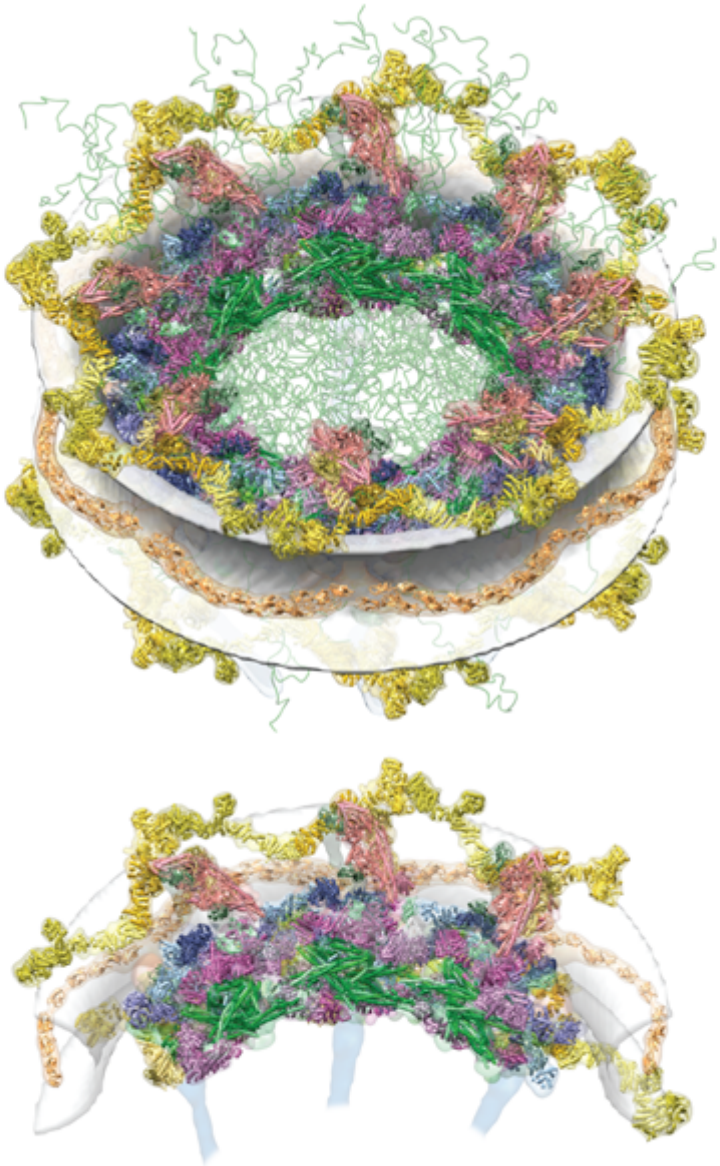
UNIVERSITY OF PITTSBURGH SCHOOL OF MEDICINE

CELL BIOLOGY

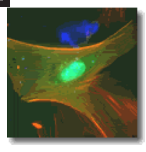


FY18 ANNUAL REPORT AND FY19 BUSINESS PLAN

Front Page

Cover figure by Yi Shi. Integrative structure of the yeast Nuclear Pore Complex (NPC). The yeast nuclear pore complex (NPC) is an organelle-sized macromolecular assembly (552 stable proteins) that pays key roles in the nuclear-cytoplasmic transport of numerous biomolecules. Approximately one-third of NPC proteins contain intrinsically disordered regions which populate the NPC central channel (modeled in green filaments) to mediate transport. As the nexus for many cellular processes, the NPC meets a large number of engineering challenges: e.g., it must provide a stable platform for numerous RNA processing and chromatin regulatory functions and resist external stresses from the nuclear envelope. This integrative NPC structure was determined at a precision of ~ 9 angstrom by using hybrid proteomics, structural biology, and modeling approaches; it provides a blueprint to understand the building principles and mechanistic details of this gigantic ancient cellular machinery.

Table of Contents of Cell Biology Annual Report



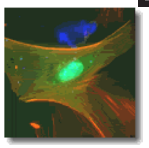
In the cell, life is governed by a multitude of molecular systems that shape and sustain the organellar system of the cell, maintain cellular homeostasis and respond to extracellular cues. These systems are dynamic, multicomponent macromolecular complexes. Maintaining and regulating the function of these complexes is essential for normal cell motility, growth, division, differentiation and programmed death. Dysregulation inevitably leads to an aberrant cell behavior and commonly disease. Understanding the structure, function and interactions of these macromolecular machineries and the underlying mechanisms by which they regulate organelles and other cellular compartments lie at the core of Cell Biology. The faculty in the Department of Cell Biology employs an interdisciplinary approach to address a broad spectrum questions in cell biology from the roles of single molecules to through complex multicomponent cellular mechanisms to integrated studies at the organismal level in yeast, fly, fish and mouse. The research in the Department involves translation of the fundamental cell functions to understanding the disease mechanisms and development of therapeutics.

The Department of Cell Biology is one of eight basic science departments in the School of Medicine. Members of our Department benefit from close and collegial interactions with researchers in other Departments, and with basic scientists in other Schools of the University of Pittsburgh and Carnegie-Mellon University. The Department is comprised currently of nineteen primary faculty, eighteen of them with vigorous research programs. Members of our faculty are active in both the medical and graduate school curricula, in curriculum development and student recruitment and mentoring. The graduate program in Cell Biology and Molecular Physiology is part of the Interdisciplinary Biomedical Graduate Program (IBGP) (http://www.gradbiomed.pitt.edu/) and led by our department faculty. We teach extensively in and direct (Dr. Hong) the Cell Biology Block, which comprises approximately one-third of the first year graduate course, Foundations of Biomedical Science. Our flagship course that departments offers, "Cell Biology of Normal and Disease States", is required of all students entering the program, and further information can be found at our departmental website (see: http://www.cbp.pitt.edu). The course has been recently revised to include exciting areas in modern cell biology as well as clinical conditions that arise from defects in these processes. Overall, the School of Medicine graduate program has more than 300 students currently working toward the PhD, and includes students in the newly-formed ISB (Integrated Systems Biology) program, also HHMI-funded Computational Biology program, Center for Neuroscience Program (CNUP), the Program in Integrative Molecular Biology, and the Structural Biology/Molecular Biophysics graduate program. Several of our faculty are active members of these programs. The Department is also actively participating in teaching in new Biomedical Master program (BMP) that was launched in 2017. After the successful first year with the enrollment of 35 students, recruitment of new student is increased to 60 in 2018.

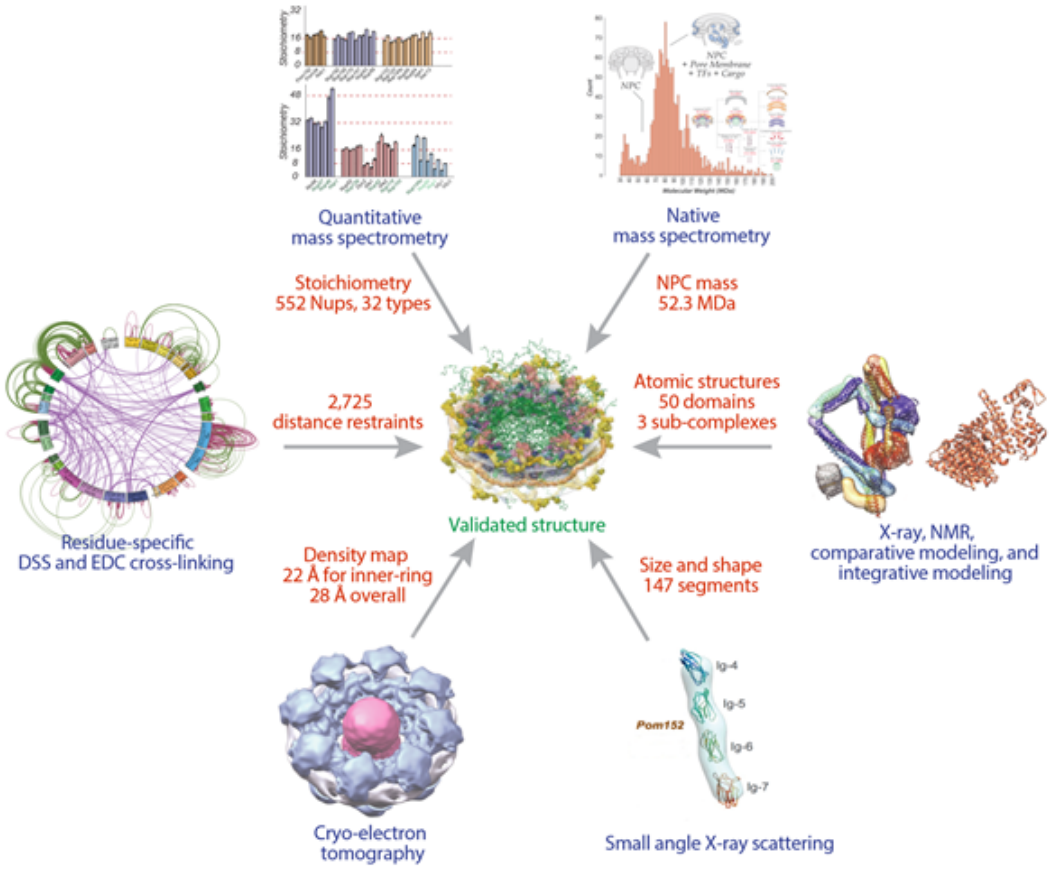
The Department is housed in administrative and research space in the South Wing of the Biomedical Science Tower (SBST). We also have laboratories in BST3 and the Hillman Cancer Institute. Our modern facilities and support cores provide the faculty with space designed to optimize their research efforts.

Faculty member featured in this Report: Yi Shi

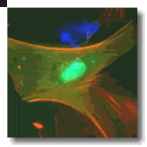
Dr. Shi is interested in the development of cutting-edge mass spectrometry-based proteomic technologies. One active area of research is to develop enabling hybrid methods for elucidating the structure- function of large native cellular machines. Another interest of the lab is to develop



highly enabling nanobody-based technologies for both affinity proteomics and drug therapeutics, Several images of the data from Dr. Yi Shi research are included with this report.



Dr. Yi Shi. Integrative structural analysis of large native cellular complexes such as the NPC. In this work, development of hybrid proteomics technologies is instrumental for the identification of the NPC components (affinity proteomics), determination of the stoichiometry (quantitative and native MS) and residue-specific spatial connectivity of the NPC proteins (chemical cross-linking and mass spectrometry). The figure was adapted from our recent publication by Kim et al (2018) **Nature** 555, 475–482



Research foci

Biomedical research in the Department of Cell Biology is directed at several major areas, as described below. The department is home of the School of Medicine's Center for Biological Imaging. The Department's major faculty groupings and research foci are summarized below.

Membrane trafficking and organelle biogenesis

Aridor
Butterworth
Devor
Ford
Hammond
Murray
Sorkin
Traub
Watkins

Scientists in this program are part of a larger "trafficking" community combining researchers from the School of Medicine, School of Arts and Sciences, and Carnegie Mellon University. The research is aimed at identifying the mechanisms underlying the organization of the cellular membrane compartment system, targeting of proteins and lipids to specific organelles and compartments, and at defining how these processes are disrupted in disease.

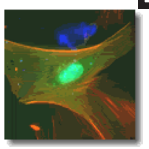
Regulation of channels and transporters

Butterworth
Devor
Sorkin
Watkins

Studies in this group aim at elucidating the physiological mechanisms underlying regulation of several ion channel and transporter proteins. Our approaches include biochemical, molecular, electrophysiologic, imaging, cell biologic and transgenic techniques. Inherited mutations in ion channels are responsible for many genetic diseases, including cystic fibrosis (CF). The department is home to a Translational Core Center in CF funded by the NIH and to a program grant from the CF Foundation.

Cellular organization and cell-cell communications

Hong
Kwiatkowski
Murray
Shi
Stoltz
St. Croix
Traub
Watkins



This group uses various state-of-the-art cell imaging, biochemical and genetic approaches to define the mechanisms involved in development and maintenance of epithelial cell polarity, regulation of all types of cellular junctions, mitochondria, nucleus, angiogenesis and vasculogenesis, and various routes of functional communication between dendritic cells.

Regulation of intracellular signaling and gene expression

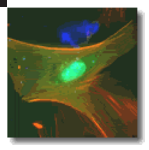
Drain
Hammond
Leuba
Sorkin
St. Croix

Scientists in this group are examining signaling processes mediated by receptors for growth factors and hormones, mechanisms of hormone secretion, processes involved in the regulation of cell cycle progression, ROS signaling and the mechanisms underlying virus replication. The particular focus is on the events leading to dysregulation of cellular signaling networks leading in the disease such as cancer.

Mass-spectrometry and proteomics

Shi
Yates

These laboratories are focused on developing new methodologies of quantitative mass-spectrometric analyses of proteins including new approaches to data acquisition, analysis and storage.

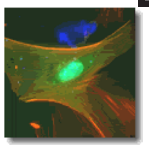


Center for Biologic Imaging

Over the last several years, microscopy as a scientific tool has reinvented itself. It has changed from a group of principally descriptive methodologies, to a wide range of primary tools and techniques to investigate the molecular organization of organs, tissues and cells. Advances in microscope and camera design, fluorescent dye technology and the development of fluorescent proteins as well as the advent of inexpensive, powerful computers have made the simultaneous resolution and quantitation of multiple concurrent molecular markers for both protein and DNA at a sub-micron resolution a reality. Furthermore, using these same systems, it is possible to probe living cells using a rapidly expanding repertoire of dyes sensitive to changes in cellular pH or the concentration of specific intracellular ions, and to optically section and rebuild images of cells in 3 dimensions using confocal microscopy. The development of nanometer sized particulate markers has been an essential extension of these techniques, allowing the distribution of proteins and mRNA to be studied within cells at a molecular resolution using electron microscopy.
The recognition of the potential utility of these techniques to the rapidly expanding research community here at the University of Pittsburgh School of Medicine led to the formation of a centralized microscope imaging center; the Center for Biologic Imaging (CBI), 25 years ago. Since then the CBI has become an essential resource for most of the research programs within the medical school and collaborates extensively with most of the active research programs within the school.

Capacity of the Center:
The capacity of the Center is limited only by instrumentation, by space, and by staff within the center. Over the last year, the Facility has continued to expand such that the base of imaging technologies has increased significantly, so that it now includes almost all cutting edge light microscopic, electron microscopic, and computer aided image analysis tools. In the last few years the CBI has successfully competed for new instrumentation for live cell (2 new systems), multicolor imaging, spectral confocal imaging (2 new systems), high speed confocal (3 systems) super resolutions systems (SIM, STORM, PALM, STED) electron microscopes and multiphoton microscopy through the NCRR. Furthermore, the Facility has supplemented its existing microscope and computer base with 2 new live cell imaging systems with microinjection capabilities. Currently the facility has 23 confocal microscopes of different types (point scanners, spinning disks, etc) 6 live cell systems (two with micro injection, 2 multiphoton systems, a SIM system a STORM system, 6 high end upright microscopes and 3 electron microscopes (SEM and TEM). We also have multiple (30) online image processing work stations equipped with Metamorph, Elements, Imaris and Photoshop. Real time storage is 1.7 petabytes at 10 gigabit speed
Our current research themes are three fold. Very fast massive sample confocal imaging, Correlative Light and Electron Microscopy and probe development and application for reactive oxygen species imaging.

The Director:
Dr. Simon C. Watkins was recruited to the University of Pittsburgh from the Dana Farber Cancer Institute (DFCI) in Boston in 1991 to provide scientific leadership of the Center. He is a Distinguished Professor in the Department of Cell Biology and Professor of Immunology



within the School of Medicine. His experience in microscopic methods covers most of the present light and electron microscopic methodologies.

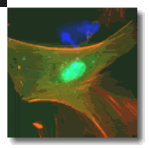
The Associate Directors:
Dr. Donna Beer-Stolz is an Associate Professor in Cell Biology. Her funded research interests are in liver regeneration and vasculogenesis. She was recruited specifically to facilitate interactions between the Cell and Tissue Imaging Core and its users. Dr. Beer-Stolz' primary role lies in the management and development of the electron microscopy component of the center.

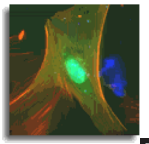
Dr. Claudette St. Croix is an Associate Professor in Cell Biology. Dr. St. Croix's funded research interests focus primarily on the pulmonary system and vascular biology. She is also heavily involved in the living system (both animal and cell) components of the Center.

Dr. Alan Watson is an Assistant Professor in Cell Biology. Dr Watson's research program is directed towards the use and application of massive data methods including tissue clearing, very fast confocal and image analysis. His research focus is currently directed towards following rare events such as viral infectivity in entire tissues including brain, the ocular system, kidney, lung and bowel.

Technical Specialists: The technical bases of the Center are all trained microscopists; in total 19 technical specialists work in the center. Furthermore we have a staff of three research assistants who provide general lab maintenance and digital imaging services. These staff are responsible for the processing and experimental manipulation of materials for light and electron microscopy. They assist users directly in the application of microscopic techniques, though equally they perform complete procedures for users who are not sufficiently experienced to perform their own experiments. They are also responsible for the day-to-day running of the Center, including management of microscope usage, microscope maintenance, bookkeeping, solution preparation, etc.

Administrative assistance: The primary administrative responsibilities are in the preparation of grants, and the monthly billing of charge-back users, processing Center for Biologic Imaging purchase requisitions and other general administrative duties.





Cell Biology Faculty Data

[Current as of June, 2018]

Name	Rank	Office Address	Email Address	Phone	Fax
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Traub, Linton	Professor	S325 BST-South Wing	traub@pitt.edu	412-648-9711	412-648-8330
Watkins, Simon C.	Distinguished Professor	S225 BST-South Wing	swatkins@pitt.edu	412-648-3051	412-383-8894
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Yates, Nathan	Associate Professor	9043B BST3	yatesn@pitt.edu	732-718-9739	412-648-9009

CELL BIOLOGY
FY18 ORGANIZATIONAL CHART

Office of the Chairman
Alexander D. Sorkin, Ph.D.
Richard Beatty Mellon Professor and
Chair of Cell Biology

CBMP Graduate Program
Michael Butterworth, Ph.D.
Director

Cell Biology and Pharmacology Shops

Machine Shop
Travis Wheeler, Manager

Matthew Greb

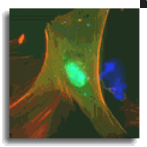
Electronics Shop
Dominick Caimano

Center for Biologic Imaging
Simon C. Watkins, Ph.D.
Director

Tenured/Tenure Track Faculty
Meir Aridor, Ph.D.
Michael B. Butterworth, Ph.D.
Daniel Devor, Ph.D.
Peter Drain, Ph.D.
Marijn Ford, Ph.D.
Gerald Hammond, Ph.D.
Yang Hong, Ph.D.
Adam Kwiatkowski, Ph.D.
Sanford Leuba, Ph.D.
Sandra Murray, Ph.D.
Yi Shi, Ph.D.
Claudette St. Croix, Ph.D.
Donna Beer Stolz, Ph.D.
Stephen Thorne, Ph.D.
Linton Traub, Ph.D.
Simon Watkins, Ph.D.

Non-Tenure Track Faculty

Wei Dong, Ph.D.
Georgia Duker, Ph.D.
Natalia Ford, Ph.D.
Mads Larsen, Ph.D.
Yang Li, Ph.D.
Itziar Pinilla Macua, Ph.D.
Sachin Surve, Ph.D.
Alan Watson, Ph.D.
Nathan Yates, Ph.D.



Cell Biology Seminar Series Schedule 2017-2018

September 15, 2017
Mark von Zastrow, MD, PhD
Professor, Psychiatry
University of California, San Francisco
"An innerlife of GPCRs"

October 24, 2017
Ann Miller, PhD
Assistant Professor, Molecular, Cellular and Developmental Biology
University of Michigan
"Regulation of Cell-cell Junction Dynamics in the Vertebrate Epithelium"

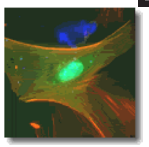
November 7, 2017
Zachary Freyberg, , MD, PhD
Assistant Professor, Psychiatry
University of Pittsburgh Medical Center
"Opening a new window into the secretory cell with *in situ* cryo imaging"

January 23, 2018
Tina Lee, PhD
Associate Professor, Biological Sciences
Carnegie Mellon University
"Mechanism of ER membrane fusion by the atlastin GTPase"

March 6, 2018
Adam Kwiatkowski, PhD
Assistant Professor, Cell Biology
University of Pittsburgh
"Cytoskeletal network integration at cardiomyocyte adherens junctions"

March 13, 2018
Matthew Lazzara, PhD
Associate Professor, Chemical Engineering
University of Virginia
"Applications of mechanistic and data-driven models to problems in cell signaling"

March 20, 2018
Andrew van Demark, PhD
Associate Professor, Biological Sciences
University of Pittsburgh
"Driving changes in cellular morphology through the Shrm-Rock signaling module"



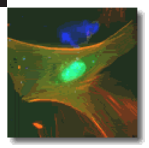
March 27, 2018
Marijn Ford, PhD
Assistant Professor, Cell Biology
University of Pittsburgh
"Vps1, membrane remodeling and TORC1"

April 3, 2018
Gerald Hammond, PhD
Assistant Professor, Cell Biology
University of Pittsburgh
"Reverse Engineering Lipid Signaling in Living Cells"

April 10, 2018
Jun Qin, PhD
Professor, Biochemistry
Baylor College of Medicine
"Proteomics-driven Precision Medicine"

April 17, 2018
Yi Shi, PhD
Assistant Professor, Cell Biology
University of Pittsburgh
"Integrative Proteomics of Native Cellular Machines"

May 1, 2018
Carsten Schultz, PhD
Professor and Chair, Physiology & Pharmacology
Oregon Health & Science
"Chemical biology of intra- and extracellular lipid signaling"



Faculty Research Interests

Meir Aridor, Ph.D.
Associate Professor

The endoplasmic reticulum (ER) is the first compartment of the secretor pathway. Plasma membrane receptors, ion channels, hormones and secreted enzymes are few examples of proteins that are being processed and sorted for vesicular transport in the ER. The development of a variety of human diseases, ranging from hemochromatosis, cystic fibrosis or hereditary emphysema to Pelizaeus-Merzbacher or ALS and Alzheimer's neurodegeneration can be derived from mistakes in ER sorting. Viruses such as coxsackie, polio, cytomegalovirus, HIV-1 Epstein-Barr and others manipulate sorting to self propagate and/or to evade immune surveillance.

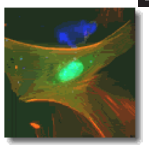
We take a multi disciplinary approach using a wide range of molecular, biochemical, biophysical and cellular techniques to unravel the molecular basis for protein and lipid sorting in the ER. Specifically, we use these approaches to address several related questions including the following: 1. What is the physical basis for membrane shaping and fission during ER exit? 2.What is the molecular basis for the assembly and organization of ER exit sites (ERES)? 3. How is the molecular machinery that organizes ERES regulated to couple ER sorting activities with physiological demands? 4. How are quality control activities in the ER coupled with cellular lipid homeostasis in normal and disease states?

