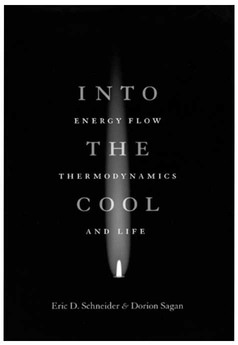
books

Emergent life

BY **ARTYOM MALKOV**



COURTESY OF UNIVERSITY OF CHICAGO PRESS

INTO THE COOL : ENERGY FLOW, THERMODYNAMICS, AND LIFE
by Eric D. Schneider and Dorion Sagan
University of Chicago Press (2005)
ISBN 0-226-73936-8

It's been argued that the second law of thermodynamics is one of the most fundamental principles of physics, and that any proper discussion of the origins of life must keep thermodynamics in mind. *Into the Cool: Energy Flow, Thermodynamics and Life* by Erc D. Schneider and Dorion Sagan looks into this issue. With certain parts more complex than others it ought to be a great read for those interested in science. It covers the energies that make the world go around and examines how physics affects every part of life, biologically and economically.

Into The Cool discusses planet formation, as well as weather patterns and what causes them, and numerous natural effects are deconstructed to create a fuller picture for the reader. One part that stands out is a comparison between human society and biological ecosystems. Species' populations in an ecosystem grow when the resources are abundant and shrink back to previous levels when damaged or when they've expanded beyond capacity. The authors argue we are the process of an analogous optimization, contributing our own share of energy (work) to the balance of the economy. When there is a shortage of a certain good or a service, we can be assured that it will be filled in very short time, ideally to optimize return on investment. On a more individual account, people can be predisposed to putting only as much energy into their actions as they deem needed.

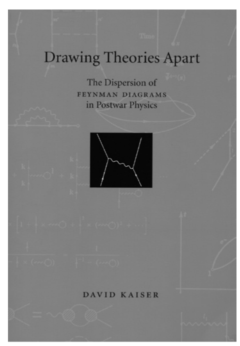
Into the Cool looks into many aspects of energy, from a perspective that often goes unnoticed in the environment around us. Its paradigm portrays society as an ever-growing organism, an ecosystem.

Another interesting aspect was a description of the processes of life, how life is organized chaos, yet we always try to make sense of it, clinging to comfort zones which simply may not exist in reality. *Into the Cool* presents situations that normally may seem completely unexpected as fully predictable, due to the structure that emerges from the underlying chaos.

Our reactions and the comfort that we get when we are in the zone that feels safe, our comfort zone, collides with the ever-progressing world around us that doesn't follow a set pattern, leading to isolation and confinement, often not literal but real nonetheless. The book will appeal to a wide audience, as it covers a number of seemingly unrelated subjects, and encompasses them in a clear and concise manner.

Scribble while we work

BY **RAPHAEL C. ROSEN**



COURTESY OF UNIVERSITY OF CHICAGO PRESS

DRAWING THEORIES APART: THE DISPERSION OF FEYNMAN DIAGRAMS IN POSTWAR PHYSICS
by David Kaiser
University of Chicago Press (2005)
ISBN 0-226-42267-4

In the 1950s, he authored one of the most elegant presentations of basic physics ever. In 1986, he discovered the cause of the Space Shuttle Challenger disaster. Yet, among the myriad of achievements for which physics Nobel laureate Richard Phillips Feynman (1918–1988) received so much praise, one of his greatest was nothing more than a scribble.

Known as Feynman diagrams, they were shunned at their 1948 debut. Feynman himself thought it would be humorous if his squiggles one day filled the *Physical Review.* He must be laughing from his grave now. His sketches are ubiquitous in physics today: in solid-state physics, in superconductivity, and in cosmology. David Kaiser, a professor of physics and the history of science at MIT, provides an easy-to-read, engaging, rigorous history of the diffusion that brought these particle doodles to omnipresence in *Drawing Theories Apart: The Dispersion of Feynman Diagrams in Postwar Physics*.

Drawing Theories Apart is principally the history of a tool. Since modern theorists live in a world awash in calculations, we can understand the day-to-day influences on a physicist's life by analyzing the devices they use for computations. Looking at the influence of material culture – tools – on science, Kaiser probes the very nature of how a physical theory is born.

