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Siemens Competition
2015 Regional Finals
University of Notre Dame Judges

Paul Helquist, Ph.D., Lead Judge
Department of Chemistry and Biochemistry
Professor and Associate Chair
University of Notre Dame

Dr. Paul Helquist received his B.S. degree in chemistry and mathematics at the University of Minnesota. He then earned his M.S. and Ph.D. degrees in organic chemistry at Cornell University followed by postdoctoral research in synthetic organic chemistry at Harvard University with Nobel Laureate E. J. Corey.

Dr. Helquist has been a university faculty member for 42 years. He held a professorship at another university before coming to Notre Dame in 1984. He is a specialist in synthetic organic chemistry and has over 170 publications and patents in the following areas: development of new synthetic methods; design and development of transition metal reagents and catalysts for selective synthetic reactions, including new enantioselective methods; development of new methods for the total synthesis of natural products synthesis and applications to new pharmaceuticals, including antibacterial and antitumor agents and treatments for rare inherited diseases as part of an international network of collaborators in the U.S.A., Europe, and Asia. A therapeutic agent that he has developed is currently being used in an FDA-approved human clinical trial. Dr. Helquist has served as Chair of the Chemistry Board of Examiners for the Graduate Records Examination at the Educational Testing Service, as the Director of the National Science Foundation Workshop for College Teachers of Organic Chemistry, as a consultant to the pharmaceutical industry, and head of an Indiana state-wide program for clinical translational research at Indiana University, Purdue University, and Notre Dame. Since 1981, he has offered special courses on advanced synthetic organic chemistry on 140 occasions at sites throughout the U.S.A., Canada, and Europe under the auspices of the Continuing Education Department of the American Chemical Society and several other sponsors. He teaches organic chemistry and advanced synthetic organic chemistry courses for undergraduate and graduate students at Notre Dame. He has held guest professorships in Sweden and Denmark on several occasions.

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Amanda Hummon, Ph.D.
Department of Chemistry and Biochemistry
Charles L. Huisking Associate Professor of Chemistry and Biochemistry
University of Notre Dame

Dr. Amanda Hummon received her AB degree in chemistry at Cornell University. She then earned her Ph.D. degree in bioanalytical chemistry at the University of Illinois, Urbana-Champaign followed by postdoctoral research in cancer biology at the National Cancer Institute.

Dr. Hummon joined the faculty of the Department of Chemistry and Biochemistry of the University of Notre Dame in 2009 as the Walther Cancer Assistant Professor. In 2015, she was promoted to the Charles L. Huisking Associate Professor of Chemistry. Her laboratory specializes in the analysis of biomolecules altered in the progression of colorectal cancer. In the last six years, her laboratory has characterized a number of alterations in both the transcriptome and the proteome of colorectal cancer cells and published 25 peer-reviewed manuscripts on the topic. They have uncovered changes in the expression of microRNAs in the progression of colorectal cancer and determined protein expression differences between primary and metastatic colon cancer cells. Her laboratory has also developed imaging mass spectrometry for the analysis of three dimensional cell cultures. They are currently employing the approach in combination with electrospray tandem mass spectrometry to characterize epigenetic changes in three dimensional cell cultures. Dr. Hummon teaches general chemistry and analytical chemistry for the undergraduate students at Notre Dame. She also teaches a genomics and proteomic course to the graduate students.

David Galvin, Ph.D.
Department of Mathematics
Associate Professor
University of Notre Dame

Before arriving in South Bend, Dr. David Galvin held postdoctoral positions at the University of Pennsylvania, the Institute for Advanced Study in Princeton, and the Microsoft Research Theory Group in Redmond, Washington. He received his Ph.D. from Rutgers, The State University of New Jersey under the supervision of Jeff Kahn, and his B.A. and M.Math from the University of Cambridge.

