February 27 – March 9, 2009

Evolution Emanation

**GUIDE TO PROGRAM & EVENTS**

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<td>Ft. Lauderdale, FL</td>
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<tr>
<td>Sat., Feb. 28</td>
<td>Half Moon Cay, Bahamas</td>
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<td>Sun., March 1</td>
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<td>Mon., March 2</td>
<td>Oranjestad, Aruba</td>
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<td>Tues., March 3</td>
<td>Willemstad, Curacao</td>
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<td>Wed., March 4</td>
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<td>Thurs., March 5</td>
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27th of February — Friday

5pm  Ship Departs from Fort Lauderdale

6pm – 7pm  Bon Voyage Cocktail Party  [ Lido Deck, Indoor Pool ]

28th of February — Saturday

8am  Ship Arrives Half Moon Cay

3pm  Ship Departs from Half Moon Cay

4pm – 5:30pm  The History of Life on Earth  
Stephen J. Freeland, Ph.D. — [ Queens Lounge ]

Batten down the hatches and take a trip back through four billion years of evolution, filtered through the senses and sensibilities of a molecular evolutionist/geneticist/computer scientist. Dr. Freeland’s itinerary: from the 21st century to the origin of our species; from the “age of mammals” back to the Cambrian explosion; from the age of single celled life back to the Last Universal Common Ancestor (LUCA); and finally, from LUCA to the origin of life.

6pm – 7:30pm  1859: The Impact of a Dangerous Idea  
Jerry Coyne, Ph.D. — [ Queens Lounge ]

On Nov. 22, 1859, with the publication of On the Origin of Species, Charles Darwin forever changed not only biology, but also the way humans view their place in nature. There is a good case to be made that Darwinism is the best idea anyone ever had. In this series of five seminars by Dr. Coyne we will look at Darwin’s theories, how he developed them, the amazing variety of evidence supporting them, and what they mean for us humans, both biologically and philosophically.

In this first session we’ll trace the origin of Darwin’s “dangerous idea” (actually several ideas) beginning with his famous voyage on the HMS Beagle. We will learn what Darwin really proposed, what impact the ideas of evolution and natural selection had on the Victorian world, and why Darwinism was — and still is — considered a dangerous idea.

1st of March — Sunday (Sea Day)

8:30am – 10:30am  On the Origin of Species, Really  
Mohamed Noor, Ph.D. — [ Queens Lounge ]

Although Darwin’s book title suggested that he provided us with insights on the origin of species, in fact, he only focused on the process of divergence within species and assumed the same processes “eventually” led to something that could be called a new species. In this session, we’ll talk about how species are identified (in practice and in principle), and then how modern evolutionary biologists use this type of information to get a handle on how species are formed.
2nd of March — Monday

Noon
Ship Arrives Aruba

10pm
Ship Departs from Aruba

8:30am – Noon
Evolution of Individuality and Complexity
Through Cooperation and Conflict
Richard Michod, Ph.D. — [ Queens Lounge ]

Our understanding of life is being transformed by the realization that evolution occurs not only among individuals within populations, but also through the integration of groups of cooperating individuals into new higher-level individuals — that is, through evolutionary transitions in individuality (ETIs). The major landmarks in the diversification of life and the hierarchical organization of the living world are consequences of a series of ETIs: from genes to gene networks to the first cell; from prokaryotic to eukaryotic cells; from cells to multicellular organisms; from asexually reproducing individuals to sexually reproducing pairs; and from solitary individuals to societies. How do groups become new individuals? Cooperation and conflict play a major role in these evolutionary transitions. Join Dr. Michod and come away with a new perspective on the process of evolution and what it means to be an individual.

3rd of March — Tuesday

8am
Ship Arrives Curaçao

5pm
Ship Departs from Curaçao

5:30pm – 7pm
The Mathematics of Mind:
Exploring the Formal Foundations of Human Thought
Tom Griffiths, Ph.D. — [ Queens Lounge ]

Over the last two millennia, scientists and philosophers have used approaches such as logic, artificial neural networks, and probability theory to develop scientific and mathematical models of thought. Dr. Griffiths will talk about current status of work to understand the formal principles that underlie human thought and our ability to solve the computational problems we face in everyday life.

