A Henry Stewart Talks Series in Biomedicine and the Life Sciences

Evolution and Medicine

How New Applications Advance Research and Practice

38 seminar style presentations by many of the world's leading authorities

Series Editor:

Professor Randolph Nesse – University of Michigan, USA

Target Audience:

Students of undergraduate and graduate courses in biology, medical and nursing courses and health care clinicians. This is a complete course that covers the breadth of this new field in depth

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Fundamentals of evolution and medicine – Evolutionary genetics – Infectious diseases, co-evolution and arms races – Environmental factors – Constraints and trade-offs – Sexual selection and reproduction – Cancer – Mental disorders – Practical applications

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Prof. Timothy Bromage
Dr. Valerie Curtis
Prof. S. Boyd Eaton
Prof. Peter Ellison
Prof. Paul Ewald
Prof. Mel Greaves
Prof. David Haig
Dr. David Houle
Dr. Matthew Keller
Prof. Matthew Kluger
Dr. Daniel Kruger
Dr. Christopher Kuzawa
Prof. Jeffrey Long
Prof. Randolph Nesse
Prof. Gilbert Omenn
Prof. Mark Pagel
Prof. Linda Partridge
Prof. Andrew Read
Prof. Graham Rook
Prof. Paul Schmid-Hempel
Prof. Nicholas Schork
Prof. Paul Sherman
Prof. Stephen Stearns
Dr. Mark Thomas
Prof. John Torday
Prof. Wenda Trevathan
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Evolution and Medicine

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Fundamentals of Evolution and Medicine

1. Why Medicine Needs Evolutionary Biology
Prof. Randolph Nesse – University of Michigan, USA
How evolution is useful to medicine – Why doctors don't know evolution – The body: perfect and pathetically flawed – Proximate and evolutionary explanations – Explain vulnerability, not diseases – Six reasons for vulnerability – Darwinian medicine growing fast

2. Evolution and Medicine: From the Perspective of an Evolutionary Biologist
Prof. Stephen Stearns – Yale University, USA
How we are mismatched to modernity – Birth control and cancer risk – Impact of early-life events on late-life obesity and diabetes – Hygiene and autoimmune disease – Evolutionary conflicts that produce reproductive problems – Evolutionary technologies used in medicine – The evolutionary principles and mechanisms underpinning these examples

3. Developmental Plasticity, Evolution and the Origins of Disease
Dr. Mary Jane West-Eberhard – Smithsonian Tropical Research Institute, Costa Rica
Developmental plasticity – Genes and environment in development – Adaptive developmental decisions and their betrayal if conditions change – Phenotypic accommodation – Multiple pathways – Myth of single gene control – Blueprints and programs as false metaphors – Cross-generational continuity of the phenotype – Origins of novel phenotypes including disease

Evolutionary Genetics

4. Genetic Variation and Human Disease
Dr. David Houle – Florida State University, USA
Proximal vs. ultimate causation – Causes of death in modern societies – Quantifying genetic causation – Relative risks of common diseases – Fitness – Why do genetic diseases exist? – Selection can maintain disease – Mutation-selection balance – Evolutionary lag – Gene flow and genotype-environment interactions – Co-evolutionary arms races – Why evolution matters

5. Evolutionary Genetic Epidemiology
Prof. Nicholas Schork – Scripps Genomic Institute of Medicine of La Jolla, USA
What is 'evolutionary genetics'? – Evolution, genetic variation and association analyses – Within-species diversity and population genetics – Human genetic diversity and phenotypic variation – Human community 'metagenomics'

6. Evolutionary Genetics: The Detection of Natural Selection Using Molecular Data
Dr. Mark Thomas – University College London, UK
Mutation and variation in populations – The fate of mutations under random genetic drift and natural selection – Measures of variation – Detecting signatures of natural selection in genomic data

