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## The Polymer Model in Early 20th Century Physics

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It is a well-established result in the history of science that the various disciplines are not isolated entities, but instead exchange knowledge in the form of mathematical structures, paradigmatic examples, analogies, and models. Consider, for example, the Lotka–Volterra model, which describes two competing animal species and represents one of the first uses of a mathematical structure to describe a biological phenomenon. Or take note of how the mathematical formalism developed by Dirac for Quantum Mechanics is now used in Information Retrieval to model the context of a sentence.

Given the importance of knowledge transfer between different disciplines—or even between different branches of the same discipline—we will examine the polymer model in early 20th-century physics, as it is within this model that the concept of entropic force emerged, a concept that has greatly influenced the idea of gravity as an “emergent” force. We will focus in particular on the evolution of the model’s ontological structure, as it is this very structure that first made possible the later application of statistical thermodynamics to the physical properties of rubber.

We will also show how the theoretical study of the model will occur when a large body of experimental data and technological research will require a deeper theoretical framework. The polymer model, therefore, is the outcome of a long process spanning at least seventy years, involving physics, chemistry, and technology, and culminating in the early 1950s with the definition of what a polymer is and what its physical characteristics are.

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