



LINKING EVOLUTION AND MEDICINE CARL T. BERGSTROM

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In an age of emerging infectious diseases, ecologists and evolutionary biologists have significant contributions to offer to medical research and practice. Containing the spread of antibiotic-resistant bacteria in hospitals, preventing avian flu from triggering a human pandemic, treating a cancerous tumor, or even slowing the progression of HIV within an individual patient – each of these problems is literally an exercise in applied evolutionary biology. In each case, physicians and public health experts are battling against an evolving enemy. In order to win, we need to know how that evolution is likely to proceed, and how

we can influence its direction. In order to anticipate and to contain disease spread and disease evolution, we need to understand the underlying population biology and population genetics of both pathogen and host.

Conversely, medical science offers one of the greatest resources to biologists interested in the “basic science” aspects of evolution. Through the wealth of available data and the rapidity of pathogen evolution, infectious disease biology offers to population biologists an opportunity to observe evolution taking place in “real time”, and as such provides a rich set of study systems for biologists who are interested in the basic ecological and evolutionary principles.

The fact that in medicine we often deal with rapidly evolving pathogens is only one of the many connections between the disciplines of evolution and medicine. Other connections reflect the fact that we ourselves, the beneficiaries of medical science, are evolved organisms. Without understanding how evolution has shaped our physiological and psychological responses to the world, we lack a full understanding of the nature of both health and of disease. To know how to promote health and avoid certain pathologies, it helps to understand the evolutionary origin of the responses involved in each.

Despite these seemingly obvious and clearly important connections, medical education and evolutionary biology have remained largely disconnected. Medical curricula rarely include courses in evolution, and relatively few (though this is changing) evolutionary biologists have a deep understanding of any area of experimental or clinical medicine.

This past year at the Wissenschaftskolleg, I was fortunate enough to have the opportunity to participate in a revolutionary working group led by Dr. Randolph Nesse, with the aim of engineering a unification of these fields. While I was only able to visit for four short weeks, due to the constraints of having young children at home in Seattle, I was able to make up for the restricted time with an intensity of work and focus that is rarely ever possible at home.

Meeting for several hours a day while I was there, as a group we sketched out the broad connections between the disciplines and drew upon one another’s diverse backgrounds in order to expand our own understanding of how these aspects of science fit together. We looked to the future, carefully evaluating alternative approaches to bringing these fields together, while at the same time always questioning the utility of doing so and moving forward only where we could solidly justify the benefits. I arrived in Berlin with a firm understanding of my own research area – infectious disease evolution – but largely ignorant (and sometimes skeptical) of the other connections between evolution and medicine.

I left Berlin with a much fuller background in the connections between evolution and mental health, evolution and nutritional health, evolution and genetic disease, to mention just a few examples. I hope I was able to contribute a small measure of my own background in infectious disease to the understanding of the other members of the group.

And I was able to be part of the founding of what I believe will be a very valuable service to our research community, the *Evolution and Medicine Review*, edited by Wissenschaftskolleg Fellows Randolph Nesse and Catriona MacCallum. One of the fascinating aspects of our discussions was the focus on how we could set up the appropriate communications structures to move the field forward. In 2008, a traditional scholarly society and associated print journal might not be the best way to go. Instead, we decided (among other things) to establish a new communication model, which we term a WeView – short for Web Review, that lies somewhere between commentary and review journal, a dynamic interactive forum with top-quality article content written by the leading people in the field and commented upon by the community at large. The *Evolution and Medicine Review* is a fully open-access, creative-commons licensed platform, available on the web at <http://evmedreview.com/>. I have already contributed several pieces – rather like short review papers or commentaries – in my capacity as a senior correspondent. This is a great venue for promoting ideas that have been published but perhaps underappreciated in the literature and for generating enthusiasm and interest in fruitful areas of evolution and medicine. Given my own personal interests in the evolving world of scholarly communication, this was a particularly exciting and gratifying project for me, and seeing it come to fruition serves as the highlight of my time in Berlin during 2007–2008.