Laudatio

For his many original and outstanding contributions to the field of
nonlinear physics in periodic, quasiperiodic
and random structures

DR. SERGE AUBRY

has been awarded the
Martin-Gutzwiller-Fellowship 2009/2010
of the Max Planck Institute for the Physics of Complex Systems.

Serge Aubry is an internationally recognized authority in the complex dynamics of classical and quantum systems with many interacting degrees of freedom. His contributions cover a remarkably broad spectrum ranging from nonlinear waves to quantum many body excitations.

Starting already at the time of his doctoral studies with Pierre-Gilles de Gennes, Serge Aubry set exacting standards in scientific work and has practiced a unique and independent style of brilliant, deep, and innovative research. He is a highly creative and inspiring physicist, who has made deep contributions to nonlinear phenomena in solid-state physics, dynamical systems theory and biological physics. His approach combines attention to experimental results, deep physical insight, formulation of key problems, incisive numerical simulation, innovative use of mathematics, unconventional interpretations and imaginative predictions.

It is a reflection of the high quality of his work across a broad range of topics that opinions on what is his most important work differ widely. Indeed, his seminal papers are so numerous that even listing them all takes significant effort. For instance, in his studies of ferroelectrics, his work was central in introducing solitons to condensed matter physics. His awe-inspiring mathematical talents were perhaps exhibited most strikingly in his studies of the ground states of the Frenkel-Kontorova models, where he introduced the concept of ‘breaking of analyticity’ in his analysis of incommensurate structures. He then transposed this work to a seemingly unrelated field, Hamiltonian dynamics, via a correspondence of the former problem to one of area-preserving maps.

He has also done ground breaking work on the physics of localization. For instance, he has shown that Anderson localization can also occur in strong quasiperiodic potentials, a topic of renewed relevance in the light of recent experimental progress involving cold atoms.

In a separate strand of work, on nonlinear lattices, he demonstrated the existence of time-periodic and spatially localized ‘discrete breathers’.

Indeed, Serge Aubry is currently actively working on the properties of nonlinar wave propagation in disordered media. We have little doubt that Serge's contributions will decisively shape future developments in this field as well.