Michael B. Butterworth, Ph.D.
Assistant Professor

Dr. Butterworth's research interest is in the hormonal regulation of ion transport, with a focus on non-coding RNAs. Defective ion transport results in diseases such as hypertension and cystic fibrosis. To achieve sodium homeostasis, higher organisms rely on a complex signaling cascade which culminates in the hormonal regulation of sodium transport in kidney tubular epithelial cells. The role of non-coding RNAs in this regulation is being investigated by Dr. Butterworth. MicroRNAs (miRNAs) are small RNAs that pair to the mRNA of protein coding genes to direct their post-transcriptional repression. The regulation of miRNAs by steroid hormones and impact of changes in miRNA expression on ion channel function is being studied. In separate projects, the ability of hormonally-altered long non-coding RNAs to interact with miRNAs as an additional component of hormone signaling is under investigation.

Daniel C. Devor, Ph.D.
Professor

Intermediate (KCa3.1 or IK) and small (KCa2.3 or SK3) conductance, calcium-activated potassium channels play critical roles in a host of physiological processes, including the endothelial derived hyperpolarizing factor (EDHF) response which is critical to the maintenance of vascular tone and hence blood pressure regulation, the maintenance of a hyperpolarized membrane potential across the basolateral membrane of polarized epithelia required for transepithelial fluid secretion as well as being intimately involved in the afterhyperpolarization in nerves and a host of other processes. Thus, an understanding of the physiological and pharmacological regulation of these channels as well as their assembly, trafficking and gating is crucial to the development of

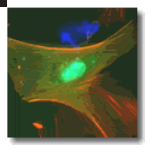


novel therapies based on targeting these channels. The long-term goals of my lab are to obtain a detailed molecular understanding of these channels in order to unravel the mechanisms involved in their assembly, trafficking, regulation and gating as well as to define the physiological role these channels play using *C. elegans* as a model system. In light of these goals, we have several ongoing projects designed to further our understanding of these channels.

First, Mark Bailey, a graduate student in the lab, is carrying out patch-clamp studies designed to elucidate the role of S6 in the gating of KCa3.1. In these studies, we are employing PCMBS to probe the cysteines in S6 and evaluate their role in gating. PCMBS has advantages over MTS reagents in both the site of the reactive moiety as well as the size of the molecule such that a larger perturbation in local molecular space is achieved. By using PCMBS in combination with a mutagenesis approach we have demonstrated that side chains pointing away from the pore, and toward S5, are critical to the coupling between Ca^{2+} binding to the calmodulin binding domain and channel gating. In collaboration with Dr. Michael Grabe, of the Biological Sciences Department at the University of Pittsburgh, we are modeling the gating kinetics of KCa3.1 to extract the rate constants being affected by both PCMBs as well as mutations in this region of the channel. In the future, we plan to probe S5 by conducting a tryptophan scan of the region across from the cysteines in S6 to further our understanding of how S5-S6 interactions modulate the coupling between increasing Ca^{2+} and channel gating. We have also identified critical amino acids in the S4-S5 linker region of both KCa3.1 and the related family member KCa2.3 which, when mutated to increase side-chain volume, result in a shift in apparent Ca^{2+} affinity. These results suggest this region of the channel is similarly involved in the coupling between Ca^{2+} binding to calmodulin in the cytoplasmic C-terminus and subsequent gating. A combination of patch-clamping, mutagenesis and modeling will be employed to definitively define the role of this region of the channel in the coupling between Ca^{2+} and gating.

Second, as any physiological response is dictated by not only the likelihood that channels are in the open state (P_o), i.e., gating, but also the number of actively gating channels (N), it is critical to understand how the number of KCa3.1 and KCa2.3 channels at the plasma membrane is maintained and regulated. To this end, Yajuan Gao and Corina Balut, two post-doctoral associates in the lab, recently developed novel biotin ligase acceptor peptide (BLAP)-tagged KCa2.3 and KCa3.1 constructs which allow us to evaluate, in real time, the endocytic fate of these channels. Using these constructs, we have developed three separate projects. In one project, our recent data demonstrates that KCa2.3 is rapidly endocytosed and enters the recycling pathway back to the plasma membrane in a Rab35/EPI64C (RabGAP)- and RME1-dependent manner. Indeed, our evidence points to the role of a 12 amino acid domain in the N-terminus of KCa2.3 as being critical in this process via an association with RME1. Future studies along these lines will be designed to elucidate the role of ubiquitination/de-ubiquitination in the recycling of this channel to the plasma membrane in addition to determining the role of agonists in regulating this process. We have also recently identified the Rab5 pathway as being critical to the endocytosis of KCa2.3, whereas endocytosis and recycling are independent of the Arf6 pathway. These results point to this being a dynamin and clathrin-dependent endocytic process, although Rab5 has also been shown to be important in clathrin-independent endocytosis. The mechanism by which KCa2.3 is endocytosed will be defined using a combination of imaging, protein biochemical mutagenesis and cell biological techniques.

In a related project to the one above, we have recently demonstrated that KCa3.1 is targeted to the lysosome via the ESCRT machinery. We have recently begun to utilize tandem ubiquitin

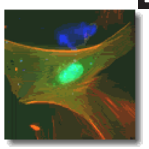


binding entities (TUBES) to define the role of ubiquitinylation in this process. By combining BLAP tagging and TUBES we are able to rapidly assess the ubiquitination of plasma membrane channels and correlate ubiquitinylation with endocytosis. In this regard, we have now shown that the endocytosis of KCa3.1 is directly correlated with poly-ubiquitinylation of the channel. By inhibiting ubiquitinylation we are able to block the channels endocytosis. This was first identified using a 96-well plate assay to identify modulators of channel endocytosis and formed the basis of our upcoming publication in *Future Medicinal Chemistry*, detailing this approach. Future studies will continue to explore the role of ubiquitin in the endocytosis of KCa3.1 as well as determine whether this is a regulated process. For example, is this a classic K63-dependent ubiquitinylation process, or are other ubiquitin-linked side-chains involved? Can the endocytosis of KCa3.1 be modified by second messengers generated in response to agonist stimulation? Of course, we are also attempting to identify the deubquitinylating enzymes (DUBs) involved in ubiquitin removal as this is critical for both the proper degradation of KCa3.1 as well as the recycling of KCa2.3. In this regard, we have begun a collaboration with Dr. Christian Loch at LifeSensors. We have now screened KCa3.1 prior to and following endocytosis using a DUB CHIP and have identified USP8 and USP2 as being DUBs critical in the endocytosis of this channel. As both KCa2.3 and KCa3.1 enter dynamic endosomal compartments, modulation of the rate-limiting steps in these events will allow for the regulation of the number of channels present at the plasma membrane such that the physiological response to agonists may be modified.

Given that KCa3.1 is targeted to the basolateral membrane in polarized epithelia, where it plays a critical role in the generation of the electromotive driving force required for Ca^{2+}-dependent agonists to stimulate Cl^- and fluid secretion, an additional project, being undertaken in collaboration with Dr. Kirk Hamilton at the University of Otago in Dunedin, NZ, is designed to understand the mechanisms by which this channel is correctly targeted and endocytosed in various model systems, including FRT, MDCK and LLC-PK1 cells. In this regard, we have found that KCa3.1 is correctly targeted in each of these cell lines and that, similar to our studies on HEK cells and a microvascular endothelial cell line (HMEC-1), the channel is rapidly endocytosed. Further, we have generated chimeras between the C-terminal tail of KCa3.1 and the nerve growth factor receptor (NGFR, p75) and demonstrate that the C-terminus of KCa3.1 can redirect NGFR from its typical apical localization to the basolateral membrane in polarized epithelia. Future studies will be designed to elucidate the molecular motifs involved in the basolateral targeting of this channel as well as understanding the molecular mechanisms involved in the correct targeting of this channel to the basolateral membrane.

Fourth, in conjunction with our studies outlined above, we are using our BLAP-tagged channels to develop a 96-well plate assay to screen siRNA libraries to identify novel proteins involved in the endocytosis, recycling and lysosomal targeting of KCa2.3 and KCa3.1. By monitoring co-localization of these channels with a membrane marker over time we can determine whether knockdown of a specific protein influences the endocytic fate of these channels. Given the crucial role these channels play in a host of physiological processes it is anticipated that the identification of these novel proteins involved in maintaining plasma membrane localization will provide unique targets for therapeutic intervention.

While the majority of our studies are being carried out in HEK cells in order to facilitate an initial understanding of these processes which have not heretofore been studied in the context of KCa2.3 and KCa3.1, we similarly carry out crucial studies using the HMEC-1 microvascular endothelial cell line. One of our future aims is to develop a virus-based infection system, such that the



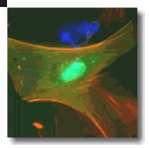
trafficking of these channels can be studied in confluent endothelial monolayers. This will not only allow us to gain a greater understanding of these channels in endothelial cells, but also afford us the opportunity to study the fate of these channels under more unique physiological situations, such as sheer stress.

Given our interest in understanding these channels at a tissue/model system level, Cavita Chotoo, a graduate student in the lab, in collaboration with Drs. Cliff Luke and Gary Silverman at Children's Hospital of Pittsburgh, is further defining the physiological role of one of these channels using *C. elegans* as a model system. A single *C. elegans* SK channel homologue was targeted for deletion and this KO animal displays a developmental delay phenotype. The exact nature of this phenotype is currently being studied. Cavita has also generated transgenic *C. elegans* lines expressing GFP- and RFP-tagged channels to determine both an expression pattern profile as well as to determine the effect of overexpression of this gene product on physiological function. Our data demonstrate that the *C. elegans* SK channel is expressed in both the gut as well as in numerous nerves, including the nerve ring, ventral nerve chord and ganglia in the tail. Future studies will elucidate the role of this SK channel in this model physiological system. Cavita has also begun to culture cells from her transgenic line which will allow us to define cells expressing the transgene and characterize these *C. elegans* channels by patch-clamping. We can then determine whether mutations at conserved amino acids to those identified by us in mammalian channels will produce similar phenotypes, including increased Ca^{2+} sensitivity; allowing us to evaluate the effect of a hyperactive phenotype on function at the level of an intact organism. Finally, we can utilize known endocytic/recycling phenotypes in *C. elegans* to probe the regulation of the number of channels (N) in a model system and determine how perturbations in N alter physiological function. These studies will tie together our efforts on heterologously expressed channels to our proposed studies on channels within the microvasculature; providing us with a clear picture of how KCa2.3 and KCa3.1 are regulated at the plasma membrane. Given the role of these channels in multiple disease processes, an understanding of how the number of channels is regulated at the plasma membrane is critical to understanding how these channels can be manipulated for therapeutic gain.

Peter F. Drain, Ph.D.
Associate Professor

Our laboratory studies regulatory mechanisms underlying secretory vesicle cell biology in health and disease. Currently, the experimental focus is on the cell biology of mutations and binding partners of vesicle proteins that cause monogenic forms of diabetes and Parkinson's disease:

(1) We are continuing our ongoing investigations into the structure-mechanism relations underlying the ATP-inhibited potassium (KATP) channel response to physiologically important ligands, ATP, ADP, and anti-diabetic sulfonylureas. In pancreatic beta cells, the KATP channel brings insulin secretion under the control of blood glucose levels. Our major goal is to establish the cellular mechanisms underlying how interactions of the KATP channel with its small molecular ligands and with its protein binding partners changes with high and low glucose metabolism, and consequent changes in insulin granule transport and exocytosis. Normally, the fraction of time the KATP channel spends in the inhibited state determines insulin secretory rates. When this regulation goes awry, serious complications at the whole-organism level lead to diabetes and other diseases. The research has fundamental importance to pharmaco-genetics, in which certain diabetic subjects with certain mutations can be transferred from insulin replacement

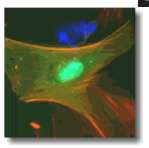


therapy injected multiple times a day to an oral sulfonyluea pill once a day.
(2) Another key molecule in insulin secretion is insulin itself. Mutations in human proinsulin, the propeptide precursor to insulin, have been shown to cause clinical diabetes. In studying the associated cellular mechanisms underlying insulin biogenesis, trafficking, and secretion, we have combined confocal fluorescence microscopy and a novel molecular strategy to visualize insulin secretion in live cells. The Ins-C-GFP reporter has exploded our ability to look inside live insulin-secreting cells to study glucose-stimulated insulin biogenesis, vesicle transport and exocytosis. Using this approach, we have localized KATP channels to the beta cell's large dense core vesicle (LDCV) where we have shown they mediate ATP- and glibenclamide-stimulated insulin secretion. In this way, the proteins whose mutation causes diabetes, the KATP channel and insulin, have a more intimate cell biological relationship and clinical pertinence than previous thought. Diabetic mutations in human insulin are used to study the beta cell biology of proinsulin trafficking, biogenesis, ER stress and protein degradation, and the consequences on insulin secretion. These investigations provide mechanistic details of the relationships between how KATP channels and insulin work together properly and fail to do so in diabetes.
(3) More recently we have found that alpha-synuclein is expressed in pancreatic beta cells, where it localizes to secretory vesicles, in addition to its well-established presence in dopaminergic and glutaminergic neurons of the brain. This has led to a new line of investigation studying the role of alpha-synuclein and how its interactions with other vesicle proteins changes under conditions of the stress leading to the hallmark degenerative cell biology that characterize these diseases.

Trainees in our laboratory have the opportunity to combine the techniques of molecular genetics and confocal live-cell fluorescence imaging, with transgenic techniques to integrate understanding at the level of the molecule, organelle, whole cell, organ, and organism.

Georgia K. Duker, Ph.D.
Assistant Professor

My contributions to the University Of Pittsburgh School Of Medicine are primarily through teaching. I contribute as a faculty member to twelve separate courses throughout the first and second years of the medical students' education. My responsibilities include course director, lectures, problem-based learning sessions, microscopy laboratories, physiology workshops, designing and leading team-based learning and tutorial sessions. For seven of these courses, I direct the microscopy labs in normal histology. My photographs have been formed into slide-based lab sessions to cover many of the organ system studied. In recent years, a focus has been to contribute to the medical education web site: http://navigator.medschool.pitt.edu. Annotated image collections now guide medical students through the renal, gastrointestinal, pulmonary, endocrine, musculoskeletal, reproductive and nervous systems. The Normal Histology image collection for the entire body is available to students on the Navigator site. In 203, I served as the course director for the Cell Structure, Metabolism & Nutrition course. 2003-04 also saw my participation in both the Basic Science Task Force and the Organ Systems Task Force; these committees oversaw the restructuring of the first two years of the medical school curriculum. From 2004 through to 2017, I am a co-director for the second-year Digestion and Nutrition course.



Within the Department of Cell Biology and Molecular Physiology I am course director for the Graduate Histology course (1995-2017). This course is taken by the majority of our students. It is abroad survey of all the organ systems, focusing on structure/function at the cellular, tissue and organ levels, with multiple clinical and pathological correlations. For most students, it is the only time they encounter a full body overview of systems beyond their own research. Graduate students within the Department of Cell Biology and Molecular Physiology may then serve as Teaching Assistants for the Histology labs within seven Medical School courses. One of my roles is coordinator of the Teaching Assistants, especially to oversee their training and preparation.

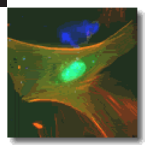
A third role has emerged for me as a School of Medicine Coordinator for the Undergraduate Honors College Program. I created a new course, Biomedicine: Past, Present and Future, 2002-2017. We examine 12 significant biotechnologies via their history and future applications. Twenty-eight faculty from the School of Medicine contribute. This course is one of three from the School of Medicine to form the core requirements for a new Certificate in the History of Medicine. The Certificate program, coordinated by Dr. Johnathon Erlen, will be offered through the Undergraduate Honors College. It is an inter-university program with course offering from the University of Pittsburgh, Duquesne University and Carnegie Mellon University. Students from all three universities are permitted to cross register for the courses. This is the first inter-university certificate program in Pittsburgh.

Marijn Ford, Ph.D.
Assistant Professor

Our laboratory has two broad objectives: to understanding the molecular mechanism of membrane remodeling by members of the Dynamin-Related Protein (DRP) family, and to study the signaling pathways yeast use to respond to stress, particularly starvation stress.

The mechanism of membrane remodeling by the DRP family
DRPs are believed to remodel membranes by self-assembly into helices that concomitantly remodel the underlying membrane. We are interested in how this self-assembly is coupled to membrane deformation and also in exploring the biology of some of the pathways where DRP function is required. To this end, we have been focusing on a poorly characterized fungal-specific DRP known as Vps1, that was initially identified in a screen for yeast mutants defective in sorting of carboxypeptidase Y to the vacuole. We chose Vps1 for two reasons: first, it is a better model for a typical DRP than dynamin and second, as it is a fungal protein, we could leverage the genetic and imaging tractability of *Saccharomyces cerevisiae* for our studies.

Structural Studies:
Using crystallographic approaches, we have obtained insight into Vps1 assembly and helix formation by solving two novel structures of the GTPase domain of Vps1, the first in complex with GDP and the second in complex with the non-hydrolyzable GTP analog GMPPCP. Strikingly, the structure of the GDP-bound GTPase forms a dimer interface of 2,722 $Å^2$ with the GDP "trapped" in a deep pocket between the dimer partners. The switch I and II regions of the GTPase domains are unusually well ordered for a GDP-bound GTPase, due to partial stabilization by a



loop contacting the GDP *in trans* from the dimerization partner. The structure bound to GMPPCP includes the full "Bundle Signaling Element" in an extended conformation. Comparison of the two structures has revealed new insight into the regulation of helix assembly by members of this family.

We have also determined the structure of a helical assembly of full-length Vps1 by cryo-electron microscopy, in collaboration with Frances Alvarez in the Zhang lab. The key enabling advance in this work was the ability to express and purify full length Vps1 for the first time. Extensive biochemical characterization resulted in optimized samples for cryo-preparation and data collection. The structure of the Vps1 helix, determined to ~13 Å resolution, demonstrates a novel lateral interface between the GTPase domains in the assembled helix that may regulate the kinetics of helix assembly and disassembly and consequently its function in the cell.

Cell Biology:
We have identified a novel function for Vps1 in autophagic processes as well as other stress response pathways. In all these cases, Vps1 concentrates into puncta (presumably assembling) at sites of close endosomal/vacuolar juxtaposition that are the site of membrane remodeling in various vacuolar uptake processes, including microautophagy and piecemeal microautophagy of the nucleus. We demonstrated that Ivy1, a marker for microautophagic invaginations, and Vps1 segregate during the autophagic process. We have made extensive use of the imaging facilities in the Center for Biologic Imaging for this work.

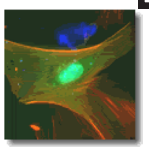
Yeast Stress Response Pathways:
TORC1 is a multiprotein complex that couples external cues such as nutrients and other environmental stimuli to the pathways regulating cell growth. TORC1 deregulation is associated with variety of human cancers and metabolic disorders and has consequently been the object of intense study. In yeast, the amino acid availability signal is relayed to TORC1 via the conserved Rag GTPases Gtr1 and Gtr2, both components of the vacuolar-membrane-associated EGO complex (EGOC).

Cell Biology:
While studying the function of Vps1 in microautophagy, we identified the largely uncharacterized yeast protein Pib2 as an additional regulator of microautophagy and TORC1 signaling. Pib2 has a role in lysosomal membrane permeabilization and has two human homologues Phafin 1 and Phafin 2. Our work has demonstrated that Pib2, like the yeast EGO Complex, is required for TORC1 reactivation after exposure to the TORC1 inhibitor rapamycin.

Deletion of Pib2 phenocopies deletion of components of the EGO Complex in several assays: vacuolar morphology, TORC1 localization and activity, rapamycin sensitivity and inability to respond to amino acid supplementation after starvation.

The ΔPib2 phenotype can be rescued by active form of TOR1, but not by the constitutively active forms of GTRs. Pib2 is required for EGO Complex-mediated activation of TORC1 by glutamine and leucine as well as for redistribution of Tor1 on the vacuolar membrane.

High-throughput Genetics:
A synthetic dose lethality screen, where Pib2 is overexpressed in each individual knockout in the yeast deletion collection, demonstrated strong genetic interactions with components of the EGO



Complex, TORC1 and downstream components of the Protein Phosphatase 2A branch of TORC1 signaling.

Together, we show that Pib2 and EGO Complex are reciprocally required for TORC1 activation and function within the same molecular pathway. Our observations therefore demonstrate that Pib2 is a novel relay in the cell's signaling pathway from amino acid perception to a TORC1 signaling response post-starvation.

Gerald Hammond, Ph.D.
Assistant Professor

Healthy cellular function demands the co-ordination of assorted signals, molecular traffic and cytoskeletal attachment at membranes. Although protein function is usually the focus of research into these processes, inositol-containing phospholipids are absolutely crucial to membrane function in eukaryotes. They act as substrates in signaling reactions, recruit adaptors for membrane traffic, activate components of the cytoskeleton, as well as many other functions including the control of ion flux. How are these lipids and their protein ligands normally organized and co-ordinated? What homeostatic mechanisms maintain a stable lipid and protein composition in the face of membrane turnover?

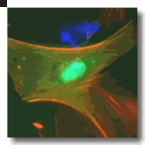
Answering these basic questions is crucial, because genetic diseases ranging from cancer to hereditary hearing loss are caused by disruption of membrane function resulting from mutations in inositol lipid metabolizing enzymes. Furthermore, many bacterial and viral pathogens re-model host cell membranes by actively disrupting inositol lipid distribution.

The overall aim of the lab is therefore to delineate the mechanisms of membrane organization and homeostasis, and how these mechanisms are altered in genetic and infectious disease. We use an array of state of the art methods, including live cell imaging, single molecule, super-resolution and chemical genetic approaches, supported by conventional molecular/cellular techniques, to probe the molecular scale organization of membranes. We interrogate specific protein-lipid complexes in both healthy cells and infectious or hereditary disease models.

Yang Hong, Ph.D.
Associate Professor

Research in my lab focuses on the molecular mechanisms regulating the cell polarity. Specifically, epithelial cells develop so-called apical-basal polarity by partitioning the cell surface into distinct apical and basolateral domains through polarized formation of cell junctions. Establishing and maintaining apical-basal polarity is crucial for the function and structure of epithelia, while disruption of such polarity often accompanies the malignant transformation or stress-induced damage of epithelial cells.

To date a dozen of so-called "polarity proteins" have been identified for their conserved and essential roles in regulating the cell polarity in both vertebrates and invertebrates. A key feature of these polarity proteins is that they must localize to specific apical or basolateral membrane domains to regulate cell polarity, and it is generally assumed that their membrane targeting is achieved by physical interactions with other polarity proteins or cytoskeleton etc. However, we



recently discovered that plasma membrane targeting of polarity protein Lgl is in fact mediated by direct binding between its positively charged polybasic domain and negatively charged inositol phospholipids PIP2 and PI4P on the plasma membrane. Using both *Drosophila* and cultured mammalian cells as model systems, we are investigating how direct interactions between polarity proteins and membrane lipids may act as a crucial molecular mechanism regulating the subcellular localization and functions of polarity proteins, such as:

1) Control of plasma membrane targeting of polarity proteins: direct binding to plasma membrane phospholipids likely targets proteins to all plasma membrane domains. We are identifying essential mechanisms that spatially restrict polarity proteins to specific membrane domains in polarized cells.

2) Role of phospholipids in regulating cell polarity: polybasic domain-mediated membrane targeting also highlights the critical role of inositol phospholipids such as PIP2 in establishing and maintaining cell polarity under cellular stress. Our discovery that hypoxia acutely and reversibly inhibits Lgl plasma membrane targeting through depleting membrane phospholipids suggests that phospholipid turn-over and homeostasis play significant role to conserve cell polarity and promote cell survival under cellular stress such as hypoxia/ischemia.

