A History of Entropy through Various Methods: Specially Focused on Technical Term Analysis

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Abstract

Rudolf Clausius's 16 papers on the mechanical theory of heat have been studied through four various methods, i.e. traditional text analysis with the help of Clausius's own manuscripts, mathematical equation analysis, experimental data table analysis, and technical term analysis. The first three analyses were briefly summarized while the result of the last technical analysis was explained with such important terms in thermodynamics as Disgregation (Degree of dispersion) and Uncompensirte Verwandlung (Non compensated transformation). These terms played important roles through indicating the micro nature and irreversible character, respectively before the appearance of the term Entropie (entropy) in Clausius's famous paper of 1865. The result of technical term analysis for his paper on the theory of electricity (1853) by the use of a text mining method is also shown with tables and figures.

Key words: R. Clausius, Entropy, mechanical theory of heat, irreversible (non reversible), text mining

1. Introduction

We have been studying the papers of Rudolf Clausius (1822–88) published between 1847 and 1873 under the name of the mechanical theory of heat for the past 20 years, and published a book, in which our research papers were mostly collected in 2002.[1] On this occasion the results of our studies through four important analyses will be mentioned.

1.1. Traditional Text Analysis with Clausius's own Manuscripts

We discovered the strong influence of Joseph Fourier's work, the analytical theory of heat on Clausius's mathematical approach through studying Clausius's own manuscript which was in the style of a notebook, called "Aus Wärmetheorie von Fourier (1848)" HS 6452 at the Archive section of the Library of the Deutsches Museum in Munich.[2] It was

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[1] Eri Yagi, *A Historical Approach to Entropy, Collected Papers of Eri Yagi and Her Coworkers* (Tokyo: International Publishing Institute, 2002). Eri Yagi, *A Supplement of the Collected Papers of Eri Yagi and Her Coworkers, A Database from R. Clausius's Abhandlungen I–XVI*(Kawagoe: Eri Yagi Institute of Science, 2002).

[2] J. Fourier, *Theorie de la chaleur* (Paris. 1822) in *Oeuves de Fourier*, part 1(Paris, 1887): 1–563.