7. Ecogenetics, Evolutionary Biology and Human Disease
Prof. Gilbert Omenn – University of Michigan, USA
Ecogenetics of nutrition and cultural sensitivity – Is lactose intolerance/lactase persistence a disease or an evolutionary normal variant? – Assessment, management and communication of health risks and genetic susceptibility to environmental chemicals

8. Race in Genetics and Medicine
Prof. Jeffrey Long – University of Michigan, USA
Questions about race – Fundamentals of DNA and the genome – Human genome sequence – DNA sequence variation – Three essential features of human genome diversity – Expected nucleotide diversity – STR analysis – Relationships among human populations – Major long-range human migrations – Definition of race – Allocation of individuals to genetic clusters – Principal pathway of ethanol metabolism – Allele frequencies at ALDH2 locus – European ancestry and diabetes risk

9. Health Disparities in Common Complex Diseases: A Role for Genetics?
Dr. Kathleen Barnes – Johns Hopkins University, USA
Genetic epidemiology of common, complex and chronic diseases – Evidence of a role for a genetic basis of health disparities – Genetic studies on asthma and allergic disease and ethnicity – Gene-environment interactions – Biogeography and the hygiene hypothesis – Innate vs. adaptive immunity and the common variant/multiple disease hypothesis – Antagonistic pleiotropy

Infectious Disease

10. Bacteria and Virus Evolution: A Model for the Study of Natural Selection
Dr. Paul Turner – Yale University, USA
Experimental evolution – Classic experiments using bacteria and viruses – Evolution of antibiotic resistance in bacteria – Evolution of higher and lower virulence in pathogens – Evolution of pathogen emergence

11. Evolutionary Arms Races
Prof. Mark Pagel – University of Reading, UK
Arms races and evolutionary arms races – What are they and how are they defined – Features of arms races – Who wins?: the Red Queen and the life-dinner principle – Common arms races in nature – Predators and prey, sexual selection, parent offspring conflict and host-parasite co-evolution – HIV evolution, parent-infant resemblance in humans and genomic imprinting

12. Antibiotic Resistance and Hospital-Acquired Infection
Dr. Carl Bergstrom – University of Washington, USA
Rates and consequences of hospital acquired infection – History of antibiotic resistance – The process of natural selection – Mutation as a source of resistance – Lateral gene transfer – The bacterial ecology of a hospital – Resistance in the community – Agricultural use of antibiotics – Modeling resistance in a hospital – Antibiotic cycling

13. Evolution of Virulence: Malaria, a Case Study
Prof. Andrew Read – Edinburgh University, UK
Why are infectious agents virulent? – Evolutionary and mechanistic explanations – Natural selection on malaria virulence – Why are malaria parasites so virulent? – Why not more virulent? – Possible selective effects of public health interventions – Other infectious diseases – Why evolutionary explanation matters

14. Infection and Chronic Disease
Prof. Paul Ewald – University of Louisville, USA
Chronic diseases (cystic fibrosis, atherosclerosis, tuberculosis) – Risk factors – Primary and secondary causes – Categories of disease causation – Risk factors and disease causation – The ε4 allele and the thrifty genotype hypothesis – Geographical variations in allele frequencies – Pathogen vulnerability hypothesis – Environmental causations (smoking, high fat diet, alcohol, garlic, iron) – Drug treatment and atherosclerosis

Defenses

15. Fever and Related Defenses
Prof. Matthew Kluger – George Mason University, USA
Evolutionary history of fever – Role of fever in disease – Role of related host defenses in disease – Concept of Darwinian Medicine

16. The Evolutionary Ecology of Immunity
Prof. Paul Schmid-Hempel – ETH Zurich, Switzerland
Why immune defense matters – Asking for evolutionary reasons and constraints – Using immune defenses is very costly for the individual – The nature of the costs – Differences among the sexes – Specific defenses and their impact – What would be the best defense – Parasites are interfering – The consequences for medicine

