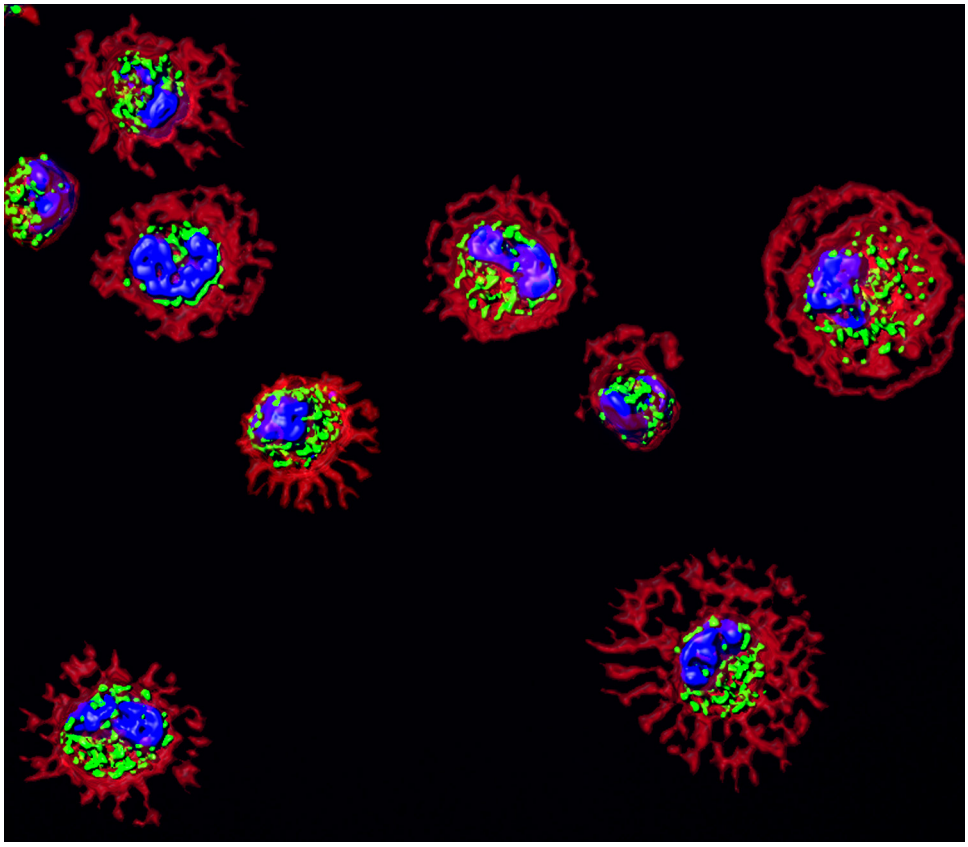
UNIVERSITY OF PITTSBURGH SCHOOL OF MEDICINE

CELL BIOLOGY

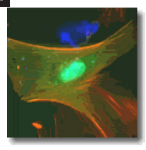


FY17 ANNUAL REPORT AND FY18 BUSINESS PLAN

Front Page

Cover figure by Dr. Claudette St. Croix. Surface rendered 3D reconstruction of the mitochondrial network in alveolar macrophages. Mitochondria (green), actin (red) and nuclei (blue). This is from work we published last year with Anuradha Ray (PACCM) (Khare A, Raundhal M, Chakraborty K, Das S, Corey C, Kamga CK, Quesnelle K, **St Croix C, Watkins SC**, Morse C, Oriss TB, Huff R, Hannum R, Ray P, Shiva S, Ray A. Mitochondrial H2O2 in Lung Antigen-Presenting Cells Blocks NF-κB Activation to Prevent Unwarranted Immune Activation. Cell Rep. 2016 May 24;15(8):1700-14. doi: 10.1016/j.celrep.2016.04.060. Epub 2016 May 12. PubMed PMID: 27184852; PubMed Central PMCID: PMC4880515.

Table of Contents of Cell Biology Annual Report



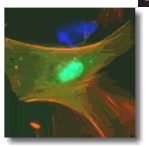
In the cell, life is governed by a multitude of molecular systems that shape and sustain the organellar system of the cell, maintain cellular homeostasis and respond to extracellular cues. These systems are dynamic, multicomponent macromolecular complexes. Maintaining and regulating the function of these 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 the 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 departmental offering, "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 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.

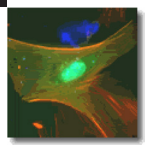
Faculty member featured in this Report: Dr. Claudette St. Croix

Dr. St. Croix's 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, Dr. St. Croix expertise in the application of novel fluorescence-based probes and advanced in vivo imaging technologies have led to her appointment as an associate director of the Center of Biologic Imaging (CBI) at the University of Pittsburgh and invitations to present her work internationally and to take lead roles in well-respected courses such as Quantitative Fluorescence Microscopy (Mount Desert Island Biology Laboratory). In her leadership role at the CBI, Dr. St. Croix has 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 her role as co-Investigator on federally funded projects, and as co-author on peer-reviewed manuscripts, including a recent Cell paper.

Several images of the data from Dr. St. Croix research are included with this report.



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.

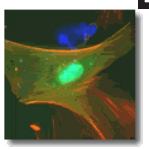
Regulation of channels and transporters

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

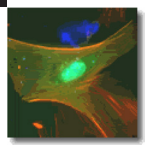
Drain
Hammond
Leuba
Sorkin
St. Croix
Thorne

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 dysregylation 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

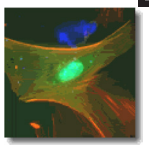
Over the last several years, microscopy as a scientific tool has reinvented itself. It has changed from a group of principally descriptive methodologies, to a wide range of primary tools and techniques to investigate the molecular organization of organs, tissues and cells. Advances in microscope and 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

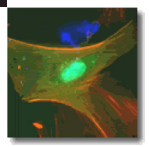


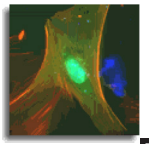
Distinguished Professor in the Department of Cell Biology and Professor of Immunology within the School of Medicine. His experience in microscopic methods covers most of the present light and electron microscopic methodologies.

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.

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, 2017]

Name	Rank	Office Address	Email Address	Phone	Fax
Aridor, Meir	Associate Professor	S310 BST-South Wing	aridor@pitt.edu	412-624-1970	412-648-8330
Butterworth, Michael	Assistant Professor	S314 BST-South Wing	michael7@pitt.edu	412-383-8591	412-648-8330
Devor, Daniel	Professor	S312 BST-South Wing	dd2@pitt.edu	412-383-8755	412-648-8330
Drain, Peter	Associate Professor	S323 BST-South Wing	drain@pitt.edu	412-648-9412	412-648-8792
Duker, Georgia	Assistant Professor	322 Scaife Hall	gduker1@pitt.edu	412-648-9409	412-648-8330
Ford, Marijn	Assistant Professor	S326 BST-South Wing	marijn@pitt.edu	412-383-9025	412-648-8330
Ford, Natalia	Res. Asst. Professor	S355 BST-South Wing	nw@pitt.edu	412-383-9026	412-648-8330
Hammond, Gerald	Assistant Professor	S327 BST-South Wing	ghammond@pitt.edu	412-383-2215	412-648-8330
Hong, Yang	Associate Professor	S325 BST-South Wing	yhong@pitt.edu	412-648-2845	412-648-8330
Kwiatkowski, Adam	Assistant Professor	S324 BST-South Wing	adamkwi@pitt.edu	412-383-8139	412-648-8330
Leuba, Sanford	Associate Professor	2.26g Hillman Cancer Center	leuba@pitt.edu	412-623-7788	412-623-4840
Murray, Sandra	Professor	S313 BST-South Wing	smurray@pitt.edu	412-648-9566	412-648-8330
Shi, Yi	Assistant Professor	9049 BST3	yi.shi@pitt.edu	412-383-3242	412-648-9009
St. Croix, Claudette	Associate Professor	S220.5 BST-South Wing	claudette.stcroix@pitt.edu	412-624-0180	412-383-8894
Sorkin, Alexander	Professor and Chair	S368 BST-South Wing	sorkin@pitt.edu	412-624-3116	412-648-8330
Stolz, Donna Beer	Associate Professor	S221 BST-South Wing	dstolz@pitt.edu	412-383-7283	412-648-8330
Thorne, Stephen	Assistant Professor	1.46 Hillman Cancer Center	thornesh@upmct.edu	412-623-7713	412-623-4840
Traub, Linton	Associate Professor	S325 BST-South Wing	traub@pitt.edu	412-648-9711	412-648-8330
Wan, Yong	Professor	2.6 Hillman Cancer Center	yow4@pitt.edu	412-623-3275	412-623-4840
Watkins, Simon C.	Distinguished Professor	S225 BST-South Wing	swatkins@pitt.edu	412-648-3051	412-383-8894
Yates, Nathan	Associate Professor	9043B BST3	yatesn@pitt.edu	732-718-9739	412-648-9009

CELL BIOLOGY
FY17 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

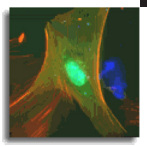
Matthew Greb

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.
Yong Wan, Ph.D.
Simon Watkins, Ph.D.

Non-Tenure Track Faculty
Georgia Duker, Ph.D.
Natalia Ford, Ph.D.
Sameera Sayeed, Ph.D.
Nathan Yates, Ph.D.



Cell Biology Seminar Series Schedule 2016-2017

September 30, 2016
Suzanne Pfeffer, PhD
Professor, Department of Biochemistry
Stanford University
"Structural surprises for vesicle tethering and cholesterol transport"

October 25, 2016
Alexandra Ainsztein, PhD
Program Director, Division of Cell Biology & Biophysics
NIH - NIGMS
"Navigating the NIH and Peer Review Process"

November 15, 2016
Umamaheswar Duvvuri, MD, PhD
Associate Professor, Otolaryngology
University of Pittsburgh Medical Center
"Chloride Channels and Cancer – Please Pass the Salt"

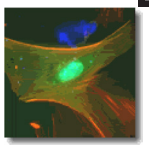
November 21, 2016
Marco Sardiello, PhD
Assistant Professor, Molecular& Human Genetics
Baylor College of Medicine
"Clearage of Storage Material in Lysosomal Storage Disorders"

November 29, 2016
John York, PhD
Professor & Chair, Biochemistry
Vanderbilt University
"Inositol Phosphates Act as Structural Cofactors to Regulate Biological Processes"

March 21, 2017
Roberto Botelho, PhD
Associate Professor, Chemistry & Biology
Ryerson University, Toronto
"Having fun with lysosomes and phagosomes: how to adapt, expand and engorge them"

March 28, 2017
Jianping Jin, PhD
Associate Professor, Biochemistry and Molecular Biology
University of Texas, Health Science Center of Houston
"Control Cytokine-induced inflammation Responses by Ubiquitin and Ubiquitin-like Proteins"

April 4, 2017
Brenton Hoffman, PhD
Assistant Professor, Biomedical Engineering



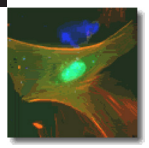
Duke University
"Visualizing Molecular Forces Across Specific Proteins in Living Cells"

April 18, 2017
Adam Kwiatkowski, PhD
Assistant Professor, Department of Cell Biology
University of Pittsburgh
"The actin connection: building adhesion complexes through alpha-catenin"

April 25, 2017
Marijn Ford, PhD
Assistant Professor, Department of Cell Biology
University of Pittsburgh
"A Structural characterization of Vps1"

May 2, 2017
Junying Yuan, PhD
Professor, Cell Biology
Harvard Medical School
"RIPK1 and necroptosis: from basic cell biology to human clinical trials"

May 9, 2017
Michael Butterworth, PhD
Assistant Professor, Department of Cell Biology
University of Pittsburgh
"Regulation of renal transporters by non-coding RNAs"



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.

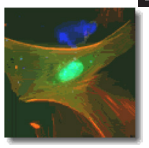
We take a multi disciplinary approach using a wide range of molecular, biochemical, biophysical and cellular techniques to unravel the molecular basis for protein and lipid sorting in the ER. Specifically, we use these approaches to address several related questions including the following: 1. What is 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 regulation of epithelial channels by vesicle trafficking and recycling. Research is focused into two broad areas. First, ongoing studies aim to characterize the mechanisms that underlie channel regulation by membrane trafficking in the mammalian kidney. Three renal transporters, namely the epithelial sodium channel (ENaC), potassium channel (ROMK) and aquaporin water channels are investigated. The work aims to map the intracellular itinerary of these channels and identify protein mediators that regulate channel surface density. In separate, but related studies, primary human bronchiolar epithelial cells are used to characterize ENaC regulation in the human distal airway, in particular mechanisms which may contribute to disease states like cystic fibrosis. By comparing ENaC regulation in two distinct systems, areas of common and divergent regulation have been established. The second research focus investigates the regulation of ENaC by microRNAs (miRNA). miRNAs are small RNAs that pair to the mRNA of protein coding genes to direct their post-transcriptional repression. Channel density in epithelial cells is determined to a large extent by steroid hormone signaling. The regulation of miRNAs by these hormones and impact of changes in miRNA expression on channel regulation is being studied.

Daniel C. Devor, Ph.D.
Professor

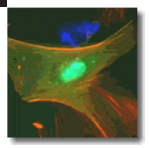
Intermediate (KCa3.1 or IK) and small (KCa2.3 or SK3) conductance, calcium-activated potassium channels play critical roles in a host of physiological processes, including the endothelial derived hyperpolarizing factor (EDHF) response which is critical to the maintenance of vascular tone and hence blood 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.

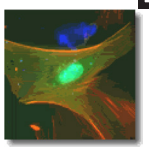


In a related project to the one above, we have recently demonstrated that KCa3.1 is targeted to the lysosome via the ESCRT machinery. We have recently begun to utilize tandem ubiquitin binding entities (TUBES) to define the role of ubiquitinylation in this process. By combining BLAP tagging and TUBES 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



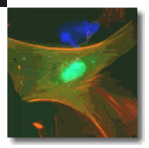
of these channels can be studied in confluent endothelial monolayers. This will not only allow us to gain a greater understanding of these channels in endothelial cells, but also afford us the opportunity to study the fate of these channels under more unique physiological situations, such as sheer stress.

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,



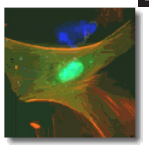
the propeptide precursor to insulin, have been shown to cause clinical diabetes. In studying the associated cellular mechanisms underlying insulin biogenesis, trafficking, and secretion, we have combined confocal fluorescence microscopy and a novel molecular strategy to visualize insulin secretion in 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.

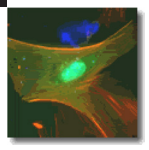
Marijn Ford, Ph.D.
Assistant Professor

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).

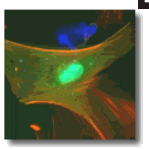
Cell Biology:
While studying the function of Vps1 in microautophagy, we identified the largely uncharacterized yeast protein Pib2 as an additional regulator of microautophagy and TORC1 signaling. Pib2 has a role in lysosomal membrane permeabilization and has two human homologues Phafin 1 and Phafin 2. 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 Pib2 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.

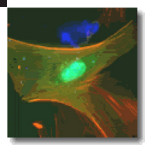
The overall aim of the lab is therefore to delineate the mechanisms of membrane organization and homeostasis, and how these mechanisms are altered in genetic and infectious disease. We use an array of state of the art methods, including live cell imaging, single molecule, super-resolution and chemical 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.

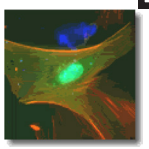
We have developed genomic engineering tools that allow efficient generation of knock-in alleles of *Drosophila* genes. We also developed comprehensive imaging tools for visualizing the dynamic subcellular localizations of polarity proteins under various physiological conditions including hypoxia.

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.

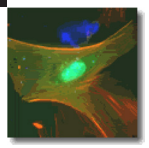
- We have used spFRET to demonstrate that PcrA DNA helicase displaces RecA from both ssDNA as well as dsDNA (Anand et al., 2007), as a model for regulation of homologous recombination.

- 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.

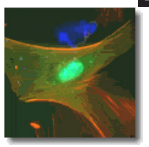
Sandra A. Murray, Ph.D.
Professor

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.
Professor, Chair of Department

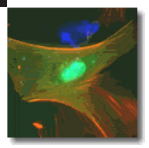
The focus of the research in the laboratory is currently split into two major directions which are distinct from each other with respect to the biological systems involved, their relation to the human disease, and experimental models used. However, the main idea underlying both directions is conceptually 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.

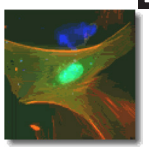
Stephen Thorne, Ph.D.
Assistant Professor

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.

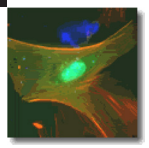
Through combining these approaches, we are looking to develop novel therapies that can be produced at clinical grade for early Phase I clinical trials.

Linton M. Traub, Ph.D.
Associate 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.

Yong Wan, Ph.D.
Professor

Posttranslational modifications such as ubiuqitylation, methylation, ADP-ribosylation as well as phosphorylation orchestrate genome stability, cell division, signal transduction, apoptosis and tumorigenesis. Posttranslational modifications act as critical molecular switches or fine-tune operators that determine the activation, deactivation or subcellular localization of functional proteins. Emerging evidence has drawn attention to the modulation of regulatory proteins in response to extrinsic/intrinsic signaling being executed simultaneously by multiple posttranslational modifications. Research interests in my laboratory seek to address how defects in the ubiquitin-proteasome system (E3 ligase/deubiquitinase), protein methyltransferase and



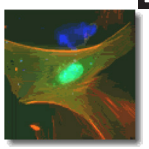
poly (ADP-ribose) polymerase 1 (PARP1) would result in genomic instability, abnormal cell cycle or apoptosis, and aberrant signal transductions (e.g., ER, TGF-beta and EGFR) that predispose otherwise normal cells to become cancerous tumor cells. The ultimate objective is to integrate our basic research with clinical translational studies that would allow the development of new anti-cancer therapy thereby fully exploiting our knowledge of posttranslational modifications. To achieve our goals, we have developed a multidisciplinary approach that includes biochemical, cell biological and genetic analyses as well as the use of animal models and analyses of clinical samples.

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 2016-2017)

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
Breast Cancer Now / UK (mail) 2016
Springboard UK/Ireland (mail) 2016

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

Donna B. Stolz, Ph.D.
Associate Professor

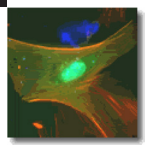
ZDK1-GRB-8 J1 review of NIH NIDDK P01 grants, 4 meeting grants
NIDDK P01 review. I grant, phone meeting.
NIDDK Training Grant Special Emphasis Panel, Member

Linton Traub, Ph.D.
Associate Professor

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

Yong Wan, Ph.D.
Professor

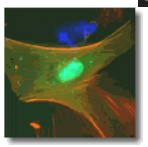
Molecular Oncogenesis Study Section (MONC), NIH, Standing member (2013-2019)



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

Canadian Foundation for Innovation Chair of Panel, July 6th -8th 2016
NIH review P41, New York Structural Biology Research Center Chair of Panel, October 26th-29th 2016
ACS Study Section (Peer Review Committee on Clinical Cancer Research and Epidemiology), Chair of Panel, Atlanta, GA, January 25st-27th 2017
NIH Common Fund's 4D Nucleome (4DN) program; Reviewer March 16th 2017
CFI Mac Grant Review Chair of Panel Ottawa CA April 5th-7th
NIH Common Fund's 4D Nucleome (4DN) program Phase 2 reviewer April 8th 2017
ACS Study Section (Peer Review Committee on Clinical Cancer Research and Epidemiology), Chair of Panel, Atlanta, GA, June 29th-30th 2017
Dutch Research Council (NWO) National imaging resource, August 13th 2017 Reviewer

Cell Biology/Pharmacology Machine Shop



Faculty Advisory Committee Memberships (Fiscal Year 2016-2017)

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's Committee

Michael Butterworth, Ph.D.
Assistant 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
Chair, Interdisciplinary Biomedical Graduate Program Recruitment Committee

Peter F. Drain, Ph.D.
Associate Professor

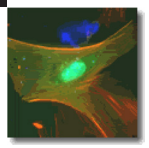
University of Pittsburgh School of Medicine Interdisciplinary Biomedical Graduate Program- Cell Biology and Molecular Physiology Program Committee
Cell Biology Representative, Graduate Student Recruitment Committee
Biomedical Masters Program Committee
UPSOM Curriculum Committee

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
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

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

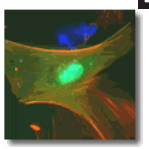
Organizer – Cell Biology Department Retreat
Local Traffic Symposium Organizing Committee
Integrative Systems Biology Admissions Committee

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
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 Science Program Executive Committee

Claudette St. Croix, Ph.D.
Associate Professor

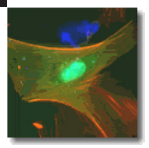
Cell Biology Faculty Recruitment Committee
Graduate Student Mentoring Committee, EOH, Graduate School of Public Health
Director of Student Recruitment and Admissions, EOH, Graduate School of Public Health

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

Stephen Thorne, Ph.D.
Assistant Professor

University of Pittsburgh and University of Pittsburgh Cancer Institute, UPCI;
Director, Small Animal Imaging Core, UPCI
Leader, Viral Vector and Gene Delivery Section, Molecular Virology Program at UPCI
Steering Committee, UPCI Flow Cytometry Facility



Linton M. Traub, Ph.D.
Associate Professor

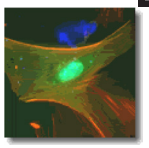
University of Pittsburgh School of Medicine Health Sciences Research Advisory Committee
Cell Biology Tenure and Promotions Committee
Cell Biology Faculty Recruitment Committee
Cell Biology Space Committee

Yong Wan, Ph.D.
Professor

Cell Biology Tenure and Promotions Committee
Cell Biology Departmental Tenure and Promotions Committee

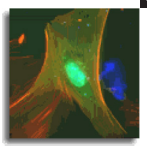
Simon C. Watkins, Ph.D.
Distinguished Professor and Vice Chairman, Director of Center of Biologic Imaging

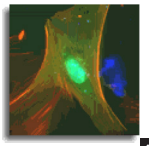
Cell Biology Tenure and Promotions Committee
Cell Biology Student Advisory Committee
Cell Biology Space Committee
Cell Biology Faculty Recruitment Committee
Graduate Program, Curriculum Committee
University of Pittsburgh School of Medicine, Research Advisory Committee
University of Pittsburgh Cancer 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 (FY17)

