, fewer accidents, and smaller expense to the city and the state. If so, is it not our duty as a profession to urge total abstinence from the standpoint of the health and the general welfare of the entire community? [9]

As the Supreme Court of the United States has

[9] Since the date of this address, the most important testimony that has been published is contained in a pamphlet issued by the "Manufacturers Record" of Baltimore, Maryland. It contains extracts from about 400 business men who view the subject from the economic and the moral standpoint. Much of this testimony takes into account the very imperfect enforcement of the law. I have room only for what the Pres-

decided that the Eighteenth, the Prohibition Amendment, is constitutional, and is, therefore, the supreme law of the land, it is proper to call attention to the serious effect that prohibition will have upon industry and trade.

ident of the United States himself says and one other quotation from the same journal for June 8, 1922.

"In every community men and women have had an opportunity now to know what Prohibition means. They know that debts are more promptly paid, that men take home the wages that once were wasted in saloons; the families are better clothed and fed, and more money finds its way into the savings banks. The liquor traffic was destructive of much that was most precious in American life. . . . In another generation I believe that liquor will have disappeared not merely from our politics, but from our memories."

WARREN G. HARDING
May 29, 1922.

" . . . In my own experience which is principally agriculture in which I have several hundred people engaged . . . the change is as different as from night unto day. Before national Prohibition came into effect I seriously considered that it was impossible to continue my development and agricultural operations on a large scale; it certainly was very unprofitable with so much waste of time and money caused by a large per cent. of drunkenness among those with whom I had to deal. I think this trouble has been reduced fully 95 per cent. and where formerly my men were mostly uncertain and unreliable, I now have less than 1 per cent. of such trouble. . . . My labor and tenants are far more industrious, better satisfied and more prosperous generally as well as better fed, better clothed and better housed since the advent of national Prohibition. Many of them have paid for first class farming outfits and have anywhere from two to twenty mules fully paid for, and some have their own money in the bank to raise their this year's cotton and other crops; several have even bought valuable farms. . . . "

S. E. SIMONSON, Luxora, Ark.

Under prohibition undoubtedly fewer hours are lost by workingmen and fewer industrial accidents occur, since both are largely due to alcoholic excesses. In the modern keen competition for the markets of the world, a drinkless nation will thus have a most important economic advantage over a drinking nation, both in the better character of its workmen and in the more uninterrupted hours of labor. Hence the output of its products will be greatly increased and the cost lessened.

7. *Bravery.*—In combating great plagues, when and where have the doctors been cowards? Where have they run away to gain safety for themselves, leaving the victims of disease to suffer and die unattended?

Let Serbia and Poland respond. Let the southern cities in the United States—Norfolk, Memphis, New Orleans—so often devastated by yellow fever, reply. In Europe and America, let the cities which have been decimated by cholera give answer.

The case needs no argument. It is confidently committed to the jury of the world without instructions from any judge. The verdict is and has always been, "Guilty of the highest bravery known among men." Without the gorgeous trappings of war, without the beating of drums and the blare of trumpets, with only "Duty" as a watchword, and Godlike Compassion as a motive, they have ministered to the sick and dying and only too often have been among the slain.

8. Finally, we stand for pure and undefiled re-

ligion as the surest guide for the present and the surest hope for the future. Observe, I say, not theology, which is a separating, a sundering force, but religion, which is even etymologically that which binds together, and morally is the supreme hope of the world.

BE STRONG

Be strong!
We are not here to play, to dream, to drift;
We have hard work to do, and loads to lift.
Shun not the struggle; face it. 'Tis God's gift.

Be strong!
Say not the days are evil—who's to blame?
And fold the hands and acquiesce—O shame!
Stand up, speak out, and bravely, in God's name.

Be strong!
It matters not how deep intrenched the wrong,
How hard the battle goes, the day, how long;
Faint not, fight on! To-morrow comes the song.

—Maltbie D. Babcock.

VIVISECTION [1]

Vivisection means literally "cutting a living being." Every surgical operation is literally a vivisection. In common speech, however, the word has obtained a much wider meaning—namely, any mode of experimenting on an animal, by administering a drug by the mouth, by a hypodermic syringe or by the other means; by varying the quality or the quantity of food; and also any cutting operation for the purpose of research. The proper term is "experimental research."

The three principal objections to "Experimental Research" are: That it is cruel; that only 25 per cent. of the profession approve of it; and that it has been of no benefit either to man or to animals. I will consider them in the order given.

1. That cruel suffering was inflicted in the past is an undoubted fact, but we must never forget that prior to October 16, 1846, anesthesia was impossible, for no effective anesthetic was known. Even the words anesthesia and its derivatives did not exist. I condemn the utter indifference to pain such as was admitted by Klein before the first English commission in 1875; whether he is now alive or not I do not know. Dr. B. A. Watson, of Jersey City, was cruel in his experiments on

[1] Reprinted by the kind permission of the Editor from *The Country Gentleman* for February 12, 1921.

shock and was soundly rebuked at the time. Mantegazza, in his book on the Physiology of Pain, is the only experimenter of whom I have any knowledge who did perform cruel experiments for the very purpose of studying the effects of pain *per se.*

But, while the experiments mentioned above are constantly described by the A-V's, one important fact is nearly always omitted—the dates of these events. The reader, uninformed in the history of medicine, is apt to believe that these men are now living and still performing such experiments.

