of science, Sir William Osler, whose spirit animated a part of this university and still lives in it. Never was a man more completely devoted to his chosen research; and yet, how alive to the moral needs of his contemporaries, how full of human kindness, how intimate with classical and modern poets! May many such accomplished men of science meet in this university so fit to welcome them, may many rise out of it, doing good service to mankind and honor to their country!

L. LEVY-BRUHL

UNIVERSITY OF PARIS

THE MEDICAL SCHOOL A PROFESSIONAL SCHOOL OF SCIENCE[1]

THE zero hour has come. At least, being no orator, I have much the feeling usually attributed to that momentous occasion. Selected on the basis of seniority and obedient to command I extend the call to medical graduates to go over the top in a new advance in the age long war of experimental science against credulous adherence to tradition. In this war it was the privilege of the Johns Hopkins University to establish the first school for officers in this country and thus to make a new declaration of independence one hundred years after the first, a declaration of intellectual independence.

Her graduates have gone to all parts of the country to aid in the development of American universities as institutions for the advancement as well as the diffusion of knowledge. Many of these graduates have returned here to-night to celebrate the fiftieth anniversary of their alma mater and at the same time to bring with them the cordial greetings of the institutions with which they are now connected. These institutions are so numerous that a personal public tribute from each is impossible at this time. I therefore desire to extend in behalf of the medical graduates engaged in teaching the heartiest expression of good will from their respective faculties.

As an example of the kind of tribute which each would like to pay if time permitted, I desire personally to extend the greetings of the university with which I have been connected during the past twenty-two years, the University of Wisconsin. During the early years of the Johns Hopkins University, Wisconsin, then essentially a college, sent many of her graduates here for advanced training. During the eighteen-nineties Wisconsin became a university by developing extensive facilities for graduate work and research. In the process of university development Wisconsin called upon the Johns Hopkins for numerous leaders, including such men as Richard Ely and W. A. Scott in economics, Moses Slaughter in Latin, Charles H. Haskins in history and Joseph Jastrow in psychology. Some of her own alumni who took a leading part in this university development, such as Frederick Turner in history and H. L. Russell in bacteriology, had graduate work at the Johns Hopkins. Robert Wood, trained here, made his mark at Wisconsin before returning to continue a brilliant career in physics. When the medical school at Wisconsin was established early in the present century, the Johns Hopkins Medical School was called upon to furnish men to head several departments. The furnishing of leaders for educational advance has not, however, been entirely one-sided. Wisconsin was called upon to sacrifice Carl C. Thomas when the Johns Hopkins established the school of engineering and E. V. McCollum when the Johns Hopkins established her School of Hygiene and Public Health.

Many similar illustrations might be given of what the Johns Hopkins has meant to other institutions during the past half century. To use a medical metaphor, she has been a thyroid gland, the products of which at first helped to ward off cretinism in our institutions of higher learning and to-day help to ward off myxoedema.

I am asked to-night to discuss the next half century of the university from the standpoint of the medical school. Unfortunately, I am not only not a prophet, I am not even a clinician accustomed to giving professional prognoses properly protected. Were I to regard myself as a clinician of medical institutions, I should have to regard myself rather in the light of an obstetrician and pediatrician than in the light of a geriatrician to be called in to give a health examination to a lusty individual of fifty whose only complaint appears to be a tremendous appetite, and whose ideas of a balanced diet are millions for philosophy against millions for medicine.

The success of the Johns Hopkins during the past fifty years, however, has been due not to abundance of material resources but to adherence to ideals, to vitamins rather than to calories. Among the more important of these vitamins I take to be:

Vitamin A: Let practice preach.
Vitamin B: Live leaders, not monumental mortuaries.
Vitamin C: Achievement, not acquirements.
Vitamin D: Individuality, not institutionalism.
Vitamin E: Service to science, for light not lucre.
Vitamin F: The future foremost.

These vital principles we all desire to see continued during the next fifty years, however the course of our civilization may trend. It may pay us to consider each a little more in detail to illustrate its meaning.

