

THE  
LEAVEN OF SCIENCE.

AN ADDRESS DELIVERED AT THE OPENING OF THE WISTAR INSTITUTE OF ANATOMY  
AND BIOLOGY OF THE UNIVERSITY OF PENNSYLVANIA, MAY 21, 1894.

BY

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## THE LEAVEN OF SCIENCE.

MR. PROVOST, LADIES, AND GENTLEMEN: In the continual remembrance of a glorious past individuals and nations find their noblest inspiration, and if to-day this inspiration, so valuable for its own sake, so important in its associations, is weakened, is it not because in the strong dominance of the individual, so characteristic of a democracy, we have lost the sense of continuity? As we read in Roman history of the ceremonies commemorative of the departed, and of the scrupulous care with which, even at such private festivals as the Ambarvalia, the dead were invoked and remembered, we appreciate, though feebly, the part which this sense of continuity played in the lives of their successors,—an ennobling, engentling influence, through which the cold routine of the present received a glow of energy from 'the touch divine of noble natures gone.' In our modern lives no equivalent to this feeling exists, and the sweet and gracious sense of an ever-present immortality, recognized so keenly and so closely in the religion of Numa, has lost all value to us. We are even impatient of those who would recall the past, and who would insist upon the importance of its recognition as a factor in our lives, impatient as we are of everything save the present with its prospects, the future with its possibilities. Year by year the memory of the men who made this institution fades from out the circle of the hills, and the veil of oblivion falls deeper and deeper over their forms, until a portrait, or perhaps a name alone, remains to link the dead with the quick. To be forgotten seems inevitable, but not without a sense of melancholy do we recognize the fact that the daily life of three thousand students and teachers is passed heedless of the fame, careless of the renown of these men; and in the second state sublime it must sadden the 'circle of the wise,' as they cast their eyes below, to look down on festivals in which they play no part, on gatherings in which their names are neither invoked nor blessed. But ours the loss, since to us, distant in humanity, the need is ever present to cherish the memories of the men who in days of trial and hardship laid on broad lines the foundations of the old colonial colleges.

To-day, through the liberality of General Wistar, we dedicate a fitting monument to one of the mighty dead of the University,—Caspar

Wistar. The tribute of deeds has already been paid, to him in this splendid structure, to all in the stately group of academic buildings which you now see adorning the campus,—the tribute of words remains, to be able to offer which I regard a very special honor.

But as this is an Institute of Anatomy, our tribute to day may be justly restricted, in its details at least, to a eulogy upon the men who have taught the subject in this University. About the professorship of anatomy cluster memories which give to it precedence of all others, and in the septemviri of the old school the chairs were arranged, with that of anatomy in the centre, with those of physiology, chemistry, and materia medica on the left, while those of practice, surgery, and obstetrics were placed on the right. With the revival of learning anatomy brought life and liberty to the healing art, and throughout the sixteenth, seventeenth, and eighteenth centuries the great names of the profession, with but one or two exceptions, are those of the great anatomists. The University of Pennsylvania has had an extraordinary experience in the occupancy of this important chair. In the century and a quarter which ended with the death of Leidy, six names appear on the faculty roll as professors of this branch. Dorsey, however, only delivered the introductory lecture to the course, and was seized the same evening with his fatal illness; and in the next year Physick was transferred from the chair of surgery, with Horner as his adjunct. In reality, therefore, only four men have taught anatomy in this school since its foundation. Physick's name must ever be associated with the chair of surgery. We do not know the faculty exigencies which led to the transfer, but we can readily surmise that the youthfulness of Horner, who was only twenty-six, and the opportunity of filching for surgery so strong a man as Gibson from the Faculty of the University of Maryland, then a stout rival, must have been among the most weighty considerations.

If in the average length of the period of each incumbency the chair of anatomy in the University is remarkable, much more so is it for the quality of the men who followed each other at such long intervals. It is easy to praise the Athenians among the Athenians, but where is the school in this country which can show such a succession of names in this branch: Shippen, the first teacher of anatomy; Wistar, the author of the first text-book of anatomy; Horner, the first contributor to human anatomy in this country; and Leidy, one of the greatest comparative anatomists of his generation? Of European schools, Edinburgh alone presents a parallel picture, as during the same period only four men have held the chair. The longevity and tenacity of the three Monros have become proverbial; in succession they held the chair of anatomy for 126 years. Shortly before the

foundation of this school Monro *secundus* had succeeded his father, and taught uninterruptedly for fifty years. His son, Monro *tertius*, held the chair for nearly the same length of time, and the remainder of the period has been covered by the occupancy of John Goodsir, and his successor, Sir William Turner, the present incumbent.

