books

The peregrinations of a French philosopher

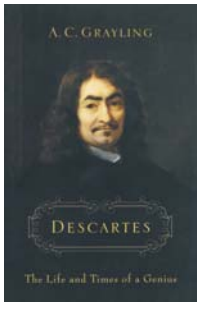
Descartes
The Life and Times of a Genius

A. C. Grayling
Walker, New York, 2006. $26.95 (303 pp.). ISBN 978-0-8027-1501-2

Reviewed by Roger Hahn

Anthony C. Grayling's *Descartes: The Life and Times of a Genius* is a lively new work that centers on the philosopher's life rather than his writings. Grayling, a professor of philosophy at Birkbeck College at the University of London, assumes correctly that his subject was a genius who needed no justification. Students everywhere take René Descartes (1596–1650) as the key thinker who ushered in the modern world of philosophy. What Grayling sets out to do is to offer the nonspecialist a biographical account that will reveal how intimately connected the French savant was to his times. Given Descartes' reputation as a thinker who craved solitude, writing a narrative about him is no obvious or simple task. The result, in Grayling's case, is both tantalizing and, ultimately, not fully successful.

In the first chapters, Grayling suggests, without ever fully demonstrating the point, that Descartes' peregrinations from France to the United Provinces (now the Netherlands), to Bohemia, and, later, to Italy were motivated by his activity as an intelligencer for the Hapsburg-allied Jesuits. The idea is plausible and novel, especially in light of the intrigues of western European politics in the age leading up to the religious Thirty Years' War (1618–48) that devastated much of central Europe. Taking readers by the hand, Grayling follows Descartes' movements and parallels them to the complex events surrounding attempts by Catholics to regain souls they had lost to the Reformation. He suggests that the philosopher's peripatetic wanderings are best understood if we posit him as a spy. It is a good story, yet with many missing parts. We never know for sure who sponsored Descartes, how much he was paid, or if and where he filed his findings. Moreover, the argument that Descartes gave allegiance to Hapsburg Jesuits rather than the French Jesuits who had trained him as a youth is unconvincing. There are also unexplained motivations involving Descartes' association with the Protestant army in Breda, the United Provinces, and his sudden shift to the Catholic side, which took him to Prague and to Ulm, Germany. The irony of Grayling's account is that it is about a thinker who searched for truth by basing his philosophy on clear and indubitable ideas, but readers are left with speculations about the philosopher that may or may not be true.



Nevertheless, the author's attempt to explain Descartes' wanderings by following local events of the era is fruitful because it reminds us that not even the most abstruse thinker is shielded from his times. Most of the recent biographical studies on Descartes focus on intellectual history, which Grayling takes for granted. He selectively relies on the much fuller, more detailed analyses of Geneviève Rodis-Lewis and Stephen Gaukroger, who both mastered the philosopher's thought. By paying attention to the political context, Grayling can better explain why Descartes toyed with the Rosicrucian movement before rejecting its tenets. Later in his life, Descartes corresponded with and dedicated *The Principles of Philosophy* to Princess Elizabeth of Bohemia, the daughter of Frederick V, who was the Protestant Elector Palatine. Readers would never fully comprehend Descartes' dedication if they didn't know that Descartes was a witness on the winning side at the 1620 Battle of White Mountain, in which Frederick V lost the Bohemian crown. The defeat pushed the princess into relative poverty and cut short her marital ambitions, and then turned her into a valuable philosophic correspondent to Descartes.

Descartes' natural philosophy seems unproblematic to Grayling, who offers a conventional, nontechnical account for the general reader. Sections of the book explaining Descartes' ambiguous stand on Copernicanism after the Catholic Church's condemnation of Galileo are well presented, but the arguments for and against the new philosophy are unspoken. Grayling gives no account of Descartes' discovery of the principle of inertia, even though it was a turning point of historical significance. He barely explains Descartes' adamant belief that space is completely filled with matter and is unlimited, nor does he comment usefully about Descartes' attitude toward experimentation, which would have saved the philosopher from making gross errors about the collision of hard bodies.

In short, *Descartes* will not enlighten physicists about their craft and how it came to be so central to the scientific revolution. Rather, Grayling's study will reveal with a vengeance how difficult the passage from medieval cosmology to modern science was in the 17th century. Timeworn beliefs needed to be supplanted while new ones had to be carved out in a bewildering context of continuous political and religious strife. In the end, Grayling has penned a fascinating story that leaves readers yearning for clearer and more distinct answers.

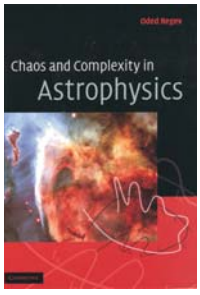
Roger Hahn is a professor of history at the University of California, Berkeley, and specializes in the history of science. He is the author of *Pierre Simon Laplace, 1749–1827: A Determined Scientist* (Harvard U. Press, 2005).

Chaos and Complexity in Astrophysics

Oded Regev
Cambridge U. Press, New York, 2006. $85.00 (455 pp.). ISBN 978-0-521-85534-1

Oded Regev's *Chaos and Complexity in Astrophysics* does an excellent job of

introducing nonspecialists to a wide range of topics in nonlinear dynamics. The first part of the book develops the subject in a methodical, step-by-step manner that is particularly well suited for graduate students. Regev, a professor of physics at Technion–Israel Institute of Technology, gives the essential details of such topics as bifurcation theory, strange attractors, fractals, and Hamiltonian systems in an easy-to-follow style that benefits greatly from the inclusion of representative examples.



