SCIENCE

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*PROFESSOR ROWLAND, 1848–1901.**

A GREAT man has fallen in the ranks—great in talents, great in achievements, great in renown. Not now need we recall the incidents of his life, nor estimate the characteristics of his impressive personality, nor enumerate his contributions to physical science. We are assembled in this academic hall as his friends, his pupils, his colleagues, about to follow his deserted body to the church, and there in silence to give thanks for such an example, or to utter, with his kindred, words of faith and hope, consecrated by the comfort they have given to the mourners of many climes and of many centuries. Before these last rites, we pause to think what sort of a man was this whom we so love and honor, whom we so lament, whose death, in one aspect, seems so premature; in another, crowned with the best that earth can give.

* An address before the officers and students of the Johns Hopkins University, assembled before the funeral, April 18, 1901.

H. A. Rowland

Our friend was born with a powerful mind, and the older he grew the more powerful it appeared to those who knew him intimately and to those most capable of understanding the problems and the methods which engaged his thoughts. Others may have eyes as keen and fingers as facile, but his vision and his dexterity were controlled by a brain of extraordinary fineness, versatility and strength. Nobody could walk with him, hunt with him, sail with him, talk with him, work with him, without perceiving his firm grasp, his clear aim, his concentrated energy, his extraordinary powers. In early youth his mind was directed to the study of nature—not so much to plants and animals as to physical and chemical forces. This was the bent of his life. It is true that he was fond of music, classical music especially—Chopin's funeral march, for example—and he loved good works of art—the Madonnas of Raphael, for example.

Yet he cared but little for literature, having showed, in his early days, a boyish animosity toward Greek and Latin which he never wholly overcame. Aristotle was no authority to him. But the mysterious forces of the physical world—gravitation, sound, light, heat, electricity and magnetism—were his constant study. The principles of mechanics were to him of fundamental importance, and mathematics was subservient to all his investigations. In this broad field he was a reader, a student, an experimenter, an inventor, a discoverer, a philosopher. He knew how to ask a difficult and far-reaching question, and he knew how to seek the answer.

Extraneous considerations were excluded when he saw the point of an inquiry, and on that point he concentrated all his powers. For example, when he began the brilliant series of experiments in spectrography which made him peerless in this domain, he saw that the spectrum depended on the accuracy of the gratings, and the gratings on the dividing engine, and the dividing engine on the screw—so he began the study of light by devising and making a screw more exact than any screw that has ever been produced by the most accomplished makers of instruments of precision, and then he saw that photography must be improved before he could reveal to the eye of others the intricacy of the solar spectrum.

His intellectual apparatus was controlled by a powerful will. When he was determined upon a given course, no regard for consequences, no apprehension of perils or of difficulties, no dread of failure, proved a barrier. They heightened his zest. Fortunately his ends were noble and his proceedings wise, so that rarely, if ever, did failure disappoint him or weaken his self-confidence. He would have been a great soldier, a great explorer, a great lawyer.

But above his keen perceptions, his logic, his adaptation of means to ends, and his marvelous concentration, I must place another moral quality—one that appeals to every one of us, whether we understand his determination of the mechanical equivalent of heat, or the steps by which he arrived at the value of the ohm. This moral quality is the love of truth. Of course, he was true in all the ordinary relations of life. That is the beginning of truth, but not the end of it. He was also true in all his investigations, careful to eliminate errors, to avoid preconceptions, to shrink from hasty conclusions and inferences, to be critical of other investigations, to be accurate, exact, conscientious, to spare no pains, to shrink from no efforts, to conceal no difficulties, in order that the absolute facts might be established, so far as this can be done by limited humanity. To him science was another word for truth—not all the truth, but that amount of truth which the limited powers of man have discovered. He was a follower of Isaac New-

ton, picking up upon the seashore a few pebbles and discerning their lessons.

At the close of our first decennium, two speakers were brought forward to tell, respectively, what had been the aims of this University in providing for the study of science and letters. These speakers were Professor Gildersleeve and Professor Rowland. They had no preliminary conference, but each brought his discourse to a close by a return to the key-note—the key-note which had governed and should govern our personal behavior and the harmonies of our associated lives as members of the Johns Hopkins University.

Said the exponent of letters: "First and last, the scientific standard must be upheld for the university man, be he a student of letters, be he a physicist; and that standard is the absolute truth, the ultimate truth. 'Nothing imperfect is the measure of anything,' says the prince of idealists."

Said the man of science: "But for myself, I value in a scientific mind most of all that love of truth, that care in its pursuit, and that humility of mind which makes the possibility of error always present more than any other quality. This is the mind which has built up modern science to its present perfection, which has laid one stone upon the other with such care that it today offers to the world the most complete monument to human reason. This is the mind which is destined to govern the world in the future and to solve problems pertaining to politics and humanity as well as to inanimate nature.

"It is the only mind which appreciates the imperfections of the human reason and is thus careful to guard against them. It is the only mind that values the truth as it should be valued and ignores all personal feeling in its pursuit. And this is the mind the physical laboratory is built to cultivate."

These are words worthy to be recalled by the successive groups of students who come here for instruction and counsel as the years roll on. Let us sacredly cherish our inheritance.

In closing, let me call our departed brother, our dear colleague, our honored teacher, our ornament, our pride and our delight, by another nobler title. He was a servant of the Lord. If one who leads a life of purity, fidelity and integrity, and who consecrates, without self-seeking, his strength, his talents, his time, at home and at his laboratory, in health and in bodily infirmities, in youth and in maturity, to the interpretation of the laws by which the cosmos is governed, is a servant of the Lord, —then reverently and truly we may say of our departed friend he was a servant of the Lord, Maker of heaven and earth. Let me apply to him words of the Master, whom he was taught from childhood to revere. His 'eye was single' and 'his whole body was full of light.'

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*AN OUTLINE OF THE PROGRESS OF CHEMISTRY IN THE NINETEENTH CENTURY.**

CHEMISTRY is one of the youngest of the natural sciences. Its growth and development have taken place almost entirely in the past one hundred years. Nevertheless, it is well to remember that some of the foundation stones of the science were laid in the latter part of the eighteenth century. There was no such thing as a science of chemistry in the time of the ancient Greeks and Romans. Nor during the middle ages, nor previous to the year 1750 can there be said to have been any systematized chemical knowledge.

In the middle of the eighteenth century the attempt was made to explain in a general way that most striking of all ordinary

* Address delivered before the Academy of Science at St. Louis, on March 18th.