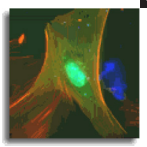
Name	Agency Name	Title	Annual DC	Annual IDC
Daniel Byrd	National Institutes of Health	Combing STAT3-Silencing and Oncolytic Vaccinia Virus to Enhance Anti-tumor Therapeutic Activity	16818	
Michael Butterworth	National Institutes of Health	Role of MicroRNAs in kidney sodium regulation	221324	119515
Peter Drain	Prader-Willi Syndrome	Understanding Multiple Hormone Secretion Deficits in Prader-Willi Syndrome	6188	495
Marijn Ford	National Institutes of Health	The Roles of the Dynamin-Related Protein Vps1 and the ESCRT Complex in Microautophagy	197500	91932
Gerry Hammond	National Institutes of Health	Directing Membrane Function with Inositol Lipids in Health and Disease	209890	113603
Yang Hong	National Institutes of Health	Membrane Targeting and Retargeting of Polarity Proteins	49125	25997
Christine Klemens	American Heart	Ankyrin G A Regulation of the Epithelial Sodium Channel after Adosterone Stimulation	26000	0
Adam Kwiatkowski	National Institutes of Health	Alpha-Catenin Function in Cardiomyocyte Adhesion and Cytoskeletal Organization	247439	126193
Mads Larsell	National Institutes of Health	Cystic Fibrosis Foundation (Betrand)	9727	0
Sanford Leuba	National Institutes of Health	NNRTI Induced Conformational Changes in HIV 1 RT (Sluis-Cremer)	62411	25923
Sanford Leuba	National Institutes of Health	Novel Mechanisms of HIV Resistance ti RTIS (Sluis-Cremer)	5734	3104
Sanford Leuba	National Institutes of Health	Evolved DNA Contacts Required for Hexameric Helicase Unwinding.	51570	20870
Sandra Murray	National Science Foundation	Regulation of annular gap junctionp rocessing	169553	88859
Chelsea Merkel	National Institutes of Health	The Role of Vinculin in Cardiomyocyte Adhesion and Mechanical Continuity	36384	0
Alexander Sorkin	National Institutes of Health	Pathogenesis of Cancer - Role of EGF Receptor Endocytosis	214656	94683
Alexander Sorkin	National Institutes of Health	Supplement -Pathogenesis of Cancer - Role of EGF Receptor Endocytosis	3924	2173
Alexander Sorkin	US Dept of Veterans Affairs	Investigating the Role of TMEM16A/AN01 in SCCHN	16578	0
Alexander Sorkin	National Institutes of Health	Exosome Based Placental Maternal Communication	25193	13819
Claudette St. Croix	National Institutes of Health	Cardiolipin as a Novel Mediator of Acute Lung Injury	7970	4304
Claudette St. Croix	National Institutes of Health	Aging of Mesenchymal Stem cells Missing Link in IPF	3024	1633
Claudette St. Croix	National Institutes of Health	Implications and Stability of Clinical and Molecular Phenotypes of Severe asthma	5051	2601
Claudette St. Croix	National Institutes of Health	Pathogenic Mechanisms of Gene-Environment Interactions in Parkinsons Disease	4058	2211
Claudette St. Croix	National Institutes of Health	Core C: Cell Autonomous and Non-Autonomous mechanisms of Aging	41214	22379
Claudette St. Croix	National Institutes of Health	ROS Mechanisms in BAV Aortopathy	3193	1644
Claudette St. Croix	National Institutes of Health	Signaling Mechanisms by which Mitochondria Regulates Fibrosis in the Lung	2893	1562
Claudette St. Croix	National Institutes of Health	Vascular Smooth Muscle and Blood Pressure Regulation By cyb5R2	7427	4027
Claudette St. Croix	National Institutes of Health	Mesenchymal Stem Cell Secretome inLung Fibrosis: Mitochodria and RNA shuttle	27009	14585
Claudette St. Croix	National Institutes of Health	Reactive Oxygen Species in Vascular Disease	7674	4144
Claudette St. Croix	National Institutes of Health	Vascular Subphenotypes of Lung Disease - Preclinical Assesment Core	59205	32107
Claudette St. Croix	National Institutes of Health	Novel Role of Smooth Muscle B5 Reductase in Sicle Cell Disease	3382	1827
Claudette St. Croix	National Institutes of Health	Targeted Fluorescent Indicators for Endothelial Physiology	68606	37047

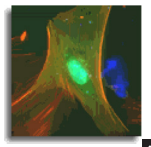




Claudette St. Croix	National Institutes of Health	Regulation of Fuel Utilization by Lysine Acetylation in the Failing Heart	2978	1616
Claudette St. Croix	National Institutes of Health	Anti-Inflammatory Lipid Mediators in Asthma	6459	3488
Claudette St. Croix	National Institutes of Health	TSP-1 and ROS: CD47 and SIRP-alpha as mediators of Vascular Dysfunction	9976	5387
Claudette St. Croix	National Institutes of Health	Real Time Visualization and Manipulation of the Metastatic, Trajectory of Breast Cancer	1897	1025
Donna Beer Stolz	National Science Foundation	Engineering Research Center	8464	4359
Donna Beer Stolz	National Institutes of Health	Core A Cell and tissue Imaging Core	59850	32463
Donna Beer Stolz	National Institutes of Health	All Human Microphysical Model of Metastasis Therapy	59512	27816
Donna Beer Stolz	National Institutes of Health	Primary Human Trophoblasts and the Transfer of Viral Resistance	6659	3429
Donna Beer Stolz	National Institutes of Health	Bio-mediated killing of oncogenic stem cells in chemoprevention	4791	2587
Donna Beer Stolz	National Institutes of Health	Mechanisms of Arsenic-induced Muscle Morbidity and Reduced Regenerative Capacity	12226	6603
Donna Beer Stolz	National Institutes of Health	Nitric Oxide and Hepatic Function in sepsis and Trauma	11517	4924
Donna Beer Stolz	National Institutes of Health	Mechanisms of Trabecular Meshwork Regeneration by stem cell	8330	3586
Donna Beer Stolz	National Institutes of Health	Critical Role for Fibroblast Growth Factor Receptors in Bladder Development	6293	3398
Donna Beer Stolz	National Institutes of Health	Dysfunctional Muscle remodeling and regeneration in environmental disease	19890	10813
Donna Beer Stolz	National Institutes of Health	Elucidting Mechanisms Involved in Lamin B1 Medited Demyelination	3947	2124
Donna Beer Stolz	National Institutes of Health	Endogenous Regulators of Inflammation in Liver Ischemia/Reperfusion	12865	4247
Donna Beer Stolz	National Institutes of Health	Luminal Epithelial Junctions, Polarity and Permeability in BPH	10801	3550
Donna Beer Stolz	National Institutes of Health	Alpha Catenin Function in Cardiomyocyte adhesion and Cytoskeletal	1989	1074
Stephen Thorne	National Institutes of Health	Combinational Immunotherapy Targeting Melanoma-Associated Vasculature	1201	649
Stephen Thorne	National Institutes of Health	Creation of Immuno-Oncolytic Viruses for Cancer Therapy	168382	90399
Stephen Thorne	Lustgarten	Novel oncolytic vaccinia strans for targeted pancreatic cancer therapy	68559	13712
Stephen Thorne	Stand Up 2 Cancer	Metabolic reprogramming suing oncolytic viruses toimprove immunotherapy	25352	2536
Stephen Thorne	National Institutes of Health	Visualization of in vivo HIV-1 vaginal transmission in the presence and absence of PrEP	23627	10057
Linton Traub	National Institutes of Health	Clatherin-coated vesicles and endocytic function	169258	91400
Simon Watkins	National Institutes of Health	Combinatioal Immunotherapy targeting the Malonoma	1721	817
Simon Watkins	National Institutes of Health	Combinatioal Immunotherapy targeting the Malonoma	19014	9030
Simon Watkins	National Institutes of Health	Pittsburgh Center for Kidney Research	13755	6437
Simon Watkins	National Institutes of Health	Pittsburgh Center for Kidney Research	1245	583
Simon Watkins	National Institutes of Health	CYP 450 Mediated CBF Dysregulation and Neurotoxicity in Pediatric Cardiac Arrest	9467	4221
Simon Watkins	National Institutes of Health	CYP 450 Mediated CBF Dysregulation and Neurotoxicity in Pediatric Cardiac Arrest	857	382
Simon Watkins	National Institutes of Health	Cardiolipin as a Novel Mediator of Acute Lung Injury	105256	50908
Simon Watkins	National Institutes of Health	PQC2 Alteration of 3D nuclear organization at nanoscale in breast tumorigenesis	8087	3067
Simon Watkins	National Institutes of Health	Mechanisms of Perineural Invasion in Head and Neck Cancer	10056	5430

Simon Watkins	National Institutes of Health	Mesoscale MR imaging of cellular connectivity in the ex vivo human hippocampus-	2168	811
Simon Watkins	National Institutes of Health	ROS driven mitochondrial-telomere dysfunction during environmental stress-	7910	2112
Simon Watkins	National Institutes of Health	University of Pittsburgh Center for HIV Protein Interactions (PCHPI)	6366	3331
Simon Watkins	National Institutes of Health	University of Pittsburgh Center for HIV Protein Interactions (PCHPI)	71745	36807
Simon Watkins	National Institutes of Health	In vivo localization and mechanism of regultory B cell function in alloimmunity and trasplant tolerance	11356	6128
Simon Watkins	National Institutes of Health	Pulmonary Arteriole Occlusion by Platelet Neutrophil Micro Emboll in acute chest syndrom	24472	2415
Simon Watkins	National Institutes of Health	Cancer Center Support Grant	82294	44438
Simon Watkins	National Institutes of Health	Aging of MSCs missing Link in IPF	2450	1324
Simon Watkins	National Institutes of Health	Basic and Clinical Studies of Cystic Fibrosis - Core C	80270	39242
Simon Watkins	National Institutes of Health	Mechanima-directed sequential deliver of radiation mitgagors	24684	11887
Simon Watkins	National Institutes of Health	Mechanima-directed sequential deliver of radiation mitgagors	122745	59670
Simon Watkins	National Institutes of Health	Inhibition of Neural Electrode-Mediated Inflammation and Neuronal Cell Death	9995	4437
Simon Watkins	National Institutes of Health	DNA Damage Recognition by Nucleotide Excision Repair Proteins	8168	4410
Simon Watkins	National Institutes of Health	Exosomes as paracrine signal mediators in cardiac allograft rejection	19020	7571
Simon Watkins	National Institutes of Health	Genetics of Extracellular Matrix in Health and Disease (Urban)	7497	1698
Simon Watkins	National Institutes of Health	Countering the Pro-Inflammatory Attributes of IL-33 During Hematopoietic Cell Tansplantation for Tolerance Induction	7552	2459
Simon Watkins	National Institutes of Health	Stem Cells for Corneal Engineering	5000	2700
Simon Watkins	National Institutes of Health	ROS Mechanisms in BAV Aortopathy	4816	2480
Simon Watkins	National Institutes of Health	Biochemical and Spatial Regulation of IKKg/NEMO During T Cell Activation	11449	6183
Simon Watkins	National Institutes of Health	T Cell Memory in Organ Transplantation	10000	5400
Simon Watkins	National Institutes of Health	Inhibition of the ALT Pathway by Interfering with Poly-ADP-Ribose Metabolism	15062	5434
Simon Watkins	National Institutes of Health	Mapping Lipid Oxidation in Traumatic Brain Injury by Mass Spectrometric Imaging	11284	5811
Simon Watkins	National Institutes of Health	PINK1 Regulation of Neuronal and Mitochondrial Homeostatis	2500	1353
Simon Watkins	National Institutes of Health	Center for Biological Imaging - Bakkenist	2500	0
Simon Watkins	National Institutes of Health	BMP10 in Cardiovascular Development and Hereditary Hemorrhagic Telangiectasia.	9969	5383
Simon Watkins	National Institutes of Health	Targeted Fluorescent Indicators for Endothelial Physiology	22944	7098
Simon Watkins	Department of Defense	Predictive understanding of the effects of encephalitic virus exposure on the blood brain barrier	90000	21600
Simon Watkins	National Institutes of Health	Cell Autonomous and Non-Autonomous Mechanisms of Aging	95650	46245
Simon Watkins	Cystic Fibrosis Foundation	Research Development Project - Imaging Core	3199	1727
Simon Watkins	National Institutes of Health	Structure and Activation of a Multiprotein Signaling Complex (Vignali)	15049	4617
Simon Watkins	Cystic Fibrosis Foundation	Research Development Project - Imaging Core	40000	0

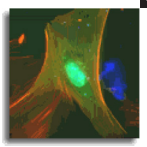


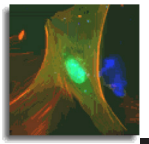


Simon Watkins	American Cancer Society	Epstein-Barr Virus Oncogenesis in Nasopharyngeal Carcin	10047	2009
Simon Watkins	National Institutes of Health	Mechanistic Elucidation and Targeted Therapy of Platelet Dysfunction After Trauma	9403	5077
Simon Watkins	National Institutes of Health	Improving Cerebral Aneurysm risk Assessment Through Understanding Wall Vulnerability and Failure Models	23936	10047
Simon Watkins	National Institutes of Health	The role of RTK Signaling in Opiod Tolerance	25974	14026
Simon Watkins	National Institutes of Health	B Cells in the Pathogenesis of Allograft Rejection	5726	3106
Simon Watkins	National Institutes of Health	Center for Biological Imaging - Biogen - Gutstein	12500	0
Simon Watkins	National Institutes of Health	Mechanisms of HMGB1 Release from Ischemic Muscle in Peripheral Arterial Disease (Hartman)	436	241
Nathan Yates	National Institutes of Health	Cell Autonomous and Non-Autonomous Mechanism of Aging	126548	54836
Nathan Yates	National Institutes of Health	Plasticity of Auditory Cortical Circuits in Schizophrenia	11434	6175
Nathan Yates	National Institutes of Health	Novel and Robust Methods for Differential Protein Network Analysis of Proteomics Data in Schizophrenia Research	16192	2475
Nathan Yates	National Institutes of Health	Regulation of Fuel Utilization by Lysine Acetylation in the Falling Heart	15840	8732
Nathan Yates	National Institutes of Health	Implications of Procaspase-8 mutations in oral	5706	3081
Nathan Yates	National Institutes of Health	Alzheimer's Disease Research center-funding	2852	1541
Nathan Yates	National Institutes of Health	Novel and Robust Methods for Differential Protein Network Analysis of Proteomics Data in Schizophrenia Research	6286	3158
			3785995	1728629

Cell Biology Sponsored Research Funding (FY18)

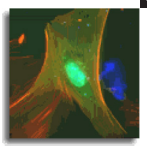
Name	Agency Name	Title	Annual DC	Annual IDC
Michael Butterworth	National Institutes of Health	Role of MicroRNAs in kidney sodium regulation	216608	116968
Peter Drain	Prader-Willi Syndrome	Understanding Multiple Hormone Secretion Deficits in Prader-Willi Syndrome	2063	165
Marijn Ford	National Institutes 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	242143	123196
Mads Larsen	National Institutes of Health	Cystic Fibrosis Foundation (Betrand)	29516	0
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)	6336	3422
Sanford Leuba	National Institutes of Health	Evolved DNA Contacts Required for Hexameric Helicase Unwinding.	56026	22971
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	23855	0
Alexander Sorkin	National Institutes of Health	Exosome Based Placental Maternal Communication	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	208322	116966
Alexander Sorkin	National Institutes of Health	Regulation of Dopamine Transporter by Trafficking	259589	143715
Alexander Sorkin	National Institutes of Health	Coupling Between Dopamine Transporter Structural Dynamics, Oligomerization, Cellular Localization and Function	42753	24048
Claudette St. Croix	National Institutes of Health	In vivo localization and mechanism of regultory B cell function in alloimmunity and trasplant tolerance	11458	6186
Claudette St. Croix	National Institutes of Health	Pulmonary Arteriole Occlusion by Platelet Neutrohil micro emboli in acute chest syndrome	25356	2504
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	10240	5530
Claudette St. Croix	National Institutes of Health	Vascular Subphenotypes of Lung Disease - Preclinical Assesment Core	65672	36401
Claudette St. Croix	National Institutes of Health	Signaling Mechanisms by which Mitochondria Regulates Fibrosis in the Lung	4175	2324
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	8368	4519
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	7410	4098
Claudette St. Croix	National Institutes of Health	Novel Role of Smooth Muscle B5 Reductase in Sicle Cell Disease	4563	2525
Claudette St. Croix	National Institutes of Health	Aging of Mesenchymal Stem Cells Missing Link in IPF	9581	5174

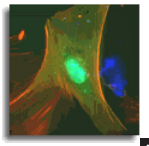




Claudette St. Croix	National Institutes of Health	Regulation of Fuel Utilization by Lysine Acetylation in the Failing Heart	3036	1690
Claudette St. Croix	National Institutes of Health	Mechanisms oand Promotion of Immune Regulation by CD4+	18059	7023
Claudette St. Croix	National Institutes of Health	Dissecting and breaking metabolic symbiosis between cancer cells and regulatory T cells	7256	4027
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	The Anit-Aging Role of Klotho in Skeletal Muscle Regeneration	22342	7798
Donna Beer Stolz	National Science Foundation	Engineering Research Center	2775	1429
Donna Beer Stolz	National Institutes of Health	Core A Cell and tissue Imaging Core	11554	4598
Donna Beer Stolz	National Institutes of Health	Bio-Mediated Killing of Oncogenic Stem Cells in chemoprevention	5038	2721
Donna Beer Stolz	National Institutes of Health	Mechanisms of Arsenic-induced Muscle Morbidity and Reduced Regenerative Capacity	12226	6603
Donna Beer Stolz	National Institutes of Health	Nitric Oxide and Hepatic Function in sepsis and Trauma	11692	4751
Donna Beer Stolz	National Institutes of Health	Mechanisms of Trabecular Meshwork Regeneration by stem cell	10000	4336
Donna Beer Stolz	National Institutes of Health	Critical Role for Fibroblast Growth Factor Receptors in Bladder Development	6451	3483
Donna Beer Stolz	National Institutes of Health	Dysfunctional Muscle remodeling and regeneration in environmental disease	19888	10914
Donna Beer Stolz	National Institutes of Health	Elucidting Mechanisms Involved in Lamin B1 Medited Demyelination	3946	2131
Donna Beer Stolz	National Institutes of Health	Endogenous Regulators of Inflammation in Liver Ischemia/Reperfusion	12866	4248
Donna Beer Stolz	National Institutes of Health	Luminal Epithelial Junctions, Polarity and Permeability in BPH	9952	4411
Donna Beer Stolz	National Institutes of Health	Alpha Catenin Function in Cardiomyocyte adhesion and Cytoskeletal	8013	4327
Donna Beer Stolz	National Institutes of Health	Characterization of Meiotic Crossover Surveillance System	6156	3478
Stephen Thorne	National Institutes of Health	Creation of Immuno-Oncolytic Viruses for Cancer Therapy	183052	96218
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	35011	14596
Simon Watkins	National Institutes of Health	Pittsburgh Center for Kidney Research	15000	7667
Simon Watkins	National Institutes of Health	CYP 450 Mediated CBF Dysregulation and Neurotoxicity in Pediatric Cardiac Arrest	9464	4220
Simon Watkins	National Institutes of Health	Cardiolipin as a Novel Mediator of Acute Lung Injury	105256	50908
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	6737	2555
Simon Watkins	National Institutes of Health	Regulated Activation of latent-TGfB Determines Leukocyte Occupany of the Epidermal Niche	2500	0
Simon Watkins	National Institutes of Health	ROS driven mitochondrial-telomere dysfunction during environmental stress-	7910	2111
Simon Watkins	National Institutes of Health	University of Pittsburgh Center for HIV Protein Interactions (PCHPI)	29428	16055
Simon Watkins	National Institutes of Health	Cancer Center Support Grant	82566	44586
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	147733	71253

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	5242	7337
Simon Watkins	National Institutes of Health	Exosomes as paracrine signal mediators in cardiac allograft rejection	19020	7571
Simon Watkins	National Institutes of Health	Genetics of Extracellular Matrix in Health and Disease (Urban)	7497	1618
Simon Watkins	National Institutes of Health	Mechanistic Elucidation and Targeted Therapy of Platelet Dysfunction After Trauma (Neal)	11255	6077
Simon Watkins	National Institutes of Health	Stem Cells for Corneal Engineering	5000	2700
Simon Watkins	National Institutes of Health	Improving cerebral aneurysm risk assessment rhrough understanding wall vulnerabilitya nd failure models	23936	10047
Simon Watkins	National Institutes of Health	Biochemical and Spatial Regulation of IKKg/NEMO During T Cell Activation	11449	6184
Simon Watkins	National Institutes of Health	T Cell Memory in Organ Transplantation	10000	5400
Simon Watkins	National Institutes of Health	Predictive understanding of the effects of encephalitic virus exposure on the blood brain barrie	50091	21649
Simon Watkins	National Institutes of Health	Inhibition of the ALT Pathway by Interfering with Poly-ADP-Ribose Metabolism	15062	5434
Simon Watkins	National Institutes of Health	Mapping Lipid Oxidation in Traumatic Brain Injury by Mass Spectrometric Imaging	11284	5811
Simon Watkins	National Institutes of Health	B Cells in the Pathogensis of Allograft Rejection (Chalasani)	6875	3729
Simon Watkins	National Institutes of Health	BMP10 in Cardiovascular Development and Hereditary Hemorrhagic Telangiectasia.	9969	5383
Simon Watkins	National Institutes of Health	Cell Autonomous and Non-Autonomous Mechanisms of Aging	79436	39286
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	25974	14026
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	Structural Analysis of the TCR-CD3 Complex and TCR Signaling	12538	3845
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)	5260	2910
Simon Watkins	National Institutes of Health	Visualizing Synaptic Connection Between Distinct Cell types in Whole Mouse Brain (Bruchez - CMU subcontract)	80000	38965
Simon Watkins	National Institutes of Health	Pittsburgh Center for HIV Protein Interactions (PCHPI) Gronenborn-	25001	13870
Simon Watkins	National Institutes of Health	Signaling by the EGF Receptor from Endosomes	9728	5415
Simon Watkins	National Institutes of Health	Surgery Triggered Immune Response and Liver Matastases	9728	5415
Simon Watkins	National Institutes of Health	A Conofcal fluorescence Microscoy Brain Data Archive	33320	18548
Simon Watkins	National Institutes of Health	Illuminting Metabolic Pathways Enabled by Early T Cell Activation	6743	2708
Simon Watkins	National Institutes of Health	Inflammasoome Acivation in Trauma Hemorrhagic shock	12616	5386
Simon Watkins	National Institutes of Health	Mechanisms of HMGB1 Release from Ischemic Muscle in Peripheral Arterial disease	7362	2707





Nathan Yates	National Institutes of Health	Cell Autonomous and Non-Autonomous Mechanism of Aging	100602	44076
Nathan Yates	National Institutes of Health	Plasticity of Auditory Cortical Circuits in Schizophrenia	9905	5350
Nathan Yates	National Institutes of Health	Novel and Robust Methods for Differential Protein Network Analysis of Proteomics Data in Schizophrenia Research	5839	3241
Nathan Yates	National Institutes of Health	Regulation of Fuel Utilization by Lysine Acetylation in the Falling Heart	19546	10864
Nathan Yates	National Institutes of Health	Alzheimer's Disease Research center-funding	11534	6650
Nathan Yates	National Institutes of Health	Influence of Hormonal Contraception on Adolescent Vaginal Ecology	10149	5621
Nathan Yates	National Institutes of Health	Novel Approaches to Enchance Tumor Cell Cytotoxicity of Alkylating Agents	32915	12632
Nathan Yates	National Institutes of Health	Role of Chemokine CXCR4 Receptors in Cocaine Addiction	25000	13875
Nathan Yates	National Institutes of Health	Role of Chemokine CXCR4 Receptors in Cocaine Addiction	2920	1643
			3976451	1947061

Faculty Editorships (Fiscal Year 2016-2017)

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

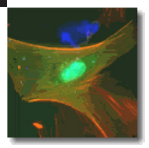
Molecular Biology of the Cell – Reviewing Editorial Board
Traffic, Associate Editor
Scientific Reports (Nature) Editorial Board

Donna Beer Stolz, Ph.D.
Associate Professor

Editorial Board: Cell Transplantation: The Regenerative Medicine Journal. Hepatocyte section.