17. Mapping Motivations: Evolutionary Health Promotion
Dr. Valerie Curtis and Dr. Robert Aunger – London School of Hygiene and Tropical Medicine, UK
Most of today's health problems can be prevented by changes in behavior – How understanding behavior, and behavioral motivation in particular, from an evolutionary perspective can provide new avenues for health promotion – Example of how an evolutionary insight into the disgust motivation led to an effective handwashing campaign in Ghana

Novel Environmental Factors

18. The Original Human Diet: What was it and should it be a Model for Contemporary Nutrition?
Prof. S. Boyd Eaton – Emory University, USA
Human evolution – Contemporary genetic-lifestyle discordance – Ancestral nutrition as a model for the present – Current American nutrition – Successes (life expectancy) and failures ('afflictions of affluence') – The paradigm concept

19. The Paleolithic Lifestyle and Prevention of Chronic Disease
Prof. S. Boyd Eaton – Emory University, USA
Stone Age genes and Space Age lives – Chronic degenerative diseases – Case illustrations: from dental caries to diabetes – Paleolithic health promotion: deviation from the basics of ancestral life increases disease risk whilst reversion reduces it

20. Early Nutrition, Development and Health: Evolutionary Perspectives on the Metabolic Syndrome
Dr. Christopher Kuzawa – Northwestern University, USA
The Developmental Origins of Health and Disease – The thrifty genotype hypothesis – Metabolic scaling in mammals – Energy partitioning in humans – The developmental bottleneck of weaning – Baby fat as a brain buffer – How fat and insulin resistance protect the brain – Why prenatal undernutrition induces the metabolic syndrome – Implications for adaptation and global disease change

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21. The Hygiene Hypothesis
Prof. Graham Rook – University College London, UK
Definition of the hygiene hypothesis – Gene-environment interactions – Protection from allergic disorders by the farming environment – Changing incidences of allergic disorders, autoimmunity and inflammatory bowel disease – Deficient regulatory T cell activity in chronic inflammatory disorders – Environmental microorganisms, immunoregulation and mammalian evolution – Changing microbial exposure in developed countries – Regulatory T lymphocytes and regulation of inflammation – Animal models – Cellular mechanisms – Clinical trials

22. Diseases of Civilization: An Evolutionary Legacy
Prof. Alan Weder – University of Michigan, USA
There is a mismatch between what we were originally selected for and our modern environment – The 'diseases of civilization' result from this mismatch – Hypertension is a prototypic disease of civilization – Many factors mediate the interaction between genes and the environment to promote hypertension

Problems Arising From Constraints and Trade-Offs

23. Aging and Evolutionary Medicine
Prof. Linda Partridge – University College London, UK
Declined mortality in industrialized societies – Maximum human longevity – Werner's syndrome – Common age-related pathologies – The force of natural selection declines with age – Mutation-accumulation theory – The pleiotropy or trade-off theory – Evolutionary theories of aging – Aging in different organisms – Testing the theories – Interventions that slow aging in diverse organisms – Insulin/IGF-like signaling – Genetic effects on lifespan – Extension of lifespan by dietary restriction

24. Evolutionary Obstetrics
Prof. Wenda Trevathan – New Mexico State University, USA
Human evolutionary history – Human evolution and childbirth – Birth in other primates – How anatomical changes for bipedalism impact birth – Birth in early human ancestors – The helpless human newborn – The evolutionary legacy of birth – Why women benefit from assistance at birth – Value of emotional support during labor and delivery

25. Why we Cook with Spices: Preventative Darwinian Medicine
Prof. Paul Sherman – Cornell University, USA
Evolution of chemicals that give spices their unique flavors – All spices have antimicrobial properties – Use of spices in human cultures – Foodborne illnesses – In every country and culture, people learn to enjoy the tastes of the spices that are most effective because of their beneficial (antimicrobial) effects on food safety and thus health

