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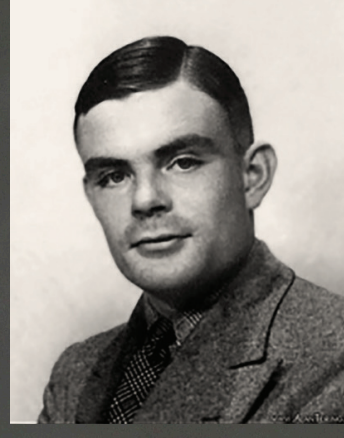
ALAN TURING LECTURES

The Alan Turing Lecture Series is a new initiative of ICTS. In this series, eminent Biologists, Computer Scientists, and Engineers are invited to deliver lectures on significant developments in their areas. The first lecture in this series is aimed at a general scientific audience, while the remaining two pedagogical lectures are aimed at specialists.



FRANK JÜLICHER

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Frank Jülicher studied Physics at the University of Stuttgart and RWTH Aachen University. He did his PhD work at the Institute for Solid State Research at the Research Center Jülich and received his PhD in 1994 from the University of Cologne. His postdoctoral work at the Simon Fraser University in Vancouver and the Institut Curie and ESPCI in Paris was followed by a CNRS research position at the Institut Curie in Paris in 1998. Since 2002, he is a Director at the Max Planck Institute for the Physics of Complex Systems in Dresden and a professor of biophysics at the Technical University of Dresden. His research interests are theoretical approaches to active matter and the spatiotemporal organization of cells and tissues.

ACTIVE PROCESSES IN CELLS AND TISSUES

Living matter is highly dynamic and organizes in complex patterns and spatial structures. Fundamental questions of biology are to understand how spatial patterns and morphologies emerge at the scale of cells and at larger scales in multicellular systems. Living systems are driven far from thermodynamic equilibrium by a constant flux of energy via metabolic processes. This activity is at the core of the extraordinary dynamics and the ability of cells and tissues to organize in space and time. At the cell scale, the breaking of symmetries is a key element that underlies the spatial organization of cellular processes. Examples for cell symmetry breaking are cell polarity and cell chirality, which play an important role during the formation of complex organisms. Cell symmetry breaking is often mediated by active dynamical processes. I will discuss fluid flows generated by active processes that provide a key mechanism for cellular symmetry breaking. Such symmetry breaking plays a role in the establishment of the mainbody axes as well as the left-right asymmetry of developing organisms. Going to larger scales, I will discuss the collective organization of many cells during morphogenesis. Morphogenesis often involves the dynamic remodeling of tissues by active cellular processes that involve cell rearrangements, cell divisions and cell flows. These examples show that cells and tissues are a form of active matter that exhibits original and unconventional dynamics and material properties that play an important role in biological morphogenesis.

LECTURE 1: **4 PM, DECEMBER 9**
LECTURE 2: **4 PM, DECEMBER 10**
LECTURE 3: **4 PM, DECEMBER 11**
LECTURE 4: **4 PM, DECEMBER 12**

9-12 DECEMBER 2019
RAMANUJAN HALL, ICTS, BENGALURU

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