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ADDRESS ON THE OCCASION OF THE DEDICATION OF THE NEW HOSPITAL OF THE UNIVERSITY OF MICHIGAN[1]

LET me thank you, ladies and gentlemen, for the opportunity which your officers have placed before me in inviting me to address this gathering. It is a privilege to take part in such ceremonies at one of the first and greatest of those American universities which have shown that the people of a self-governing state will support an institution in no way second to those older private bodies in this and in other countries, which have long prided themselves on offering to teacher and student freedom of thought, study and utterance; which have afforded them liberty to pursue truth for truth's sake.

The guiding principles of a university should be liberty and tolerance. The true university is a society of students and scholars, searchers for truth. Only such can be real teachers. The mechanical retailer of the assertions and convictions of others has no place in a university. He can not be a teacher in the true sense of the word. He can not be a successful teacher even in a secondary school. 'Tis one of the gravest defects of our secondary education in this rapidly growing country that with the wealth of opportunity open to all there are sadly few students or scholars engaged in secondary teaching. Too many are young people retailing information, teaching up to the limits of their knowledge, who have no thought of making their immediate occupation a career. Secondary teaching is but a passing incident in their lives, a means to acquire the wherewithal with which they may pass on to other opportunities which to them are more tempting.

What a difference it would make to our boys and girls were they, in the secondary schools, thrown into association with real students and scholars, as is commoner in some of the older countries. Those individuals who have had the rare good fortune to fall under the quickening influence of a scholar in their early life, and those teachers who have had the opportunity to meet, later, with such men, know full well the enormous influence that the scholar in a secondary school may have on the character and the mind and life of his pupils—and indirectly on the future of the state.

A true university should seek primarily in all branches for those men and women who have shown

[1] Given on November 19, 1925.

themselves to be disinterested students and who seem to be especially qualified to profit by the advantages offered by its libraries, its laboratories, its unions, its opportunities for association with other superior men. To these men and women the university should offer its confidence, and then—freedom. One more privilege it always offers, the greatest of all privileges, that of association with those other students who are entering the field possessed of that blessed gift

. . . . . .
Kind nature's richest dower,
Youth, the fair bud that holds life's opening flower,
Full of high hopes, no coward doubts enchain,
With all the future throbbing in its brain,
And mightiest instincts which the beating heart
Fills with the fire its burning waves impart.

For association with the young is the greatest privilege of the teacher—the only vaccine against age and apathy. Only the student can be a real teacher; for only the student can inspire. And to secure the services of the student he must be offered opportunities for study. But there are students and students, and, in all branches of learning, one meets now and then with quiet, modest individuals with minds of the delicacy of fine lace work who can not work in the open, who can not commune with the many, who need protection and seclusion. Teachers in the ordinary sense they are not. Yet the influence of some of these men is precious. Opportunity and protection and freedom for an occasional delicate vessel of this sort it is the privilege of a university sometimes to offer.

Freedom from the cares of the world, liberty to pursue the search for truth in his own way, liberty of thought, liberty of utterance, these are perhaps the greatest gifts that a university can offer to its faculty—and to its pupils.

The other guiding principle of the university should be tolerance; tolerance without which the word freedom is but mockery. Intolerance is the child of fear, and fear is the son of doubt and incomprehension. The university should offer to its staff liberty to search for truth; truth can never be dangerous.

"But," say those in the terror of incomprehension and ignorance, "there are directions in which you may not search. For by that very search you deny the truth which is ours and is more precious than all else, our faith."

But the searcher for truth attacks no faith. He seeks for truth alone and he has faith that truth once revealed will prevail. But truth is often very hard to find. To him who possesses or feels that he possesses truth how can there be such words as doubt or fear? To doubt that truth will prevail is to doubt one's faith. The searcher for truth may doubt the faith of another, but he denies no man's faith. A poor and unworthy searcher for truth is he who attacks the faith of his neighbor, who lacks respect for the sincere belief of any man. Of this he is sure, that once revealed, truth will prevail, that truth needs no defense, that if, perchance, that which to his human vision has seemed to be a truth shall fade in the light of a new day, there yet remains hidden a greater, larger, purer truth for which with a wider horizon, his mind is open.[2] And if his neighbor blaspheme that which seems to him the higher truth, how shall that concern him? For has he not faith that he who blasphemes truth but lays bare his own littleness in the purer light which must, one day, burst even upon his blindness?