[1] Address delivered at the fiftieth anniversary banquet of the Johns Hopkins University, October, 1926.

VITAMIN A: LET PRACTICE PREACH

The Johns Hopkins has always been more interested in the study of her own opportunities and in the development of these opportunities than in telling others what they ought to do. This is probably a chief factor in the great influence which she has had upon the development of higher education in America. Example excites emulation.

By showing the value of standards of achievement in place of standards of acquirements in the mathematical, physical, biological and social sciences she succeeded in establishing for our colleges in place of the practice "Who can not preach, teaches" (with due apologies to Bernard Shaw) the standard "To teach, produce at least a doctor's thesis."

By showing the value of special training for matriculation in the medical course, preclinical teaching in the hands of specialists, clinical teaching in a hospital under medical school control, the obligation of the medical school to advance knowledge and to give clinical teachers more freedom for research, she has contributed much toward the transformation of the standard American medical college from a cheap trade school into a costly academy of science.

By organizing the School of Hygiene and Public Health, she has recently emphasized the need of having more knowledge in a field of great popular activity: brains to direct, where heart inspires.

In the proposed School of International Relations, in the proposed changes in the plans for the School of Engineering, she is directing her steps into fields now lacking development, among the other fruits of which there will doubtless be new aids to health.

In the move to give up elementary college teaching the Johns Hopkins is, I believe, wise. This work when first established served a good purpose. It may now be entrusted to other hands. The Johns Hopkins should ever be ready to drop work which other agencies, public or private, can do as well, in order to concentrate her resources in directions in which they are more greatly needed. If, during the next fifty years, it should be found that the undergraduate medical course is less needed than purely graduate work in medicine, I hope that the medical graduates may acquiesce in the same good spirit shown by most of the graduates of the college course toward the giving up of elementary college work. To alter the well-known lines of Pope:

> In plans for future the sane rule will hold
> Fear not adventure with new or old
> Be ever first by whom the new is tried
> And ever first to lay outworn aside.

VITAMIN B: LIVE LEADERS NOT MONUMENTAL MORTUARIES

The simplicity of the physical plant and the inspiring vigor of the faculty of this university in its early days under the leadership of Daniel Gilman is an oft told tale. Even in 1893 when I came here to study medicine, attracted by the reputation of the graduate school and by the announcement of the opening of the first medical school in the country on a graduate basis, I found the physical plant of the academic part of the university most disappointing and that of the medical school still more so. For aside from the hospital, in which work was not to begin for two years, there literally was no medical school in the physical sense. Some temporary quarters for dissection and physiological chemistry were being fixed up in the old pathological laboratory of the hospital but were not yet completed. The Women's Fund Memorial Building for anatomy and pharmacology was not completed until the following year. It was six years before physiology was transferred from the old biology building to the physiology building. We were given space in the quarters provided for undergraduate students in biology and were given an intermediate status between graduate and undergraduate students. We did not know how to behave as graduate students and resented being treated as undergraduate students. In spite of the grand simplicity of W. K. Brooks, who taught us osteology, before the year was well advanced about half the class resolved to leave and go elsewhere for medical work. Dean Welch heard of this, asked us to come around to his room to talk things over, gave us cigars, explained the difficulties of starting a new school, asked for our cooperation and persuaded us to stay on. It is needless to say that all of us have since been grateful for the advice. With what envy the hundreds of applicants who are now denied admission each year must look upon those early days when students once admitted had to be persuaded to remain.

To all our instructors we of the early classes are each of us to-day, a generation later, profoundly grateful for the friendship shown and the inspiration offered.

I am personally especially indebted to Franklin Mall, with whom I spent ten years as student assistant, instructor and associate and whose friendship I shall always prize as the most inspiring of my life.

Other students of these early classes were similarly enriched and inspired by special intimacy with other members of the faculty. Fortunately, many of the members of the early faculty still lend inspiration to the medical school either directly or indirectly through the sister school of hygiene, and are with us here

to-night. Of these men I shall say nothing now, although my heart, as I am sure the hearts of all medical men here, goes out to them with warmest gratitude.

