DIPARTIMENTO DI INGEGNERIA CIVILE E AMBIENTALE

POLITECNICO
MILANO 1863

SEMINAR ANNOUNCEMENT

Aula Castigliano – Building 5, ground floor
Department of Civil and Environmental Engineering

12 November 2018 – 16:00-17:00

ENGINEERING NEW DRUGS: PROBLEMS IN (NANO)MEDICAL MECHANICS

Prof. Mauro Ferrari
President of the Houston Methodist Institute for Academic Medicine (USA)
Senior Associate, Dean and Professor at the Weill Cornell Medical School of Manhattan

A new drug will be presented (ML-016, a.k.a.iNPG-pDox), which was designed employing mathematical mechanics models, and has demonstrated unprecedented, curative efficacy in preclinical models of metastatic cancer.
This presentation will be embedded in a broader context, which articulates in the following objectives:

1. To state three classes of mathematical problems in biomedical mechanics, and discuss their significance. They are: The transport of (nanoscale) mass through the body, and its pathological correlate: Transport Oncophysics; The transport of mass through nanoscale environments, with particular emphasis on signaling pathways inside of cells; and The development of predictive anatomy.
2. To identify simplifications to these problems, which are amenable to solutions that offer insights into solutions of the general problems in biomedical mechanics. These simplifications are based on currently available nanotechnology platforms, so that these can be used for experimental verification. For the first problem, the simplification arises from the use of synthetic nanoparticles of known properties, to model the nanoscale objects being transported throughout the body. For the second, the simplification is the use of synthetic nanochannels of known properties as models for the nanoscale environments. The third general problem is simplified by reference to the optimal homogenization of biohybrid composites (biological and synthetic components) comprising nanoscale phases of known properties.
3. To illustrate the significance of the solutions to the simplified problems for securing advances against cancer and other diseases, as well as developing novel perspectives over the basic understanding of these maladies, and the nature of their differences from 'health'.

Before the statement of the general problems, some current aspects of nanotechnology and nanomedicine will be reviewed. Familiarity with these will aid in obtaining the special problems from the general problems, and in the discussion of the implications of their solutions for the clinic.

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Biosketch

Mauro Ferrari, PhD, is the Executive Vice President of Houston Methodist and the President of the Houston Methodist Institute for Academic Medicine where he is the Ernest Cockrell Jr. Presidential Distinguished Chair. Ferrari oversees all research and education programs at Houston Methodist, over 2.200 research employees and credentialed clinicians executing more than 1.000 clinical protocols.

He also serves as the Senior Associate Dean of the Weill Cornell Medical College, the primary academic affiliate of Houston Methodist, holds Adjunct and Honorary Professorships at many universities worldwide.

Ferrari is the founder of biomedical nano/micro-technology, especially in their applications to drug delivery, cell transplantation, implantable bioreactors, and other innovative therapeutic modalities. Dr. Ferrari served as special expert on nanotechnology at the National Cancer Institute in 2003-2005, providing leadership for the formulation, refinement, and approval of the NCI's Alliance for Nanotechnology in Cancer, currently the world's largest program in medical nanotechnology.

He has to his credit more than 400 publications, including seven books and is the inventor of over 50 issued patents in the US and Europe. Throughout his academic career, he has supervised trainees and students who have gone on to senior faculty positions at premier universities like Oxford, Massachusetts Institute of Technology (MIT), University of California Berkeley, University of California San Francisco, Duke University, University of Washington, and Ohio State University. Dr. Ferrari's degrees are in Mathematics (Padova, Italy), and Mechanical Engineering (M.S., & Ph.D., U.C. Berkeley.

His seminal contributions to the field of biomedical nanotechnology have been recognized through numerous awards and accolades, including: Founders Award − Controlled Release Society, the Wallace H. Coulter Award for Biomedical Innovation and Entrepreneurship, the ETH Zürich Stodola Medal, Blaise Pascal Medal in Biomedical Engineering − European Academy of Sciences, and the Shannon Director's Award of the National Institutes of Health. Dr. Ferrari is a Fellow of the American Society of Mechanical Engineers, American Academy for the Advancement of Science and American Institute for Medical and Biological Engineering. He also holds honorary doctorates in Electrical Engineering and Biotechnology from the University of Palermo and the University of Naples "Federico II", respectively. Early in his career he served as Ricercatore in Structural Mechanics at the University of Udine, Department of Civil Engineering.

His personal career research portfolio totals over $120 million in grants, including support from the NCI, NIH, DoD, NASA, NSF, DARPA, DoE, the state of Texas, the state of Ohio, the Ohio State University, and several private enterprises. He began his academic career at the University of California, Berkeley, where he tenured in Material Science, Civil Engineering, and Bioengineering. Upon recruitment to the Ohio State University, he served as the Edgar Hendrickson Professor of Biomedical Engineering, Professor of Internal Medicine, Mechanical Engineering and Materials Science. He was also the Associate Vice President, Health Sciences Technology and Commercialization, Associate Director of the Dorothy M. Davis Heart and Lung Research Institute and Director of the Biomedical Engineering Center. Upon recruitment to Houston, he served as Professor and Founding Chair of the Department of Nanomedicine and Biomedical Engineering at the University of Texas Health Science Center and M.D. Anderson Cancer Center.