HEINRICH WIELAND PRIZE

Speaker Profiles – overview

Benjamin F. **Cravatt** – 2024 Heinrich Wieland Laureate
"Activity-based proteomics – protein and ligand discovery on a global scale"

Nenad **Ban** – 2010 Heinrich Wieland Prize:
"Revealing the machinery for production of proteins in human cells"

Jens **Brüning** – 2019 Heinrich Wieland Prize:
"Neural control of metabolism"

Cristina **García Cáceres**: "Beyond neurons in the neuroendocrine control of metabolism"

Johannes **Kohl**: "Plasticity of the parental brain"

Julia **Mahamid**: "Enabling discovery by in-cell structural biology"

Gero **Miesenböck** – 2015 Heinrich Wieland Prize:
"Mitochondrial origins of the pressure to sleep"

Kelly **Nguyen**: "Safeguarding the ends: Structural mechanisms of human telomeric complexes"

Paola **Picotti**: "Decoding the protein dance"

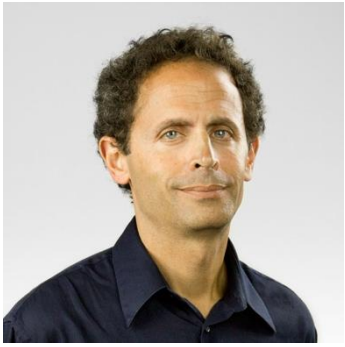
James **Rothman** – 2013 Nobel Laureate, 1990 Heinrich Wieland Prize:
"The mechanism of explosive neurotransmitter release"

Edward **Tate**: "Chemical biology approaches for drug discovery"

Christoph **Thaiss**: "Body–brain communication"

Ekaterina **Vinogradova**: "Chemical proteomic approaches to study post-translational and pharmacological landscapes of immune dysregulation"

Boehringer Ingelheim Stiftung



Professor Benjamin F. Cravatt III, PhD
Scripps Research, La Jolla, USA
2024 Heinrich Wieland Prize Laureate

Research

Benjamin Cravatt receives the 2024 Heinrich Wieland Prize for his groundbreaking contributions to the development and application of methods for the functional annotation of enzymes. He devised activity-based protein profiling (ABPP), a chemical proteomic strategy, which uses small-molecule probes to measure the activity of many enzymes in parallel directly in native biological systems. ABPP is now widely applied in the discovery and characterization of enzymes and small-molecule enzyme inhibitors in vitro, in cells, and in vivo, across the entire proteome. With ABPP, Benjamin Cravatt discovered selective and efficacious inhibitors of enzymes that regulate endocannabinoid signalling in the brain. His research revealed central roles for endocannabinoid pathways in pain, inflammation, and neuropsychiatric and neurodegenerative disorders. More recently, Benjamin Cravatt extended the ABPP technology to non-enzymatic proteins. With this, it is now possible to map interactions for any small-molecule directly and globally across the proteome and to discover chemical probes for historically undruggable proteins. Benjamin Cravatt's transforming technologies have enabled the discovery of fundamental regulatory pathways in human physiology and disease and revolutionized how drug discovery is done today. The chemistry platforms and probes developed in Benjamin Cravatt's laboratory have served as the foundation for several drug candidates currently investigated in clinical trials for the treatment of cancer and neurological disorders.

Academic career

Benjamin Cravatt studied biological sciences and history at Stanford University, USA. After receiving his PhD in macromolecular and cellular structure and chemistry from Scripps Research Institute in La Jolla, USA, in 1996, he joined the faculty at Scripps Research as assistant professor. He was promoted to associate professor in 2001 and since 2004, he is full professor and the Norton B. Gilula Chair in Chemical Biology at Scripps Research. He is the recipient of numerous awards, including the Wolf Prize in Chemistry, the AACR Award for Outstanding Achievement in Chemistry and Cancer Research, the Jeremy Knowles Award by the Royal Society of Chemistry, and the R35 Outstanding Investigator Award of the National Cancer Institute. He is an elected member of the National Academy of Medicine, the American Academy of Arts and Sciences, the National Academy of Sciences, and a fellow of the National Academy of Inventors and the American Association for the Advancement of Science, USA.