Sex and Reproduction

26. Sex Differences in Mortality
Dr. Daniel Kruger – University of Michigan, USA
Senescence – Reproductive strategies and mortality – Contemporary and historical sex differences in mortality rates – Male competition and sex differences in mortality rates within a society, across societies and across time in societies undergoing socio-economic changes

27. The Endocrinology of Human Life History Transitions
Prof. Peter Ellison – Harvard University, USA
The energy allocation model of life history evolution – Quantitative variation in energy allocation to reproduction – Endocrine control of qualitative, state transitions in human life history – Three example transitions: postpartum resumption of ovarian function, puberty, birth

28. Genetic Conflicts in Human Pregnancy
Prof. David Haig – Harvard University, USA
The association of maternal provisioning of a fetus and opportunity cost – The relationship between maternal investment in fetus to the benefit to the fetus and the cost to its siblings – The maternal-fetus unit: genes and their direct benefit to the fetus and indirect cost to its siblings – Syndromes associated with the imprinted cluster of genes of human chromosome 11p15.5: Beckwith-Wiedemann syndrome and Silver-Russell syndrome – 3 potential areas for conflict during pregnancy: whether to carry/miscarry the embryo, nutrient quality of maternal blood and the volume of blood reaching the placenta – Placental hormones and fetal attempts to manipulate maternal physiology for fetal benefit – Maternal carbohydrate metabolism: glucose and insulin levels in the maternal blood, and maternal insulin sensitivity – The maternal-fetus blood circulation during pregnancy and the systemic blood supply shared between them

29. Environmental Effects on Human Reproduction
Prof. Gillian Bentley – University of Durham, UK
Environmental effects on human reproduction – Measuring reproductive ability – Hormonal variation and ovarian function in different populations – Effect of nutrition on reproductive function – Effect of energetics on reproductive function – Effect of genetics on reproductive function – Developmental effects on reproductive function – Immunological effects on reproductive function – Hormones and health implications

Cancer

30. A Darwinian Eye View of Cancer
Prof. Mel Greaves – Institute of Cancer Research, UK
The prevalence of cancer: man vs. animals – The proximal causes of cancer: mutations and genotoxic exposures – Limitations of evolutionary adaptation by natural selection – Vulnerability to cancer from an evolutionary perspective – Lack of perfection in evolutionary 'engineering': faults/trade-offs – Evolutionary adaptation 'has no eyes to the future': mismatches between genetics and lifestyle – Natural selection will happen: evolution of robust cancer clones – The only fitness test of 'natural selectability' in evolution is survival and reproductive success: cancer risk escalation in old age

31. Viruses and Cancer
Prof. Robin Weiss – University College London, UK
Oncogenic viruses of animals and humans have given us insights into cancer in general – Specific genes involved in cancer such as oncogenes and tumor suppressor genes were first discovered through research on tumor viruses – Only a subset of viruses cause cancer – For cancers caused by viruses, the viruses are a necessary but insufficient cause of the disease – Cancer is multifactorial and different risk factors act together – Vaccines hold great promise to reduce the cancer burden – The incidence is higher in immunodeficient people – Transplant recipients and AIDS

Specific Body Systems

32. Hard Tissue Biology in Human Health and Evolution
Prof. Timothy Bromage – New York University, USA
Dental development – Enamel structure and anti-crack propagating characteristics – Global climate change and human tooth evolution – Dental and facial health issues – Bone structure and mechanical factors with aging – Bone health issues – Bone health in space

33. Lung Biology and Lung Disease
Prof. John Torday – Harbor-UCLA Medical Center, USA
The evolution of the vertebrate lung – Vertebrate evolution from unicellular organisms is reflected in lung development – Stretch-regulated pathways of lung development leading to homeostasis can fail, leading to chronic lung disease – The cell/molecular pathways that integrate lung development and homeostasis can serve to effectively diagnose and treat chronic lung disease

