Higher Endeavor in Science

THE ADDRESS DELIVERED AT THE LAYING OF THE CORNERSTONES OF THE CHEMICAL LABORATORY AND ENGINEERING BUILDING ON MAY TWELFTH

BY MICHAEL I. PUPIN

Professor of Electro-Mechanics, Columbia University

PHILADELPHIA, Princeton, and Menlo Park are the beginning, the middle, and the end of a tiny bit of territory which is the cradle of American history. No other spot in the vast territory of these United States reminds us of so many great historical events. No names of Americans remind us of so many great events in the history of American Science as the following names: Benjamin Franklin of Philadelphia, Joseph Henry of Princeton, and Thomas Edison of Menlo Park. Just as the achievements of the Continental Congresses in Philadelphia and Washington's victory at Trenton and Princeton laid the foundation of these United States, so the scientific achievements of Franklin, of Joseph Henry, and of Edison laid the foundation and added some of the superstructures of earlier American Science.

The tiny State of New Jersey and the tiny strip of its territory on which we are standing today can justly claim the lion's share of the glory of these great achievements. The Battle Monument here at Princeton, speaking in accents modulated by the chisel of Macmonnies, tells a story of a great victory; these buildings, the cornerstones of which we are laying today, will be monuments which will tell a wonderful story of great achievements in American Science and of a victory which was one of the crowns of these achievements. This victory, just like that of the battle of Princeton, was won right here in Princeton. It is seemly that on this memorable occasion I recite a bit of this story.

Prior to Franklin's time the natural philosopher riveted his attention upon electricity at rest. Franklin's discovery that lightning is a motion of electricity revolutionized the mental attitude of the natural philosopher of Franklin's time, and motion of electricity became the favorite subject of his inquiry. Just as during the century preceding Franklin the genius of Galileo and of Newton had revealed a new universe, the universe of matter moving in obedience to simple laws, so during the century which Franklin's discovery inaugurated, a new universe was revealed; it is the universe of electricity in motion obeying simple laws of electrical action. The discovery and formulation of these laws are the greatest scientific glory of the century which began with Franklin's discovery. Joseph Henry's discovery of the inertia of electricity is one of the greatest contributions to the glory of this remarkable century. His great electro-magnet which gave birth to this discovery is still here in Princeton. Grateful science, recognizing the eminent value of this work, named the unit of electro-magnetic inertia after Henry, and thus assigned to him a place of honor in the Hall of Fame of Science. In this Hall of Fame is the Valhalla where Joseph Henry and other immortals like Volta, Ohm, Ampere, and Faraday dwell. Just think of it! Princeton, a little village in a little state, represented by Henry among the immortals in the Valhalla of Science. Think of it, and it will recall to your mind another glorious picture, the picture of little Cambridge represented by Newton in the same Valhalla of Science.

Just as the spirit of Newton has been the scientific spirit of Cambridge during the last two hundred years, so the spirit of Joseph Henry has been the scientific spirit of Princeton during the last hundred years. That transformed little Cambridge and little Princeton into mighty cities in the world of science. Such is the power of the spirit of genius.

PRINCETON'S IMPORTANT MISSION

WHAT is that spirit of Princeton which is guided by the spirit of Joseph Henry, the patron saint of Princeton's science? It is not as generally known as it ought to be that Joseph Henry is the inventor of the electro-magnetic telegraph which he, nearly a hundred years ago, operated between his house and his laboratory here at Princeton. This was the beginning of the present art of electrical communication which enables us today to speak at any time to any person in the United States. Would that Washington and Lincoln could have foreseen this new power for the consolidation of the American Union! Henry knew the practical value of his invention, but that did not divert him from the pursuit of a new truth the vision of which appeared to him in the activities of moving electricity. He let the practical men like Wheatstone and Morse develop the practical applications of his electro-magnetic experiments; he worshiped at the temple dedicated to the eternal truth of science, and there he found the revelation of the inertia of moving electricity, a new glimpse of the eternal truth never caught before by the eye of man.

