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Seminar Presented by

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Heat and Wave Equations Revisited: Beyond Fourier and'Alembert

Abstract:

Two of the most important PDEs, appearing in a plethora of important applications in sciences and engineering, are the heat and the wave equations. The former led Fourier to introduce the celebrated Fourier series, whereas the later is associated with the famous solution of d'Alembert. However, it turns out that PDEs containing a third order spatial derivative (like the Stoke's equation) cannot be solved by a series expansion, and the d'Alembert solution is applicable only to the initial value problem of the wave equation. In this talk it will be shown that the unified transform, also known as the Fokas method (https://urldefense.com/v3/__https://en.wikipedia.org/wiki/Fokas_method__;!!LIr3w8kk_Xxm!_fJn3x2rgXSXVND6wx3mEKDi215hCJkk-O4WvAeCJuL3E9BOnTPe4k_dWMEgDA$) bypasses these limitations.

Furthermore, even for the classical problem of the heat equation on an interval, the unified transform yields a new formula which has several analytical and numerical advantages with respect to Fourier's classical solution.

Bio:

Prof. Thanasis Fokas has a BSc in Aeronautics from Imperial College (1975), a PhD in Applied Mathematics from the California Institute of Technology (1979), and an MD from the University of Miami (1986). In 1996 he was appointed to a Chair in Applied Mathematics at Imperial College and in 2002 he was appointed to the newly inaugurated Chair in Nonlinear Mathematical Science at the University of Cambridge. Since 2015 he is an Adjunct Professor at the departments of Civil and Environmental Engineering, and of Biomedical Engineering at the University of Southern California, USA. In 2000,on the occasion of the millennium, he was awarded the Naylor Prize, which is the most prestigious prize in Applied Mathematics and Theoretical Physics in UK (the last recipient before Fokas was Stephen Hawking). Other distinctions include, the Aristeion Prize in Sciences of the Academy of Athens, the Excellence Prize of the Bodossaki Foundation, and a Guggenheim Fellowship. He is a member of various Academies and prestigious Institutions, including a full membership of the Academy of Athens (he is the first ever Applied Mathematician to be elected), a membership of the European Academy of Sciences, a Fellowship at Clare Hall, Cambridge, a membership of the Academy of Sciences and Arts, and a Fellowship of the American Institute for Medical and Biological Engineering. He was appointed Ambassador of Hellenism in 2010 and an Onassis Senior Visiting Scholar at the University of Harvard in 2012. He has been awarded honorary degrees from eight universities and has been decorated with the Commander of the Order of Phoenix by the President of the Hellenic Republic. He is the author or co-author of five monographs and nearly 400 papers, as well as the co-editor of eight books. He has been included in the list of the most highly cited researchers in the ISI Web of sciences. He has published in different areas of science, ranging from classical areas of mathematics such as the introduction of a new approach to the celebrated Lindelöf's hypothesis, to applied areas such as models of chronic myelogenous leukaemia, protein folding, and mathematical models for Covid-19,to areas in the general theory of relativity. He has introduced the transformative 'Fokas method' for solving partial differential equations and has played a pivotal role in the solution of several mathematical problems arising in medical imaging.