4th of March — Wednesday (Sea Day)

8:30am – 10am
Unconscious Design: Natural Selection
Jerry Coyne, Ph.D. — [ Hudson ]

While the idea of evolution was immediately accepted by 19th-century biologists, the concept of natural selection — the purposeless driving force of evolution and adaptation — has been much more controversial. This talk will describe what natural selection really is and see examples of how it works in nature. We will also examine the complementary theory of sexual selection, which explains the remarkable difference in appearance and behaviour between males and females in many species.

10:30am – Noon
Evolution and Natural Selection — Are the Winners Always the Fittest?
Mohamed Noor, Ph.D. — [ Hudson ]

Darwin is often caricatured as someone who was obsessed with change by natural selection. However, he would be the first to admit that some evolutionary changes probably have little or nothing to do with natural selection. In this session, we talk a bit about the role of natural selection in evolution as well as other forces that also contribute to evolutionary change. This session will be primarily instructional on basic microevolutionary theory.

Noon – 2pm
LUNCH

2pm – 3:30pm
From Magic to Muons: Why People Believe in Strange Things
Tania Lombrozo, Ph.D. — [ Hudson ]

Much of our knowledge is about things that we cannot see or touch. By studying human reasoning we can begin to understand both how people make scientific discoveries and how these processes can lead to some surprising errors in understanding our world. We’ll consider the debate over evolution and intelligent design as a case study in people’s understanding of and preference for different kinds of explanations for the world around us.

4:30pm – 7:30pm
Genetics, Genomics, and You: Don’t Fear Your Genotype!
Mohamed Noor, Ph.D. — [ Queens Lounge ]

The missing element in Darwin’s theory was how it worked in terms of inheritance. Today, such a problem is so distantly past that it is hard to even conceive it used to be an issue. With human and other genome sequences readily available, and “personal genomics” opportunities arising, a host of issues spanning medical, legal, ethical, and other areas are all being forced into the forefront. Movies like “Gattaca” paint a grim view of how such information could create a cold world, but is this realistic? What is going on, what are possible benefits to you, what are things to watch out for, and what the hairy heck does it all mean? This will be an extended discussion, with some on-board “lab demonstrations” to try to get participants to understand the lingo, opportunities, and issues associated with living in the genomics era.

5th of March — Thursday

5am
Ship Arrives Panama Canal

(no Evolution Emanation Events on this day)
In many species of animals, such as the peacock, males and females look and behave very different from each other. This long posed a problem to evolutionists, but now we have a good understanding of how selection can create such differences between the sexes. This lecture illustrates the stunning diversity of traits that have evolved by “sexual selection,” and explains modern views of how this process (first suggested by Darwin) really works.

What is it like to be a science journalist? Steve Mirsky has been a science writer for two decades, the last 12 years at Scientific American. He'll talk about the process by which science gets turned into articles for a general audience, along with some of the more amazing moments that have occurred during that process (like the editor who confused Caesar the Roman with Caesar the salad). He'll also share some of the interactions that occur between writers and readers at Scientific American.

The theory of evolution is a lens through which many scientific disciplines can be refracted. Steve Mirsky discusses evolutionary medicine — the developing field that studies the implications of evolutionary principles for medical practice and health policy. From the evolution of microorganisms to immune mechanisms to contemporary diet, life expectancy, and physical fitness, Steve updates you on the broad developments in evolutionary medicine.

Evolution has been a subject of waxing and waning controversy since the day that Darwin published The Origin of Species. We'll look at some of the history of the antievolution movement, with special attention to the "creationist science" and "intelligent design" efforts of the last three decades. One of the seminal events in this period — perhaps the biggest evolution trial since Scopes — was the 2005 Kitzmiller lawsuit in Dover, PA, brought by parents against an "intelligent-design" friendly school board. Steve Mirsky attended opening arguments and some of the testimony of the month-long Dover trial and will discuss the case background, the events in the courtroom and the groundbreaking decision rendered by Judge Jones. We'll also spend some time on the Cobb County, GA, textbook sticker antievolution case, and share mail from some Scientific American readers still unconvinced by Judge Jones. We'll also spend some time on the Cobb County, GA, textbook sticker antievolution case, and share mail from some Scientific American readers still unconvinced about the scientific validity of evolution.