3) Regulation of membrane targeting of polarity proteins in tumorigenesis: many polarity proteins, such as Lgl, also function as tumor suppressors. Loss of Lgl membrane targeting is a hallmark in both *Drosophila* and human tumor cells. We are investigating the mechanism contribute to the compromised membrane targeting of polarity proteins and the progressive loss of cell polarity during tumorigenesis.

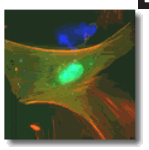
We have developed genomic engineering tools that allow efficient generation of knock-in alleles of *Drosophila* genes. We also developed comprehensive imaging tools for visualizing the dynamic subcellular localizations of polarity proteins under various physiological conditions including hypoxia.

Adam Kwiatkowski, Ph.D.
Assistant Professor

The primary focus of work in the Kwiatkowski Lab is to gain a mechanistic understanding of cardiomyocyte adhesion and cytoskeletal organization. Our approach is to use to a combination of protein biochemistry, cell biology and microscopy to define mechanisms of cell-cell adhesion, and downstream regulation of actin and intermediate filament organization, by the cadherin-catenin adhesion complex. Our rationale is that understanding the molecular mechanisms of adherens junction adhesion in cardiomyocytes will provide fundamental insight into cardiomyocyte cell-cell adhesion and adherens junction biology.

Sanford H. Leuba, Ph.D.
Associate Professor

Since the discovery of the nucleosome in the early 1970's, scientists have sought to correlate chromatin structure and dynamics with biological function. More recently, we have learned that



nucleosomes and chromatin play a critical role in the regulation of transcription, replication, recombination, and repair (Zlatanova and Leuba, 2004). Our laboratory uses an interdisciplinary approach combining the disciplines of molecular biology, biochemistry, engineering, and physics to try to understand at the single nucleosome and single chromatin fiber level how chromatin structure and dynamics regulate biological processes that use DNA as a template. To this end, we are applying several single-molecule approaches such as atomic force microscopy (AFM), magnetic tweezers, optical tweezers and single-pair fluorescence resonance energy transfer (spFRET) to native or reconstituted chromatin fibers of different protein compositions with the latter three methods using homebuilt instrumentation. Single-molecule techniques provide the sensitivity to detect and to elucidate small, yet physiologically relevant, changes in chromatin structure and dynamics. Recent examples of what we have been able to discover include the following:

- We have been able to use AFM to detect conformational changes in chromatin fiber structure due to the presence of 24 methyl groups per nucleosome (Karymov et al., 2001) implying that the combined action of the DNA methylation and linker histone binding required to compact chromatin may affect the transcription of large chromatin domains.

- We also used AFM to investigate the role of histone variants in chromatin fiber structure (Tomschik et al., 2001). Eukaryl and archaeal organisms have similar fiber structure with differences likely related to the more complex needs of eukaryl organisms to regulate transcription.

- We have used optical tweezers to determine the piconewton forces necessary to unravel individual nucleosomes in a fiber context (Bennink et al., 2001) and found that the measured forces for individual nucleosome disruptions are in the same range of forces reported to be exerted by RNA- and DNA-polymerases.

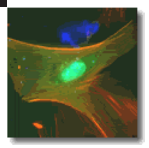
- We have used magnetic tweezers to observe a dynamic equilibrium between force dependent nucleosomal assembly and disassembly on a single DNA molecule in real time (Leuba et al., 2003) as a model of what happens to nucleosomes when a transcribing polymerase passes through the region where they are located.

- We have used spFRET to demonstrate fast, long-range, reversible conformational fluctuations in nucleosomes between two states: fully folded (closed) with the DNA wrapped around the histone core, and open, with the DNA significantly unraveled from the histone octamer (Tomschik et al., 2005), implying that most of the DNA on the nucleosome can be sporadically accessible to regulatory proteins and proteins that track the DNA double helix.

- We have used spFRET to demonstrate that PcrA DNA helicase displaces RecA from both ssDNA as well as dsDNA (Anand et al., 2007), as a model for regulation of homologous recombination.

- We have developed a method to isolate in one-step histones containing their native post-translational modifications (Rodriguez-Collazo et al., 2009). This method has also been patented and licensed.

- We have used spFRET to demonstrate the wrapping of DNA around the archaeal



homohexameric MCM helicase from Sulfolobus solfataricus (Graham et al., NAR 2011), protecting the displaced single-stranded DNA tail and preventing reannealing.

- In collaboration with Li Lan, Satoshi Nakajima and Vesna Rapic-Otrin (Molecular Genetics and Biochemistry), we have studied the ability of an E3 ligase to ubiquitinate histone H2a and destabilize nucleosomes with UV-damaged DNA (Li et al., JBC 2012).

- We have used spFRET to demonstrate that PcrA DNA helicase displaces RecA but not RecA mutants (Fagerburg et al., NAR 2012) indicating that direct transduction of chemomechanical forces alone by translocating helicases, such as PcrA and Srs2, are insufficient to displace recombinases such as RecA and Rad51 that form large polymeric assemblies on ssDNA.

- We have used spFRET, single molecule protein induced fluorescence enhancement (PIFE), fluorescence anisotropy and modeling to demonstrate for the first time that allosteric inhibitors directly alter the mobility of HIV-1 reverse transcriptase on its DNA substrate by modulating its conformation, without changing the binding affinity of RT to DNA (Schauer et al., 2014).

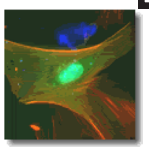
Our future goals are to build combination single-molecule instruments to image and manipulate intramolecular nanometer movements in submillisecond real-time with piconewton force sensitivity (e.g., we want to observe directly what happens to the histones in a nucleosome in the path of a transcribing polymerase). We want to observe what changes in superhelicity occur upon nucleosome formation, nucleosome by nucleosome. We hope to resolve whether the positive supercoils generated by a transcribing polymerase are sufficient to displace histone octamers. In addition to chromatin, we are studying the mechanism of action of individual helicases unwinding DNA. We are also working on the capability to observe in real time single nucleosome dynamics in living cells.

Sandra A. Murray, Ph.D.
Professor

In Dr. Murray's laboratory, integrated approaches are being used in studies to assess the role of gap junctions and cell-to-cell communication in endocrine cell proliferation, migration, differentiation, and hormone production and to elucidate the molecular machinery that regulates gap junction plaque endocytosis. Four different techniques (time-lapse video microscopy, immunocytochemistry, quantum dot immuno-electron microscopy, and western blot analysis) are being used to examine the role of clathrin and protein phosphorylation in gap junction protein (connexin) trafficking, including gap junction plaque assembly and subsequent internalization. The effect of over expression and inhibition of gap junctions on adrenal cell function, are being studied with cDNA antisense vectors, dominant-negative constructs, siRNA approaches, and antibody directed against gap junction genes products. Together these studies are designed to elucidate the role of cell-cell communication in tissue function with particular interest in how endocytosis and post-endocytic trafficking of gap junction proteins is regulated to control cellular function(s).

Yi Shi, Ph.D.
Assistant Professor

The extraordinarily emergent properties of living cells have evolved largely as a consequence of



the intricately ordered interactions of their biomolecular components. These cellular building blocks interact with each other to form a hierarchy of dynamic macromolecular assemblies that drive a plethora of important biological processes. Unfortunately, despite their central role in cell biology, many protein complexes identified to date remain refractory to structure-functional characterization.

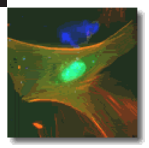
We are interested in the development of integrative proteomic technologies to elucidate the structure and function of large, native protein complexes. We are interested in developing new proteomic tools to investigate the spatiotemporal regulations of mitochondria, as well as their roles in aging and neurodegenerative diseases.

Alexander D. Sorkin, Ph.D.
Richard B. Mellon Professor and Chairman

The focus of the research in the laboratory is currently split into two major directions which are distinct from each other with respect to the biological systems involved, their relation to the human disease, and experimental models used. However, the main idea underlying both directions is conceptually the same - to understand how endocytosis and post-endocytic trafficking regulate function(s) of the transmembrane proteins, such as receptors and transporters. One major project aims at elucidating the molecular mechanisms of endocytosis of growth factor receptors using a prototypic member of the family, epidermal growth factor (EGF) receptor, and analyzing the role of endocytosis in spatial and temporal regulation of signal transduction by the EGF receptor. Another major research direction is the study of the role of trafficking of the plasma membrane dopamine transporter (DAT) in the regulation of dopaminergic neurotransmission. In both these research areas we are using multidisciplinary methodological approach in *in vitro* and novel *in vivo* experimental models. Finally, we have recently engaged in a new collaborative project aimed at elucidating the mechanisms by which placenta-derived exosomes are internalized by target cells.

Claudette St. Croix, Ph.D.
Associate Professor
Assistant Director of Center for Biologic Imaging

My independent research program utilizes a combination of advanced optical imaging technologies to dissect molecular signaling pathways controlling vascular function in rodent and zebrafish model systems of disease. An important facet of this work is the *in vivo* application of novel fluorescent molecular reporters to study the biology of reactive oxygen and nitrogen species (ROS and RNS, respectively). These approaches are central to my multi-PI efforts with Drs. Marcel Bruchez and Alan Waggoner from Carnegie Mellon University. In addition, my expertise in the application of novel fluorescence-based probes and advanced *in vivo* imaging technologies have led to my appointment as an associate director of the Center of Biologic Imaging (CBI) at the University of Pittsburgh and invitations to present my work internationally and to take lead roles in well-respected courses such as Quantitative Fluorescence Microscopy (Mount Desert Island Biology Laboratory). In my leadership role at the CBI, I have well-established, active and productive collaborations with NIH funded investigators to study ROS based signaling, cell survival, and mitochondrial dynamics in living cells, tissue and animal models using an array of advanced, fluorescence based, optical imaging modalities. This is evidenced by my role as co-Investigator on federally funded projects, and as co-author on peer-reviewed manuscripts,



including a recent Cell paper.

Donna Beer Stolz, Ph.D.
Associate Professor
Assistant Director of Center for Biologic Imaging

Overview: Angiogenesis is the process whereby new blood vessels sprout from existing vessels and requires that the specialized resident cells lining the vasculature, the endothelial cells (ECs), proliferate, migrate and differentiate spatially and temporally in response to specific signals. Vasculogenesis, on the other hand, has only recently emerged as an alternative mechanism of blood vessel growth in adult tissues and is the result of homing and engraftment of circulating EC precursors (ECPs) of bone marrow origin to sites of neovascularization. Both events are known to occur within tissue vasculature under very different conditions of growth, injury and repair, but the extent of each and the mechanisms by which they occur for each case is incompletely understood. We evaluate various signaling events that accompany blood vessel growth and repair during liver regeneration following partial hepatectomy, the result of cold ischemia/warm reperfusion injury following liver transplantation or warm ischemia/warm reperfusion following surgical resections for cancer. Comparative analysis of these systems will elucidate both similar and dissimilar mechanisms that control these events and potentially lead to optimization of therapies that will reflect the specific requirements for injury based neovascularization in the liver. Additional research concentrations include vascular and parenchymal changes in liver and kidney with normal aging and in mouse models of accelerated aging.

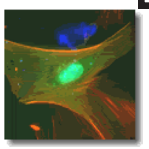
Dr. Stolz is Associate Director of the Center for Biologic Imaging and directs the electron microscopy facility of CBI. Her main role as Associate Director of CBI is to facilitate PI usage with the facility, as well as assist in design, execution and interpretation of experiments involving all types of imaging technologies in general. Additionally, she coordinates interactions of PIs and students with other arms of the CBI, including widefield and confocal microscopy as well as live cell imaging. Dr. Stolz's research specialties involve vascular biology, liver regeneration and liver and kidney aging.

Stephen Thorne, Ph.D.
Assistant Professor

It was first reported that viral infections, on occasion, result in tumor regressions over 100 years ago. This was further advanced 20 years ago with the development of viral vectors engineered to display tumor-selectivity in their replication (oncolytic viruses).

Although clinical responses were reported, it has become clear that directly lytic viral replication alone is rarely sufficient to eradicate large tumors or metastatic disease. However, in the last several years, the combination of faster replicating vectors and the expression of immune-activating transgenes from the viruses themselves have resulted in improved clinical responses. This resulted in the first in class approval of the oncolytic virus IMLYGIC for the treatment of metastatic melanoma earlier this year and has led to extensive interest in the field.

Our interest has primarily focused on the pre-clinical and translational development of enhanced, next generation oncolytic virus vectors based on vaccinia virus. This has focused on several key



areas that were determined to be of special interest;

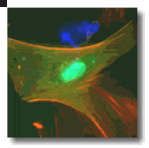
We felt that the immune response raised against the virus in the tumor can play a critical role in the successful application of this platform. Tumor-selective viral replication leads to localized acute inflammation, helps direct the immune response towards the tumor and transiently overcomes tumor-mediated immunosuppression. Meanwhile, lysis of tumor cells releases relevant tumor antigens and associated danger molecules, resulting in priming of anti-tumor immunity and in situ vaccination. Previously this immunotherapeutic activity has relied on the viral vector's naturally evolved interactions with the host immune response, often boosted by the expression of a single cytokine transgene. We have successfully implemented a variety of strategies to enhance the immune interactions, including altering Toll Like Receptor signaling pathways, targeting of immunosuppressive cells within the tumor, selectively activating anti-tumor CTL responses and altering trafficking patterns to direct activated immune cells into the tumor.

In addition, the limited ability to deliver oncolytic viral vectors intravenously to tumors in the clinic, especially in the face of anti-viral immunity, has seriously hampered the field. We have examined a variety of novel approaches to enhance this delivery, including altering the viral surface envelope, creating synthetic membranes to envelop the virus and delivering the virus within immune cell therapies.

Through combining these approaches, we are looking to develop novel therapies that can be produced at clinical grade for early Phase I clinical trials.

Linton M. Traub, Ph.D.
Professor

Many molecules enter the cell interior within clathrin-coated vesicles, in process termed endocytosis. In the simplest sense, the clathrin-coated vesicle can be viewed as a nanomachine that temporally couples preferential retention of designated cargo with rapid vesicle assembly, invagination, and fission from the plasma membrane. In fact, this rapid process is critical to the way we move and think. At the tip of each axon, synaptic vesicles (packages of neurotransmitter) release their contents by fusing with the cell surface in response to stimulus-dependent calcium influx. Almost instantly, the membrane of the synaptic vesicle is then retrieved from the synapse within clathrin-coated vesicles. Clathrin-mediated endocytosis is thus tightly coupled to exocytosis, the stimulated release of neurotransmitter. Failure to recover synaptic-vesicle membrane results in both morphological disruption of the nerve terminal and defective neurotransmission. Clathrin-coated vesicles also play an important role in controlling plasma LDL-cholesetrol levels in humans and yolk protein accumulation in *Drosophila* and mosquitoes by promoting the rapid internalization of a family of related lipoprotein receptors. We study the mechanisms and molecules involved in clathrin-coat assembly. We are interested how this complex process, involving a network of more than 25 discrete protein components, is temporally coordinated to prevent chaotic seizures or run-away coat assembly. We have found recently that some of these protein components display unexpected cargo sorting properties that expand the overall sorting repertoire of the forming clathrin-coated vesicle. To understand how these complex structures, assemble within only a minute or two, we use biochemical, cell biological, structural and live-cell imaging approaches to unravel the protein–protein interactions that orchestrate the formation of this elaborate protein-sorting machine.

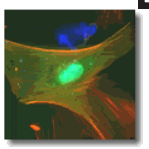


Simon C. Watkins, Ph.D.
Distinguished Professor, Vice Chairman of Department
Director of Center for Biologic Imaging

The application of advanced imaging tools to the field of cell biology is constantly revealing new facets of cellular and molecular behavior. The goals of my research program are two-fold. To develop novel quantitative fluorescent based assays using optical microscopy, and secondly to develop novel imaging platforms for use in health and disease. Recent accomplishments have been the development of multiple new high speed high resolution imaging platforms for multidimensional imaging of model systems as well as the development and implementation of imaging tools for new multiparametric imaging probes.

Nathan Yates, Ph.D.
Associate Professor

The systematic goal motivating our work is to develop and apply powerful mass spectrometry based tools that represent a new "microscope" for studying biology and advancing efforts to understand and treat disease. By integrating mass spectrometry, automation, and informatics, we are developing new analytical tools for the characterization and quantification of complex biological systems. These –omics tools provide exciting opportunities to probe biology with absolute molecular specificity, however, significant hurdles must be cleared before they tools have widespread impact in basic and clinical research. A specific aim of our research is to develop distributed informatics tools and mass spectrometry data analysis techniques. Prior to joining the University of Pittsburgh, Dr. Yates' work at Merck & Co. Inc. led to the invention and eventual the commercialization of Differential Mass Spectrometry; an unbiased quantitative proteomics method for comparing complex biological systems. The lab is also focused on the development of innovative technologies that are designed to improve the throughput and reliability of quantitative proteomics assays. In collaboration with several industry partners, the lab is developing "easy to use" assay platforms that will enable scientists in basic and clinical research.



Study Sections (Fiscal Year 2017-2018)

Adam Kwiatkowski, Ph.D.
Assistant Professor

Ad hoc member, NIH Intercellular Interactions (ICI) Study Section

Alexander D. Sorkin, Ph.D.
Richard B. Mellon Professor and Chairman

ASIRC - Italian Association for Cancer Research; Standing Member
Cancer Research, UK. Scientific Experts Panel, London, February, 2018

Claudette St. Croix, Ph.D.
Associate Professor

American Heart Association, Molecular Signaling 3 Study Section, Co-chair
NIH/EBIT-A (90), Panel Member
NIH CMT Standing Panel - Cellular and Molecular Technologies 2018/01
American Heart Association Innovative Program Award Basic Sciences 2 Review Panel
American Cancer Society RE Clinical Cancer Research and Epidemiology (CCE) Standing Member

Donna B. Stolz, Ph.D.
Associate Professor

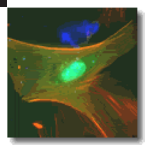
NIDDK Training Grant Special Emphasis Panel, Member

Linton Traub, Ph.D.
Professor

Ad hoc member of NIH ZRG, CSF and NRSA Study Sections

Simon C. Watkins, Ph.D.
Distinguished Professor and Vice Chairman, Director of Center of Biologic Imaging

Dutch Research Council (NWO) National imaging resource, August 2017 Reviewer
ACS/MRA Panel for Melanoma center Grants Peer Review Panel: 2017, Chair of Panel
ACS Study Section (Peer Review Committee on Clinical Cancer Research and Epidemiology), Chair of Panel, Atlanta, GA, January 2018
NIH Study section ZRG1 BST-T. June 2018 panelist



ACS Study Section (Peer Review Committee on Clinical Cancer Research and Epidemiology), Chair of Panel, Atlanta, GA, June 2017

Cell Biology/Pharmacology Machine Shop

Faculty Advisory Committee Memberships (Fiscal Year 2017-2018)

Meir Aridor, Ph.D.
Associate Professor

University of Pittsburgh School of Medicine Interdisciplinary Biomedical Graduate Program- Cell Biology and Molecular Physiology Program Committee
Local Traffic Symposium; Organizing Committee Member
Cell Biology Faculty Recruitment Committee
Integrated Systems Biology (ISB) Admission Committee
University of Pittsburgh, School of Medicine, Integrated Systems Biology (ISB) Admission committee, PhD program.2014-2017
Biomedical Master Program (BMP) Admissions committee MSc program 2018-present
Biomedical Master Program (BMP) Academic advising. 2018-present.

Michael Butterworth, Ph.D.
Associate Professor

Cell Biology Space Committee
Integrated Systems Biology (ISB) Program Committee
Integrated Systems Biology (ISB) Course Director, Core Course (Imaging)
Cell Biology and Molecular Physiology Graduate Program, Director

Daniel Devor, Ph.D.
Professor

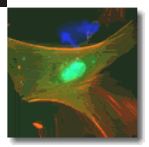
Cell Biology Departmental Tenure and Promotions Committee

Peter F. Drain, Ph.D.
Associate Professor

University of Pittsburgh School of Medicine Interdisciplinary Biomedical Graduate Program- Cell Biology and Molecular Physiology Program Committee
Cell Biology Representative, Graduate Student Recruitment Committee
Biomedical Masters Program Committee
UPSOM Curriculum Committee

Georgia K. Duker, Ph.D.
Assistant Professor

Honor Council Hearing Board – School of Medicine



Marijn Ford, Ph.D.
Assistant Professor

Organizer – Cell Biology Department Retreat
Organizing Committee, Pittsburgh "Local Traffic" symposium
Cell Biology Space Committee

Gerald Hammond, Ph.D.
Assistant Professor

Organizer – Cell Biology Department Retreat
Organizing Committee, Pittsburgh "Local Traffic" symposium
Cell Biology Space Committee
Interdisciplinary Biomedical Graduate Program, Admissions Committee

Yang Hong, Ph.D.
Associate Professor

Director, Summer Undergraduate Research Program (SURP) in Cell Biology and Molecular Physiology
Cell Biology Space Committee
Cell Biology Faculty Recruitment Committee

Adam Kwiatkowski, Ph.D.
Assistant Professor

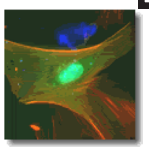
Cell Biology Space Committee
Local Traffic Symposium Organizing Committee, Chair
Integrative Systems Biology Admissions Committee

Sanford Leuba, Ph.D.
Associate Professor

University Molecular Biophysics and Structural Biology Graduate Program Chair of Admissions Committee & Curriculum Committee

Sandra A. Murray, Ph.D.
Professor

Graduate School of Public Health Research Advisory Committee – Center for Minority Health
Provost Advisory Committee for the Provost Development Fund Awards
Morehouse College of Medicine Advisory Board



Cell Biology and Physiology Tenure and Promotions Committee
Cell Biology Faculty Recruitment Committee
Co-Chair of the Research Center of Excellence Committee, Graduate School of Public Health, University of Pittsburgh
Graduate School of Public Health Community Engagement Research Core
University Community Representative for Equipoise
Junior Faculty Advancement – Panel Member

Yi Shi, Ph.D.
Assistant Professor

Organizer – Cell Biology Department Retreat

Alexander D. Sorkin, Ph.D.
Richard B. Mellon Professor and Chair

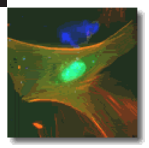
Executive Committee – School of Medicine
University of Pittsburgh and Carnegie Mellon Medical Scientist Training Program Committee - MSTP
Center for Neuroscience University of Pittsburgh – CNUP
University of Pittsburgh Cell Biology and Molecular Physiology Program Committee
Cell Biology Tenure and Promotions Committee
Cell Biology Faculty Recruitment Committee
External Advisory Committee for Nevada's Cell Biology COBRE Grant, University of Nevada School of Medicine, Reno, NV
Dickson Prize Selection Committee – SOM
Integrated Systems Biology Executive Committee
Biomedical Masters Program Executive Committee

Claudette St. Croix, Ph.D.
Associate Professor

Cell Biology Faculty Recruitment Committee

Donna Beer Stolz, Ph.D.
Associate Professor

University of Pittsburgh School of Medicine Interdisciplinary Biomedical Graduate Program- Cell Biology and Molecular Physiology Program Admissions Committee
Assistant Director - Cell Biology and Molecular Physiology Program
School of Medicine Tenured Faculty Promotions and Appointments Committee