To one feature in the history of anatomy in this school I must refer in passing. Shippen was a warm personal friend and house-pupil of John Hunter. Physick not only had the same advantages, but became in addition his house-surgeon at St. George's Hospital. Both had enjoyed the intimate companionship of the most remarkable observer of nature since Aristotle, of a man with wider and more scientific conceptions and sympathies than had ever before been united in a member of our profession, and whose fundamental notions of disease are only now becoming prevalent. Can we doubt that from this source was derived the powerful inspiration which sustained these young men. One of them, on his return from England, at once began the first anatomical classes which were held in the colonies; the other entered upon that career so notable and so honorable, which led to the just title of the Father of American Surgery. It is pleasant to think that direct from John Hunter came the influence which made anatomy so strong in this school, and that zeal in the acquisition of specimens which ultimately led to the splendid collections of the Wistar-Horner Museum.

WILLIAM SHIPPEN shares with John Morgan the honor of establishing medical instruction in this city. When students in England they had discussed plans, but it was Morgan who seems to have had the ear of the trustees, and who broached a definite scheme in his celebrated "Discourse," delivered in May, 1765. It was not until the autumn of the year that Shippen signified to the board his willingness to accept a professorship of anatomy and surgery. He had enjoyed, as I have mentioned, the friendship of John Hunter, and had studied also with his celebrated brother, William. Associated with him as fellow-pupil was William Hewson, who subsequently became so famous as an anatomist and physiologist, and as the discoverer of the leucocytes of the blood, and whose descendants have been so prominent in the profession of this city. No wonder, then, with such an education, that the younger Shippen, on his return in 1762, in his twenty-sixth year, should have begun a course of lectures in anatomy, the introductory to which was delivered in the State House on November 16th. To him belongs the great merit of having made a beginning, and of having brought from the Hunters methods and traditions which long held sway in this school. Wistar in his eulogium pays a warm tribute to his skill as a lecturer and as a demonstrator, and to the faithfulness with which he taught the subject for more than forty years. Apart

from his connection with this institution he served as Director-General of the Military Hospitals from 1777 to 1781, and was the second president of the College of Physicians.

In the history of the profession of this country CASPAR WISTAR holds an unique position. He is its Avicenna, its Mead, its Fothergill, the very embodiment of the physician who, to paraphrase the words of Armstrong, used by Wistar in his Edinburgh Graduation Thesis, "Sought the cheerful haunts of men, and mingled with the bustling crowd." He taught anatomy in this school as adjunct and professor for twenty-six years. From the records of his contemporaries we learn that he was a brilliant teacher, "the idol of his class," as one of his eulogists says. As an anatomist he will be remembered as the author of the first American Text-Book on Anatomy, a work which was exceedingly popular, and ran through several editions. His interest in the subject was not, however, of the 'knife and fork' kind, for he was an early student of mammalian palæontology, in the development of which one of his successors was to be a chief promotor. But Wistar's claim to remembrance rests less upon his writings than upon the impress which remains to this day of his methods of teaching anatomy. Speaking of these, Horner, who was his adjunct and intimate associate, in a letter dated February 1st, 1818, says, "In reviewing the several particulars of his course of instruction, it is difficult to say in what part his chief merit consisted; he undertook everything with so much zeal, and such a conscientious desire to benefit those who came to be instructed by him, that he seldom failed of giving the most complete satisfaction. There were, however, some parts of his course peculiar to himself. These were the addition of models on a very large scale to illustrate small parts of the human structure; and the division of the general class into a number of sub-classes, each of which he supplied with a box of bones, in order that they might become thoroughly acquainted with the human skeleton, a subject which is acknowledged by all to be at the very foundation of anatomical knowledge. The idea of the former mode of instruction was acted on for the first time about fifteen years ago." We have no knowledge of a collection of specimens by Shippen, though it is hard to believe that he could have dwelt in John Hunter's house and remained free from the insatiable hunger for specimens which characterized his master. But the establishment of a museum as an important adjunct to the medical school was due to Wistar, whose collections formed the nucleus of the splendid array which you will inspect to-day. The trustees, in accepting the gift on the death of Dr. Wistar, agreed that it should be styled the Wistar Museum, and now, after the lapse of seventy-six years, the collection has found an appropriate home in an Institute of Anatomy which bears his honored name.

