Contribution ID: **564** Type: **Oral**

Perspectives on Research in Computational Plasma Physics with Diverse Applications to Experiments

Friday 28 June 2019 08:30 (1 hour)

Computational plasma physics was born some fifty years ago with the development of high-speed computers. Computer simulation is well suited to the challenging nature of fundamental and applied plasma science. Plasma physics exhibits enormous ranges of time and space scales, and the underlying mathematical framework comprised of nonlinear partial differential equations and nonlinear kinetic equations does not generally admit analytic solution except in much simplified conditions. Computational plasma physics has advanced from relatively simple calculations with limited dimensionality and scope to sophisticated and comprehensive simulation models. Moreover, computational plasma physics has matured as a significant scientific discipline with a rigorous mathematical foundation and voluminous literature. While computational plasma physics has greatly benefitted from the growth in computing capability by many orders of magnitude, contributions from innovation in methods and algorithms have been no less important.

This talk presents a personal perspective on the development and application of computational plasma physics to plasmas in nature and the laboratory. The examples described are based on experience over the course of a career in computational plasma physics and illustrate fundamental plasma phenomena and the behavior of natural and laboratory plasmas. Some of the example include simulations of microinstabilities in magnetic mirror, tokamak, and spheromak plasmas, laser-plasma interactions, and Knudsen-layer phenomena affecting fusion performance. The examples will illustrate the development of appropriate models and algorithms that were well suited to simulating the phenomena of interest efficiently. A particular interest has been the development of multiple time-scale algorithms.

I am very grateful to Professor C. K. Birdsall who provided me with my initial exposure to kinetic simulation of plasmas, supported and encouraged my career, and was an enthusiastic research collaborator and friend.

*This work was performed under the auspices of the U. S. DOE by the Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

Author: Dr COHEN, Bruce (Lawrence Livermore National Laboratory)

Presenter: Dr COHEN, Bruce (Lawrence Livermore National Laboratory)

Session Classification: Plenary Fri - Bruce Cohen (2018 Charles K. Birdsall Award)

Track Classification: Plenary Talk