Stephen Thorne, Ph.D.
Assistant Professor

Journal of Clinical and Cellular Immunology
American Journal of Cancer Research
American Journal of Nuclear Medicine and Molecular Imaging
Molecular Therapy - Oncolytics



Linton Traub, Ph.D.
Associate Professor

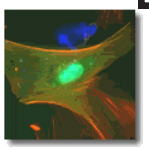
Member of editorial board of Traffic
Member of editorial board of Cellular Logistics
Member of editorial board of Scientific Reports
Member of editorial board of The Journal of Biological Chemistry
Member of board of reviewing editors, Molecular Biology of the Cell

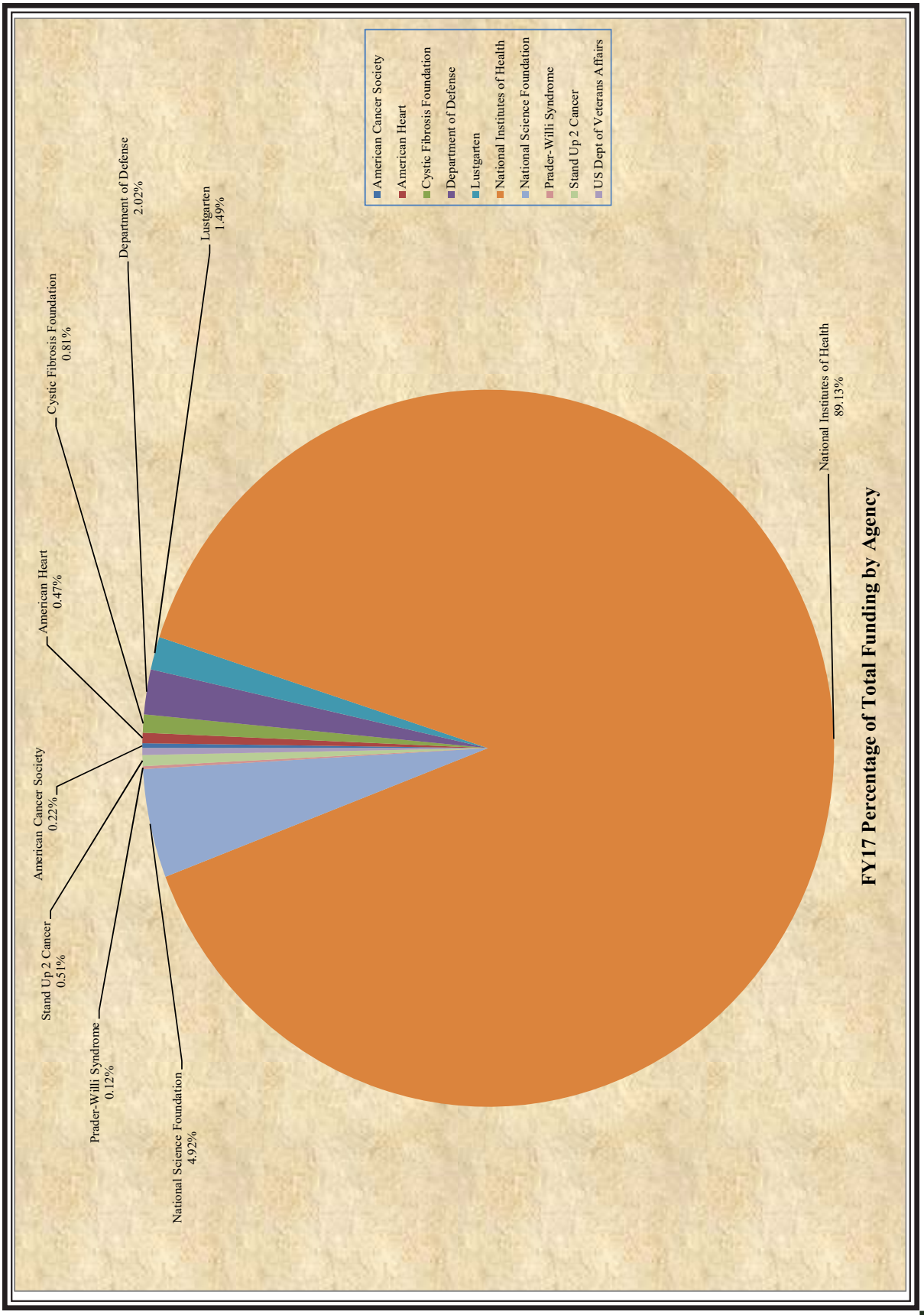
Yong Wan, Ph.D.
Professor

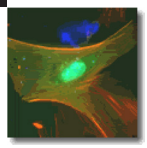
Member, Editorial Board, Journal of Biological Chemistry

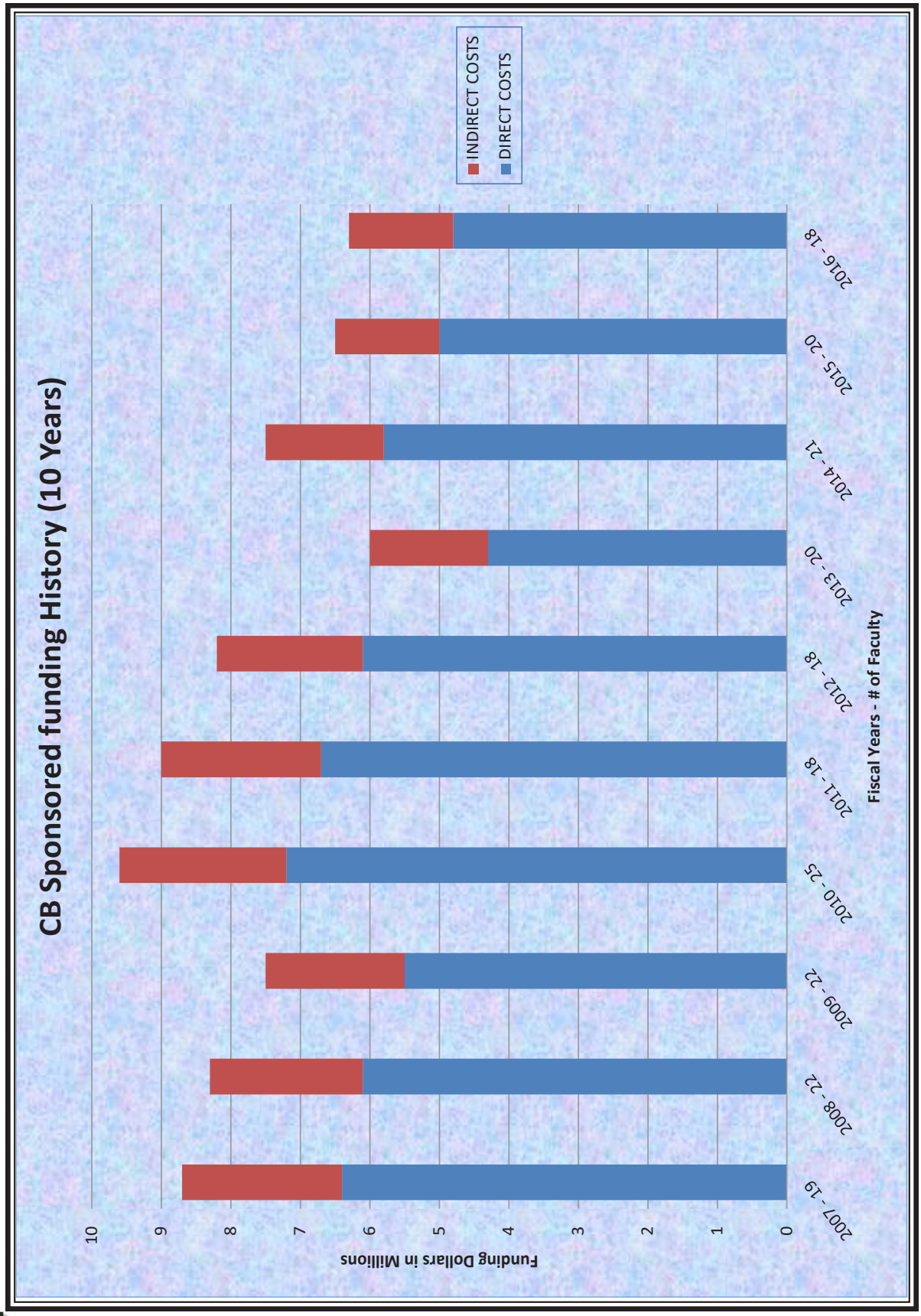
Simon C. Watkins, Ph.D.
Distinguished Professor and Vice Chairman, Director of Center of Biologic Imaging

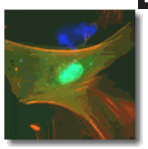
Member, Editorial Board, PittMed
Associate Editor, Experimental Biology and Medicine
Editor, Current Protocols in Cytometry
Editor, Experimental Science and Medicine
Editor, Microscopy Today

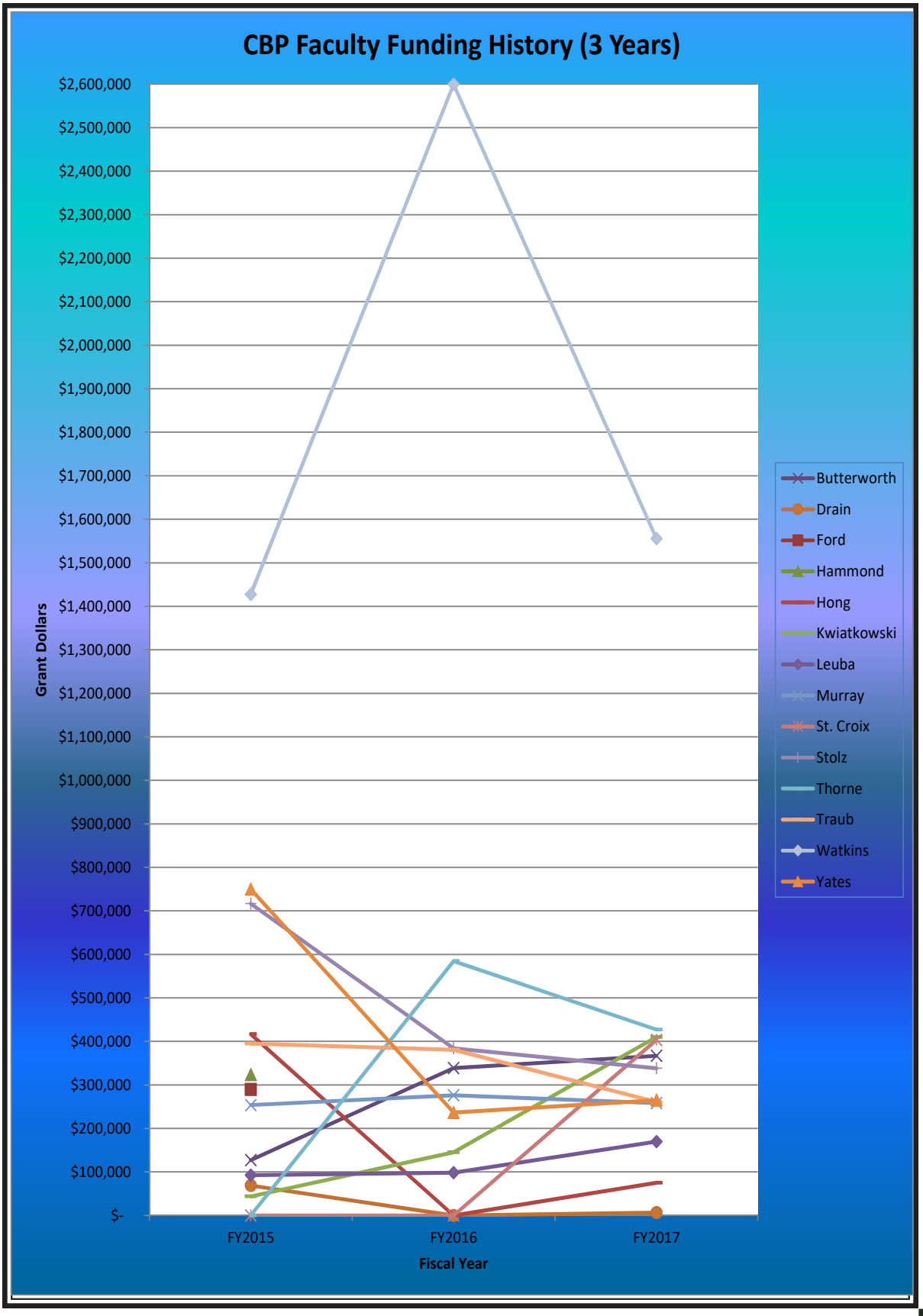


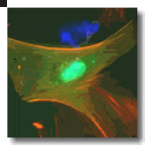

FY17 Percentage of Total Funding by Agency
American Cancer Society
American Heart
Cystic Fibrosis Foundation
Department of Defense
Lustgarten
National Institutes of Health
National Science Foundation
Prader-Willi Syndrome
Stand Up 2 Cancer
US Dept of Veterans Affairs
National Institutes of Health 89.13%
National Science Foundation 4.92%
Prader-Willi Syndrome 0.12%
Stand Up 2 Cancer 0.51%
American Cancer Society 0.22%
American Heart 0.47%
Cystic Fibrosis Foundation 0.81%
Department of Defense 2.02%
Lustgarten 1.49%




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
2007 - 19
2008 - 22
2009 - 22
2010 - 25
2011 - 18
2012 - 18
2013 - 20
2014 - 21
2015 - 20
2016 - 18
Fiscal Years - # of Faculty



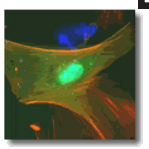

CBP Faculty Funding History (3 Years)
$2,600,000
$2,500,000
$2,400,000
$2,300,000
$2,200,000
$2,100,000
$2,000,000
$1,900,000
$1,800,000
$1,700,000
$1,600,000
$1,500,000
$1,400,000
$1,300,000
$1,200,000
$1,100,000
$1,000,000
$900,000
$800,000
$700,000
$600,000
$500,000
$400,000
$300,000
$200,000
$100,000
$-
Grant Dollars
FY2015
FY2016
FY2017
Fiscal Year
Butterworth
Drain
Ford
Hammond
Hong
Kwiatkowski
Leuba
Murray
St. Croix
Stolz
Thorne
Traub
Watkins
Yates



CBP FACULTY ROSTER
(Effective June, 2017)

Faculty Member	Salary Support on Grants	Rank	Status
Stolz, Donna	87.5%	Associate Professor	Tenured
St. Croix, Claudette	85.9%	Associate Professor	Tenured
Watkins, Simon*	84.0%	Professor	Tenured
Thorne, Stephen	64.6%	Assistant Professor	Tenure Track
Kwiatkowski, Adam	50.0%	Assistant Professor	Tenure Track
Traub, Linton	48.5%	Associate Professor	Tenured
Hammond, Gerald	46.9%	Associate Professor	Tenured
Butterworth, Michael	40.0%	Assistant Professor	Tenure Track
Ford, Marijn	40.0%	Assistant Professor	Tenure Track
Yates, Nathan*	40.0%	Associate Professor	Non-tenure Track
Ford, Natalia	37.6%	Res. Assistant Professor	Non-tenure Track
Sorkin, Alexander*	23.2%	Professor	Tenured
Leuba, Sanford	27.4%	Associate Professor	Tenured
Murray, Sandra	16.4%	Professor	Tenured
Hong, Yang	9.8%	Associate Professor	Tenured
Drain, Peter	6.7%	Associate Professor	Tenured
Aridor, Meir	1.4%	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

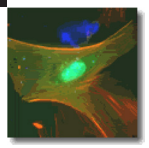
*Calculated using year appropriate NIH salary cap as upper limit for each grant



STUDENTS INVOLVED IN RESEARCH IN CBP FACULTY LABS
Snapshot as of June, 2017

GRADUATE STUDENTS ENROLLED IN CBMP PROGRAM

STUDENT	LAB	SUPPORT
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. Cell Biology & Teaching Fellowship
Christine Klemens	Michael Butterworth, Ph.D. Cell Biology	Michael Butterworth, Ph.D. AHA Training Grant &Teaching Fellowship
George Michael Preston	Jeffrey Brodsky, Ph.D. Biological Sciences	Jeffrey Brodsky, Ph.D. Biological Sciences



FY16 Projects

Butterworth lab: *Ankyrin G A Regulation of the Epithelial Sodium Channel after Adosterone Stimulation*
(American Heart Association)

Thorne lab: *Combining STAT3-silencing and Oncolytic Vaccinia Virus to Enhance Anti-tumor Therapeutic Activity*
(National Institutes of Health)

The combined funding for this post-doctoral fellowship grants is $40,030 in FY16 (Total costs, annualized).

FY17 Projects

Butterworth lab: *Ankyrin G A Regulation of the Epithelial Sodium Channel after Adosterone Stimulation*
(American Heart Association)

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

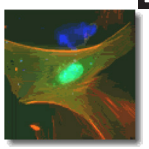
Thorne lab: *Combining STAT3-silencing and Oncolytic Vaccinia Virus to Enhance Anti-tumor Therapeutic Activity*
(National Institutes of Health)

The combined funding for this post doctoral fellowship grants is $85,111 in FY17 (Total costs, annualized).

Program Grant Training Program:

The Cystic Fibrosis Center funded Research Development Program (RDP) offer training funds to qualified post doctoral candidates, as follows in the amount of $35,000.

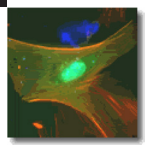
FY16 Program Grant Training Funds - $35,000 (Transferred to Pediatrics January 1, 2016)
FY17 Program Grant Training Funds - $0



Cell Biology Program Grants (Fiscal Year 2016-17)

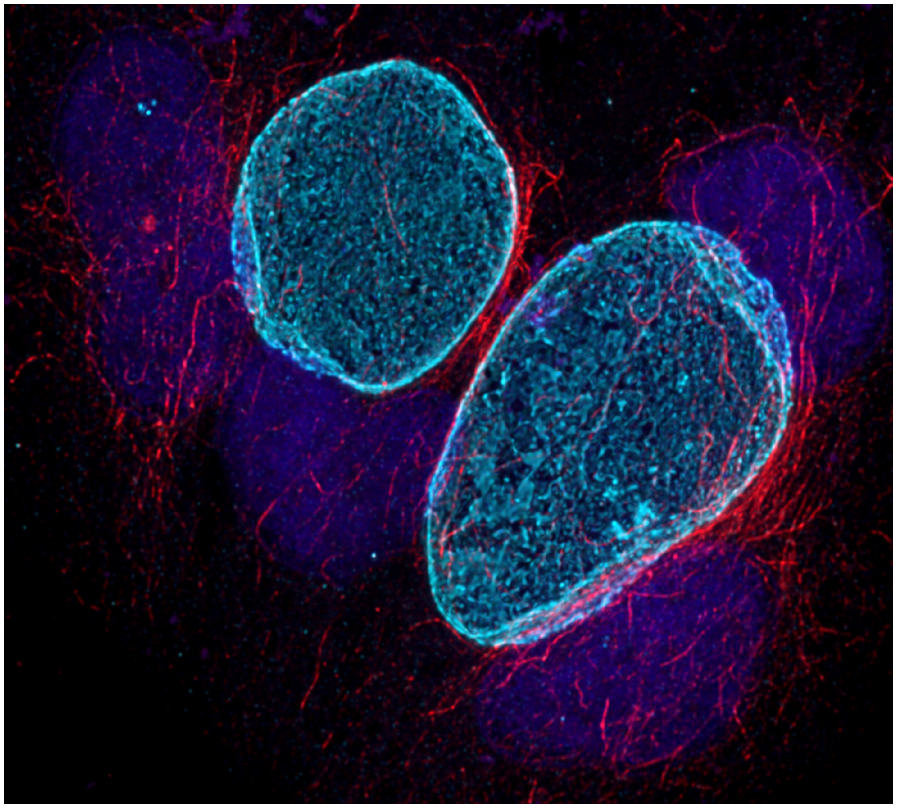
The Department of Cell Biology is funded for four Program Grants, two by the National Institutes of Health and one by the Cystic Fibrosis Foundation, as follows:

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 11 currently funded program grants including "Cancer Center support Grant" (PI Nancy Davidson P30 CA047904), "Basic and clinical studies of Cystic Fibrosis" (PI Ray Frizzell P30 DK072506) "Research studies in CF" (PI Ray Frizzell R8883-CR07), "Cell Autonomous and Non-Autonomous Mechanism of Aging" (PI Robbins P., 1P01AG043376-01A1); "DirectingTumor-specific T cells to Tumors" (PI Kalinski P, 5P01CA132714-05), "University of Pittsburgh Center for HIV Protein interactions" (PCHPI, PI Gronenborn A., 5P50GM082251-07), "Cardiolipin as a Novel Mediator of Acute Lung Injury" (Mallampalli R. P01 HL114453), "Vascular Subphenotypes of Lung Disease" (PI Gladwin M. 5P01HL103456-03), "Pittsburgh Center for Kidney Research" (PI Gerard Apodaca P30 DK079307-09), "Mechanism-Directed Sequential Delivery of Radition Mitigators Imaging Radiation Apathology Core" (PI Joel Greenberger U19 AI068021), and "Alzheimer's Disease Research Center" (PI Matthew MacDonald P30 AG05133)

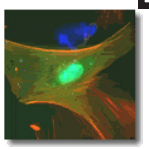


New CBP Research Recruits in FY17

Name	Rank	
Faculty Level		
Yi Shi	Assistant Professor	
Claudette St. Croix	Associate Professor	
Name	**Rank**	**Lab Association**
Post Doctoral Level		
Changzhong Jin	Post Doctoral Associate	Dr. Yi Shi
SM Ahasanul Kobir	Post Doctoral Associate	Dr. Sanford Leuba
Yang Li	Vis. Research Associate	Dr. Adam Kwiatkowski
Jonathan Pacheco	Post Doctoral Associate	Dr. Gerald Hammond
Syed Raza	Post Doctoral Associate	Dr. Adam Kwiatkowski



Dr. Claudette St. Croix. An image of a chlamydial inclusion (cyan) inside a host cell that is labeled with DAPI (nuclei) and tubulin (red). This from work we published in collaboration with Fabienne Paumet from Thomas Jefferson University (Wesolowski J, Weber MM, Nawrotek A, Dooley CA, Calderon M, St Croix CM, Hackstadt T, Cherfils J, Paumet F. Chlamydia Hijacks ARF GTPases To Coordinate Microtubule Posttranslational Modifications and Golgi Complex Positioning. MBio. 2017 May 2;8(3). pii: e02280-16. doi: 10.1128/mBio.02280-16. PubMed PMID: 28465429; PubMed Central PMCID: PMC5414008.).



Graduate Program in Cell Biology and Molecular Physiology

The program in Cell Biology and Molecular Physiology has a rich tradition of scientific training and discovery. Graduates of the Ph.D. program are now chairs of departments at six major U.S. medical schools. Today, the department brings together basic and clinical research faculty who are dedicated to their research programs and to the training of 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 to understand the integrated functions of cells, tissues, organs and model organisms in the era following description of the human genome.

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 far beyond formal classroom training, including numerous journal clubs, casual "work in progress" interactions with student peers, research conferences and the opportunity to attend national and international meetings.

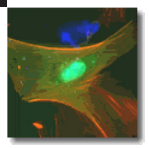
CBMP students have the opportunity to develop their teaching and mentoring skills by participating as instructors for the histology laboratory sections taught to first and second year medical students. Student instructors assist the medical students in using microscopes and presentations to identify 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 the majority 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 grant writing. 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 meet 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.