But Wistar has established a wider claim to remembrance. Genia and hospitable, he reigned supreme in society by virtue of exceptional qualities of heart and head, and became, in the language of Charles Caldwell, "the *sensorium commune* of a large circle of friends." About no other name in our ranks cluster such memories of good fellowship and good cheer, and it stands to-day in this city a synonym for *esprit* and social intercourse. Year by year his face, printed on the invitations to the "Wistar Parties" (still an important function of winter life in Philadelphia) perpetuates the message of his life, "Go seek the cheerful haunts of men."

How different was the young prosector and adjunct who next taught the subject! HORNER was naturally reserved and diffident, and throughout his life those obstinate questionings which in doubt and suffering have so often wrung the heart of man were ever present. Fightings within and fears without harassed his gentle and sensitive soul, on which mortality weighed heavily, and to which the four last things were more real than the materials in which he worked. He has left us a *journal intime*, in which he found, as did Amiel, of whom he was a sort of medical prototype, "a safe shelter wherein his questionings of fate and the future, the voice of grief, of self-examination and confession, the soul's cry for inward peace, might make themselves freely heard." Listen to him: "I have risen early in the morning, ere yet the watchman had cried the last hour of his vigil, and in undisturbed solitude giving my whole heart and understanding to my Maker, prayed fervently that I might be enlightened on this momentous subject, that I might be freed from the errors of an excited imagination, from the allurements of personal friendship, from the prejudices of education, and that I might, under the influence of Divine grace, be permitted to settle this question in its true merits." How familiar is the cry, the great and exceeding bitter cry of the strong soul in the toils and doubtful of the victory! Horner, however, was one of those on whom both blessings rested. Facing the spectres of the mind, he laid them, and reached the desired haven. In spite of feeble bodily health and fits of depression, he carried on his anatomical studies with zeal, and as an original worker and author brought much reputation to the University. Particularly did he enrich the museum with many valuable preparations, and his name will ever be associated with that of Wistar in the anatomical collection which bears their names.

But what shall I say of LEIDY? the man in whom the leaven of science wrought with labor and travail for so many years. The written record survives, and such a record! scarcely equalled in variety and extent by any naturalist, but how meagre is the picture of the man as known to his friends. The traits which made his life of such value—

the patient spirit, the kindly disposition, the sustained zeal—we shall not see again incarnate. The memory of them alone remains. As the echoes of the eulogies upon his life have scarcely died away, I need not recount to this audience his ways and work, but upon one aspect of his character I may dwell for a moment, as illustrating an influence of science which has attracted much attention and aroused discussion. So far as the facts of sense were concerned, there was not a trace of Pyrrhonism in his composition, but in all that relates to the ultra-rational no more consistent disciple of the great sceptic ever lived. There was in him, too, that delightful ἀταξία, that imperturbability which is the distinguishing feature of the Pyrrhonist, in the truest sense of the word. A striking parallel exists between Leidy and Darwin in this respect, and it is an interesting fact that the two men of this century who have lived in closest intercourse with nature should have found full satisfaction in their studies and in their domestic affections. In the autobiographical section of the life of Charles Darwin, edited by his son Francis, in which are laid bare with such charming frankness the inner thoughts of the great naturalist, we find that he, too, had reached in supra-sensuous affairs that state of mental imperturbability in which, to borrow the quaint expression of Sir Thomas Browne, they stretched not his *pia mater*. But while acknowledging that in science scepticism is advisable, Darwin says that he was not himself very sceptical. Of these two men, alike in this point, and with minds distinctly of the Aristotelian type, Darwin yet retained amid an overwhelming accumulation of facts—and here was his great superiority—an extraordinary power of generalizing principles from them. Deficient as was this quality in Leidy, it was not associated in him with “the curious and lamentable loss of the higher æsthetic taste” which Darwin mourns, and which may have been due in part to protracted ill health, and to an absolute necessity of devoting all his capabilities to collecting facts in support of his great theory.