34. Evolutionary Considerations and the Endothelium
Dr. William Aird – Harvard Medical School, USA
The endothelial organ – Proximate mechanisms of endothelial cell heterogeneity – Evolutionary mechanisms of endothelial cell heterogeneity – Hagfish as a model for early endothelium

Mental Disorders

35. Mental Disorders in the Light of Evolutionary Biology
Prof. Randolph Nesse – University of Michigan, USA
Psychiatry is just now recognizing the need for evolutionary explanations – Same six origins of vulnerability as the rest of medicine – Emotional disorders are dysregulated defenses – Research and treatment implications – Towards a fully biological foundation for psychiatry

36. Evolutionary Behavioural Genetics and Mental Disorders
Dr. Matthew Keller – University of Colorado, Boulder, USA
Ways of assessing heritability in humans: twin and adoption designs – The evolutionary paradox of common, heritable mental disorders – Possible resolutions to the paradox: balancing selection, neutral mutation and polygenic mutation-selection balance

37. Evolutionary Biology of Depression
Prof. Lewis Wolpert – University College London, UK
Depression has a genetic component and can be triggered by stress – It is a common mental illness – Why has it not been selected out? – Sadness is adaptive but depression is probably not – Depression can be thought of as sadness becoming excessive and malignant

Questions and Answers

38. Audience Questions about Evolutionary Medicine
Prof. Randolph Nesse – University of Michigan, USA
Certain questions always come up – They reveal deep interest in the evolutionary medicine and substantial ignorance about evolution – Answering them fills some gaps in the rest of the lecture series – The future of Darwinian Medicine

HENRY STEWART TALKS

Speaker Biographies

Dr. William Aird – Harvard Medical School, USA
William C. Aird received his medical degree from the University of Western Ontario. After completing a clinical fellowship in Hematology at the Brigham and Women's hospital, Harvard Medical School and a postdoctoral fellowship in the Department of Biology at Massachusetts Institute of Technology, he established an NIH-funded research program in vascular biology at the Beth Israel Deaconess Medical Center in Boston. He is currently Associate Professor of Medicine at Harvard Medical School and Chief of the Division of Molecular and Vascular Medicine at the Beth Israel Deaconess Medical Center.

Dr. Robert Aunger – London School of Hygiene and Tropical Medicine, UK
Robert Aunger is Senior Lecturer in Evolutionary Public Health at the London School of Hygiene and Tropical Medicine. He has an interdisciplinary background, with graduate level training in economics, psychology and biology, including a PhD in biological anthropology from UCLA and postdoctoral experience at the University of Chicago and the University of Cambridge. He has written a number of books including a popular science book on the transmission of knowledge called *The Electric Meme* (2002). He has taught at the University of Cambridge, the University of Chicago and Northwestern University.

Dr. Kathleen Barnes – Johns Hopkins University, USA
Kathleen Barnes is an Associate Professor of Medicine and Mary Beryl Patch Turnbull Scholar in the Divisions of Allergy & Clinical Immunology and Pulmonary & Critical Care Medicine and the Department of Epidemiology, and Director of the Johns Hopkins Bayview Genetic Susceptibility Research Facility and Lowe Family Genomics Core. She received her PhD in biomedical anthropology at the University of Florida. Her current area of interest is the genetic epidemiology and immunogenetics of complex lung and inflammatory diseases in diverse populations, with a focus on gene-environment interactions.

Prof. Gillian Bentley – University of Durham, UK
Gillian Bentley is a Professor in the Department of Anatomy at the University of Durham, UK. She is interested in the impact of environmental stressors on reproductive function and interpopulational variation in reproductive hormone levels and its causes.

Dr. Carl Bergstrom – University of Washington, USA
Carl Bergstrom is an Associate Professor in the Department of Biology at the University of Washington. Dr. Bergstrom received his PhD in theoretical population genetics from Stanford University in 1998. His research group focuses on the ecology and evolution of infectious diseases and on the role of information in biological systems.