He who fears that the searcher for truth may destroy his faith, he who, possessing high ideals, fancies that this faith and these ideals may give way to anything that is not higher and broader and larger, thereby doubts and insults his faith. He who would seek to defend and protect those ideals by circumscribing the mental activity of his fellows not only insults his own faith, but stands forth as a cruel enemy to truth and progress and humanity. This is intolerance, a hateful beast of sordid ancestry.

The true university is the protagonist of liberty and tolerance and opens the way in its sphere to the search for truth. It attacks no faith. Fear it knows not, secure in the faith that new truths can lead us only into a higher and broader life. To the eager youth who seek to penetrate further and further into the great mysteries of life and death it says in the words of the wise old teacher and poet:

Take from the past the best its toil has won,
But learn betimes its slavish ruts to shun.
Pass the old tree whose withered leaves are shed,
Quit the old paths that error loved to tread
And a new wreath of living blossoms seek,
A narrower pathway up a loftier peak;
Lose not your reverence, but unmanly fear
Leave far behind you, all who enter here!

Truth needs no defense. Freedom, alas, may. And the true university through its tolerance toward all who are sincere should be the sword and the buckler of that liberty of thought and speech through which alone new truths will be revealed.

The opportunities and associations of university life you are now offering to the teacher and student of medicine and surgery, and 'tis well that it should

[2] *Cf.* Maeterlinck. Le temple enseveli, Paris, 12°, 1902, Charpentier, pp. 106; 110–112.

be so. Instruction in the art of medicine, to but relatively a few years ago, while often carried on under the wing of the university, was left largely to active practitioners of the art with few opportunities and little time to give to the study of its scientific aspects. But within the last century, and especially the last fifty or sixty years, the scientific basis of medicine has been greatly strengthened. For many years the fundamental sciences called into service in the study of medicine have been subjects for university study and investigation. Now at last we are coming to realize that even in the practical branches of the art the university must offer to a selected kernel of its staff the same protection, the same financial support, the same opportunities for research and study that it has long offered to the student in other branches of science and the liberal arts. As to the student of the classics you offer your libraries, as to the botanist you give gardens and laboratories, so here you are offering to the clinical instructors in your departments of medicine and surgery this great hospital in which they may study and practice their art. At the same time you are giving to a selected group of men who desire to give their lives to study and university work that financial support which may set them free from many of the burdens and cares of self-support and place them on a university plane with the student of the humanities and natural sciences. It is a great step forward, advantageous alike to the profession and to the community.

The practice of medicine has changed amazingly even in a period so short as that of one lifetime. Forty years ago on my graduation from college the time demanded for the examination of a patient by the best equipped consultant was but short; the methods of examination employed were such that they could for the most part be carried on in the consulting room by the examiner himself. The few additional special studies that had to be made were easily carried out. But what is the situation now? The patient who is suffering from some obscure complaint, trivial or serious, it is immaterial, tells his story to the physician. The examination may uncover few definite revealing signs. The physician is in doubt; there are many possibilities. What shall he do? What would be the ideal thing to do? The ideal thing to do would be to make a thorough routine examination of the patient just as one makes his own physical examination in the consulting room, a systematic study, anatomical and functional, from head to foot. This would mean observation in a hospital, the consultation of a considerable number of special students and would involve many complicated and expensive physical and chemical investigations of special organs, of body fluids, excretions and secretions. That which one might do in the attempt to make a complete study in any given case is almost unlimited. Where shall one begin? Where shall one stop? Many studies which are desirable in a complete survey are impossible for the general practitioner to carry out. Indeed, they may be wholly out of his reach. With the physician lies the responsibility of determining what examinations are necessary, what desirable, what superfluous. In him the patient places his faith; he must consider all the aspects of the situation; he must know how best to utilize the diagnostic machinery, simple or elaborate, which may be employed; he must consider the measures at his disposal, the means of his patient. The student must learn the significance and the relative importance of different diagnostic procedures, for upon him falls the responsibility of deciding that which is necessary.