PRAISED BY PROFESSOR PUPIN

Joseph Henry, inventor of the telegraph, who taught Civil Engineering at Princeton as early as 1832

There he found the immortality which gave him a place in the Valhalla of Science. This devotion to the eternal truth and scientific idealism was the expression of Joseph Henry's spirit. It manifested itself in all his work at Princeton and later in his scientific leadership as Secretary of the Smithsonian Institution and as President of the National Academy of Sciences. He, assisted by his personal friend, immortal Lincoln, organized the National Academy and with the aid of its distinguished members he inaugurated, sixty years ago, the historic movement for higher endeavor in American Science. Higher endeavor in science was Henry's motto, and it was also the motto of Young, and Brackett and of all the scientists of Princeton of former days and of today. Higher endeavor in philosophy was the motto of McCosh, President of Princeton, when sixty years ago he, a Presbyterian clergyman, lectured on evolution. The scientific spirit of Princeton inspired this brave and extraordinary gesture. Loyal to the spirit of Joseph Henry, its patron saint in science, Princeton today, just as in the days of McCosh, worships at the altar of scientific idealism, of fearless and unselfish devotion to the eternal truth. Princeton's mission is to cultivate this idealism and make it effective in the life of the American commonwealth.

A NEW NATIONAL MOTTO

NO elaborate statistical figures are needed to demonstrate the value of higher endeavors in science. Every industry in the land recognized this value long ago. The practical value of the eternal truth is known today to the practical man just as its spiritual value was known to the prophets of several thousand years ago. The same eternal truth which, according to the prophets promises spiritual freedom, promises today economic freedom. American industries are craving today for the revelation of scientific truth, and the only problem which faces us today is the problem of training our generation in the science and in the art of revealing new scientific truth. Pure science research and the engineering discipline which will apply efficiently the findings of pure science to the development of our industries and of our daily life is now our national motto; it is the motto of our universities as well as of our industries.

Scientific research laboratories are springing up on every side in our American industries; they are by universal consent the most effective arms of our national defense. They call for trained men capable of searching for the primordial energies hidden in the mysterious structure of matter. He who has a new glimpse of the eternal truth can unlock these hidden energies and make them willing servants of man, the most powerful defenders of his freedom. These two buildings will be new training camps for such men.

The spirit of Princeton's patron saint in science, the spirit of Joseph Henry, will be with them and will guide them, just as it has always guided the highest scientific endeavors of Princeton.

The proud citizens of many cities of ancient Greece sacrificed a hundred oxen to the Olympian gods when one of their fellow citizens had discovered a new theorem in geometry. Let the proud citizens of the State of New Jersey and the friends of Princeton think of the many revelations in science which appeared here first on the sacred ground on which Nassau Hall stands, and they will find no difficulty in deciding what sacrifices they should bring to these new altars of the God of Eternal Truth.

More About the Ph.D.: A Thought-Proof Barrier

Editor, the *Weekly*
Sir:

Your editorial, "Alumni Apathy," together with the Ph.D. debate, encourages this gentle reader to take Underwood in hand and meditatively tap the keys of academic reminiscence.

The arguments of Mr. Bakeless move, or shake me, more than the invective of Mr. Allen, who, in his editorial capacity, is also often a contributing humorist.

The naïve assumption that the Ph.D. in the humanities has aught to do with "Original Thought" is, in itself a stupendously original idea, although thoroughness and genuine knowledge may be fairly claimed as prerequisites for the degree. Even the rag-picker or junk-dealer must "know his stuff." But the perspicacious Mr. Allen distinguishes between truth and facts.

Auld acquaintance brings to mind the day when a Princeton graduate submitted a dissertation for the M.A. at a Middle Western university. The work may have been thorough and based upon genuine knowledge. That is, the necessary rags were there, neatly arranged in quilt or carpet pattern. But our plot begins with one short and fatal paragraph which contained a bit of "original thought," "constructive criticism," or what have you?

That single sinister paragraph was objectionable to the friendly and learned gentlemen who were then supervising our hero's mute and inglorious career. To quote their objections, it was "too striking to be effective." Perhaps it gleamed incongruously like "cloth o' gold i' th' rags." The idea, they said, was better suited for development as an entire thesis. It was a good point, but they demanded its withdrawal. The rest was acceptable.

Naturally our obliging Princetonian withdrew—not the offending paragraph, but his candidacy for a degree from that university. He was asked to leave the dissertation for further examination. They lost it. He had no other copy. Careless fellow!