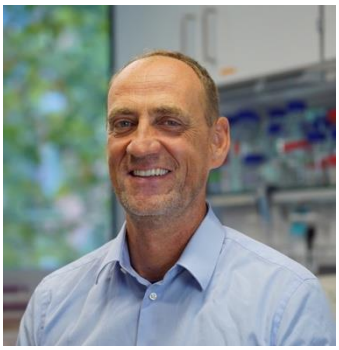
Professor Nenad Ban, PhD
Swiss Federal Institute of Technology (ETH),
Zurich, Switzerland

Research

Nenad Ban has made outstanding contributions to the fields of biochemistry and structural biology through his studies of the mechanisms of protein synthesis. He revealed unique architectural features of eukaryotic ribosomes and advanced our understanding of eukaryotic translation and protein biogenesis, including co-translational processing, folding, and targeting of proteins to biological membranes. In studying mitochondrial ribosomes, he revealed their unusual structure, discovered how they initiate and terminate protein synthesis, and identified features that make them specialized for exclusive synthesis of membrane proteins in human mitochondria. Additionally, working on giant multifunctional enzymes involved in fatty acid synthesis, the Ban laboratory provided groundbreaking insights into the function of cellular assemblies involved in central metabolic processes. Their research explained the mechanism of substrate shuttling and delivery in these and related multienzymes.

Academic career

Nenad Ban is a professor of structural molecular biology at ETH Zurich. He studied molecular biology and biochemistry at University of Zagreb, Croatia, and in 1994 obtained his PhD in biochemistry with a minor in computer science from the University of California at Riverside, USA. Following his stay at Yale University as a postdoctoral fellow and a Burroughs Wellcome Fund Career Award group leader, he became assistant professor at ETH Zurich, Switzerland in 2000 and was promoted to full professor in 2007. Nenad Ban received several awards including the Heinrich Wieland Prize, the AAAS Newcomb Cleveland Prize, the Jung Prize for Medicine, and the Otto Naegeli Prize for Medical Research. He is an elected member of the United States National Academy of Sciences, American Academy of Arts and Sciences, EMBO, the Croatian Academy of Arts and Sciences, and the German Academy of Sciences Leopoldina.



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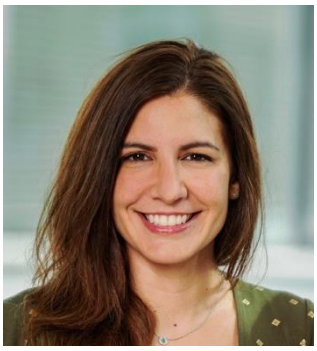
Professor Jens C. Brüning, MD
Max Planck Institute for Metabolism Research, Cologne, Germany

Research

Jens Brüning made groundbreaking contributions to our understanding of how the brain regulates energy metabolism. He uncovered important and surprising roles of insulin signalling. He revealed how special groups of neurons of the hypothalamus in the brain respond to insulin: They regulate feeding behaviour, energy expenditure, and the distribution of nutrients to different organs according to glucose levels in the blood and the amount of fat stored in the body. More recently, his group unraveled, that these hypothalamic cells are already regulated by the sensory perception of food, i.e. the smell of food, even before calories enter the body, and that this regulation rapidly modulates endoplasmic reticulum (ER) and mitochondrial functions in liver to metabolic adaptations for the changes to occur, when food is consumed.

Academic career

Jens Brüning received his MD from the University of Cologne, Germany, in 1993. He then moved to Harvard Medical School in Boston, USA, as a postdoc, and returned to Cologne in 1997 for his residency and to set up his own research group. He became tenured professor at the University of Cologne in 2003. He was appointed director of the MPI for Metabolism Research and director of the Polyclinic for Endocrinology, Diabetes, and Preventive Medicine at the University Hospital of Cologne in 2011. His work was awarded by the Gottfried Wilhelm Leibniz Prize of DFG, the Ernst Jung Prize for Medicine, the Carl Friedrich von Weizsäcker Prize, the Heinrich Wieland Prize, and the Ernst Schering Prize. He is an elected member of EMBO and the National Academy of Sciences Leopoldina.



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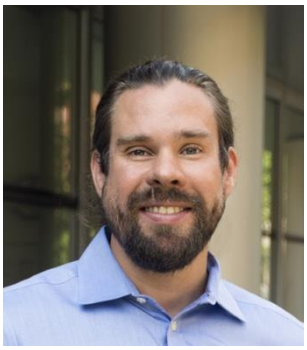
Professor Dr Cristina García-Cáceres
Helmholtz Munich and Ludwig-Maximilians-Universität (LMU), Munich, Germany

Research

Cristina García-Cáceres unravelled paradigm-shifting roles of glial cells in the neuroendocrine control of metabolism. She discovered that glial cells, such as astrocytes, are key players in the regulatory control centres of the hypothalamus. They respond to nutritional and hormonal cues from the body and feed directly into neuronal circuits. She found that high levels of the hormone leptin in the blood of obese mice induce pathologic changes in the hypothalamic microvasculature and activate a signalling pathway in astrocytes that drives arterial hypertension. This may explain how obesity-associated high leptin levels can cause hallmark symptoms of metabolic syndrome. Recently, she found how gender-specific pathologies of obesity may arise by revealing that the female hormone estradiol feeds into hypothalamic circuits controlling metabolism.

