Yale-New Haven Teachers Institute®

Curriculum Units by Fellows of the Yale-New Haven Teachers Institute
2009 Volume V: Evolutionary Medicine

Introduction

Evolutionary biology involves studying genetic changes within populations over time, and resolving relatedness among species. Although evolution is central to the understanding of biology and the history of life on Earth, one problem with teaching evolutionary biology is that students often fail to grasp its applied significance. Evolutionary medicine is the application of evolutionary thinking to gain valuable insights and new perspectives into human health and disease, demonstrating that knowledge of evolution vitally impacts our everyday lives.

The overall aim of this seminar was to explore ways to teach students about aspects of evolutionary medicine, emphasizing that this interdisciplinary science helps explain the origins of many medical conditions, including obesity, diabetes, asthma, heart disease, allergies and aging. Also, the seminar stressed that evolutionary medicine informs why humans often suffer from infectious diseases ranging from benign to deadly, and how illnesses such as smallpox, malaria, AIDS and the flu have profoundly influenced human evolution, societal interactions, and major historical events. The seminar incorporated instruction and discussions of readings on evolutionary medicine, some hands-on laboratory experiments, and tours of museum exhibits relating to evolutionary biology and the impact of this science on art and culture. The seminar was intended for teachers of science, mathematics and social studies at all grade levels.

The resulting units were diverse, reflecting the varied interests and backgrounds of the Fellows. Joseph Corsetti examines the historical controversies and ethical issues relating to eugenics: selective breeding in humans. Fallon Daniels looks at evolutionary biology through the lens of infectious diseases, emphasizing how human evolution can be better understood by studying the microbes that make us sick. Todney Harris focuses on the Columbian Exchange, and the historical impact caused by movement of pathogens between the Old World to the New World. Paul Jones shows that evolution may be taught from the perspective of genetic changes in virus populations, a useful tool for convincing reluctant students that evolution exists and is a matter of life and death. John Laub's unit is on the role of twentieth-century government in protecting public health against the spread of deadly infectious diseases, and allows students to debate policy in this area. Kathleen Rooney uses a mathematics unit to show how math functions are useful for translating data into models, especially in the case of Lyme disease and West Nile fever. Nancy Schmitt's unit warns students that human health may be adversely affected by increased levels of toxic pollutants, similar to the alarming declines evident in frog and other amphibian populations. Hermine Smikle's unit connects biology with mathematics, showing that math concepts can be usefully demonstrated by examining growth and spread of disease microbes. Kenneth Spinka's unit seeks to prepare students for math and physics by exploring mathematical probabilities in evolutionary medicine, especially the generation of fractals.

Paul E. Turner