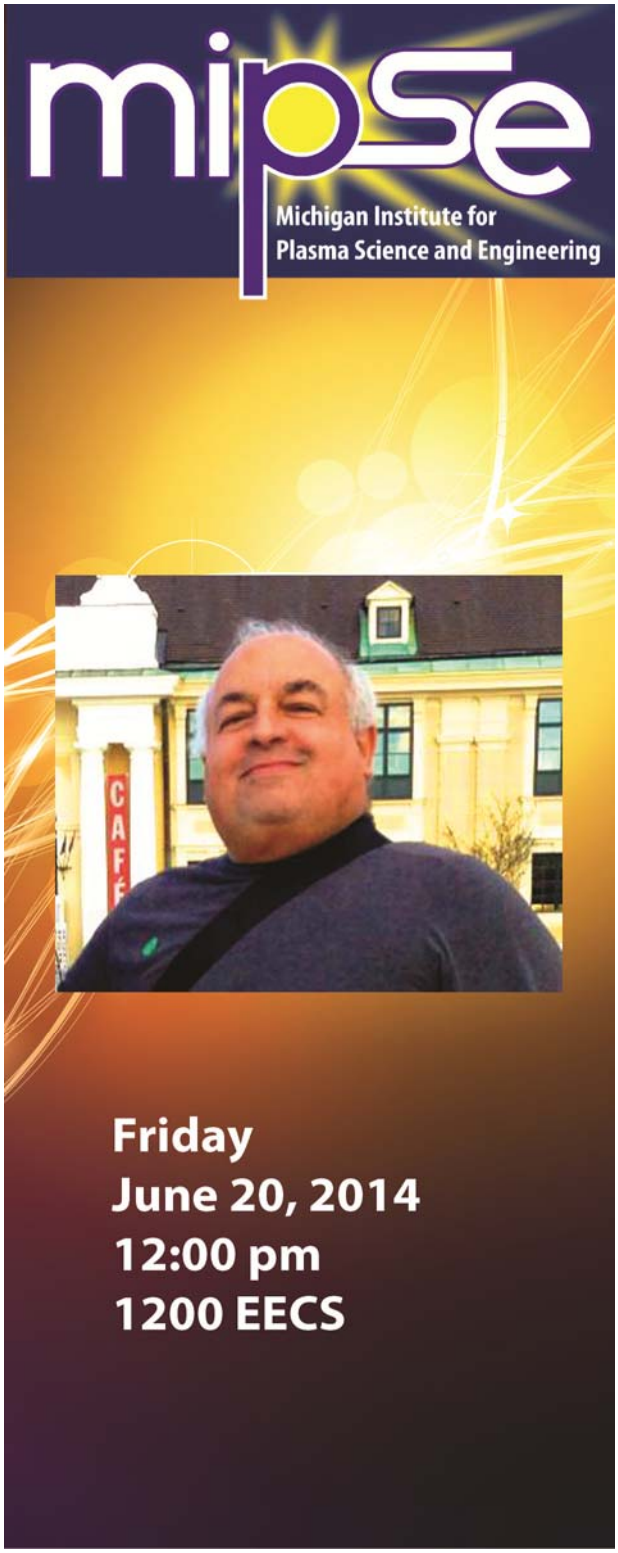


# Dr. Bedros Afeyan

**Polymath Research, Pleasanton, CA**

## Nonlinear, Nonstationary, Self-Organized Asymptotic States in High Energy Density Plasmas

In this seminar, we will explore nonlinear kinetic states of self-organization in Vlasov plasmas and examine their wave-particle interaction dynamics. Stationary BGK modes, linear Landau damping, quasilinear theory or chaotic particle dynamics in the presence of prescribed fields are paradigms that are made less relevant by the existence of these self-organized, non-stationary, highly robust, bootstrapped states. An example is KEEN waves, kinetic electrostatic electron nonlinear waves which exist in the spectral gap of traditional (infinitesimal amplitude based) plasma theory. We will show how KEEN waves may be excited, how they reorganize themselves into finite and few partitions in phase space, how coherent self-consistent (electric) fields are maintained despite chaotic, trapping, unwrapping and subsequent retrapping oscillations in a significant ring layer around the deeply trapped particle partitions. These novelties do not allow stationary descriptions in any frame of reference. However, the maintenance of coherent long lived field structures are shown not to depend on local trapping fractions but only on global ones. We will also show how KEEN waves resonantly interact with electron plasma waves in Vlasov-Poisson and Vlasov-Maxwell simulations. In the latter case, Stimulated Raman Scattering, SRS, coexists and interacts with stimulated KEEN wave scattering, SKEENS.

**About the Speaker:** Dr. Bedros Afeyan received his MS and PhD from the University of Rochester in Theoretical Plasma Physics. He has since worked at the University of Maryland at College Park and at Lawrence Livermore national Laboratory and UC Davis-Livermore before forming Polymath Associates and then Polymath Research, Inc. 15 years ago. His work is focused on the Nonlinear Optics of Plasmas, Statistical methods, kinetic theory, wavelets and multi-resolution analysis, photonics, Wigner optics, and laser fusion research. He has been involved in theory, simulations and experiments on high energy density plasmas for the past 34 years collaborating with scientists and teams from various institutions, most notably LANL, LLNL, SNL, LLE, NRL and SLAC. He especially likes the arena where coherent lasers meet incoherent or unruly plasmas leading to self-organization and controlled dressed collective states.