

# Precision Medicine Research Fellowships Summer 2022

**IMPORTANT DATES TO REMEMBER:**

Application Window – November 1, 2021 - January 17, 2022

Notification of Awards – March 18, 2022

Internship/Research Period – Approx. June 1 - July 31, 2022

Please see <https://precisionhealth.nd.edu/opportunities/> for more information and the online application.



We are proud to announce the **2022 Precision Medicine Research Fellowships!**

These competitive awards are given annually to highly qualified undergraduate and graduate students from Notre Dame that enable them to spend eight weeks in summer residence conducting laboratory and clinical research at the [Feinstein Institute for Medical Research](#) in Manhasset, New York.

The Feinstein Institute, which is part of 21-hospital Northwell Health, recruits more than 15,000 patients each year into over 2,100 studies. These fellowships, sponsored by the [Institute for Precision Health](#) affords Notre Dame students an opportunity to experience **hands-on research in a world-class setting.**

**For Summer 2022, four fellowships will be awarded.** The fellowships will be concurrent with FIMR’s existing summer internship program, which takes place from approx. June 1 to July 31 each year. Awards include a \$5,600 stipend, travel funding, and no-cost **co-ed** housing at the institute’s campus in Manhasset, NY.

Each student will apply to work in a specific lab at FIMR and, thus, must understand the interests and capabilities of participating labs before submitting an application. Please refer to the list below to find a description of participating labs for 2022.

Kevin J. Tracey, MD .....	3
Philippe Marambaud, PhD .....	4
Betsy Barnes, PhD .....	5
Lance Becker, MD, FAHA .....	6
Yousef Al Abed, PhD .....	7
Patricio Huerta, PhD .....	8
Bruce Volpe, MD .....	9
Lionel Blanc, PhD .....	10
Betty Diamond, MD .....	11
Daniel Grande, PhD .....	12
Barbara Sherry, PhD .....	13
Theodoros P. Zanos, PhD .....	14
Stavros Zanos, MD, PhD .....	15
Timir Datta-Chaudhuri, PhD .....	16
Ona E. Bloom, PhD .....	17
Nicholas Chiorazzi, MD .....	18
Anne Davidson, MBBS .....	19
Peter Gregersen, MD .....	20
Christine Metz, PhD .....	21
Ping Wang, MD .....	22
Lopa Mishra, MD .....	23

If you have any questions about the labs at the Feinstein Institute, please contact Meredith Burcyk at 516- 562-1256 or [mburcyk@northwell.edu](mailto:mburcyk@northwell.edu).

## Kevin J. Tracey, MD



*President and CEO, The Feinstein Institute for Medical Research*

*Director, The Laboratory of Biomedical Science, The Feinstein Institute for Medical Research*

*Professor, Molecular Medicine & Neurosurgery, Hofstra Northwell School of Medicine*

Kevin J. Tracey is a leader in the study of the molecular basis of inflammation. He and his colleagues identified the neural mechanism for controlling the immunological responses to infection and injury, and developed devices to replace anti-inflammatory drugs in clinical trials of rheumatoid arthritis, a new field termed bioelectronic medicine. The recipient of numerous awards and honors, including an honorary degree from the Karolinska Institute, Dr. Tracey is a fellow in the American Association for the Advancement of Science, and a member in the American Society for Clinical Investigation, and the Association of American Physicians. He is co-founder and Councilor of the Global Sepsis Alliance.

Professor Tracey graduated *summa cum laude* from Boston College, majoring in chemistry, and received his MD from Boston University. He trained in neurosurgery at the New York Hospital/Cornell University Medical Center, and was guest investigator at The Rockefeller University. Since 1992 he has directed the Laboratory of Biomedical Science in Manhasset, NY, where in 2005 he was appointed president of the Feinstein Institute. Dr. Tracey delivers lectures nationally and internationally on inflammation, sepsis, the neuroscience of immunity, and bioelectronic medicine. He is the author of *Fatal Sequence* (Dana Press) and more than 320 scientific papers.

**Research Focus** – The major focus of Dr. Tracey’s laboratory is the molecular basis of inflammation and identifying the mechanism by which neurons control the immune system.

Dr. Tracey participated in the discovery of the direct inflammatory activity of tumor necrosis factor-alpha (TNF) and the therapeutic role of monoclonal anti-TNF. He and his colleagues discovered the role of HMGB1 in inflammation, and identified the molecular mechanisms for signal transduction by signaling through pattern recognition receptors. This provided the first direct evidence to unify mechanisms of inflammation produced by molecules derived from the pathogen and host.

His laboratory discovered the molecular mechanism for the neural control of inflammation, now termed the inflammatory reflex. They delineated the neurophysiological mechanism as dependent upon action potentials transmitted in the vagus nerve, which regulate a T cell subset in spleen that produce acetylcholine. This lymphocyte derived neurotransmitter interacts with alpha-7 nicotinic receptors expressed in macrophages. Signal transduction via this receptor-ligand interaction inhibits cytokine release by suppressing inflammasome activation.

These discoveries enabled Dr. Tracey and his colleagues to develop devices to replace anti-inflammatory drugs. This new field, termed bioelectronic medicine, utilizes electrons delivered to neurons to modulate pathogenic targets in disease. The lead program utilizes devices to stimulate the inflammatory reflex which inhibits TNF in healthy subjects and in patients with rheumatoid arthritis. His lab participated in reporting the first successful clinical trial demonstrating that vagus nerve stimulation can be effective in methotrexate-resistant rheumatoid arthritis patients.

## Philippe Marambaud, PhD



*Professor, The Litwin-Zucker Center for Alzheimer's Disease & Memory Disorders, Feinstein Institutes for Medical Research*

*Director, Laboratory of Memory Disorders & Vascular Biology, Feinstein Institutes for Medical Research*

Since 1995, the major goal of Dr. Marambaud's research has been to elucidate the molecular basis of neuronal degeneration in Alzheimer's disease. Dr. Marambaud is currently an associate professor at the Litwin-Zucker Research Center at the Feinstein Institutes for Medical Research, Northwell Health, where he directs the Laboratory of Memory Disorders.

