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JOSIAH WILLARD GIBBS AND THE EXTENSION OF THE PRINCIPLES OF THERMODYNAMICS

FIFTY years ago there was being published in the *Transactions* of the Connecticut Academy of Sciences a paper by Josiah Willard Gibbs, then professor of mathematical physics at Yale. This paper bore the title, "On the Equilibrium of Heterogeneous Substances." To-day from various parts of the world come notices and reports of meeting of societies and groups of scientific men engaged in apparently most diverse lines of investigation or industry, who, recognizing the lapse of fifty years and the changes they have brought, pause to recall the event of the publication of Gibbs's paper and to pay superlative tribute to the intellect and accomplishment of a man who influenced so profoundly the remarkable scientific progress made during this period.

It is therefore appropriate to call attention at this time to some of these memorial tributes and in particular to some of those expressed at the recent jubilee celebration held in his honor by the Chemical Society of Holland; for by quotations from them it may be realized through the words of eminent scientists the high esteem in which the most eminent American man of science is held throughout the world. By this means, too, something may be conveyed of his character, his industry, his wonderful ability for taking pains, and chiefest, his commendable lack of self interest in research.

It is worth while also to refer to the environment of Gibbs, since the environment of a man—especially the intellectual environment of an intellectual man—is an essential part of him and may largely determine the form and direction his intellectual activities shall take.

The period covered by the life of Gibbs, 1839–1903, was marked by an unusual interest and activity in physics. It is only necessary to recall the names of eminent physicists of that period to be assured of this. This interest, too, was general, and in so far as it pertained to the people at large, was inspired by the relation, then becoming more and more obvious, between the useful and practical applications of physics to industry and commerce. Industry was beginning to establish its laboratories and seek the leadership of scientific method.

The concept of energy was emerging during the early life of Gibbs and although not yet seen with