Doctor Watson died in 1892. His experiments were done thirty years ago, in 1890. Mantegazza's book was published in 1880, forty years ago. The "ferociously cruel Magendie" was born in 1783, six years before the Constitution of the United States was adopted, and his last paper was published in 1842, four years before the introduction of anesthesia in 1846. Dupuytren was born in 1777 and died in 1835, eleven years before anesthesia was known.

To compare the work of men who never knew there was such a thing as an anesthetic with those of to-day is like comparing the antiquated methods of the engineers of seventy-five and one hundred years ago with the methods of General Goethals and his associates in Panama.

The A-V's—I adopt A-V as a clearly understood contraction of antivivisection and its derivatives—insist that vivisection is cutting up and torturing live animals with the alleged idea of gaining from their *torments* certain biological and pathological facts designed to be used in the treatment of human maladies. All this is precisely what modern research by experiment on animal is *not*. Torturing animals and studying their torments are not the occupation of research workers. Such suffering, especially severe suffering, would defeat the very objects of such researches. "To rend them to shreds," could by no possibility give the least information on any problem of health or disease.

Had the A-V's followed Owen Wister's suggestion and said, "The Declaration of Independence was signed by Christopher Columbus on Washington's birthday during the seige of Vicksburg in the presence of Queen Elizabeth and Judas Iscariot," their statement would have been equally veracious and more striking.

Moreover, the A-V's studiously avoid any mention of anesthesia in connection with the many cases which they quote. For instance, take an experiment by Crile, of Cleveland. Crile is said to have poured boiling water into the intestines of a dog while he was alive. If this description were literally true Crile should have been prosecuted and would have been convicted by his testimony. Yet no prosecution was ever instituted by those who express such horror.

But what are the real facts? For certain reasons, later proved to be valid for both animal and man, Crile suspected that operative roughness, or any procedure which involved serious injury and which were the animal conscious would be extremely painful but which when the animal was rendered unconscious to pain could not cause the least pain, was nevertheless injurious to the animal and would endanger its recovery after any operation. He suspected that the tearing out of a cancerous breast—as I was taught to do by Joseph Pancoast, the best surgeon of his age, sixty years ago—so as to lessen hemorrhage, seriously injured the patient and might easily turn the scale against recovery, although, being anesthetized, the patient was not conscious of the least pain.

Accordingly, Crile tested his idea upon dogs. He did pour boiling water into the belly—not into the intestines—he did crush the paws with stout pincers and did burn the paws in a gas flame, and so forth, and in his book—Surgical Shock, p. 14—he especially states that "in all cases the animals were anesthetized," a statement the A-V's carefully suppress.

What has been the result of his researches? Crile has become the Apostle of Gentleness to all the surgical world. By heeding his warnings many a life was saved in the Great War, through watching the blood pressure, especially in shock, when even a slight additional injury, by operating roughly, might turn the scale.

Now is it fair to suppress all mention of an anesthetic in such apparently cruel experiments, especially when the author expressly stated that an anesthetic had been given in every case?

It may be that the operator is a physiologist seeking to unravel the complex processes of the nervous system or a surgeon testing a new operation. On a struggling animal no exact observation can be made and no delicate surgical operation can be performed. An anesthetic, therefore, is an absolute necessity, apart from any humane motive.

It has been asserted that the lips of animals are sewed or clamped together to prevent their screams from disturbing the operator's nerves. Never, till now, in all my long life have I heard such an allegation. I do not believe it is true. Besides that try the experiment on yourself. Hold your lips together and find out whether you can still scream. I can.

"Under incomplete anesthesia," is a phrase often quoted against Crile. Let me give an instance from my own experience. A young lady was threatened with a permanently stiff elbow. To prevent this serious disability I had a dentist give her nitrous oxid several times. As soon as she was unconscious I forcibly flexed and extended the joint. Any one ignorant of surgery and looking on would have exclaimed. "What a brute that surgeon is!" For she writhed and struggled so that three of us had difficulty in preventing her from landing on the floor. Yet when she recovered she knew nothing of her struggles and had not felt the slightest pain. That was "incomplete anesthesia."

Again, the surgeon has every possible selfish motive to facilitate in every way the speedy recovery of the animal by the greatest kindness and care. If the mortality of his new operation is large his hopes are blasted and his reputation suffers.

The head nurse of one of America's best surgical clinics was called to the Rockfeller Institute to care for the animals. Yet an A-V describes it as "Hell at close Range."

Claude Bernard's experiments on the effects of heat on dogs are made much of in A-V literature. "Some" are said to have been baked to death and "some" merely boiled at temperatures of between 200 and 300 degrees Fahrenheit. Again, what are the real facts? First, these experiments were done forty-four years ago, in 1876, to determine the effects of heat alone on healthy animals—that is, with none of the profound disturbances caused by disease. Second, there were just three dogs. The naming of 300 degrees is unwarrantable, for the highest temperature in Bernard's three experiments was just 100 degrees Centigrade, or 212 degrees of our absurd Fahrenheit scale. The dogs died when their own body temperature reached about 112 degrees Fahrenheit, only a few degrees higher than a not uncommon temperature in high fever in our patients.