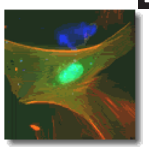


Linton M. Traub, Ph.D.
Professor

University of Pittsburgh School of Medicine Health Sciences Research Advisory Committee
Cell Biology Tenure and Promotions Committee
Cell Biology Faculty Recruitment Committee
Cell Biology Space Committee

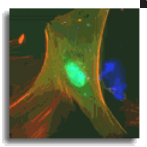
Simon C. Watkins, Ph.D.
Distinguished Professor and Vice Chairman, Director of Center of Biologic Imaging

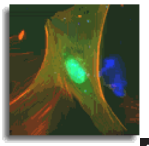
Cell Biology Tenure and Promotions Committee
Cell Biology Student Advisory Committee
Cell Biology Space Committee
Cell Biology Faculty Recruitment Committee
Graduate Program, Curriculum Committee
University of Pittsburgh School of Medicine, Research Advisory Committee
University of Pittsburgh Cancer Institute Core Resources Committee
University of Pittsburgh Tenure and Promotions Committee
Chair UPCI Luminex advisory committee
Chair UPCI Proteomics advisory committee
Chair UPCI flow cytometry advisory committee
UPCI chemical biology advisory committee



Cell Biology Sponsored Research Funding (FY18)

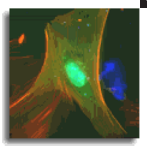
Name	Agency Name	Title	Annual DC	Annual IDC
Michael Butterworth	National Institutes of Health	Role of MicroRNAs in kidney sodium regulation	216642	116987
Michael Butterworth	National Institutes of Health	Altered biosynthesis and function of ABCC6 in systemic mineralizatin disorders	10827	6028
Peter Drain	Prader-Willi Syndrome	Understanding Multiple Hormone Secretion Deficits in Prader-Willi Syndrome	2063	165
Marijn Ford	National Institutes of Health	The Roles of the Dynamin-Related Protein Vps1 and the ESCRT Complex in Microautophagy	197500	94486
Gerry Hammond	National Institutes of Health	Directing Membrane Function with Inositol Lipids in Health and Disease	235183	130445
Yang Hong	National Institutes of Health	Membrane Targeting and Retargeting of Polarity Proteins	196500	104518
Adam Kwiatkowski	National Institutes of Health	Alpha-Catenin Function in Cardiomyocyte Adhesion and Cytoskeletal Organization	239368	123463
Mads Larsen	Cystic Fibrosis Foundation	Regulation of a Cystic Fibrosis Disease Modifier, SLC26A9	29516	0
Mads Larsen	Cystic Fibrosis Foundation	Selective Steps in Wild-Type and F50 08 del CFTR processing	18258	1460
Sanford Leuba	National Institutes of Health	NNRTI Induced Conformational Changes in HIV 1 RT (Sluis-Cremer)	55424	29294
Sanford Leuba	National Institutes of Health	Novel Mechanisms of HIV Resistance ti RTIS (Sluis-Cremer)	6293	3399
Sanford Leuba	National Institutes of Health	Evolved DNA Contacts Required for Hexameric Helicase Unwinding.	51229	27768
Chelsea Merkel	National Institutes of Health	The Role of Vinculin in Cardiomyocyte Adhesion and Mechanical Continuity	40053	0
Alexander Sorkin	National Institutes of Health	Supplement -Pathogenesis of Cancer - Role of EGF Receptor Endocytosis	47277	26181
Alexander Sorkin	US Dept of Veterans Affairs	Investigating the Role of TMEM16A/AN01 in SCCHN	22864	0
Alexander Sorkin	National Institutes of Health	Exosome Based Placental Maternal Communication-MWRI	60478	33188
Alexander Sorkin	National Institutes of Health	Modeling Spatiotemporal Control of EGFR-ERK Signaling in Gene-Edited Cell Systems	101008	56060
Alexander Sorkin	National Institutes of Health	Signaling by them EGF Receptor from Endosomes	173632	96500
Alexander Sorkin	National Institutes of Health	Regulation of Dopamine Transporter by Trafficking	259589	143715
Claudette St. Croix	National Institutes of Health	In vivo localization and mechanism of regultory B cell function in alloimmunity and trasplant tolerance	10092	5450
Claudette St. Croix	National Institutes of Health	Pulmonary Arteriole Occlusion by Platelet Neutrohil micro emboli in acute chest syndrome	25275	2517
Claudette St. Croix	National Institutes of Health	Pathogenic Mechanisms of Gene-Environment Interactions in Parkinsons Disease	7864	4257
Claudette St. Croix	National Institutes of Health	Cardiolipin as a Novel Mediator of Acute Lung Injury	10434	5635
Claudette St. Croix	National Institutes of Health	Vascular Subphenotypes of Lung Disease - Preclinical Assesment Core	65674	36402
Claudette St. Croix	National Institutes of Health	Signaling Mechanisms by which Mitochondria Regulates Fibrosis in the Lung	4215	2276
Claudette St. Croix	National Institutes of Health	Regulation of Fuel Utilization by Lysine Acetylation in the Failing Heart	745	404
Claudette St. Croix	National Institutes of Health	Reactive Oxygen Species in Vascular Disease	8371	4520
Claudette St. Croix	National Institutes of Health	Anti-Inflammatory Lipid Mediators in Asthma	8575	4759
Claudette St. Croix	National Institutes of Health	Vascular Smooth Muscle and Blood Pressure Regulation By cyb5R2	7422	4115
Claudette St. Croix	National Institutes of Health	Novel Role of Smooth Muscle B5 Reductase in Sicle Cell Disease	4626	2565

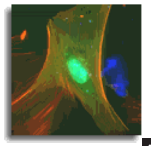




Claudette St. Croix	National Institutes of Health	Aging of Mesenchymal Stem cells Missing Link in IPF	6806	3777
Claudette St. Croix	National Institutes of Health	Regulation of Fuel Utilization by Lysine Acetylation in the Failing Heart	3036	1690
Claudette St. Croix	National Institutes of Health	Mechanisms oand Promotion of Immune Regulation by CD4+	17856	6896
Claudette St. Croix	National Institutes of Health	Exploring and Exploiting Metabolic Plasticity in Regulatory T Cells	7256	4039
Claudette St. Croix	National Institutes of Health	Core C: Cell Autonomous and Non-Autonomous mechanisms of Aging	49273	27223
Claudette St. Croix	National Institutes of Health	Host Control Mechanisms Against K. Pneumoniae Infection in the Lungs	6488	3650
Claudette St. Croix	National Institutes of Health	The Anit-Aging Role of Klotho in Skeletal Muscle Regeneration	29172	10194
Claudette St. Croix	American Heart Association	Reprogramming of the vascular matrisome & matrix cellularity as a pathogenic lynchpin for pulmonary	1664	167
Claudette St. Croix	National Institutes of Health	Mechanisms of Myocardial-Infarction Induced Insulin Resistance	3084	1732
Donna Beer Stolz	National Science Fdn.	Engineering Research Center	1141	527
Donna Beer Stolz	National Institutes of Health	Core A Cell and tissue Imaging Core	11554	6266
Donna Beer Stolz	National Institutes of Health	Bio-Mediated Killing of Oncogenic Stem Cells in chemoprevention	3779	2041
Donna Beer Stolz	National Institutes of Health	Mechanisms of Arsenic-induced Muscle Morbidity and Reduced Regenerative Capacity	12147	6681
Donna Beer Stolz	National Institutes of Health	Nitric Oxide and Hepatic Function in sepsis and Trauma	11481	4951
Donna Beer Stolz	National Institutes of Health	Mechanisms of Trabecular Meshwork Regeneration by stem cell	10000	4224
Donna Beer Stolz	National Institutes of Health	Critical Role for Fibroblast Growth Factor Receptors in Bladder Development	6445	3480
Donna Beer Stolz	National Institutes of Health	Dysfunctional Muscle remodeling and regeneration in environmental disease	19886	10914
Donna Beer Stolz	National Institutes of Health	Elucidting Mechanisms Involved in Lamin B1 Medited Demyelination	3947	2131
Donna Beer Stolz	National Institutes of Health	Endogenous Regulators of Inflammation in Liver Ischemia/Reperfusion	13027	4248
Donna Beer Stolz	National Institutes of Health	Luminal Epithelial Junctions, Polarity and Permeability in BPH	9596	4411
Donna Beer Stolz	National Institutes of Health	Alpha Catenin Function in Cardiomyocyte adhesion and Cytoskeletal	8028	4336
Stephen Thorne	National Institutes of Health	Creation of Immuno-Oncolytic Viruses for Cancer Therapy	123476	63325
Stephen Thorne	Stand Up 2 Cancer	Metabolic reprogramming suing oncolytic viruses toimprove immunotherapy	26699	2670
Stephen Thorne	National Institutes of Health	Visualization of in vivo HIV-1 vaginal transmission in the presence and absence of PrEP	11826	5037
Simon Watkins	National Institutes of Health	Pittsburgh Center for Kidney Research	14996	7666
Simon Watkins	National Institutes of Health	CYP 450 Mediated CBF Dysregulation and Neurotoxicity in Pediatric Cardiac Arrest	9615	4236
Simon Watkins	National Institutes of Health	Cardiolipin as a Novel Mediator of Acute Lung Injury	107052	51880
Simon Watkins	National Institutes of Health	Biomimetric surface for neural implants	10056	5430
Simon Watkins	National Institutes of Health	PQC2 Alteration of 3D nuclear organization at nanoscale in breast tumorigenesis	7640	2776
Simon Watkins	National Institutes of Health	Regulated Activation of latent-TGfB Determines Leukocyte Occupancy of the Epidermal Niche	2500	0
Simon Watkins	National Institutes of Health	University of Pittsburgh Center for HIV Protein Interactions (PCHPI)	6469	3332
Simon Watkins	National Institutes of Health	Cancer Center Support Grant	82308	44446

Simon Watkins	National Institutes of Health	Basic and Clinical Studies of Cystic Fibrosis - Core C	75000	39229
Simon Watkins	National Institutes of Health	Core G: signature-directed sequential delivery of radiation mitigators	147430	71557
Simon Watkins	National Institutes of Health	Inhibition of Neural Electrode-Mediated Inflammation and Neuronal Cell Death	9613	4478
Simon Watkins	National Institutes of Health	DNA Damage Recognition by Nucleotide Excision Repair Proteins	8886	4864
Simon Watkins	National Institutes of Health	Exosomes as paracrine signal mediators in cardiac allograft rejection	15829	7467
Simon Watkins	National Institutes of Health	Mechanistic Elucidation and Targeted Therapy of Platelet Dysfunction After Trauma (Neal)	11251	6075
Simon Watkins	National Institutes of Health	Improving cerebral aneurysm risk assessment rhrough understanding wall vulnerabilitya nd failure models	22373	9381
Simon Watkins	National Institutes of Health	Biochemical and Spatial Regulation of IKKg/NEMO During T Cell Activation	10701	4939
Simon Watkins	National Institutes of Health	T Cell Memory in Organ Transplantation	9974	5386
Simon Watkins	National Institutes of Health	Inhibition of the ALT Pathway by Interfering with Poly-ADP-Ribose Metabolism	15195	5506
Simon Watkins	National Institutes of Health	B Cells in the Pathogensis of Allograft Rejection (Chalasani)	6963	3851
Simon Watkins	National Institutes of Health	BMP10 in Cardiovascular Development and Hereditary Hemorrhagic Telangiectasia.	10054	3554
Simon Watkins	National Institutes of Health	Cell Autonomous and Non-Autonomous Mechanisms of Aging	79436	39287
Simon Watkins	Cystic Fibrosis Foundation	Research Development Project - Imaging Core	40000	0
Simon Watkins	American Cancer Society	Epstein-Barr Virus Oncogenesis in Nasopharyngeal Carcin	10047	2009
Simon Watkins	National Institutes of Health	The role of RTK Signaling in Opiod Tolerance	4338	2342
Simon Watkins	National Institutes of Health	Center for Biological Imaging - Biogen - Gutstein	12500	0
Simon Watkins	National Institutes of Health	Blue Light Protects against Ischemia Induced Organ Injury (Rosengart)	3247	1753
Simon Watkins	National Institutes of Health	Adult Stem Cell-Based Enhancement of Nerve Conduit for Peripheral Nerve Repair (McMann)	3199	1727
Simon Watkins	National Institutes of Health	ROS Driven Mitochondrial-Telomere Dysfunction During Environmental Stress (Van Houten)	43473	24128
Simon Watkins	National Institutes of Health	Mechanisms of HMGB1 Release from Ischemic Muscle in Peripheral Arterial Disease (Hartman)	4420	1625
Simon Watkins	National Institutes of Health	Visualizing Synaptic Connection Between Distinct Cell types in Whole Mouse Brain (Bruchez - CMU)	68307	33242
Simon Watkins	National Institutes of Health	Pittsburgh Center for HIV Protein Interactions (PCHPI) Gronenborn-	23700	13201
Simon Watkins	National Institutes of Health	Signaling by the EGF Receptor from Endosomes	9731	5417
Simon Watkins	National Institutes of Health	Surgery Triggered Immune Response and Liver Matastases	5839	3269
Simon Watkins	National Institutes of Health	A Conofcal fluorescence Microscoy Brain Data Archive	33368	18519
Simon Watkins	National Institutes of Health	Structure and Activation of Multiprotein Signaling Complex (PI Vignali)	11059	3348
Simon Watkins	National Institutes of Health	Benzodiazepine Treatment Induced Neuroplasticity (PI - Jacob)	5839	3256
Simon Watkins	National Institutes of Health	Mechanisms of HMGB1 Release from Ischemic Muscle in Peripheral Arterial disease	12700	7085
Simon Watkins	National Institutes of Health	Request for a Nikon A1R Multiphoton Microscope	870023	0
Simon Watkins	National Institutes of Health	Inflammasome Activation in Trauma-Hemorrhagic Shock	5017	1853
Simon Watkins	National Institutes of Health	Mechanisms of Immune Dysfunction After Trauma and Surgical Sepsis	1687	811
Alan Watson	National Institutes of Health	Closed-Loop Neuroelectric Control of Meesis and Gastric Motility	2017	197

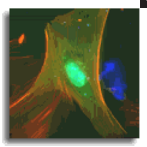


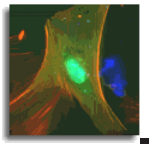


Nathan Yates	National Institutes of Health	Cell Autonomous and Non-Autonomous Mechanism of Aging	100602	44077
Nathan Yates	National Institutes of Health	Plasticity of Auditory Cortical Circuits in Schizophrenia	11669	6301
Nathan Yates	National Institutes of Health	Novel & Robust Methods for Differential Protein Network Analysis of Proteomics Data in Schizophrenia Res	5839	3241
Nathan Yates	National Institutes of Health	Regulation of Fuel Utilization by Lysine Acetylation in the Falling Heart	19548	10837
Nathan Yates	National Institutes of Health	Alzheimer's Disease Research center-funding	11581	6253
Nathan Yates	National Institutes of Health	Hormones, Immunity and HIV Risk	4650	2565
Nathan Yates	National Institutes of Health	Novel Approaches to Enchance Tumor Cell Cytotoxicity of Alkylating Agents	31457	6349
Nathan Yates	National Institutes of Health	The Metabolic Evolution of Staphylococcus Aureus	9731	5417
Nathan Yates	American Heart Association	Defining the Systems Biology of the Vascular	2237	224
			4545830	1785553

Cell Biology Sponsored Research Funding (FY19)

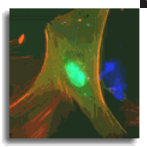
Name	Agency Name	Title	Annual DC	Annual IDC
Michael Butterworth	National Institutes of Health	Role of MicroRNAs in kidney sodium regulation	216,562	116,944
Michael Butterworth	National Institutes of Health	Altered Biosynthesis and Function of ABCC6 in Systemix Mineralization Disorders	14,138	7,969
Marijn Ford	National Institutes of Health	The Roles of the Dynamin-Related Protein Vps1 and the ESCRT Complex in Microautophagy	193,752	99,936
Gerry Hammond	National Institutes of Health	Directing Membrane Function with Inositol Lipids in Health and Disease	242,237	136,685
Yang Hong	National Institutes of Health	Membrane Targeting and Retargeting of Polarity Proteins	196,500	106,228
Adam Kwiatkowski	National Institutes of Health	Alpha-Catenin Function in Cardiomyocyte Adhesion and Cytoskeletal Organization	238,382	126,735
Mads Larsen	National Institutes of Health	Cystic Fibrosis Foundation (Betrand)	30,491	-
Mads Larsen	National Institutes of Health	Selective Steps in Wild-Type and F508del CFTR Processing (PI - Frizzell)	3,652	292
Sanford Leuba	National Institutes of Health	NNRTI Induced Conformational Changes in HIV 1 RT (Sluis-Cremer)	4,550	2,457
Sanford Leuba	National Institutes of Health	Novel Mechanisms of HIV Resistance ti RTIS (Sluis-Cremer)	5,354	2,891
Sanford Leuba	National Institutes of Health	Evolved DNA Contacts Required for Hexameric Helicase Unwinding.	42,857	24,176
Chelsea Merkel	National Institutes of Health	The Role of Vinculin in Cardiomyocyte Adhesion and Mechanical Continuity	40,053	-
Alexander Sorkin	National Institutes of Health	Pathogenesis of Cancer	218,068	115,028
Alexander Sorkin	US Dept of Veterans Affairs	Investigating the Role of TMEM16A/AN01 in SCCHN	23,203	-
Alexander Sorkin	National Institutes of Health	Exosome Based Placental Maternal Communication	52,152	28,721
Alexander Sorkin	National Institutes of Health	Modeling Spatiotemporal Control of EGFR-ERK Signaling in Gene-Edited Cell Systems	122,500	69,113
Alexander Sorkin	National Institutes of Health	Signaling by them EGF Receptor from Endosomes	218,058	123,081
Alexander Sorkin	National Institutes of Health	Regulation of Dopamine Transporter by Trafficking	263,367	138,820
Claudette St. Croix	National Institutes of Health	In vivo localization and mechanism of regulatory B cell function in alloimmunity & transplant tolerance	8,857	4,783
Claudette St. Croix	National Institutes of Health	Pulmonary Arteriole Occlusion by Platelet Neutrohil micro emboli in acute chest syndrome	24,427	2,066
Claudette St. Croix	National Institutes of Health	Pathogenic Mechanisms of Gene-Environment Interactions in Parkinsons Disease	2,917	1,575
Claudette St. Croix	National Institutes of Health	Cardiolipin as a Novel Mediator of Acute Lung Injury	5,314	2,870
Claudette St. Croix	National Institutes of Health	Vascular Subphenotypes of Lung Disease - Preclinical Assessment Core	65,303	36,805
Claudette St. Croix	National Institutes of Health	Signaling Mechanisms by which Mitochondria Regulates Fibrosis in the Lung	4,500	2,459
Claudette St. Croix	National Institutes of Health	Reactive Oxygen Species in Vascular Disease	8,236	4,448
Claudette St. Croix	National Institutes of Health	Anti-Inflammatory Lipid Mediators in Asthma	8,575	4,845
Claudette St. Croix	National Institutes of Health	Vascular Smooth Muscle and Blood Pressure Regulation By cyb5R2	7,499	4,227
Claudette St. Croix	National Institutes of Health	Novel Role of Smooth Muscle B5 Reductase in Sickle Cell Disease	4,585	2,549
Claudette St. Croix	National Institutes of Health	Aging of Mesenchymal Stem cells Missing Link in IPF	6,984	3,771
Claudette St. Croix	National Institutes of Health	Regulation of Fuel Utilization by Lysine Acetylation in the Failing Heart	3,644	2,029
Claudette St. Croix	National Institutes of Health	Mechanisms oand Promotion of Immune Regulation by CD4+	14,224	5,207

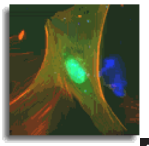




Claudette St. Croix	National Institutes of Health	Exploring and Exploiting Metabolic Plasticity in Regulatory T Cells	8,929	5,032
Claudette St. Croix	National Institutes of Health	Host Control Mechanisms Against K. Pneumoniae Infection in the Lungs	26,333	14,813
Claudette St. Croix	National Institutes of Health	The Anti-Aging Role of Klotho in Skeletal Muscle Regeneration	27,569	9,919
Claudette St. Croix	American Heart Association	Reprogramming of the vascular matrisome & matrix cellularity as a pathogenic lynchpin for pulmonary	3,328	334
Claudette St. Croix	National Institutes of Health	Mechanisms of Myocardial-Infarction Induced Insulin Resistance	12,074	6,795
Claudette St. Croix	National Institutes of Health	The Role of Telomerase in Valvular Calcification	3,312	1,871
Claudette St. Croix	National Institutes of Health	Obesity-associated Mitophagy Resistance	15,060	5,809
Donna Beer Stolz	National Institutes of Health	Mechanisms of Arsenic-induced Muscle Morbidity and Reduced Regenerative Capacity	4,036	2,240
Donna Beer Stolz	National Institutes of Health	Mechanisms of Trabecular Meshwork Regeneration by stem cell	10,000	3,814
Donna Beer Stolz	National Institutes of Health	Critical Role for Fibroblast Growth Factor Receptors in Bladder Development	6,638	3,585
Donna Beer Stolz	National Institutes of Health	Dysfunctional Muscle remodeling and regeneration in environmental disease	23,873	13,179
Donna Beer Stolz	National Institutes of Health	Elucidting Mechanisms Involved in Lamin B1 Medited Demyelination	4,025	2,174
Donna Beer Stolz	National Institutes of Health	Endogenous Regulators of Inflammation in Liver Ischemia/Reperfusion	13,300	4,890
Donna Beer Stolz	National Institutes of Health	Luminal Epithelial Junctions, Polarity and Permeability in BPH	1,629	765
Donna Beer Stolz	National Institutes of Health	Alpha Catenin Function in Cardiomyocyte adhesion and Cytoskeletal	8,116	4,382
Donna Beer Stolz	National Institutes of Health	Characterization of Meiotic Crossover Surveillance System	12,839	7,100
Donna Beer Stolz	National Institutes of Health	Core G: Signature-Directed, Sequential Delivery of Radiation Mitigators (PI - Greenberger)	11,327	6,117
Donna Beer Stolz	National Institutes of Health	Melatonin Biosynthesis in Neuronal Mitochondria - (PI - Friedlander)	3,923	2,217
Steven Truschel	National Institutes of Health	Bladder Mucosal Dysfunction During Aging	26,612	15,036
Simon Watkins	National Institutes of Health	Pittsburgh Center for Kidney Research	1,250	644
Simon Watkins	National Institutes of Health	Cardiolipin as a Novel Mediator of Acute Lung Injury	45,190	21,703
Simon Watkins	National Institutes of Health	Biomimetric surface for neural implants	5,447	2,941
Simon Watkins	National Institutes of Health	Regulated Activation of latent-TGfB Determines Leukocyte Occupancy of the Epidermal Niche	2,500	-
Simon Watkins	National Institutes of Health	ROS driven mitochondrial-telomere dysfunction during environmental stress-	43,833	24,427
Simon Watkins	National Institutes of Health	Cancer Center Support Grant	81,261	43,882
Simon Watkins	National Institutes of Health	Core G: signature-directed sequential delivery	130,832	63,027
Simon Watkins	National Institutes of Health	Inhibition of Neural Electrode-Mediated Inflammation and Neuronal Cell Death	9,351	4,753
Simon Watkins	National Institutes of Health	DNA Damage Recognition by Nucleotide Excision Repair Proteins	9,315	5,103
Simon Watkins	National Institutes of Health	Exosomes as paracrine signal mediators in cardiac allograft rejection	17,157	7,511
Simon Watkins	National Institutes of Health	Genetics of Extracellular Matrix in Health and Disease (Urban)	6,311	1,968
Simon Watkins	National Institutes of Health	Mechanistic Elucidation and Targeted Therapy of Platelet Dysfunction After Trauma (Neal)	12,262	6,917
Simon Watkins	National Institutes of Health	Improving cerebral aneurysm risk assessment through understanding wall vulnerability & failure	17,218	8,863
Simon Watkins	National Institutes of Health	T Cell Memory in Organ Transplantation	8,414	4,544