Later, having absorbed his M.A. elsewhere, and acquired a surfeit of residence and sufficient credits for the Ph.D. at an Eastern university (neither Princeton nor Harvard) he bethought himself of his Western mentor's valuation of the rejected idea. Here was a further test! So, having for some years past been busied with investigation, analysis and "synthetic thought," and with nothing else but the merely perfunctory to offer, he submitted a preliminary sketch of the thesis he proposed to develop in detail.

The brief paper, it turned out later, was "thoughtful and incisive" enough "to interest deeply" Mr. Glenn Frank of the *Century Magazine*. The Editors of the *Forum* wrote of it as "a definite contribution—an important analysis of new trends" in the field.

But, to the university, it was not a "fitting subject" for the candidate. Quite naturally he again withdrew himself and "Original Thought" from aspiration for a higher degree, reminded of the story of God and the prayerful applicant, neither of whom could quite make the grade for membership in an exclusive church.

The twice-rejected subject, fully developed, is now being published by an endowed philosophical journal that specializes in research free from academic restrictions.

A similar experience is related by a colleague who, in order to take his Ph.D. degree was forced to abandon an original theory of free verse forms and patterns that have since been developed by the poets outside of the universities.

Students' Photo Service

ARCHED OPENINGS

A window and a doorway in the Class of 1904-*Henry Hall*

Conclusions based upon such limited empiricism as personal observation and experience may be necessarily imperfect or tentative. But I know of no evidence to refute the proposition that the scientific method of graduate study and research in the humanities tends to erect a truth-proof barrier that is impervious to genuine and vital creative thought. And this inhibition has been extended to undergraduate teaching.

Other trivial bits of evidence support this conclusion.

For instance, suppose you wish to indulge in a bit of literary sleuthing on that fascinating controversy over the identity of the "Third Murderer" in *Macbeth*. Let us assume that you propound an hypothesis that takes into account all the evidence, and reconciles the conflicting arguments. Your new constructive theory will be ruled out as "adding nothing to the subject" *because you cannot produce Shakespeare's original manuscript or prompter's copy* showing the alteration of speech-tags in Act III, Scene iii. You cannot prove revision, which is the basis of your contention.

Just try to publish such an article in one of the learned journals edited by Ph.Ds!

On the other hand, with the aid of an index, string together scraps of useless "Evidences of the Effect of the Romantic Movement on Emerson as Noted in the Journals,"—self-evident by-products of more thoughtful research. Your pot-boiler that cost merely several hours of extra time will be lauded to the empyrean and read to the graduate seminar as a model of research. Why? Because it means nothing—requires compilation rather than thought. It is part of the harmless ritual that bolsters our educational superstitions, and it reaches no disquieting conclusions.

Of course the program of the graduate professor is difficult. He must suggest topics for theses that have never been treated before (under exactly the same title) and are sufficiently trivial, harmless, and inconclusive as not to give offense by originality.

Perhaps when we develop more imaginative Ph.D.'s who understand the meaning of creative or constructive work, the graduate student who is supervised by the Ph.D. will be *permitted* to produce something original.

An investigation of "Vital Contributions to Human Thought and Progress Offered by the Universities" would, I fear, bring negative results. For I believe a little study will show that nearly all great advances have been made outside of educational research. Witness art, literature, philosophy, science, medicine, mechanical invention.

Yet I would not minimize the value of training in the scientific method. It offers an antidote to dilettantism and charlatanism. Perhaps we expect too much from our learned friends the Ph.D.'s. The college or university, in the main, must be a conservative storehouse of knowledge which is supplied, discovered, and usually first recognized by those outside its walls.

Very truly yours,

ROY PETRAN LINGLE '08 AND '13

May 9, 1927.

Princeton Fund to Fete Representatives

THE Princeton Fund will entertain its class representatives, the class secretaries, and members of the Graduate Council at a dinner at the Princeton Inn, at 7 p.m. next Saturday, May 21.

The purpose of the dinner, according to Frederick P. King '00, chairman of the Princeton Fund Committee on Class Organization, is two-fold: to give expression to the Princeton Fund's gratitude to those who have been invited for their interest and effort on behalf of the Fund among members of their Class, and to provide an opportunity for mutual exchange of ideas as to methods of work among the alumni.

There will be no set speeches, but a general discussion will follow the dinner. Mr. King will preside.