In industry we have men exposed to very high temperatures. In 1892 (Medical News, LXI, p. 262) Coplin published the results of exposure of 500 and 800 men, the day and night shifts, in a sugar refinery at temperatures from 95 degrees Fahrenheit to 165 degrees Fahrenheit in a hot July. Of this large number, 213 had to stop work on account of heat exhaustion. In consequence of his wise and vigorous treatment, aimed especially at reducing their body temperatures, 185 were able to return to work and only one died.

I do not hesitate to condemn Bernard's omission of opium or other narcotic in his experiments; but at least his experiments should be truthfully quoted.

I can also contribute a bit of personal experience just here. I have had quite a lot of accidents—"annual accidents," my friends insist on calling them. I have broken my nose and both collar bones, have dislocated one shoulder and broken the other. Also, in addition to other minor operations, I have had a portion of my large bowel cut out. I might almost pose as a "museum specimen."

When my dislocated shoulder threatened to become stiff I was "baked alive"—that is, my shoulder and a considerable adjacent area on my arm, chest and back were so baked—up to 250 degrees Fahrenheit without discomfort, and with the result that my arm is as useful as ever.

When the piece of my large bowel was cut out and the two open ends sewed together—I was nearly seventy-five years old at that time—I was reclining in bed with a letter pad on my knee three days after the operation, was out of bed in ten days, and here I am, nine years later, in good health.

Before the perfection of the antiseptic method by Lister and others, and before the very many experiments needed to determine just the best and safest way to do such an operation, no prudent surgeon would have dared to attempt such an operation on a human being. I should have been allowed to die. The very many meticulous details required to sew the two open ends of the bowel together so exactly as to prevent any possible leakage—for the least leakage meant a fatal peritonitis—had been worked out by experiments on animals, and my friends and I thank God that they had been so determined.

If we are to improve our treatment in any department of medicine, only two courses are open to us: First, to try a new drug or a new method first on animals and, if the results justify it, then use the better treatment on man; Second, try it first on man. Personally I advocate the first.

Mrs. Caroline Earle White, long the leader and still the idol of the A-V's, in 1886 published an answer to one of my addresses. On page 4 she said: "I take issue with Doctor Keen . . . where he says 'These experiments cannot be, nay, they must not be, tested first upon man.' I assert, on the contrary, that in the majority of cases they *must be tested first upon man or not tested at all.*" *

On page 10 she said: "Doctor Keen next mentions that "in India alone 20,000 human beings die annually from snake bites and that as yet no antidote has been discovered. . . . How can we seek intelligently for an antidote,' he asks, 'until we know accurately the effects of the poison?' The answer that suggests itself to me is very different from the one which he makes. . . . Here is an opportunity which is not often afforded of *experimenting upon human beings.** Since they would infallibly die from the snake bites, there can be no objection to trying upon them every antidote that can be discovered." The proposal is as absurd as it is cruel.

* Italics my own.

Thirty-five years have passed since Mrs. White thus urged "human vivisection." I have yet to see the first repudiation of it by any A-V!

In 1909 a set of rules regarding experiments on animals was drawn up. They are given in full in my book on Animal Experimentation and Medical Progress, p. 246. I know of no laboratory in the United States in which these rules are not posted up; and, what is more, they are lived up to.

These rules provide for the scrupulous care of the animals. No operations whatever are permitted except with the sanction of the director, usually a responsible member of the faculty. In case the operation would cause greater discomfort than that attending anesthesia, the animal must first be "rendered incapable of perceiving pain." Exceptions are allowed only by express sanction of the director. Such exceptions are excessively rare. "At the conclusion of the experiment the animal shall be painlessly killed."

2. With regard to the attitude of the medical profession, in an extraordinary pamphlet called "Medical Opinions Against Vivisection," issued without any date by the New York A-V Society, on page 2 it is stated that only 25 per cent. of the medical fraternity are in favor of experimental research. We are not informed how this astonishing conclusion has been reached by the authors of the pamphlet.

The only real way to obtain any correct idea of the general sentiments of the profession is by knowing what the profession itself has said in the great International Congresses of Medicine and Surgery in Europe and America, with their thousands of members; in the national associations—for example, the American Medical Association, comprising over 84,000 members; in the American Association for the Advancement of Science, having also thousands of members; and in special societies with hundreds of members.

These organizations have passed resolutions indorsing experimental research again and again. On pages xv-xviii of my book on Animal Experimentation, etc., I give several of these resolutions in full. How were these expressions of opinion possibly passed and, as is frequently recorded, *unanimously,* if three-quarters of the profession are neutral or hostile? Why did not these three-quarters protest?

On the other hand, I do not know of a single organization, medical or scientific, which has passed any resolution against such research.