Academic career

Cristina García-Cáceres studied biology and neuroendocrinology at the Universidad Autónoma de Madrid in Spain, where she completed her doctoral thesis in 2012. She then moved to Helmholtz Munich and Technical University of Munich, Germany, as a postdoctoral researcher. In 2015, she became head of the Astrocyte-Neuron Networks Unit at Helmholtz Munich and since 2018, she is associate director of the Institute for Diabetes and Obesity. Since 2021, she holds a joint appointment as associate professor of Neuroendocrinology of Systems Metabolism at Helmholtz Munich and the Faculty of Medicine of LMU Munich. She is the recipient of the Young Investigator Award of the European Society for Clinical Investigation, the Obesity Research Award of the Deutsche Adipositas-Gesellschaft, and of an ERC Starting Grant.



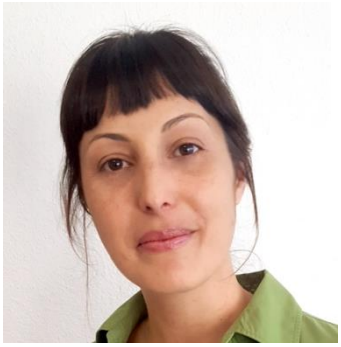
Johannes Kohl, PhD
Francis Crick Institute, London, UK

Research

Instinctive behaviours, such as parenting, aggression, or mating are orchestrated by evolutionarily sculpted neural circuits. Johannes Kohl showed that a genetically defined group of neurons in the hypothalamus of the brain coordinates the motor, motivational, hormonal, and social aspects of parenting. He discovered that these neurons form non-overlapping pools – each defined by its projection in the brain – which control distinct aspects of parenting. His group recently found that during pregnancy, the hormones estrogen and progesterone change the form and function of parenting-relevant neurons in the brain, and that this is necessary for the onset of parental behaviour. Pregnancy hormones thus remodel the female brain in preparation for parenthood.

Academic career

Johannes Kohl studied biochemistry at the University of Bayreuth and neuroscience and medicine at the University of Magdeburg, Germany. He then moved to the MRC Laboratory of Molecular Biology in Cambridge, UK, where he completed his PhD in neurobiology in 2014. Following two years of postdoctoral research at Harvard University in Cambridge, USA, he split his time between Harvard University and the Sainsbury Wellcome Centre for Neural Circuits and Behaviour (London, UK) as a Sir Henry Wellcome Fellow. He started his own group at The Francis Crick Institute in London in 2019. He is the recipient of the Eppendorf & Science Prize for Neurobiology, the Peter and Patricia Gruber International Research Award of the Society for Neuroscience, and an ERC Starting Grant.



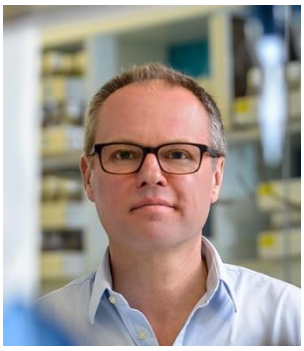
Dr Julia Mahamid
European Molecular Biology Laboratory (EMBL)
Heidelberg, Germany

Research

Julia Mahahmid pioneered methods of cryo-electron tomography for in-cell structural biology. She significantly contributed to the development of cryo-focused ion beam to make parts of a cell transparent to electrons. Through such “windows” it is now possible to visualize 3D macromolecular structures in their native environment at a level of detail that enables mechanistic insights. Her research group has resolved structures of transcribing RNA polymerases and translating bacterial ribosomes and showed how antibiotics reshape translational landscapes. Recently, they developed a correlative light and electron microscopy imaging approach with which they can follow growing 3D organoid cultures at the millimeter-scale and analyze their subcellular architecture down to the nanometer-scale. Her methods thus unlock an enormous potential for new discoveries through label-free in-cell structural biology.