Prof. Timothy Bromage – New York University, USA
Timothy Bromage is Director of the Hard Tissue Research Unit, NYUCD, concentrating on the micro-anatomy of mammalian bones and teeth, particularly how it relates to environmental and evolutionary studies. He is Co-President of the Foundation for Human Health and Evolution.

Dr. Valerie Curtis – London School of Hygiene and Tropical Medicine, UK
Valerie Curtis is a Senior Lecturer in Hygiene Promotion at the London School of Hygiene and Tropical Medicine. She has worked in water, sanitation and hygiene in developing countries for over 20 years. She is trained in epidemiology and anthropology and has a particular interest in human behavior, especially from an evolutionary perspective.

Prof. S. Boyd Eaton – Emory University, USA
S. Boyd Eaton graduated from Duke University and Harvard Medical School. He practices musculoskeletal radiology in Atlanta, Georgia, USA, where he has teaching appointments in Emory University's Radiology and Anthropology departments. His 1985 *New England Journal of Medicine* article, 'Paleolithic Nutrition' is considered a seminal contribution to the field of evolutionary medicine.

Prof. Peter Ellison – Harvard University, USA
Peter Ellison is the John Cowles Professor of Anthropology at Harvard University and a leading expert in the field of human reproductive ecology. He has conducted studies involving dozens of human populations around the world, documenting the way in which human reproductive physiology responds to ecological context. His research has provided a fundamental paradigm for understanding the evolution of human reproduction and life history.

Prof. Paul Ewald – University of Louisville, USA
Paul Ewald is an evolutionary biologist specializing in the evolution of infectious disease. Paul Ewald received his PhD in 1980 from the University of Washington in zoology, specializing in ecology and evolution. He is currently director of the program in Evolutionary Medicine at the Biology Department of the University of Louisville.

Prof. Mel Greaves – Institute of Cancer Research, UK
Mel Greaves is a Professor of Cell Biology and Chairman of the Section of Haemato-Oncology at the Institute of Cancer Research, London. He trained in zoology and immunology at UCL and Stockholm. His work on the molecular genetics of childhood leukaemia has uncovered the pre-natal origin of this disease and shed light on its possible causes.

Prof. David Haig – Harvard University, USA
David Haig is an evolutionary biologist and geneticist interested in evolutionary theory, intragenomic conflicts, parent-offspring relations and evolution of the plant life cycles. He is currently a Professor in the Department of Organismic and Evolutionary Biology at Harvard University.

Dr. David Houle – Florida State University, USA
David Houle completed a PhD at the State University of New York at Stony Brook under Dr. Walt Eanes. Dr. Houle is interested in the relationship between genetic variation and evolvability and the ability to respond to natural selection. His current experimental work exploits the *Drosophila* wing as a model system to study these issues.

Dr. Matthew Keller – University of Colorado, Boulder, USA
Matthew C. Keller is an Assistant Professor of Psychology at the University of Colorado, Boulder. He received a BA from the University of Texas, Austin in 1995 and a PhD from University of Michigan, Ann Arbor in 2004. He has done postdoctoral work in psychiatric genetics at the Virginia Institute for Psychiatric and Behavioral Genetics and at the Center for Society and Genetics at UCLA. His primary interest lies in integrating evolutionary psychology and behavioral genetics.

Prof. Matthew Kluger – George Mason University, USA
Matthew Kluger received his PhD from the University of Illinois and he and his students and colleagues conducted their research on the evolution and adaptive value of fever at the University of Michigan in the 1970s and 1980s. He currently serves as Vice President for Research & Economic Development at George Mason University.

Dr. Daniel Kruger – University of Michigan, USA
Daniel Kruger earned his PhD in social psychology at Loyola University, Chicago and completed a NIMH postdoctoral fellowship in psychosocial epidemiology at the Institute for Social Research, University of Michigan. He has a broad interest in the study of humans in an evolutionary framework, especially life history and reproductive strategies.