Artificial intelligence (AI) research has drawn inspiration from human thought processes. If you’re curious about the behind-the-scenes mechanisms of Google's PageRank mechanism, Amazon book recommendations, and the tough work of email spam filters get the basics on the ideas behind the methods used to solve these problems. Dr. Griffiths will discuss how cognitive science is currently scrutinizing the successes of AI to better understand how human minds work.

Animals and plants show a diverse and bizarre group of adaptations designed to hide them or make them mimic features of their environment. This lecture illustrates the wonderful panoply of such adaptations but also uses them to illustrate the diverse ways that natural selection can operate.
In his final lecture, Dr. Freeland will examine the 20th century orthodoxy of a lucky species on a lucky planet to disentangle what we know from what we guess. He will show that our place within the universe is far less well understood than you might think, and that new technologies and powerful computers are finally enabling us to approach some of the deepest questions of our existence.

10:30am – Noon Teaching the Evolution of Complexity: Intelligent Design or Darwinian Evolution? Richard Michod, Ph.D. — [Hudson]

Episodic and ongoing controversies in American schools involve the teaching of evolution, "intelligent design", and creationism. The diversity of life is usually taught with little discussion of complexity per se. Dr. Michod shares his views that, by not addressing the issue of complexity directly when teaching about the diversity of life, biology curricula have opened the door to claims like those of "intelligent design" which argues that so-called "irreducible" complexity cannot be explained by Darwinian principles. Dr. Michod proposes forging a modern approach to teaching evolution using, as case studies, the major evolutionary transitions in individuality (ETIs), such as the transition from unicellular to multicellular life. Using the social principles of cooperation and conflict in biology curricula should provide an intuitive framework for students — they are social individuals and experience the opportunities of cooperation and the temptation and risks of cheating in their lives. By using these intuitive principles to understand the remarkable transitions in complexity during the history of life we can address an important social issue that threatens rationality in our schools.

Noon – 2pm LUNCH

2pm – 3:30pm Evolution Today: What About Us? What Remains to be Done? Jerry Coyne, Ph.D. — [Hudson]

Although Darwin largely got it right in 1859, he did not by any means solve all the problems of evolution. In this final session we will examine the mysteries still remaining about evolution, and what is being done to solve them, including some of my own work on the origin of species. In addition, we will discuss how humans typify many principles of evolution, how they are unique among animals, and, finally, what evolution means to our lives, society, and mores.

4:30pm – 8pm Evolution of Sex and the Immortality of Life Richard Michod, Ph.D. — [Queens Lounge]

Sex is a problem. Given the high biological cost of sexual reproduction, what are the benefits that lead it to evolve? From the basic tension between the preservation of cellular individuality and the need to address genetic error and promote healthy genetic variation, you’ll get the groundwork for the rationale for sexual reproduction in terms of gene repair and genetic mixing. Gain an understanding from Dr. Michod about the role of oxidative stress in triggering the development of sex, and the advantages and rejuvenation that genetic mixing and gene repair bring to life. Spend some time with Dr. Michod developing a uniquely biological concept of immortality, and you’ll gather food for thought on immortality as an activity and process rather than as a state or continuity of an individual organism.
organization and composition of modern genomes) are ongoing interests of Dr. Freeland and his colleagues. Developments and details are available at http://www.evolvingcode.net.

**Thomas Griffiths, Ph.D.** has served as an Assistant Professor in the Department of Psychology at the University of California, Berkeley since July 2006. Griffiths studies the problems of induction that people face in everyday life (such as probabilistic reasoning, learning causal relationships, acquiring and using language) which require inferences from limited data. He analyzes these aspects of human cognition by comparing human behavior to optimal or “rational” solutions to the underlying computational problems.