Of those no longer with us I shall refer briefly but to two, W. S. Halsted and William Osler. Halsted, like Mall, was a man of delightfully modest character richly endowed. His talent as a teacher is best attested by the large number of scientific surgeons who last fall formed the Johns Hopkins Surgical Club. Halsted, while like Mall in modesty, originality and individuality, was essentially an aristocrat while Mall was exceptionally democratic. I well remember walking along the hospital corridor with another student desirous of ingratiating himself with Halsted, who was walking just ahead. This student put his hand on Halsted's shoulder and tried to start a friendly conversation with "Professor." He got no further. Halsted turned, looked him up and down and said, "Don't call me 'professor.' I'm no damned dancing master."

Of Osler it appears presumptuous to speak on this occasion. He has had in Harvey Cushing's biography too magnificent a tribute paid to him to justify a brief eulogy from me. And yet there is one thing sometimes overlooked that Osler helped to emphasize. Medicine is an art as well as a science. A medical faculty to be well balanced needs men of the artistic as well as the scientific point of view. The strength of our early faculty lay in the fact that we had on it not only men of exceptional scientific gifts like Mall and Halsted but also a man of exceptional artistic gifts in Osler.

For the leaders we have lost the medical school is a monument, not of work buried but of work rich with the vigorous life which they inspired.

VITAMIN C: ACHIEVEMENTS NOT ACQUIREMENTS

The most characteristic feature of higher education as developed at the Johns Hopkins, the greatest contribution which the university has made to education in America, is the spirit which leads every member of the faculty, every graduate, every student, to feel an obligation to contribute to the advance of the work in which he is engaged beyond the extent to which his own welfare is involved. Achievement is placed ahead of acquirements.

On the other hand, the acquirement of a bachelor's degree (no one can call this an achievement) has thus far been a condition for taking up advanced work at the university. I believe that a distinct step in advance has been taken by the philosophical departments in planning to admit to advanced work students who have had requisite special preparation irrespective of whether or not the student has a college degree. While there may be legal difficulties involved in the deed conveying the original endowment of the medical school, I should like to see a similar liberality displayed in the matriculation requirements of this school. As a preparation for the practice of medicine prolonged withdrawal from the world within college, medical school and hospital walls has serious disadvantages. The patient as such is only half a patient. The other half is his environment. A student too long withdrawn from ordinary human surroundings is likely as a clinician to have difficulty in viewing the patient as a whole.

A somewhat extreme view of the effects of too prolonged a training divorced from practical affairs has been voiced by an active medical representative of a state which has not yet officially succumbed to fundamentalism:

> Men come into our state from Johns Hopkins. We have a number of new members on our faculty.—They were inducted into the faculty because they knew enough of the sciences to get in and God knows that is all they do know. Not a single member probably knew there was a medical society and do not seem to know there is a medical profession.—They are like automatons. They never respond to the glorious things in medicine—any more than a plumber in handling his dead material. —[They escape] the thrills that come to you and me from the glorious privileges that are permitted to us.

With all due allowance for the exaggeration displayed, I believe there is here a grain of truth. Society as well as science should mould the medical course.

VITAMIN D: INDIVIDUALITY, NOT INSTITUTIONALISM

Freedom from the burdens of organization, freedom of the individual for independent work were features of the early days at the Johns Hopkins which favored original research. Among the most productive days of the medical school were those of its nine years of gestation, from 1884, when Professor Welch took charge of the department of pathology, until the opening of the school in 1893. Those were the days when, for instance, the men were trained who subsequently laid the scientific foundation for the eradication of yellow fever from America.