Simon Watkins	National Institutes of Health	Inhibition of the ALT Pathway by Interfering with Poly-ADP-Ribose Metabolism	15,626	5,573
Simon Watkins	National Institutes of Health	Lipid Imaging in Traumatic Brain Injury by High Resolution GCIB-Secondary Ion Mass Spectrometry	18,420	10,407
Simon Watkins	National Institutes of Health	B Cells in the Pathogensis of Allograft Rejection (Chalasani)	7,007	3,912
Simon Watkins	National Institutes of Health	BMP10 in Cardiovascular Development and Hereditary Hemorrhagic Telangiectasia.	10,207	3,705
Simon Watkins	Cystic Fibrosis Foundation	Cell and Tissue Imaging Core C	38,014	-
Simon Watkins	American Cancer Society	Epstein-Barr Virus Oncogenesis in Nasopharyngeal Carcinoma	11,256	2,251
Simon Watkins	National Institutes of Health	Center for Biological Imaging - Biogen - Gutstein	12,500	-
Simon Watkins	National Institutes of Health	Blue Light Protects against Ischemia Induced Organ Injury (Rosengart)	1,864	1,053
Simon Watkins	National Institutes of Health	Adult Stem Cell-Based Enhancement of Nerve Conduit for Peripheral Nerve Repair (McMann)	800	432
Simon Watkins	National Institutes of Health	Mechanisms of HMGB1 Release from Ischemic Muscle in Peripheral Arterial Disease (Hartman)	13,337	7,514
Simon Watkins	National Institutes of Health	Visualizing Synaptic Connection Between Distinct Cell types in Whole Mouse Brain (Bruchez - CMU)	79,762	39,326
Simon Watkins	National Institutes of Health	Pittsburgh Center for HIV Protein Interactions (PCHPI) Gronenborn-	23,750	13,201
Simon Watkins	National Institutes of Health	Signaling by the EGF Receptor from Endosomes	11,860	6,686
Simon Watkins	National Institutes of Health	Surgery Triggered Immune Response and Liver Matastases	11,692	6,533
Simon Watkins	National Institutes of Health	A Confocal fluorescence Microscoy Brain Data Archive	33,333	18,883
Simon Watkins	National Institutes of Health	Illuminting Metabolic Pathways Enabled by Early T Cell Activation	11,893	6,711
Simon Watkins	National Institutes of Health	Caspace-1 and Inflammasome Activation in Traumahemorrhagic Shock	20,068	7,913
Simon Watkins	National Institutes of Health	Mechanisms of HMGB1 Release from Ischemic Muscle in Peripheral Arterial disease	8,847	3,264
Simon Watkins	National Institutes of Health	Benzodiazepine Treatment Induced Neuroplasticity	7,008	3,924
Simon Watkins	National Institutes of Health	Structure and Activation of Multiprotein Signaling Complex (PI Vignali)	13,434	4,198
Simon Watkins	National Institutes of Health	Mechanisms of Immune Dysfunction After Trauma and Surgical Sepsis	20,240	9,726
Simon Watkins	National Institutes of Health	HIV-Reservoir in Naïve CD+T Cells	25,611	12,211
Simon Watkins	National Institutes of Health	Damage Sensor role of UV-DDB during base excision repair	9,778	5,525
Simon Watkins	National Institutes of Health	Project 1 for SSC Cort	8,333	4,625
Simon Watkins	National Institutes of Health	Molecular Mechanisms of Eastern Equic Encephalitis Virus Pathogenesis	25,850	11,780
Simon Watkins	National Institutes of Health	IFITM-Mediated Virus Restriction	25,089	12,594
Simon Watkins	National Institutes of Health	Pgh Center for Kidney research	5,210	2,944
Simon Watkins	National Institutes of Health	DNA Damage Signaling to Dormant Originals of Replication	24,989	14,119
Simon Watkins	National Institutes of Health	Exploring Antisense Oligonucleotides as potential therapy for autosomal dominant	24,989	14,119
Simon Watkins	National Institutes of Health	Targeting Host Responses to Prevent Virus Induced ARDS in the Nonhuman primate model	10,966	6,132
Simon Watkins	National Institutes of Health	Nitrite Therapy to Improve Mitochondrial Energetics and Physical Activity in Older Adults	10,092	5,702





Alan Watson	National Institutes of Health	Closed-Loop Neuroelectric Control of Meesis and Gastric Motility (supplement 1)	22,182	2,168
Alan Watson	National Institutes of Health	High Precision Fasciculus Tracking in dMRI, Histology and idealized Axons for Connectome	113,997	41,808
Nathan Yates	National Institutes of Health	Plasticity of Auditory Cortical Circuits in Schizophrenia	8,790	4,747
Nathan Yates	National Institutes of Health	Regulation of Fuel Utilization by Lysine Acetylation in the Falling Heart	19,122	10,777
Nathan Yates	National Institutes of Health	Alzheimer's Disease Research center-funding	8,790	4,747
Nathan Yates	National Institutes of Health	Novel Approaches to Enhance Tumor Cell Cytotoxicity of Alkylating Agents	23,593	4,835
Nathan Yates	National Institutes of Health	The Metabolic Evolution of Staphylococcus Aureus	11,681	6,503
Nathan Yates	American Heart Association	Defining the Systems Biology of the Vascular Matrix in Pulmonary Hypertension	4,474	448
Nathan Yates	National Institutes of Health	Mechanisms by Which Cyanotriazoles Activate Latent HIV	11,886	6,694
Nathan Yates	National Institutes of Health	Obesity-associated Mitophagy Resistance	10,918	6,169
Nathan Yates	National Institutes of Health	Chemokine CXCL 12/CXCR4 System and Synthetic Cathiones	20,833	11,771
			3,702,296	1,828,695

Faculty Editorships (Fiscal Year 2017-2018)

Michael B. Butterworth, Ph.D.
Assistant Professor

American Journal of Physiology – Renal Physiology
Frontiers in Renal and Epithelial Physiology
PLoS ONE
Physiological Genomics

Adam Kwiatkowski, Ph.D.
Assistant Professor

Associate Editor, BMC Cell Biology

Sanford Leuba, Ph.D.
Associate Professor

Section Editor, BMC Biophysics

Alexander D. Sorkin, Ph.D.
Richard B. Mellon Professor and Chair

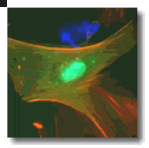
Traffic, Associate Editor
Scientific Reports (Nature) Editorial Board

Linton Traub, Ph.D.
Professor

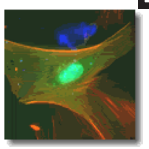
Member of editorial board of Traffic
Member of editorial board of Cellular Logistics
Member of editorial board of Scientific Reports
Member of editorial board of The Journal of Biological Chemistry
Member of board of reviewing editors, Molecular Biology of the Cell

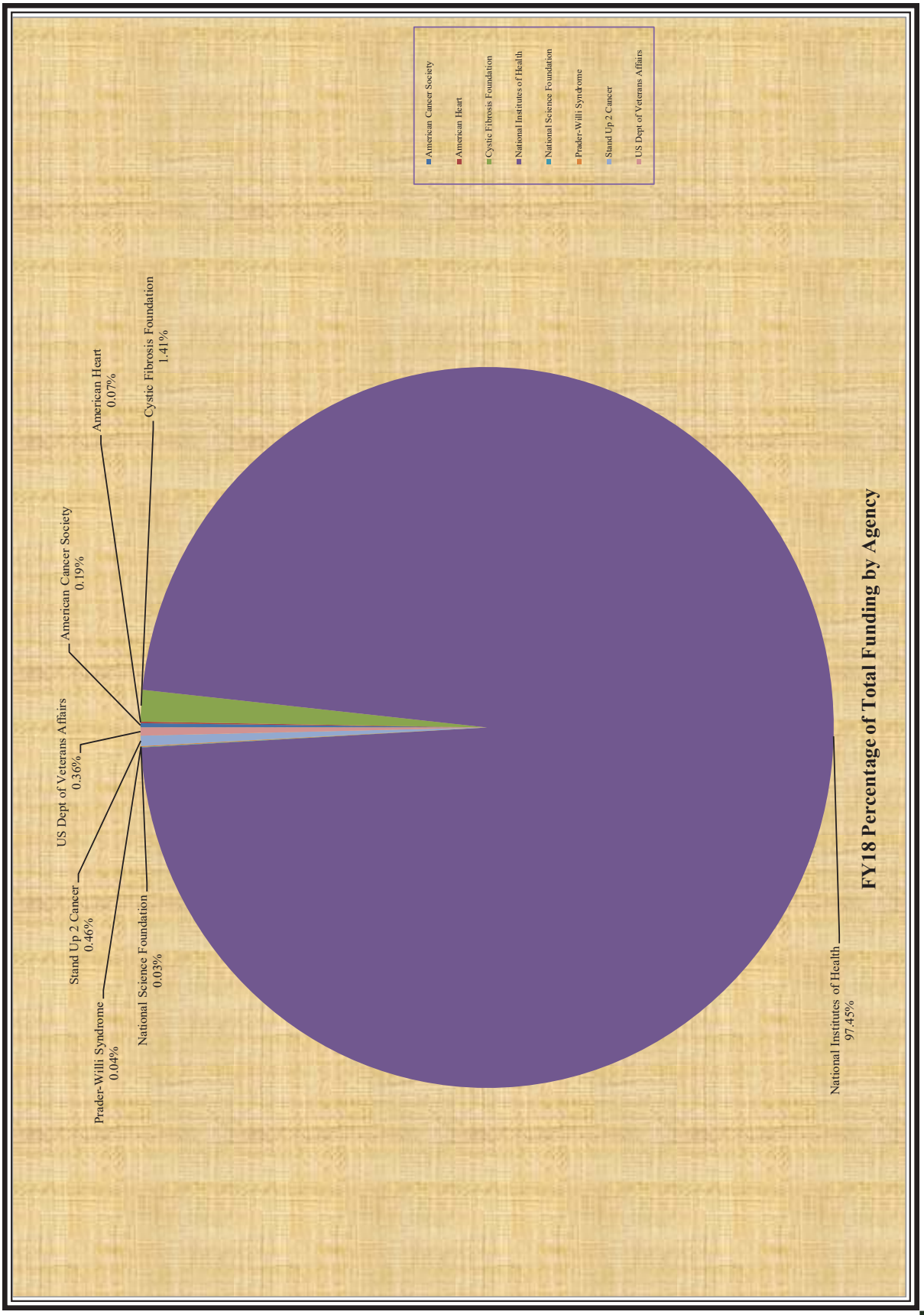
Simon C. Watkins, Ph.D.
Distinguished Professor and Vice Chairman, Director of Center of Biologic Imaging

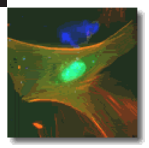
Member, Editorial Board, PittMed
Associate Editor, Experimental Biology and Medicine

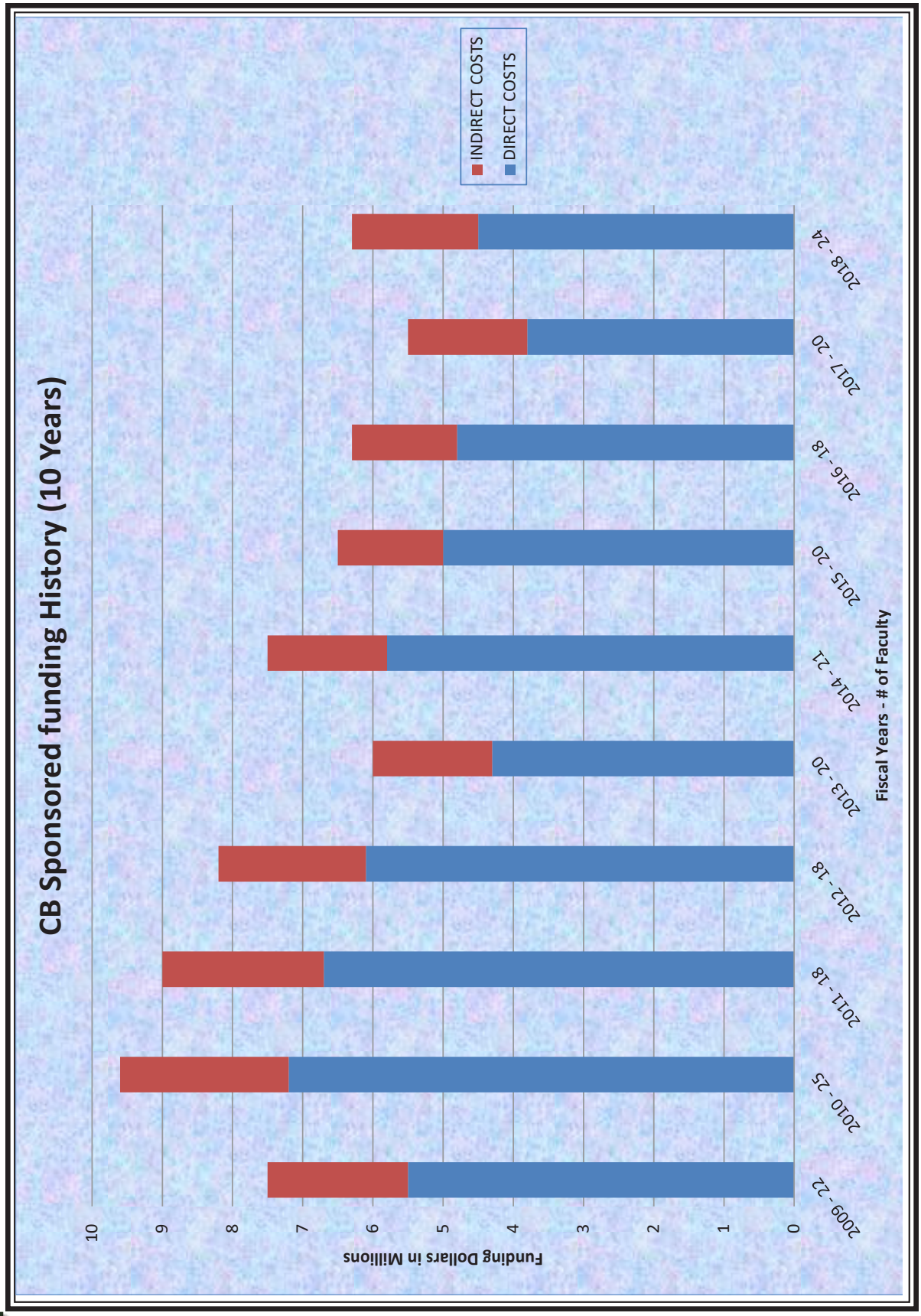


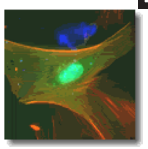
Editor, Current Protocols in Cytometry
Editor, Experimental Science and Medicine
Editor, Microscopy Today

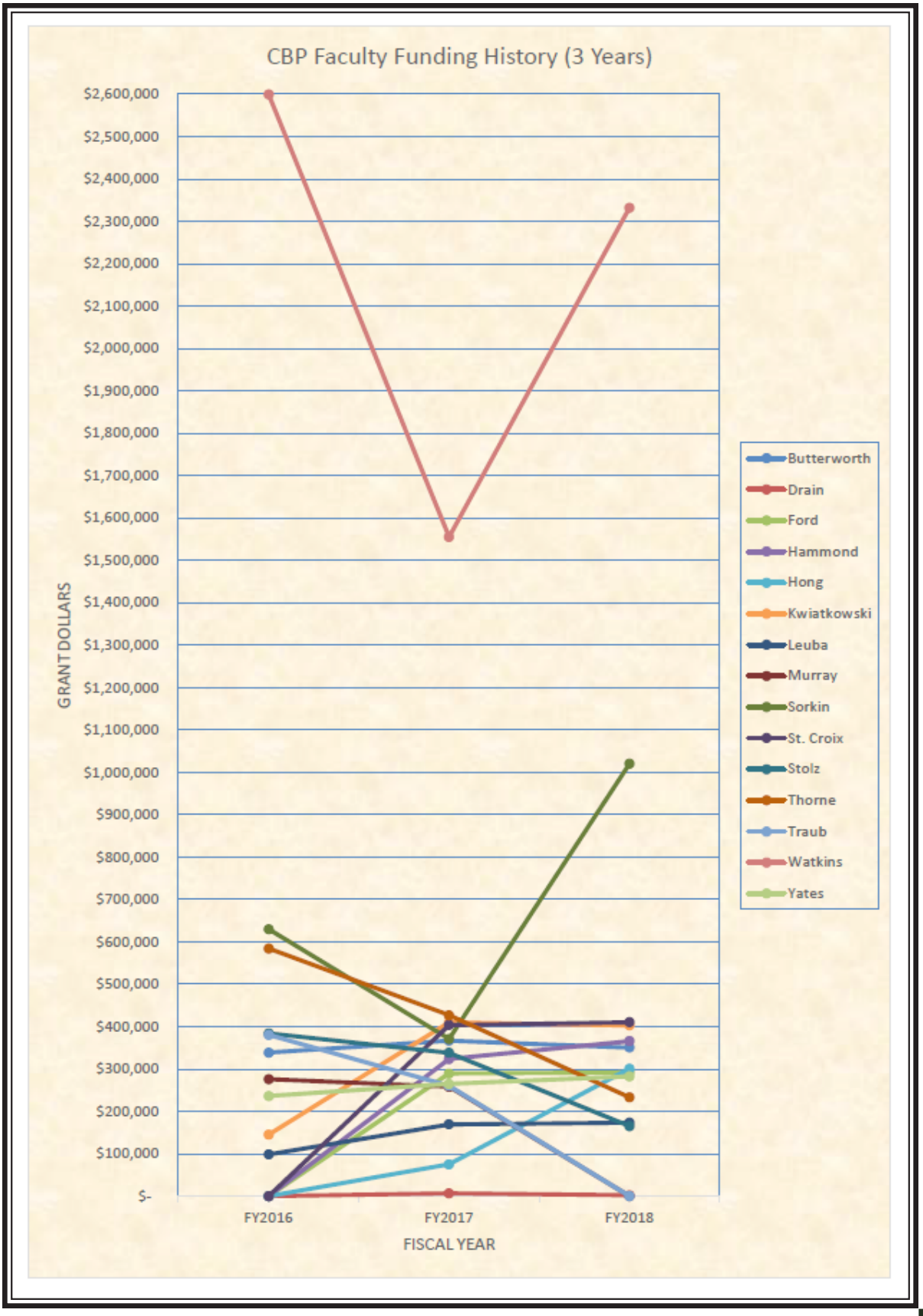


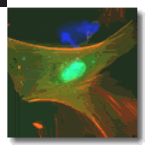

FY18 Percentage of Total Funding by Agency
American Cancer Society
American Heart
Cystic Fibrosis Foundation
National Institutes of Health
National Science Foundation
Prader-Willi Syndrome
Stand Up 2 Cancer
US Dept of Veterans Affairs
American Cancer Society 0.19%
American Heart 0.07%
Cystic Fibrosis Foundation 1.41%
US Dept of Veterans Affairs 0.36%
Stand Up 2 Cancer 0.46%
Prader-Willi Syndrome 0.04%
National Science Foundation 0.03%
National Institutes of Health 97.45%




CB Sponsored funding History (10 Years)
INDIRECT COSTS
DIRECT COSTS
Funding Dollars in Millions
0
1
2
3
4
5
6
7
8
9
10
2009 - 22
2010 - 25
2011 - 18
2012 - 18
2013 - 20
2014 - 21
2015 - 20
2016 - 18
2017 - 20
2018 - 24
Fiscal Years - # of Faculty



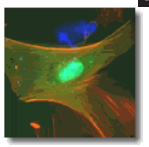

CBP Faculty Funding History (3 Years)
$2,600,000
$2,500,000
$2,400,000
$2,300,000
$2,200,000
$2,100,000
$2,000,000
$1,900,000
$1,800,000
$1,700,000
$1,600,000
$1,500,000
$1,400,000
$1,300,000
$1,200,000
$1,100,000
$1,000,000
$900,000
$800,000
$700,000
$600,000
$500,000
$400,000
$300,000
$200,000
$100,000
$-
GRANT DOLLARS
FY2016
FY2017
FY2018
FISCAL YEAR
Butterworth
Drain
Ford
Hammond
Hong
Kwiatkowski
Leuba
Murray
Sorkin
St. Croix
Stolz
Thorne
Traub
Watkins
Yates



CBP FACULTY ROSTER
(Effective June, 2018)

Faculty Member	Salary Support on Grants	Rank	Status
Dong, Wei	100%	Research Instructor	Non-tenure Track
Larsen, Mads Breum	100%	Research Instructor	Non-tenure Track
Li, Yang	100%	Research Instructor	Non-tenure Track
Pinilla Macua, Itziar	100%	Research Instructor	Non-tenure Track
Surve, Sachin	100%	Research Instructor	Non-tenure Track
Watson, Alan	100%	Res. Assistant Professor	Non-tenure Track
Watkins, Simon*	81.9%	Professor	Tenured
St. Croix, Claudette	81.8%	Associate Professor	Tenured
Stolz, Donna	80.4%	Associate Professor	Tenured
Sorkin, Alexander*	77.5%	Professor	Tenured
Yates, Nathan*	57.6%	Associate Professor	Non-tenure Track
Hammond, Gerald	51.0%	Associate Professor	Tenured
Kwiatkowski, Adam	50.0%	Assistant Professor	Tenure Track
Ford, Natalia	45.0%	Res. Assistant Professor	Non-tenure Track
Butterworth, Michael	40.0%	Assistant Professor	Tenure Track
Ford, Marijn	40.0%	Assistant Professor	Tenure Track
Hong, Yang	33.0%	Associate Professor	Tenured
Leuba, Sanford	29.7%	Associate Professor	Tenured
Traub, Linton	20.9%	Professor	Tenured
Murray, Sandra	16.7%	Professor	Tenured
Drain, Peter	4.3%	Associate Professor	Tenured
Aridor, Meir	1.6%	Associate Professor	Tenured
Devor, Daniel	0.0%	Associate Professor	Tenured
Duker, Georgia	0.0%	Assistant Professor	Non-tenure Track
Shi, Yi	0.0%	Assistant Professor	Tenure Track

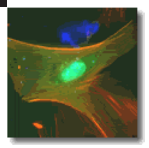
*Calculated using year appropriate NIH salary cap as upper limit for each grant



STUDENTS INVOLVED IN RESEARCH IN CBP FACULTY LABS
Snapshot as of June, 2018

GRADUATE STUDENTS ENROLLED IN CBMP PROGRAM

STUDENT	LAB	SUPPORT
Sarel Urso	Todd Lamitina, Ph.D. Dept. Pediatrics	Todd Lamitina, Ph.D. Dept. Pediatrics
Rachel Wills	Gerald Hammond, Ph.D. Cell Biology	Gerald Hammond, Ph.D. Cell Biology & Teaching Fellowship
Jonathan Heier	Adam Kwiatkowski, Ph.D. Cell Biology	Adam Kwiatkowski, Ph.D. Cell Biology & Teaching Fellowship
Amity Eaton	Gerard Apodaca, Ph.D. Renal-Electrolyte Division	Gerard Apodaca, Ph.D. Cell Biology & Teaching Fellowship
Paige Rudich	Todd Lamitina, Ph.D. Dept. Pediatrics	Todd Lamitina, Ph.D. Cell Biology & Teaching Fellowship
Chelsea Merkel	Adam Kwiatkowski, Ph.D. Cell Biology	Adam Kwiatkowski, Ph.D. National Research Service Award NIH Trainee



FY18 Projects

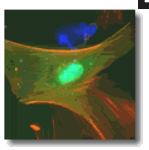
Kwiatkowski lab: *The Role of Vinculin in Cardiomyocyte Adhesion and Mechanical Continuity* (National Institutes of Health)

The combined funding for this post-doctoral fellowship grants is $40,053 in FY18 (Total costs, annualized).