Dr. Griffiths earned a B.A. in Psychology from the University of Western Australia and an M.A. in Psychology and M.S. in Statistics from Stanford University. Subsequent to completing Master's degrees, he performed a climate change and worked as an Exchange scholar in the Brain and Cognitive Sciences Department and Computer Science and Artificial Intelligence Laboratory of the Massachusetts Institute of Technology from 2002–2004. He was awarded a Ph.D. in Psychology from Stanford University in 2005. Griffiths was an Assistant Professor in the Department of Cognitive and Linguistic Sciences at Brown University from January 2005 until July 2006.

In addition to authoring numerous papers, book chapters, and other professional publications, Dr. Griffiths is a frequent speaker, is a consulting editor for Journal of Experimental Psychology: Learning, Memory, and Cognition, and an ad hoc reviewer for many publications and conferences, among them Proceedings of the National Academy of Sciences, Science, Cognitive Science, Cognition, the Annual Conference of the Cognitive Science Society, the International Conference on Machine Learning, and the International Joint Conference on Artificial Intelligence.

On the occasion of the 50th anniversary of the first artificial intelligence conference IEEE Intelligent Systems magazine honored Tom Griffiths among its “AI Ten to Watch” award list.

When people ask what **Tania Lombrozo, Ph.D.** studies, she says “explanation”, which is clearly an answer that requires explanation. A new area of study in cognitive psychology, the motivation for studying explanation comes from the potential to learn about other areas of cognition. Explanation is at the core of basic cognitive processes like learning, inference, and categorization. Investigating these basic aspects of cognition involves the marriage of experimental methods from psychology with the conceptual analysis of analytic philosophy. Accordingly, much of Dr. Lombrozo’s work is informed by philosophy of science, epistemology, and moral philosophy. She also studies the structure of conceptual knowledge and how it changes through time, particularly the parallel between scientific development within communities and conceptual change within individuals.

Dr. Lombrozo earned a B.A. in Philosophy and a B.S. in Symbolic Systems from Stanford University and an M.A. and Ph.D. in Psychology from Harvard University. Since 2006, she has been an assistant professor in the department of psychology at the University of California, Berkeley. She is also a member of Berkeley’s Institute for Cognitive and Brain Sciences and an affiliate of the philosophy department. Her research has received support from the National Science Foundation and the McDonnell Foundation, and has appeared in leading journals, including the Proceedings of the Royal Society, Psychological Science, and Cognitive Psychology. She is on the editorial board of Cognition, a leading journal in cognitive science, as well as Evolution: Education & Outreach, a new journal focusing on evolution education.

Dr. Lombrozo is continuing to explore why we are driven to seek explanations, what makes some explanations more satisfying than others, and how we represent and reason about theoretically fundamental concepts like causation, functions, and moral status.

**Richard Michod, Ph.D.** is Professor and Department Head of the Department of Ecology and Evolutionary Biology at the University of Arizona. Our understanding of life is being transformed by the realization that evolution occurs not only among individuals within populations, but also through the integration of groups of individuals into new higher-level individuals. Indeed, the major landmarks in the diversification of life and the hierarchical organization of the living world are consequences of a series of evolutionary transitions in individuality: from genes to gene networks to the first cell, from prokaryotic to eukaryotic cells, from cells to multicellular organisms, from asexual to sexual populations, and from solitary to social organisms. Dr. Michod’s research group is interested in understanding the diversity of life by understanding the evolution of interactions among individuals and how these interactions can create the new kinds of evolutionary individuals just described. He is especially interested in cooperation and conflict during the origin of multicellularity and the evolution of sex. He is interested in the consequences of sex in terms of coping with genetic error (mutation and damage), and how sex affects evolutionary transitions in individuality. The methods used in his work involve mathematical and computer models, experiments with micro-organisms, and philosophical analysis. His ongoing experimental work concerns the evolution of cooperation, multicellularity and sex in volvocine green algae. Richard Michod earned a B.S. in Zoology from Duke University, an M.A. in Mathematics from the University of Georgia, and was awarded a Ph.D. in Genetics and Zoology from the University of Georgia. He joined the faculty of the University of Arizona in 1978. Dr. Michod has published over 100 scientific works including the following books: *Darwinian Dynamics* (1999); *Eros and Evolution: A Natural Philosophy of Sex* (1995); *The Origin of Values* (with others, 1993) and; *The Evolution of Sex: An Examination of Current Ideas* (with others, 1988). More information about him can be found at his website www.michod.com.

