Understanding Geometry in Nature Bridges Mathematical and Physical Reality

Michel L. Lapidus

CURRENT RESEARCH

Exploring the mathematical and geometrical structures that underlie physics

Imagine someone playing a drum. Another person sits a few yards away and tries to guess the shape of the drum just by listening to its music. How can the drum's shape be identified in such a way? The drum has an intricate and wrinkled shape at all scales, which makes it a 'fractal' drum. Fractal geometry measures and defines rough shapes—in contrast to the smooth circle or square—that iterate in nature. Examples of fractal structures include clouds, lungs, trees, river beds, coastlines, mountain ranges, blood vessels, rainfall and many other natural objects. Dr. Michel Lapidus, Professor of Mathematics and cooperating faculty member in the departments of Physics and Astronomy and of Computer Science and Engineering at the University of California, Riverside, is a theory-builder who studies the mathematical and geometrical structures that underlie physics, as well as the complicated geometry that arises in nature. His highly-cited interdisciplinary work has a significant impact on various branches of mathematics and scientific disciplines, including physics, biology, chemistry, geology, engineering, scientific computing, and computer science.

Dr. Lapidus' novel theories—including his development of complex fractal dimensions—often serve as a motivation for physical experiments and numerical computations aimed at verifying certain physical phenomena. It provides "food for thought" to many mathematicians, physicists and other scientists, by proposing a large number of conjectures and open problems that shine new light on, and build new bridges between, previously unrelated areas of mathematics, physics, and other sciences. His long-term research program—which combines aspects of fractal geometry,...

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AFFILIATION

University of California, Riverside

EDUCATION

- Habilitation to Direct Research in Mathematics/Mathematical Physics, 1987,Universite Pierre et Marie Curie (Paris VI), France
- Doctorat d'Etat es Sciences in Mathematics/Mathematical Physics, 1986,Universite Pierre et Marie Curie (Paris VI), France
- Ph.D. in Mathematics/Mathematical Physics, 1980,Universite Pierre et Marie Curie (Paris VI), France
- Diploma for Advanced Study in Mathematics/Mathematical Physics, 1978,Universite Pierre et Marie Curie (Paris VI), France
- M.S. in Mathematics,1977,Universite Pierre et Marie Curie (Paris VI), France

AWARDS

- M.G. Michael Award for Excellence in Science, 1989
- Creative Research Medal, 1989
- US National Science Foundation (NSF), 1987-present
- Fellow of the American Association for the Advancement of Science (AAAS), 2000
- Anassilaos International Research Prize in Mathematics, 2011
- and 6 more...

RESEARCH AREAS

Technology, Computational Sciences / Mathematics, Informational Sciences / Internet, Materials Science / Physics

FUNDING REQUEST

Your contributions will help fund Dr. Lapidus' continued research in understanding fractal geometry underlying physics, and its vast connections to mathematics and science. Costs include $100K-$150K/per year to support his research program for an expected five years. Your funds support students and postdocs, support personnel, publications, equipment, travel, equipment, and research workshops. Play a role in developing important mathematical theories that have wide implications; fund Dr. Lapidus.