The major accomplishments of his research include the discovery that the presenilin/gamma-secretase complex (a drug target for Alzheimer's disease) is involved in the proteolysis and function of the adhesion proteins, E- and N-cadherins. This work, which was conducted in Dr. Nik Robakis' laboratory (Mount Sinai School of Medicine, NY), revealed important new aspects of cadherin and presenilin biology and increased our understanding of the relevance of these two proteins for Alzheimer's disease pathogenesis.

**Research Focus** - Dr. Marambaud focuses on the molecular basis of neuronal degeneration in Alzheimer's disease. His laboratory studies the early biochemical changes leading to the formation of two classic lesions of the Alzheimer brain, the senile plaques and the neurofibrillary tangles. We currently focus our attention on the role played by the ion channel CALHM1 and the kinase AMPK in the pathogenesis of this disease. Since 2015, his laboratory has significantly expanded its activities to include programs aimed at studying the vascular disease called hereditary hemorrhagic telangiectasia (HHT), also known as Rendu-Osler-Weber syndrome.

## Betsy Barnes, PhD



*Investigator, Head, Laboratory of Autoimmune and Cancer Research  
Center for Autoimmune and Musculoskeletal Diseases  
The Feinstein Institute for Medical Research*

Prior to joining the health system, Dr. Barnes was an Associate Professor in the Department of Molecular Biology, Biochemistry and Genetics at Rutgers, The State University of New Jersey in the New Jersey Medical School –Cancer Center. She received her PhD in Medicinal Chemistry from the University of North Carolina at Chapel Hill in 1999. Dr. Barnes did her postdoctoral training as a fellow in the NIH-sponsored Anti-Cancer Drug Development program in the Department of Oncology at Johns Hopkins University Sidney Kimmel Comprehensive Cancer Center. She then became an Assistant Professor at Johns Hopkins University and moved her laboratory to Rutgers in 2006 where she became a leader in the field of Interferon and cytokine research.

Dr. Barnes has mentored many successful Ph.D. and M.D./Ph.D. students that have gone on to have successful careers in science. She travels both nationally and internationally to deliver lectures on inflammation, immunity, tumor-immunity and autoimmune disease. She is a well-funded researcher who has established numerous collaborations with the Pharmaceutical Industry in the hopes of developing new therapeutic options for patients with autoimmune disease and cancer.

**Research Focus** – Dr. Barnes’ laboratory studies a family of transcription factors – interferon (IFN) regulatory factors (IRFs) – that regulate immune cell signaling and the cellular response to extracellular stressors. She was the first to clone the family member IRF5 and show that it is an integral regulator of type I IFN gene expression. Later studies demonstrated its significant role(s) in mediating Toll-like receptor signaling, DNA damage signaling and death receptor signaling. Her lab is thus interested in understanding the role of IRF5 as an immune regulator and a tumor suppressor.

With the identification of *IRF5* as an autoimmune susceptibility gene for systemic lupus erythematosus (SLE) in 2005, her lab began to study how alterations in IRF5 could contribute to SLE disease pathogenesis in both human and mouse models of SLE. Subsequent studies have now shown that the *IRF5* risk locus is associated with susceptibility to numerous autoimmune diseases.

Given that the immune system plays critical roles in tumor development and susceptibility as well, her lab studies how alterations within a tumor can change the way the immune system recognizes it. Her lab’s specific interest is in hematologic malignancies and breast cancer.

## Lance Becker, MD, FAHA



*Department Chair, Emergency Medicine, Northwell Health*

*Department Chair, Emergency Medicine, Hofstra Northwell School of Medicine*

*Professor, Emergency Medicine, Hofstra Northwell School of Medicine*

Before joining the health system, Dr. Becker served as founder and director of the Center for Resuscitation Science at the Hospital of the University of Pennsylvania in Philadelphia, and professor of the Center for Mitochondrial and Epigenomic Medicine at The Children’s Hospital of Philadelphia. Prior to that, he was founder and director of the Emergency Resuscitation Center at the University of Chicago and Argonne National Laboratory.

He has received numerous honors and awards from such organizations as the American Heart Association, the American College of Emergency Physicians and American Society of Critical Care.

A recipient of prestigious teaching awards, he has mentored many successful research fellows. He is a renowned, well-funded researcher who holds many patents for his discoveries. His professional affiliations include membership in the American Heart Association, Society of Academic Emergency Medicine, the US Institute of Medicine, the National Academy of Science, the American College of Emergency Physicians and the American Physiological Society. In addition, he holds many offices in professional and scientific societies, and has organized many national and international scientific meetings. He is an elected member of the Institute of Medicine/National Academy of Medicine.

**Research Focus** – A national and international leader in academic emergency medicine, critical care and the science of resuscitation, Dr. Becker has research interests that are translational and extend across the basic science laboratory into animal models of resuscitation and to human therapies.

He has been a leader in the field of resuscitation for more than 25 years, pioneering advances in improving the quality of CPR, AED use, defining the “three phase” model for cardiac arrest care, and therapeutic hypothermia. He has worked closely with the American Heart Association in emphasizing the importance of a “systems of care” approach to improving survival within communities. His cellular studies have helped define reperfusion injury mechanisms, mitochondrial oxidant generation, reactive oxygen and nitrogen species responses to ischemia, apoptotic activation following ischemia, signaling pathways, new cellular cytoprotective strategies and hypothermia protection.

## Yousef Al Abed, PhD



*Investigator, Head, Center for Molecular Innovation, The Feinstein Institute for Medical Research*

*Professor, Molecular Medicine & Medicine, Hofstra Northwell School of Medicine*

Dr. Yousef Al-Abed received his bachelor's degree from College of Science and Technology in Jerusalem, Israel, and his master's from the University of Jordan. He later received his doctorate in organic chemistry from the University of Tübingen in Germany. His thesis focused on developing novel methodologies for the utilization of carbohydrate scaffolds in the syntheses of complex molecules.

In 1994, Dr. Al-Abed was recruited as a postdoctoral fellow by Dr. Anthony Cerami to work at the Picower Institute in Manhasset, NY. He became an assistant professor in 1997, and in 2002 he accepted a position as an associate investigator and director of Drug Discovery Programs at The Feinstein Institute for Medical Research. In 2009, he became a professor of molecular medicine at Hofstra Northwell School of Medicine.