In the spirit of a good introductory text, he omits unnecessary details and concentrates on the key points and important concepts, and he directs interested readers to the appropriate references for technical subtleties. Good demonstrations of his commendable approach are provided in discussions of nearly integrable systems and the Kolmogorov-Arnold-Moser theorem, fractal sets and dimensions, and patterns in spatially extended systems.

The second part covers astrophysical applications—and that is where the general topic, not the book itself, becomes somewhat problematic. The point is that, with the exception of a few isolated subfields, chaos theory actually has had a limited impact on most areas of astrophysical research. Such a state of affairs is, in fact, clearly reflected in the contents of Regev's book. Despite its title, almost two-thirds of *Chaos and Complexity in Astrophysics* is devoted to basic explanations of dynamical systems in general, if one includes the discussions of fluid dynamics and convection, and only one-third to concrete applications to astrophysics. The breakdown of the topics is not a consequence of astrophysicists being unaware of developments in nonlinear dynamics. Although Regev implicitly complains about astrophysicists resorting too quickly to brute-force computer simulations in situations in which insights might have been gained using a nonlinear-dynamics approach, reality is often more complex.

Many astrophysical systems are genuinely complicated; they involve numerous processes that operate on a huge range of physical and temporal scales. To pretend that those systems are governed by a simple, underlying mechanism described by a limited set of nonlinear equations is, in many cases, not only unproductive but also untrue. Thus problems such as large-scale structure formation or the dynamics of globular structures do require massive simulations. In those areas in which chaos theory has made significant contributions to astrophysics—for example, in the dynamics of the solar system, the theory of stellar pulsations, and the process of accretion onto compact objects—Regev's description is generally comprehensive and very clear. He justifiably excludes chaotic inflation, in spite of its name, because it has nothing to do with chaos theory. I was, however, slightly disappointed by his omission of the more recent developments in the theory of convection, particularly the extensive works of Juri Toomre, Nic Brummell, and their collaborators.

Despite the relatively minor role that chaos theory has played so far in astrophysics, *Chaos and Complexity in Astrophysics* provides an important service by filling a gap in the description of nonlinear dynamics in existing astrophysical literature. Any researcher interested in dynamical systems in general, and in such systems in astrophysics in particular, will likely find something interesting in Regev's book. And the fact that the text is essentially self-contained makes it attractive for graduate students to use.

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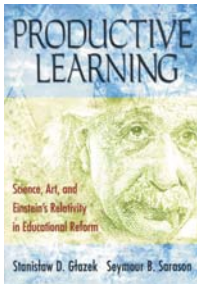
Productive Learning

Science, Art, and Einstein's Relativity in Educational Reform

Stanisław D. Głazek and Seymour B. Sarason
Corwin Press, Thousand Oaks, CA, 2007. $75.95, $35.95 paper (269 pp.). ISBN 978-1-4129-4059-7, ISBN 978-1-4129-4060-3 paper

Productive Learning: Science, Art, and Einstein's Relativity in Educational Reform is a collaboration between a physicist and a psychologist. Stanisław Głazek is a professor of physics at Warsaw University in Poland, and Seymour Sarason is a professor emeritus of psychology at Yale University. The premise is intriguing: Głazek teaches Sarason relativity while Sarason teaches Głazek about productive learning, and their shared educational journey is documented in a book. But such a text must naturally contain two very different voices. Successful ways that other authors have handled this potential problem are to either clearly identify who is speaking in a given section or hire a good editor to harmonize the distinct styles and generate a seamless flow. Unfortunately, Głazek and Sarason chose neither approach.



The first four chapters were probably written by Sarason, because they deal primarily with educational matters at pre-college levels. In later chapters that deal with the physics, the reader regularly bumps up against paragraphs that compare school-based learning to the way scientists make discoveries or that change the focus to issues related to learning and teaching. The effect on the reader is much like the effect on a dancer when the music suddenly stops for an announcement: It takes time to get the rhythm back. As a result, much of the book is hard to read. The authors could have made the reading less jerky by putting the comments related to education in a box, in a footnote, or at the beginning or end of a chapter. The comments interrupt the "storyline," a favorite term of the celebrated physicist and teacher Arnold Arons.

A peculiar aspect of Głazek and Sarason's book is that it seems to have been written in a theoretical vacuum. I am mystified that the authors make no reference to more than 30 years of systematic research in physics education. Thousands of papers have detailed the many conceptual and reasoning difficulties that students have had with a variety of physics principles, and teaching approaches for overcoming those difficulties. The authors also make no reference to the vast science-education and cognitive-science literature on conceptual change, constructivism, and various aspects of cognition. Equally surprising is the almost blanket condemnation of much of the US education system without reference to the numerous innovations in physics curricula or to the many successful education programs and initiatives for science teachers at all levels of the education system. The lack of contextualization of their work, combined with their harsh criticism of US education in general, gives the writing an air of arrogance.

Chapters 1 through 4 and the final chapter, 17, desperately need editing. They are excruciatingly ponderous, repetitive, and patronizing. Few new insights, entwined