The last British Commission on Vivisection, 1906-07, of which, observe, opponents as well as advocates of research were members, unanimously passed the following resolution—Final Report, p. 20:

"We desire further to state that the harrowing descriptions and illustrations of operations inflected on animals, which are freely circulated by post, advertisement or otherwise, are in many cases calculated to mislead the public, so far as they suggest that the animals in question were not under an anesthetic. To represent that animals subjected to experiments in this country are wantonly tortured would, in our opinion, be absolutely false."

The same is true of the United States to-day.

So much for quantity. Now let us look at the quality of the men on the two sides.

The pamphlet just alluded to contains several hundred names. It has influenced many persons. In a letter to one of my friends, Mrs. Belais, president of the New York A-V Society, says: "Errors occur *very infrequently*"—her italics—"but we are always most punctilious about correction." How "accurate" the pamphlet is the following will show.

Dr. William H. Welch, of Johns Hopkins, our champion advocate of experimental research, appears in the list of its opponents! Doctor Woglum, of the Crocker Cancer Commission, is classed as another opponent! Sir David Ferrier, my old Scotch friend and a world-famous experimenter on the brain, who has lived in London for over forty years, as I know personally, is listed in Paris, France, and among the opponents!

How "punctilious' they are about such corrections is evident by this instance:

In the London Times of April 18, 1902, Sir Frederick Treves protested against the misuse of his name as an opponent of research. In 1920, eighteen years after this and later repeated protests, his name is still so misquoted in this story pamphlet.

Of living, really eminent medical men, I cannot count a score who are opposed to experimental research.

3. Let us now consider a few of the benefits of experimental research.

The A-V's declare that bacteriology, one of the greatest discoveries ever made in medicine, is not a science at all. They claim that germs are not the cause of typhoid, tetanus, diphtheria, tuberculosis, and on forth; that all the wonderfully effective vaccines and serums against these various diseases are, "pouring filth into the blood," and are of no use anyhow. In their suit against the Red Cross they alleged that "nothing has been discovered by means of it [vivisection] that is at all beneficial to the human race," and in a letter, dated July 29, 1920, sent to every member of the 1921 Pennsylvania legislature, they state, "The results of this cruelty are of no value to the human race."

They deny that any benefits have followed from the researches of Pasteur and Lister!

I can give only a few examples of many perfectly attested benefits. I shall consider each very briefly: Typhoid fever, puerperal (childbed) fever, diphtheria, tetanus, syphilis, yellow fever, The Surgery of War, The Surgery of Peace and The Cry of the Animals.

Typhoid Fever. In the Civil War 10 per cent. of all deaths were from typhoid.

In the Spanish-American War every fifth soldier in our Army fell ill of typhoid, and 86 per cent. of all deaths were from typhoid.

In the Great War almost none! Why? Because in the interval between 1898 and 1914 vaccination against typhoid had been discovered and developed.

Let me illustrate by two great experiments on

8000 and on about 750,000 human beings respectively:

Plymouth, Pennsylvania, a town of 8000 people, was supplied with water from a reservoir fed by a mountain stream. In the first three months of 1885 one man living on the banks of this stream, was ill with typhoid fever. His copious dejecta were thrown out upon the snow without disinfection. When a warm thaw with rain occurred towards the end of March, the germs of typhoid from the dejecta were washed into the stream. On April tenth an epidemic of typhoid broke out in the town and caused, in all, 1104 cases and 114 deaths.

From September 21, 1917, to January 25, 1918—the figures are official—a period about two weeks longer than the war with Spain, there were, on the average, 742,626 soldiers every day in the camps in the United States. They came from unprotected communities, where autumnal typhoid was rife. Yet during these four months there were but 114 cases of typhoid and five of paratyphoid fever, a milder fever closely resembling typhoid. Had the conditions of 1898 prevailed, there would have been 144,506 cases and about 15,000 deaths.

Why was typhoid almost banished? Because every soldier on enlisting was immediately vaccinated against the fever. As soon as this vaccination was completed in these new recruits in the less than five weeks from December 14, 1917, to January 15, 1918, there were only six cases in the three-quarters of a million men. These magnificent results were a direct outcome of laboratory work.

During the Great War the British A-V's did their best to dissuade the soldiers from being vaccinated. Had the soldiers heeded them, thousands of lives would have been needlessly sacrificed.[2]

Childbed, or Puerperal Fever. In my student days—1860-1862—childbearing caused the death of three to five mothers in every hundred. Was not this a horrible result of a normal and necessary human function?

But sometimes this mortality rose to 20 per cent. and, in local epidemics, even fifty-five mothers out of every one hundred died!

What are the present figures? You will find them in detail in A. W. W. Lea's "Puerperal Infection" (London, 1910, p. 24). Cases already infected entering the maternity ward, of course, are excluded. Lea quotes various wonderful statistics, culminating in one series of 8373 successive births without the death of even one mother from infection.

