

**Siemens Competition
2016 Regional Finals**

Carnegie Mellon University Judges



Dr. Bruce Armitage – *Department of Chemistry*

Bruce Armitage earned his BS in Chemistry from the University of Rochester in 1988 and his Ph.D from the University of Arizona in 1993, where he studied photochemical reactions in phospholipid membrane environments. He then spent four years doing postdoctoral research on the chemistry of natural and synthetic nucleic acids at the University of Illinois, Georgia Institute of Technology and University of Copenhagen before joining the faculty at Carnegie Mellon in 1997, where he is now Professor of Chemistry and Co-Director of the Center for Nucleic Acids Science and Technology. Dr. Armitage is also Senior Editor of the journal *Langmuir*, which publishes research in colloid and surface science.

Dr. Armitage's research focuses on the use of chemical methods and concepts to understand the molecular mechanisms of gene expression. His research group designs and synthesizes molecules that can bind to specific RNA and DNA targets. By optimizing the strength and selectivity of these binding interactions, these molecules will be useful for understanding the functions of genes and represent potential candidates for therapeutics for genetic diseases. In addition, Dr. Armitage's lab specializes in the use of nanotechnology to create functional DNA-based materials for biological imaging and sensing. Dr. Armitage teaches courses in organic chemistry, medicinal chemistry and sensor technology for undergraduate and graduate students at Carnegie Mellon.



Dr. Boris Bukh – *Department of Mathematical Sciences*

Boris Bukh studied computer science at the City College of San Francisco, leaving it in 2003 without a degree. He then enrolled into UC Berkeley from which he graduated in 2005 with a B.A. in mathematics. He then obtained a doctorate from Princeton in 2009. The next three years he spent in the Churchill College of the University of Cambridge. He joined Carnegie Mellon in 2012.

Dr. Bukh's interests are in pure mathematics. He is easily seduced by combinatorial problems with analytic and algebraic flavours. Among his favorite problems are: is there a polynomial f whose square has much fewer terms than f ? How can one arrange n points in the plane so that the triangles that they span do not overlap too much? What do graphs with many edges but no cycles of length 4 look like?



Dr. Markus Deserno – *Department of Physics*

Markus Deserno received a diploma in Physics from the University of Erlangen/Nürnberg (Germany) in 1996 and a Ph.D. in Physics from the Max-Planck-Institute for Polymer Research (MPI-P) and the University of Mainz (Germany) in 2000. After three years as a postdoctoral researcher in the Department of Chemistry and Biochemistry at UCLA, he became a project leader at the MPI-P, where he also earned his "habilitation". He joined the faculty at Carnegie Mellon in 2007, where he is now Full Professor in the Department of Physics, for which he also serves as the Associate Department Head since 2013.

Dr. Deserno uses a wide variety of theoretical and computational tools to study problems in the field of Biological Physics. He is particularly interested in the question how proteins shape biological membranes. On the computational side, he uses and has developed coarse-grained models to study lipid membranes and proteins at length- and time-scales exceeding the capabilities of traditional atomistic molecular dynamics. On the theoretical side, Dr. Deserno applies tools such as continuum elasticity theory, differential geometry, and statistical field theory. He has taught graduate courses in Statistical Physics and Biological Physics, and has brought the undergraduate course "Physics for future Presidents" to CMU, which he co-taught between 2009 and 2013.



Dr. Francois Lanusse – *Department of Physics*

Francois Lanusse received a diploma in electrical engineering and information sciences from the École supérieure d'électricité (France) in 2011. He then earned a Master's degree in fundamental physics from Paris XI University before joining the Astrophysics department of the French CEA research institute for a PhD in observational cosmology and signal processing he completed in 2015. He then moved to the US for a postdoctoral research position at CMU within the McWilliams Center for Cosmology.