It is important for the public that there should be centers in which such studies may be made under proper supervision. A university clinic like this should afford every opportunity to the teacher and student to pursue these studies. To the students it should afford the necessary opportunities to acquire certain fundamental conceptions as to the nature of disease and the principles of therapeusis that can be acquired satisfactorily only where the necessary scientific apparatus is at hand, as well as the required knowledge of the significance and relative importance of a great variety of diagnostic procedures. Many of these he may be unable to employ himself, but occasionally or more often he will be obliged to make use of them for the benefit of his patients. For the public, medical and general, it is desirable that there should be centers to which the practitioner may bring his patient for those special investigations and studies which are impossible other than in an institution with elaborate scientific equipment in the hands of highly trained and disinterested students.

It is needless to point out what an opportunity is offered in this connection to the unscrupulous and the venal. There are to-day many so-called laboratories and clinics more or less commercial institutions, in which examinations are made by men who are far from competent. An examination, even if well made, the results of which are improperly interpreted is worse than useless. Too often the doctor or patient is confused or deceived, the patient perhaps suffers, the public is bled. It is not easy for the practitioner who has not had a good basic training to appreciate the significance and the relative value of new and perhaps valuable diagnostic procedures. Commercial laboratories conducted by men of shallow general training are not a public safeguard; they are a liability.

That the well-equipped school of medicine should have in its medical and surgical departments a group of men who are well-salaried and afforded wide clini-

cal and laboratory advantages is, I think, becoming very generally recognized. These men are in a true sense university professors. Such a group of men is as valuable to the hospital as it is to the university. This truth is becoming more and more apparent to the intelligent public. An interesting example is the action, a few years ago, by the enlightened governors of a public institution which has for many years been conducted with unusual credit. The trustees of the Boston City Hospital having observed the value of university divisions in various private hospitals, deliberately, voluntarily and of their own initiative, established that model university division which is now presided over by Professor Francis W. Peabody. By so doing they have established in the hospital a scientific center of equal value to university, to city, to the hospital and its visiting staff and to the general public.

Such a division and such an association are invaluable to any large general hospital.

But it should not be forgotten that there is another element without which no hospital and no department of medicine is complete and that is a coordinate staff of expert clinical surgeons and physicians. The professor of medicine, the director of a university division of medicine or surgery, may and I think should be an experienced clinician or surgeon. But he can become so only through long experience in general or consulting practice of his art in all branches of society. Such experience may be offered by hospital in its public and private wards, but the experience is indispensable.

It takes many men to make a department of medicine or surgery—the adept in special branches as well as the experienced or skilled general surgeon or clinician.

What sort of man should be the director of a university department of medicine or surgery? As I have often said in public and in private there is no absolutely set type for a director of a university clinic; the essential thing is that he should be a learned physician or surgeon with a good scientific foundation and scholarly tastes, who is a good organizer and whose heart is in his work. He should in my opinion always be a man who has had a considerable and well-digested clinical experience. It is conceivable that such a man may have special interests, neurological, bacteriological, chemical, but if he is the right sort of man he will see that his clinic is complete. Ten years ago, in discussing the objections that had been raised by some to the establishment even of a nucleus of university professors in the clinical branches, I said:

> So far as the student goes, the danger that under the direction of a salaried professor, he may be given a training more purely academic and insufficiently practical seems to me small. In the first place, it has already been pointed out that the professor of medicine will doubtless be a man who has had a considerable clinical experience with patients in all classes of life, whose training has been by no means purely academic, and although some of his associates will perhaps be men who have not yet acquired the ripened experience which should be that of the head of the department, yet no one for a moment fancies that *all* the instruction in medicine and surgery will be given by the nucleus of teachers wholly dependent on their salaries. In every large clinic, and in every large hospital affiliated with a university, a considerable part of the instruction in general medicine and surgery, as well as in specialties, must be entrusted to men with or without salaries, who are more or less actively engaged in practice. The fancy that because the director of such a clinic and many of his assistants are no longer at the beck and call of the public, the student is to be regarded as deprived of the opportunities offered by association with men who have been or are engaged in active practice, is a misconception.