Why this enormous saving of human lives. Because in 1843 Oliver Wendell Holmes showed that, in some then unknown way, the doctor and the nurse carried the fever from patient to patient. Thirty-six years later, 1879, Pasteur, in a debate in the Academy of Medicine of Paris, when a doubt was expressed as to whether the germ, asserted to be the cause of this dreadful mortality, would ever be seen, leaped to the blackboard, drew what we

[2] For later and better statistics see the correspondence between Surgeon-General Ireland of our army and Surgeon-general Goodwin of the British Armies in the Journal of the American Medical Association, January 2, 1922, page 233.

now know as the Streptococcus, one of the deadliest germs, and cried out, "Look! This is the germ of puerperal fever!" And this germ, which formerly left death and woe in its path, is now under our heel.

When your own wives and daughters face the pangs and perils of maternity to whom will you turn for help—to those who have practically abolished childbed fever or to those who would have prevented this blessed victory?

It is claimed by the A-V's that all this is due to sanitation and to cleanliness. But what are sanitation and cleanliness? They are based wholly on laboratory researches into what the streptococcus is, what it does, how the infection is spread and how it may be abolished. In other words, this saving of lives is due to bacteriology, a science which the A-V's totally reject.

Diphtheria. Up to 1895 every active surgeon, myself among the number, was often called upon to do a tracheotomy—that is, to open the windpipe, or trachea, in the neck to prevent the death of a child by suffocation from diphtheria.

I have not the time to paint the picture in detail of the agonized mother begging for the life of her child, yet dreading the operation. And no wonder! The surgeon dreaded it almost as much, for death, alas, too often followed in spite of his efforts.

In 1895 the antitoxin against diphtheria was introduced and soon became a common treatment. Exactly as the use of the antitoxin increased in frequency the calls on the surgeon for tracheotomy decreased. After a few years I was never called on to do this operation, and my experience is duplicated, I may safely say, by practically every surgeon.

The mortality of diphtheria increases with every day that the use of the antitoxin is delayed. When given on the very first day, in 218 cases of a series of nearly 4000, the mortality was zero—not one death. If delayed till the second day, the mortality was 5 per cent. If delayed till the third day, it rose to 12 per cent. If delayed till the fourth day, it rose to 16 per cent.

TETANUS, OR LOCKJAW. I wish I had space to describe this horrible disease as I saw it in the Civil War, when it killed nine out of every ten men attacked by it. Imagine the muscles all over the body to be gripped by cramps, so severe that the whole body is sometimes bent backward, only the heels and the head touching the bed. Unfortunately, the patient's mind is as clear as my reader's at this moment. Finally a mercifully cruel spasm of the muscles of the throat chokes the patient to death.

The germ of tetanus was discovered in 1884. Its home is in the intestines of animals, especially of the horse.

The soil of Belgium and Northern France has been cultivated and roamed over by horses and other animals for 2000 years, as every schoolboy knows from Cæsar's Gallic War. It is the most dangerous spot of ground, I suppose, on earth, for it is full of the most virulent germs of tetanus and other infections.

In the Great War practically every wound became infected and with a virulence never before met with. Hence, very soon it became the rule to give every wounded soldier a full dose of the antitetanic serum at the very first opportunity. Tetanus at once became less and less frequent, so that later one case in Paris was shown to Dr. Harvey Cushing, of Harvard, as a curiosity.

Syphilis. This scourge has ravaged the world since the sixteenth century. In this long time we have been able to ameliorate the disease but practically never to cure it.

Why? Because we did not know the cause. Until this was found we were fighting in the dark. Now mark what the advent of the experimental method meant.

Metchnikoff, in 1903, first succeed in inoculating the disease in apes and later in other animals. Experiments on animals, impossible before that time, were immediately begun. In 1905 Schaudinn and Hoffmann thus discovered the germ. In 1910, after a most extraordinary series of experiments with six hundred and five other remedies, which had to be discarded as ineffective or too dangerous, Ehrlich discovered his Salvarsan, or 606. Since that date we have had the whip hand over this desolating plague. Many of the victims of this dreadful disease are innocent women; many others are innocent children, some already dead when born and others destined happily to an early grave; still others, less fortunate, doomed to drag out a miserable existence. Not a few of the victims were innocent doctors, accidentally infected, of whom I have known five; one committed suicide.

In seven years experiments on animals did more for alleviating human misery from this one disease than clinical observation on man alone had done in over four centuries.

Yellow Fever. We were more fortunate in the fight against yellow fever, for by the research work of Reed, Lazear and others was discovered the means by which the disease was carried, and, by attacking the mosquito, a wonderful victory was won.

But lately Noguchi, that genius of the Rockefeller Institute, has finally discovered the actual germ of the disease. This discovery enabled him to prepare a preventive serum. To-day, December tenth, as I am writing these words, the newspapers announce that the serum of Noguchi has been tried where the fever exists and has been found to confer immunity upon those who have never had the fever.

Very soon the dream of Surgeon-General Gorgas will be realized, that yellow fever will have been banished from the world.

Surgery of War. I have mentioned the intensity of the infection seen in the Great War. At first our ordinary disinfectants failed utterly.

Two classes of wounds were recognized—the contaminated and the infected.

