

THE ROLE OF PHYSICS IN MEDICINE AND MEDICAL EDUCATION

Creating a New Generation of Practicing Physicians and Biomedical Researchers

Concept, Rationale, Objectives and Curricular Deliverables

Presented by

Edward P. Szuszcwicz. PhD

*Founder and Director – Claude Moore Programs on Physics in Medicine
Center for Applied Proteomics and Molecular Medicine
School of Systems Biology - George Mason University*

Abstract

The Physics in Medicine program, supported by the Claude Moore Charitable Foundation, is a response to the ever-growing concern about the content in medical education and the need for reform throughout the entire academic spectrum from the undergraduate level onto and through programs of Continuing Medical Education. With diagnostic errors resulting in extraordinarily high numbers of deaths and life-altering disabilities per year, studies are unanimous in pointing to a compelling need for more training in the basic sciences, with connections to clinical work and an emphasis on scientific inquiry and discovery, not past traditions and algorithmic practices. The program's focus is on physics as the foundational science of all life sciences, and the development of essential transdisciplinary and integrative approaches to clinical practice. It is designed to expand the skills and influence the mindset of our doctors at the earliest stages of their careers to think more innovatively and creatively, to relentlessly question the validity of what they think they know or what data tend to suggest. The program brings together a consortium of academicians, basic and applied researchers, clinicians, and health-care executives from within the medical and physics communities in a team effort to help establish a first-order cause-effect understanding of human physiological processes from cells, to tissues, to organs, and ultimately to whole-human systems. The effort and its curricular deliverables are designed to bridge the ever-widening gap between how physicians are being trained and their abilities to understand, with clinical relevance, the coupling between principles of physics and human system controls, as in, for example, cardiology, the multi-domain functionality of the brain, and the metastatic properties of cancer. The program's ultimate goal is a first-order understanding of the foundational principles of physics that underlie a cause-effect analysis of all maladies, regardless of medical discipline, with major advances in diagnostic accuracy and more effective and expedient treatments and cures.

BIOSKETCH

Edward P. Szuszcwicz, PhD

**Founder and Director – Claude Moore Programs on Physics in Medicine
Center for Applied Proteomics and Molecular Medicine – George Mason University**

OVERVIEW. Dr. Szuszcwicz is a widely-published experimental physicist, interdisciplinary technologist, leader, teacher and corporate executive with credentials in basic and applied research, technology transfer, and program development at national and international levels

UNIVERSITY, ACADEMIC, AND RESEARCH INSTITUTE EXPERIENCE. He was a Resident Guest Scientist at UCLA, a Humboldt Fellow at the University of Wuerzburg (Germany), a National Academy of Sciences Research Fellow at the NASA Goddard Spaceflight Center, and is an Affiliate Professor at George Mason University (VA). He has teaching experience at graduate and undergraduate levels, and medical-education and medical-device program development experience focused on the driving forces of physics in medicine and medical technologies, promoting innovations in treatment and care. He conceived and developed the Physics in Medicine Program that he now directs within GMU's Center for Applied Proteomics and Molecular Medicine. He has published extensively with university collaborators, and has organized and directed distributed teams of scientists in cross-disciplinary R&D programs.

INDUSTRY EXPERIENCE. Dr. Szuszcwicz has more than 30 years of increasingly responsible activities in scientific leadership, R&D management, business development and technology transfer. His professional positions grew from research scientist, through Branch and Division Manager, to Executive Vice President, then to Chief Technology Officer and Business Owner. His overall expertise is in basic and applied research as a leader, organizer, manager and principal investigator in major government-funded programs. His areas of expertise include experimental plasma physics, sensor design, test and applications, space sciences and spaceborne investigations, laboratory simulations, oil & gas technologies, medical physics, and information systems.

INTERNATIONAL EXPERIENCE. As a research physicist and corporate executive he lived and worked in Germany and Venezuela; organized and led: (a) A global science and technology transfer program for Venezuela's state-owned oil & gas company (PDVSA); (b) The development of a collaborative R&D venture between a leading EU plasma research institute and a premier U.S. plasma fusion laboratory; and (c) A 16-country space-weather science team.