Recently, Dr. Al-Abed was named the head of Feinstein's newly established Center of Molecular Innovation. This Center leads the discovery and development of novel therapeutics for human diseases including lupus, arthritis, diabetes, Alzheimer's disease and sepsis. It is an essential component of The Feinstein Institute that integrates target discovery with medicinal chemistry approaches to generate molecular probes (small organic compounds) and potential drugs. So far, the Center has successfully identified several drug candidates and has repurposed existing drugs to target critical proteins involved in neurodegenerative and autoimmune diseases.

**Research Focus** – Molecular Innovation's impact on drug discovery can be exemplified by Dr. Al-Abed's laboratory team's previous work with macrophage migration inhibitor factor (MIF), a pro-inflammatory cytokine involved in many inflammation-mediated diseases. Their research so far indicates that MIF is a prime candidate for small molecule drug development. Based on their successful approach, the pharmaceutical industry (e.g., Novartis, Sanofi-Aventis, Vertex and others) has begun to invest heavily in MIF as a drug target.

## Patricio Huerta, PhD



*Professor of Neuroscience, Center for Autoimmune and Musculoskeletal Diseases, The Feinstein Institute for Medical Research*

*Professor, Molecular Medicine, Hofstra Northwell School of Medicine*

Dr. Patricio Huerta attended the University of Chile, where he studied biology and philosophy and later earned a master's degree in physiology. He then moved to Boston to pursue doctoral studies at Brandeis University under the advise of Dr. John Lisman. Dr. Huerta's doctoral thesis dealt with the topic of theta-band oscillations and synaptic plasticity in the hippocampus. Dr. Huerta stayed in Boston for his postdoctoral fellowship and joined the laboratories of Susumu Tonegawa and Matthew Wilson at the Massachusetts Institute of Technology. His postdoctoral work focused on the mechanisms by which the synaptic receptor, known as N-methyl-D-aspartate receptor, participates in the molecular basis of episodic memory.

Dr. Huerta worked as an assistant professor at New York University and, subsequently, migrated to the Burke Institute, an affiliate of Cornell Medical School, which allowed him to pursue biomedical research in preclinical models in conjunction with clinical studies in human patients.

Dr. Huerta is highly interested in exploring the interactions between the nervous system and the immune system in health and disease. During his training, and as an independent investigator, he has gained expertise in neural recordings of ex vivo brain slices, in vivo neural recordings of freely moving mice, brain anatomy and imaging, behavioral science, molecular genetics, genomics, immunology, and animal modeling of neurological and autoimmune diseases.

**Research Focus** – Dr. Huerta's Laboratory of Immune & Neural Networks explores how the brain organizes cognitive behavior. The brain areas that are relevant for cognition, such as the hippocampus and cortex, have been well mapped anatomically but the functional aspects remain elusive. Dr. Huerta's team uses a multi-level approach to study the physiological processes and the brain areas that are engaged in cognition.

Current projects include the development of clinically relevant murine models for the brain abnormalities that occur during immune-related diseases, such as systemic lupus erythematosus, overwhelming sepsis, maternal transfer of antibodies, and neuroinflammation. His laboratory's overarching goal is to isolate key neural and immune mechanisms that can guide us in the generation of rational therapies for brain disorders and autoimmunity.

## Bruce Volpe, MD



*Investigator, Laboratory of Biomedical Science, The Feinstein Institute for Medical Research*

*Professor, Department of Molecular Medicine, Hofstra Northwell School of Medicine*

Dr. Bruce Volpe graduated with a BS from Yale University and an MD from Yale Medical School. He completed a residency in internal medicine at the University of Chicago Medical Center and at Columbia Presbyterian Medical Center and received further clinical training in neurology at Cornell-New York Hospital Medical Center.

Dr. Volpe has headed brain trauma and stroke recovery units at Cornell affiliated hospitals, and directed the neurorehabilitation fellowship training for neurologists also at the Cornell-Burke Program. He worked with the first interactive robotic devices in the dawn of the modern age of neuro-recovery, testing whether these devices were effective.

He is a member of the Departments of Neurology and Physical Medicine and Rehabilitation at the Northwell Health Hospital Center, and he mentors residents from those departments in performing clinical research projects.

**Research Focus** – At The Feinstein Institute for Medical Research, Dr. Volpe is attempting to extend the reach of restoration after neurological injury with non-invasive technology and with novel pharmacology. Clinical research in stroke recovery has demonstrated that many stroke survivors can relearn skills that are lost when part of the brain is damaged. Rehabilitation efforts focus on teaching new ways of performing tasks to circumvent or compensate for residual disabilities. This approach leaves aside training for the affected limbs. Now, robotic devices can be used to re-train weakened upper limbs. This novel technology moves a patient's paralyzed or paretic limb and senses when a patient is moving so that it can get out of the way and let the patient execute the movement. The lab is also testing whether robotic training can be complemented and enhanced by transcranial direct current stimulation (tDCS), and eventually by repetitive trans-cranial magnetic stimulation (rTMS).

His laboratory at The Feinstein Institute also applies techniques of quantitative histopathology in collaborative projects that study the effect of autoantibodies on the brain and the toxic delayed effects of severe sepsis on the brain.

## Lionel Blanc, PhD



*Associate Professor, Laboratory of Developmental Erythropoiesis,  
Center for Autoimmune, Musculoskeletal and Hematopoietic  
Diseases,  
The Feinstein Institute for Medical Research*

*Associate Professor, Molecular Medicine and Pediatrics,  
Donald and Barbara Zucker School of Medicine at  
Hofstra/Northwell*

Dr. Blanc received his PhD in Molecular Medicine from the University of Montpellier in 2008. He then moved to New York to do his postdoctoral training at the New York Blood Center in the Red Cell Laboratory and the Mammalian Genetics Laboratory, under the essential mentoring of Drs. Mohandas Narla and Luanne Peters respectively. After three and a half years spent at the New York Blood Center, Dr. Blanc joined the Northwell Health Department of Pediatrics Hematology/Oncology in 2012 initially as a postdoctoral fellow first. Shortly after, he became an Associate Investigator and an Associate Professor of Molecular Medicine and Pediatrics and established the Laboratory of Developmental Erythropoiesis. Dr. Blanc has established numerous collaboration both nationally and internationally, and also served as ad-hoc member on NIH study section as early career reviewer.