A contaminated wound is one in which the tissues involved had had a moderate number of bacteria strewn on the surfaces of the wound. The missiles of the war far exceeded those of any other war in their enormous velocity. When a fragment of shell struck the body, it contaminated all the surfaces of the wound, but also, by the impact of the blow, killed or devitalized a certain thickness of tissue next the surface of the wound. This dead and dying tissue is the very best food for the various bacteria. In from six to, say, twelve hours, or sometimes more, these germs penetrate deeply into the tissues. Then the wound is an infected wound.

In a contaminated wound it was found that the germs could be removed in a mass by cutting away all the contaminated tissue. Then the wound could be closed at once; and eighty-five to ninety wounds in every hundred would heal at once.

In an infected wound this procedure alone was not sufficient. The bacteria were too deep and too numerous. Then Carrel and Dakin came to the rescue. They showed, by experiments, that a weak solution of bleaching powder was the most efficient antiseptic, provided it could be kept continually in contact with the entire surface of the wound. Carrel's little rubber tubes, connected with a reservoir, were laid in the wound in every direction, and every two hours fresh solution irrigated the entire surface of the wound.

The enormous number of lives of our gallant soldiers saved will be shown when the medical and surgical history of the war is published. Never before has such a large percentage of the wounded been saved, nor with such relatively small disability.

The Surgery of Peace. I need not enter into details here. Every intelligent reader knows that surgical operations have been robbed, not only of pain by anethesia but also of their chief danger—infection. An amputation of a breast or an operation for the removal of gallstones or of the appendix early in the attack has now practically no mortality, whereas prior to Lister's day amputation of the breast was a very dangerous and therefore rare operation, and removal of gallstones and operations for appendicitis were never even attempted. Most of such sufferers died because the danger of infection practically prohibited any operative interference. Ovariotomy was done. But two out of every three patients died; now scarcely one in a hundred dies.

The Cry of the Animals. I wish I could voice the pleas of the animals, demanding that their happiness, health and lives should also be conserved.

In 1915, when prices were normal, the following were the direct losses in the United States every year, as conservatively estimated in dollars:

Hog Cholera	$75,000,000
Texas Cattle Fever	40,000,000
Tuberculosis	25,000,000
Contagious Abortion	20,000,000
	$160,000,000
Other Diseases of Animals	52,850,000
Total in 1915	$212,850,000

Not only was there loss of dollars of value and of urgently needed food but this loss meant sickness, suffering and death to millions of cattle, hogs, horses, sheep, poultry. Are not their suffering and death to be weighed in the balance as well as the suffering and death of human beings?

Take only one disease—anthrax, or woolsorters' disease—as an example of what has been done.

Pasteur conquered anthrax. When he began his researches thousands of cattle and sheep were dying from anthrax every year. It was a veritable plague. Morever, in Europe hundreds and hundreds of human beings were also fellow victims. As Huxley pointed out, the money value of this one victory was enough to pay the whole indemnity paid by France to Germany after the war of 1870!

Read in his Life, by Valery Radot, the dramatic account of his final experiment in 1882 on twenty-five already vaccinated and twenty-five unvaccinated sheep. All of the fifty were inoculated on May thirty-first with the virulent germs of anthrax. He predicted that by June fifth the twenty-five unvaccinated animals would be dead and the twenty-five vaccinated would be living. On June second twenty-three of the unvaccinated sheep were dead, and the other two were dying. Every one of the twenty-five vaccinated sheep had escaped. The animals of all France, nay, of all the world, are his debtors for this victory.

Now, in the name of common sense, was not this a righteous and commendable experiment, and were not the prior experiments which gave such conclusive evidences of the means of escape of millions of hogs, cattle and sheep and thousands of human beings a scientific, a humane and therefore a Christian duty?

What is true of anthrax is true of many other diseases of animals. In addition, there are diseases of animals in which we have not yet found the germ and therefore have no reliable means of vaccination against them. These, too, must be and will be conquered in time by continued research.

If the A-V's had been in control in France in the seventies and eighties, anthrax and other diseases of animals, now partly or wholly conquered, would still be as rampant as ever.

If only the animals themselves could speak! Would they not, with one accord, cry out: "*Save us from our professed friends, who are in reality our deadly enemies!*"

But a new era seems to be coming. An editorial in the November, 1920, issue of the Open Door, the journal of the New York A-V Society, relates that the San Francisco S. P. C. A. makes the following statement in the San Francisco Bulletin of October 19, 1920:

"Our investigations have shown that the animals receive the same care and consideration accorded to human beings who are subjected to operations of various kinds."

This statement was made as a result of "unannounced visits to vivisection laboratories." If only the other societies would do the same, their views would be greatly changed and they would support such experiments because of the enormous benefits to animals as well as to the human race. The Blue Cross has shown that the doors are all open in *every one* of the eighty-six laboratories of research in the United States.—October 1922.

I am not a vivisector, but I know that every day and in every operation upon my fellow creatures since 1876 I have been guided by the results of experimental research. Research has given to surgeons, physicians and obstetricians new operations and new means of treatment wholly impossible of attainment by any other method, and these have been blest of God to millions of our suffering fellow men as well as to animals. These researches have changed the surgery of desperation before 1876 into to-day's surgery of assurance.