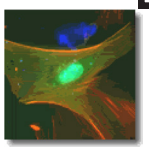
Ghazi, Lamitina, Leuba, Swamynathan, Thorne, Walker, Yanowitz.

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-17

Title: MS Thesis Research
Course Number: 2800
Course Director: Donna Beer Stolz
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.

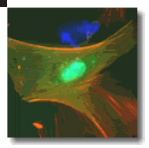
Title: Regulation of Membrane Traffic
Course Number: 2840
Course Director: Gerard Apodaca and Ora Weisz
When: Summer Term
Prerequisites: INTBP 2000 Foundations of Biomedical Sciences
INTBP 2005 Conference
Core Course for: students in the Program in Cell Biology and Molecular Physiology with research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

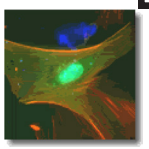
Title: Multiparametric Microscopic Imaging
Course Number: 2860
Course Director: Claudette St. Croix and Donna Beer Stolz
When: Summer Term
Prerequisites: INTBP 2000 Foundations of Biomedical Sciences
INTBP 2005 Conference

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: Peter Drain, 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.

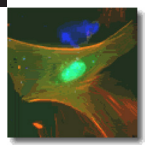
Title: Imaging Cell Biology in Living Systems
Course Number: 2885
Course Director: Simon Watkins
When: Spring Term
Prerequisites: None

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: Donna Beer Stolz
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: Donna Beer Stolz
When: Fall Term, Spring Term, Summer Term
Prerequisites: Successful completion of the Comprehensive Examination
INTBP 2000 Foundations of Biomedical Sciences
INTBP 2005 Conference

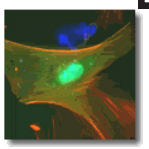
Description: After advancement to candidacy for the Ph.D. degree, students enroll in this course to pursue original experimental laboratory research. The results of which will provide the substance of their doctoral dissertation. A minimum of forty credits of this course are required for the Ph.D. degree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

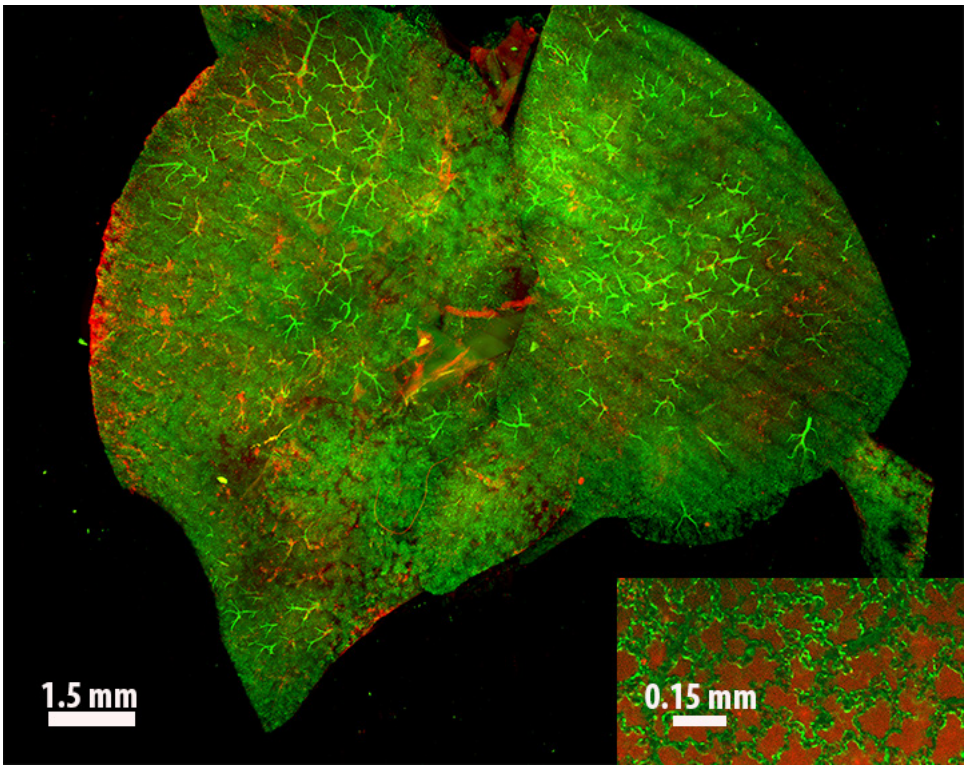
Description: The course is a journal club on current topics in DNA Repair as it relates to human disease, DNA damage processing, genome stability, telomere biology, cancer and aging. Primarily designed for students in the second year of their graduate program and beyond. Presentations will be held twice 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

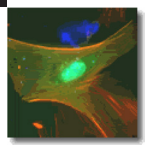
Description: This course focuses on the molecular aspects of the transition from gamete to a reproductive organism. The course progresses through the building of germ cells, fertilization and stem cell participation to sex determination, gonad morphogenesis, puberty, menopause and pregnancy. This course 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.



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.



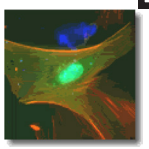
Dr. Claudette St. Croix. The lung image shows high resolution large area ribbon scanning confocal microscopy of lungs that have been perfused with green fluorescent beads and inflated with red fluorescent beads. The inset shows a zoomed in region of the image where you can clearly see the basket like structure of the capillary network (green) surrounding each alveolus (red). This new technology allows us to show the architecture of the vessels and the airways in the entire mouse lung and look for regional differences due to disease/damage. We recently published this method in Watson AM, Rose AH, Gibson GA, Gardner CL, Sun C, Reed DS, Lam LKM, St Croix CM, Strick PL, Klimstra WB, Watkins SC. Ribbon scanning confocal for high-speed high-resolution volume imaging of brain. PLoS One. 2017 Jul 7;12(7):e0180486. doi: 10.1371/journal.pone.0180486. eCollection 2017. PubMed PMID: 28686653;PubMed Central PMCID: PMC5501561.



Faculty Teaching Honors (Fiscal Year 2016-2017)

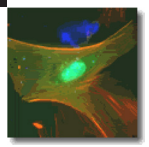
Georgia K. Duker, PhD
Assistant Professor

Golden Apple Pre-Clinical Award for Excellence IN Teaching (2016) in MS-1 & MS-2
From the Medical Graduating Class of 2018



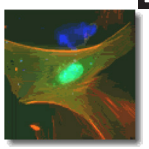
University of Pittsburgh School of Medicine
Educational Credit Units (2015-2016)
Department of Cell Biology
Summary of Faculty ECU's

Faculty Name	Activity	ECURV	Units	ECUs
Aridor, Meir				
	GS - Course Director	50.0	1.0	50.0
	GS - Lecture	2.0	12.0	24.0
	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	28.0	56.0
		Total ECUs:		245.0
Butterworth, Michael				
	MS-1, MS-2 - Laboratory	2.0	8.4	16.8
	MS-1, MS-2 - Lecture	2.0	1.3	2.7
	MS-1, MS-2 - Small group (e.g., PBL, conference, workshop)	2.0	13.3	26.7
	GS - Course Director	50.0	3.0	150.0
	GS - Laboratory supervision (e.g., MSTP, Ph.D. & M.Sc.)	1.0	11.0	11.0
	GS - Lecture	2.0	6.5	13.0
	GS - Member: Curriculum, Recruiting, Program, or other SOM Committee	2.0	2.0	4.0
	GS - Member: Program Steering Committee	40.0	1.0	40.0
	GS - Ph.D. or M.Sc. Mentor	50.0	1.0	50.0
	GS - Program Director	100.0	1.0	100.0
	GS - Small group (e.g., PBL, conference, workshop)	2.0	10.0	20.0
		Total ECUs:		434.2
Devor, Daniel				
	MS-1, MS-2 - Small group (e.g., PBL, conference, workshop)	2.0	16.8	33.5
	GS - Chair: Admissions Committee	100.0	1.0	100.0
	GS - Course Director	50.0	1.0	50.0
	GS - Lecture	2.0	4.0	8.0
	GS - Member: Comprehensive, Dissertation, Thesis, Preliminary or Reprint	5.0	1.0	5.0
	GS - Other	2.0	4.0	8.0
		Total ECUs:		204.5
Drain, Peter				
	MS-1, MS-2 - Course Director	200.0	2.0	400.0
	MS-1, MS-2 - Lecture	2.0	1.5	3.0
	MS-1, MS-2 - Small group (e.g., PBL, conference, workshop)	2.0	16.8	33.5
	MS - Applicant Interviewer	1.0	21.0	21.0
	MS - Member, Admissions Committee	75.0	1.0	75.0
	MS - Member, Curriculum Committee	20.0	1.0	20.0
	MS - Member, Promotions Committee	5.0	1.0	5.0



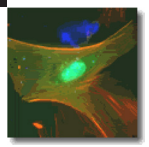
University of Pittsburgh School of Medicine
Educational Credit Units (2015-2016)
Department of Cell Biology
Summary of Faculty ECU's

Faculty Name / Activity	ECURV	Units	ECUs
GS - Course Director	50.0	2.0	100.0
	Total ECUs:		657.5
Duker, Georgia			
MS-1, MS-2 - Course Director	200.0	1.0	200.0
MS-1, MS-2 - Course Segment Coordinator	5.0	1.0	5.0
MS-1, MS-2 - Laboratory	2.0	18.2	36.3
MS-1, MS-2 - Lecture	2.0	20.7	41.3
MS-1, MS-2 - Other	2.0	12.0	24.0
MS-1, MS-2 - Small group (e.g., PBL, conference, workshop)	2.0	27.3	54.7
MS - Member, Promotions Committee	5.0	1.0	5.0
GS - Course Director	50.0	1.0	50.0
GS - Lecture	2.0	43.0	86.0
GS - Other	2.0	6.0	12.0
GS - Small group (e.g., PBL, conference, workshop)	2.0	34.0	68.0
	Total ECUs:		582.3
Ford, Marijn			
GS - Lecture	2.0	3.0	6.0
GS - Small group (e.g., PBL, conference, workshop)	2.0	10.0	20.0
	Total ECUs:		26.0
Hammond, Gerald			
GS - Laboratory supervision (e.g., MSTP, Ph.D. & M.Sc.)	1.0	11.0	11.0
GS - Lecture	2.0	9.0	18.0
GS - Member: Comprehensive, Dissertation, Thesis, Preliminary or Reprint	5.0	3.0	15.0
	Total ECUs:		44.0
Hong, Yang			
GS - Lecture	2.0	7.0	14.0
	Total ECUs:		14.0
Kwiatkowski, Adam			
MS-1, MS-2 - Lecture	2.0	1.8	3.7
GS - Laboratory supervision (e.g., MSTP, Ph.D. & M.Sc.)	1.0	20.0	20.0
GS - Lecture	2.0	10.0	20.0
GS - Member: Admissions Committee	75.0	1.0	75.0
GS - Member: Comprehensive, Dissertation, Thesis, Preliminary or Reprint	5.0	2.0	10.0
GS - Ph.D. or M.Sc. Mentor	50.0	3.0	150.0
	Total ECUs:		278.7



University of Pittsburgh School of Medicine
Educational Credit Units (2015-2016)
Department of Cell Biology
Summary of Faculty ECU's

Faculty Name / Activity	ECURV	Units	ECUs
Leuba, Sanford			
GS - Chair: Admissions Committee	100.0	1.0	100.0
GS - Course Director	50.0	2.0	100.0
GS - Lecture	2.0	2.3	4.7
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 - Member: Program Steering Committee	40.0	1.0	40.0
GS - Ph.D. or M.Sc. Mentor	50.0	1.0	50.0
GS - Small group (e.g., PBL, conference, workshop)	2.0	21.3	42.5
	Total ECUs:		344.2
Murray, Sandra			
MS-1, MS-2 - Laboratory	2.0	41.5	83.0
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:		140.0
Sorkin, Alexander			
GS - Lecture	2.0	6.0	12.0
GS - Member: Comprehensive, Dissertation, Thesis, Preliminary or Reprint	5.0	4.0	20.0
GS - Member: Program Steering Committee	40.0	1.0	40.0
GS - Ph.D. or M.Sc. Mentor	50.0	1.0	50.0
	Total ECUs:		122.0
Stolz, Donna			
MS-1, MS-2 - Laboratory	2.0	14.3	28.7
MS-1, MS-2 - Lecture	2.0	2.3	4.7
MS-1, MS-2 - Small group (e.g., PBL, conference, workshop)	2.0	11.1	22.2
MS - Mentored Scholarly Project (MSP) Mentor	25.0	1.0	25.0
GS - Chair: Comprehensive, Dissertation, Thesis, Preliminary or Reprint Committee	5.0	6.0	30.0
GS - Course Director	50.0	5.0	250.0
GS - Lecture	2.0	17.8	35.5
GS - Member: Comprehensive, Dissertation, Thesis, Preliminary or Reprint	5.0	11.0	55.0
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 - Program Director	100.0	1.0	100.0
	Total ECUs:		593.0

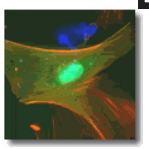


University of Pittsburgh School of Medicine
Educational Credit Units (2015-2016)
Department of Cell Biology
Summary of Faculty ECU's

Faculty Name / Activity	ECURV	Units	ECUs
Thorne, Stephen			
GS - Laboratory supervision (e.g., MSTP, Ph.D. & M.Sc.)	1.0	20.0	20.0
GS - Lecture	2.0	5.5	11.0
GS - Small group (e.g., PBL, conference, workshop)	2.0	8.0	16.0
	Total ECUs:		47.0
Traub, Linton			
GS - Course Director	50.0	2.0	100.0
GS - Lecture	2.0	10.0	20.0
	Total ECUs:		120.0
Wan, Yong			
GS - Lecture	2.0	6.0	12.0
	Total ECUs:		12.0
Watkins, Simon			
MS - Mentored Scholarly Project (MSP) Mentor	25.0	1.0	25.0
GS - Course Director	50.0	1.0	50.0
GS - Lecture	2.0	16.5	33.0
GS - Member: Comprehensive, Dissertation, Thesis, Preliminary or Reprint	5.0	4.0	20.0
	Total ECUs:		128.0
Yates, Nathan			
GS - Course Director	50.0	1.0	50.0
GS - Lecture	2.0	4.3	8.7
	Total ECUs:		58.7
	Subtotal:		**4051.0**

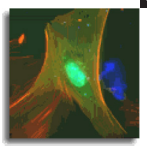
Total Faculty Reporting: 18

Total ECU's for Cell Biology: 4051.0



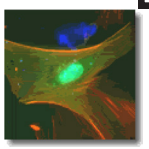
Post Doctoral Personnel Data
[Current as of June, 2017]

Name	Title	Office Address	Email Address	Office Phone	Fax	Research Focus
Bell, Cheryl	Post Doctoral Associate	S346 BSTWR	clb206@pitt.edu	412-648-9565	412-648-8330	Murray Lab
Bell-Temin, Harris	Post Doctoral Associate	BST3-9th Fl	hbb16@pitt.edu	412-383-5937	412-641-2458	Yates Lab
Dong, Wei	Research Associate	S333 BSTWR	wed16@pitt.edu	412-648-2846	412-648-8330	Hong Lab
Changzhong, Jin	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
Larsen, Mads	Vis. Research Associate	S234 BSTWR	mbl6@pitt.edu	412-648-9796	412-648-8330	Watkins Lab
Li, Yang	Vis. Research Associate	S324 BSTWR	yangli@pitt.edu	412-383-7891	412-648-8330	Kwiatkowski 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
Pinilla-Macua, Itziar	Post Doctoral Associate	S372 BSTWR	itp2@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
Sampath, Padmavathi	Vis. Research Associate	HCCLB G.16	pas6@pitt.edu	412-623-1390	412-623-7709	Thorne Lab
Surve, Sachin	Vis. Research Associate	S372 BSTWR	svs23@pitt.edu	412-624-8147	412-648-8330	Sorkin Lab
Zhou, Zhuan	Vis. Research Associate	HCCLB-2.6	zhouz2@upmc.edu	412-623-7811	412-623-7761	Wan Lab



Current Cell Biology and Molecular Physiology Graduate Program Students as of June 30, 2017

Student	Mentor	Year
Christine Klemens	Dr. Mike Butterworth	5th
George Michael Preston	Dr. Jeff Brodsky	5th
Chelsea Merkel	Dr. Adam Kwiatkowski	3nd
Paige Rudich	Dr. Todd Lamitina	2st
Amity Eaton	Dr. Gerard Apodaca	2st
Jonathan Heier	Dr. Adam Kwiatkowski	1st
Rachel Wills	Dr. Gerald Hammond	1st



Prior Graduates of the Cell Biology and Molecular Physiology Program as of June 2017
(Past five years)

Kathryn Wack, Ph.D.
Defended July 23, 2014
Clinical Scientist, Omxyx, GE, Healthcare/UPMC Pittsburgh

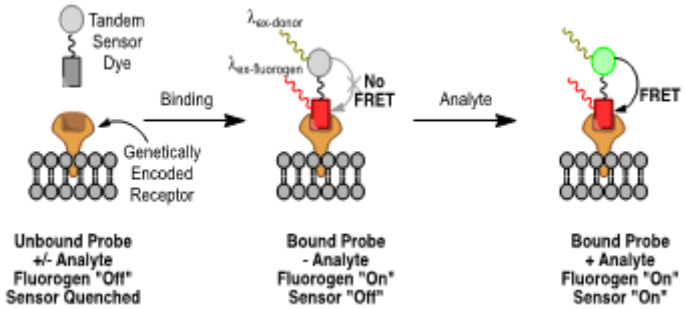
Arvind Suresh, M.S.
Defended October 11, 2013
Scientist Consultant, Men's Mentis Consulting Service

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

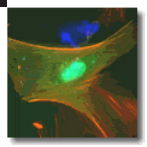
Cavita Kitty Chotoo, Ph.D.
Defended March 26, 2013
Rutger's, Post-Doc

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

Xinxian Qiao, M.S.
Defended December 17, 2012
Technician, Hillman Cancer Center, Pittsburgh, PA



Dr. Claudette St. Croix. Targeted fluorescent biosensors are constructed by linking together a sensitive optical sensor of ROS, with a fluorescent signaling moiety (FRET acceptor) that is activated upon binding to a genetically encoded receptor, called a fluorogen activating protein (FAP). The FAP-bound sensor is able to report (fluorescence signal) the physiology of the sensing at the site of interest.

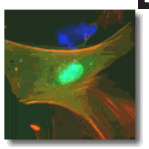


Student Ratings of CBMP Faculty Teaching FY2017

Name	Course	Type	Date	Rating	Ave
Butterworth	Investigation and Discovery	SGCS	Fall-16	4.60	4.60
Devor	Investigation and Discovery	SGCS	Fall-16	3.90	3.90
Drain	Investigation and Discovery	SGCS	Fall-16	4.60	4.60
Duker	Introduction to Being a Physician	SGCS	Fall-16	4.30	
Duker	Body Fluid Homeostasis Cardiovascular	LEC	Fall-16	4.80	
Duker	Digestion and Nutrition	LAB	Fall-16	4.90	
Duker	Cellular and Pathological Basis of Disease	LAB	Spring-17	4.50	
Duker	Immunology in Health and Disease	LAB	Spring-17	5.00	4.70
Kwiatkowski	Cellular and Pathological Basis of Disease	LEC	Spring-17	3.40	
Kwiatkowski	Cellular and Pathological Basis of Disease	LAB	Spring-17	5.00	4.20
Murray	Medical Anatomy	LEC	Fall-16	3.90	
Murray	Medical Anatomy	LAB	Fall-16	4.60	4.25
Stolz	Cellular and Pathological Basis of Disease	LAB	Spring-17	5.00	
Stolz	Digestion and Nutrition	LAB	Fall-16	4.70	4.85
	Overall Teaching Average			**4.51**	

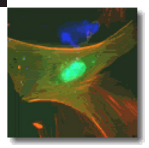
Type codes:

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



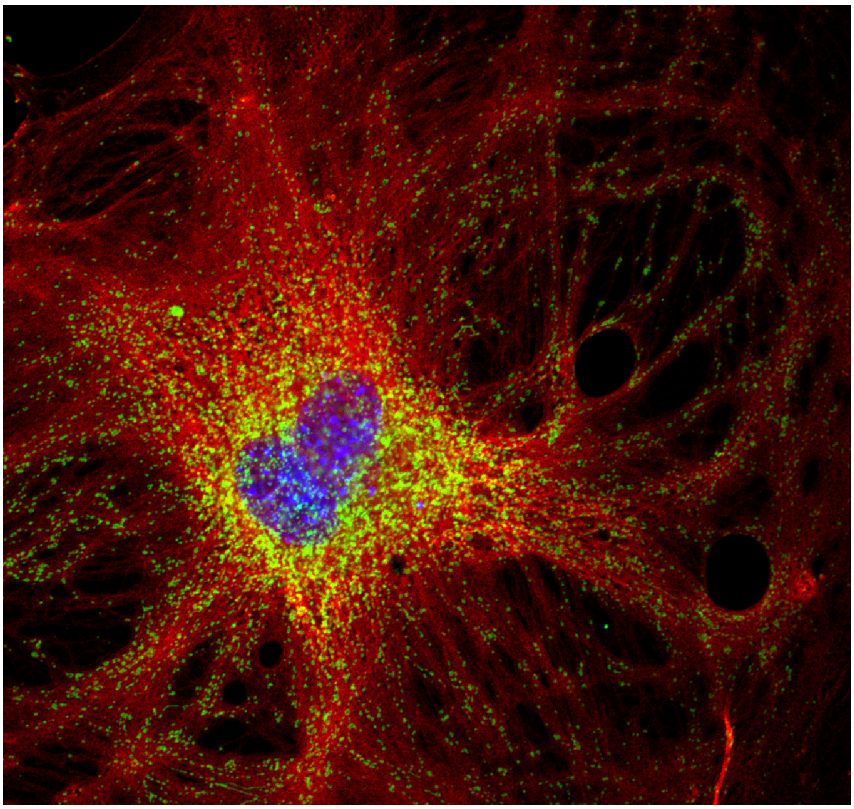
CBP FACULTY ROSTER
(Effective June, 2017)

Last Name	First	Rank	Status
Sorkin	Alexander	Professor & Chair	Tenured
Devor	Daniel	Professor	Tenured
Murray	Sandra	Professor	Tenured
Wan	Yong	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
Traub	Linton	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

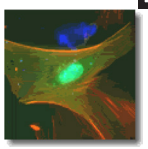


New CBP Faculty in FY17

Name	Prior Institution /Rank	Current Rank
Yi Shi	The Rockerfeller University New York, NY Research Associate	Assistant Professor
Claudette St. Croix	University of Pittsburgh Department of Environmental and Occupational Health Pittsburgh, PA 15260 Associate Professor	Associate Professor



Dr. Claudette St. Croix. A pretty picture of a senescent cell showing fragmented mitochondria (green), tubulin (red) and nuclei (blue).