This seems to me as true to-day as yesterday. But there is a danger which may be mentioned; the danger of offering chairs of medicine and surgery to young men of special promise who after two or three years of internship have given the great majority of their time to the study of special problems which have held them aloof from active clinical work. These men may make admirable professors of medicine in the sense that they may have a thorough and sound conception of what a department of medicine should be. But at the time when they enter on their duties such men are not—and can not have become—trained or experienced clinicians. The responsibilities of the chair of medicine in a great university are heavy and I fear that for some of these men the professorship may bar the way to the acquisition of that experience necessary to make them finished diagnosticians or clinicians. To become a well-equipped diagnostician or clinician requires an amount of time spent at the bedside and in conference with patients that these men have not been able to give previously and are scarcely likely to be able to give in the future. Such men may be great administrators, profound students of a special branch, learned medical men, but, I am afraid, rarely great clinicians. In a properly organized clinic, it may be answered, these men will so select their staff that students and patients are offered association with the experienced clinician or surgeon. This may be, but, on the whole, it is I think unfortunate, especially for the professor himself, that he should be obliged to assume the duties of director of a large clinic at a time when he is not wholly at home at the bedside. I can not help feeling that the situation of

some men who, too early in their careers, are tempted to accept a professorship, may be rather tragic.

An associate professorship in a university division should offer priceless opportunities for the acquisition of competence in any branch of surgery or medicine. These foundations bring to the clinic men of special talent and training in special lines. But if a man desire to become a clinician or an operating surgeon, he can not, at the same moment, give the main part of his time to teaching and to the investigation of special problems which confine him to the laboratory and classroom. He must of choice and deliberately give years of his life to the intensive study of clinical problems. This opportunity the university should offer him, profiting the while by his special talents which are occupied in teaching and in research in the field of his special competence. But he should be protected from all unnecessary teaching while he devotes a large part of his time to the acquisition of clinical experience among patients in all classes of life. There is abundant room in the university school of medicine for the clinician and the student of special problems side by side. No clinician who is worth anything can fail to be pursued by the desire for research, but he must have daily and engrossing clinical duties if he is to be a clinician. The student of a special problem should not be required at the outset to teach subjects with which he is not wholly familiar. At the beginning of his career he must for a number of years give a large part of his time to clinical duties before he acquires that competence necessary for the general clinical teacher. He should be protected during those years in which he is not only pursuing his special studies but is also acquiring this necessary clinical experience, and during this period he should not be expected to bear the burdens of general clinical teaching. His most valuable contributions are for the time being in his special line.

A school with a purely university staff would be incomplete. It could not do its full duty to patient or student or staff. The patients would be deprived of the diagnostic and practical skill of men of larger experience and the student of instruction by such men. On the other hand, the burden of duties as instructors in an art in which they are not altogether at home would take the valuable time of specially trained men who should be protected in their investigations and offered opportunities, if they desire them, for the acquisition of that general clinical experience, highly desirable if not necessary for the director of a department. Too many duties in the way of general clinical teaching should not be forced upon these men too early in their career. The desirability of association with an experienced clinical staff should be generally appreciated. The university and the clinical staffs should be interdependent.

The problems of teaching of medicine and surgery are engaging. You in Michigan have had among you some of the most distinguished students in this country. I need not name them. Many are here today. One whom I have especially loved and honored has already spoken. The presence of these men has made Michigan one of the great schools. The efforts which the state and the faculty have made and are making will make it greater. You have had your critics. What an uninteresting school you would have had if you had not! But you have looked forward, and following the wise maxim of Candide, you have cultivated your garden.

And while we are working in our garden striving for better things, full of enthusiasm and hope, rejoicing at times, perhaps, in what we have accomplished, along comes our old friend with resigned air or cynical smile, and says: "Foolish man, you talk of your garden and even of the world as if 'twere a garden or a world of flowers. Wake up! Look about you! Is this a world of flowers? Is it not rather a world of weeds? And your very garden be it university or profession, what is the commonest thing in your garden, the flower or the weed? Is not your very garden in truth a garden of weeds?" And almost lovingly he directs our eye to the familiar, amusing or dreary or sordid and tragic picture of our omni-present neighbor, the weed.

Ah, entertaining whisperer of half-truths, how familiar is your picture! How well we know the back yards and the ash heaps and the tin cans and the waste iron and the neglected field. How well we realize that the bright flowers that illume the roadside and the meadow are but spots, islands amidst the riot of stubble and weeds among which they rise. And in the world of which we are members are we not but too familiar with the infrequency with which the human flower raises its head above the drab and dreary monotony of weeds?

But why dwell upon the weed? Is it not the flower that counts? What is it that fixes and freshens the eye of the traveler on the road of life, the dusty weed or the gleam of the flower? Are the labors of the botanist and the gardener in vain—the gardener who prepares the ground for the growth of the flower; the botanist whose transformations may bring a halo even to the lowly weed?