When the medical school was opened in 1893, there were introduced pedagogical and clinical duties which tended to restrict freedom for scientific work for teachers of these subjects as compared with those devoting themselves to various special branches of knowledge such as advanced physics or chemistry. In spite of this fact the medical school has from its origin distinguished itself for its scientific productivity. Various expedients have been devised to pre-

vent routine pedagogical and clinical duties from unduly interfering with scientific work, limitation of size of classes, limitation of the portion of the year to be devoted to routine teaching, large teaching staff, full time professorships. In the old days there was no danger from burdens of elaboration of physical plant. The total endowment of the medical school was but a fraction of the endowment necessary merely to heat, light, keep clean and in repair a medical school building recently completed for another university. With the increase of facilities made possible by gifts in recent years and hoped for in the future there is ever the danger that scientific liberty may be hampered by elaboration of institutionalism. This danger should be carefully shunned. To return to a previous metaphor, we do not want the medical school to develop goiter.

VITAMIN E: SERVICE TO SCIENCE, FOR LIGHT NOT LUCRE

Training of professional scientists as the highest duty of the university has in practice been recognized by this university from its foundation. The times have been propitious. Specialization of occupation has been rapidly developing in this country during the past fifty years. When the Johns Hopkins was opened there were comparatively few opportunities for a professional scientist to find a full time position as such. There soon developed, however, opportunities to combine this profession with the profession of teaching, with various administrative duties or with other work not overloaded with time-consuming routine. To-day there are numerous openings in endowed research institutes, governmental and industrial establishments and other places for the professional scientist and the number of such places is likely to increase rapidly in the future. We hope, therefore, to see the university continue to make its chief aim the training of students to advance science.

In no field is this more important than in the field of medicine and hygiene.

When the Johns Hopkins was established but little attention was paid to public health. Sickness was an individual affair. Shakespeare's version of the seven ages of man still applied. To-day man enters upon the stage a little earlier and leaves a little better equipped, as described by Dr. Bryant:[2]

> The prenatal clinic cares for the baby in the mother's womb and guides it into a hostile world. It is received in the motherly lap of the baby welfare clinic and tenderly cared for. It receives its nourishment from the warm and hygienic bottle prepared in the baby milk laboratory. Its tottering steps are guided by the helping hand of the child welfare society. In due time, the child enters school, and he is welcomed on the threshold by the school nurse and introduced to the school physician. He is vaccinated against smallpox, inoculated against typhoid and is given the Schick test. His teeth are looked after at the dental clinic, and his tonsils and adenoids removed at some hospital out-patient department. His eyes are examined and possibly fitted with glasses. Thus prepared and equipped, he at once starts to do his health chores. Found underweight, he enjoys for a time the luxury of an open-air school under the supervision of the nurse and physician of the anti-tuberculosis association. Thus, he is guided through school and may take a chance at college. If he here escapes for a moment from his guardians and falls into evil ways, there are free clinics provided, even for these emergencies.
>
> Safely passing health inspection and eugenic examinations, wedlock is entered. In due time, his wife becomes an attendant of the maternal welfare clinic. His health is guarded by periodic health examinations. He is looked after at his work by the industrial nurse and prescribed for by the industrial physician. If sick at home, he has the care of the visiting nurse and the social worker. His future is provided for by his industrial insurance and old age pension. In his declining years, he enters some rest home for the aged. His dying pillow is smoothed by the institution nurse and his room brightened by the home visitor. Some burial society looks after his funeral. At last, he lies at rest, after a long and pleasant journey along the free health road. Even heaven has been made sure, and the ministering angels will continue to guard him through all eternity.

[2] Bulletin, American Medical Association, November 15, 1922.

The movement to socialize medicine and hygiene thus graphically painted has behind it many agencies, private and public. We find in the medical profession, where on the whole the spirit of individualism survives more than in any other important social group, a vast unrest and considerable resentment against the invasion by outside forces of the field of work which physicians regard as properly their own. There are ahead great problems to be solved involving not only the advancement but also the application of medical knowledge.

VITAMIN F: THE FUTURE FOREMOST

President Eliot, I believe, once said that a good teacher has either to be young or one who has never grown old. This is likewise true of educational institutions. The topic assigned to the speakers tonight, the Johns Hopkins 1926–1976, the warning which we have all had, to deal with the future not with the past, shows the direction in which the university is still aimed, as it always has been aimed, ahead not backward. Even the deepest students of classical antiquity of her faculty, as Professor Laing

has shown, are at heart more concerned with contributing to the future scholarship of the world than with becoming lost in the past.