As Feynman diagrams spread to various branches of physics, they took on different meanings. Feynman was a visual thinker: the diagrams represented the concrete world of quantum electrodynamics. By contrast, Freeman Dyson, Feynman diagrams' greatest emissary, conceived the diagrams as divorced from any physical meaning. As years accrued, Dyson's and Feynman's sketches began to look different. As a result, physicists reached divergent understandings as to what the diagrams meant. Moreover, the significance and purpose of Feynman diagrams differed internationally, with unique understandings in England, Japan, and the Soviet Union.

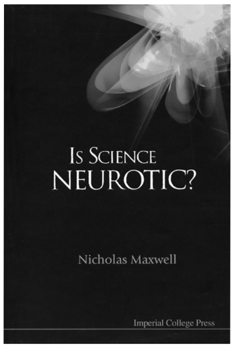
Physicists the world over rapidly recognized – above all – the pedagogical power of these diagrams. The sketches spread with celerity largely because they came into being in postwar America, a place where enrollments in graduate physics departments grew at nearly twice the rate of all other fields combined. Demand was high for instructional tools and Feynman diagrams proved especially adept for this purpose. Indeed, among the most important insights of *Drawing* is the centrality of personalized teaching in contemporary physics.

Nobel laureate Hans Bethe admitted that following physics' latest developments was "almost impossible without close personal contact with the men leading in the field."

Yet, despite its many insights into the nature of physics, *Drawing* leaves unanswered one of its foremost questions: how did this tool achieve its unchanging universality? How does something that is supposed to be open to constant innovation eventually become standardized? Feynman diagrams do not spring fully formed from Zeus's head; they are taught, adopted, disseminated. As Kaiser puts it, "theoretical physicists are not born, they are made." For anyone fascinated by why we envision the laws of nature the way we do, this is a rewarding read. By studying a scribble, Kaiser has scrutinized the furnace in which theoretical physicists are forged.

Crossing philosophy's divide

BY **SARAH SMELLIE**



COURTESY OF WORLD SCIENTIFIC PUBLISHING

IS SCIENCE NEUROTIC?
by Nicholas Maxwell
World Scientific Publishing (2005)
ISBN 1-86094-500-7

The lack of co-operation between science and the philosophy of science is generally taken for granted, as each discipline claims to have completely different aims. *Is Science Neurotic?*, by Nicholas Maxwell, Emeritus Reader in Philosophy of Science and Professor of Philosophy of Science, University College London, is a rare and refreshing text that convincingly argues for a new conception of scientific empiricism that demands a re-evaluation of what the two fields can contribute to one another and of what they, and all academia, can contribute to humanity.

Maxwell claims that, contrary to the "standard empiricist" view of science, which has persisted since the Enlightenment, scientific methodology uses metaphysical and value assumptions. Ultimately, he argues, science is a social endeavour that contributes to social life. Standard empiricism cannot account for this aspect of science, nor can it account for the true aims that science as a social endeavour pursues.

This misrepresentation of scientific methodology and its aims contributes to "scientific neurosis," a neurosis that is also embedded into the methodologies of the social sciences. The result is that these fields cannot be used for anything other than "knowledge-inquiry." This is contrary to "wisdom-inquiry," the original goal of academia as established during the Enlightenment: discovering how to use scientific methodology to create a better, more civilized society.

Maxwell proposes "aim-oriented empiricism," which evaluates not only empirical data but the metaphysical and value assumptions implicit in scientific methodology. He argues that aim-oriented empiricism will require a more intellectually rigorous and socially responsible approach to academia, as well as more co-operation amongst academic fields in their investigations.

Is Science Neurotic? is primarily a philosophy of science text, but it is clear that Maxwell is also appealing to scientists. The clear and concise style of the text's four main chapters make them accessible to anyone even vaguely familiar with philosophical writing and physics. Maxwell does a fair job of explaining the philosophical notions and arguments he has built on. The text includes a more technical appendix for those more familiar with common philosophy of science terminology and problems. The book does not start off well, and at times seems to slip into utopian daydreaming, but the reader should persevere, for it is quite inspiring to read a sound critique of the fragmented state of academia and an appeal to academia to promote and contribute to social change.

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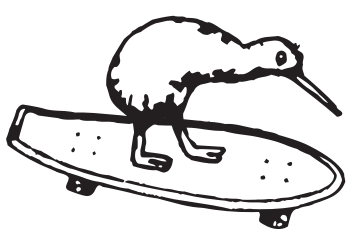

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