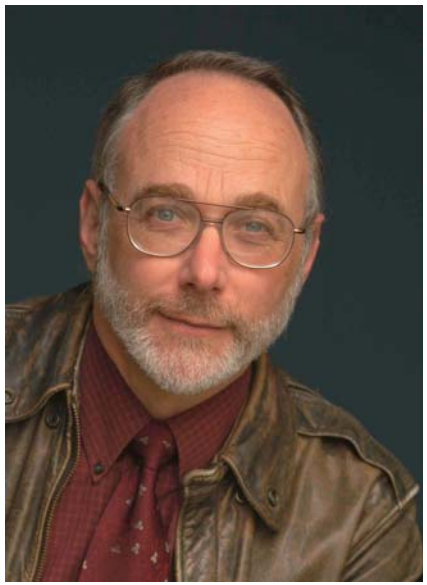
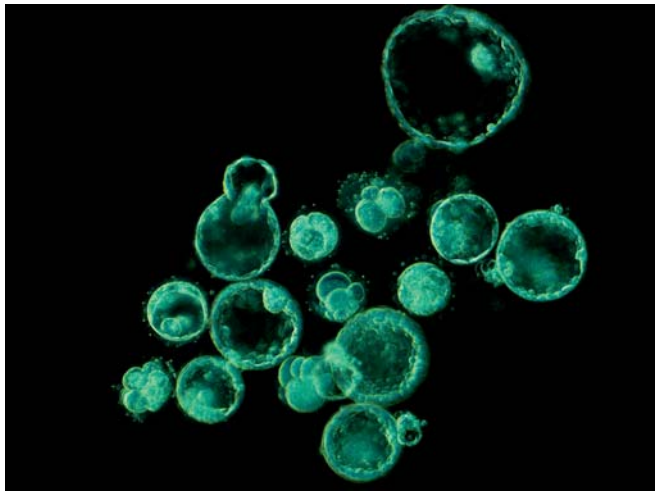
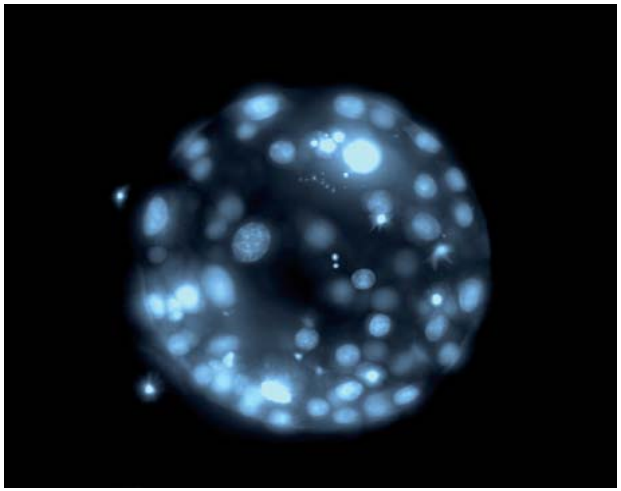
The Institute of OPTICS **Joint Colloquium** University of Rochester

Timing is everything:

Predicting Embryo Viability through Quantitative Imaging of the First Three Days of Human Development







Dr. Thomas Baer
Executive Director
Stanford Photonics Research Center
Stanford University

8:30 am, Tuesday, Dec 7, 2010
Sloan Auditorium, Goergen 101
Refreshments provided.

This talk will describe studies of preimplantation human embryo development that correlate microscopic time-lapse image analysis and gene expression profiling. Our studies indicate that success and failure in human embryo development is largely determined before embryonic gene activation. Our methods and algorithms may provide an improved approach for early diagnosis of embryo potential in assisted reproduction procedures.

HAJIM SCHOOL OF ENGINEERING & APPLIED SCIENCES

Co-sponsored by Department of Biomedical Engineering

Timing is everything: Predicting Embryo Viability through Quantitative Imaging of the First Three Days of Human Development

Thomas Baer, Stanford University

Abstract: I will discuss studies of preimplantation human embryo development that correlate microscopic time-lapse image analysis and gene expression profiling. By examining a large set of zygotes from *in vitro* fertilization (IVF), we find that early viability (success in progression to the blastocyst stage) can be predicted with >93% sensitivity and specificity by measuring three dynamic, noninvasive imaging parameters. These parameters can be reliably monitored by automated image analysis, confirming that successful human embryo development follows a set of carefully orchestrated and predictable events. Moreover, we show that these imaging phenotypes reflect molecular programs of the embryo and of individual blastomeres. Single-cell gene expression analysis reveals that blastomeres develop heterogeneously, with some cells advancing to gene activation and others arresting. Our studies indicate that success and failure in human embryo development is largely determined before embryonic gene activation. Our methods and algorithms may provide an improved approach for early diagnosis of embryo potential in assisted reproduction procedures.

Biography: Dr. Baer is the Executive Director of the Stanford Photonics Research Center and a member of the Applied Physics Department at Stanford University. His current research is focused on developing imaging and analysis technology for exploring the molecular basis of developmental biology and neuroscience.

From 1996 to 2005 Dr. Baer was the CEO, chairman, and founder of Arcturus Bioscience, a biotechnology company located in Mountain View, CA, which he established in 1996. Arcturus Bioscience pioneered the area of Microgenomics by developing and manufacturing laser microdissection instrumentation and integrated bioreagent systems. Arcturus developed products that allowed precise genetic analysis of microscopic tissue samples and which were integrated by the company into a new generation of cancer diagnostic tests. Prior to Arcturus, Dr. Baer was Vice President of Research at Biometric Imaging, where he led an interdisciplinary group developing products with applications in the areas of AIDS monitoring, bone marrow transplant therapy, and blood supply quality control. From 1981 to 1992 Dr. Baer was at Spectra-Physics, Inc., where he held positions as Vice-President of Research and Spectra-Physics Fellow. While at Spectra-Physics his research focused on ultra-fast lasers, optical pulse compression, diode-pumped solid-state lasers, and non-linear optics.

Dr. Baer has made major contributions in the areas of biotechnology, quantum electronics, and laser applications, has over 60 patents,. and is co-founder of four companies in Silicon Valley. Dr. Baer graduated with a BA degree in Physics Magna Cum Laude from Lawrence University and received his MS and Ph.D. degrees in Atomic Physics from the University of Chicago. He is also an alumnus of Harvard Business School. He is a fellow of the American Association for the Advancement of Science and The Optical Society of America (OSA), and served as the President of OSA in 2009.