



# The Butterfly in the Quantum World: The story of the most fascinating quantum fractal (Iop Concise Physics)

By Indubala I Satija

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*Butterfly in the Quantum World* by Indu Satija, with contributions by Douglas Hofstadter, is the first book ever to tell the story of the "Hofstadter butterfly", a beautiful and fascinating graph lying at the heart of the quantum theory of matter. The butterfly came out of a simple-sounding question: What happens if you immerse a crystal in a magnetic field? What energies can the electrons take on? From 1930 onwards, physicists struggled to answer this question, until 1974, when graduate student Douglas Hofstadter discovered that the answer was a graph consisting of nothing but copies of itself nested down infinitely many times. This wild mathematical object caught the physics world totally by surprise, and it continues to mesmerize physicists and mathematicians today.

The butterfly plot is intimately related to many other important phenomena in number theory and physics, including Apollonian gaskets, the Foucault pendulum, quasicrystals, the quantum Hall effect, and many more. Its story reflects the magic, the mystery, and the simplicity of the laws of nature, and Indu Satija, in a wonderfully personal style, relates this story, enriching it with a vast number of lively historical anecdotes, many photographs, beautiful visual images, and even poems, making her book a great feast, for the eyes, for the mind and for the soul.

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## **Editorial Review**

### **About the Author**

Born in Amritsar, India, Indu Satija grew up in Bombay. After graduating with a Masters degree in physics from Bombay University, she came to New York to get her doctorate in theoretical physics at Columbia University. Currently, she is a physics professor at George Mason University in Fairfax, Virginia. Her recent areas of research include topological insulators, Bose-Einstein condensates, and solitons. She has published numerous scientific articles; this, however, is her first book. Physics is Indu's first love, and the outdoors is her second. She lives in Potomac, a suburb of Washington, DC, with her husband Sushil, a physicist at the National Institute of Standards and Technology. Both Indu and Sushil are marathon runners, and they enjoy hiking and biking as well. They have two children: Rahul, who is a biologist, and Neena, who is an investigative reporter.

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