



Wednesday
February 27, 2019
3:30 pm
Room 1005 EECS

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Electric Breakdown in Thunderstorms and Plasma Technology – Chances and Puzzles

Electric breakdown of gases occurs in thunderstorms and in a wide range of applications in plasma and high voltage technologies. Fields such as plasma processing, plasma medicine and plasma assisted combustion are rapidly progressing due to new sources, diagnostics and modeling techniques. Meanwhile, our understanding of lightning physics is challenged by transient luminous events (elves, halos, sprites, jets and gigantic jets) above thunderstorms, and by high energy processes related to active thunderstorms such as terrestrial gamma-ray flashes and signatures of nuclear reactions in our atmosphere. I will explain the common ground of these natural and technical phenomena, and discuss discharge formation, from inception through the streamer discharge evolution to leaders and sparks. Key features of these dynamics are the extreme tails of the electron energy distribution in certain discharge stages, up to electron runaway from eV energies to tens of MeV in thunderstorms.

About the Speaker: Ute Ebert studied physics at the University of Heidelberg, Germany, and at the Hebrew University in Jerusalem, Israel, and she defended her PhD on the renormalization group analysis of long polymer chains at the University of Essen, Germany, in 1994. As a postdoc at the University of Leiden, The Netherlands, she switched to nonlinear dynamics and pattern formation, in particular, in application to streamer ionization fronts. In 1998 she gained a staff position at the Netherlands' national research Centre for Mathematics and Computer Science (CWI) in Amsterdam. Since 2002, she leads the research group "Multiscale Dynamics" at CWI, and she is a full professor of physics at Eindhoven University of Technology (TU/e). In this double role, she has built up a wide collaboration network with numerous projects together with plasma physics, high voltage engineering and mechanical engineering at TU/e, with physicists at the Dutch radio telescope LOFAR and with a European and international network for thunderstorm observations from space (in particular, through the ASIM mission) and from the ground.