Finally, Dr. Blanc is involved in the teaching of the Hematology course for the first-year students at the Hofstra Northwell School of Medicine, and notably delivers a lecture on the hematopoietic stem cell and on the structure of the red cell membrane. He is also involved in the critical reading course offered to the MD-PhD students. He is currently mentoring two successful MD/PhD students.

**Research Focus** – Dr. Blanc’s two main axes of research are: (i) developmental erythropoiesis and its impairment in pathological conditions and (ii) cancer predisposition in children with Diamond Blackfan anemia. In 2014, Dr. Blanc received the Allied World Career Development Award from the St. Baldrick’s Foundation in order to study this osteogenic sarcoma development in these children.

## Betty Diamond, MD



*Professor & Head, Center for Autoimmune, Musculoskeletal and Hematopoietic Diseases,  
The Feinstein Institute for Medical Research*

*Professor, Molecular Medicine and Medicine, Donald and Barbara Zucker School of Medicine at Hofstra/Northwell*

*Director, PhD Program, Donald and Barbara Zucker School of Medicine at Hofstra/Northwell*

Dr. Betty Diamond graduated with a BA from Harvard University and an MD from Harvard Medical School. She performed a residency in internal medicine at Columbia Presbyterian Medical Center and received postdoctoral training in immunology at the Albert Einstein College of Medicine.

Dr. Diamond has headed the rheumatology divisions at Albert Einstein School of Medicine and at Columbia University Medical Center. She also directed the Medical Scientist Training Program at Albert Einstein School of Medicine for many years. She is currently head of the Center for Autoimmune, Musculoskeletal and Hematopoietic Diseases at The Feinstein Institute for Medical Research and director of the PhD and MD/PhD programs of the Donald and Barbara Zucker School of Medicine at Hofstra/Northwell.

A former president of the American Association of Immunology, Dr. Diamond has also served on the Board of Directors of the American College of Rheumatology and the Scientific Council of the National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS).

Dr. Diamond is a fellow of the American Association for the Advancement of Science (AAAS) and a member of the National Academy of Medicine.

**Research Focus** Dr. Diamond's laboratory studies DNA-reactive B cells in the autoimmune disease systemic lupus erythematosus. Her team is interested in the alterations within B cells that lead to the survival and activation of DNA-reactive B cells and in the alterations in other cells of the immune system that affect B cell function and can also lead to the survival and activation of DNA-reactive B cells. The laboratory is particularly interested in the regulation of autoreactive B cells that acquire autoreactivity by somatic mutation during a germinal center response and in determining whether the processes that govern the selection of the B cell repertoire early in B cell development are the same as those that govern selection after activation. These studies are designed to provide new strategies to protect against autoimmune disease.

Dr. Diamond's laboratory also examines whether autoantibodies in individuals with autoimmune disease or protective antibodies in non-autoimmune individuals might frequently cause brain injury if they penetrate the blood-brain barrier. It is their hypothesis that antibodies may frequently contribute to acquired changes in cognition or behavior.

## Daniel Grande, PhD



*Associate Professor, Center for Bioelectronic Medicine, The Feinstein Institute for Medical Research*  
*Director, Orthopaedic Research Laboratory, The Feinstein Institute for Medical Research*  
*Associate Professor, Molecular Medicine and Orthopedic Surgery, Donald and Barbara Zucker School of Medicine at Hofstra/Northwell*

Dr. Grande is associate investigator and director of Orthopaedic Research at the Feinstein Institute for Medical research. He is also associate professor at the Donald and Barbara Zucker School of Medicine at Hofstra/Northwell. He completed his PhD at New York University and his post-doctoral fellowship in biomechanics at the Hospital for Special Surgery. He has worked extensively in the area of regenerative medicine and tissue engineering. His early work developed the first use of cell based therapy for cartilage repair, currently known as autologous chondrocyte transplantation.

He is the author of over 80 peer review publications and five book chapters. He has served on committees with the Orthopaedic Research Society as spine topic chair and on the basic science committee. Dr. Grande is significantly involved in mentoring and teaching of orthopaedic residents for his department. He has been a reviewer for a number of journals including: Journal of Orthopaedic Research, Clinical Orthopaedics, Osteoarthritis and Cartilage, American Journal of Sports Medicine, Nature Reviews Rheumatology and Journal of Applied Biomaterials.

Dr. Grande has been awarded eight patents and helped found two companies in the orthopaedic surgery field of use. He has also served as a member of the scientific advisory boards for several companies. He completed a five year rotation with OREF to assist in grant reviews, and regularly serves on NIH study sections for RO1, R21, and SBIR/STTR grants specific to musculoskeletal applications.

**Research Focus**—Dr. Grande's research program involves mechanistic concepts for the causality of degenerative disc disease. In this application he will fulfill his role of co-investigator by collaborating in his area of expertise: cartilage biology and repair. This is an area in which he has spent his entire career conducting research, and has resulted in currently FDA-approved cell based therapies, eg. autologous chondrocyte transplantation [ACI]. The focus of this grant application is the early events that result in disc degeneration. This is a concept that Dr. Grande and his group have been developing over the last two years, performing numerous studies which have been documented in peer review publications. As part of this application, his team will be performing all of biomechanics testing and histology. Successful completion of the research objectives of this application would have broad impact in the area of the spine, which is a major health care burden for the USA.

## Barbara Sherry, PhD



*Professor, Institute of Molecular Medicine, Feinstein Institutes for Medical Research*

*Director, Research Training, Feinstein Institutes for Medical Research*

*Professor, Molecular Medicine and Medicine, Donald and Barbara Zucker School of Medicine at Hofstra/Northwell*

Dr. Sherry received her bachelor's degree from Smith College and her doctoral degree from Brandeis University. Early in her career, while a postdoctoral fellow at The Rockefeller University, Dr. Sherry pioneered a protein-based strategy to discover novel cytokines—immune regulatory proteins secreted by blood cells—that play a role in protecting the body against pathogens. Her work led to the discovery of three novel proteins (MIP-1 $\alpha$ , MIP-1 $\beta$  and MIP-2) whose actions are critical for both host defense and normal immune system homeostasis. These were three of the founding members of the group of proteins now known as chemokines – a class of secreted proteins that regulate cell movement and serve as the “traffic cops” of the immune system. Dr. Sherry's laboratory continues to investigate the biological roles of these molecules in the body's response to bacterial and viral infections and cancer.