Faculty Honors, Recognition and Professional Affiliations (Fiscal Year 2016-2017)

Michael Butterworth, Ph.D.
Assistant Professor

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

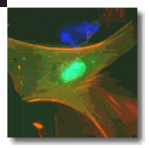
Member, Biophysical Society
Member, American Association for the Advancement of Science
Member, Society of General Physiologists
Member, American Diabetes Association

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

Sanford Leuba, Ph.D.
Associate Professor

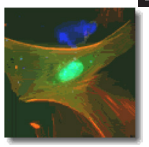
Member, Biophysical Society
Member, Spectroscopy Society of Pittsburgh

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

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

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
Member, North American Vascular Biology Association
Member, American Society for Investigative Pathology
Member, American Physiological Society

Stephen Thorne, Ph.D.
Assistant Professor

American Association of Cancer Research
American Society of Cellular and Gene Therapy
Society of Nuclear Medicine and Molecular Imaging

Linton M. Traub, Ph.D.
Associate Professor

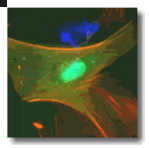
Member, American Society for Cell Biology
American Association for the Advancement of Science
American Society for Biochemistry and Molecular Biology

Yong Wan, Ph.D.
Professor

Member, American Association for Cancer Research
Member, American Association of Cell Biology
Member, American Association for the Advancement of Science

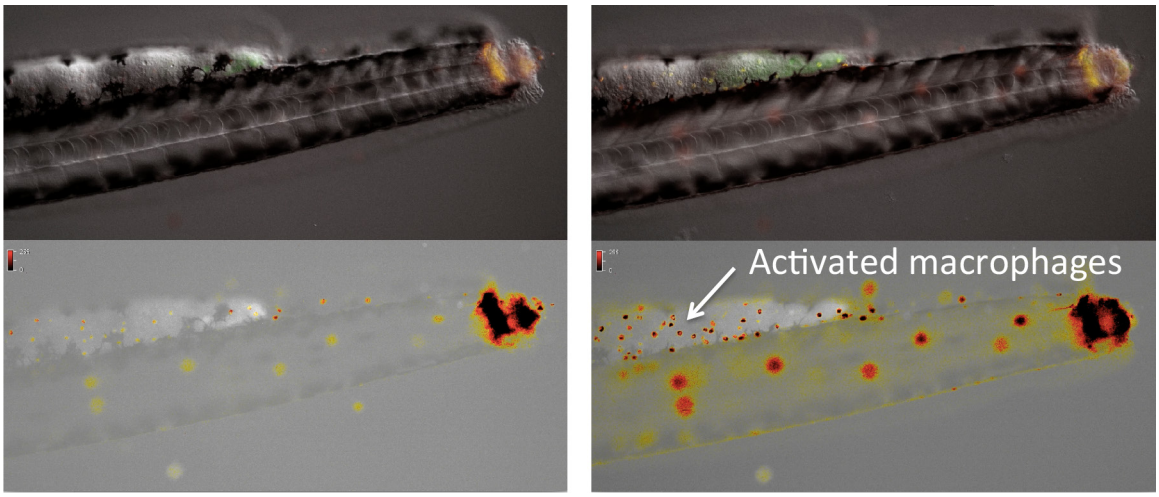
Simon C. Watkins, Ph.D.
Distinguished Professor and Vice Chairman, Director of Center of Biologic Imaging

Member, The Pittsburgh Cancer Institute

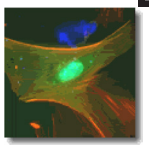


Nathan Yates, Ph.D.
Associate Professor

American Chemical Society
American Society for Mass Spectrometry



Dr. Claudette St. Croix. The activation of the ROS sensor in an embryonic zebrafish after tail injury are consistent with expected biological responses (activation of macrophages, wound-site activation).Representative Publication: He J, Wang Y, Missinato MA, Onuoha E, Perkins LA, Watkins SC, St Croix CM, Tsang M, Bruchez MP. Nat Methods. 2016 PubMed PMID: 26808669.



Faculty Presentations (Fiscal Year 2016-2017)

Michael Butterworth, Ph.D.
Assistant Professor

"MicroRNAs and the Regulation of Epithelial Ion Transport". Experimental Biology (FASEB) Chicago, IL, 2017

Gerald Hammond, Ph.D.
Assistant Professor

"It's all about the middle man: new insights into the metabolism and function of the phosphoinositides", Upstate Medical University, Syracuse, NY, 2017.

"Multitasking Molecules: new insights into the metabolism and function of the phosphoinositides" Penn State University, State College, PA, 2017.

"An inositol lipid conductor and the membrane orchestra", Senior Vice Chancellor's Seminar Series, University of Pittsburgh, 2017.

"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.

Yang Hong, Ph.D.
Associate Professor

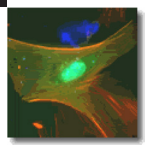
Annual Drosophila Research Conference, San Diego, March, 2017
PGH Translational Medicine Research Conference, Guangzhou, China, November 2016

Adam Kwiatkowski, Ph.D.
Assistant Professor

"Talk, Cell Contact & Adhesion", Gordon Research Conference, Andover, NH. June, 2017.

Yi Shi, Ph.D.
Assistant Professor

Magee Women's Research Institute, Pittsburgh, PA, May 2017.
65th American Society of Mass Spectrometry (ASMS) Conference on Mass Spectrometry and Allied Topics, Indianapolis, IN, June, 2017



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

Regeneron Pharmaceuticals, Inc., Teddytown, NY, November 2016
University of Nebraska, December 2016
Ryerson University, Toronto, Canada, February 2017
Genentech, Inc., San Francisco, CA, April 2017
University of San Francisco, CA, April 2017
Stanford University, Palo Alto, CA, April 2017

Donna B. Stolz, Ph.D.
Associate Professor

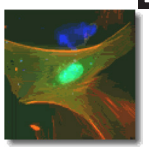
Keynote Speaker, Duquesne University of Biological Sciences Retreat "Not all who wander are lost: My story of navigating the world of Biomedical Science as a Cell Biologist", August 2016.
Nobel Autophagy: "A Lot to Digest". University of Pittsburgh Medical School Nobel Lectures, December 2016.

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

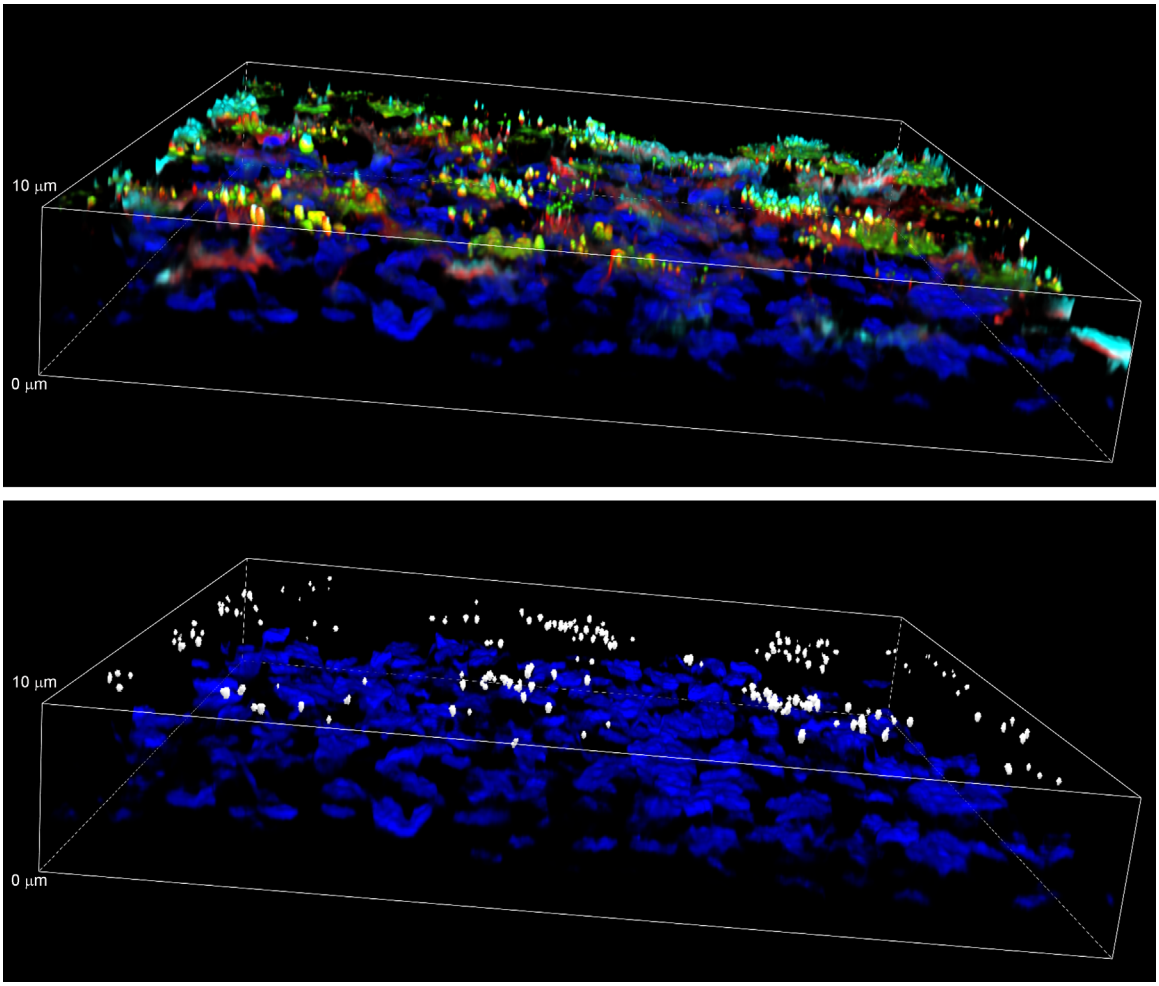
Inaugural lecture, Distinguished Professor, "From Little Animals to Moving Molecules".
University of Pittsburgh, September 15th 2016
Opportunities in Correlative EM, JEOL USA, September 28th, 2016
Ohio State University, Department of Physics, Invited Colloquim speaker "From Little Animals to Moving Molecules", February 1 2017
Canadian Microscopy and Cytometry Symposium Montreal Quebec: May 9th 2017 Round Table Leader: Choices and Imperatives for facility management
Canadian Microscopy and Cytometry Symposium Montreal Quebec: May 11th 2017 Super-Resolution imaging past, present and future. Invited speaker.

Nathan Yates, Ph.D.
Associate Professor

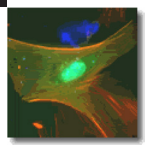
"Rapid Identification of Proteins that Bind Small Molecule Drugs by Differential Intensity Screening and Ranking of Unknown Protein Targets (DISRUPT)" Cell Biology Retreat, Pittsburgh, PA, September 2016
"Precision Proteomics-New Tech Reveals Novel Drug Targets" Science 2016 –Game Changers, Pittsburgh, PA, October 2016
"Introduction to the Biomedical Mass Spectrometry Center" Immunology Department Meeting, Pittsburgh, PA, December 2016
"Introduction to Proteomics at the University of Pittsburgh" Kallyope, New York, NY, December 2016



"Application of Differential Mass Spectrometry for the Unbiased Identification of CSF Biomarkers and Novel Protein Targets" Center of Excellence for Computational Chemogenomics Drug Abuse Research (CDAR), Pittsburgh, PA, December 2016
"Performance Proteomics – Next Generation Technology Needs for Precision Medicine" Mozaic Solutions Annual Meeting, Pittsburgh, PA, May 2017
"Modular Design and Independent Control: Two Important Features For Prototyping Innovative Nanoflow Chromatography Systems" CPSA Analytics, Pittsburgh, PA, May 2017
"Benefits of Larger Studies in Discovery Proteomics" New Objective ASMS Users Meeting, Indianapolis, IN, June 2017



Dr. Claudette St. Croix. 3D confocal reconstruction of human airway endothelial cells stimulated with IL-13 showing immuno-localization of 15LO1 (green), PEBP1 (red) and GPX(4) (cyan). The white puncta in the bottom panel identify regions where the three proteins co-localize. These three proteins (15LO1, PEBP1 and GPX4) through their interactions with each other and with phospholipids in a complex termed "a redox phospholipoxysome" (RPL), are purported to play a fundamental role in determining the episodic nature asthma. This work will appear in the October 19th, 2017 issue of Cell ("PEBP1 Wardens Ferroptosis by Enabling Lipoxygenase Generation of Lipid Death Signals" by SE Wenzel, YY Tyurina, J Zhao, CM St. Croix, G Mao, VA Tyurin, TS Anthonymuthu, AA Kapralov, K Mikulska-Ruminska, IH Shrivastava, E Kenny, Q Yang, HH Dar, F Qu, AA Amoscato, LJ Sparvero, DR Emlet, JC Rosenbaum, SC Watkins, AP VanDemark, JA Kellum, Y Minami, I Bahar, H Bayir, VE Kagan.)



Peer Reviewed Publications (Fiscal Year 2018-2017)

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.

Long KR and Aridor M. (2017) ER Exit Sites Organization Regulates Sec13/31 assembly. In preparation.

Michael Butterworth, Ph.D.
Assistant Professor

Roy, A., Al-Qusairi, L., Donnelly, B.F., Ronzaud, C., Marciszyn, A., Gong, F., Chang, Y.P, Butterworth, M.B., Pastor-Soler, N., Hallows, K.R., Staub, O. and Subramanya, A.R. (2015). Alternatively spliced proline-rich cassettes link WNK1 to aldosterone-dependent signaling cascades. *Journal of Clinical Investigation*. 125(9):3433-48.

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.

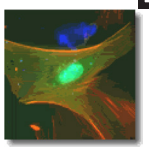
Mukherjee, A., Wang, Z., Kinlough, C.L., Poland, P.A., Marciszyn, A.L., Montalbetti, N., Carattino, M.D., Butterworth, M.B., Kleyman, T.R. and Hughey, R.P. (2017). Specific palmitoyltransferases associate with and activate the Epithelial Sodium Channel. Journal of Biological Chemistry. 292(10):4152-4163.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

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

Antonny B, Burd C, DeCamilli P, Chen E, Daumke O, Faelber K, Ford M, Frolov VA, Frost A, Hinshaw JE, Kirchhausen T, et al. Membrane fission by dynamin: what we know and what we need to know. EMBO J. 2016 Nov 2;35(21):2270-2284.

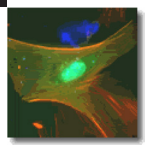
Natalia Varlakhanova Ford, Ph.D.
Research Assistant Professor

Varlakhanova NV, Clark N, Watkins SC & Ford MGJ. A role for the dynamin related protein Vps1 in microautophagy in *Saccharomyces cerevisiae*.

Varlakhanova NV, Mihalevic M, Bernstein K, Ford MGJ. Pib2 and EGO Complex are Both Required for Activation of TORC1. J. Cell Sci. (in revision)

Gerald Hammond, Ph.D.
Assistant Professor

Bojjireddy, N. Botyanszki, J., Hammond, G. R. V., Creech, D., Peterson, R., Kemp, D., Snead, M., Brown, R., Wilson, S., Harrison, S., Moore, C. and Balla, T. Pharmacological and Genetic



targeting of PI4KA reveals its important role in maintaining plasma membrane PtdIns4P and PtdIns(4,5)P_2 levels and cellular responsiveness to Gq-coupled receptors. J Biol Chem. 2014. 289 (9): 6120-32. PMID 24415756

Hammond, G. R. V.*, Machner, M. and Balla, T. A Novel Probe for Phosphatidylinositol-4-Phosphate Reveals Multiple Pools Beyond the Golgi. J Cell Biol. 2014. 205 (1). PMID 24711504

Hammond G. R. V.*, Takasuga, S., Sasaki, T., Balla, T. The ML1Nx2 Phosphatidylinositol 3,5-Bisphosphate Probe Shows Poor Selectivity in Cells. Falasca M, editor. PLoS ONE. 2015;10(10):e0139957. PMID 26460749

Xie, S., Bahl, K., Reinecke, J.B., Hammond, G. R. V., Naslavsky, N., Caplan, S. The endocytic recycling compartment maintains cargo segregation acquired upon exit from the sorting endosome. Mol Biol Cell. American Society for Cell Biology; 2016 Jan 1;27(1):108–26. PMID 26510502

Tóth, J. T., Gulyás, G., Tóth, D.J., Balla, A., Hammond, G. R. V., Hunyady, L., et al. BRET-monitoring of the dynamic changes of inositol lipid pools in living cells reveals a PKC-dependent PtdIns4P increase upon EGF and M3 receptor activation. BBA - Molecular and Cell Biology of Lipids. Elsevier B.V; 2016 Mar 1;1861(3):177–87. PMID 26692031

Levin R, Hammond GRV, Balla T, DeCamillli P, Fairn, GD, Grinstein S. 2017. Multiphasic dynamics of phosphatidylinositol 4-phosphate during phagocytosis. Mol Biol Cell 28, 128-140.

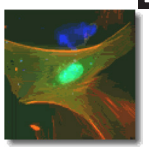
Yang Hong, Ph.D.
Associate Professor

Liu K, Lin Q, Wei Y, He R, Shao X, Ding Z, Zhang J, Zhu M, Weinstein LS, Hong Y, Li H and Li H. (2015) Gαs regulates asymmetric cell division of cortical progenitors by controlling Numb mediated Notch signaling suppression. Neurosci Lett. 597:97-103. PMID:25916881.

Yuva-Aydemir Y, Xu X-L, Aydemir O, Gascon E, Sayin S, Zhou W, Hong Y, and Gao F-B. (2015) Downregulation of the Host Gene jigr1 by miR-92 Is Essential for Neuroblast Self-Renewal in Drosophila. PLoS Genetics 11(5): e1005264. PMID:26000445

Dong W, Zhang XJ, Liu WJ, Chen YJ, Huang J, Austin E, Celotto A, Jiang WZ, Palladino MJ, Jiang Y, Hammond GR and Hong Y. (2015) A conserved polybasic motif mediates plasma membrane targeting of Lgl and its regulation by hypoxia. J Cell Biology 211(2):273-286. PMID: 26483556

Liu Y, Yu Q, Shao X, Ding Z, Wang Q, Deng Y, Jiang N, Wang Y, Lu T, Wang Y, Yang S, Jiang C, Xu Z, Hong, Y, Li HC, and Li HS. (2016) Numb regulates vesicular docking for homotypic fusion of early endosomes via membrane recruitment of Mon1b. Cell Research 26(5):593-612. PMID: 26987402 PMCID: PMC4856763



Liu K, Lei R, Li Q, Wang X, Wu Q, An P, Zhang J, Zhu M, Xu Z, Hong Y, Wang F, Shen Y, Li H, and Li HS. (2016) Transferrin receptor controls AMPA receptor trafficking efficiency and synaptic plasticity. Scientific Reports 6:21019. PMID: 26880306 PMCID: PMC4754636

Lei R, Zhang K, Wei Y, Chen M, Weinstein LS, Hong Y, Zhu M, Li H, Li H. (2016) G-Protein α-Subunit Gsα Is Required for Craniofacial Morphogenesis. PloS One. 2016; 11(2):e0147535. PMID: 26859889 PMCID: PMC4747491

Shao X, Liu Y, Yu Q, Ding Z, Wang Q, Deng Y, Jiang N, Wang Y, Lu T, Wang Y, Yang S, Jiang C, Xu Z, Hong Y, Li HC and Li HS. (2016) Numb regulates vesicular docking for homotypic fusion of early endosomes via membrane recruitment of Mon1b. Cell Research 26(5):593-612. PMID: 26987402 PMCID: PMC4856763

Zhang J, Shao X, Sun H, Liu K, Ding Z, Chen J, Fang L, Su W, Hong Y, Li H and Li H. (2016) NUMB negatively regulates the epithelial-mesenchymal transition of triple-negative breast cancer by antagonizing Notch signaling. Oncotarget. 7(38):61036-53. PMID: 27506933

Cao H, Xu R, Shi Q, Zhang D, Huang J and Hong Y. (2017) FERM Domain Phosphorylation and Endogenous 3'UTR are not Essential for Regulating the Function and Subcellular Localization of Polarity Protein Crumbs. J Genetics & Genomics (in press)

Chen Y-J, Huang J, Huang L, Austin E and Hong Y. (2017) Phosphorylation Potential of Drosophila E-Cadherin Intracellular Domain is Essential for Development and Regulating Adherens Junction Biosynthetic Dynamics. Development 144(7):1242-1248. PMID: 28219947

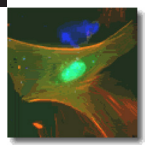
Adam Kwiatkowski, Ph.D.
Assistant Professor

McConnell RE, van Veen JE, Vidaki M, Kwiatkowski AV, Meyer AS, Gertler FB. A Requirement for Filopodia Extension Towards Slit During Robo-Mediated Axon Repulsion. J Cell Biol. 2016 Apr 25;213(2):261-74. PMID: 27091449

Wickline ED, Dale IW, Merkel CD, Heier JA, Stolz DB, Kwiatkowski AV. Alpha-T-Catenin Is a Constitutive Actin-Binding α-Catenin That Directly Couples the Cadherin-Catenin Complex to Actin Filaments. J Biol Chem. 2016 Jul 22;291(30):15687-99. PMID: 27231342

Kang H, Bang I, Jin KS, Lee B, Lee J, Shao X, Heier JA, Kwiatkowski AV, Nelson WJ, Hardin J, Weis WI, Choi HJ. Structural and Functional Characterization of Caenorhabditis elegans □-Catenin Reveals Constitutive Binding to □-catenin and F-actin. 2017 March 15 Epub. PMID: 28298447

Heier JA, Dickinson DJ, Kwiatkowski AV. Measuring Protein Binding to F-actin by Co-sedimentation. J. Vis. Exp. (), e55613, doi:10.3791/55613 (2017). In press



Sanford Leuba, Ph.D.
Associate Professor

Pastrana CL, Carrasco C, Akhtar P, Leuba SH, Khan SA, Moreno-Herrero F. (2016) Force and twist dependence of RepC nicking activity on torsionally-constrained DNA molecules. Nucleic Acids Res. 2016 Aug 3. pii: gkw689. [Epub ahead of print] PMID:27488190 DOI:10.1093/nar/gkw689

Sandra A. Murray, Ph.D.
Professor

Falk, M.M., Bell, C.L., Kells Andrews, R.M., and Murray, S.A. Formation, Trafficking and Processing of Annular Gap Junctions, BMC Cell Biology Journal, Section: Cell-Cell Contacts & Adhesion 17:5-23, 2016.

Shakespeare, T. I., O'Neil, S.J., Nickel, B., and Murray, S.A. Life and Times of the Annular Gap Junction: Morphological and Dynamic Changes, Submitted, 2016.

Murray, S.A., and Shakespeare, T.I. Immunofluorescence: application for analysis of connexin disstribution and trafficking. Gap Junction Channels and Hemichannels. Boca Raton, FL: CRC Press. Taylor & Francis Group (2016), pp. 1-19.ISBN: 9781498738620.

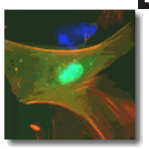
Vanderpuye, V.O., Bell, C.L., and Murray, S.A., Dynamic Redistribution of Connexin 43 During Cell Division. Cell Biology International 40(4):387-96, 2016, doi: 10.1002/cbin.10576.

Bell, C.L., and Murray, S.A. Adrenocortical Gap Junctions and Their Functions. Frontier in Endocrinology 2016 ACTH action in the Adrenal Cortex: From Molecular Biology to Pathophysiology 29:1-13, 2016, doi. 10.3389/fendo.2016.00082.