When I think of Leidy’s simple life, of his devotion to the study of nature, of the closeness of his communion with her for so many years, there recur to my mind time and again the lines,—

“He is made one with nature ; there is heard  
 His voice in all her music, from moan  
 Of thunder to the song of night’s sweet bird ;  
 He is a presence to be felt and known  
 In darkness and in light, from herb and stone,  
 Spreading itself where’er that Power may move  
 Which has withdrawn his being to its own.”

Turning from the men to the subject in which they worked, from the past to the present, let us take a hasty glance at some of the devel-

opments of human anatomy and biology. Truth has been well called the daughter of Time, and even in anatomy, which is a science in a state of fact, the point of view changes with successive generations. The following story, told by Sir Robert Christison, of Barclay, one of the leading anatomists of the early part of this century, illustrates the old attitude of mind still met with among 'bread and butter' teachers of the subject. Barclay spoke to his class as follows: "Gentlemen, while carrying on your work in the dissecting-room, beware of making anatomical discoveries; and above all beware of rushing with them into print. Our precursors have left us little to discover. You may, perhaps, fall in with a supernumerary muscle or tendon, a slight deviation or extra branchlet of an artery, or, perhaps, a minute stray twig of a nerve,—that will be all. But beware! Publish the fact, and ten chances to one you will have it shown that you have been forestalled long ago. Anatomy may be likened to a harvest-field. First come the reapers, who, entering upon untrodden ground, cut down great store of corn from all sides of them. These are the early anatomists of modern Europe, such as Vesalius, Fallopius, Malpighi, and Harvey. Then come the gleaners, who gather up ears enough from the bare ridges to make a few loaves of bread. Such were the anatomists of last century,—Valsalva, Cotunnus, Haller, Winslow, Vicq d'Azyr, Camper, Hunter, and the two Monros. Last of all come the geese, who still contrive to pick up a few grains scattered here and there among the stubble, and waddle home in the evening, poor things, cackling with joy because of their success. Gentlemen, we are the geese." Yes, geese they were, gleaning amid the stubble of a restricted field, when the broad acres of biology were open before them. Those were the days when anatomy meant a knowledge of the human frame alone; and yet the way had been opened to the larger view by the work of John Hunter, whose comprehensive mind grasped as proper subjects of study for the anatomist all the manifestations of life in order and disorder.

The determination of structure with a view to the discovery of function has been the foundation of progress. The meaning may not always have been for "him who runs to read;" often, indeed, it has been at the time far from clear; and yet a knowledge in full detail of the form and relations must precede a correct physiology. The extraordinary development of all the physical sciences, and the corresponding refinement of means of research, have contributed most largely to the enlightenment of the 'geese' of Barclay's witticism. Take the progress in any one department which has a practical aspect, such as, in the anatomy and physiology of the nervous system. Read, for example, in the third edition of Wistar's "Anatomy," edited by Hor-



ner in 1825, the description of the convolutions of the brain, on which to-day a whole army of special students are at work, medical, surgical, and anthropological, and the functions of which are the objective point of physiological and psychological research,—the whole subject is thus disposed of: “The surface of the brain resembles that of the mass of the small intestine, or of a convoluted, cylindrical tube; it is, therefore, said to be convoluted. The fissures between these convolutions do not extend very deep into the substance of the brain.” The knowledge of function correlated with this meagre picture of structure is best expressed, perhaps, in Shakespearian diction, “that when the brains were out, the man would die.” The laborious, careful establishment of structure by the first two generations in this century led to those brilliant discoveries in the functions of the nervous system which have not only revolutionized medicine, but have given to psychologists almost enough of metaphysics to enable them to dispense with metaphysics altogether. It is particularly interesting to note the widespread dependence of many departments on accurate anatomical knowledge. The new cerebral anatomy, particularly the study of the surface of the brain, so summarily dismissed in a few lines by Wistar, made plain the path for Hitzig and Fritsch, the careful dissection of cases of disease of the brain prepared the way for Hughlings Jackson; and gradually a new phrenology on a scientific basis has replaced the crude notions of Gall and Spurzheim; so that with the present generation, little by little, there has been established, on a solid structure of anatomy, the localization of many of the functions of the brain. Excite with a rough touch, from within or from without, a small region of that mysterious surface, and my lips may move, but not in the articulate expression of thought, and I may see, but I cannot read the page before me; touch here and sight is gone, and there again and hearing fails. One by one the centres may be touched which preside over the muscles, and they may, singly or together, lose their power. All these functions may go without the loss of consciousness. Touch with the slow finger of Time the nutrition of that thin layer, and backward by slow degrees creep the intellectual faculties, back to childish simplicity, back to infantile silliness, back to the oblivion of the womb.