Barbara Sherry, PhD, is currently a professor and head of the Center for Immunology and Inflammation at The Feinstein Institutes for Medical Research. She holds a joint appointment as professor in the departments of medicine and molecular medicine at the Donald and Barbara Zucker School of Medicine at Hofstra/Northwell.

**Research Focus** – Dr. Sherry's laboratory has had a long-standing interest in the mechanisms that coordinate the innate immune response—the body's first line of defense against invading pathogens including bacteria, viruses, parasites and tumors. Early work led to the discovery of a novel set of chemoattractant proteins secreted by cells in response to bacterial challenge, and the determination that those proteins were in fact members of a larger family of proteins (the chemokine family) that plays a critical role in host defense and immune system homeostasis.

As with other inflammatory cytokines, the team now recognizes that excessive production of these same chemokine proteins and/or dysregulation of chemokine receptor expression can have harmful consequences and contribute to disease-associated pathology.

Their ongoing research goal is to gain a better understanding of the molecular mechanisms that regulate chemokine and chemokine receptor responses in healthy individuals, and to identify how these pathways are dysregulated in sepsis, HIV infection and chronic lymphocytic leukemia. Their studies will identify new therapeutic targets to restore immune function and improve clinical outcome in disease.

## Theodoros P. Zanos, PhD



*Assistant Professor, Neural and Data Science Laboratory, Institute of Bioelectronic Medicine, Feinstein Institutes for Medical Research*

*Assistant Professor, Department of Molecular Medicine, Donald and Barbara Zucker School of Medicine at Hofstra/Northwell*

Dr. Theo Zanos is the head of the Neural and Data Science Lab and an assistant professor at the Feinstein Institutes for Medical Research and the Zucker School of Medicine at Hofstra/Northwell. He received his Bachelor of Engineering degree in electrical and computer engineering from the Aristotle University of Thessaloniki in Greece in 2004, his Master of Science and his Doctorate in biomedical engineering from the University of Southern California, Viterbi School of Engineering in 2006 and 2009 respectively. His thesis, supervised by Dr. Vasilis Marmarelis, focused on developing machine learning and system identification approaches for Multi-Input Multi-Output hippocampal neural circuits to be used for a cognitive neuroprosthesis platform.

In 2009, Dr. Zanos was recruited as a postdoctoral fellow by Dr. Christopher Pack to work at the Montreal Neurological Institute (MNI), McGill, in Montreal, Canada, combining high-channel-count primate electrophysiology with machine-learning based neural data analysis methods to relate neural activity to behavior and cognition. In 2016, Dr. Zanos joined the Institute of Bioelectronic Medicine at the Feinstein Institutes for Medical Research.

Dr. Zanos has authored more than 20 peer-reviewed publications in journals like *Neuron*, *PNAS*, *Journal of Neuroscience* and others and his research has been featured in PBS, *Scientific American* and other media outlets. He has been awarded the Excellence in Research Award in 2018, the Jean Timmins Award in 2012 and the Center of Excellence in Commercialization and Research Award in 2010.

**Research Focus** - The goal of the Neural and Data Science Lab is to develop the algorithms that will power the next generation bioelectronic medicine devices to enable early diagnosis, assess disease severity and personalize and adapt therapies. Our ambition is to learn how the nervous system senses the state and affects the function of the immune, metabolic and cardiopulmonary systems. We want to use this knowledge to develop devices that are able to diagnose and treat various diseases and conditions by interacting with the nervous system. To achieve that, we combine neural and physiological signal processing, machine learning and neurophysiology. Current projects include decoding immune and metabolic states from vagal signals, closed-loop optimization of bioelectronic therapies, non-invasive bioelectronic analytics and machine learning and reinforcement learning applied in healthcare data.

## Stavros Zanos, MD, PhD



*Assistant Professor, Translational Neurophysiology Lab, Center for Bioelectronic Medicine, Feinstein Institutes for Medical Research*

*Affiliate Assistant Professor, Department of Physiology & Biophysics, University of Washington School of Medicine*

Dr. Zanos obtained his MD diploma from Aristotle University, in Thessaloniki, Greece. He served as a general medical practitioner and a military physician, before training in internal medicine and cardiology, and earning a PhD in Neuroscience and Physiology from the University of Washington School of Medicine in 2013, where he also served as senior fellow and instructor. He joined the Feinstein Institutes for Medical Research as assistant professor in 2017. At the Feinstein Institutes, he leads the Translational Neurophysiology Lab, at the Institute for Bioelectronic Medicine. He is also adjunct assistant professor at the University of Washington.

**Research Focus** - One of Dr. Zanos' research interest is the study of mechanisms, fiber types and neural circuits by which the autonomic nervous system informs the brain about the status of peripheral organs and systems, and exerts control over them. At the Translational Neurophysiology lab, anatomical techniques are developed to map the peripheral and central neural circuits responsible for these functions and to track how these circuits are altered by disease. Physiological, electrophysiological, optical and genetic methods are used to understand neural activity related to autonomic function in the nerves themselves, the ganglia and the brain and to study how nerve stimulation affects the brain and the organs to which the nerves project.

Another major area of interest are techniques and technologies for responsive and adaptive neuromodulation of central and peripheral neural systems. "Responsive" means that neurostimulation is delivered upon the occurrence of certain physiological events or states of the system or the organism. "Adaptive" means that neurostimulation is optimized in real time with regards to its physiological and/or neurological effects, by adjusting its parameters on the fly to maximize effectiveness and minimize side effects. Special surgical methods, probes and stimulation techniques are used to selectively activate organ systems, nerves and nerve fibers. Recording and stimulation systems, both rack-mounted and implantable, are developed and deployed to interface with the nervous system in real time, in a bidirectional manner.

At the Translational Neurophysiology lab, neurostimulation-based, bioelectronic therapies are tested in preclinical models of disease, using the knowledge gained from basic neurophysiological studies and the neuromodulation technology developed. Disease models are developed and studied in different small and large animal models, each of which has unique advantages and limitations in the translation process. Experiments are designed so that what is learned from earlier models is directly transferable to later models, and ultimately to human clinical applications. Such therapies are ultimately tested in clinical trials, in collaboration with clinical research teams at Northwell Health.