Academic career

Julia Mahamid studied biology at the Technion – Israel Institute of Technology in Haifa and obtained her PhD in structural chemistry from the Weizmann Institute of Science in Rehovot in 2010. After postdoctoral research at the Max Planck Institute of Biochemistry in Martinsried, Germany, she moved to a group leader position at EMBL in Heidelberg. She is the recipient of the Ernst Ruska Prize of the German Society for Electron Microscopy, the EMBO Gold Medal, the Kate Bárány Award of the Biophysical Society, and ERC Starting and Synergy Grants. She is also an EMBO Member.



© Centre for Neural Circuits and Behaviour, Oxford

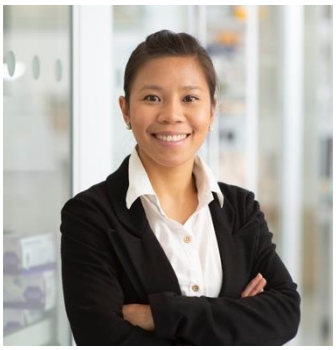
Professor Gero Miesenböck, MD, FRS
University of Oxford, UK

Research

Gero Miesenböck invented the breakthrough concept of optogenetics. He was the first to program neurons genetically to express a photoreceptor, allowing him to regulate the cells' electrical activity with light. By restricting the photoreceptor to distinct neurons in the brain, he was able to remote-control specific behaviours, such as different forms of movement or the courtship display of male flies. Optogenetics is now used worldwide in fundamental biological research and holds promise for the development of new therapeutic approaches to brain disorders. Gero Miesenböck's current work centres on the neural control and biological function of sleep. His discovery of machinery that gears the activity of sleep-control neurons to the fate of electrons in the respiratory chain suggests that sleep helps to tame the dangers of aerobic metabolism.

Academic career

Gero Miesenböck studied medicine at the University of Innsbruck in his native Austria. After completing his MD, he moved to Memorial Sloan Kettering Cancer Center in New York, USA, for postdoctoral research. He was on the faculty of Memorial Sloan-Kettering Cancer Center and Yale University before being appointed Waynflete Professor of Physiology at the University of Oxford in 2007. Since 2011, he has also served as the founding director of the Centre for Neural Circuits and Behaviour. Miesenböck has received numerous awards for the invention of optogenetics, including the Brain Prize, the Heinrich Wieland Prize, the Massry Prize, the Shaw Prize, and the Japan Prize. He is a Fellow of the Royal Society and an elected member of EMBO, the Austrian Academy of Sciences, the German Academy of Sciences Leopoldina, and the Academia Europaea.



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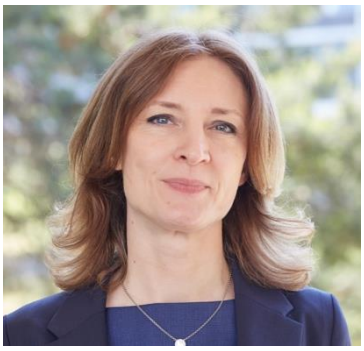
Kelly Nguyen, PhD
MRC Laboratory of Molecular Biology (LMB),
Cambridge, UK

Research

Kelly Nguyen has solved the first complete atomic model of the large RNA-containing enzyme telomerase which rebuilds the natural ends of chromosomes, the telomeres, by adding new telomeric DNA repeats with each cell division. Telomeres form a protective cap of chromosome ends and are vital for keeping the genome intact. She discovered a histone dimer as a novel telomerase subunit, suggesting a new role for histones in telomerase RNA folding and function. In mammals, telomeres are bound by shelterin, a protein complex that regulates telomerase. Kelly Nguyen's most recent structures of telomerase interacting with subunits of shelterin reveal unprecedented insights into the molecular basis of how shelterin recruits and activates telomerase for the extension of chromosome ends. This opens new ways for finding drugs to target telomerase, for example in cancer.

Academic career

Kelly Nguyen studied chemistry at the Australian National University in Canberra, Australia. She earned her PhD from the MRC-LMB in Cambridge, UK, in 2014, then moved to the University of California in Berkeley, USA, for postdoctoral research. She returned to the MRC-LMB in Cambridge in 2019 to set up her own research group. Her research has been recognized by the Eppendorf Award for Young European Investigators, the Suffrage Science Award curated by MRC-LMS, the Early Career Research Award, and the Colworth Medal of the Biochemical Society.