Dr. Lanusse's research interests encompass observational cosmology, signal processing, statistics and machine learning. His research mainly focuses on developing innovative tools to exploit the weak gravitational lensing effect, which causes minute deformations of distant galaxy images in the presence of massive objects along the line of sight. Measuring this extremely faint signal makes it possible to probe the dark matter distribution in the Universe and help answer questions about the nature of dark energy.



Dr. A. Javier Lopez – *Department of Biological Sciences and Lane Center for Computational Biology*

Javier Lopez earned his BA in Biology from Cornell University in 1979 and his Ph.D. in Biochemistry and Genetics from Duke University in 1985, where he studied the mechanisms of filamentous virus assembly at the bacterial cell membrane. He then pursued postdoctoral research at Stanford University, where he investigated the role of alternative pre-mRNA splicing in regulating gene expression and function during development in *Drosophila*. He joined the faculty of Carnegie Mellon in 1990, where he is now a member of the Department of Biological Sciences and the Lane

Center for Computational Biology.

Dr. Lopez's research focuses on the mechanisms and biological functions of regulated alternative splicing and other RNA processing events. His work combines genetic, molecular, biochemical and computational approaches.

Current projects in his laboratory include fundamental studies in *Drosophila* and mammalian models, with a focus on the role of alternative splicing in aging and oxidative stress. Dr. Lopez teaches courses in genetics and genomics for undergraduate and graduate students at Carnegie Mellon.



Dr. Brooke McCartney – *Department of Biological Sciences*

Brooke McCartney earned her bachelor's degree in Biological Sciences from Mount Holyoke College in 1992, and her Ph.D. in Cell and Developmental Biology from Duke University in 1997, where she studied the basic cellular functions of the Neurofibromatosis-2 tumor suppressor Merlin. She then spent five years doing postdoctoral research on the cytoskeletal and signaling functions of the colorectal cancer tumor suppressor Adenomatous polyposis coli (APC) at the University of North Carolina at Chapel Hill. Dr. McCartney joined the faculty at Carnegie Mellon in 2003, where

she is now an Associate Professor of Biological Sciences.

Dr. McCartney's laboratory uses the fruit fly *Drosophila melanogaster* as an experimental model to investigate two distinct areas of biology. One focus area is the mechanisms that control the assembly of the actin cytoskeleton and that govern actin-microtubule crosstalk during normal development and cancer development. The second focus area is host-microbe interaction. Specifically, the lab is investigating how the normal microbial residents of the gut, the gut microbiota, influence animal physiology and behavior. Dr. McCartney teaches an introductory level course for non-majors on the connections between fundamental biology and modern medical therapies, and an advanced course in developmental biology for the undergraduate and graduate students at Carnegie Mellon.



Dr. Kevin Noonan – *Department of Chemistry*

Kevin Noonan earned his B.Sc in Chemistry from Dalhousie University in 2003 and his Ph.D from the University of British Columbia in 2008, where he studied controlled polymerization approaches to phosphorus-based polymers. He then moved to the United States and conducted postdoctoral research on alkaline membrane fuel cells at Cornell University under Geoffrey Coates as part of the Energy and Materials Center. He joined the faculty at Carnegie Mellon in 2011, where he is now

an Assistant Professor of Chemistry.

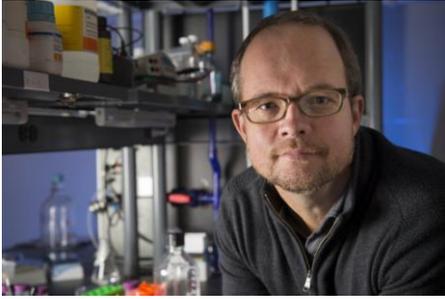
Dr. Noonan's research focuses on the design and synthesis of polymer materials for transport applications. He has three main thrusts in his research group: semiconducting polymers for electron transport, gas separation membranes for CO₂ sequestration and phosphorus-based materials for anion exchange membranes. The phosphorus-based polymers are being developed as a solid support to be used in alkaline fuel cells. There is currently a great deal of interest in new chemistries for alkaline membranes to make materials with similar stability to Nafion. Dr. Noonan also teaches courses in organic and organometallic for undergraduate and graduate students at Carnegie Mellon.