## Timir Datta-Chaudhuri, PhD



*Assistant Professor, Center for Bioelectronic Medicine, Bioelectronics and Biosensors Laboratory, Feinstein Institutes for Medical Research*

Dr. Timir Datta-Chaudhuri received his BS, MS, and PhD degrees in electrical engineering from the University of Maryland, College Park, MD, in 2007, 2013, and 2015, respectively. His thesis work was on the development of hybrid bioelectronic sensing systems, integrating CMOS circuits with living systems.

He was recruited into the Neural Technologies Group within the Center for Bioengineering at Lawrence Livermore National Laboratory, Livermore, CA, as a postdoctoral fellow in 2015. His research focus was on the development of implantable neural interfaces for restoring memory and the treatment of neuropsychiatric disorders. His research interests include brain-machine interfaces, lab-on-a-chip, cell-based sensing, biosensors, microsystem design and packaging, mixed-signal integrated circuit design, adaptive analog circuits, and neuromorphic engineering.

In 2017, Dr. Datta-Chaudhuri accepted a position as an assistant professor at the Feinstein Institutes for Medical Research, where he joined the Center for Bioelectronic Medicine as the lead of the Bioelectronics and Biosensing Laboratory.

**Research Focus** - The intersection of biology and electronics has always been the focus of the work performed by Dr. Datta. His early work involved neural networks and neuromorphic computing, building systems that emulated the computational capability of biology by employing spiking neural networks built using silicon integrated circuits. He then went on to develop lab-on-CMOS systems that intimately combined electronics and biology to create hybrid bioelectronics systems with capabilities greater than the sum of their parts. These systems included electrical and optical interfaces to living cells, and electronics that were designed to interact with living systems. The living cells were used to sense the environment and the signals from the cells were processed by the onboard electronics using the same computational paradigms seen in biology. Building these systems required developing novel die-level packaging techniques to allow the biology and electronics to work together harmoniously. Now his work focuses on the development on implantable neural interfaces for treatment of diseases and for augmenting human capability.

The underlying goal of all the work performed at the Bioelectronics and Biosensing Laboratory is the development of next-generation bioelectronic therapeutic devices. Working with the other collaborating laboratories at the Center for Bioelectronic Medicine, the Bioelectronics and Biosensing Laboratory will develop the miniaturized implantable devices that will enable later-stage clinical trials and eventually the commercial realizations of the bioelectronics therapies being pioneered at the Feinstein Institutes for Medical Research. The work performed at the laboratory consists of developing the miniaturized electronics and implantable packages required for chronically implantable neural interfaces as well as answering the basic scientific questions about the optimal ways to apply bioelectronic therapies to maximize efficacy through selective targeting.

## Ona E. Bloom, PhD



*Professor, Institute of Molecular Medicine, Feinstein Institutes for Medical Research*

*Professor, Molecular Medicine, Donald and Barbara Zucker School of Medicine at Hofstra/Northwell*

*Director of Research and Associate Professor, Physical Medicine and Rehabilitation, Donald and Barbara Zucker School of Medicine at Hofstra/Northwell*

Dr. Ona Bloom is director of the Laboratory of Spinal Cord Injury Research and associate professor at the Feinstein Institutes for Medical Research. She is jointly appointed as associate professor of Physical Medicine & Rehabilitation and of Molecular Medicine at the Donald and Barbara Zucker School of Medicine at Hofstra/Northwell. Dr. Bloom also serves as the director of research for the Department of Physical Medicine and Rehabilitation.

Prior to joining Northwell Health, Dr. Bloom performed her postdoctoral studies and served as an associate research scientist in the Departments of Cell Biology and Immunology at the Yale University School of Medicine. Her studies at Yale focused on understanding how immune cells communicate with each other. Dr. Bloom received her PhD from The Rockefeller University, where she studied molecular and cellular neuroscience in the laboratory of Professor Paul Greengard. Her PhD studies were focused on understanding the molecular anatomy of synapses, the points of communication between nerve cells.

**Research Focusm** - Traumatic spinal cord injury (SCI) affects more than 17,000 people in the United States each year. The focus of Dr. Bloom's research is to identify the necessary biological mechanisms and identify potential strategies to promote functional recovery and overall health in adults and children with SCI. To do so, Dr. Bloom's research group is using biochemical, cell biological, functional genomics, immunological and behavioral methods. In addition to unbiased approaches, Dr. Bloom is particularly interested in understanding how the immune system changes after SCI and how these changes may influence recovery and health after SCI. Her research group performs both clinical and pre-clinical studies, with the hopes of identifying new targets and strategies for potential therapeutic intervention.

Dr. Bloom's clinical studies on acute and chronic SCI are performed in collaboration with Dr. Adam Benjamin Stein, chairman of the Department of Physical Medicine and Rehabilitation at the Donald and Barbara Zucker School of Medicine at Hofstra/Northwell and Dr. Matthew Alan Bank, medical director of the ACS-verified Level One Trauma Center at North Shore University Hospital. Dr. Bloom's SCI research program has received external funding from the Craig H. Neilsen Foundation, the Empire Clinical Research Investigator Program, the Spinal Cord Injury Research Board of New York State, the National Institutes of Health and the US Department of Defense. Dr. Bloom is also an affiliated researcher at the RR&D National Center of Excellence for the Medical Consequences of Spinal Cord Injury at the James J. Peters VA Medical Center, Bronx, NY.

Dr. Bloom also collaborates with other Northwell Health colleagues, Drs. Betty Diamond and Yousef Al-Abed, to develop novel therapeutic agents for the treatment of lupus.

## Nicholas Chiorazzi, MD



*Professor, Karches Center for Oncology Research, Feinstein Institutes for Medical Research*

*Head, Karches Center for Chronic Lymphocytic Leukemia Research, Feinstein Institutes for Medical Research*

*Professor, Medicine and Molecular Medicine, Donald and Barbara Zucker School of Medicine at Hofstra/Northwell*

Dr. Nicholas Chiorazzi received his medical degree from Georgetown University. He completed internal medicine training and rheumatology and allergy-clinical immunology training in the Cornell Cooperating Hospitals. He was also an immunology research fellow at Harvard Medical School in the laboratory of Baruj Benacerraf and at The Rockefeller University in the laboratory of Henry G. Kunkel.