Dr. Christopher Kuzawa – Northwestern University, USA
Chris Kuzawa is a biological anthropologist and epidemiologist with interests in developmental biology, evolutionary theory and disease. He is in the Department of Anthropology at Northwestern University and also has a visiting appointment on the Faculty of Medical and Health Sciences at the University of Auckland, New Zealand.

Prof. Jeffrey Long – University of Michigan, USA
Jeffrey Long is a Professor of Human Genetics and adjunct Professor of Biostatistics at the University of Michigan, USA. He received his PhD in human genetics from the same institution in 1984. The research in his lab is focused on the analysis of human polymorphism, including human population genetics, the inheritance of complex diseases and statistical genetics.

HENRY STEWART TALKS

Speaker Biographies

Prof. Randolph Nesse – University of Michigan, USA
Randolph M. Nesse, MD, is Professor of Psychiatry and Professor of Psychology at the University of Michigan, where he directs the Evolution and Human Adaptation Program. He collaborated with George Williams to write several seminal works on Darwinian Medicine, including *Why We Get Sick: The New Science of Darwinian Medicine*. His early research on the neuroendocrinology of anxiety has been transformed into a focus on how selection shapes mechanisms that regulate defenses such as pain, fever, anxiety and low mood. He is devoted to the mission of helping to organize the growing Evolution and Medicine community via writing, speaking and EvolutionAndMedicine.org.

Prof. Gilbert Omenn – University of Michigan, USA
Gilbert Omenn is Professor of Internal Medicine, Human Genetics, Public Health and Computational Biology at the University of Michigan. He earned his PhD in genetics at the University of Washington. His research interests include cancer proteomics, cancer prevention, science-based risk analysis, ecogenetics, health policy and science policy. He was president of the American Association for the Advancement of Science in 2006.

Prof. Mark Pagel – University of Reading, UK
Mark Pagel is Professor of Evolutionary Biology at Reading where he runs the Reading Evolutionary Biology Group. His interests include evolutionary genetics, signaling theory, sexual selection and cultural and linguistic evolution. He is best known for his work on inferring the patterns and processes of historical evolution using statistical models.

Prof. Linda Partridge – University College London, UK
Linda Partridge is a BBSRC Professional Fellow at the UCL Center for Research on Ageing, UK. The aim of her research is to use *Drosophila* as a model organism to discover genes and mechanisms that determine the rate of aging.

Prof. Andrew Read – Edinburgh University, UK
Andrew Read is the Chair of Natural History at Edinburgh University in Scotland. He received his PhD in evolutionary biology from Oxford University. His research group works on the ecology and evolution of infectious disease, with experimental work focused on malaria, entomopathogenic fungi and poultry viruses.

Prof. Graham Rook – University College London, UK
Graham Rook completed training in clinical medicine at St Thomas' Hospital, London. Prof. Rook considers himself to be an integrative physiologist, interested in linking together information from immunology, microbiology, endocrinology, neuroscience and evolution. His work has used tuberculosis and allergic disorders as its focal points.

Prof. Paul Schmid-Hempel – ETH Zurich, Switzerland
Paul Schmid-Hempel is an evolutionary biologist and ecologist interested in host-parasite interactions, their role in nature and their significance for our own species. He received his graduate training at the University of Zurich, before becoming Professor of Experimental Ecology at ETH. Among Paul's current interests is the study of evolutionary strategies of immune defenses.

Prof. Nicholas Schork – Scripps Genomic Institute of Medicine of La Jolla, USA
Nicholas Schork received his PhD in genetic epidemiology from the University of Michigan under Drs. Michael Boehnke and Patricia Peyser. Dr. Schork is interested in the genetic analysis of complex phenotypes, with a focus on statistical analysis methods for analysing and integrating data across different technology platforms and different experimental contexts.