And there is still so much to be learned! So much ignorance to be dispelled! Were there room I could tell of cases in which my own ignorance—an involuntary ignorance shared by all my fellow surgeons—has cost human lives, as afterward I learned to my unending sorrow.

Do you wonder then that my cry—that our cry, as a profession—is for *more light?*

By 1921 the serum discovered by the Bureau of Animal Industry by experiments on 17 hogs had reduced the loss from Hog Cholera from $75,000,000 to about $28,000,000, a saving to the farmers of over $47,000,000 and adding over 2,000,000 hogs to the food of a starving world.

On October 12 in Reading, Pennsylvania, over 600 women representing over 60,000 women of the State Federation of Women adopted the following resolution by a vote of over 600 to about 10 negative votes.

WHEREAS, it has been conclusively demonstrated that the health and happiness of hundreds of thousands of animals, and of many millions of human beings, have been promoted and their lives prolonged by the application of knowledge obtained through scientific experiments on animals, and

WHEREAS, These researches are conferring a wonderful boon upon the starving nations by constantly adding greatly to the food supply of the world.

THEREFORE, BE IT RESOLVED, THAT THE STATE FEDERATION OF PENNSYLVANIA WOMEN, assembled in annual general Convention in the City of Reading, Pennsylvania, on the twelfth day of October, 1922, hereby put on record their gratitude to Medical Science for past discoveries so profoundly beneficial to human beings and to animals, and we believe that such beneficent researches should be continued and encouraged.

A MESSAGE OF HOPE[1]

DURING an active surgical life of almost half a century, I have seen many hundreds of cases of cancer, and I am happy to assure my readers that it *is* curable, *provided* the advice of those who have been in constant contact with this terrible disease is sought and followed.

In a very large number of cases, especially of cancer of the breast, the following represents the conversation which followed a careful examination:

"How long ago did you first notice this lump in your breast?"

"About a year ago." (Or it may be even longer.) This is an astonishingly frequent reply.

"Why in the world didn't you come to me *at once?*"

"Why, Doctor, it didn't hurt me at all." (As if "pain" meant that it was a dangerous lump, and "no pain" that it was a harmless lump! Cancer at the beginning is *almost never* painful.)

"I am sorry to tell you that I fear you have come too late to expect a cure. Had you come the moment you discovered this lump I could have removed it by a very easy and safe operation, from which you would have been well within a week.

[1] Reprinted by the kind permission of the Editor from the *Woman's Home Companion* for December, 1921.

But now I can promise nothing, except to do my very best for you."

How often my heart has been wrung by such a conversation (worded of course more tactfully and not in this brusque, almost brutal, form) with a wife and mother, who, by her neglect to seek aid at once, has condemned her husband and her children to lose so dear a wife, so cherished a mother, just when she is most needed! How often have I said to myself, *"If only women knew; if only women knew!"*

Sometimes they would declare, "I was afraid to come, for fear you would tell me it was cancer." To which I have so often replied, "If you smelt smoke in your house would you sit still and wait because you were afraid that you would find your house was afire? Why not do for your own self what you would do for your own house? Find out the truth at once."

Sometimes she would say—I am almost ashamed to admit it, but it is true: "I did see my doctor, and he told me to wait and see whether it would grow any bigger." I am glad to say this is not true of the younger men, but only of some of the doctors who graduated years ago and have not kept up with our modern discoveries. "If you saw a little fire in your house," I would reply, "would you wait to see if it would grow bigger before you tried to put it out?"

If every woman who had found a lump in her breast would consult a competent surgeon at once —that is to say, within forty-eight hours, if possible, but in any case within a week—I am sure that eighty-five out of every hundred, and it might well be ninety out of every hundred, would *be* cured and *stay* cured. So cancer *is* curable—provided you consult a good surgeon *at once.* Remember that, when you find a lump already formed, the disease has been at work for weeks, and it may be for three or four months, before a discoverable lump has been formed.

I have patients on whom I operated fifteen, twenty, and more years ago, and they are still well; but they came early, except one unexpectedly happy case over twenty years ago. One breast had been removed before I saw her. The disease had returned on that side, and had begun in the opposite breast. I operated for the recurrent disease and also amputated the second breast, and she is well to-day—twenty years later.

The complete operation is not a very long one. It has to-day, remember, practically *no* mortality, and the recovery is complete in a week or ten days without much suffering. Before the days of antiseptic and aseptic surgery, the suffering was severe and prolonged, practically every case became infected, and the mortality was large. Usually the patient was in the hospital for from four to six weeks, or longer, and if erysipelas or severe infection occurred, it might be three or four months before she was well—if, indeed, she escaped with her life.

The same rule applies to women who notice any abnormal discharge of blood. Consult a competent surgeon *at once.* Certain internal cancers that were formerly beyond our power to cure are now well within our power, but solely on the condition noted—instant competent advice.

Every man or woman who passes blood from the bowels should at once seek an examination. That is the anti-cancer slogan: "INSTANT, THOROUGH EXAMINATION BY A COMPETENT SURGEON." It may come from a slight and easily curable affliction; but it may, on the other hand, be the very first observed sign of something serious. Here, again, pain or its absence is no criterion of danger.