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Professor Dr Paola Picotti
Institute for Molecular Systems Biology, ETH Zurich, Switzerland

Research
Paola Picotti is a pioneer in structural systems biology. She developed LiP-MS, a novel technology that combines limited proteolysis with mass spectrometry to monitor changes in protein structure on a proteome-wide scale in biological samples like cells or tissues. She has used LiP-MS to create maps of protein–metabolite interactions and thus revealed structural and functional principles of chemical communication. Paola Picotti also employs proteome-wide approaches to study protein aggregation and protein stability, particularly in the context of protein aggregation diseases. For example, she discovered novel molecular players in neurodegenerative diseases that might be potential targets for the treatment of such disorders and identified novel structural biomarkers for Parkinson’s disease.

Academic career
Paola Picotti studied medicinal chemistry and obtained her PhD in biotechnology from the University of Padua, Italy, in 2006. Following postdoctoral research at ETH Zurich, Switzerland, she became assistant professor at ETH Zurich in 2011 and was promoted to associate professor in 2017 and to full professor in 2022. Since 2021, she holds a guest professorship at the University of Cologne, Germany. She has received several awards, including the EMBO Gold Medal, the Discovery Award of the Human Proteome Organization, the Rössler Prize of ETH Zurich, the Friedrich Miescher Award, as well as Starting and Consolidator Grants of the ERC. She is an elected member of the German National Academy of Sciences Leopoldina and EMBO.

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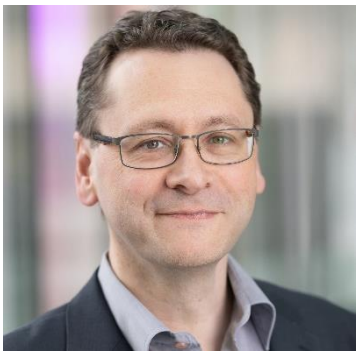
Professor James E. Rothman, PhD
Yale University, New Haven, USA

Research

James Rothman's pioneering research discovered key molecular machinery responsible for transferring materials among compartments within cells. He provided the conceptual framework for understanding important biological processes, including the release of insulin into blood, communication between nerve cells in the brain, and the entry of viruses to infect cells: In a cell-free system, he reconstituted the budding and fusion of tiny membrane-enveloped vesicles that ferry packets of enclosed cargo between cell compartments. He discovered the complex of SNARE proteins that mediates vesicle fusion and affords it its specificity. He also uncovered the so-called GTPase-switch mechanism which controls the budding of coated vesicles in the cell. His contributions to other fields include unveiling how the hsp70 molecular chaperones cycle on and off proteins to control their folding/unfolding, devising the theoretical concept of how the Golgi compartment functions, and providing the first evidence of sequential processing and vectorial transport across the Golgi stack. He currently investigates the biophysics of explosive neurotransmitter release at synapses and the hypothesis that phase separations of Golgin proteins organize its stack of cisternae.

Academic career

James Rothman studied physics at Yale University in New Haven, USA. He obtained his PhD in biological chemistry from Harvard University in 1976. After postdoctoral research at MIT, he became professor at Stanford University in 1978. He moved on to Princeton University in 1988, then to Memorial Sloan-Kettering Cancer Center in New York, where he founded and chaired the Department of Cellular Biochemistry and Biophysics from 1991 to 2004. He then became the Wu Professor of Chemical Biology and the director of Columbia University's Sulzberger Genome Center. In 2008, he returned to Yale University as the Sterling Professor and chair of the Department of Cell Biology. He received numerous awards, including the Heinrich Wieland Prize, the Albert Lasker Award for Basic Biomedical Research, the Kavli Prize for Neuroscience, and the Nobel Prize in Physiology or Medicine. He is a fellow of the American Association for the Advancement of Science and the Royal Society, and a member of the US National Academy of Sciences.



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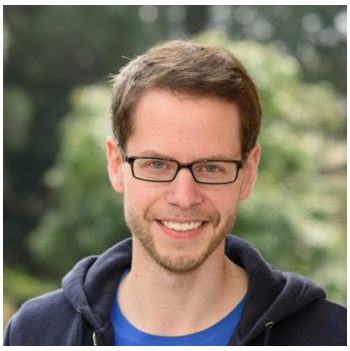
Professor Edward Tate, PhD, FRSC, FRSB
Department of Chemistry, Imperial College London, and The Francis Crick Institute, London, UK

Research

The Tate lab develops novel chemical biology approaches to enable drug discovery against post-translational modification (PTM) pathways and intractable drug targets, including chemical proteomic target identification, screening technologies, and chemical probe discovery for protein-protein interactions and enzymes modulating PTMs. Recent highlights include the first cell-active activity-based probes (ABPs) for deubiquitinases (DUBs), new tools for analysis and discovery of pathogenic secreted protease activities, and pioneering advances in technology and drug discovery targeting protein lipidation PTM through chemical genetics and proteomics. His lab is also interested in developing new therapeutic modalities including molecular glues and the first examples of antibody-PROTAC conjugates.