In 1987, Dr. Chiorazzi was appointed chief of the then-new Division of Rheumatology & Allergy-Clinical Immunology of North Shore University Hospital. In 2000, he was appointed the first director and CEO of the Feinstein Institutes for Medical Research. He is currently a professor of medicine and molecular medicine at the Zucker School of Medicine.

He has been elected to American Society of Clinical Investigation and the Association of American Physicians and was the recipient of the Binet-Rai Medal for Excellence in CLL Research.

**Research Focus** - Dr. Chiorazzi's laboratory studies the activation and maturation of B-lymphocytes in health and disease, in particular chronic lymphocytic leukemia (CLL). Dr. Chiorazzi and his colleagues have demonstrated the following; CLL cells are responsive to signals from the internal microenvironment, in particular those delivered by the B-cell antigen receptor (BCR), leading to leukemic cell proliferation and maturation or death; BCR-induced signals are likely delivered by common self antigens and are mediated through sets of BCRs of remarkably similar amino acid structure; patients with CLL segregate into two subgroups based on BCR structure that differ dramatically in clinical outcome; CLL cells proliferate and die in vivo at rates higher than originally appreciated.

These findings have led to the view that (auto)antigen drive is a promoting factor in the development and evolution of CLL and have been a pivotal in refining patient prognosis.

## Anne Davidson, MBBS



*Professor, Institute of Molecular Medicine, Feinstein Institutes for Medical Research*

*Professor, Molecular Medicine, Donald and Barbara Zucker School of Medicine at Hofstra/Northwell*

Anne Davidson, MBBS, is professor of Molecular Medicine at the Donald and Barbara Zucker School of Medicine at Hofstra/Northwell and investigator at the Feinstein Institutes for Medical Research. She received her MBBS degree from the University of Melbourne, Australia and is a board certified Rheumatologist. She is currently the program director of the Rheumatology fellowship at Northwell Health. Dr. Davidson is a member of the medical advisory board for the NY SLE Foundation and co-chairs the grant review committee of the animal models subsection for the Lupus Research Institute. She is currently the chair of the scientific advisory council for the Rheumatology Research Foundation.

**Research Focus** - The current interests of Dr. Davidson's laboratory are focused on pathogenesis and therapy of SLE, an autoimmune disease affecting women of childbearing years. Production of autoantibodies directed against ubiquitous cellular components, such as DNA and other nuclear antigens, results in formation of immune complexes that can deposit in target tissues and initiate inflammation that causes organ damage. Other immune cells also become activated and contribute to the inflammatory process.

The first goal of the laboratory is to understand more about the regulation of autoantibody producing B cells and to use newly-discovered pathways of immune activation to design and test novel therapies for SLE.

The second goal of the laboratory is to understand the role of co-stimulatory molecules in target organ inflammation. Co-stimulatory receptors are involved in trafficking of immune cells to target organs. Normally, immune cells are sequestered in the lymphoid organs, such as the spleen and lymph nodes. When they traffic to a non-lymphoid organ, such as the kidney, they can induce inflammation. Recent work therefore focuses on lupus nephritis and the role of immune cell activation in kidney damage so as to understand the molecular basis for cell migration to the kidney and for resolution of inflammation after remission inducing therapies.

## Peter Gregersen, MD



*Professor, Institute of Molecular Medicine, Feinstein Institutes for Medical Research*

*Professor, Medicine and Molecular Medicine, Donald and Barbara Zucker School of Medicine at Hofstra/Northwell*

Originally trained as a rheumatologist, Peter K. Gregersen, MD, has been working in the area of genetics for over two decades and led several major international consortia to study the genetics of rheumatoid arthritis, systemic lupus, myasthenia gravis, myositis and other autoimmune disorders.

On May 2, 2013, the Royal Swedish Academy of Sciences presented Dr. Gregersen with the Crafoord prize for his genetic research in rheumatoid arthritis. The prize was presented to Dr. Gregersen in Stockholm by the king. The prestigious Crafoord prize is an annual science prize established in 1980 by Holger Crafoord, a Swedish industrialist.

In addition, he has spearheaded the development of a robotic biorepository and informatics resources to support these studies, including a large normal control registry with a view toward understanding genotype-phenotype relationships in both normal and disease populations. He has longstanding interests related to the genetics of absolute pitch and synesthesia, as well as studies of immunological aspects of autism.

**Research Focus** - Dr. Gregersen's ongoing studies in the laboratory include international collaborative efforts to achieve a comprehensive description of the genetics of autoimmune diseases, with a particular focus on rheumatoid arthritis and systemic lupus erythematosus. At least 46 genetic regions have been identified for rheumatoid arthritis, but it is likely that many more remain to be discovered.

In addition, Dr. Gregersen is pursuing functional studies of a number of newly defined risk genes for autoimmunity, particularly genes that regulate the thresholds for activation of the immune system. Several of these genes for autoimmunity are potential targets of new drugs that may be able to modify activation thresholds, in order to either enhance or reduce aspects of the immune response. These studies include work on the following genes:

- CSK (c-Src tyrosine kinase)
- TNIP1 (TNFAIP3 interacting protein 1)
- BLK (B lymphoid kinase)
- PTPN22

## Christine Metz, PhD



*Professor, Institute of Molecular Medicine, Feinstein Institutes for Medical Research*

*Director, Faculty Affairs, Feinstein Institutes for Medical Research*

*Associate Dean and Professor, Elmezzi Graduate School of Molecular Medicine*

*Professor, Molecular Medicine and Obstetrics & Gynecology, Donald and Barbara Zucker School of Medicine at Hofstra/Northwell*

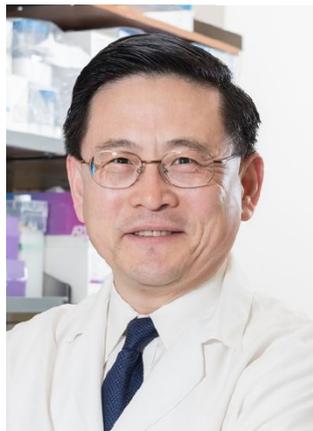
Christine N. Metz is head of the laboratory of medicinal biochemistry and a professor in the Center of Molecular Medicine at the Feinstein Institutes for Medical Research. She is the director for ObGyn research for the Maternal Fetal Medicine Fellowship program at North Shore University Hospital and LIJ Medical Center at Northwell Health. Drs. Christine Metz and Peter K. Gregersen received the 2018 Northwell Health Innovation Award for their research on developing a novel non-invasive diagnostic test for endometriosis.

