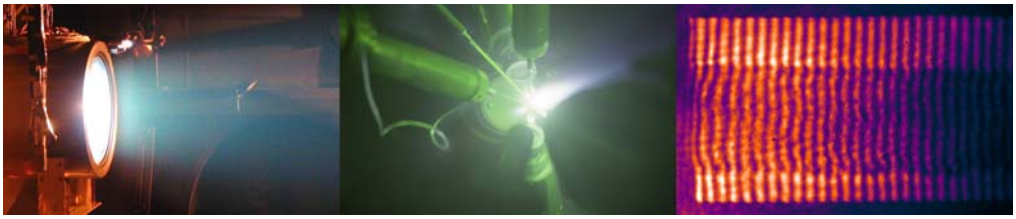
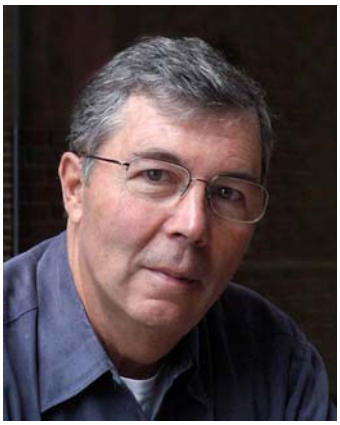


Michigan Institute for Plasma Science and Engineering Seminar

EXPLOSIVE NUCLEOSYNTHESIS STUDIED IN THE LABORATORY



Prof. Frederick Becchetti
University of Michigan

Friday, 22 January 2010 - 4:00 pm
White Auditorium – Cooley Building

Joint Seminar - Dept. Nucl. Engr. & Radiol. Sci.
(Refreshments will be served before the seminar.)

Abstract

The synthesis of elements in the Big Bang and, in particular, the synthesis of heavy elements in stars and supernovae involve many nuclear reactions taking place on short time scales (e.g., < 1 sec). Yet, until recently, the study of such reactions has been limited to those involving long-lived stable nuclear beams. In this talk, I will describe some of the methods recently developed and used to produce short-lived, radioactive nuclear beams, including excited isomeric beams, and the type of nuclear reactions that can now be studied in the laboratory. Study of the latter is providing new insights into the "dark matter" problem - the fact that the majority of gravitational matter in the Universe is not nuclear in origin. This also allows us to study the nuclear equation of state for very neutron-rich and proton-rich systems, the extreme example being neutron stars. A new generation of "exotic beam" facilities is now being constructed, including the Department of Energy funded Facility for Rare-Isotope Beams (FRIB) at Michigan State University, and the National Ignition Facility (NIF) at Lawrence Livermore National Lab. The unique capabilities of these and other new facilities, and the challenges they pose for development of new plasma ion sources and nuclear detectors, will be described, along with potential applications in materials sciences and medical research.

About the Speaker: Dr. Fred Becchetti is a Professor in the Dept. of Physics at the University of Michigan. His BS, MS and PhD degrees in Physics are from the University of Minnesota. He was an NSF Fellow at the Niels Bohr Institute in Copenhagen and a post-doctoral fellow at Lawrence Berkeley Laboratory before joining the faculty at UM in 1973. His research focuses on short-lived nuclear beams; heavy ion collisions; nuclear instrumentation; radiation oncology and nuclear medicine. Prof. Becchetti is a Fellow of the American Physical Society.