May 22, 2008

biomimicrydefined
interview with Janine Benyus

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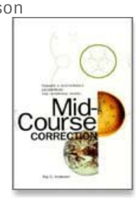
Mid-Course Correction: Toward a Sustainable Enterprise: The Interface Model
by Ray C. Anderson



Mid-Course is the personal story of Ray Anderson's realization that businesses need to embrace principles of sustainability

human+nature
connection

Ecological design transforms awareness by making nature visible. It awakens our sense of belonging to a wider natural world. Ultimately, it brings us home.
Sim Van Der Ryn & Stuart Cowan

CBID is an interdisciplinary center for research and development of design solutions that occur in biological processes. Founded in 2005, It is one of more than 100 interdisciplinary research units funded at Georgia Institute of Technology

Seminar Series

The Center for Biologically Inspired Design Spring Seminar Series continues in 2007
with John Dabiri of Caltech on April 23rd, 2007
and Ron Miles of Binghamton College on April 9, 2007.
Future talks will be announced here and in Georgia Tech College bulletins.
Abstracts of these speakers as well as those of earlier presentations can be found below.

Dr Peter Vukusic
School of Physics, University of Exeter

Evolutionary photonics: new designs inspiration from natural systems

August 7, 2006

Abstract: Diverse designs of naturally evolved nano-scale periodicity are known to generate optical functionality in the living world. While such systems have clearly evolved for biological purposes, they are increasingly offering inspiration and design protocols for applied photonic technologies. This lecture will present both an overview of the knowledge base of this emerging field of study, as well as several exciting recent discoveries that reflect nature's optical expertise and design ingenuity.

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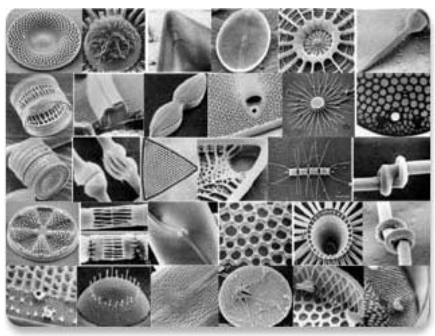


Dr. Nils Kroger
Georgia Institute of Technology , Chemistry & Biochemistry

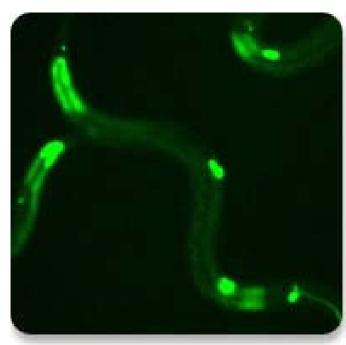
Molecular Analysis and Design of Silica Biogenesis in Diatoms

August 25, 2006

Abstract: Silica Biotechnology. Silica formation by Diatoms is a very rapid, highly controlled process that takes place within a specialized intracellular compartment termed the silica deposition vesicle (SDV). Recently, novel phosphoproteins (silaffins) and unusually long-chain polyamines have been identified and implicated in Diatom biosilica formation.
Research in Silica Biotechnology aims to establish the molecular tools allowing the creation of mutated Diatoms that produce tailored silica nanostructures adapted for nanotechnological applications. image: F.E. Round, R.M. Crawford, D.G. Mann

profile

Dr. Hang Lu
Georgia Institute of Technology , Chemical and Biomolecular Engineering



Probing Worms' Mind and Cellular Behaviors with Microfluidics

8 September 2006

Abstract: In this seminar, I will talk about our efforts in designing, fabricating, and using microfluidic chips to study biological problems. The techniques that we use to make these microchips are similar to those used in microelectronics industry. We take advantage of physical phenomena at the micro/nano scale to deliver stimuli, control microenvironment, achieve separation, and carry out analysis. I will give two examples of using microfluidics on C. elegans sensory biology: (1) to study oxygen sensation, and (2) to study pathogenic learning. I will also give some examples to use microchips for studying cell adhesion and performing subcellular separation. We believe that what microfluidics brings to medicine and biology today and tomorrow is parallel to how microelectronics revolutionized computation in the last few decades.

profile | press release

Dr. Robert Michelson
Principal Research Engineer, Emeritus
Georgia Tech Research Institute
Aerospace, Transportation & Advanced Systems Laboratory (ATAS-CCRF)

Biologically Inspired Air Vehicle Design Principles

2 October 2006

Abstract: No other air vehicle design space has presented the mix of challenges as that of miniature flight platforms. By definition these tiny platforms are unmanned and endeavor to invade the flight regime of birds and insects. In order to do so, the creators of these aerial robots must address the same physical design constraints which have already been mastered by the world of airborne biology, including low Reynolds number aerodynamics, high energy density, and extreme miniaturization. This presentation focuses on the high degree of innovation required to make practical miniaturized flying machines on the scale of small birds and insects.