Professor Metz received her BS degree (with honors and distinction) and MS degree in human nutrition from Cornell University and her PhD degree in immunology/pathology from New York University. Since Professor Metz established her own laboratory in 1998 in Manhasset, NY, she has focused her research on the regulation of inflammation. Much of her work has centered on improving women's health. She is the author of more than 140 peer-reviewed scientific research papers and more than a dozen review articles and book chapters. In addition, she served as the first president of Advancing Women in Science and Medicine (AWSM, pronounced "awesome") at the Feinstein Institutes

**Research Focus** - Although inflammation is necessary and important for maintaining homeostasis, there are many conditions characterized by dysregulated inflammation. When left unchecked, dysregulated inflammation leads to aberrant angiogenesis, tissue damage, and organ injury. Some conditions, such as infections and sepsis, are characterized by excessive, acute production of inflammatory mediators. Whereas other conditions, such as obesity and nutrient deficiencies, are accompanied by chronic low level inflammation. Dr. Metz's laboratory investigates both acute and chronic inflammation in various disease states and conditions to identify mechanisms for regulating inflammation to reduce or prevent tissue damage and organ injury.

Dr. Metz is committed to performing research that will advance women's health. She investigates conditions of pregnancy, including gestational diabetes, preterm labor, and pre-eclampsia, as well as how maternal health affects fetal/neonatal health outcomes. In addition, she studies endometriosis, a potentially debilitating condition affecting 5-10% of women, which is characterized by chronic pelvic pain and can lead to infertility when left untreated.

## Ping Wang, MD



*Professor, Chief Scientific Officer, and Senior Vice President,, Feinstein Institutes for Medical Research*

*Vice Chairman for Research, Department of Surgery, Long Island Jewish Medical Center and North Shore University Hospital*

*Professor, Surgery and Molecular Medicine, Donald and Barbara Zucker School of Medicine at Hofstra/Northwell*

*Head, Center for Immunology and Inflammation, Feinstein Institutes for Medical Research*

Ping Wang, MD, is senior vice president and chief scientific officer at the Feinstein Institutes for Medical Research and vice chairman for research in the department of surgery at North Shore University Hospital and Long Island Jewish Medical Center. He is also professor of surgery and molecular medicine at the Zucker School of Medicine at Hofstra/Northwell and head of the Center for Immunology and Inflammation in the Feinstein Institutes for Medical Research.

In 2002, Dr. Wang became professor of surgery at Albert Einstein College of Medicine and chief of the division of surgical research at North Shore University Hospital and Long Island Jewish Medical Center. Prior to joining the department of surgery at North Shore University Hospital and Long Island Jewish Medical Center, Dr. Wang held positions of professor of surgery (with tenure), professor of pathology, physiology and biophysics at University of Alabama at Birmingham (UAB) and associate professor in the department of surgery at Brown University School of Medicine. Dr. Wang is a member of various societies, including Shock Society, American Association of Immunologists, American Physiological Society, Society of Critical Care Medicine, Surgical Infection Society, Society for Leukocyte Biology, Association for Academic Surgery, American Heart Association, American Association for the Advancement of Science, and New York Academy of Science. Dr. Wang served as the president 2016-2017 of the Shock Society. He has also served as the program chair of the Shock Society at the Annual Shock Conference in 2013.

**Research Focus** - The Center for Immunology and Inflammation's long-term goal is to understand the pathobiological mechanisms contributing to organ dysfunction and to develop better therapies for inflammatory diseases such as sepsis. A strong research focus of the Center is the role of extracellular cold-inducible RNA-binding protein (eCIRP) in health and disease. We have discovered that eCIRP acts as a new damage-associated molecular pattern (DAMP) to exaggerate inflammation and organ injury in sepsis and other inflammatory diseases. We also identified that eCIRP plays a critical role on cognition by demonstrating that alcohol intoxication causes eCIRP to be released into the brain, leading to cognitive impairment. This finding may inspire us to determine eCIRP's role in progressive neurodegenerative conditions such as Alzheimer's disease. Another line of research at the Center involves neutrophils in sepsis. While neutrophil effector molecules may neutralize infection, uncontrolled release of these effectors often cause tissue damage. Our research on eCIRP, neutrophils, and NETs have elucidated novel mechanisms of disease in sepsis, and reveal new potential therapeutic avenues for patients with sepsis and related inflammatory diseases.

## Lopa Mishra, MD



*Co-Director & Professor, Institute of Bioelectronic Medicine, Feinstein Institutes for Medical Research*

Lopa Mishra, MD, is co-director of the Institute of Bioelectronic Medicine at the Feinstein Institutes, and the inaugural Susan and Herman Merinoff Distinguished Chair in Translational Medicine. She co-directs the Institute with Yousef Al-Abed, PhD.

Dr. Mishra previously served as director of the Center for Translational Medicine at George Washington University (GW) where she established clinical and scientific programs, including liver and gastrointestinal diseases, and cancer. Prior to GW, Dr. Mishra served as the chair of the Department of Gastroenterology at MD Anderson Cancer Center in Houston, Texas, from 2009 to 2016, where in 2011, she assumed leadership of the GI cancer program.

Among many accomplishments at both GW and MD Anderson Cancer Center, Dr. Mishra cultivated a strong educational and mentoring program that developed a pipeline of physician-scientists. Over this past academic year, she built six multidisciplinary collaborative programs, given eight invited talks, chaired five sessions at national and international meetings, and co-authored/senior authored seven publications. She serves on five advisory boards, including the University of California, Los Angeles (UCLA) Mayo Clinic, Virginia Commonwealth University (VCU), Cincinnati and Georgetown University, and is currently working on two new studies focusing on the intersection of obesity/fibrosis and cancer.

**Research Focus** - The major focus of Dr. Mishra's research is on the continuum of science-driven clinical care by working on novel therapies and improved clinical outcomes, honing liver disease, metabolism/alcohol, obesity/addiction gastrointestinal cancers, inflammatory bowel disease, and neural regulation of disease and cancer, which links her to the field of bioelectronic medicine.