FY19 Projects

Kwiatkowski lab: *The Role of Vinculin in Cardiomyocyte Adhesion and Mechanical Continuity* (National Institutes of Health)

The combined funding for this post-doctoral fellowship grants is $40,493 in FY18 (Total costs, annualized).



Cell Biology Program Grants (Fiscal Year 2017-18)

The Department of Cell Biology is funded for ten Program Grants, two by the National Institutes of Health and one by the Cystic Fibrosis Foundation, as follows:

The CBI is funded to a large degree through multiple programmatic PHS grants, in which the CBI is listed as a core resource for the grant. There are 12 currently funded program grants including

Cancer Center support Grant (PI Charleen Chu P30CA047904)

Basic and clinical studies of Cystic Fibrosis (PI Ray Frizzell P30DK072506)

Research studies in CF (PI Ray Frizzell R8883-CR07)

Cell Autonomous and Non-Autonomous Mechanism of Aging (PI Robbins P., 1P01AG043376)

University of Pittsburgh Center for HIV Protein interactions (PCHPI, PI Gronenborn A 5P50GM082251)

Cardiolipin as a Novel Mediator of Acute Lung Injury (Mallampalli R. P01HL114453)

Vascular Subphenotypes of Lung Disease (PI Gladwin M. 5P01HL103456-03)

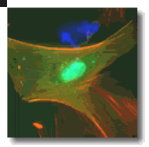
Pittsburgh Center for Kidney Research (PI Gerard Apodaca P30DK079307-09)

Mechanism-Directed Sequential Delivery of Radition Mitigators Imaging Radiation Apathology Core (PI Joel Greenberger U19AI068021)

Alzheimer's Disease Research Center (PI Matthew MacDonald P30AG05133)

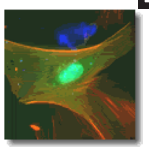
Project 1 for SSc Cort Novel Pathways in Systemic Sclerosis (PI Robert Lafyatis 2P50AR06078006)

Luminal Epithelial Junctions, Polarity and Permeabiility in BPH Pathogenesis (PI-Zhau Wang U54DK112079)



New CBP Research Recruits in FY18

Name	Rank	
Faculty Level		
Alan Watson	Research Assstant Professor	
Name	**Rank**	**Lab Association**
Post Doctoral Level		
Tarique Bagalkot	Post Doctoral Associate	Dr. Alexander Sorkin
Fei Fang	Post Doctoral Associate	Dr. Yi Shi
Juan Lu	Post Doctoral Associate	Dr. Yang Hong
Mireia Perez Verdaguer	Post Doctoral Associate	Dr. Alexander Sorkin
Dapeng Sun	Post Doctoral Associate	Dr. Marijn Ford



Graduate Program in Cell Biology and Molecular Physiology

The program in Cell Biology and Molecular Physiology has a strong track-record of scientific training and discovery. Graduates of the Ph.D. program undertake a range of careers in both academic and scientifically related fields. The department brings together basic and clinical research faculty who are dedicated to their research programs and to the training of graduate students. Among the medical school departments, this faculty is uniquely focused on integrative biology; that is, using the tools of genetics, cellular and molecular biology, imaging and systems biology to understand the integrated functions of cells, tissues, organs, organisms and humans.

The educational component of the program offers students the opportunity to interact with multiple, well-supported faculty with international reputations. Students in the program enjoy a rich experience going beyond formal classroom training, including numerous journal clubs, "work in progress" interactions with student peers, research conferences and the opportunity to attend national and international meetings.

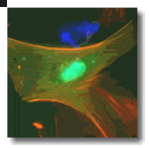
CBMP students can develop their teaching and mentoring skills by participating as instructors for the histology laboratory sections taught to first and second year medical students. Student instructors assist the medical students in using microscopes and presentations to identify tissues and cells as well as to understand the functions of the tissues and cells that they are observing. Teaching responsibilities normally require approximately 5 to 10 hours per month of preparation and teaching time. Prior to becoming instructors, the CMBP students are required to take the graduate level course in Histology (MSCBMP2870), which will prepare them for their teaching responsibilities. Senior students may have the opportunity to develop and present lectures in the graduate Histology Course. Beyond the teaching experience, these fellowships also provide students with funding for much of their stipend and tuition for two years.

Courses

The CBMP program has 2 required courses and several electives available to students. Before entering the CBMP program, students successfully complete all the required first year IBGP courses including the foundations course, grant writing, ethics and data analysis. After matriculating into the CBMP program all students are required to enroll in "Cell Biology of Normal and Disease States" (MSCBMP 2880) in the spring, and **one** of the imaging courses offered, either "Imaging Cell Biology in Living Systems" (MSCBMP 2885) in the spring or "Mutliparametric Microscopic Imaging" (MSCBMP 2860) in the summer. Students are encouraged to take the histology course (MSCBMP 2870) to be eligible to TA medical students. Ongoing classes include the work-in-progress class "Experiments and Logic in Cell Biology" (MSCBMP 2875) and a journal club that meets throughout the year.

Faculty

Faculty have a common interest in understanding the cellular basis of life and disease. As most human diseases arise from failures on a cellular level, our faculty investigate the cellular underpinnings of kidney, heart, lung and brain diseases, cancer, diabetes and inherited diseases of development and reproduction. Their research can be divided into the following broad categories:



Membrane Traffic of Proteins and Lipids
Many of our faculty study how cells assemble the molecular machinery to coordinate membrane and organelle transport. Studies investigate how errors in cellular trafficking result in disease.

Apodaca, Aridor, Brodsky, Butterworth, Ford, Goetzman, Hammond, Hong, Hughey, Murray, Sorkin, Swiatecka-Urban, Thorne, Traub, Weisz.

Cell Communication, Signaling and Ion Channel Biology
Studies aim to understand how cells receive, decode and transmit signals to establish complex signaling networks in the body. A breakdown in cellular communication leads to diseases like diabetes, neurodegenerative disease, cystic fibrosis, hypertension, heart disease and others, all under investigation by faculty.

Brodsky, Butterworth, Carattino, Devor, Du, Dutta, Hammond, Hughey, Kashlan, Kleyman, Kwiatkowski, Murray, Nicotra, Roy, Salama, Lamitina, Sims-Lucas, St. Croix, Stolz, Swiatecka-Urban, Subramanya, Thibodeau, Thorne, Watkins, Weisz.

Cellular Injury, Wound Healing, Aging and Tissue Regeneration
Researchers are investigating responses to stress, cell or tissue damage to understand the cellular mechanisms that mediate repair and maintenance. This includes acute injury, chronic aging and new tissue growth.

Du, Dutta, Funderburgh, Ghazi, Kwiatkowski, Lamitina, Mallampalli, Murray, Stolz, Swamynathan, Yanowitz.

DNA Damage/Repair, Cell-Cycle Control and Gene Expression, Cancer
An undamaged genome is essential to prevent cancer. Our faculty strive to identify defects associated with the cellular response to DNA damage/repair and cancer.

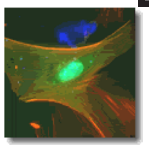
Ghazi, Lamitina, Leuba, Swamynathan, Thorne, Walker, Yanowitz.

Genomics, Proteomics and Metabolomics
Faculty that aim to describe cellular function as a product of their genomic, proteomic or small molecule interactomes.

Brodsky, Butterworth, Drain, Devor, Goetzman, Hong, Kwiatkowski, Lamitina, Rajkovic, Shi, Sims-Lucas, Sorkin, Swiatecka-Urban, Thibodeau, Thorne, Weisz, Whitcomb.

Reproductive Biology
Faculty specialize in the unique cellular processes associated with reproduction, and defects linked to reproductive disease and disorder.

Ghazi, Rajkovic, Schatten, Walker, Yanowitz.



Courses in the Cell Biology and Molecular Physiology Graduate Program

Courses in FY-18

Title: MS Thesis Research
Course Number: 2800
Course Director: Michael Butterworth
When: Fall Term, Spring Term, Summer Term
Prerequisites: INTBP 2000 Foundations of Biomedical Sciences
INTBP 2005 Conference

Description: A directed research project that results in a thesis for a Master's Degree.

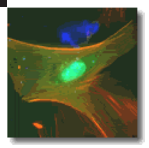
Title: Regulation of Membrane Traffic
Course Number: 2840
Course Director: Gerard Apodaca and Ora Weisz
When: Summer Term
Prerequisites: INTBP 2000 Foundations of Biomedical Sciences
INTBP 2005 Conference
Core Course for: students in the Program in Cell Biology and Molecular Physiology with research focus in cellular biology

Description: The focus of this course is to analyze membrane/protein traffic along both the biosynthetic and endocytic pathways. The general goal is to teach students how to read and interpret the literature. In particular, we emphasize the conclusions of the assigned papers, examine the experimental basis of these conclusions, and discuss their validity. The course is updated each year to include topics in which new and interesting developments have occurred. Emphasis is placed on how membrane traffic is regulated and how it is disrupted or subverted during disease processes. The course is of general interest to students, fellows, and faculty interested in cell biology, immunology, neurobiology, pharmacology, and virology.

Title: Research Seminar in Cellular Biological Membrane Trafficking
Course Number: 2852
Course Director: Gerard Apodaca
When: Fall Term, Spring Term
Prerequisites: INTBP 2000 Foundations of Biomedical Sciences
INTBP 2005 Conference
Core Course for: students in the Program in Cell Biology and Molecular Physiology with research focus in cellular biology

Description: Advanced research seminar with journal club format specializing in current aspects of membrane traffic.

Title: Research Seminar in Reproductive Physiology
Course Number: 2853
Course Director: William Walker
When: Fall Term, Spring Term



Prerequisites: INTBP 2000 Foundations of Biomedical Sciences
INTBP 2005 Conference

Description: Advanced research seminar with journal club format specializing in current aspects of reproductive physiology.

Title: Research Seminar in Molecular Physiology
Course Number: 2855
Course Director: Thomas Kleyman
When: Fall Term, Spring Term
Prerequisites: INTBP 2000 Foundations of Biomedical Sciences
INTBP 2005 Conference

Description: Advanced Research Seminar with Journal Club format specializing in current aspects of molecular and cellular physiology.

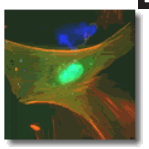
Title: Multiparametric Microscopic Imaging
Course Number: 2860
Course Director: Claudette St. Croix and Donna Beer Stolz
When: Summer Term
Prerequisites: INTBP 2000 Foundations of Biomedical Sciences
INTBP 2005 Conference

Description: a lecture/lab course that immerses students in the theory and practical aspects of modern microscopic imaging. The fields will cover the theory and implementation of all types of light and electron microscopy and computer aided imaging. Students will be expected to reach a functional capability in a selected technology.

Title: Histology
Course Number: 2870
Course Director: Georgia Duker
When: Spring Term
Prerequisites: INTBP 2000 Foundations of Biomedical Sciences
INTBP 2005 Conference

Description: The objective of this lecture/lab course is to comprehend the relationship between structure and function at the cell, organ and organ system levels. Focus is placed on the integration of cell biology, classical histology and basic physiology of each of the organ systems, with the exclusion of the central nervous system. This knowledge is applied by building skills in the interpretation of light and electron micrographic images of cells and organs. This course is a requirement for those graduate students wishing to serve as teaching fellows in Histology for the Medical School.

Title: Experiments and Logic in Cell Biology
Course Number: 2875
Course Director: Michael Butterworth and Donna Beer Stolz



When: Spring and Fall Term
Prerequisites: INTBP 2000 Foundations of Biomedical Sciences
INTBP 2005 Conference

Description: The purpose of Experiments and Logic in Cell Biology (ELCB) is to engage the students of the Cell Biology and Molecular Physiology graduate program in a self-directed seminar structured to stimulate the students ability to think scientifically and critically as future scientists. The iterative, collaborative and collegial process of ELCB is the same used by teams of collaborating scientists to develop and solve biomedical projects.

Title: Cellular Biology of Normal and Disease States
Course Number: 2880
Course Director: Daniel Devor
When: Spring Term
Prerequisites: INTBP 2000 Foundations of Biomedical Sciences
INTBP 2005 Conference
Core Course for: Cell Biology and Molecular Physiology Program

Description: This course will extend basic knowledge of cell and molecular biology obtained in Foundations of Biomedical science. The lectures will focus on four or five intensely active research areas of cell biology. Basic principles will be reinforced by considering disease states in which these processes are defective. Examples: cell growth and cancer, cell polarity and protein targeting, diseases of ion channels, cell biology of diabetes. Lectures and discussion groups.

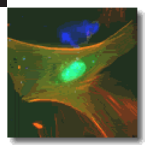
Title: Imaging Cell Biology in Living Systems
Course Number: 2885
Course Director: Simon Watkins
When: Spring Term
Prerequisites: None

Description: The focus of this course is to study relevant problems in Cell Biology, Immunology, Developmental Biology and Neurobiology and how they have been solved using imaging approaches. The course will follow a Lecture/Demo/Journal Club format. Lectures will be interspersed with a journal club discussion of a relevant paper on each technology.

Title: Directed Study
Course Number: 2890
Course Director: Michael Butterworth
When: Fall Term, Spring Term, Summer Term, and Fall Term
Prerequisites: INTBP 2000 Foundations of Biomedical Sciences
INTBP 2005 Conference

Description: This course provides the student an opportunity to carry out a specific laboratory project in any area of interest in Cell Biology or Physiology.

Title: Ph.D. Dissertation Research
Course Number: 3800



Course Director: Michael Butterworth
When: Fall Term, Spring Term, Summer Term
Prerequisites: Successful completion of the Comprehensive Examination
INTBP 2000 Foundations of Biomedical Sciences
INTBP 2005 Conference

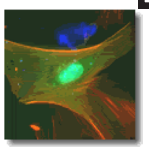
Description: After advancement to candidacy for the Ph.D. degree, students enroll in this course to pursue original experimental laboratory research. The results of which will provide the substance of their doctoral dissertation. A minimum of forty credits of this course are required for the Ph.D. degree in the School of Medicine.

Title: DNA Repair Journal
Course Number: 3835
Course Director: Bennett Van Houten
When: Fall Term, Spring Term
Prerequisites: INTBP 2000 Foundations of Biomedical Sciences
INTBP 2005 Conference

Description: The course is a journal club on current topics in DNA Repair as it relates to human disease, DNA damage processing, genome stability, telomere biology, cancer and aging. Primarily designed for students in the second year of their graduate program and beyond. Presentations will be held twice per month during the fall and spring semester. In order to receive credit for the course, students must attend a minimum of 80% of the sessions, present once per semester, participate in class discussion and complete anonymous peer-evaluations for each presenter. One week prior to presentation, presenters will identify a recent publication in the field and distribute it to their classmates. Presenters must define the hypothesis of the paper, provide background and significance, describe experimental methods used, interpret the data, conclude whether the data support the author's conclusions and propose future experiments. Grades will be determined by attendance (10%), class participation (20%) and quality of presentation (70%).

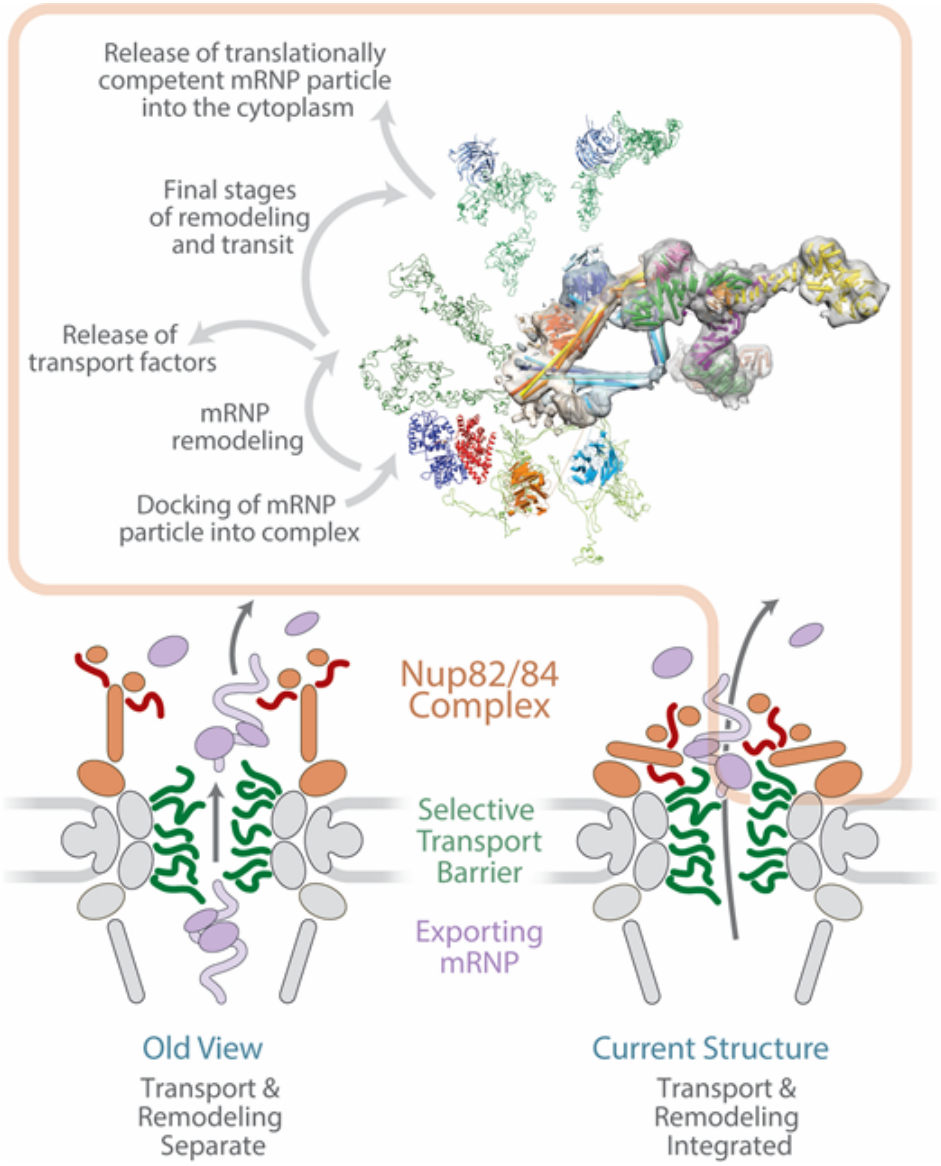
Title: Reproductive Development from Model Organisms to Humans
Course Number: 3840
Course Directors: Judith Yanowitz
When: Fall Term
Prerequisites: None

Description: This course focuses on the molecular aspects of the transition from gamete to a reproductive organism. The course progresses through the building of germ cells, fertilization and stem cell participation to sex determination, gonad morphogenesis, puberty, menopause and pregnancy. This course highlights both human and model organisms to bring together diverse aspects of the cell and developmental biology of reproductive tissues and their impact on disease pathology.

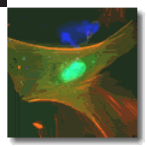


Faculty Teaching Honors (Fiscal Year 2016-2017)

None

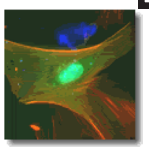


Dr. Yi Shi. Structure-functional characterization of the yeast mRNA transport/remodeling complexes challenges the old textbook model of how this large machinery functions. Our results suggest that the Nup82/84 mRNA complexes are position to face inward of the NPC central channel thus forming a continuum of FG nups that efficiently integrates transport and remodeling of selected cargos. The figure is adapted from Fernandez-Martinez et al (2016) **Cell** 167, 1–14.