In men, cancer of the stomach or of the bowels is the most frequent. If a man steadily loses weight—twenty, thirty, forty pounds—and has indigestion, internal cancer of the stomach or bowel should be suspected. If he does not soon get better, say within two or three months, the abdomen should be opened and any necessary operation be done. The diseased section of the stomach or bowel is removed; but too often the exploratory operation is done too late and the disease returns after a while. If no cancer is found, the abdomen is closed and he is practically sure to get well within ten to fourteen days.

Warts and moles—not such as come and go on the hands of young people, but those which remain apparently harmless for years without any change—are serious sources of danger, more particularly those which are discolored, brown, or black. After many years of a quiet existence, for some unknown reason suddenly they begin to grow. Very soon the glands in the neck, armpit or groin begin to enlarge, at first always quite painlessly. When these glands become enlarged the whole system is often involved and the possibility of saving life is very doubtful.

All such permanent, pigmented moles and warts should be removed *before* they begin to grow, together with the whole thickness of the skin. To tie a woman's long hair around them is the very worst thing to do. It only stimulates them to grow more rapidly.

The deaths from cancer are continually increasing, and have reached a most alarming total. In the World War, from April, 1917, to July, 1919, 76,433 of our gallant soldiers lost their lives by wounds and disease. In the same length of time, about 180,000 of our population died from cancer—over 100,000 more than the total military deaths! Of our total annual deaths of persons over forty years of age, one person in every ten dies of cancer. Of all deaths among women over forty, one out of every eight is caused by cancer. Do not these figures startle you, my reader? Is it not all-important that you should recognize the red flag of "danger," when you discover the first recognizable sign of possible cancer—a "lump" anywhere, or an abnormal discharge of blood?

"What is the cause of cancer?" you ask; "and why aren't you busy finding it?" I answer that no one problem of disease is being attacked as is the cause of cancer. If we find the cause, we will be at the half-way house on the road to prevention or cure.

There are special laboratories of research on cancer alone in Boston, New York City, London, Paris, Heidelberg, and other cities, and also not a few personal investigators in other places, all laboring to discover the cause, and how to prevent cancer and thus to avoid the dreadful alternative of a surgical operation.

The problem has been attacked from the surgical, the pathological, the microscopic, the chemical, the biological, and the experimental side. We have learned a great deal; for instance, that cancer is *always a strictly local* disease at the beginning, so that, if you remove this small lump early enough, cure is almost certain. If you wait, the disease spreads by the absorbent vessels and the blood vessels to the neighboring glands (under the jaw, in the armpit or the groin, or in the internal glands) or to distant parts, and then the case is hopeless for cure. All we can do is palliate. *Early* operation *before* the disease has thus spread is the *sine qua non* for success.

The X-rays and radium are being very extensively experimented with, and most hopefully in certain forms of cancer. It is with this in view that the fine women of America presented Madame Curie with one gram (15 grains) of radium, costing one hundred thousand dollars. I have personally known of some remarkable cures by the X-rays and radium. But they should be *used only by experts,* or they may do irreparable damage. Even if they do no damage, in case they do not cure, their use not seldom delays operation until it is *too late.*

We have also learned by these laboratories of research that this, that, and the other line of research is not the true road to the discovery of the cause. Thus, by exclusion, we are gradually limiting our researches to the methods which give promise of possible success.

I feel as certain of our ultimate success as I do of my own existence. I am expectant, hopeful, impatient for that glorious day to come. It will most likely come like a thief in the night to some lonely, patient, persistent worker. Then, indeed, after it has been tested and found true, may we chant a Te Deum—and turn our energies to the solution of the many other problems in medicine.

Above everything else *not* to do, I urge that none of the so-called "cancer cures" be used. I have seen the damage done by many of them, and the happy time when early operation might almost certainly have cured has gone by, and again "Too late" is the sad verdict.

The American Society for the Control of Cancer was formed in 1913. Dr. Charles A. Powers, a retired surgeon of Denver, whom I am proud to call an old friend, is the president. They are carrying on a vigorous campaign of enlightment, to wake up the nation to the growing peril of cancer. They are a very live body. A large number of doctors and members and, what is most encouraging, an increasing number of public-spirited men and women are also members. The nominal dues are five dollars a year, but many give up to fifty dollars a year as patrons, and others, to aid the cause, give their hundreds and thousands. The society sends out circulars, pamphlets, etc., by the thousand, organizes lecture courses in many places, and spreads abroad the good news of the curability of cancer, *provided* that their advice is strictly followed. This year [1921] they propose to make a special effort during the week of October 30th to November 5th to arouse a nation-wide interest and a nation-wide activity to control cancer, by persuading all who have or suspect they have the disease to secure immediate competent advice and treatment.

I earnestly urge that every reader of this paper will join this admirable and wholly altruistic society. It takes much effort and much money to wake up a whole nation; but that is exactly our intention. We doctors are heartily in accord with the objects of this society.

Readers of this paper may obtain any desired information on this subject by the writing to the American Society for the Control of Cancer, 25 West 45th Street, New York City.

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