

**EXPERIMENTAL AND
THEORETICAL APPLICATIONS
OF THERMODYNAMICS TO
CHEMISTRY**

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Experimental and Theoretical Applications of Thermodynamics to Chemistry by Walther Nernst

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WALTHER NERNST

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THERMODYNAMICS
TO CHEMISTRY



BY

DR. WALTHER NERNST

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WITH DIAGRAMS

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THE SILLIMAN FOUNDATION

In the year 1883 a legacy of eighty thousand dollars was left to the President and Fellows of Yale College in the City of New Haven, to be held in trust, as a gift from her children, in memory of their beloved and honored mother Mrs. Hepsa Ely Silliman.

On this foundation Yale College was requested and directed to establish an annual course of lectures designed to illustrate the presence and providence, the wisdom and goodness of God, as manifested in the natural and moral world. These were to be designated as the Mrs. Hepsa Ely Silliman Memorial Lectures. It was the belief of the testator that any orderly presentation of the facts of nature or history contributed to the end of this foundation more effectively than any attempt to emphasize the elements of doctrine or of creed; and he therefore provided that lectures on dogmatic or polemical theology should be excluded from the scope of this foundation, and that the subjects should be selected rather from the domains of natural science and history, giving special prominence to astronomy, chemistry, geology, and anatomy.

It was further directed that each annual course should be made the basis of a volume to form part of a series constituting a memorial to Mrs. Silliman. The memorial fund came into the possession of the Corporation of Yale University in the year 1902; and the present volume constitutes the fourth of the series of memorial lectures.

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P R E F A C E

IN the following Lectures which were delivered at Yale University, October 22d to November 2d, 1906, I have given, after a general theoretical introduction, a résumé of the experimental investigations which I have carried out in recent years, with the aid of my students, on chemical equilibria at high temperatures.

The study of the results thus far obtained in this field makes it appear probable that there prevails here more conformity to general laws than the two laws of thermodynamics would lead us to expect. To explain these regularities I have developed a new theorem which seems to reveal new truths concerning the relation between chemical energy and heat. It can hardly be doubted that this theorem will prove useful in the treatment of questions other than purely chemical, but in the following Lectures I have not entered into this phase of the subject.

As to the theorem itself, I should like to add

the following general remarks. The large mass of experimental data upon which the theorem has been successfully tested will probably remove any doubt as to whether the formulas developed by its aid have disclosed new laws to us. To decide the question whether the theorem represents only an approximate principle or an exact law of nature similar to the first and second laws of thermodynamics will, however, necessitate many further investigations. From a practical point of view this question is of minor importance, as my formulas are sufficiently accurate for many purposes. From a theoretical standpoint it is, however, of the greatest importance, for the reason that a more exact formulation of the theorem may possibly be found.

In the preparation of these lectures, and in the correction of the proofs, I have been assisted by Dr. K. George Falk, for whose willing and efficient services I wish to express my best thanks.

W. N.

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