Yi Shi, Ph.D.
Assistant Professor

Fernandez-Martinez, J.*, Kim, S.J.*, Shi, Y.,* Paula, U.*, Pallerin, R.*, Zenklusen, D., Chemmama, I, Nudelman, I., Wang, J.J., Timney, B., Williams, R., Strokes, D.L., Chait, B.T., Sali, A., and Rout, M.P . (2016). Structure and function of the cytoplasmic mRNA export platform. Cell 167 (5), 1215-1228. (* equal contribution)

Kim, S.J.*, Fernandez-Martinez, J.*, Nudelman, I.*, Shi, Y.*, Zhang, W., Raveh, B., Herricks, T., Slaughter, B.D., Hogan, J., Paula, U., Chemmama, I., Pallerin, R., Echeverria, I., Shivaraju, M., Chaudhury, A.S., Wang, J.J., Williams, R., Unruh, J.R., Greenberg, C.H., Jacobs, E.Y., Yu, Z., De la Cruz, M.J., Mironska, R., Strokes, D.L., Aitchison, J.D., Jarrold, M.F., Gerton, J.L., Ludtke, S.J., Akey, C.W., Chait, B.T., Sali, A., and Rout, M.P. Structure and Functional Anatomy of the Nuclear Pore Complex. Nature (under revision). (* equal contribution)



Chait, B.T., Cadene, M., Olinares, P.D., Rout, M.P. & Shi, Y. (2016). Revealing Higher Order Protein Structure Using Mass Spectrometry. JASMS 27, 952-965.

Shi, Y., Pellarin, R., Fridy, P.C., Fernandez-Martinez, J., Thompson, M.K., Li, Y., Wang, Q.J., Sali, A., Rout, M.P., and Chait, B.T. (2015). A strategy for dissecting the architectures of native macromolecular assemblies. Nature Methods 12, 1135-1138.

Sun, J., Shi, Y., Georgescu, R.E., Yuan, Z., Chait, B.T., Li, H., and O'Donnell, M.E. (2015). The architecture of a eukaryotic replisome. Nat Struct Mol Biol 22, 976-982.

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

Caltagarone, J., Ma, S. and Sorkin, A. (2015) Dopamine transporter is enriched in filopodia and induces filopodia formation. *Mol. Cell. Neuroscience.* 2015 Apr 30;68:120-130. PMID: 25936602

Tomas, A., Vaughan, S. O., Burgoyne, T., Sorkin, A., Hartley., Hochhauser, J. A. D., Futter, C. E. WASH and Tsg101/Alix-dependent diversion of stress-activated EGFR from the canonical endocytic pathway. *Nat. Comm*. 2015 Jun12;6:7324. PMID: 26066081.

Cheng, M.H., Hua, F., Block, E., Sorkin, A. and Bahar, I. Insights into mechanisms of dopamine transporter function modulation by amphetamine, orphenadrine and cocaine binding. *Frontiers Neuropharm.* 2015 Jun 9:6:134. PMID: 26106364

Fortian, A., Dionne, L. K., Hong, S. H., Kim, W., Gygi, S. P., Watkins, S., and Sorkin, A. (2015) Endocytosis of ubiquitylation-deficient EGF receptor mutants via clathrin coated pits is mediated by ubiquitylation. *Traffic.* 2015 Aug 7. Epub hade of print. PMID 26251007

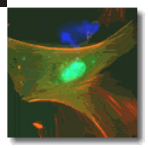
Block, E., Nuttle, J., Balcita-Pedicino, J. J., Caltagarone, J., Sesack, S. R., and Sorkin, A. (2015) Brain region-specific trafficking of the dopamine transporter. *J. Neurosci.* 2015 Sep 16:35(37):12845-58. PMID: 26377471

Martínez-Mármo, R., Comes, N., Pérez-Verdaguer, M., Vicente, R., Pujadas, L., Soriano, E., Sorkin, A., Felipe, A. (2016) Unconventional EGF-induced ERK1/2-mediated Kv1.3 endocytosis. *Cell.Mol.Life Sci.* Apr;73(7):1515-28. Epub 2015 Nov 5. PMID: 26542799

Pinilla-Macua I, Watkins, S. C., and Sorkin, A. (2016) Endocytosis separates active EGF receptors from endogenously labeled HRas and diminishes signaling to MAP kinases from endosomes. Proc Natl Acad Sci U S A. 2016 Feb 23;113(8):2122-7. PMID: 26858456

Martínez-Mármol, R., Styrczewska, K., Pérez-Verdaguer, M., Vallejo-Gracia, A., Comes, N., Sorkin, Felipe, A. Ubiquitination mediates Kv1.3 endocytosis as a mechanism for protein kinase C-dependent modulation. *Sci. Reports (Nature)* In press.

Ma, S., Cheng, M. H., Guthrie, D.A., Newman, A. H., Bahar, I., and Sorkin, A. Targeting of dopamine transporter to filopodia requires an outward-facing conformation of the transporter.



(2017) *Sci. Reports (Nature)* In press.

Claudette St. Croix, Ph.D.
Associate Professor

Phinney DG, Di Giuseppe M, Njah J, Sala E, Shiva S, St Croix CM, Stolz DB,Watkins SC, Di YP, Leikauf GD, Kolls J, Riches DW, Deiuliis G, Kaminski N,Boregowda SV, McKenna DH, Ortiz LA. Mesenchymal stem cells use extracellular vesicles to outsource mitophagy and shuttle microRNAs. Nat Commun. 2015 Oct 7;6:8472. doi: 10.1038/ncomms9472. PubMed PMID: 26442449; PubMed Central PMCID:PMC4598952.

Khoo NK, Cantu-Medellin N, St Croix C, Kelley EE. In Vivo Immuno-Spin Trapping: Imaging the Footprints of Oxidative Stress. Curr Protoc Cytom. 2015 Oct 1;74:12.42.1-11. doi: 10.1002/0471142956.cy1242s74. PubMed PMID: 26423693.

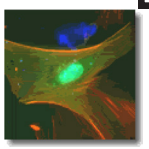
Balasubramanian K, Maeda A, Lee JS, Mohammadyani D, Dar HH, Jiang JF, St Croix CM, Watkins S, Tyurin VA, Tyurina YY, Klöditz K, Polimova A, Kapralova VI, Xiong Z, Ray P, Klein-Seetharaman J, Mallampalli RK, Bayir H, Fadeel B, Kagan VE. Dichotomous roles for externalized cardiolipin in extracellular signaling:Promotion of phagocytosis and attenuation of innate immunity. Sci Signal. 2015 Sep 22;8(395):ra95. doi: 10.1126/scisignal.aaa6179. PubMed PMID: 26396268; PubMed Central PMCID: PMC4760701.

St Croix CM, Steinhorn RH. New Thoughts about the Origin of Plexiform Lesions. Am J Respir Crit Care Med. 2016 Mar 1;193(5):484-5. doi:10.1164/rccm.201510-1959ED. PubMed PMID: 26930432.

Lai YC, Tabima DM, Dube JJ, Hughan KS, Vanderpool RR, Goncharov DA, St Croix CM, Garcia-Ocaña A, Goncharova EA, Tofovic SP, Mora AL, Gladwin MT.SIRT3-AMP-Activated Protein Kinase Activation by Nitrite and Metformin Improves Hyperglycemia and Normalizes Pulmonary Hypertension Associated With Heart Failure With Preserved Ejection Fraction. Circulation. 2016 Feb 23;133(8):717-31. PubMed PMID: 26813102; PubMed Central PMCID: PMC4766041.

Kagan VE, Jiang J, Huang Z, Tyurina YY, Desbourdes C, Cottet-Rousselle C, Dar HH, Verma M, Tyurin VA, Kapralov AA, Cheikhi A, Mao G, Stolz D, St Croix CM,Watkins S, Shen Z, Li Y, Greenberg ML, Tokarska-Schlattner M, Boissan M, Lacombe ML, Epand RM, Chu CT, Mallampalli RK, Bayır H, Schlattner U. NDPK-D (NM23-H4)-mediated externalization of cardiolipin enables elimination of depolarized mitochondria by mitophagy. Cell Death Differ. 2016 Jan 8. doi: 10.1038/cdd.2015.160. [Epub ahead of print] PubMed PMID: 26742431.

Mao G, Qu F, St Croix CM, Tyurina YY, Planas-Iglesias J, Jiang J, Huang Z, Amoscato AA, Tyurin VA, Kapralov AA, Cheikhi A, Maguire J, Klein-Seetharaman J, Bayır H, Kagan VE. Mitochondrial Redox Opto-Lipidomics Reveals Mono-Oxygenated Cardiolipins as Pro-Apoptotic Death Signals. ACS Chem Biol. 2016 Feb 19;11(2):530-40. doi: 10.1021/acschembio.5b00737. Epub 2016 Jan 5. PubMed PMID: 26697918.



Stoner MW, Thapa D, Zhang M, Gibson GA, Calderon MJ, St Croix CM, Scott I. α-Lipoic Acid Promotes α-Tubulin Hyperacetylation and Blocks the Turnover of Mitochondria through Mitophagy. Biochem J. 2016 Apr 20. pii: BCJ20160281. [Epub ahead of print] PubMed PMID: 27099338.

He J, Wang Y, Missinato MA, Onuoha E, Perkins LA, Watkins SC, St Croix CM, Tsang M, Bruchez MP. A genetically targetable near-infrared photosensitizer. Nat Methods. 2016 Mar;13(3):263-8. doi: 10.1038/nmeth.3735. Epub 2016 Jan 25. PubMed PMID: 26808669.

Dezfulian C, Kenny E, Lamade A, Misse A, Krehel N, St Croix C, Kelley EE, Jackson TC, Uray T, Rackley J, Kochanek PM, Clark RS, Bayir H. Mechanistic characterization of nitrite-mediated neuroprotection after experimental cardiac arrest. J Neurochem. 2016 Nov;139(3):419-431. doi: 10.1111/jnc.13764. PubMed PMID: 27507435.

Rogers NM, Sharifi-Sanjani M, Yao M, Ghimire K, Bienes-Martinez R, Mutchler, SM, Knupp HE, Baust J, Novelli EM, Ross M, St Croix C, Kutten JC, Czajka CA, Sembrat JC, Rojas M, Labrousse-Arias D, Bachman TN, Vanderpool RR, Zuckerbraun BS, Champion HC, Mora AL, Straub AC, Bilonick RA, Calzada MJ, Isenberg JS. TSP1-CD47 Signaling is Upregulated in Clinical Pulmonary Hypertension and Contributes to Pulmonary Arterial Vasculopathy and Dysfunction. Cardiovasc Res. 2016 Oct 13. pii: cvw218. [Epub ahead of print] PubMed PMID: 27742621.

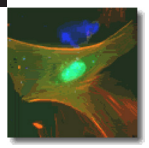
Kelly NJ, Dandachi N, Goncharov DA, Pena AZ, Radder JE, Gregory AD, Lai YC, Leme AS, Gladwin MT, Goncharova EA, St Croix CM, Shapiro SD. Automated Measurement of Blood Vessels in Tissues from Microscopy Images. Curr Protoc Cytom. 2016 Oct 10;78:12.44.1-12.44.13. doi: 10.1002/cpcy.10. PubMed PMID: 27723088.

Olonisakin TF, Li H, Xiong Z, Kochman EJ, Yu M, Qu Y, Hulver M, Kolls JK, St Croix C, Doi Y, Nguyen MH, Shanks RM, Mallampalli RK, Kagan VE, Ray A, Silverstein RL, Ray P, Lee JS. CD36 provides host protection against Klebsiella pneumoniae intrapulmonary infection by enhancing LPS responsiveness and macrophage phagocytosis. J Infect Dis. 2016 Sep 28. pii: jiw451. [Epub ahead of print] PubMed PMID: 27683817.

Pohl PH, Lozito TP, Cuperman T, Yurube T, Moon HJ, Ngo K, Tuan RS, St Croix C, Sowa GA, Rodrigues LM, Kang JD, Vo NV. Catabolic effects of endothelial cell-derived microparticles on disc cells: Implications in intervertebral disc neovascularization and degeneration. J Orthop Res. 2016 Aug;34(8):1466-74. doi:0.1002/jor.23298. PubMed PMID: 27246627.

Khare A, Raundhal M, Chakraborty K, Das S, Corey C, Kamga CK, Quesnelle K, St Croix C, Watkins SC, Morse C, Oriss TB, Huff R, Hannum R, Ray P, Shiva S, Ray A. Mitochondrial H2O2 in Lung Antigen-Presenting Cells Blocks NF-κB Activation to Prevent Unwarranted Immune Activation. Cell Rep. 2016 May 24;15(8):1700-14. doi: 10.1016/j.celrep.2016.04.060. PubMed PMID: 27184852; PubMed Central PMCID: PMC4880515.

Lai YC, Tabima DM, Dube JJ, Hughan KS, Vanderpool RR, Goncharov DA, St Croix CM, Garcia-Ocaña A, Goncharova EA, Tofovic SP, Mora AL, Gladwin MT. SIRT3-AMP-Activated Protein Kinase Activation by Nitrite and Metformin Improves Hyperglycemia and Normalizes



Pulmonary Hypertension Associated With Heart Failure With Preserved Ejection Fraction. Circulation. 2016 Feb 23;133(8):717-31. doi: 10.1161/CIRCULATIONAHA.115.018935. PubMed PMID: 26813102; PubMed Central PMCID:PMC4766041.

Osei-Hwedieh DO, Kanias T, St Croix C, Jessup M, Xiong Z, Sinchar D, Franks J, Xu Q, M Novelli E, Sertorio JT, Potoka K, Binder RJ, Basu S, Belanger AM, Kim-Shapiro DB, Triulzi D, Lee JS, Gladwin MT. Sickle Cell Trait Increases Red Blood Cell Storage Hemolysis and Post-Transfusion Clearance in Mice. EBioMedicine. 2016 Sep;11:239-248. doi: 10.1016/j.ebiom.2016.08.006. PubMed PMID: 27523807; PubMed Central PMCID: PMC5049931.

Dukes AA, Bai Q, Van Laar VS, Zhou Y, Ilin V, David CN, Agim ZS, Bonkowsky JL, Cannon JR, Watkins SC, St Croix CM, Burton EA, Berman SB. Live imaging of mitochondrial dynamics in CNS dopaminergic neurons in vivo demonstrates early reversal of mitochondrial transport following MPP(+) exposure. Neurobiol Dis. 2016 Nov;95:238-49. doi: 10.1016/j.nbd.2016.07.020. PubMed PMID: 27452482; PubMedCentral PMCID: PMC5010936.

Sehrawat A, St. Croix C, Baty CJ, Watkins S, Tailor D, Singh RP, Singh SV. Inhibition of mitochondrial fusion is an early and critical event in breast cancer cell apoptosis by dietary chemopreventative benzyl isothiocyanate. Mitochondrion. 2016 Sep;30:67-77. doi: 10.1016/j.mito.2016.06.006. PubMed PMID: 27374852; PubMed Central PMCID: PMC5023488.

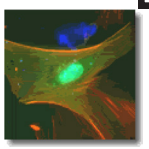
Mischler SE, Cauda EG, Di Giuseppe M, McWilliams LJ, St Croix C, Sun M, Franks J, Ortiz LA. Differential activation of RAW 264.7 macrophages by size-segregated crystalline silica. J Occup Med Toxicol. 2016 Dec 15;11:57. doi:10.1186/s12995-016-0145-2. PubMed PMID: 28018477; PubMed Central PMCID:PMC5159951.

Braganza A, Li J, Zeng X, Yates NA, Dey NB, Andrews J, Clark J, Zamani L, Wang XH, St Croix C, O'Sullivan R, Garcia-Exposito L, Brodsky JL, Sobol RW. UBE3B is a Calmodulin-Regulated, Mitochondria-Associated E3 Ubiquitin Ligase. J Biol Chem.2016 Dec 21. pii: jbc.M116.766824. doi: 10.1074/jbc.M116.766824. [Epub ahead of print] PubMed PMID: 28003368.

Dezfulian C, Kenny E, Lamade A, Misse A, Krehel N, St Croix C, Kelley EE, Jackson TC, Uray T, Rackley J, Kochanek PM, Clark RS, Bayir H. Mechanistic characterization of nitrite-mediated neuroprotection after experimental cardiac arrest. J Neurochem. 2016 Nov;139(3):419-431. doi: 10.1111/jnc.13764. PubMed PMID: 27507435.

Wang Y, Ballou B, Schmidt BF, Andreko S, St Croix CM, Watkins SC, Bruchez MP. Affibody-targeted fluorogen activating protein for in vivo tumor imaging. Chem Commun (Camb). 2017 Feb 7;53(12):2001-2004. doi: 10.1039/c6cc09137g. PubMed PMID:28120951; PubMed Central PMCID: PMC5340305.

Chakraborty K, Raundhal M, Chen BB, Morse C, Tyurina YY, Khare A, Oriss TB, Huff R, Lee JS, St Croix CM, Watkins S, Mallampalli RK, Kagan VE, Ray A, Ray P. The mito-DAMP cardiolipin blocks IL-10 production causing persistent inflammation during bacterial pneumonia. Nat Commun. 2017 Jan 11;8:13944. doi:10.1038/ncomms13944. PubMed PMID: 28074841; PubMed Central PMCID: PMC5241690.



Zhao J, Fuhrmann-Stroissnigg H, Gurkar AU, Flores RR, Dorronsoro A, Stolz DB, St Croix CM, Niedernhofer LJ, Robbins PD. Quantitative Analysis of Cellular Senescence in Culture and In Vivo. Curr Protoc Cytom. 2017 Jan 5;79:9.51.1-9.51.25. doi: 10.1002/cpcy.16. PubMed PMID: 28055114.

Wesolowski J, Weber MM, Nawrotek A, Dooley CA, Calderon M, St Croix CM, Hackstadt T, Cherfils J, Paumet F. Chlamydia Hijacks ARF GTPases To Coordinate Microtubule Posttranslational Modifications and Golgi Complex Positioning. MBio. 2017 May 2;8(3). pii: e02280-16. doi: 10.1128/mBio.02280-16. PubMed PMID:28465429; PubMed Central PMCID: PMC5414008.

Wang Y, Ballou B, Schmidt BF, Andreko S, St Croix CM, Watkins SC, Bruchez MP. Affibody-targeted fluorogen activating protein for in vivo tumor imaging. Chem Commun (Camb). 2017 Feb 7;53(12):2001-2004. doi: 10.1039/c6cc09137g. PubMed PMID: 28120951; PubMed Central PMCID: PMC5340305.

Kagan VE, Mao G, Qu F, Angeli JP, Doll S, St Croix C, Dar HH, Liu B, Tyurin VA, Ritov VB, Kapralov AA, Amoscato AA, Jiang J, Anthonymuthu T, Mohammadyani D, Yang Q, Proneth B, Klein-Seetharaman J, Watkins S, Bahar I, Greenberger J, Mallampalli RK, Stockwell BR, Tyurina YY, Conrad M, Bayır H. Oxidized arachidonic and adrenic PEs navigate cells to ferroptosis. Nat Chem Biol. 2017 Jan;13(1):81-90. doi: 10.1038/nchembio.2238. Epub 2016 Nov 14. PubMed PMID: 27842066.

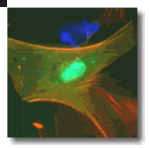
Watson AM, Rose AH, Gibson GA, Gardner CL, Sun C, Reed DS, Lam LKM, St Croix, CM, Strick PL, Klimstra WB, Watkins SC. Ribbon scanning confocal for high-speed high-resolution volume imaging of brain. PLoS One. 2017 Jul 7;12(7):e0180486. doi: 10.1371/journal.pone.0180486. eCollection 2017. PubMed PMID: 28686653; PubMed Central PMCID: PMC5501561.

Billaud M, Phillippi JA, Kotlarczyk MP, Hill JC, Ellis BW, St Croix CM, Cantu-Medéllin N, Kelley EE, Gleason TG. Elevated oxidative stress in the aortic media of patients with bicuspid aortic valve. J Thorac Cardiovasc Surg. 2017 May 25. pii: S0022-5223(17)31118-2. doi: 10.1016/j.jtcvs.2017.05.065. [Epub ahead of print] PubMed PMID: 28651938.

Donna B. Stolz, Ph.D.
Associate Professor

Gandhi CR, JR Chaillet, MA Nalesnik, S Kumar, A Dangi, AJ Demetris, R Ferrel, T Wu, S Divanovic, T Stankeiwicz, B Shaffer, DB Stolz, SA Harvey, J Wang, TE Starzl. Liver-specific deletion of Augmentor of liver regeneration accelerates development of steatohepatitis and hepatocellular carcinoma. Gastroenterology. 148(2):379-391. 2015. PMID 25448926

Wheeler SE, JT Borenstein, AM Clark, MR Ebrahimkhani, IJ Fox, L Griffith, W Inman, D Lauffenburger, T Nguyen, VC Pillai, R Prantil-Braun, DB Stolz, DTaylor, T Ulrich, R Venkataramanan, A Wells C Young. All-Human microphysical model of metastasis therapy. Stem Cell Res Ther. 2013:4 Suppl 1:S11 Dio.1186/srct372. Epub 2013 Dec 20 Review. PMID:



24565274

Delorme-Axford E, S Morosky, J Bomberger, DB Stolz, WT Jackson, CB Coyne. BPIFB3 regulates autophagy and Cocksakievirus B replication through a noncanonical pathway independent of the core initiation machinery. MBio 5(6). Pii: e02147-14. 2014. PMID: 25491355.

Zhao Y, TF Olonisakin, Z Xiong, M Hulver, S Sayeed, MT Yu, AD Gregory, EJ Kochman, BB Chen, RK Mallimpalli, M Sun, RL Silverstein, DB Stolz, SD Shapiro, A Ray, P Ray, JS Lee. Thrombospondin-1 restrains neutrophil granule serine protease function and regulates the innate immune response during Klebsiella pneumoniae infection. Mucosal Immunol. 7(2):440-448. 2014. PMID: 25492474

Nuschke A, M Rodrigues, DB Stolz, CT Chu, L Griffith, A Wells. Human mesenchymal stem cells/multipotent stromal cells consume accumulated autophagosomes early in differentiation. Stem Cell Res Ther 5(6):1140 2014. PMID 25523618.

Geskin LJ, S Viragova, DB Stolz, P Fuschiotti. Interleukin-13 is over expressed in cutaneous T-cell lymphoma cells and regulates their proliferation. Blood 125(18):2798-2805. 2015. PMID: 25628470.

Himes KP, A Young, E Koppes, D Stolz, Y Barak, Y Sadovsky, JR Chaillet. Loss of inherited genomic imprints in mice leads to severe disruption in placental lipid metabolism. Placenta. 36(4):389-396. 2015. Doi: 10.1016/j.placenta.2015.01.012. PMID: 25662615

Tafaleng EN, S Chakraborty, B Han, P Hale, W Wu, A Soto-Gutierrez, CA Feghali-Bostwick, AA Wilson, DN Kotton, M Nagaya, SC Strom, JR Chowdhury, DB Stolz, DH Perlmutter, IJ Fox. Induced pluripotent stem cells model personalized variations in liver disease due to a1-antitrypsin deficiency. Hepatology 62(1):147-157. 2015. PMID:25690322.

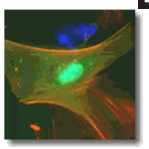
Manohar R, Y Li, H Fohrer, L Guzik, DB Stolz, UR Chandran, WA LaFramoise, E Lagasse. Identification of a candidate stem cell in human gallbladder. Stem Cell Res. 14(3):258-269. 2015. PMID:25690322.

