WPI

HAROLD J GAY
LECTURE SERIES

PDEs and Fractals
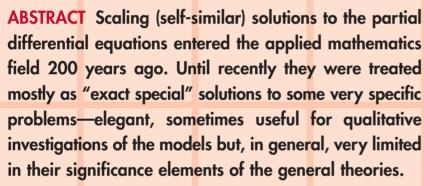
Grigory Isaakovich Barenblatt

Professor in Residence, Department of Mathematics
University of California at Berkeley

Scaling, Self-similarity, and the Renormalization Group in Partial Differential Equations
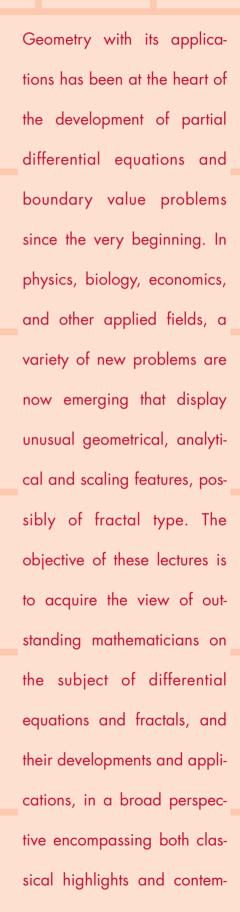
Friday, 3:30 pm
September 28, 2007
Bartlett Center   (Refreshments at 3:00 in Stratton Hll 107)

ABSTRACT Scaling (self-similar) solutions to the partial differential equations entered the applied mathematics field 200 years ago. Until recently they were treated mostly as "exact special" solutions to some very specific problems—elegant, sometimes useful for qualitative investigations of the models but, in general, very limited in their significance elements of the general theories.
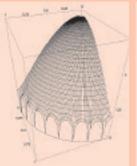
Gradually it was recognized that the value of these solutions is much more significant: they are the intermediate asymptotics to the solutions to wider classes of problems when the influence of the details of the initial and/or boundary conditions already disappeared, but the solution is still far from its ultimate form. The appearance of computers did not reduce but increase the value of the scaling solutions.

In some cases (in fact, such cases are rather rare) the scaling solutions can be obtained using the dimensional analysis. However, as a rule this is not the case: scaling solutions appear due to the invariance of the problem to an additional group (note group, not semigroup), which we identify as the renormalization group.

A survey of these topics will be presented in this lecture; illustrative examples will be used.

Geometry with its applications has been at the heart of the development of partial differential equations and boundary value problems since the very beginning. In physics, biology, economics, and other applied fields, a variety of new problems are now emerging that display unusual geometrical, analytical and scaling features, possibly of fractal type. The objective of these lectures is to acquire the view of outstanding mathematicians on the subject of differential equations and fractals, and their developments and applications, in a broad perspective encompassing both classical highlights and contemporary trends.

Sponsored by WPI and hosted by the Department of Mathematics
Coffee and tea available one half hour before lecture time
Participation of faculty and students is most welcome
www.wpi.edu/+Math/News/lectureseries.html