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ELIHU THOMSON[1]

ELIHU THOMSON'S INTEREST IN RESEARCH

To treat this subject comprehensively would be to write a complete biography of Professor Thomson, for research, both in its broadest sense of a search for knowledge and in its narrower sense of systematic experimentation, was the major interest of his life.

As a young boy we find him studying industrial processes, both mechanical and chemical. At the age of ten or eleven he was constructing small cupola furnaces and attempting to make iron castings. Prepared for high school two years before he reached the required age for entry, and urged to give up his books for a while, he weepingly protested that life would not be worth living if he had to discontinue his studies. He employed the two-year interval in school work in building static machines, Leyden jars, condensers, etc., and was continually making experiments, some of which, as he recognized later, were worthy of publication as original matter. Chemical knowledge he was simultaneously pursuing, through books and by experiment.

Throughout his high-school years he was always "constructing things," but it was after graduation, when at the age of seventeen, he became assistant professor and, two or three years later, full professor of chemistry, that his marvelously productive career as a scientist truly began. It was during this period from the age of seventeen to twenty-seven that he published his first original papers (on chemical subjects); experimented with electromagnetic waves, foreshadowing radio, and produced the first "tuned" circuit; accomplished telephone relaying; studied the fundamentals of dynamo-electric machines and established new and basic principles; suggested high voltage d-c transmission; advanced the novel but now accepted theory of relation between sun-spots, magnetic storms and auroras; studied hysteresis, and advanced precociously

[1] Papers presented at a meeting in commemoration of the life and work of Elihu Thomson under the auspices of the American Philosophical Society, the Franklin Institute of Pennsylvania, the Central High School of Philadelphia, the Massachusetts Institute of Technology and the General Electric Company, held in the halls of the American Philosophical Society and the Franklin Institute on February 16.

the electrical theory of matter; built and studied transformers, and experimented with electric energy distribution by their means; and somehow found leisure to construct a pipe organ and a microscope, fashioning all parts of these with his own hands. In later years he constructed with his own hands a telescope with 10-inch diameter objective, and used it constantly in astronomical studies.

When, in 1880, he gave up teaching, to devote himself to the commercial development of his ideas and to the building up of the great electrical industry which owes so much to him, he soon found that the urgent need for inventions and engineering design was engrossing nearly all his time, leaving small opportunity for scientific research. But he never lost his keen interest in science. In its literature he closely followed its progress, and often contributed to it by original suggestions.

To show the variety of his interests, I might mention the following diverse subjects which he studied and on which he contributed original papers: very high frequency currents, and their effects on the human body; x-rays, their diffusion, their effect on human tissue, their use in stereoscopic pictures; lightning hazards; aeroplanes; electric welding; the meteorite which fell in Canyon Diabolo, and the use of helium mixed with oxygen to prevent "bends" in caisson workers.

In 1899, as vice-president of the American Association for the Advancement of Science, he read a paper on "The Field of Experimental Research," and, the next year, took an active part in instituting the Research Laboratory of the General Electric Company. That laboratory was unique in industry in having for its primary purpose fundamental research. While the written record indicates that the laboratory was first proposed by E. W. Rice, Jr., then vice-president of the company, and while it was certainly founded by his authority, yet it is equally certain that Mr. Rice's keen interest in research in pure science arose from his long and close association with Professor Thomson, first as pupil and then as assistant. There can be no doubt but that Professor Thomson was the father of scientific research in the General Electric Company.

For years he was a most helpful and inspiring member of the advisory council of the laboratory, keenly interested in all details of its work and frequently helping by wise and timely suggestions. From his broad knowledge and experience he often could throw new light on our problems, and his resourcefulness seemed never-failing in suggesting methods of attack. To all of us in the laboratory his enthusiasm and keen mentality were always an inspiration. His wise counsel and hearty support were invaluable to us in the laboratory's early years.

In his later life, when he had relinquished all direct responsibility for engineering activities of the company, he was again able, in his Lynn laboratory, to return to his first and deepest interest—research. It was then that he did his classic work on fused quartz, producing a quartz mirror 60 inches in diameter for a telescope. A visit to him there was always delightful and stimulating. Always would he be found with some new experiment, new material or new idea, which he would eagerly discuss with his characteristic friendly smile and sparkling eyes. Even when failing health forbade active work, his old keen interest in science remained and stayed with him to the end.

A cultured gentleman, a lovely character, a great inventor, a most able engineer, he was also a gifted scientist, and truly the father of General Electric research.

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ELIHU THOMSON THE SCIENTIST

NEARLY a decade ago, in reviewing Elihu Thomson's productive life, I wrote: "More than any man now living . . . Professor Thomson has combined in a most remarkable way the constructive power of the inventor, the thoroughness and soundness of the man of science, and the kindly balance of the ideal philosopher, teacher, and friend." Now that Professor Thomson is no longer with us, I still abide by that appraisal; and in again reviewing his contributions and characteristics, this time with emphasis on his talents as a scientist, I find added reasons to support this judgment.

There are scientists who dwell in ivory towers remote from the Rialto, and it is well that they do if it is there that they can be most productive; and there are scientists no less important to the world who elect to practice the scientific method for the realization of practical ends, and it is well that they do, for science must take its place in the workaday world.

The ivory tower scientist seeks primarily, we might say, to understand nature, while the applied scientist, whom we usually call an engineer, seeks to control nature. This distinction has been concisely stated by our distinguished colleague, Dr. Gano Dunn. "Engineering," says he, "is the art of the economic application of science to social purposes . . . the scientist . . . shuts his mind as far as possible to all human prejudice and influence of feeling, save only for the divine fire of that imagination which creates the working hypothesis; and he learns to discern truth and new knowledge in a study of the order of nature. The engineer, by the same intellectual processes as the scientist, applies that new knowledge to social service."

It was a notable characteristic of Professor Thomson that he embodied both these types of science in a