

1: Introduction

Entropy is widely understood as a measure of the internal disorder of a system. However, that notion on its own is absurdly vague because, given our modern understanding of the particulate nature of matter, one can imagine many different measures of disorder. In fact, entropy was discerned and defined without reference to any microscopic view of matter, and it is as specific a macroscopic property of a system as the spatial dimensions and the material contents.

At the same time, the existence of entropy as an independent macroscopic property did suggest that the macroscopically observable spatial dimensions and material contents of a system do not tell a complete story, and hinted that matter comprises invisible bits that can be arranged in distinct ways. The question then is what specific account of the microscopic picture corresponds with, and can account for, the macroscopically mandated entropy.

The following two chapters lay out these two developments in their logical sequence: first the macroscopic argument, worked out by Clausius in 1865, and second the microscopic response worked out by Boltzmann in the 1870's. A final chapter considers the practical significance of the overall framework. Throughout, important material that is tangential to the logic is relegated to appendices. For the present purposes, less is more.

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