Galvin's research is primarily in discrete mathematics and combinatorics, with a particular focus on structural and enumerative aspects of discrete structures such as graphs, hypergraphs and homomorphism spaces. He also explores connections between discrete probability, statistical physics and theoretical computer science.

Galvin has published research papers in leading journals such as Combinatorics, Probability & Computing, Random Structures & Algorithms, the Journal of Graph Theory, and the Journal of Combinatorial Theory (Series A and B). As well as giving invited research talks at many universities across the USA, he has spoken at such venues as Mathematisches Forschungsinstitut Oberwolfach in Germany, the Isaac Newton Institute in England, and the Banff International Research Station in Canada.

Grant J. Mathews, Ph.D.
Department of Physics
Professor, and
Director, Center for Astrophysics
University of Notre Dame

Dr. Grant J. Mathews is a professor in the Department of Physics at the University of Notre Dame and Director of the Center for Astrophysics at Notre Dame (CANDU). He received his B.S. from Michigan State University and his PhD from the University of Maryland. After post-doctoral positions at the University of California, Berkeley and the California Institute of Technology, he joined the Physics Division of Lawrence Livermore National Laboratory obtaining the position as Group Leader in Astrophysics. He joined the University of Notre Dame in 1994 where he is currently the Director of the Center for Astrophysics. He has published over 250 papers in technical research journals and has presented over 370 invited talks and colloquia on topics in theoretical astrophysics and cosmology. He has also co-authored books on relativistic hydrodynamics and observational astronomy. He has served on various review panels for astrophysics proposals to the DoE, NSF and NASA and has served as a Siemens competition judge. His research areas include studies of black hole formation, neutron star mergers, supernovae, galaxy formation and evolution along with studies of the big bang. He most recently has taught graduate and undergraduate classes in astronomy, the general theory of relativity, quantum field theory, astrophysics, and cosmology.

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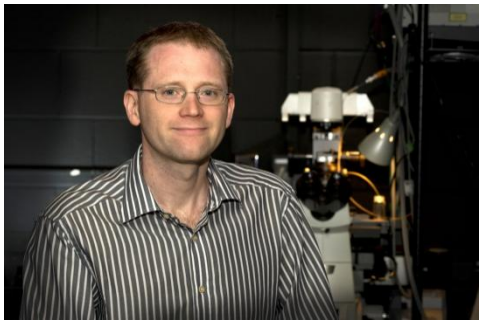
Jed Fisher, Ph.D.
Department of Chemistry and Biochemistry
Research Professor
University of Notre Dame

Dr. Jed Fisher is an alumnus of Stony Brook University and the Massachusetts Institute of Technology. Prior to joining the faculty of the University of Notre Dame in 2003, he completed post-graduate study at Harvard University, was on the faculty of the University of Minnesota, and was a research scientist in the pharmaceutical industry in Michigan. His research focus is the chemical mechanisms of molecules—drugs, coenzymes, and enzymes—relevant to human health. Most recently, this research has focused on the relationship between the mechanism of antibiotics (especially those of the penicillin class) and the developing resistance mechanisms used by pathogenic bacteria to thwart their chemotherapeutic value.



Jeremiah Zartman, Ph.D.
Department of Chemical and Biomolecular Engineering
Assistant Professor
University of Notre Dame

Dr. Jeremiah Zartman received his Bachelor's degree from the University of Colorado at Boulder with a dual major in Chemical Engineering and Engineering Physics in 2004. In 2009 he obtained his Ph.D. in Chemical and Biomolecular Engineering under the supervision of Prof. Stanislav Shvartsman at Princeton University as a Princeton Hertz Fellow. From 2009-2011, he worked as post-doctoral research in the lab of Prof. Konrad Basler, University of Zurich, in Molecular Life Sciences as an EMBO Long-term Post-doctoral Fellow. Since 2012, Dr. Zartman has led a research group at the University of Notre Dame. The lab's research focus is on developing a fundamental understanding of how cells coordinate cellular decision making at the tissue scale. The lab focuses on the integration of computational and experimental approaches toward the development and function of multicellular systems as well as the development of advanced in vivo and in vitro screening approaches for target discovery in cancer and regenerative medicine.

