



The Lazy Universe: An Introduction to the Principle of Least Action

By Jennifer Coopersmith

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This is a rare book on a rare topic: it is about 'action' and the Principle of Least Action. A surprisingly well-kept secret, these ideas are at the heart of physical science and engineering. Physics is well known as being concerned with grand conservatory principles (e.g. the conservation of energy) but equally important is the optimization principle (such as getting somewhere in the shortest time or with the least resistance). The book explains: why an optimization principle underlies physics, what action is, what 'the Hamiltonian' is, and how new insights into energy, space, and time arise. It assumes some background in the physical sciences, at the level of undergraduate science, but it is not a textbook. The requisite derivations and worked examples are given but may be skim-read if desired.

The author draws from Cornelius Lanczos's book "The Variational Principles of Mechanics" (1949 and 1970). Lanczos was a brilliant mathematician and educator, but his book was for a postgraduate audience. The present book is no mere copy with the difficult bits left out - it is original, and a popularization. It aims to explain ideas rather than achieve technical competence, and to show how Least Action leads into the whole of physics.

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Editorial Review

Review

"Inspired by the monumental work of Lanczos, Jennifer Coopersmith has constructed a beautiful exposition of the philosophical basis underlying classical mechanics. It has enough technical meat to be interesting to an expert, while remaining accessible to a novice." -- *Gerald Jay Sussman, Panasonic Professor of Electrical Engineering, Massachusetts Institute of Technology*

"This is a well written and comprehensible presentation of some of the most fascinating and fundamental principles which theoretical physics has uncovered. The author has done a great job in making accessible 'as if-laws' to a broader audience." --*Helmut Pulte, Ruhr University Bochum, Germany*

"This book has a general audience: every practicing physicist -- and a specific audience: every physics textbook writer. Envision and teach physics powerfully and directly with energy, action, and the Principle of Least Action." -- *Edwin F. Taylor, Senior Research Scientist Emeritus, Massachusetts Institute of Technology*

About the Author

Jennifer Coopersmith, *Honorary Research Associate, La Trobe University, Australia*

Jennifer Coopersmith took her PhD in nuclear physics from the University of London, and was later a research fellow at TRIUMF, University of British Columbia. She was for many years an associate lecturer for the Open University (London and Oxford), and was then a tutor on astrophysics courses at Swinburne University of Technology in Melbourne while based at La Trobe University in Bendigo, Victoria. She now lives in France.

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