To this new cerebral physiology, which has thus gradually developed with increasing knowledge of structure, the study of cases of disease has contributed enormously, and to-day the diagnosis of affections of the nervous system has reached an astonishing degree of accuracy. The interdependence and sequence of knowledge in various branches of science is nowhere better shown than in this very subject. The facts obtained by precise anatomical investigation, from experiments on animals in the laboratory, from the study of nature's experi-

ments upon us in disease, slowly and painfully acquired by many minds in many lands, have brought order out of the chaos of fifty years ago. In a practical age this vast change has wrought a corresponding alteration in our ideas of what may or may not be done in the condition of perverted health which we call disease, and we not only know better what to do, but also what to leave undone. The localization of centres in the surface of the brain has rendered it possible to make, with a considerable degree of certainty, the diagnosis of focal disease, and Mac-ewen and Horsley have supplemented the new cerebral physiology and pathology by a new cerebro-spinal surgery, the achievements of which are scarcely credible.

But this is not all ; in addition to the determination of the centres of sight, hearing, speech, and motor activities, we are gradually reaching a knowledge of the physical basis of mental phenomena. The correlation of intelligence and brain weight, of mental endowment and increased convolution of the brain surface, was recognized even by the *gleaners* of Barclay's story ; but within the past twenty-five years the minute anatomy of the organ has been subjected to extensive study by methods of ever-increasing delicacy, which have laid bare its complex mechanism. The pyramidal cells of the cerebral gray matter constitute the anatomical basis of thought, and with the development, association, and complex connection of these psychical cells, as they have been termed, the psychical functions are correlated. How far these mechanical conceptions have been carried, may be gathered from the recent Croonian Lecture before the Royal Society, in which Ramón y Cajal based the action and the degree, and the development of intelligence upon the complexity of the cell mechanism and its associations. Even the physical basis of moody madness has not evaded demonstration. Researches upon the finer structure of the cerebral cortex lead to the conclusion that imbecility, mental derangement, and the various forms of insanity are but symptoms of diseased conditions of the pyramidal cells, and not separate affections of an indefinable entity, the mind. Still further ; there is a school of anthropologists which strives to associate moral derangement with physical abnormalities, particularly of the brain, and urges a belief in a criminal psychosis, in which "men are villains by necessity, fools by heavenly compulsion, knaves, thieves, and treachers by spherical predominance." This remarkable revolution in our knowledge of brain functions has resulted directly from the careful and accurate study by Barclay's 'geese,' of the anatomy of the nervous system. Truly the gleaning of the grapes of Ephraim has been better than the vintage of Abi-Ezer.

The study of structure, however, as the basis of vital phenomena, the strict province of anatomy, forms but a small part of the wide

subject of biology, which deals with the multiform manifestations of life, and seeks to know the laws governing the growth, development, and actions of living things. John Hunter, the master of Shippen and Physick, was the first great biologist of the moderns, not alone because of his extraordinary powers of observation and the comprehensive sweep of his intellect, but chiefly because he first looked at life as a whole, and studied all of its manifestations, in order and disorder, in health and in disease. He first, in the words of Buckle, "determined to contemplate nature as a vast and united whole, exhibiting, indeed, at different times, different appearances, but preserving amidst every change, a principle of uniform and uninterrupted order, admitting of no division, undergoing no disturbance, and presenting no real irregularity, albeit to the common eye irregularities abound on every side." We of the medical profession may take no little pride in the thought that there have never been wanting men in our ranks who have trodden in the footsteps of this great man ; not only such giants as Owen, Huxley, and Leidy, but in a more humble way many of the most diligent students of biology have been physicians. From John Hunter to Charles Darwin enormous progress was made in every department of zoology and botany, and not only in the accumulation of facts relating to structure, but in the knowledge of function, so that the conception of the phenomena of living matter was progressively widened. Then with the "Origin of Species" came the awakening, and the theory of evolution has not only changed the entire aspect of biology, but has revolutionized every department of human thought.

