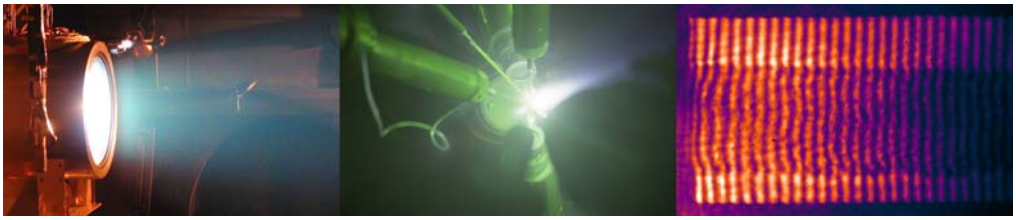

Michigan Institute for Plasma Science and Engineering Seminar

Plasma Medicine: Mechanisms of Direct Non-Thermal Plasma Interaction with Living Tissue

Prof. Alexander Fridman

Drexel University.

Thursday, 29 Oct. 2009 - 4:00 pm, Room 1005 EECS.
(Refreshments will be served after seminar.)

Abstract

This talk will focus on the achievements of the Drexel Plasma Institute in direct application of plasmas in medicine and on understanding the physical, chemical and biological mechanisms of the direct non-thermal plasma interaction with living tissue. Engineering research has resulted in many advances in healthcare. Ionizing radiation and lasers are examples of technological breakthroughs that created new diagnostics and treatments for disease. Similarly, non-thermal plasma based medical technologies will also have important therapeutic effects and result in new medical diagnostic tools. Some of these include deactivating pathogens, stopping bleeding without damaging healthy tissue, promoting wound healing and treating cancer. Recent advances in controlled non-thermal plasma systems together with discoveries of intense, but non-damaging, direct treatment of living tissues with non-thermal plasmas in open air, have enabled formation of a revolutionary new branch of engineering medicine – Plasma Medicine. The success of Plasma Medicine will depend on a deeper fundamental understanding of the physics, chemistry and biology of plasma/living tissue interaction as well as the development of plasma based medical instruments.

The use of plasmas in medicine has precedents. Thermal plasmas are used for cauterization, tissue ablation and tissue cutting where living tissue is destroyed by the plasma's heat. Non-thermal plasmas have greater flexibility and can produce more subtle non-lethal effects permitting substantial selectivity in its treatment of different types of living organisms, cells and tissues and of sterilizing temperature sensitive medical instruments and implants. Non-thermal plasmas offer these capabilities by catalyzing specific biochemical activity in living tissues and organisms. This activity can be adjusted by tuning plasma properties including the amount and identify of radicals, electronically excited molecules and atoms, charges and UV radiation. The talk will cover optimal discharge configurations and the non-thermal plasma regimes which are effective in healing but non-damaging healthy tissue, especially on the DNA level.

About the Speaker:

Alexander Fridman, is the Nyheim Chair Professor and director of the Drexel Plasma Institute at Drexel University. During his 37 year career in plasma science, he has worked and taught in the USA, Russia and France, authored 6 books and over 500 journal publications, and advised more than 20 Ph.D. students. He has received many awards, including the Kaplan Distinguished Professorship, Soros Distinguished Professorship, DuPont Award for Outstanding Achievements in Chemistry, Chernobyl Award, Kurchatov Gold Medal for Life Achievements in Science and Technology, and the USSR State Prize (with Nobel Prize laureate N.G. Basov). Dr. Fridman co-founded the field of Plasma Medicine and is President of the Intl. Society for Plasma Medicine.