Prof. Paul Sherman – Cornell University, USA
Paul Sherman joined the Cornell faculty in 1981 and his research has contributed to scientific understanding in six general areas: altruism, kin recognition, eusociality, sexual selection, conservation biology and Darwinian Medicine. At Cornell, Prof. Sherman teaches courses and seminars in behavioral ecology, animal behavior and Darwinian Medicine.

Prof. Stephen Stearns – Yale University, USA
Stephen Stearns received his undergraduate training at Yale and his graduate training at the universities of Wisconsin and British Columbia. He taught at Reed College in Oregon and at the University of Basel in Switzerland before moving to Yale in 2000. He works on life history evolution, the evolution of aging, evolutionary medicine and the impact of evolutionary thought on the social sciences.

Dr. Mark Thomas – University College London, UK
Mark Thomas completed a PhD in plant molecular biology at the University of Liverpool before doing postdoctoral research in medical molecular genetics at King's College Hospital, London and human evolutionary genetics and ancient DNA at the University of Cambridge. He is currently a senior lecturer in the Department of Biology, University College London, UK. His interests are in various aspects of human evolution, including genetic history, comparative genomics, cultural evolution and gene culture co-evolution.

Prof. John Torday – Harbor-UCLA Medical Center, USA
John Torday is the Director of the Perinatal Research Training Program and of the Henry L. Guenther Cell/Molecular Research Laboratory, Harbor-UCLA Medical Center. He received his PhD in experimental medicine from McGill University. He is currently Professor of Pediatrics and Professor of Obstetrics and Gynecology at UCLA. John's current area of interest is in cell/molecular signaling in lung development and disease, particularly as it relates to lung evolution.

Prof. Wenda Trevathan – New Mexico State University, USA
Wenda Trevathan is Regents Professor of Anthropology at New Mexico State University, where she has been since 1983. She is a biological anthropologist whose research focuses on the evolutionary and biocultural factors underlying human reproduction including childbirth, maternal behavior, sexuality and menopause.

Dr. Paul Turner – Yale University, USA
Paul Turner is Associate Professor of Ecology and Evolutionary Biology at Yale University. He received his PhD from Michigan State University and worked as a postdoctoral researcher at the University of Maryland, University of Valencia and the NIH. Paul's current area of interest is the ecology and evolution of infectious diseases.

Prof. Alan Weder – University of Michigan, USA
Alan Weder is Professor of Medicine at the University of Michigan where his clinical focus is on prevention of cardiovascular disease. His research interests include renal sodium handling, the genetic epidemiology of hypertension and evolution.

Prof. Robin Weiss – University College London, UK
Robin Weiss is Professor of Viral Oncology at University College London. Dr. Weiss has pioneered our understanding of HIV and AIDS, including the identification of CD4 as its cell surface receptor, HIV screening tests and contributions to public health policy on AIDS. He has also conducted research on other emerging infections such as SARS, pig viruses and avian influenza, and he has investigated AIDS-associated cancers such as lymphoma and Kaposi's sarcoma. He is currently President of the Society for General Microbiology.

Dr. Mary Jane West-Eberhard – Smithsonian Tropical Research Institute, Costa Rica
Mary Jane West-Eberhard is a Research Scientist at the Smithsonian Tropical Research Institute. She studied at the University of Michigan and was a postdoctoral fellow at the Museum of Comparative Zoology, Harvard. She has written on the evolution of social behavior, sexual selection and natural history of social wasps.

Prof. Lewis Wolpert – University College London, UK
Lewis Wolpert is Emeritus Professor of Biology as Applied to Medicine in the Department of Anatomy and Developmental Biology of UCL. His research interests are in the mechanisms involved in the development of the embryo. He was made a Fellow of the Royal Society in 1980 and awarded the CBE in 1990. His most recent book *Six Impossible Things before Breakfast: the Evolutionary Origins of Belief* was published by Faber in 2006.

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