Even the theory itself has come within the law ; and to those of us whose biology is ten years old, the new conceptions are, perhaps, a little bewildering. The recent literature shows, however, a remarkable fertility and strength. Around the nature of cell-organization the battle wages most fiercely, and here again the knowledge of structure is sought eagerly as the basis of explanation of the vital phenomena. So radical have been the changes in this direction that a new and complicated terminology has sprung up, and the simple, undifferentiated bit of protoplasm has now its cytosome, cytolymph, caryosome, chromosome, with their somacules and biophores. These accurate studies in the vital units have led to material modifications in the theory of descent. Weismann's views, particularly on the immortality of the unicellular organisms, and of the reproductive cells of the higher forms, and on the transmission or non-transmission of acquired characters, have been based directly upon studies of cell-structure and cell-fission.

In no way has biological science so widened the thoughts of men as in its application to social problems. That throughout the ages, in the gradual evolution of life, one unceasing purpose runs ;

that progress comes through unceasing competition, through unceasing selection and rejection; in a word, that evolution is the one great law controlling all living things, "the one divine event to which the whole creation moves," this conception has been the great gift of biology to the nineteenth century. In his recent work, Kidd thus states the problem in clear terms: "Nothing tends to exhibit more strikingly the extent to which the study of our social phenomena must in future be based on the biological sciences than the fact that the technical controversy now being waged by biologists as to the transmission or non-transmission to offspring of qualities acquired during the lifetime of the parent, is one which, if decided in the latter sense, must produce the most revolutionary effect throughout the whole domain of social and political philosophy. If the old view is correct, and the effects of use and education *are* transmitted by inheritance, then the Utopian dreams of philosophy in the past are undoubtedly possible of realization. If we tend to inherit in our persons the result of the education and mental and moral culture of past generations, then we may venture to anticipate a future society which will not deteriorate, but which may continue to make progress, even though the struggle for existence be suspended, the population regulated exactly to the means of subsistence, and the antagonism between the individual and the social organism extinguished. But if the views of the Weismann party are in the main correct; if there can be no progress except by the accumulation of congenital variations above the average to the exclusion of others below; if, without the constant stress of selection which this involves, the tendency of every higher form of life *is actually retrograde*; then is the whole human race caught in the toils of that struggle and rivalry of life which has been in progress from the beginning. Then must the rivalry of existence continue, humanized as to conditions it may be, but immutable and inevitable to the end. Then also must all the phenomena of human life, individual, political, social, and religious, be considered as aspects of this cosmic process, capable of being studied and understood by science only in their relations thereto."

Biology touches the problems of life at every point, and may claim, as no other science, completeness of view and a comprehensiveness which pertains to it alone. To all whose daily work lies in her manifestations the value of a deep insight into her relations cannot be overestimated. The study of biology trains the mind in accurate methods of observation and correct methods of reasoning, and gives to a man clearer points of view, and an attitude of mind more serviceable in the working-day-world than that given by other sciences, or even by the humanities. Year by year it is to be hoped that young men will obtain in this Institute a fundamental knowledge of the laws of life.

To the physician particularly a scientific discipline is an incalculable gift, which leavens his whole life, giving exactness to habits of thought and tempering the mind with that judicious faculty of distrust which can alone, amid the uncertainties of practice, make him wise unto salvation. For perdition inevitably awaits the mind of the practitioner who has never had the full inoculation with the leaven, who has never grasped clearly the relations of science to his art, and who knows nothing, and perhaps cares less, for the limitations of either.

And, Mr. Provost, I may be permitted on higher grounds to congratulate the University of Pennsylvania on the acquisition of this Institute. There is great need in the colleges of this country of men who are thinkers as well as workers,—men with ideas, men who have drunk deep of the Astral wine, and whose energies are not sapped in the treadmill of the class-room. In these laboratories will be given opportunities for this higher sort of university work. The conditions about us are changing rapidly, and in the older states utility is no longer regarded as the test of fitness, and the value of the intellectual life has risen enormously in every department. Germany must be our model in this respect. She is great because she has a large group of men pursuing pure science with unflagging industry, with self-denying zeal, and with high ideals. No secondary motives sway their minds, no cry reaches them in the recesses of their laboratories, “of what practical utility is your work?” but unhampered by social or theological prejudices they have been enabled to cherish “the truth which has never been deceived,—that complete truth which carries with it the antidote against the bane and danger which follow in the train of half-knowledge.” (Helmholtz.)

