

**Siemens Competition
2017 Regional Finals
Carnegie Mellon University Judges**

DR. BROOKE MCCARTNEY - *Department of Biological Sciences (Lead Judge)*



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. PHIL CAMPBELL - *Institute for Complex Engineered Systems (ICES)*



Phil Campbell is a Research Professor within the Institute for Complex Engineered Systems at CMU's Carnegie Institute of Technology with appointments in Biomedical Engineering, Material Science and Engineering, Bone Tissue Engineering Center, Molecular Biosensor and Imaging Center, Biological Sciences and MERITS. He has over 25 years' experience conducting interdisciplinary biomedical engineering research involving endocrinology tissue engineering, bioimaging, microimplantable biosensors, biological patterning with special interest in musculoskeletal repair and regeneration.

Dr. Campbell is actively involved with undergraduate, graduate and post-graduate education and also involved in outreach education from K-12 through to adults. He is a co-founder of the Pittsburgh regional middle/school teacher tissue engineering intern program. He regularly lectures and conducts hands-on tissue engineering laboratory experiences for such programs as the Pittsburgh Science Festival, the Pennsylvania Governor's School, the Pittsburgh Jewish Foundation, the Girl Scout Biotechnology Initiative, Academy for Lifelong Learning, and the Elderhausen Program. He is also co-founder and Chief Scientific Officer for Carmell, Inc. a

Pittsburgh-based biotechnology company developing blood plasma-based plastics for biomedical applications.

DR. WALTER CARSON - *Department of Biological Sciences, University of Pittsburgh*



Walter Carson completed his doctorate at Cornell University in Ecology and Evolutionary Biology in 1993. He then completed postdoctoral research at Princeton University where he began 20 years of research on the ecology of tropical forests in Panama, Costa Rica, and most recently Ecuador. He joined the Department of Biological Sciences at the University of Pittsburgh in 1994 where he is currently an Associate Professor. He is a former University of Pittsburgh Fellow in Sustainability (2015-2016) and is currently a Charles Bullard Fellow in Forest Research at Harvard University. He just returned from two weeks in Russia as a guest of the Russian Festival of Science and the United States Embassy in Moscow. While there, he lectured extensively on the future of the world's temperate forest biomes.

Dr. Carson's research focuses on the ecology and sustainability of both tropical and temperate forests with a focus on the Neotropics in Central and South America and the Eastern Deciduous Forest Biome of North America. He uses long-term and large-scale field experiments to study the underlying causes of forest change and biodiversity loss. He has additional research interests in the ecology of endophytic leaf bacteria and has recently begun extensive studies in collaboration with one of his doctoral students on the ecology of hyperdiverse epiphyte communities that inhabit the canopies of Neotropical cloud forests.

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. TINA KAHNIASHVILI - *Department of Physics*



Tina Kahniashvili has received M.S. with honors in Physics (Theoretical Physics) from Tbilisi State University, Georgia, in 1984, and she got her Ph.D. degree in Physics in 1988 from Space Research Institute (Moscow, Russia). Dr. Kahniashvili has received Doctor of Sciences (Habilitation) in Physics and Mathematics from Lebedev Physics Institute (Moscow, Russia) in 1999. She has worked at different universities worldwide, including Rutgers, New Jersey State University (USA), Kansas State University (USA), New York University (USA), Geneva University (Switzerland). Since 2006 she is a senior associate member at International Center for Theoretical Physics (Italy) and she is also an adjunct professor at Laurentian University (Canada). In 2008 she started to work at Ilia State University (Georgia) where she is now a full professor of Astrophysics. Dr. Kahniashvili has joined Carnegie Mellon University in 2009 as a visiting professor, and since 2013 she is an associate research professor at the Department of Physics.

Dr. Kahniashvili's research includes investigations of physical processes in the universe at very early epochs as well as at late times. In particular, she studies (i) fundamental symmetry tests at very high energies (early epochs of the universe expansion) using available data of astrophysical, cosmological, and particle physics experiments; (ii) gravitational wave signals from the very early universe (inflation, cosmological phase transitions); (iii) cosmic microwave background fluctuations in beyond standard cosmological models. In addition, she is interested in alternative scenarios to explain the accelerated expansion of the universe, such as modifications of general relativity (especially massive gravity models). From the astrophysics side, Dr. Kahniashvili is working on cosmic magnetic fields and the origin, evolution, and observables signatures of primordial hydro and magnetohydrodynamic turbulence.