Brown MF, BJ Leibowitz, D Chen, K He, F Zou, RW Sobol, D Beer-Stolz, L Zhang, J Yu. Loss of Caspase-3 sensitizes colon cancer cells to genotoxic stress via RIP1-dependent necrosis. Cell Death Dis. 6:e1729. PMID: 2590322.

O-Sullivan I, W Zhang, DH Wasserman, CW Liew, J Liu, J Paik, RA DePinho, DB Stolz, CR Kahn, MW Schwartz, TG Unterman. FoxO1 integrates direct and indirect effects of hepatic glucose utilization. Nat Commun 6:7079. Doi.1038/ncomms8079. 2015. PMID: 25963540.

Reay, DP, SI Bastacky, KE Wack, DB Stolz, PD Robbins, PR Clemens. D-Amino acid substitution of peptide-mediated NF-kB suppression in mdx mice preserves therapeutic benefit in skeletal muscle but causes kidney toxicity. Mol. Med. PMID: 26018805.

Stolz, DB Sims-Lucas. Unwrapping the origins and roles of the renal endothelium. Pediatr



Nephrol. 30(6):865-872. 2015 PMID:24633402. PMC4164630. (Cover)

Yokota S, Yoshida O, Dou L, Spadaro AV, Isse K, Ross MA, Stolz DB, Kimura S, Du Q, Demetris AJ, Thomson AW, Geller DA. IRF-1 promotes liver transplant ischemia/reperfusion injury via hepatocyte IL-15/IL-15Rα production. J Immunol. 2015; 194(12):6045-56. PMID: 25964490. PMC4458432

Tafaleng EN, S Chakraborty, B Han, P Hale, W Wu, A Soto-Gutierrez, CA Feghali-Bostwick, AA Wilson, DN Kotton, M Nagaya, SC Strom, JR Chowdhury, DB Stolz, DH Perlmutter, IJ Fox. Induced pluripotent stem cells model personalized variations in liver disease due to a1-antitrypsin deficiency. Hepatology 62(1):147-157. 2015. PMID: 25690322. PMC4482790.

Zhao Y, TF Olonisakin, Z Xiong, M Hulver, S Sayeed, MT Yu, AD Gregory, EJ Kochman, BB Chen, RK Mallimpalli, M Sun, RL Silverstein, DB Stolz, SD Shapiro, A Ray, P Ray, JS Lee. Thrombospondin-1 restrains neutrophil granule serine protease function and regulates the innate immune response during Klebsiella pneumoniae infection. Mucosal Immunol. 7(2):440-448. 2015. PMID: 25492474. PMC4465063.

Brown MF, BJ Leibowitz, D Chen, K He, RW Sobel, D Beer-Stolz, L Zhang, J Yu. Loss of caspase-3 sensitizes colon cancer cells to genotoxic stress via RIP-1-dependent necrosis. Cell Death Dis. Apr 23;6:e1729. doi:10.1038/cddis.20q5.104 PMID: 25906152.

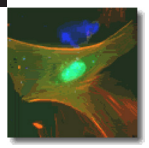
Schoiswohl G, Stefanovic-Racic M, Menke MN, Wills RC, Surlow BA, Basantani MK, Sitnick MT, Cai L, Yazbeck CF, Stolz DB, Pulinilkunnil T, O'Doherty RM, Kershaw EE. Impact of reduced ATGL-mediated adipocyte lipolysis on obesity-associated insulin resistance and inflammation in male mice. Endocrinology. 2015. Jul 21:en20151322. PMID: 26196542.

Harris KG, Morosky SA, Drummond CG, Patel M, Kim C, Stolz DB, Bergelson JM, Cherry S, Coyne CB. RIP3 Regulates Autophagy and Promotes Coxsackievirus B3 Infection of Intestinal Epithelial Cells. Cell Host Microbe. 2015 Aug 12;18(2):221-32. doi: 10.1016/j.chom.2015.07.007. PubMed PMID: 26269957. PMC4562276.

Kimura S, Ozaki KS, Ueki S, Zhang M, Yokota S, Stolz DB, Geller DA, Murase N. Contribution of alloantigens to hepatic ischemia/reperfusion injury: Roles of NK cells and innate immune recognition of non-self. Liver Transpl. 2015 Sep 3. doi: 10.1002/lt.24330. [Epub ahead of print] PubMed PMID: 26335784

Phinney DG, M DiGiuseppe, J Njah, E Sala, S Shiva, CM St Croix, DB Stolz, SC Watkins, YP Di, GD Leifkauf, J Kolls, DW Riches, G Deiuliis, N Kaminski, SV Boregowda, DH McKenna, LA Ortiz. Mesenchymal stem cells use extracellular vesicles to outsource mitophagy and shuttle microRNAs. Nature Comm 2015. 6:8472. PMID: 26442449. PMCID: PMC4598952.

Hidvegi T, DB Stolz, JF Alcorn, SA Yousem, J Wang, AS Leme, AM Houghton, P Hale, M Ewing, H Cai, N Pastore, P Annunziata, N Laminsky, J Pilewskiu, SD Shapiro, SC Pak, GA Silverman, N Brunetti-Pierri, DH Perlmutter. Enhancing autophagy with drugs or lung-directed gene therapy reverses pathological effects of respiratory epithelial cell proteinopathy. J Biol Chem 2015 290(50):29742-57 PMID 26494620



Wheeler DS, SM Underhill, DB Stolz, GH Murdoch, E Thiels, G Romero, SG Amara. Amphetamine activates RhoGTPase signaling to mediate dopamine transporter internalization and acute behavioral effects of amphetamine. Proc Natl Acad Sci USA 2015.112(51):E7138-47. PMID: 26553986.

Zhou L, T Pradhan-Sundd, M Poddar, S Singh, A Kikuchi, DB Stolz, W Shou, Z Li, KN Nejak-Bowen, SP Monga. Mice with hepatic loss of the desmosomal protein gamma catenin are prone to cholestatic injury and chemical carcinogenesis. Am J Path. 2015. 185(12):3274-89. PMID: 26485505

Dheer R, J Patterson, M Dudash EN Stachler, KJ Bibby, DB Stolz, S Shiva, Z Wang, SL Hazen, A Barchowsky, JF Stolz. Arsenic induces structural and compositional colonic microbiome change and promites host nitogen and amino acid metabolism. Toxicol Appl Pharmacol 2015. 289(3):397-408. PMID: 26529668. PMCID: PMC4662606.

Zhang C, R Ferrari, K Beezhold, K Stearns-Reider, A D'Amore, M Haschak, D Stolz, PC Robbins, A Barchowsky, F Ambrosio. Arsenic promotes NF-kB-mediated fibroblast dysfunction and matrix remodeling to impair muscle stem cell function. Stem Cells 2015 doi.1002/stem.2232. PMID: 26537186

Dangi A, C Huang, A Tandon, D Stolz, T Wu, CR Gandhi. Endotoxin-stimulated rat hepatic stellate cells induce autophagy in hepaotcytes as a survival mechanism. J Cell Physiol 2016. 231(1):94-105. PMID: 26031389.

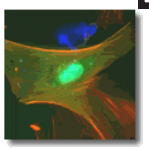
Kagan VE, Jiang J, Huang Z, Tyurina YY, Desbourdes C, Cottet-Rousselle C, Dar HH, Verma M, Tyurin VA, Kapralov AA, Cheikhi A, Mao G, Stolz D, St Croix CM, Watkins S, Shen Z, Li Y, Greenberg ML, Tokarska-Schlattner M, Boissan M, Lacombe ML, Epand RM, Chu CT, Mallampalli RK, Bayır H, Schlattner U. NDPK-D (NM23-H4)-mediated externalization of cardiolipin enables elimination of depolarized mitochondria by mitophagy. Cell Death Differ. Doi 10.1038/ccd.2015.160 PMID: 26742431

Demetris AJ, Bellamy CO, Gandhi CR, Prost S, Nakanuma Y, Stolz DB. Functional immune anatomy of the liver – as an allograft. Am J Transplant. 2016. Doi: 10.1111/ajt.13749. PMID: 26848550.

Khan Z, Venkat VL, Soltys KA, Stolz DB, Ranganathan S. A challenging case of severe infantile cholestasis in alpha-1 antitrypsin deficiency. Pediatr Dev Pathol. 2016. In press. PMID: 26855337.

Wiley CA, Bissel SJ, Lesniak A, Dixon CE, Franks J, Stolz DB, Sun M, Wang G, Switzer Iii RC, Kochanek PM, Murdoch GH. Ultrastructure of diaschisis lesions following traumatic brain injury. Journal of Neurotrauma. 2016; PMID: 26914973

Zhang C, Ferrari R, Beezhold K, Stearns-Reider K, D'Amore A, Haschak M, Stolz D, Robbins PD, Barchowsky A, Ambrosio F. Arsenic Promotes NF-Kb-Mediated Fibroblast Dysfunction and Matrix Remodeling to Impair Muscle Stem Cell Function. Stem Cells 2016; 34(3):732-42. NIHMSID: NIHMS764682 PMID: 26537186, PMCID: PMC4817845



Cunningham KE, Vincent G, Sodhi CP, Novak EA, Ranganathan S, Egan CE, Stolz DB, Rogers MB, Firek B, Morowitz MJ, Gittes GK, Zuckerbraun BS, Hackam DJ, Mollen KP. Peroxisome Proliferator-activated Receptor-γ Coactivator 1-α (PGC1α) Protects against Experimental Murine Colitis. The Journal of Biological Chemistry. 2016; 291(19):10184-200. PMID: 26969166, PMCID: PMC4858969

Wickline ED, Dale IW, Merkel CD, Heier JA, Stolz DB, Kwiatkowski AV. Alpha-T-Catenin Is a Constitutive Actin-Binding α-Catenin That Directly Couples the Cadherin-Catenin Complex to Actin Filaments. The Journal of Biological Chemistry. 2016; 291(30):15687-15699. PMID: 27231342

Patel A, Xue Y, Mukundan S, Rohan LC, Sant V, Stolz DB, Sant S. Cell-Instructive Graphene-Containing Nanocomposites Induce Multinucleated Myotube Formation. Annals of biomedical engineering. 2016; 44(6):2036-48. PMID: 26983841

Huleihel L, Hussey GS, Naranjo JD, Zhang L, Dziki JL, Turner NJ, Stolz DB, Badylak SF. Matrix-bound nanovesicles within ECM bioscaffolds. Science Advances. 2016; 2(6):e1600502. PMID: 27386584, PMCID: PMC4928894

Liu Q, Rojas-Canales DM, Divito SJ, Shufesky WJ, Stolz DB, Erdos G, Sullivan ML, Gibson GA, Watkins SC, Larregina AT, Morelli AE. Donor dendritic cell-derived exosomes promote allograft-targeting immune response. The Journal of Clinical Investigation. 2016; 126(8):2805-2820. PMID: 27348586

Corti P, Xue J, Tejero J, Wajih N, Sun M, Stolz DB, Tsang M, Kim-Shapiro DB, Gladwin MT. Globin X is a six-coordinate globin that reduces nitrite to nitric oxide in fish red blood cells. Proceedings of the National Academy of Sciences of the United States of America. 2016. 113(30):8538-8543. PMID: 27407144

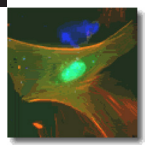
Khan Z, S Yokota, Y Ono, AW Bell, DB Stolz, GK Michalopoulos. Bile duct ligation induces ATZ globule clearance in a mouse model of Alpha-1 Antitrypsin Deficiency. Gene Expr. 2017; 17(2);115-127. PMID: 27543967 PMCID: PMC5296240

Fu H, Y Tian, L Zhou, D Zhou, RJ Tan, DB Stolz, Y Liu. Tenacin-C is a major component of the fibrogenic niche in kidney fibrosis. J Am Soc Nephrol 2017; 28(3):785-801. PMID: 27612995 PMCID: PMC4977215

Long TJ, PA Cosgrove, RT Dunn, DB Stolz, HK Hamadeh, C Afshari, H McBride LG Griffith. Modeling therapeutic antibody-small molecule drug-drug interactions using a 3D perfusable human liver co-culture platform. Drug Metab Dispos. 44(12):1940-1948. 2016 dmd.116.071456 in press. PMID: 27621203 (Cover)

Li HS, DB Stolz, G Romero. Characterization of endocytic vesicles using magnetic microbeads coated with signaling ligands. Traffic 17(10):1150 PMID: 27624842

Xiao X, G Jones, WA Sevilla, DB Stolz, KE Magee, M Haughney, A Mukherjee, Y Wang, ME Lowe. A carboxyl ester lipase (CEL) mutant causes chronic pancreatitis by forming intracellular



aggregates that activate apoptosis. J Biol Chem. 2017; 292(19):7744 pii: jbc:M116.734384. PMID: 28500240 PMCID PMC5427256

Wang H, Lu J, Edmunds LR, Kulkarni S, Dolezal J, Tao J, Ranganathan S, Jackson L, Fromherz M, Beer-Stolz D, Uppala R, Bharathi S, Monga SP, Goetzman ES, Prochownik EV. Coordinated activities of multiple Myc-dependent and Myc-independent pathways in hepatoblastoma. J Biol Chem 291(51):26241-26251. PMID: 27738108.2016

Uppala R, B Dudiak, ME Beck, SS Bharathi, Y Zhang, DB Stolz, ES Goetzman. Aspirin increases mitochondrial fatty acid oxidation. Biochem Biophys Res Comm. 482(2):346-351. 2017. PMID: 27856258 PMCID: PMC195905

Blair, HC, QC Larrouture, Y Li, H Lin, D Beer Stolz, L Liu, R Tuan, LJ Robinson, PH Schlesinger, DJ Nelson. Tissue Eng Part B Reviews 2017. 23(3):268-280. PMID: 27846781 PMCID: PMC5467150

Clark AM, SE Wheeler, CL Young, L Stockdale, L Shepard Neiman, W Zhao, DB Stolz, R Venkataramanan, D Lauffenburger, L Griffith, A Wells. A liver microphysiological system of tumor cell dormancy and inflammatory responsiveness is affected by scaffold properties. Lab Chip. 17(1): 156-168. 2016 PMID: 27910972

Li G, AT Larregina, RT Domsic ,DB Stolz,TA Medsger Jr, R Lafyatiz, P Fuschiotti. Skin-resident effector memory CD8+CD28- T-cells exhibit a pro-fibrotic phenotype in patients with systemic sclerosis. J Invest Derm 2017; 137(5):1042-1050. PMID: 28012718

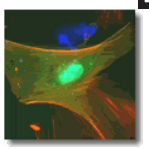
Soltys KA, Setoyama K, Tafaleng EN, Soto Gutiérrez A, Fong J, Fukumitsu K, Nishikawa T, Nagaya M, Sada R, Haberman K, Gramignoli R, Dorko K, Tahan V, Dreyzin A, Baskin K, Crowley JJ, Quader MA, Deutsch M, Ashokkumar C, Shneider BL, Squires RH, Ranganathan S, Reyes-Mugica M, Dobrowolski SF, Mazariegos G, Elango R, Stolz DB, Strom SC, Vockley G, Roy-Chowdhury J, Cascalho M, Guha C, Sindhi R, Platt JL, Fox IJ. Host conditioning and rejection monitoring in hepatocyte transplantation in humans. J Hepatol 2017; 66(5):987-1000 PMID: 28027971 PMCID: PMC5395353

Zhao J, Fuhrmann-Stroissnigg H, Gurkar AU, Flores RR, Dorronsoro A, Stolz DB, St Croix CM, Niedernhofer LJ, Robbins PD. Quantitative analysis of Cellular Senescence in culture and in vivo. Curr Protoc Cytom 2017 79:9.51.1-9.51.25. PMID: 28055114.

Khan Z, Venkat VL, Soltys KA, Stolz DB, Ragananathan S. A challenging case of severe infantile cholestasis in Alpha-1 Antitrypsin Deficiency. Ped and Dev Path. 2017; 20(2):176-181. PMID: 28326955. PMCID: PMC4977215

Franks J, Wallace CT, Shibata M, Suga M, Erdman N, Stolz DB, Watkins, SC. Correlative fluorescence and electron microscopy in a 3D-scanning electron microscope perspective. Current Protocols in Cytology. 2017; 80:12.45.1-12.45.15. PMID: 28369763

Schmitt DM, R Barnes, T Rogerson, A Haught, LK Mazzella, M Ford, T Gilson, JW Birch, A Sjostedt,DS Reed, JM Franks, DB Stolz, J Denvir, J Fan, S Rekulapally, DA Primerano,



Horzempa, J. The role and mechanism of erythrocyte invasion by Francisella tularensis. Frontiers in Cellular and Infection Microbiology. 2017. 7:173. PMID: 28536678. PMCID: PMC5423315.

Lothet EH, KM Shaw, H Lu, J Zhou, YT Wang, S Gu, DB Stolz, ED Jansen, CC Horn, HJ CHeil, MW Jenkins. Selective inhibition of small-diameter axons using infrared light. Scientific Reports 2017: 7(1):3275. PMID: 28607402/

Efimova N, F Korobova, MC Stankewich, AH Moberly, DB Stolz, A Kashina, M Ma, T Svitkina. BIII spectrin is necessary for formation of the constricted neck of dendritic spines and regulation of synaptic activity in neurons. J Neuroscience. 2017; 37(27):6442-6459. PMID: 28576936.

Buijs N, JE Oosterink, M Jessup, H Schierbeek, DB Stolz, AP Houdijk, DA Geller, PA van Leeuwen. A new key player in VEGF-dependent angiogenesis in human hepatocellular carcinoma: dimethylarginine dimethylaminohydrolase 1. Angiogenesis 2017 July 24 doi: 10.1017/s10456-017-9567-4. PMID: 28741166.

Stephen Thorne, Ph.D.
Assistant Professor

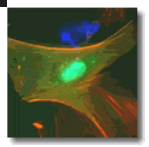
Ilkow CS, Marguerie M, Batenchuk C, Mayer J, Ben Neriah D, Cousineau S, Falls T, Jennings VA, Boileau M, Bellamy D, Bastin D, de Souza CT, Alkayyal A, Zhang J, Le Boeuf F, Arulanandam R, Stubbert L, Sampath P, Thorne SH, Paramanthan P, Chatterjee A, Strieter RM, Burdick M, Addison CL, Stojdl DF, Atkins HL, Auer RC, Diallo JS, Lichty BD, Bell JC. (2015) Reciprocal cellular cross-talk within the tumor microenvironment promotes oncolytic virus activity. Nat Med. 21(5):530-536 PMID: 25894825

Rojas J, Sampath P, Hou W, Thorne SH (2015) Defining Effective Combinations of Immune Checkpoint Blockade and Oncolytic Virotherapy. Clin. Cancer Res. [Epub ahead of print] PMID: 26187615

Liu J, Li F, Chen X, Wang L, Yue D, Zhao S, Hu W, Kalinski P, Thorne S, Hou J, Zhang Y (2014). Expression and clinical significance of CCL5 in patients with esophageal carcinoma. Zhonghua Zhong Liu Za Zhi. 36(11):828-833. PMID: 25620479

Zeh H, Downs-Canner S, McCart J, Guo Z, Rao U, Ramalingam L, Thorne S, Jones H, Kalinski P, Wieckowski E, O'Malley M, Daneshmand M, Hu K, Bell J, Hwang T, Moon A, Breitbach C, Kirn D, Bartlett D (2014) .First-in-man Study of Western Reserve Strain Oncolytic Vaccinia Virus: Safety, Systemic Spread and Anti-tumor Activity. Mol Ther. [Epub ahead of print] PMID: 25292189

Miller MR, Mandell JB, Beatty KM, Harvey SA, Rizzo M, Previte DM, Thorne SH, McKenna KC. (2014) Splenectomy Promotes Indirect Elimination of Intraocular Tumors by CD8+ T cells That Is Associated with IFNγ and Fas/FasL dependent Activation of Intratumoral Macrophages. Cancer Immunol Res. PMID: 25248763



Thorne SH. (2014). Immunotherapeutic potential of oncolytic vaccinia virus. Front Oncol. 4:155. PMID: 24987615

Zou Y, Li F, Hou W, Sampath P, Zhang Y, Thorne SH. (2014) Manipulating the expression of chemokine receptors enhances delivery and activity of cytokine-induced killer cells. Br J Cancer. 2014 Mar 18 Epub ahead of print] PMID: 24642619

Hou W, Chen H, Rojas J, Sampath P, Thorne SH (2014) Oncolytic Vaccinia Virus Demonstrates Anti-angiogenic Effects Mediated by Targeting of VEGF. Int J Cancer. 2014 [Epub ahead of print] PMID: 24474587

Albelda SM, Thorne SH. (2014) Giving Oncolytic Vaccinia Virus More BiTE. Mol Ther. (1):6-8. PMID: 24384909

Zhang M, Chakraborty SK, Sampath P, Rojas JJ, Hou W, Saurabh S, Thorne SH, Bruchez MP, Waggoner AS (2015) Fluoromodule-based reporter/probes for *in vivo* fluorescence imaging. J. Clin. Invest. (Epub) PMID 26348895

Liu JY, Li F, Wang LP, Chen XF, Wang D, Cao L, Ping Y, Zhao S, Li B, Thorne SH, Zhang B, Kalinski P, Zhang Y. (2015) CTL- vs Treg lymphocyte-attracting chemokines, CCL4 and CCL20, are strong reciprocal predictive markers for survival of patients with oesophageal squamous cell carcinoma. Br J Cancer. [Epub ahead of print] PMID: 26284335

Liu J, Li F, Ping Y, Wang L, Chen X, Wang D, Cao L, Zhao S, Li B, Kalinski P, Thorne SH, Zhang B, Zhang Y (2015) Local production of the chemokines CCL5 and CXCL10 attracts CD8+ T lymphocytes into esophageal squamous cell carcinoma. Oncotarget [EPub] PMID: 26317795

Sampath P, Thorne SH (2015) Novel therapeutic strategies in human malignancy: Combining immunotherapy and oncolytic virotherapy. Oncolytic Virotherapy 4:75-82

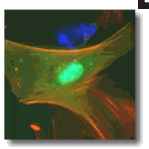
Zhang X, Huang Y, Ghazwani M, Zhang P, Li J, Thorne SH, Li S (2015) Tunable pH-responsive polymeric micelle for cancer treatment. ACS Macro Lett. 4(6):620-623

Zhang S, Shao P, Ling X, Yang L, Hou W, Thorne SH, Beaino W, Anderson CJ, Ding Y, Bai M. (2015) In vivo inflammation imaging using a CB2R-targeted near infrared fluorescent probe. Am J Nucl Med Mol Imaging. 5(3):246-58. PMID: 26069858

Weizhou Hou, Padma Sampath, Juan J Rojas, Steve H Thorne (2016). Targeting PGE2 in the tumor alters the immune microenvironment and sensitizes tumors to oncolytic viral therapy through depletion of Granulocytic MDSC. Cancer Cell. PMID: 27374223

Hou W, Thorne SH. (2016) Noninvasive Imaging of Fluorescent Reporters in Small Rodent Models Using Fluorescence Molecular Tomography. Methods Mol Biol. 1444:67-72. PMID: 27283418

Juan J Rojas, Padma Sampath, Daniel Byrd, Alexandra Ashley, Weizhou Hou, Steve H Thorne (2016) Manipulating TLR-signaling pathways significantly enhances immunotherapeutic activity of oncolytic vaccinia. Cell Reports (Epub) PMID 27050526



Thorne SH (2016) Virus fuels NK cell killing of leukemia. Blood. (Epub)PMID 27231392

Kim S-H, Hahm E-R, Arlotti JA, Samanta SK, Moura MB, Thorne SH, Shuai Y, Anderson CJ, White AG, Lokshin A, Lee J, Singh SV (2016) Withaferin A inhibits in vivo growth of breast cancer cells accelerated by Notch2 knockdown. Breast Can Res Treatment (ePub) PMID: 27097807

Thorne SH (2016) Adding STING to the tale of Oncolytic Virotherapy. Trends in Cancer 2(2):67-68 PMID: 27004260

Linton M. Traub, Ph.D.
Associate Professor

Ma, L., P.K. Umasankar, A.G. Wrobel, A. Lymar, A.J. McCoy, A. Jha[1], T. Pradhan-Sundd, S.C. Watkins, D.J. Owen and L.M. Traub. Transient Fcho1/2-Eps15/R-AP-2 nanoclusters prime the AP-2 clathrin adaptor for cargo binding. Dev. Cell 37: 428–443, 2016.

