School of Biological Sciences

Spring 2015

THE LECTURE SERIES AND ITS PURPOSE

The R. Omar and Evelyn Rilett Family Life Sciences Lecture Series was established in April 2007. It recognizes Dr. Rilett's vision and leadership, which built a Department of Biological Sciences at Illinois State University that advanced education in the natural sciences, fostered scholarly endeavors, and nurtured the development of research to the benefit of all who chose to teach and learn at this institution. The purpose is to bring outstanding life scientists and lectures to Illinois State University to benefit academic and local communities.

School of Biological Sciences

presents

R. Omar and Evelyn Rilett Family Life Sciences Lecture Series

Co-Sponsored by the

School of Biological Sciences,
Phi Sigma, and Provost Office
at Illinois State University

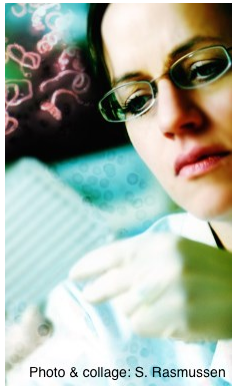

Photo & collage: S. Rasmussen

Dr. Andrea Graham

Assistant Professor
Ecology & Evolutionary Biology
Princeton University

Princeton, NJ

March 5, 2015 6:00 P.M.

Prairie Room

Bone Student Center

Illinois State University

LECTURE SERIES PROGRAM

WELCOME

Dr. David Rubin

School of Biological Sciences

HISTORY OF LECTURE SERIES

Dr. Craig Gatto

Director, School of Biological Sciences

INTRODUCTION OF SPEAKER

Dr. Ben Sadd

School of Biological Sciences

PRESENTATION

Why do immune systems harm their bearers? The evolutionary biology of "friendly fire"

Human immune systems work wonders to protect against infection, yet they also cause a great deal of collateral damage. Indeed, immune-mediated diseases such as septic shock, inflammatory bowel disease, multiple sclerosis or systemic lupus erythematosus can be debilitating or even lethal. This lecture will focus upon both molecular and evolutionary explanations for such diseases, using examples from the medical literature as well as my own work on wild animals, such as sheep on islands in the Outer Hebrides of Scotland. Molecular explanations for autoimmune disease include excessive inflammation during "cytokine storms" and self-targeted antibodies. Evolutionary explanations include improved defense against infection in autoimmune individuals, manipulation by selfish parasites, and the absence of natural microbial communities that modulate inflammation. I will explain each of these in detail and will conclude with a discussion of evolutionarily-informed treatments for immune-mediated diseases.

Highlights of Dr. Andrea Graham's career, thus far:

Dr. Graham has a general interest in understanding how both immunity and infectious diseases are shaped by natural selection. In particular, her research group studies why individuals differ in their immune responsiveness, even though a strong immune system would appear essential. The group uses familiar immunological techniques, but draws concepts from evolution and ecology. Current work investigates immune conflicts following co-infection with multiple parasites and self-harm caused by over-zealous immune responses. Malaria and intestinal worms are utilized as parasites, with mice and natural sheep populations used as hosts. In addition to grants supporting her own work, Dr. Graham is the leader of a 40-member National Science Foundation funded research network on the evolution of infectious diseases, and is part of the Health Grand Challenges Program addressing pressing problems in global health and infectious disease.

Education:

- Ph.D. in Ecology & Evolutionary Biology, Cornell University, 2001
- A.B. *Summa cum laude* in Biological Sciences & Sculpture, Mount Holyoke College, 1992

Academic Appointments:

- Assistant Professor, Princeton University, Department of Ecology & Evolutionary Biology, 2009-current
- U.K. BBSRC David Phillips Research Fellow, University of Edinburgh, Institutes of Evolution, Immunology & Infection Research, 2006-2010
- Leverhulme Trust Early Career Fellow, University of Edinburgh, Institutes of Evolution, Immunology & Infection Research, 2004-2006
- Wellcome Trust Post-doctoral Research Associate in Evolutionary Immunology, University of Edinburgh, Institute of Cell, Animal, & Population Biology 2001-2004
- Howard Hughes Medical Institute Pre-doctoral Fellow in Biostatistics & Epidemiology, Cornell University, Department of Ecology & Evolutionary Biology, 1996-2001

Awards and Honors:
Distinguished Visiting Lecturer in Biostatistics, New York University
Distinguished Visiting Lecturer in Evolutionary Medicine, Yale University
BBSRC David Phillips Fellowship Award
Leverhulme Trust & School of Biological Sciences Early Career Fellowship Award
Wellcome Trust Value in People (VIP) Award
Associate Editor for *Proceedings of the Royal Society, B: Biological Sciences*
Associate Editor for *Evolution, Medicine & Public Health*

Grant Funding:
Dr. Graham currently has funding from the National Science Foundation and the Health Grand Challenges Program. Prior funding has included support from the National Institutes of Health, Wellcome Trust, Howard Hughes Medical Institute, and the U.K. Biotechnology and Biological Sciences Research Council

Publications:
Dr. Graham's efforts have generated over 50 peer- reviewed publications. Some examples include:

- A. D. Hayward, D. H. Nussey, A. J. Wilson, C. Berenos, J. G. Pilkington, K. A. Watt, J. M. Pemberton & **A. L. Graham**. **2014**. Natural selection on individual variation in tolerance of gastrointestinal nematode infection. *PLoS Biology* 12: e1001917.
- C. J. E. Metcalf, G. H. Long, N. Mideo, J. D. Forester, O. N. Bjørnstad & **A. L. Graham**. **2012**. Revealing mechanisms underlying variation in malaria virulence: effective propagation and host control of uninfected red blood cell supply. *Journal of the Royal Society Interface* 9: 2804-13.
- G. H. Long & **A. L. Graham**. **2011**. Consequences of immunopathology for pathogen virulence evolution and public health: Malaria as a case study. *Evolutionary Applications* 4: 278-91.
- **A. L. Graham**, A. D. Hayward, K. A. Watt, J. G. Pilkington, J. M. Pemberton & D. H. Nussey. **2010**. Fitness correlates of heritable variation in antibody responsiveness in a wild mammal. *Science* 330: 662-65.
- **A. L. Graham. 2008**. Ecological rules governing helminth-microparasite co-infection. *Proceedings of the National Academy of Sciences, U.S.A.* 105: 566-70.