Juan C. Migliore, Ph.D.
Department of Mathematics
Professor and Associate Chair
University of Notre Dame

Juan Migliore received his B.A. degree from Haverford College in 1978 and then earned his Ph.D. degree in Mathematics from Brown University in 1983. He came to the University of Notre Dame as an associate professor in 1989, and has been a full professor since 1994. He is currently the associate chairman of the department, and has also served as director of undergraduate studies.

Prof. Migliore's expertise is in the overlap between algebraic geometry and commutative algebra. He has written more than 80 research articles and monographs, and one book. His work has covered a broad range of areas within these fields, but his most important contributions have been in the areas of Liaison Theory and the theory of Hilbert Functions. Some of his work has also overlapped the field of combinatorics, for instance "On the shape of a pure O-sequence," which was published by Memoirs of the American Mathematical Society. He has given lectures in four continents, including lecture series in Korea and in Japan, and 1-3 week courses in Italy (Catania, Torino, Porto Conte and Cortona) and Paraguay (twice).

Karen Cowden Dahl, Ph.D.
Assistant Professor of Biochemistry and Molecular Biology
Indiana University School of Medicine-South Bend
Adjunct Assistant Professor of Chemistry and Biochemistry
University of Notre Dame

Dr. Cowden Dahl earned a B.S. in Cell and Molecular Biology at Texas Tech University. She then attended the University of Pennsylvania for graduate school and received a Ph.D. in Cell and Molecular Biology with the emphasis on Cell Growth and Cancer. Following graduate school Dr. Cowden Dahl did a postdoctoral fellowship with Dr. Laurie Hudson at the University of New Mexico investigating ovarian cancer metastasis.

Dr. Cowden Dahl investigates the role of growth factor signaling and gene regulation in ovarian cancer invasion, metastasis, and chemoresistance. Dr. Cowden Dahl has demonstrated that growth factor signaling promotes ovarian tumor invasion that is dependent on transcription factor regulation and protease activity. Moreover the Cowden Dahl lab has demonstrated that growth factor signaling regulates microRNAs

expression in ovarian cancer cells. Recent work from the Cowden Dahl lab demonstrates that a novel transcription factor is overexpressed in ovarian cancer and correlates with tumor relapse following chemotherapy. Dr. Cowden Dahl has published 10 papers on ovarian cancer related to transcriptional control, metastasis/invasion, and chemoresistance. She has been continuously funded in the area of ovarian cancer research since 2006. Dr. Cowden Dahl teaches cell and molecular biology and biochemistry for Indiana University School of Medicine and a signal transduction course for the University of Notre Dame.

Marya Lieberman, Ph.D.
Department of Chemistry and Biochemistry
Associate Professor
University of Notre Dame

Dr. Marya Lieberman is a surface and analytical chemist with over 50 published papers in the area of self-assembled monolayers, molecular electronics, DNA origami, and low-tech analytical methods. She studied chemistry at MIT, obtained her doctorate in inorganic chemistry as a Hertz Fellow at the University of Washington, Seattle, with Prof. Tomikazu Sasaki, and conducted studies of semiconductor photovoltaic cells as an NSF Postdoctoral Fellow at the California Institute of Technology, working with Prof. Nathan Lewis.

Prof. Lieberman has received the National Science Foundation's CAREER award in materials science and the Joyce Award for Excellence in Undergraduate Teaching from Notre Dame. Her current research focuses on paper millifluidic devices for chemical analysis in low-resource settings.