In the physical sciences the startling advances in recent years make the future appear particularly alluring. But it is in the field of biology, as Professor Conklin has shown, and in studies of the immediate life of man, including medicine and hygiene, that the next fifty years offer the promise of greatest returns.

In scientific philosophy devitalization of life is yielding to vitalization of the universe. In biology the chief center of interest has shifted from description and classification, through mechanistic abstraction, to life as lived. In scientific medicine the chief center of interest has passed from the autopsy room through the clinical laboratory to the common health. The nihilism of terminal medicine is yielding to faith in the stitch in time.

Details as to what the next fifty years may offer in aims, means or results in science I shall not attempt to discuss. Those who enjoy letting fancy rove are referred to Francis Bacon's description of Solomon's House written three centuries ago. It will doubtless take another three centuries for the experiments of light to obtain the relative position there pictured. To-day the experiments of fruit enjoy the luxuries, and these are far beyond those dreamed by Bacon.

The luxuries awarded to applied science are nowhere more in evidence than in the field where the movie heroes love the great open spaces. It is to be hoped that in the future heroes endeavoring through experiment to throw light on vital activity may be granted more use of great open spaces. It is significant that state agricultural experiment stations furnished two leaders to our School of Hygiene and Public Health. The work of the late Luther Burbank, foremost of experimental breeders, shows the need of experimental genetics studied on a broad scale. The work of Henry Ford, foremost of experimental sociologists, suggests the value of experimental study of environment on human life. The example of William Mayo, foremost of experimental practitioners, shows the importance of having more space than civic centers allow for experimental studies in the medical sciences. It is noteworthy that the foremost experimental pathologist, Theobald Smith, has always recognized this. The Johns Hopkins should add to its official program for the immediate future the purchase of a tract of land near Baltimore and an endowment for experimental biology and medicine in the open.

In this era of specialization institutions as well as individuals have been becoming more and more specialized. The medical school of the Johns Hopkins University, relatively free from direct social responsibilities, may best make its chief duty the advance of medical science. The medical school of the University of Wisconsin through university, school system and state government, an organic part of the commonwealth, must devote relatively more attention to medicine and hygiene as social arts. Neither school can afford to neglect either the science or the art of medicine, but differentiation and specialization according to responsibilities and opportunities are likely to lead our medical schools and other educational institutions into their respective greatest fields of usefulness.

To sum up: My prayer for the Johns Hopkins Medical School of the next half century is abundance of freedom for the development of scientific research as an independent profession, abundance of means for developing this freedom.

For the realization of this hope ample funds are needed. Gifts to endow free care have seldom been a continued public benefit. Charity should not only begin at home but should represent a sacrifice by those immediately cognizant of its needs. Gifts made to endow schemes to save society are likewise doomed to ultimate failure. Fashions change. Gifts made to endow advancement of knowledge and gifts made to promote perfection of expression of aspiration are the most beneficent contributions of philanthropists. These have made possible mankind's truest treasures, the works of the creative imagination. It is to be hoped that the day may come when the Johns Hopkins may receive gifts which will enable her to develop creative achievement not only in the realm of science but also in that of fine arts. Freedom for both seekers for beauty and seekers for knowledge is needed to release the truth that liberates. *Veritas nobis est liberanda.* It's up to us to see that truth is freed.

C. R. BARDEEN

UNIVERSITY OF WISCONSIN

THE ANNUAL SCIENCE EXHIBITION OF THE AMERICAN ASSOCIATION

THE continued development of the annual science exhibition held in connection with annual meetings of the American Association for the Advancement of Science is showing pronounced activity this year. Those who have attended the last five annual meetings will remember that the exhibition has been a regular part of each meeting since the project of an annual exhibition was taken up at the second Toronto meeting. Through the unusually excellent work of the local committee for that meeting (December, 1921), the first exhibition of this annual series was a remarkable success. The next exhibition, at Boston, was not