**Steve Mirsky, M.Sc.** has been an editor at Scientific American magazine for 11 years. Mirsky’s personal evolutionary path encompasses a degree from the American Academy of Dramatic Arts, acting in summer stock, a bachelor’s degree from City University of New York, hosting a morning radio show and a masters’ degree in chemistry from Cornell University. Mirsky left chemistry (to the relief of the American Chemical Society) for journalism after receiving an American Association for the Advancement of Science (AAAS) Mass Media Fellowship in 1985, which he spent at the NBC TV affiliate in Miami. Other academic fellowships include two stints (general, 1993, and molecular evolution, 2001) at the Marine Biological Laboratory at Woods Hole, a Reuters Foundation Fellowship in Medical Journalism at Columbia University in 1997 and the Knight Science Journalism Fellowship at MIT for the 2003–2004 academic year (during which he also attended a semester of criminal law with Alan Dershowitz at Harvard Law School).

Mirsky is in his 12th year writing the Antigravity column, a rare venue for (alleged) humor in the world of science. In February, 2006, he launched the weekly podcast of Scientific American, “Science Talk”, which was followed in September by the daily podcast, “60 Second Science.” Both are available at iTunes and at the Scientific American website, www.sciam.com. He is also an award-winning wildlife photographer.
Mohamed A.F. Noor, Ph.D., Professor and Associate Chair of the Duke University Department of Biology, tells us that one of the greatest unsolved questions in biology is how continuous processes of evolutionary change produce the discontinuous groups known as species. In addition to the obvious historical perspective this question seeks, with the continued loss of species worldwide from human activities work arising from this question will become increasingly important in identifying the processes that generate and maintain biodiversity on the planet.

Dr. Noor has focused on understanding the processes that cause the evolution of barriers to gene exchange between diverging species, particularly hybrid sterility and species mating discrimination. The proposed work has strong evolutionary and medical implications. Understanding the nature of genetic interactions causing sterility gives direct insights into what makes one species different from another, and hence, can explain the process of the origin of new species. In addition, insights on genetic interactions causing sterility can help identify other genes whose disruptions in humans may cause infertility.

Dr. Noor earned a B.S. in Biology from the College of William and Mary, 1992 and a Ph.D. in Ecology & Evolution from the University of Chicago in 1996. He was a postdoctoral resident in Genetics & Development at Cornell University from 1996–1998. Noor won the American Society of Naturalists’ Young Investigator Prize in 1998, and Sigma Xi’s Regional Young Investigator Prize in 1999. He served on the faculty at Louisiana State University from 1998 to 2005 and received a College of Basic Sciences Research Award, an LSU Phi Kappa Phi Untenured Faculty Award in Natural and Physical Sciences, and a Louisiana State University, College of Basic Sciences Undergraduate Teaching Award. Dr. Noor won the 2007 Gordon G. Hammes Faculty Teaching Award from Duke University School of Medicine.

Dr. Noor is currently on the editorial boards of PLoS Biology, the Proceedings of the Royal Society of London Series B, and BMC Evolutionary Biology. He serves as a standing member of the Genetic Variation and Evolution grant review panel at the National Institutes of Health and is an elected Council member for both the Society for the Study of Evolution and the American Genetics Association. Noor was editor of Evolution 2006–2007 and associate editor of Evolution 2001–2005.

Among other endeavors, Dr. Noor and his Noor Lab team are now examining the fine details of the genetic architecture of the chromosomal rearrangements that occur when one animal species becomes two. In the few minutes per week he doesn’t find himself working, Noor relaxes by running, spending time with his family, or watching movies, particularly science fiction.