

# PUBLIC LECTURES SHOWCASE SERIES

## Ontology, Bioinformatics and the Life Sciences

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Scientific researchers need increasingly to work with large bodies of digital data deriving from diverse sources. Ontologies exist to make such bodies of data combinable in useful ways and accessible to human beings. UB is an international center of ontological research and this series of lectures is designed to introduce the methods of ontology to the UB scientific community.

**SEPTEMBER 28**

**Barry Smith (Philosophy)**

**The Future of Biomedicine: How Common Ontologies Create Research Communities**

We will describe what ontologies are, and show how they are helping clinical researchers to address complex phenomena of translational medicine spanning all levels of granularity from molecule to patient.

**Lindsay Cowell (Duke University)**

**Ontology in the Fight Against Bugs: The Future of Vaccine Design**

Infectious disease has become the leading cause of death for people under the age of 50, and vaccines are now our best defense. Because the purpose of vaccines is to elicit an immune response, success in designing vaccines rests on understanding the immune response in all its complexity. I will show how an ontology-based approach can help in this understanding.

**OCTOBER 5**

**Ingvar Johansson (Philosophy)**

**What the Parts of Your Body Do: Why Even Post-Darwinian Biology Needs an Ontology of Functions**

The Darwinian revolution dealt a death blow to the view that biology, in contradistinction to physics and chemistry, needs to talk about purpose and design. Philosophers of science have taken this to mean also that talk of functions is biologically unscientific. This view will be contested. It will be argued that even post-Darwinian biology needs an ontology of functions.

**Louis J. Goldberg (Dental Medicine) and Neil Williams (Philosophy)**

**Pathological Reasoning: How to Think About Disease**

Thinking about disease is thinking about the cells of the body, the normal activities they engage in, and the cooperative networks they form. We will consider an ontology of disease which conceives disease to be a distortion of such cellular networks, wherein the activities of the networks falls into a range that threatens the survival of the organism.

**OCTOBER 12**

**Marc S. Halfon (Biochemistry)**

**What Genes Do**

I will address the fundamental importance of regulating (controlling) when and where genes are active in development, evolution, and disease. A basic model for gene regulation will be given and issues surrounding the identification and characterization of regulatory DNA sequences discussed. I will conclude with an illustration of how anatomy and sequence ontologies are aiding our efforts to investigate the mechanisms of gene regulation.

**Steven R. Gill (Oral Biology)**

**The Microbiome: Assaying What Lives Inside Your Body**

The human body is home to trillions of bacteria that play critical roles in human development and physiology. These bacteria have co-evolved with their human hosts to provide essential metabolic functions. We can conclude that humans are superorganisms whose metabolism represents an amalgamation of microbial and human attributes.

**OCTOBER 19**

**Maureen Donnelly (Philosophy/Bioinformatics)**

**Anatomical Reasoning: How to Think About the Body**

Being part of and being contained in are qualitative spatial relations used in anatomy to describe the structure of the human body. This lecture will show how a precise account of the logical properties of such relations can improve clarity and reasoning power in anatomical ontologies.

**Werner Ceusters (Psychiatry/Bioinformatics)**

**Ontology and the Future of Psychiatric Diagnosis**

Psychiatric diagnoses are standardly established through the application of two distinct methodologies. The first, called 'categorical', holds that terms like 'schizophrenia' refer to single, discrete types – analogous to biological species – of which a particular patient does or does not exhibit an instance. The second, called 'dimensional', holds that mental disorders form a continuous space, so that diagnosis proceeds by locating coordinates in this space on the basis of different weighted factors. We show how a robust ontology of mental disorders can and must accommodate both views.

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**Lecturers**

**WERNER CEUSTERS** is Professor in the Department of Psychiatry in UB's School of Medicine and Biomedical Sciences and Director of the Ontology Research Group of the New York State Center of Excellence in Bioinformatics and Life Sciences.

**LINDSAY COWELL** is Assistant Professor in the Departments of Biostatistics & of Bioinformatics and Immunology at Duke University Medical Center. She studies the genetic diversification mechanisms that are the foundation of immune memory.

**MAUREEN DONNELLY** is a research scientist at the New York State Center of Excellence in Bioinformatics and Life Sciences. Her primary areas of research are ontology, spatial and temporal reasoning, and medical informatics.

**STEVEN GILL** is Associate Professor in UB's Oral Biology Department and holds a joint appointment at the Center of Excellence in Bioinformatics and Life Sciences. He uses genomics and bioinformatics approaches to study bacterial communities and their interactions with the human host.

**LOUIS J. GOLDBERG** is Professor in UB's Departments of Oral Biology and Oral Diagnostic Sciences, School of Dental Medicine, working in ontology and neuroscience.

**MARC HALFON** is Assistant Professor in UB's Department of Biochemistry and holds a joint appointment in the Center of Excellence in Bioinformatics and Life Sciences. His work combines genomics and bioinformatics with traditional molecular and genetic techniques.

**INGVAR JOHANSSON** formerly Professor of Philosophy in Umeå University, Sweden, is now Senior Researcher at the Institute of Formal Ontology and Medical Information Science, Saarland University, Germany. He has published books and articles in both ontology and philosophy of science.

**BARRY SMITH** is SUNY Distinguished Julian Park Professor of Philosophy and Director of the National Center for Ontological Research. He has published over 300 scientific papers on ontology-related topics.

**NEIL WILLIAMS** is Assistant Professor in UB's Department of Philosophy. He works at the intersection of ontology and the philosophy of science, where he is concerned with issues of causation, powers, and the laws of nature.