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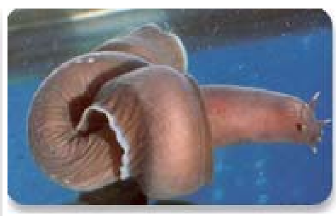

Douglas Fudge
University of Guelph

Inspiring slimes: What hagfish slime can tell us about predator defense, the cytoskeleton, and high-performance protein fibers

November 7, 2006

Abstract: Hagfish are notorious for their ability to produce alarming amounts of mechanically-intriguing defensive slime when they are provoked or stressed. In this seminar, will summarize what we know about this fascinating biomaterial and describe two lines of inquiry that have unexpectedly sprung from our research on hagfish slime. The first is the biomechanical design of the animal cell cytoskeleton, which includes an elaborate network of 10-nm diameter filaments called "intermediate filaments." The protein threads that permeate hagfish slime consist of nearly pure bundles of intermediate filaments, and provide an excellent model for exploring the mechanical behavior of these nano-scale filaments. Hagfish slime threads undergo a dramatic conformational change when they are stretched in water, the result of which is a fiber that rivals the properties of spider dragline silk. I will also talk briefly about our recent efforts to artificially produce silk-like fibres from hagfish slime thread proteins. hagfish image: C. Ortlepp

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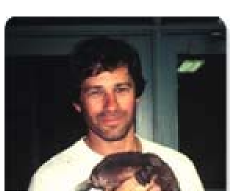

Dr. Frank Fish
University West Chester PA

Enhanced swimming performance by flow control in marine mammals

30 October 2006

Abstract: Optimization of energy by whales and dolphins requires adaptations that reduce drag, and improve thrust production and efficiency. The control of flow over and around the body of whales, therefore, is critical to efficient swimming performance.
image credits- left: W. Rossiter | right: L. Howle

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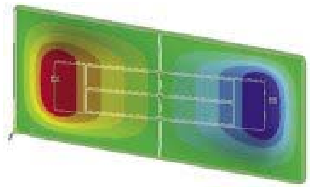


Dr. Ronald Miles
Professor, Department of Mechanical Engineering
Binghamton University New York

Fly lends an ear to microphone design
April 9, 2007

Abstract: Professor and Chairman of Mechanical Engineering at SUNY Binghamton has been awarded a DARPA grant to develop for military purposes innovative sound processing technology inspired by the ear of a small fly. In small insects like Ormia, millions of years of evolution have given rise to innovative approaches to the problem of miniaturization. It was a cross-disciplinary study by Miles, Ronald Hoy of Cornell and Daniel Robert of the University of Zurich that determined the workings of a unique structure inthe ear of Ormia and paved the way for Miles' latest project. That structure, the intertympanal bridge, allows the insect to locate, in pitch dark and with deadly accuracy, the crickets upon which it preys, even though its ears are located less than 100 microns apart. Miles is also in the second year of a three-year $1. 1 National Institutes of Health grant to develop the world's smallest directional microphone for use in hearing aids. Colored simulation depicts fly-inspired diaphragm for microphones as it teeters up to the left. image: R. Miles/SUNY Binghamton

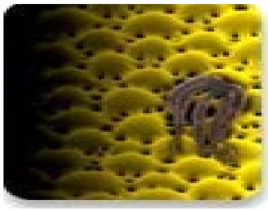
science news article | faculty profile

John O.Dabiri
Assistant Professor in the Graduate Aeronautical Laboratories and the Option of Bioengineering at Caltech

Jellyfish Biomechanics and Optimal Vortex Formation
April 23. 2007

Abstract: Professor Dabiri's research examines the mechanics and dynamics of biological propulsion, broadly defined to include the transport and transfer of fluid momentum in both stationary and mobile systems. Applications include aquatic locomotion via pulsatile jets, fluid dynamic energy conversion, and cardiac flows. A current thrust of his research is the study of jellyfish swimming as a model system for understanding behavioral and fluid dynamic aspects of animal locomotion in general. His group develops and applies new experimental and theoretical methods in fluid dynamics to investigate in situ and in vivo fluid transport, with the goal of discovering general bio-inspired design principles that can be implemented in engineering systems.

profile | video | publications



Joanna Aizenberg
Bell Labs, Lucent Technologies

New breakthroughs in biomimetic compound eye research
date TBA

Abstract: research interests include: biomineralization, biomimetics, multifunctional biomaterials, crystal engineering, nanofabrication, control of crystal nucleation and growth,

colloidal assembly. She has discovered a unique function of biologically formed single calcite crystals serving not only as skeletal armor, but also as an array of microlenses with nearly-perfect optical performance. In addition, while at Lucent she has developed a new biomimetic approach for the synthesis of ordered mineral films with highly controlled nucleation density and crystal sizes using organized organic assemblies.

research documentation | National Geographic article