Academic career

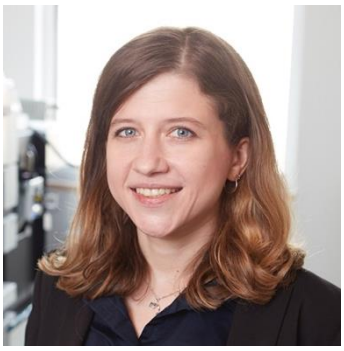
Ed Tate holds the GSK Chair in Chemical Biology at Imperial College London, he is a Group Leader at the Francis Crick Institute, and academic founder of Myricx Bio, a biotech company developing his lab's research toward clinical applications. Following his PhD (2000) with Steve Ley in Cambridge and postdoctoral research in Paris, he was awarded a BBSRC David Phillips Fellowship in 2006 to start his group at Imperial College. He sits on advisory boards of several international research institutes and biotechs, and his research has been recognised by awards and fellowships, including the 2020 Corday-Morgan Prize and 2022 Cancer Research UK Programme Award. In 2023, he was appointed to the GSK Endowed Chair in Chemical Biology at Imperial College.



Professor Christoph A. Thaiss, PhD
University of Pennsylvania, Philadelphia, USA

Research
Christoph Thaiss studies how interactions between the environment, the body, and the brain regulate human physiology and disease susceptibility. His group has uncovered several new principles of gut–brain communication and their implications in a broad range of whole-body phenomena, including the regulation of exercise physiology, the impact of psychological stress on inflammatory disease, and the neurocognitive manifestations of post-infection syndromes. His group also studies the impact of environmental and lifestyle factors on the development of common age-associated diseases. His research may open new avenues for understanding and treating diseases that involve communication pathways between the brain and the body.

Academic career
Christoph Thaiss studied Molecular Biomedicine, Immunology and Microbiology at the University of Bonn, Germany, Yale University, USA, and ETH Zurich, CH. After a short-term fellowship at the Broad Institute of MIT and Harvard, USA, he moved to the Weizmann Institute of Science, in Rehovot Israel, from where he earned his PhD in 2017. Since 2018, he is assistant professor at the University of Pennsylvania in Philadelphia, USA. He is the recipient of the Science & SciLifeLab Prize of the journal Science and the Science for Life Laboratory in Sweden, a Scholarship from the Pew Charitable Trusts, and the McKnight Brain Research Innovator Award in Aging and Memory Loss of the American Federation for Aging Research and the McKnight Brain Research Foundation.



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Professor Ekaterina V. Vinogradova, PhD
The Rockefeller University, Chemical Immunology and Proteomics, New York, USA

Research

Ekaterina (Katya) Vinogradova combines tools from chemistry, chemical proteomics, and cell biology to understand and modulate immune cell function. She developed innovative multiplexed chemical proteomic platforms to generate the first global portrait of cysteine reactivity and drugability in the human immune proteome. She further illuminated the pharmacological effects of small molecule-cysteine interactions by deploying chemically elaborated electrophiles in a functional screen of T cell activation, including a set of innovative stereoisomeric covalent electrophile probes. This led to the discovery of new immunomodulatory compounds that suppress T cell activation by diverse mechanisms, including direct inhibition of protein activity and induction of protein degradation. Most recently, her lab has leveraged this integrated approach to study molecular mechanisms of T cell exhaustion.

Academic career

Ekaterina Vinogradova studied chemistry in Moscow, Russia, and obtained her PhD in organic chemistry from Massachusetts Institute of Technology in Cambridge, USA, in 2015. After postdoctoral research at Scripps Research in La Jolla, USA, she became assistant professor and Head of the Laboratory of Chemical Immunology and Proteomics at The Rockefeller University in New York, USA, in 2020. She has received a number of awards, including the American Chemical Society Young Investigator Award, the Damon Runyon-Rachleff Innovation Award, and the Irma T. Hirschl/Monique Weill-Caulier Trust Research Award. She was named a C&EN Talented 12 by the American Chemical Society as well as a Searle Scholar.