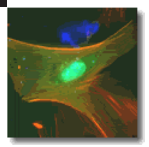
University of Pittsburgh School of Medicine
Educational Credit Units (2016-2017)
Department of Cell Biology
Summary of Faculty ECU's

Faculty Name / Activity	ECURV	Units	ECUs
Aridor, Meir			
GS - Journal Club/Seminar Series Program Director	25.0	2.0	50.0
GS - Lecture	2.0	10.0	20.0
GS - Member: Admissions Committee	75.0	1.0	75.0
GS - Member: Program Steering Committee	40.0	1.0	40.0
GS - Small group (e.g., PBL, conference, workshop)	2.0	27.0	54.0
	Total ECUs:		239.0
Butterworth, Michael			
MS-1, MS-2 - Small group (e.g., PBL, conference, workshop)	2.0	5.0	10.0
GS - Course Director	50.0	6.0	300.0
GS - GS Academic Advisor	2.0	2.0	4.0
GS - Laboratory supervision (e.g., MSTP, Ph.D. & M.Sc.)	1.0	5.0	5.0
GS - Lecture	2.0	5.5	11.0
GS - Member: Comprehensive, Dissertation, Thesis, Preliminary or Reprint	5.0	5.0	25.0
GS - Member: Curriculum, Recruiting, Program, or other SOM Committee	2.0	3.0	6.0
GS - Member: Program Steering Committee	40.0	2.0	80.0
GS - Ph.D. or M.Sc. Mentor	50.0	1.0	50.0
GS - Program Director	100.0	1.0	100.0
	Total ECUs:		591.0
Devor, Daniel			
MS-1, MS-2 - Small group (e.g., PBL, conference, workshop)	2.0	20.0	40.0
GS - Course Director	50.0	2.0	100.0
GS - Lecture	2.0	8.0	16.0
GS - Member: Admissions Committee	75.0	1.0	75.0
GS - Member: Comprehensive, Dissertation, Thesis, Preliminary or Reprint	5.0	1.0	5.0
GS - Small group (e.g., PBL, conference, workshop)	2.0	12.0	24.0
	Total ECUs:		260.0
Drain, Peter			
MS-1, MS-2 - Block Director	10.0	1.0	10.0
MS-1, MS-2 - Course Director	200.0	2.0	400.0
MS-1, MS-2 - Lecture	2.0	3.7	7.3
MS-1, MS-2 - Small group (e.g., PBL, conference, workshop)	2.0	24.5	49.0
MS - Applicant Interviewer	1.0	18.0	18.0
MS - Member, Curriculum Committee	20.0	1.0	20.0
MS - Member, Promotions Committee	5.0	1.0	5.0



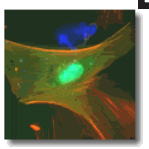
University of Pittsburgh School of Medicine
Educational Credit Units (2016-2017)
Department of Cell Biology
Summary of Faculty ECU's

Faculty Name	Activity	ECURV	Units	ECUs
			Total ECUs:	509.3
Duker, Georgia				
	MS-1, MS-2 - Course Director	200.0	1.0	200.0
	MS-1, MS-2 - Laboratory	2.0	16.1	32.2
	MS-1, MS-2 - Lecture	2.0	50.0	100.0
	MS-1, MS-2 - Other	2.0	6.0	12.0
	MS-1, MS-2 - Small group (e.g., PBL, conference, workshop)	2.0	29.7	59.5
	MS - Member, Promotions Committee	5.0	1.0	5.0
			Total ECUs:	408.7
Ford, Marijn				
	GS - Lecture	2.0	9.0	18.0
	GS - Small group (e.g., PBL, conference, workshop)	2.0	10.0	20.0
			Total ECUs:	38.0
Hammond, Gerald				
	GS - Lecture	2.0	14.0	28.0
	GS - Member: Comprehensive, Dissertation, Thesis, Preliminary or Reprint	5.0	2.0	10.0
	GS - Ph.D. or M.Sc. Mentor	50.0	1.0	50.0
			Total ECUs:	88.0
Hong, Yang				
	GS - Lecture	2.0	10.0	20.0
			Total ECUs:	20.0
Kwiatkowski, Adam				
	MS-1, MS-2 - Laboratory	2.0	6.5	13.0
	MS-1, MS-2 - Lecture	2.0	1.7	3.3
	MS-1, MS-2 - Small group (e.g., PBL, conference, workshop)	2.0	4.3	8.7
	GS - Chair: Comprehensive, Dissertation, Thesis, Preliminary or Reprint Committee	5.0	1.0	5.0
	GS - Lecture	2.0	13.0	26.0
	GS - Member: Admissions Committee	75.0	1.0	75.0
	GS - Member: Comprehensive, Dissertation, Thesis, Preliminary or Reprint	5.0	3.0	15.0
	GS - Ph.D. or M.Sc. Mentor	50.0	2.0	100.0
	GS - Small group (e.g., PBL, conference, workshop)	2.0	2.0	4.0
			Total ECUs:	250.0
Leuba, Sanford				
	GS - Course Director	50.0	1.0	50.0
	GS - Lecture	2.0	14.9	29.8



University of Pittsburgh School of Medicine
Educational Credit Units (2016-2017)
Department of Cell Biology
Summary of Faculty ECU's

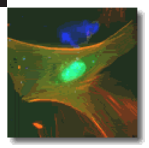
Faculty Name / Activity	ECURV	Units	ECUs
GS - Member: Comprehensive, Dissertation, Thesis, Preliminary or Reprint	5.0	1.0	5.0
GS - Member: Curriculum, Recruiting, Program, or other SOM Committee	2.0	1.0	2.0
GS - Small group (e.g., PBL, conference, workshop)	2.0	25.5	51.0
		Total ECUs:	137.8
Murray, Sandra			
MS-1, MS-2 - Laboratory	2.0	27.0	54.0
MS-1, MS-2 - Lecture	2.0	4.0	8.0
MS-1, MS-2 - Other	2.0	21.0	42.0
MS - Member, Promotions Committee	5.0	1.0	5.0
GS - Lecture	2.0	1.0	2.0
		Total ECUs:	111.0
Sorkin, Alexander			
GS - Lecture	2.0	15.0	30.0
GS - Member: Comprehensive, Dissertation, Thesis, Preliminary or Reprint	5.0	4.0	20.0
GS - Member: Curriculum, Recruiting, Program, or other SOM Committee	2.0	1.0	2.0
GS - Ph.D. or M.Sc. Mentor	50.0	1.0	50.0
		Total ECUs:	102.0
St Croix, Claudette			
GS - Course Director	50.0	2.0	100.0
GS - Lecture	2.0	9.5	19.0
GS - Member: Comprehensive, Dissertation, Thesis, Preliminary or Reprint	5.0	3.0	15.0
GS - Small group (e.g., PBL, conference, workshop)	2.0	1.5	3.0
		Total ECUs:	137.0
Stolz, Donna			
MS-1, MS-2 - Laboratory	2.0	9.3	18.7
MS-1, MS-2 - Lecture	2.0	0.8	1.7
MS-1, MS-2 - Small group (e.g., PBL, conference, workshop)	2.0	11.9	23.8
MS - Mentored Scholarly Project (MSP) Mentor	25.0	1.0	25.0
GS - Chair: Comprehensive, Dissertation, Thesis, Preliminary or Reprint Committee	5.0	4.0	20.0
GS - Course Director	50.0	5.0	250.0
GS - Lecture	2.0	12.8	25.5
GS - Member: Comprehensive, Dissertation, Thesis, Preliminary or Reprint	5.0	9.0	45.0
GS - Member: Curriculum, Recruiting, Program, or other SOM Committee	2.0	1.0	2.0
GS - Member: Program Steering Committee	40.0	1.0	40.0
GS - Small group (e.g., PBL, conference, workshop)	2.0	16.5	33.0
		Total ECUs:	484.7

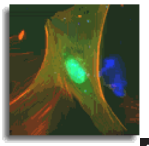


University of Pittsburgh School of Medicine
Educational Credit Units (2016-2017)
Department of Cell Biology
Summary of Faculty ECU's

Faculty Name	Activity	ECURV	Units	ECUs
Thorne, Stephen				
	GS - Lecture	2.0	5.5	11.0
			Total ECUs:	11.0
Traub, Linton				
	GS - Course Director	50.0	1.0	50.0
	GS - Lecture	2.0	8.0	16.0
			Total ECUs:	66.0
Wan, Yong				
	GS - Lecture	2.0	4.0	8.0
	GS - Member: Comprehensive, Dissertation, Thesis, Preliminary or Reprint	5.0	1.0	5.0
			Total ECUs:	13.0
Watkins, Simon				
	GS - Course Director	50.0	2.0	100.0
	GS - Lecture	2.0	27.0	54.0
	GS - Member: Comprehensive, Dissertation, Thesis, Preliminary or Reprint	5.0	5.0	25.0
			Total ECUs:	179.0
Yates, Nathan				
	GS - Lecture	2.0	3.5	7.0
			Total ECUs:	7.0
			Subtotal:	**3652.5**

Total Faculty Reporting: 19 **Total ECU's for Cell Biology: 3652.5**



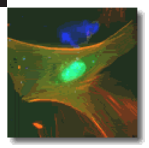


Post Doctoral Personnel Data
[Current as of June, 2018]

Name	Title	Office Address	Email Address	Office Phone	Fax	Research Focus
Bagalkot, Tarique	Post Doctoral Associate	S372 BSTWR	tariqueb@pitt.edu	412-624-8147	412-648-8330	Sorkin Lab
Fang, Fei	Post Doctoral Associate	BST3-9th Fl	fef13@pitt.edu	412-383-3242	412-641-2458	Shi Lab
Jin, Changzhong	Post Doctoral Associate	BST3-9th Fl	chj44@pitt.edu	412-383-3242	412-641-2458	Shi Lab
Kobir, SM Abasanul	Vis. Research Associate	HCCLB 2.26G	kobirsm@pitt.edu	412-623-7822	412-623-4840	Leuba Lab
Lu, Juan	Post Doctoral Associate	S333 BSTWR	jul105@pitt.edu	412-648-2846	412-648-8330	Hong Lab
Pacheco, Jonathan	Post Doctoral Associate	S332 BSTWR	jep160@pitt.edu	412-383-1783	412-648-8330	Hammon Lab
Pena, Karina	Post Doctoral Associate	S220.5BSTWR	kapena@pitt.edu	412-648-9796	412-648-2797	Watkins Lab
Perez Verdaguer, Mireia	Post Doctoral Associate	S372 BSTWR	mip85@pitt.edu	412-624-8147	412-648-8330	Sorkin Lab
Raza, Syed	Post Doctoral Associate	S324 BSTWR	syr10@pitt.edu	412-383-7891	412-648-8330	Kwiatkowski Lab
Sun, Dapeng	Post Doctoral Associate	S355 BSTWR	das306@pitt.edu	412-383-9026	412-648-8330	Ford Lab

Current Cell Biology and Molecular Physiology Graduate Program Students as of June 30, 2018

Student	Mentor	Year
Chelsea Merkel	Dr. Adam Kwiatkowski	4th
Paige Rudich	Dr. Todd Lamitina	3rd
Amity Eaton	Dr. Gerard Apodaca	3rd
Jonathan Heier	Dr. Adam Kwiatkowski	2nd
Rachel Wills	Dr. Gerald Hammond	2nd
Sarel Urso	Dr. Lamitina	1st



Prior Graduates of the Cell Biology and Molecular Physiology Program as of June 2018
(Past five years)

George Michael Preston, Ph.D.
Defended: April 13, 2017
Industry/Johnson & Johnson, Inc.

Christine Klemens, Ph.D.
Defended April 11, 2017
Post-Doc Fellow, Medical College of Wisconsin

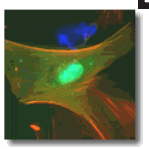
Kathryn Wack, Ph.D.
Defended July 23, 2014
Vice President of Development, Western Oncolytics, Ltd.

Arvind Suresh, M.S.
Defended October 11, 2013
Scientist Consultant, Men's Mentis Consulting Service

Christina Szalinski, Ph.D.
Defended May 20, 2013
Science Writer, American Society for Cell Biology (ASCB), Bethesda, MD

Cavita Kitty Chotoo, Ph.D.
Defended March 26, 2013
Rutger's, Post-Doc

Elizabeth Delorme-Axford, Ph.D.
Defended March 14, 2013
Research Fellow, University of Michigan

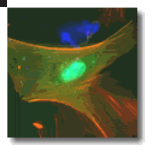


Student Ratings of CBMP Faculty Teaching FY2018

Name	Course	Type	Date	Rating	Ave
Devor	Investigation and Discovery	SGCS	Fall-17	4.70	4.70
Duker	Introduction to Being a Physician	SGCS	Fall-17	4.80	
Duker	Body Fluid Homeostasis Cardiovascular	LEC	Fall-17	4.80	
Duker	Digestion and Nutrition	LAB	Fall-17	4.70	
Duker	Tissues in Health and Disease	LAB	Spring-18	5.00	
Duker	Immunology in Health and Disease	LAB	Spring-18	5.00	4.86
Kwiatkowski	Tissues in Health and Disease	LEC	Spring-18	4.30	
Kwiatkowski	Tissues in Health and Disease	LAB	Spring-18	4.80	4.55
Murray	Medical Anatomy	LEC	Fall-17	4.10	
Murray	Medical Anatomy	LAB	Fall-17	4.60	4.35
Stolz	Cellular and Pathological Basis of Disease	LAB	Spring-18	5.00	
Stolz	Digestion and Nutrition	LAB	Fall-17	5.00	5.00
	Overall Teaching Average			**4.73**	

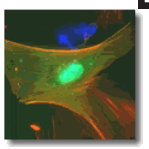
Type codes:

LEC	Lecture
PBL	Practice Based Learning
WKSP	Workshop
SGCS	Small Group Conference Session
AP	Applications Staff
LAB	Laboratory



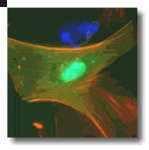
CBP FACULTY ROSTER
(Effective June, 2018)

Last Name	First	Rank	Status
Sorkin	Alexander	Professor & Chair	Tenured
Devor	Daniel	Professor	Tenured
Murray	Sandra	Professor	Tenured
Traub	Linton	Professor	Tenured
Watkins	Simon	Professor	Tenured
Aridor	Meir	Associate Professor	Tenured
Drain	Peter	Associate Professor	Tenured
Hong	Yang	Associate Professor	Tenured
Leuba	Sanford	Associate Professor	Tenured
St. Croix	Claudette	Associate Professor	Tenured
Stolz	Donna	Associate Professor	Tenured
Yates	Nathan	Associate Professor	Non-tenure Track
Butterworth	Michael	Assistant Professor	Tenure Track
Ford	Marijn	Assistant Professor	Tenure Track
Hammond	Gerald	Assistant Professor	Tenure Track
Kwiatkowski	Adam	Assistant Professor	Tenure Track
Shi	Yi	Assistant Professor	Tenure Track
Thorne	Stephen	Assistant Professor	Tenure Track
Duker	Georgia	Assistant Professor	Non-tenure Track
Ford	Natalia	Res. Assistant Professor	Non-tenure Track



New CBP Faculty in FY17

Name	Prior Institution /Rank	Current Rank
Alan Watson	University of Pittsburgh Department of Virology and Immunology Pittsburgh, PA 15260 Postdoc	Res. Assstant Professor



Faculty Honors, Recognition and Professional Affiliations (Fiscal Year 2017-2018)

Michael Butterworth, Ph.D.
AssistantProfessor

Member, American Physiological Society
Member, Elected Secretary, Salt and Water Club
American Society of Nephrology
American Heart Association

Daniel C. Devor, Ph.D.
Professor

Member, American Physiological Society
Member, Biophysical Society
Member, Mount Desert Island Biological Laboratory

Peter F. Drain, Ph.D.
Associate Professor

Member, Biophysical Society
Member, American Association for the Advancement of Science
Member, Society of General Physiologists
Member, American Diabetes Association

Marijn Ford, Ph.D.
Assistant Professor

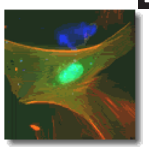
Member, The Biochemical Society

Gerry Hammond, Ph.D.
Assistant Professor

Member, Biochemical Society
Member, American Association for the Advancement of Science
American Society of Cell Biology
American Society for Biochemistry & Molecular Biology

Yang Hong, Ph.D.
Associate Professor

Member of Faculty 1000



Adam Kwiatkowski, Ph.D.
Assistant Professor

Member, American Society for Cell Biology
American Society for Biochemistry and Molecular Biology
American Heart Association

Mads Breum Larsen, Ph.D.
Research Instructor

Member, Society for Neuroscience

Sanford Leuba, Ph.D.
Associate Professor

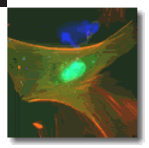
Member, Biophysical Society
Member, Spectroscopy Society of Pittsburgh

Yang Li, Ph.D.
Research Instructor

Member, American Heart Association
Member, American Society for Cell Biology

Sandra A. Murray, Ph.D.
Professor

Member, American Society for Cell Biology
Member, Society for In Vitro Biology
Member, The Pittsburgh Cancer Institute
Member, Corporation of the Marine Biological Laboratory
Member, Cell Transplant Society
Member, Endocrine Society
Member, American Physiological Society
Member, International Society for Preventive Oncology
University of Pittsburgh Helen Faison Council of Elders
School of Medicine Summer "Minority" Work-Study Program
Member, Medical Student Promotions Committee
Member, Training Faculty Immunology Graduate Training Program
NIH - Biomedical Faces of Science Mentors
Co-Chair of the Research Center of Excellence Committee Graduate School of Public Health, University of Pittsburgh



Graduate School of Public Health Community Engagement Research Cor
Graduate School of Public Health Research Advisory Committee- Center for Minority Health
Provost Special Advisory Committee
Provost Selection Committee for the Provost Development Fund Awards
University Community Representative for Equipoise
Junior Faculty Advancement – Panel Member

Itziar Pinilla-Macua, Ph.D.
Research Instructor

Spanish Society of Biochemistry and Molecular Biolog

Yi Shi, Ph.D.
Assistant Professor

Member, American Society for Mass Spectrometry
Member, New York Academy of Sciences

Alexander D. Sorkin, Ph.D.
Richard B. Mellon Professor and Chairman

Member, American Society for Cell Biology
Society for Neuroscience

Donna B. Stolz, Ph.D.
Associate Professor

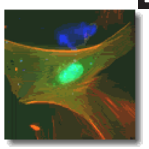
Member, American Society for Cell Biology
Member, Microscopy Society of America

Linton M. Traub, Ph.D.
Professor

Member, American Society for Cell Biology
American Association for the Advancement of Science
American Society for Biochemistry and Molecular Biology

Simon C. Watkins, Ph.D.
Distinguished Professor and Vice Chairman, Director of Center of Biologic Imaging

Member, The Pittsburgh Cancer Institute

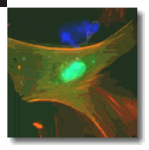


Alan Watson, Ph.D.
Research Assistant Professor

The American Association of Immunologists
The American Society for Virology
American Society for Tropical Medicine and Hygiene

Nathan Yates, Ph.D.
Associate Professor

American Chemical Society
American Society for Mass Spectrometry



Faculty Presentations (Fiscal Year 2017-2018)

Michael Butterworth, Ph.D.
Assistant Professor

"Hormonal Regulation of Non-Coding RNAs in the Distal Nephron" Renal-Electrolyte Division, School of Medicine, University of Pittsburgh, PA. 2017

"Aldosterone Action Through the Control of MicroRNAs". American Society of Nephrology Conference, New Orleans, LA.

Daniel Devor, Ph.D.
Professor

"K^+ channels: Recollections and future directions" Cystic Fibrosis Foundation Therapeutics,Lexington, MA 2018

Marijn Ford, Ph.D.
Assistant Professor

Seoul National University, Seoul, Republic of Korea "Not all dynamin-related proteins are alike: the unique architecture of Vps1"

Department of Biochemistry, University of Washington, Seattle, Washington "Not all dynamin-related proteins are alike: the unique architecture of Vps1"

Gerald Hammond, Ph.D.
Assistant Professor

"Sac1 degrades its lipid substrate P14P in the ER to maintain a steep electrochemical gradient on donor membranes", in "Regulation of Intracellular Cholesterol Transport", American Society of Biochemistry and Molecular Biology 2017 Annual Meeting, Chicago, IL, 2017.

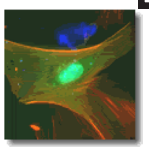
Invited seminar – Carnegie Mellon University, Department of Biological Sciences. 2017

SAC1 degrades its lipid substrate ptdlns4P in the endoplasmic reticulum to maintain a steep chemical gradient with donor membranes at Keystone Symposium. Phosphoinositide Biology: New Therapeutic Targets Beyond Class 1 PI3K". 2017

Adam Kwiatkowski, Ph.D.
Assistant Professor

Invited seminar: "When Cytoskeletal Networks Collide" Subgroup K, ASCB/EMBO Annual Mtg, Philadelphia, PA. December 2017.

Seminar, Renal Research Seminar, Renal-Electrolyte Division, University of Pittsburgh School of Medicine, Pittsburgh, PA. February 2018.



Invited Seminar: Signaling by Adhesion Receptors Gordon Research Conference, Biddeford, ME. June 2018.

Mads Breum Larsen, Ph.D.
Research Instructor

Platform presentation at the Microscopy and Microanalysis 2017 meeting in St. Louis, Missouri. "Combining Novel Probes and High Resolution Imaging to Dissect Mitochondrial Function in Living Systems".

Sanford Leuba, Ph.D.
Associate Professor

Department of Chemistry, Ludwig-Maximilian University, Munich, Germany, October 2017

Yi Shi, Ph.D.
Assistant Professor

Fudan University, Shanghai, China. Oct 12 2017.
Department of Biological Sciences, Pitt, Pittsburgh April 2018.
Chromatin Symposium, Pitt, Pittsburgh May 2018.

Alexander D. Sorkin, Ph.D.
Richard B. Mellon Professor and Chairman

Northwestern University, Chicago (February, 2018)
Gordon Research Conference, New Hampshire (June, 2018)

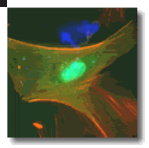
Claudette St. Croix, Ph.D.
Associate Professor

Invited Symposium Speaker: Microscopy & Microanalysis, St. Louis. August 2017.
Invited Speaker: Vail Scientific Summit, Steadman Philippon Research Institute Vail Colorado. August 2017.

Donna B. Stolz, Ph.D.
Associate Professor

Henrietta's Legacy: More than just cells. How HeLa cells revolutionized biomedicine and influenced research policies and procedures. Community College of Allegheny County, Boyce Campus. Monroeville, PA. Part of "One College, One Community Reads" Keynote Lecture and Art show March 8, 2018.

Simon C. Watkins, Ph.D.
Distinguished Professor and Vice Chairman
Director of Center of Biologic Imaging

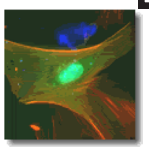


NCE National meeting, "Never a square peg in a square hole" Invited Speaker August 2017.
Microscopy and MicroAnalysis 2017, St. Louis MO. August 8th 2017 Correlative Fluorescence and Electron Microscopy in 3D Invited Speaker
Vail National meeting for regenerative Medicine August 25th 2017 Invited Speaker
Frontiers in Microscopy Technologies and Strategies for Bioimaging Centers Network: Never a round peg in a square hole: building, running and funding a large world class imaging center: Invited Speaker, Janelia Farms February 2018
Frontiers in Microscopy Technologies and Strategies for Bioimaging Centers Network: How to get money to pay for all this stuff: Invited Speaker, Janelia Farms February 2018
Frontiers in Microscopy Technologies and Strategies for Bioimaging Centers Network: Cutting edge imaging and approaches: Chair of Session, Janelia Farms February 2018
KPMP Tissue Processing Working Group Invited Speaker, March 2018
National Genito-Urinary Mapping group Invited Speaker March 2018

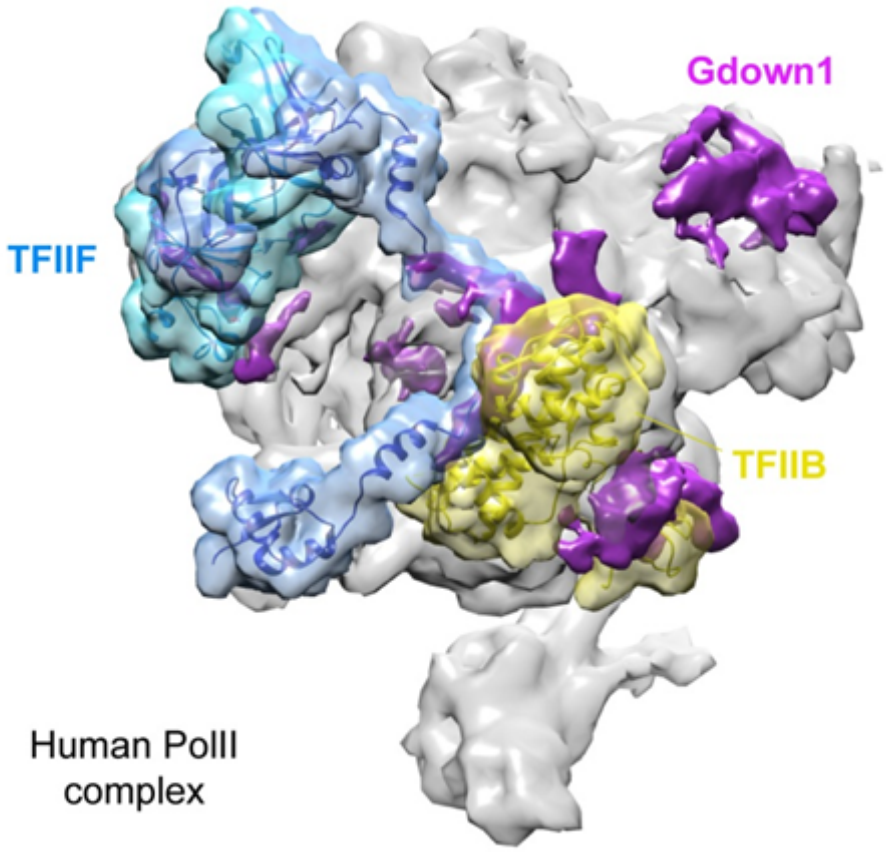
Alan Watson, Ph.D.
Research Assistant Professor

Large Volume Imaging: Tips and Tricks for Sample preparation and clearing. What can you expect from a successful protocol? How to implement CUBIC in your research. Webinar. *The Pathologist*. August 2017
Ribbon Scanning Confocal for High-Speed High-Resolution Volume Imaging. UT Southwestern: Whole Brain Microscopy Facility. Dallas, TX. October 2017
Big Tissue, Big Data, Big Questions: Ribbon Scanning Confocal for High-Resolution Imaging of Massive Volumes. University of Pittsburgh: Department of Pathology. Pittsburgh, PA. October 2017.
Big Tissue, Big Data, Big Questions: Ribbon Scanning Confocal for High-Resolution Imaging of Massive Volumes. University of Pittsburgh: Department of Pathology. Pittsburgh, PA. October 25, 2017.
Tracking Viral Invasion of the Brain through High-Speed High-Resolution Microscopy. Biological Sciences Special Seminar Series. Grantham, PA. November 2017.
Tracking Viral Invasion of the Brain through High-Speed High-Resolution Microscopy. Biological Sciences Special Seminar Series. Grantham, PA. November 2017.
Big Tissue, Big Data, Big Questions: Ribbon Scanning Confocal for High-Resolution Imaging of Massive Volumes. Caliber I.D., Rochester, NY. December 2017.
Ribbon Scanning Confocal for high-speed high-resolution imaging of Massive Volumes. MD Anderson, Baylor University of Texas. Houston, TX. March 19, 2018
Ribbon Scanning Confocal for High-Speed High-Resolution Imaging of Massive Volumes. PennState College of Medicine. Hershey, PA April 2018
Ribbon Scanning Confocal for High-Speed High-Resolution Imaging of Massive Volumes. University of California San Francisco – Mission Bay. San Francisco, CA. June 2018.