The leaven of science gives to men habits of mental accuracy, modes of thought which enlarge the mental vision, and strengthens—to use an expression of Epicharmus—“the sinews of the understanding.” But is there nothing further? Has science, the last gift of the gods, no message of hope for the race as a whole; can it do no more than impart to the individual *ἀταραξία*, imperturbability amid the storms of life, judgment in times of perplexity? Where are the bright promises of the days when “the kindly earth should slumber rapt in universal law”? Are these, then, futile hopes, vain imaginings of the dreamers, who from Plato to Comte have sought for law, for order, for the *civitas Dei* in the *regnum hominis*?

Science has done much, and will do more, to alleviate the unhappy condition in which so many millions of our fellow-creatures live, and in no way more than in mitigating some of the horrors of disease; but we are too apt to forget that apart from and beyond her domain lie those irresistible forces which alone sway the hearts of men. With

reason science never parts company, but with feeling, emotion, passion, what has she to do? They are not of her; they owe her no allegiance. She may study, analyze, and define, she can never control them, and by no possibility can their ways be justified to her. The great philosopher who took such a deep interest in the foundation of this University chained the lightnings, but who has chained the wayward spirit of man. Strange compound, now wrapt in the ecstasy of the beatific vision, now wallowing in the sloughs of iniquity, no leaven, earthly or divine, has worked any permanent change in him. Listen to the words of a student of the heart of man, a depicitor of his emotions: "In all ages the reason of the world has been at the mercy of brute force. The reign of law has never had more than a passing reality, and never can have more than that so long as man is human. The individual intellect, and the aggregate intelligence of nations and races, have alike perished in the struggle of mankind, to revive again, indeed, but as surely to be again put to the edge of the sword. Look where you will throughout the length and breadth of all that was the world, 5000 or 500 years ago; everywhere passion has swept thought before it, and belief, reason. Passion rules the world, and rules alone. And passion is neither of the head nor of the hand, but of the heart. Love, hate, ambition, anger, avarice, either make a slave of intelligence to serve their impulses, or break down its impotent opposition with the unanswerable argument of brute force, and tear it to pieces with iron hands." (Marion Crawford.)

Who runs may read the scroll which reason has placed as a warning over the human menageries: "chained, not tamed." And yet who can doubt that the leaven of science, working in the individual, leavens in some slight degree the whole social fabric. Reason is at least free, or nearly so; the shackles of dogma have been removed, and faith herself, freed from a morganic alliance, finds in the release great gain.

One of the many fertile fancies of the "laughing philosopher," a happy anticipation again of an idea peculiarly modern, was that of the influence upon us for weal or woe of Externals, of the idola, images, and effluences which encompass us,—of Externals upon which so much of our happiness, yes, so much of our every character depends. The trend of scientific thought in this, as in the atomic theory, has reverted to the Sage of Abdera; and if environment really means so much, how all-important a feature in education must be the nature of these encompassing effluences. This magnificent structure, so admirably adapted to the prosecution of that science from which modern thought has drawn its most fruitful inspirations, gives completeness to the already exhilarating *milieu* of this University. Here, at last, Mr.

Provost, and largely owing to your indomitable energy, are gathered all the externals which make up a *Schola major* worthy of this great Commonwealth. What, after all, is education but a subtle, slowly-affected change, due to the action upon us of the Externals; of the written record of the great minds of all ages, of the beautiful and harmonious surroundings of nature and of art, and of the lives, good or ill, of our fellows,—these alone educate us, these alone mould the developing minds. Within the bounds of this campus these influences will lead successive generations of youth from matriculation in the college to graduation in the special school, the complex, varied influences of Art, of Science, and of Charity; of Art, the highest development of which can only come with that sustaining love for ideals which, ‘burns bright or dim as each are mirrors of the fire for which all thirst;’ of Science, the cold logic of which keeps the mind independent and free from the toils of self-deception and half-knowledge; of Charity, in which we of the medical profession, to walk worthily, must live and move and have our being.