UCLA

Plasma Physics Seminar

Monday, March 16, 2020
1:00PM

Confining Plasmas at Arbitrary Collisionalities and Arbitrary Geometries

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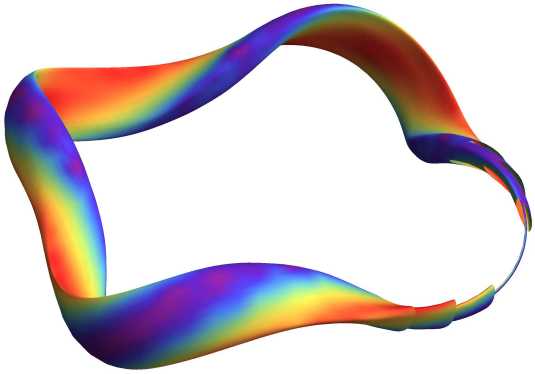

In recent years, the improvement of physics models and the advancements in computer capabilities paved the way for extraordinary progress in the theoretical modeling of plasmas. However, the understanding and control of plasma density and heat diffusion is still regarded as an outstanding open issue in magnetic fusion. In the first part of the talk, I will describe how a novel approach is being used to carry out kinetic calculations involving the full Coulomb collision operator at the levels of collisionality relevant for present and future fusion devices.

The first results obtained using this approach already show the importance of retaining an exact operator as opposed to widely used simplified operators, with important consequences for the basic understanding of plasma phenomena that occur not only in fusion plasmas, but also in laser-plasma interactions and, in general, all collisional plasma systems. In the second part of the talk, I will show how the freedom associated with the geometry of the magnetic field might be enough to mitigate some of the problems related with stability and transport of fusion plasmas. In particular, I will focus on an unusual symmetry of the magnetic field called quasisymmetry that is being used to design future fusion and magnetic trap experiments for basic physics studies.

Dr. Rogerio Jorge is a postdoctoral associate at the University of Maryland and is a member of the Simons Collaboration on Hidden Symmetries and Fusion Energy. During his PhD work at EPFL, Switzerland, and IST, Portugal, he focused on the development of hybrid kinetic-fluid models able to describe plasma dynamics at arbitrary collisionalities. For his work, he obtained the EPFL Physics Doctoral Thesis Award and the 2020 EPS-PPD PhD Research Award. Currently, he is working on the development of optimization tools for the construction of three-dimensional magnetic field equilibria.