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. 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.

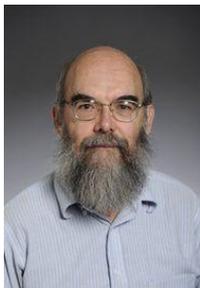
DR. WESLEY PEGDEN - *Department of Mathematical Sciences*



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. BRIAN QUINN - *Department of Physics*



Brian Quinn graduated from McGill University with a B.Sc. with first class honors in Physics in 1978 and received his Ph.D. in Nuclear Physics from MIT in 1984. He spent four years working with the Medium Energy Physics group at CMU as a postdoc and Research Physicist working on hyper-nuclear weak-decay experiments at Brookhaven's Alternating Gradient Synchrotron and on anti-proton annihilation experiments at CERN's Low Energy Antiproton Ring. He then joined the faculty at CMU in 1988 and is now a Full Professor in the Physics Department.

Dr. Quinn has broad experience in experimental sub-atomic particle physics, having worked on experiments using pion and kaon beams at Brookhaven National Lab and KEK, anti-proton and ultra-relativistic heavy ion beams at CERN and electron and gamma ray beams at MIT-Bates Linac, TUNL, and most recently Jefferson Lab's CEBAF superconducting racetrack linac. He has studied production and weak decay of systems containing the strange quark, used parity-violating electron scattering as a probe of the weak structure of the proton and nuclei, and used electron scattering to study the structure of nucleons and light nuclei. He has been involved in detector construction, custom electronics design, data acquisition programming and data analysis, working with detectors used for high resolution timing, triggering, tracking, particle identification and energy determination. He is presently involved in the construction and calibration of a hadron calorimeter for use in the Super Bigbite Spectrometer (SBS) being built at Jefferson lab. He is spokesperson for the neutron magnetic form-factor measurement which is scheduled to be the first experiment on the SBS. He has served as thesis advisor for six Ph.D. students, two of whom now have faculty positions. He has taught at the undergraduate and graduate level and participates in outreach to middle school students.

DR. MARY RADCLIFFE - *Department of Mathematical Sciences*

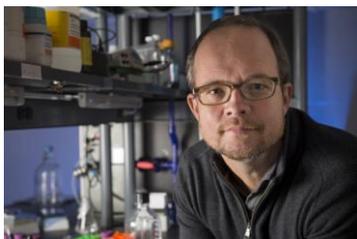


Mary Radcliffe received a PhD in Mathematics from the University of California, San Diego in 2012, where she studied random graph theory and eigenvalues of graphs. She then moved to a postdoctoral position at the University of Washington, studying geometric eigenvalues in graphs and metric spaces. In 2015, she moved to Carnegie Mellon University, and is now an Instructor in Mathematics.

Dr. Radcliffe's research focuses in graph theory, with an emphasis in both traditional and geometric spectral graph theory, clustering problems and their relationship to eigenvalues, and some coloring-related problems. One

particular area of interest is how using graphs as an underlying metric space can impact the information and usefulness of generalized graph eigenvalues. She is interested in undergraduate education, and has worked with undergraduates on several different research projects. She teaches several undergraduate courses, and has been involved with the Pennsylvania Governor's School in Math and Science over the summer, working on research projects with talented high school students.

DR. NEWELL WASHBURN - *Department of Biomedical Engineering and Chemistry*

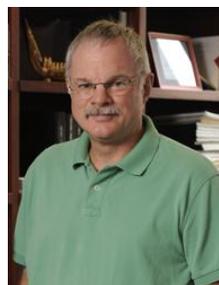


Newell Washburn received a B.S. in Chemistry from University of Illinois at Urbana-Champaign in 1993 and a Ph.D. in Chemistry from the University of California, Berkeley in 1998. Following post-doctoral research at the University of Minnesota in the Department of Chemical Engineering and Materials Science,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