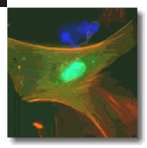
Nathan Yates, Ph.D.
Associate Professor
"Differential Mass Spectrometry Reveals Markers of Biological Age" Vail Scientific Summit, Vail, CO, August 2017
"Differential Mass Spectrometry and the Great Race to Identify the Target of Metformin" ISPROF



2017, Caparica, Portugal, September 2017
"Target ID Applications of Differential Mass Spectrometry" CPSA USA 2017, Langhorne, PA October 2017
"Drug Target Identification by Label-Free Differential mass Spectrometry" US HUPO 14th Annual Conference, Minneapolis, MN. March 2018



Dr. Yi Shi. Integrative structure determination of the human Polymerase II (grey) in complex with Gdown-1 (purple) reveals an elegant yet unexpected mechanism of transcription inhibition. The structure suggests significant structural overlaps between Gdown1 and the general transcription factors TFIIB (yellow) and TFIIF (cyan & blue) for Pol II binding. Jishage et al (2018) **Nature Structural & Molecular Biology** (in press)



Peer Reviewed Publications (Fiscal Year 2017 - 2018)

Meir Aridor, Ph.D.
Associate Professor

Ernst W. Jr., Shome K., Wu C.C., Frizzell R.A. and M. Aridor (2016) VAMP –associated proteins (VAP) as receptors that couple cystic fibrosis transmembrane conductance regulator (CFTR) proteostasis with lipid homeostasis". J Biol Chem 2016 Mar 4; 291 (10):5206-20. PMID: 26740627.

Gang Yu; Yinan Liu; Shiyong Liu; **Meir Aridor;** Yuan Huang; Yushuang Hu; Longfeii Wang; Sisi Li; Hongbo Xiong; Bo Tang; Xia Li; Chen Cheng; Susmita Chakrabarti; Fan Wang; Qingyu Wu; Sadashiva Karnik; Chengqi Xu; Qiuyun Chen; Qing Wang (2018) Small GTPases SAR1A and SAR1B regulate the trafficking of the cardiac sodium channel Nav1.5 (2018) ***BBA*** - Molecular Basis of Disease, in press.

Michael Butterworth, Ph.D.
Assistant Professor

Li, Y., Hu, H., Butterworth, M.B. and O'Neil, R.G. (2016). Expression of a Diverse Array of Ca2+-Activated K+ Channels (SK1/3, IK1, BK) that Functionally Couple to the Mechanosensitive TRPV4 Channel in the Collecting Duct System of Kidney. PLOS One, 11(5) e0155006. PMID: 27159616.

Mukherjee, A., Wang, Z., Kinlough, C.L., Poland, P.A., Marciszyn, A.L., Montalbetti, N., Carattino, M.D., Butterworth, M.B., Kleyman, T.R. and Hughey, R.P. (2017). Specific palmitoyltransferases associate with and activate the Epithelial Sodium Channel. Journal of Biological Chemistry. 292(10):4152-4163. PMID: 28154191

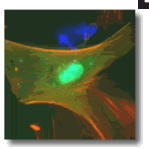
Klemens, C.A., Edinger, R.S, Kightlinger, L. Liu, X. and Butterworth, M.B. (2017). Ankyrin G expression regulates apical delivery of the epithelial sodium channel (ENaC). Journal of Biological Chemistry. 292(1):375-85. PMID: 27895120

Liu, X., Edinger, R.S., Klemens, C.A. Phua, Y.L., Bodnar, A.J., LaFramboise, W.A., Ho, J. and Butterworth, M.B. (2017). A microRNA cluster miR23~24~27 is upregulated in the distal kidney ephron where it alters sodium transport. Journal of Cellular Physiology. 232: 1306–1317. PMID: 27636893

Daniel Devor, Ph.D.
Professor

Lee, S.L., D.C. Devor and K.L. Hamilton. Modulation of retrograde trafficking of KCa3.1 in polarized epithelium. Frontiers of Physiology, DOI: 10.3389/fphys.2017.00489, 2017.

Bertuccio, C.A., T. Wang, S.B. Condliffe and D.C. Devor. Plasma membrane insertion of KCa2.3 (SK3) is dependent upon the SNARE proteins, Syntaxin 4 and SNAP23. PLoS One.



13(5):e0196717. doi: 10.1371/journal.pone.0196717, 2018.

Peter F. Drain, Ph.D.
Associate Professor

Luppi, P., and P. Drain. 2016. C-peptide antioxidant adaptive pathways in β cells and diabetes. Journal of Intern Medicine. Jun 2 epub. doi: 10.1111/joim.12522/in press.PMID: 27251308

D. Brüning, K. Reckers, P. Drain, and I. Rustenbeck. 2017. Glucose Diminishes and KCl Increases Insulin Granule Turnover in the Submembrane Space of Primary Beta-Cells. J Mol Endocrinol Oct:59(3):311-324. PMID: 28765259.

Luppi, P., and P. Drain. 2017. Autocrine C-Peptide Mechanism Underlying INS1 Beta Cell Adaptation to Free Fatty Acid-Induced Oxidative Stress. In preparation.

Li Ma, Vytautas P. Bindokas, Christine Labno, Jie Wang, Andrey Kuznetsov, Manani Hara, Xuehui Geng, Peter Drain, Christopher J. Rhodes, Donald F. Steiner, and Louis H Philipson. 2017. Non-Crystallized Cargo Protein Shifts Insulin LDCV Exocytosis From Full to Transient Fusion, in revision

Marijn Ford, Ph.D.
Assistant Professor

Varlakhanova NV, Tornabene BA, **Ford MGJ**. Feedback regulation of TORC1 by its downstream effectors Npr1 and Par32. 2018. Mol. Biol. Cell. DOI: 10.1091/mbc.E18-03-0158. PMID: 30156471.

Varlakhanova NV, Tornabene BA, **Ford MGJ**. Ivy1 is a negative regulator of Gtr-dependent TORC1 activation. 2018. J. Cell Sci. DOI: 10.1242/jcs.218305. PMID: 30097557.

Varlakhanova NV, Alvarez FJ, Brady TM, Tornabene BA, Hosford CJ, Chappie JS, Zhang P, **Ford MGJ**. Structures of the fungal dynamin related protein Vps1 reveal a unique, open helical architecture. J. Cell Biol. 2018. DOI: 10.1083/jcb.201712021. PMID: 30087125.

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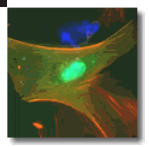

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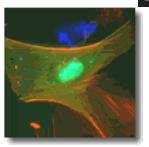

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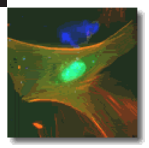

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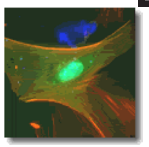

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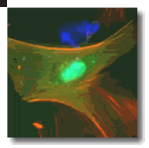

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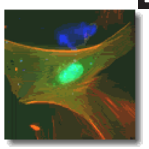

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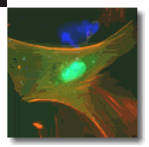

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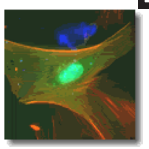

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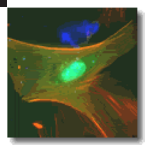

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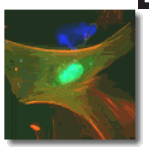

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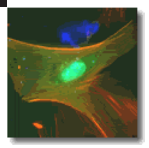

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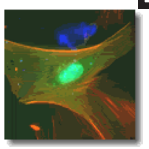

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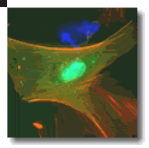

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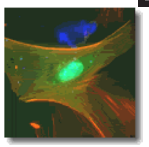

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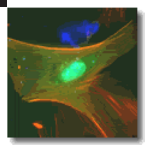

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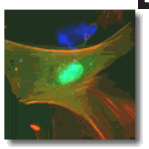

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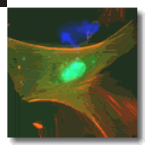

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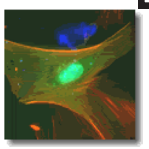

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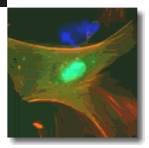

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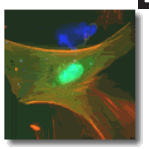

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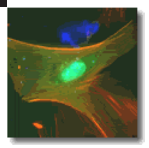

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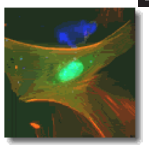

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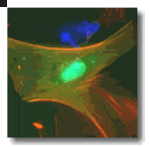

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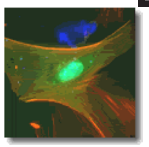

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Research Assistant Professor

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Associate Professor

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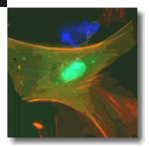

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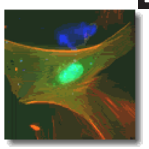

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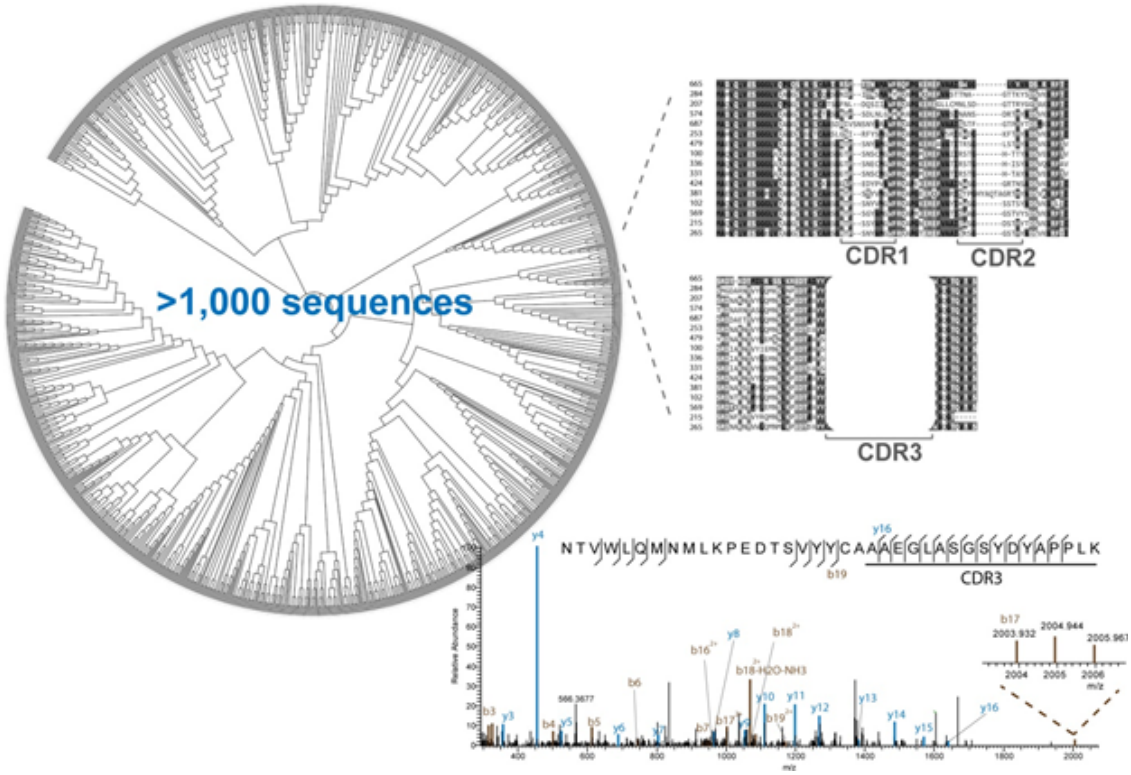

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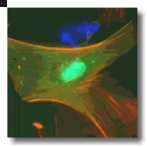
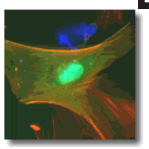


Executive Summary for the Cell Biology FY2018 Business Plan

The department has developed a diverse group of well funded investigators who contribute on many levels to the research and educational programs of the School of Medicine. During last eight years significant changes in the Department took place with ten members of the primary faculty leaving the Department and eight new members joining the faculty. Achievement of the balanced distribution of the junior and senior faculty and strong integration of all activities of the faculty remains the important goal of our FY2019 plan. To this end, we hope that one Assistant Professor will be promoted and we will recruit one more tenure-track faculty in the Department in FY19. We plan to recruit a scientist who studies fundamental aspects of cell biology, in particular, in the area of protein folding and protein conformational diseases, and who can interface with our faculty, researchers in other departments in the School of Medicine and the entire Pittsburgh scientific community.

The outlook for the future of the Department is optimistic. New research themes and resources are integrated into the Department, which should lead to the overall increase in the research productivity and funding, new scientific interactions and development of new joint funding opportnities. There is also a strong confidence in continuing excellence of the established programs in the Department.

The Department's operating budget for fiscal year 2019 has been approved and is appended at the end of this analysis.



Strengths

Research

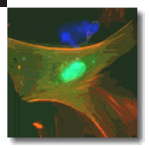
The Department of Cell Biology has a strong research program aimed at addressing fundamental questions of cell biology, including mechanisms controlling membrane trafficking, cell polarity, actin cytoskeleton, signal transduction, intercellular interactions, and membrane channel and transport regulation. The Faculty in the Department have made important contributions to these various areas of cell biology, and established themselves as leaders in their respective research fields. This is evident from recent publications in high-impact journals such as Cell (St. Croix, Watkins), Nature (Shi), eLife (Sorkin, Hammond), Journal of Cell Biology (Ford), Journal of Cell Science (Ford), and others.

Membrane trafficking is a particular strength of the Department with the research covering the entire spectrum of traffic-related issues from general mechanisms of protein and lipid trafficking, endocytosis and membrane organelle biogenesis, to cargo-specific mechanisms of anterograde and endocytic trafficking of receptors, transporters and channels. Studies of the mechanisms of cell polarity, cell motility, and intracellular signaling have also been growing in the department. Our faculty continue to present their research at international and national meetings, participate in NIH and other grant review panels and other organizational and service activities, all reflecting their influence in the respective research areas.

The majority of the Cell Biology faculty maintains active, funded research programs. We have been successful in obtaining extramural research funding in the past cycle, as evidenced by, obtaining funding in multiple collaborative grants (Watkins, St. Croix, Stolz, Yates,), and the competitive renewal of NIH grants as principal investigators (Sorkin). All tenure-stream Assistant Professors, except Yi Shi who started year and a half ago, are currently funded by NIH. Submission of new grant applications remains to be at a high rate which ensures relative fiscal stability of the Department.

The Center for Biologic Imaging (CBI) associated with the Department is one of the largest imaging facilities in the country and provides state-of-the-art equipment and indispensable expertise in all types of cellular imaging to the faculty of the Department and the entire School of Medicine and University of Pittsburgh. In the last year, Drs. Watkins was awarded NIH shared instrumentation grant to fund a new multiphoton microscope which is essential to the continued growth of the CBI and departmental infrastructure. Dr. Yates, Director of the Biomedical Mass Spectrometry Center, SOM and U. Pitt, is currently enhancing an infrastructure to implement modern methods of quantitative mass-spectrometric analyses.

Our faculty also participated in NIH funded program projects (Fluorescent Probes and Imaging for Networks and Pathways; Center for HIV Protein Interactions; Molecular Biology of Hemorrhagic Shock, etc.) and are involved in multiple collaborations with basic science faculty and various divisions of the Departments of Medicine and Pediatrics, as well as with the researchers at Carnegie Mellon University. Individual CB faculty hold major roles in organization of the annual “Local Traffic” and “Ubiquitin”



symposiums, running the Membrane Trafficking journal club and participate in various School committees.

Teaching

Medical Curriculum: The department contributes extensively to the teaching of medical and graduate students in the School of Medicine. Our faculty has been actively participating in the remodeling of the first year curriculum, particularly in the area of biochemistry and cell biology, involving formal lectures in these areas and contributing to small group PBLs.

Graduate Curriculum: We now have 6 students in the graduate Ph.D. program in Cell Biology and Molecular Physiology. One student graduated in 2018, taking position in biotech company. In addition, CB faculty participate in other graduate programs under umbrella of the Medical School Interdisciplinary Biomedical Graduate Program, as well as in the Departments of Bioengineering, Biological Sciences, ISB, CNUP among others.

Biomedical Master's Program (BMP). Faculty in the Department together with the Department of Pharmacology launched a new BMP program in September 2017. Three faculty are teaching didactic courses, Dr. Peter Drain serves as the Director of Academic Affairs, and Dr. Sorkin is a member of the Executive Committee.

Administration*:*

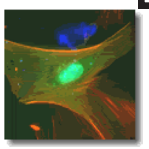
The administrative staff, headed by Susan Conway, has done an excellent job in providing various levels of support to the research, teaching and service activities. There have been additional and substantial loads placed on the administration due to extensive changes in the faculty and the associated transfer of multiple grants to and from the Department, recruitment of new faculty, as well as with changes in the administrative staff. The fact that all these tasks were successfully accomplished in a timely and efficient manner demonstrates the experience and strength of our administrative staff.

Weaknesses

Limited and poorly designed research space has become a weakness of the program, especially during our faculty recruitment efforts. We will commit major efforts to rearrange the space in BST South to allow for the growth of the research programs of new and current faculty located in this area.
One of the CBP faculty Dr. Leuba is located in the Hillman Cancer Center. There is clear separation from the rest of the Department leading to a lesser engagement of his laboratory in the main activities of the Department.

Opportunities

The vision of the chair and the leadership of the School, is to focus our research



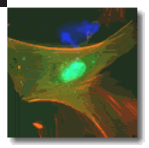
program towards basic cell biology and build a premier Department of Cell Biology. The key to accomplishing this task is the recruitment of new dynamic and creative faculty, and continue to support productive mid-career and senior faculty. We hope to continue recruiting faculty whose research programs focus on fundamental questions of cell biology. The importance of the successful recruitment of a strong faculty is to shape the future of the department, while achieving a healthy balance of junior and senior faculty members, and this is difficult to overemphasize.

Cohesiveness of the faculty research expertise in the Department creates exceptional opportunities for collaborative research, which should open doors to building new program projects and centers. The Department is now in the position to lead the assembly of new interdisciplinary research programs that would be competitive in obtaining the extramural funding.

Threats

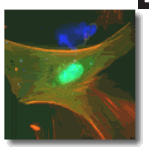
The steady decrease in federal and private funding opportunities to support basic cell biology research will continue to be the most significant threat during next several years. Several senior faculty are currently struggling with sustaining funding necessary to support their research programs. Yet, in order for the Department to become one of the elite cell biology departments, total funding of the Department must increase 2-fold above the current level.

Another difficult challenge we face is to strengthen the Cell Biology and Molecular Physiology Graduate Program through the recruitment of top-tier students and provision of the best possible training environment in the laboratories of the Department.



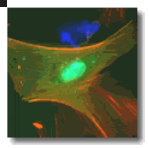
Cell Biology FY2018 Fiscal Issues

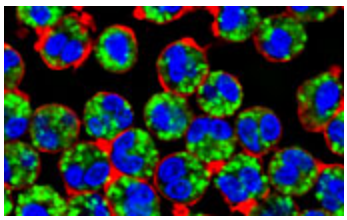
The main budgetary issue that faced the Department in the FY18 budget was maintaining the extramural funding of the faculty at the level necessary to support their research program and as required by the SOM Policies. Our goal for FY19 is to increase the funding level of previous years. Main efforts will be devoted to ensuring that the departmental infrastructure necessary for advancing research programs of the faculty continues to improve.



University of Pittsburgh School of Medicine
University of Pittsburgh Physicians
Department of Cell Biology
Schedule of Revenue and Expenses Fiscal Year 2019 Budget

	University	UPP and Other	Total Budget FY 2019
Revenue			
Patient Care	$ -	$ -	$ -
Grant:			
Directs	4,373,592	-	4,373,592
Indirects	1,862,789	-	1,862,789
Hospital Contract	-	-	-
School of Medicine	3,384,897		3,384,897
VAMC		-	-
Other	403,036	-	403,036
Total Revenue	$ 10,024,314	$ -	$ 10,024,314
Expenses			
Salaries and Fringe Benefits:			
Faculty	$ 3,615,980	$ -	$ 3,615,980
Non-Faculty	2,311,734	-	2,311,734
Malpractice Insurance		-	-
Space Rental	124,965	-	124,965
UPP Overhead		-	-
University Overhead	2,465,280		2,465,280
Other Operating Expenses	1,506,355	-	1,506,355
Total Operating Expenses	$ 10,024,314	$ -	$ 10,024,314
Excess Revenue over Expenses	$ -	$ -	$ -
Capital Equipment/Improvements	$ -	$ -	$ -
Fund Balances			
University Restricted Accounts as of 6/30/18	$ 3,232,787	$ -	$ 3,232,787
University Endowments as of 6/30/18	395,133		395,133
UPP Fund Balance as of 6/30/18		-	-
UPMC Endowments as of 6/30/18		-	-
UPMC SPF Accounts as of 6/30/18		-	-
Total Fund Balances	$ 3,627,920	$ -	$ 3,627,920





Thank you for your kind attention.