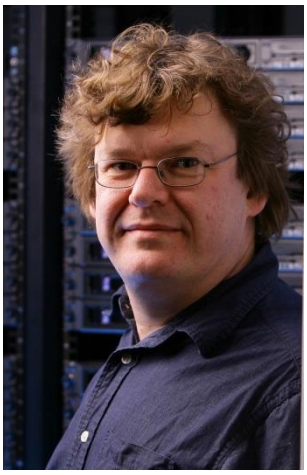
W. Matthew Leevy, Ph.D.
Department of Biological Sciences
Research Associate Professor
Director, Biological Imaging
University of Notre Dame

Dr. W. Matthew Leevy is currently a Research Associate Professor at the University of Notre Dame where he serves as the Director of Biological Imaging within the Notre Dame

Integrated Imaging Facility (NDIIF). The Biological Imaging facilities include the *In Vivo*, Optical Microscopy, and Histology Cores.

Dr. Leevy earned his Ph.D. in Biophysics from Washington University in Saint Louis under the guidance of Dr. George Gokel, and did his post-doctoral work with Dr. Bradley Smith at the University of Notre Dame. Following his post-doc, Dr. Leevy spent a year with Carestream Health (now Bruker Biospin), an industry leader for in vivo imaging, before returning to Notre Dame to manage and direct the imaging cores. He is presently funded through a $1,500,000 imaging center initiative sponsored by Bruker. Dr. Leevy is also a Captain with 18 years of service in the U.S. Army Reserve.

Research in the Leevy lab is focused on innovation at the interface of 3D printing and biomedical imaging. Three dimensional (3D) printing, or additive manufacturing, has emerged as a powerful and inexpensive platform for object creation for individuals ranging from hobbyists to scientists and engineers. Researchers across many disciplines are utilizing this technology to create parts and accessories to advance their experimental objectives. Our lab has done extensive work within the pre-clinical imaging space to reproduce the anatomy of mice and rats within physical plastic models. The myriad of lessons that were learned within pre-clinical experiments were then applied to the challenge of recreating patient data, specifically from X-ray CT scans of the ear, nose and throat space. Through the use of multi 3D-material printing, new models for ENT medical device training and patient education have been created and validated. In summary, 3D printing is a powerful tool that has turbocharged the innovative and entrepreneurial spirit of our group, resulting in over 12 patent submissions and three start-up companies in the past 3 years.



Olaf Wiest, Dr. rer. nat.
Department of Chemistry and Biochemistry
Professor and Associate Chair
University of Notre Dame
Judge

Dr. Wiest received his Diplom and doctorate in chemistry at the University of Bonn (Germany), working on mechanistic and synthetic organic chemistry. He did postdoctoral research on computational chemistry at UCLA with Ken Houk as a Feodor Lynen Fellow of the Alexander von Humboldt Stiftung.

Dr. Wiest joined the Department of Chemistry and Biochemistry at the University of Notre Dame in 1995 where he teaches organic and computational chemistry to undergraduate and graduate students. He is also a visiting professor at Peking

University, Shenzhen Graduate School. His research area is the application of computational methods to a wide range of problems to organic, metalorganic, and biochemistry, often in combination with experimental studies in Prof. Wiest's laboratories or in the laboratories of one of over 20 collaborators on three continents. His more than 150 publication cover the development of a method for the prediction of stereoselectiviy in transition metal catalyzed reactions, enzyme mechanisms, and the development of new drugs for rare and neglected diseases, including malaria and Niemann Pick type C. The later studies have led to an ongoing FDA approved clinical trial for this deadly inherited disease that mostly afflicts children. He also collaborates with a number of researchers at Notre Dame and elsewhere to provide computational support for a number of drug discovery projects, especially in epigenetics, and area that studies how gene expression is controlled.

Dr. Wiest is an Associate Editor of The Journal of Organic Chemistry, the premier journal in the field published by the American Chemical Society. He has been a permanent member of study section on computational biophysics at the National Institutes of Health, as well as a number of review panels for the National Science Foundation and international research foundations. He has been a consultant for to the pharmaceutical industry and has been recognized as a Dreyfus Teacher-Scholar. He is also an elected fellow of the American Association for the Advancement of Science.