There are, 'tis true, some earnest and serious but rather ponderous brethren who fancy that they may sharpen the enthusiasm of the gardener and the botanist by dwelling on the unloveliness and the omnipresence of the weed. And then there are those,

usually rather young, who take a sort of perverse joy in pessimistic visions of the futility of life, and in the contemplation of the unlovelier characteristics of the weed, a shallow and sophomoric epicureanism. But why waste one's time in exaggerating or gloating on the unloveliness of the weed? Even the weed has its hour of charm. There is a moment at which even the weed flowers. And then is it not the weed with its modest blossom that time, the mind of the botanist and the hand of the gardener have transformed into the perfect flower? What if the botanist and the gardener in the beginning had been content with pessimistic or cynical contemplation of the unloveliness of the weed?

Consider the world of the middle ages and the renaissance. What remains to-day? Is it the picture of the sordid ignorance and vice and eternal discord of the population? Or is it rather the lofty naves and domes and graceful spires, the glittering jewels of Chartres, the tombs of the Medici, the harmonies of the painter's art? The weeds are long forgotten; the flowers remain, more radiant and more lovely in the tender light of receding years. It is the flower that counts. Is it not our function to feed and nourish and transform the modest and transient blossom of the weed into the more perfect flower? And if our neighbor choose to devote himself to the contemplation of weeds, and close his eyes to the flowers; if he choose to dwell upon the unloveliness of the weed rather than upon *its* flower; if he be blind to the circumstance that in its modest and blundering way even the weed is seeking for beauty, let us not be annoyed. So, somehow or other, in a devious way, is our perverse friend. It is the flower that counts. "Cultivons notre jardin."

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THE FIGURE OF THE EARTH AND THE NEW INTERNATIONAL ELLIPSOID OF REFERENCE

AT the meeting of the International Geodetic and Geophysical Union, held October, 1924, at Madrid, the section of geodesy of that union adopted a so-called international ellipsoid of reference, that is, it adopted certain parameters defining an ellipsoid of revolution which, among all such possible ellipsoids, was believed to represent the best, or perhaps merely the most convenient, approximation to the actual figure of the earth. The figure which this ellipsoid of revolution is intended to represent is not, of course, that of the actual physical surface of the earth, but the ideal *geoid,* an equipotential surface which coincides approximately with the surface of the ocean as far as the latter extends and which would exactly thus coincide if the disturbing effects of winds, differences of temperature, barometric pressure, etc., were removed. The geoid is continued in imagination under the continents and could be defined physically at any point by digging a very small sea level canal connecting that point with the ocean. The water in such a canal would rise to the level of the geoid.

Several questions arise in connection with this vote of the section of geodesy, among which might be mentioned: (1) Exactly what ellipsoid was adopted? For on this point it happens that some degree of misunderstanding is possible. (2) What was the purpose in adopting this international ellipsoid? (3) How closely does it represent the actual geoid? It is the purpose of this article to give some sort of answer to these questions and also to give for reference a few numerical magnitudes derived from the fundamental parameters adopted by the section of geodesy.

The two parameters defining the ellipsoid of revolution adopted by the section of geodesy are:

Semi-major axis (equatorial radius) = 6 378 388 meters
Ellipticity (flattening) = 1/297.

These figures are those deduced by Hayford[1] in 1909 from the deflections of the vertical then available in the United States, these deflections being corrected for topography and isostatic compensation. This recognition of the importance of isostatic compensation and its systematic use in deriving a figure of the earth marked a long step in advance. The importance of this piece of Hayford's work has been increasingly recognized with the passage of time and on May 26, 1924, he was awarded the Victoria Medal of the Royal Geographic Society of London "for conspicuous merit in scientific research." The further recognition accorded by the section of geodesy in adopting his figures as the dimensions of the international ellipsoid of reference came only a few weeks before the illness that caused his premature death on March 10, 1925.

The possibility of misunderstanding arises from the fact that, since these figures were given by Hayford, the international ellipsoid based on them has often and very justly been called the Hayford ellipsoid. The semi-minor axis, however, given by Hayford as 6 356 909 meters, differs by about three meters from that determined by a simple calculation based on the parameters adopted by the section of geodesy; these latter give

Semi-minor axis = 6 356 911.946 meters

[1] J. F. Hayford, "Supplementary investigation in 1909 of the figure of the earth and isostasy." (Published by the U. S. Coast and Geodetic Survey.) 1910.