Dr. Wesley Pegden – *Department of Mathematical Sciences*

Wes Pegden earned his B.A from the University of Chicago in 2004 and his Ph.D from Rutgers University in 2010. He was a NSF Postdoctoral Fellow at the Courant Institute from 2010-2013, before joining the Mathematics department of CMU as an assistant professor.

Dr. Pegden's research is in combinatorics and probabilistic methods. A major area of focus is the Abelian sandpile, a simple iterative process introduced by physicists in the 1987, which was observed to produce striking and mysterious fractal patterns. Dr. Pegden's work developed a mathematical framework to understand and predict fractal behavior in the sandpile, through methods which connect tilings of the Euclidean plane, circle packings, and "bounded curvature" quadratic forms.



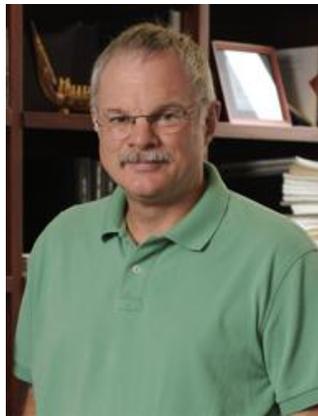
Dr. Newell Washburn – *Department of Biomedical Engineering and Chemistry*

Newell Washburn received a B.S. in Chemistry from University of Illinois at Urbana-Champaign in 1993 and a Ph.D. in Chemistry from the University of California, Berkeley in 1998. Following post-doctoral research at the University of Minnesota in the Department of Chemical Engineering and Materials Science, he moved to the

Polymers Division at the National Institute of Standards and Technology, first as a National Research Council Post-Doctoral Fellow then as Leader of the Biomaterials Group. During this time he was also an Adjunct Professor at Johns Hopkins University in the Graduate Program in Biotechnology. He joined the faculty of Carnegie Mellon University in the Departments of Chemistry and Biomedical Engineering in 2004 and is Member Faculty at the McGowan Institute of Regenerative Medicine at the University of Pittsburgh. In 2011, he was promoted to Associate Professor at CMU.

Prof. Washburn's research interests center on molecular engineering of technological materials with active areas of interest ranging from dispersants to coatings.

The Washburn lab has developed gels for localized delivery of therapeutic antibodies, lignin-based superplasticizers for concrete, and hyaluronic acid materials for medical diagnostics. Prof. Washburn teaches general chemistry, organic chemistry, and graduate-level courses in materials.



Dr. John Woolford – *Department of Biological Sciences*

John Woolford earned his BA in Chemistry from Rice University in 1971, where he studied matrix isolation infrared spectroscopy. Woolford received his Ph.D. from Duke University in 1976, where he studied effects of assembly of bacteriophage f1 on phospholipid metabolism in *E. coli*.

Woolford was a postdoctoral fellow at the Rosenstiel Center and Department of Biology at Brandeis University, where he purified and characterized ribosomal protein genes in yeast. This led to the discovery of introns in these genes and the factors that regulate splicing of pre-mRNAs. In 1979, Woolford joined the faculty at Carnegie Mellon University, where he is now Professor of Biological Sciences and co-director of the Center for Nucleic Acids Science and Technology.

Dr. Woolford's research focuses on the mechanism of assembly of ribosomes in the yeast *Saccharomyces cerevisiae*. His group takes genetic and proteomic approaches to identify and characterize proteins necessary for maturation of assembly intermediates. They developed the first methods to purify ribosome assembly intermediates from cells. Recently the Woolford group has mapped the functions in assembly of all of the protein constituents of mature

ribosome. Dr. Woolford teaches courses in Molecular Biology and Genetics to undergraduate and graduate students at Carnegie Mellon.