



THE FIELDS INSTITUTE

DISTINGUISHED LECTURE SERIES

JOHN MALLET-PARET

BROWN UNIVERSITY

MAY 4 & 5, 2015 • THE FIELDS INSTITUTE, ROOM 230

GENERALIZED LECTURE: MAY 4, 3:30 P.M.

*Recent Advances in Delay Equations*

In this talk we survey some aspects of delay-differential equations. The historical roots of the subject date from the early twentieth century. At that time much of the focus was on linear equations arising in applications in science and engineering, and the methods were often formal and ad hoc. Beginning in the 1960's more attention was paid to nonlinear systems, and a firm theoretical foundation based on infinite-dimensional dynamical systems was established. What has emerged since then is a body of theory with a rich mathematical structure that draws from numerous areas, including dynamics, functional analysis, and topology, and which retains close ties with applications. We shall discuss various recent results and ongoing research in delay equations, and we shall also mention some open problems in the field.

SPECIALIZED LECTURE: MAY 5, 9:00 A.M.

*$C^\infty$  (but not Analytic) Solutions of "Analytic" Functional Differential Equations*

While delay equations with variable delays may have a superficial appearance of analyticity, it is far from clear in general that a global bounded solution  $x(t)$  (i.e., a bounded solution defined for all time  $t$ ) is an analytic function of  $t$ ; and indeed, very often such solutions are not analytic. In this talk we describe theorems which give sufficient conditions both for analyticity and for non-analyticity (but  $C^\infty$  smoothness) of such solutions. In fact these conditions may occur simultaneously for the same solution, but in different regions of its domain, and so the solution exhibits co-existence of analyticity and non-analyticity. In fact, we show it can happen that the set of non-analytic points  $t$  of a solution  $x(t)$  can be a generalized Cantor set.



**John Mallet-Paret** is currently the George I. Chase Professor of the Physical Sciences in the Division of Applied Mathematics at Brown University. He is also the current director of the Lefschetz Center for Dynamical Systems in that department. He received his B.Sc. in mathematics from the University of Alberta in 1971 and his Ph.D. in mathematics from the University of Minnesota in 1974, and he has been at Brown since then.

His scientific work is primarily in the theoretical aspects of dynamical systems, and particularly in the dynamics of differential equations. This entails a blend of analysis (of specific differential equations, often connected to applications) together with dynamical systems theory, with sometimes a bit of topology. Of particular interest is the theory of delay-differential equations, a subject which has been of increasing significance both mathematically and scientifically in recent years.

Professor Mallet-Paret has served on the editorial boards of various mathematical publications, including the *Transactions of the American Mathematical Society*, the *Canadian Applied Mathematics Quarterly*, and the *Journal of Dynamics and Differential Equations*. He is currently a Co-Editor-in-Chief of the *Journal of Differential Equations*.

For more information, please visit:

<http://www.fields.utoronto.ca/programs/scientific/14-15/DDE/DLS>



THE FIELDS INSTITUTE FOR RESEARCH IN MATHEMATICAL SCIENCES

222 College Street, Second Floor, Toronto, Ontario, M5T 3J1 • [www.fields.utoronto.ca](http://www.fields.utoronto.ca) • 416-348-9710