Muenzner, J., L.M. Traub, B.T. Kelly, and S.C. Graham. Cellular and viral peptides bind multiple sites on the N-terminal domain of clathrin. Submitted, 2016.

Yong Wan, Ph.D.
Professor

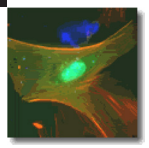
Hu D*., Gur M*., Zhou Z., Fujita N., Hung M-Q, Lan L., Bahar I. and Wan Y. 2015. Interplay between KLF4 by PRMT5 in genome stability and carcinogenesis. Nat Comm 6:8419 PMID: 26420673

He H, Li S, Hong Y, Zou H, Chen H, Ding F, Wan Y, Liu Z. 2015. Krüppel-like Factor 4 Promotes Esophageal Squamous Cell Carcinoma Differentiation by Up-regulating Keratin 13 Expression. J Biol Chem. 22;290(21):13567-77. doi: 10.1074/jbc.M114.629717. Epub 2015 Apr 7.

He M, Zhou Z, Shah AA, Tao J, Zou H, Chen Q, and Wan Y. 2016. The Emerging Role of Deubiquitinating enzymes in genomic integrity, diseases, and therapeutics. Cell and Bioscience. (in press)

Zhou Z, He M, Shah AA, and Wan Y. 2016. Insight into APC/C: from cellular function to diseases and therapeutics. Cell Div. Jul 13; 11:9 PMID: 27418942

He M, Zhou Z, Shah AA, Hong Y, Chen Q, Wan Y. (2016). New insights into posttranslational modifications of Hippo pathway in carcinogenesis and therapeutics. Cell Division: Mar 31;11:4 PMID: 27042197



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

Robertson AM, Duan X, Aziz KM, Hill MR, Watkins SC, Cebral JR. Diversity in the Strength and Structure of Unruptured Cerebral Aneurysms. Ann Biomed Eng. 2015 Jan 30. [Epub ahead of print] PubMed PMID: 25632891.

Zaccard CR, Watkins SC, Kalinski P, Fecek RJ, Yates AL, Salter RD, Ayyavoo V, Rinaldo CR, Mailliard RB. CD40L induces functional tunneling nanotube networks exclusively in dendritic cells programmed by mediators of type 1 immunity. J Immunol. 2015 Feb 1;194(3):1047-56. doi: 10.4049/jimmunol.1401832. Epub 2014 Dec 29. PubMed PMID: 25548234; PubMed Central PMCID: PMC4297732.
Zaccard CR, Watkins SC, Kalinski P, Fecek RJ, Yates AL, Salter RD, Ayyavoo V, Rinaldo CR, Mailliard RB. CD40L induces functional tunneling nanotube networks exclusively in dendritic cells programmed by mediators of type 1 immunity. J Immunol. 2015 Feb 1;194(3):1047-56. doi: 10.4049/jimmunol.1401832. Epub 2014 Dec 29. PubMed PMID: 25548234; PubMed Central PMCID: PMC4297732.

Zaccard CR, Watkins SC, Ayyavoo V, Rinaldo CR, Mailliard RB. HIV's ticket to ride: Cytotoxic T-lymphocyte-activated dendritic cells exploited for virus intercellular transfer. AIDS Res Hum Retroviruses. 2014 Nov;30(11):1023-4. doi: 10.1089/aid.2014.0218. PubMed PMID: 25354022; PubMed Central PMCID: PMC4208601.

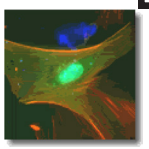
Hemmasizadeh A, Tsamis A, Cheheltani R, Assari S, D'Amore A, Autieri M, Kiani MF, Pleshko N, Wagner WR, Watkins SC, Vorp D, Darvish K. Correlations between transmural mechanical and morphological properties in porcine thoracic descending aorta. J Mech Behav Biomed Mater. 2015 Mar 19;47:12-20. doi: 10.1016/j.jmbbm.2015.03.004. [Epub ahead of print] PubMed PMID: 25837340.

Reichenbach DK, Schwarze V, Matta BM, Tkachev V, Lieberknecht E, Liu Q, Koehn BH, Pfeifer D, Taylor PA, Prinz G, Dierbach H, Stickel N, Beck Y, Warncke M, Junt T, Schmitt-Graeff A, Nakae S, Follo M, Wertheimer T, Schwab L, Devlin J, Watkins SC, Duyster J, Ferrara JL, Turnquist HR, Zeiser R, Blazar BR. The IL-33/ST2 axis augments effector T cell responses during acute GVHD. Blood. 2015 Mar 26. pii: blood-2014-10-606830. [Epub ahead of print] PubMed PMID: 25814531.

Pardee AD, Yano H, Weinstein AM, Ponce AA, Ethridge AD, Normolle DP, Vujanovic L, Mizejewski GJ, Watkins SC, Butterfield LH. Route of antigen delivery impacts the immunostimulatory activity of dendritic cell-based vaccines for hepatocellular carcinoma. J Immunother Cancer. 2015 Jul 21;3:32. doi:10.1186/s40425-015-0077-x. eCollection 2015. PubMed PMID: 26199728; PubMedCentral PMCID: PMC4509479.

Rastede EE, Tanha M, Yaron D, Watkins SC, Waggoner AS, Armitage BA. Spectral fine tuning of cyanine dyes: electron donor-acceptor substituted analogues of thiazole orange. Photochem Photobiol Sci. 2015 Jul 14. [Epub ahead of print] PubMed PMID: 26171668.

Bennewitz MF, Watkins SC, Sundd P. Quantitative intravital two-photon excitation microscopy



reveals absence of pulmonary vaso-occlusion in unchallenged Sickle Cell Disease mice. Intravital. 2014 Jul 7;3(2):e29748. PubMed PMID: 25995970; PubMed Central PMCID: PMC4435611.

Xu J, Benabou K, Cui X, Madia M, Tzeng E, Billiar T, Watkins S, Sachdev U. TLR4 deters perfusion recovery and upregulates TLR2 in ischemic skeletal muscle and endothelial cells. Mol Med. 2015 Jul 14. doi: 10.2119/molmed.2014.00260. [Epub ahead of print] PubMed PMID: 26181630.

Chen M, Tian S, Glasgow NG, Gibson G, Yang X, Shiber CE, Funderburgh J, Watkins S, Johnson JW, Schuman JS, Liu H. Lgr5(+) amacrine cells possess regenerative potential in the retina of adult mice. Aging Cell. 2015 Aug;14(4):635-43. doi: 10.1111/acel.12346. Epub 2015 May 20. PubMed PMID: 25990970.

Hemmasizadeh A, Tsamis A, Cheheltani R, Assari S, D'Amore A, Autieri M, Kiani MF, Pleshko N, Wagner WR, Watkins SC, Vorp D, Darvish K. Correlations between transmural mechanical and morphological properties in porcine thoracic descending aorta. J Mech Behav Biomed Mater. 2015 Jul;47:12-20. doi: 10.1016/j.jmbbm.2015.03.004. Epub 2015 Mar 19. PubMed PMID: 25837340; PubMed Central PMCID: PMC4430388.

Reichenbach DK, Schwarze V, Matta BM, Tkachev V, Lieberknecht E, Liu Q, Koehn BH, Pfeifer D, Taylor PA, Prinz G, Dierbach H, Stickel N, Beck Y, Warncke M, Junt T, Schmitt-Graeff A, Nakae S, Follo M, Wertheimer T, Schwab L, Devlin J, Watkins SC, Duyster J, Ferrara JL, Turnquist HR, Zeiser R, Blazar BR. The IL-33/ST2 axis augments effector T-cell responses during acute GVHD. Blood. 2015 May 14;125(20):3183-92. doi: 10.1182/blood-2014-10-606830. Epub 2015 Mar 26. PubMed PMID: 25814531; PubMed Central PMCID: PMC4432012.

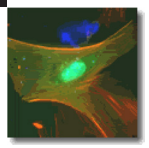
Robertson AM, Duan X, Aziz KM, Hill MR, Watkins SC, Cebral JR. Diversity in the Strength and Structure of Unruptured Cerebral Aneurysms. Ann Biomed Eng. 2015 Jul;43(7):1502-15. doi: 10.1007/s10439-015-1252-4. Epub 2015 Jan 30. PubMed PMID:25632891; PubMed Central PMCID: PMC4497939.

Zaccard CR, Watkins SC, Kalinski P, Fecek RJ, Yates AL, Salter RD, Ayyavoo V, Rinaldo CR, Mailliard RB. CD40L induces functional tunneling nanotube networks exclusively in dendritic cells programmed by mediators of type 1 immunity. J Immunol. 2015 Feb 1;194(3):1047-56. doi: 10.4049/jimmunol.1401832. Epub 2014 Dec 29. PubMed PMID: 25548234; PubMed Central PMCID: PMC4297732.

Saurabh S, Beck LE, Maji S, Baty CJ, Wang Y, Yan Q, Watkins SC, Bruchez MP. Multiplexed modular genetic targeting of quantum dots. ACS Nano. 2014 Nov 25;8(11):11138-46. doi: 10.1021/nn5044367. Epub 2014 Nov 12. PubMed PMID: 25380615; PubMed Central PMCID: PMC4246007.

Zaccard CR, Watkins SC, Ayyavoo V, Rinaldo CR, Mailliard RB. HIV's ticket to ride: Cytotoxic T-lymphocyte-activated dendritic cells exploited for virus intercellular transfer. AIDS Res Hum Retroviruses. 2014 Nov;30(11):1023-4. doi: 10.1089/aid.2014.0218. PubMed PMID: 25354022; PubMed Central PMCID: PMC4208601.

Pasta S, Phillippi JA, Tsamis A, D'Amore A, Raffa GM, Pilato M, Scardulla C, Watkins



SC, Wagner WR, Gleason TG, Vorp DA. Constitutive modeling of ascending thoracic aortic aneurysms using microstructural parameters. Med Eng Phys. 2015 Dec 6. pii: S1350-4533(15)00251-9. doi: 10.1016/j.medengphy.2015.11.001. [Epub ahead of print] PubMed PMID: 26669606.

Phong BL, Avery L, Sumpter TL, Gorman JV, Watkins SC, Colgan JD, Kane LP. Tim-3 enhances FcεRI-proximal signaling to modulate mast cell activation. J Exp Med. 2015 Dec 14;212(13):2289-304. doi: 10.1084/jem.20150388. Epub 2015 Nov 23. PubMed PMID: 26598760; PubMed Central PMCID: PMC4689164.

Ma L, Umasankar PK, Wrobel AG, Lymar A, McCoy AJ, Holkar SS, Jha A, Pradhan-Sundd T, Watkins SC, Owen DJ, Traub LM. Transient Fcho1/2-Eps15/R-AP-2Nanoclusters Prime the AP-2 Clathrin Adaptor for Cargo Binding. Dev Cell. 2016 May 24. pii: S1534-5807(16)30280-5. doi: 10.1016/j.devcel.2016.05.003. [Epub ahead of print] PubMed PMID: 27237791.

Keskinov AA, Tapias V, Watkins SC, Ma Y, Shurin MR, Shurin GV. Impact of the Sensory Neurons on Melanoma Growth In Vivo. PLoS One. 2016 May 26;11(5):e0156095.doi: 10.1371/journal.pone.0156095. eCollection 2016. PubMed PMID: 27227315.

Khare A, Raundhal M, Chakraborty K, Das S, Corey C, Kamga CK, Quesnelle K, St Croix C, Watkins SC, Morse C, Oriss TB, Huff R, Hannum R, Ray P, Shiva S, Ray A. Mitochondrial H2O2 in Lung Antigen-Presenting Cells Blocks NF-κB Activation to Prevent Unwarranted Immune Activation. Cell Rep. 2016 May 24;15(8):1700-14. doi: 10.1016/j.celrep.2016.04.060. Epub 2016 May 12. PubMed PMID: 27184852; PubMed Central PMCID: PMC4880515.

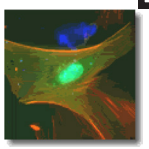
Tsamis A, Phillippi JA, Koch RG, Chan PG, Krawiec JT, D'Amore A, Watkins SC, Wagner WR, Vorp DA, Gleason TG. Extracellular matrix fiber microarchitecture is region-specific in bicuspid aortic valve-associated ascending aortopathy. J Thorac Cardiovasc Surg. 2016 Jun;151(6):1718-1728.e5. doi:10.1016/j.jtcvs.2016.02.019. Epub 2016 Feb 13. PubMed PMID: 26979916; PubMed Central PMCID: PMC4875874.

Pinilla-Macua I, Watkins SC, Sorkin A. Endocytosis separates EGF receptors from endogenous fluorescently labeled HRas and diminishes receptor signaling to MAP kinases in endosomes. Proc Natl Acad Sci U S A. 2016 Feb 23;113(8):2122-7. doi: 10.1073/pnas.1520301113. Epub 2016 Feb 8. PubMed PMID: 26858456; PubMed Central PMCID: PMC4776482

He J, Wang Y, Missinato MA, Onuoha E, Perkins LA, Watkins SC, St Croix CM, Tsang M, Bruchez MP. A genetically targetable near-infrared photosensitizer. Nat Methods. 2016 Mar;13(3):263-8. doi: 10.1038/nmeth.3735. Epub 2016 Jan 25. PubMed PMID: 26808669.

Huang Z, Epperly M, Watkins SC, Greenberger JS, Kagan VE, Bayır H. Necrostatin-1 rescues mice from lethal irradiation. Biochim Biophys Acta. 2016 Apr;1862(4):850-6. doi: 10.1016/j.bbadis.2016.01.014. Epub 2016 Jan 20. PubMed PMID: 26802452; PubMed Central PMCID: PMC4788560.

Pasta S, Phillippi JA, Tsamis A, D'Amore A, Raffa GM, Pilato M, Scardulla C, Watkins SC, Wagner WR, Gleason TG, Vorp DA. Constitutive modeling of ascending thoracic aortic



aneurysms using microstructural parameters. Med Eng Phys. 2016 Feb;38(2):121-30. doi: 10.1016/j.medengphy.2015.11.001. Epub 2015 Dec 6. PubMed PMID: 26669606; PubMed Central PMCID: PMC4755864.

Kagan VE, Jiang J, Huang Z, Tyurina YY, Desbourdes C, Cottet-Rousselle C, Dar HH, Verma M, Tyurin VA, Kapralov AA, Cheikhi A, Mao G, Stolz D, St Croix CM,Watkins S, Shen Z, Li Y, Greenberg ML, Tokarska-Schlattner M, Boissan M, Lacombe ML, Epand RM, Chu CT, Mallampalli RK, Bayır H, Schlattner U. NDPK-D(NM23-H4)-mediated externalization of cardiolipin enables elimination of depolarized mitochondria by mitophagy. Cell Death Differ. 2016 Jul;23(7):1140-51. doi: 10.1038/cdd.2015.160. Epub 2016 Jan 8. PubMed PMID: 26742431

Larsen MB, Hu J, Frizzell RA, Watkins SC. Simple image-based no-wash method for quantitative detection of surface expressed CFTR. Methods. Methods. 2016 Mar 1;96:40-5. pii: S1046-2023(15)30079-7. doi: 10.1016/j.ymeth.2015.09.006. [Epub ahead of print] PubMed PMID: 26361332.

Scharping NE, Menk AV, Moreci RS, Whetstone RD, Dadey RE, Watkins SC, Ferris RL, Delgoffe GM. The Tumor Microenvironment Represses T Cell Mitochondrial Biogenesis to Drive Intratumoral T Cell Metabolic Insufficiency and Dysfunction. Immunity. 2016 Aug 2. pii: S1074-7613(16)30282-5. doi: 10.1016/j.immuni.2016.07.009. [Epub ahead of print] PubMed PMID: 27496732.

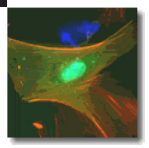
Dukes AA, Bai Q, Van Laar VS, Zhou Y, Ilin V, David CN, Agim ZS, Bonkowsky JL, Cannon JR, Watkins SC, Croix CM, Burton EA, Berman SB. Live imaging of mitochondrial dynamics in CNS dopaminergic neurons in vivo demonstrates early reversal of mitochondrial transport following MPP(+) exposure. Neurobiol Dis. 2016 Jul 21. pii: S0969-9961(16)30178-4. doi: 10.1016/j.nbd.2016.07.020. [Epub ahead of print] PubMed PMID: 27452482.

Sehrawat A, Croix CS, Baty CJ, Watkins S, Tailor D, Singh RP, Singh SV. Inhibition of mitochondrial fusion is an early and critical event in breast cancer cell apoptosis by dietary chemopreventative benzyl isothiocyanate. Mitochondrion. 2016 Jun 30;30:67-77. doi: 10.1016/j.mito.2016.06.006. [Epub ahead of print] PubMed PMID: 27374852.

Zerbato JM, Serrao E, Lenzi G, Kim B, Ambrose Z, Watkins SC, Engelman AN, Sluis-Cremer N. Establishment and Reversal of HIV-1 Latency in Naïve and Central Memory CD4+ T Cells in Vitro. J Virol. 2016 Jun 29. pii: JVI.00553-16. [Epub ahead of print] PubMed PMID: 27356901.

Kong M, Liu L, Chen X, Driscoll KI, Mao P, Böhm S, Kad NM, Watkins SC, Bernstein KA, Wyrick JJ, Min JH, Van Houten B. Single-Molecule Imaging Reveals that Rad4 Employs a Dynamic DNA Damage Recognition Process. Mol Cell. 2016 Oct 5. pii: S1097-2765(16)30522-6. doi: 10.1016/j.molcel.2016.09.005. PubMed PMID: 27720644.

Klei LR, Hu D, Panek R, Alfano DN, Bridwell RE, Bailey KM, Oravecz-Wilson KI, Concel VJ, Hess EM, Van Beek M, Delekta PC, Gu S, Watkins SC, Ting AT, Gough PJ, Foley KP, Bertin J, McAllister-Lucas LM, Lucas PC. MALT1 Protease Activation Triggers Acute Disruption of Endothelial Barrier Integrity via CYLD Cleavage Cell Rep. 2016 Sep 27;17(1):221-32. doi:



10.1016/j.celrep.2016.08.080. PubMed PMID: 27681433.
Scharping NE, Menk AV, Moreci RS, Whetstone RD, Dadey RE, Watkins SC, Ferris RL, Delgoffe GM. The Tumor Microenvironment Represses T Cell Mitochondrial Biogenesis to Drive Intratumoral T Cell Metabolic Insufficiency and Dysfunction. Immunity. 2016 Sep 20;45(3):701-703. doi: 10.1016/j.immuni.2016.08.009. PubMedPMID: 27653602.

Helfield B, Chen X, Watkins SC, Villanueva FS. Biophysical insight into mechanisms of sonoporation. Proc Natl Acad Sci U S A. 2016 Sep 6;113(36):9983-8. doi: 10.1073/pnas.1606915113. Epub 2016 Aug 22. PubMed PMID: 27551081; PubMed Central PMCID: PMC5018802

Liu Q, Rojas-Canales DM, Divito SJ, Shufesky WJ, Stolz DB, Erdos G, Sullivan ML, Gibson GA, Watkins SC, Larregina AT, Morelli AE. Donor dendritic cell-derived exosomes promote allograft-targeting immune response. J Clin Invest. 2016 Aug 1;126(8):2805-20. doi: 10.1172/JCI84577. Epub 2016 Jun 27. PubMed PMID: 27348586; PubMed Central PMCID: PMC4966303.

Kagan VE, Mao G, Qu F, Angeli JP, Doll S, Croix CS, Dar HH, Liu B, Tyurin VA, Ritov VB, Kapralov AA, Amoscato AA, Jiang J, Anthonymuthu T, Mohammadyani D, Yang Q, Proneth B, Klein-Seetharaman J, Watkins S, Bahar I, Greenberger J, MallampalliRK, Stockwell BR, Tyurina YY, Conrad M, Bayır H. Oxidized arachidonic and adrenicPEs navigate cells to ferroptosis. Nat Chem Biol. 2016 Nov 14. doi:10.1038/nchembio.2238. [Epub ahead of print] PubMed PMID: 27842066.

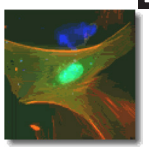
Garcia-Exposito L, Bournique E, Bergoglio V, Bose A, Barroso-Gonzalez J, ZhangS, Roncaioli JL, Lee M, Wallace CT, Watkins SC, Opresko PL, Hoffmann JS,O'Sullivan RJ. Proteomic Profiling Reveals a Specific Role for Translesion DNAPolymerase η in the Alternative Lengthening of Telomeres. Cell Rep. 2016 Nov 8;17(7):1858-1871. doi: 10.1016/j.celrep.2016.10.048. PubMed PMID: 27829156.

Sparvero LJ, Amoscato AA, Fink AB, Anthonymuthu T, New LA, Kochanek PM, Watkins S, Kagan VE, Bayır H. Imaging mass spectrometry reveals loss ofpolyunsaturated cardiolipins in the cortical contusion, hippocampus, and thalamusafter traumatic brain injury. J Neurochem. 2016 Sep 3. doi: 10.1111/jnc.13840. [Epub ahead of print] PubMed PMID: 27591733.

Wang Y, Ballou B, Schmidt BF, Andreko S, St Croix CM, Watkins SC, Bruchez MP. Affibody-targeted fluorogen activating protein for in vivo tumor imaging. Chem Commun (Camb). 2017 Jan 25. doi: 10.1039/c6cc09137g. [Epub ahead of print] PubMed PMID: 28120951

Yilmaz E, Watkins SC, Gold MS. Paclitaxel-induced increase in mitochondrial volume mediates dysregulation of intracellular Ca(2+) in putative nociceptive glabrous skin neurons from the rat. Cell Calcium. 2017 Jan 16. pii: S0143-4160(16)30135-X. doi: 10.1016/j.ceca.2017.01.005. [Epub ahead of print]PubMed PMID: 28109678.

Chakraborty K, Raundhal M, Chen BB, Morse C, Tyurina YY, Khare A, Oriss TB, Huff R, Lee JS, St Croix CM, Watkins S, Mallampalli RK, Kagan VE, Ray A, Ray P.The mito-DAMP cardiolipin blocks IL-10 production causing persistent inflammation during bacterial pneumonia.



Nat Commun. 2017 Jan 11;8:13944. doi:10.1038/ncomms13944. PubMed PMID: 28074841; PubMed Central PMCID: PMC5241690.

Csányi G, Feck DM, Ghoshal P, Singla B, Lin H, Nagarajan S, Meijles DN, Al Ghouleh I, Cantu-Medellin N, Kelley EE, Mateuszuk L, Isenberg JS, Watkins S, Pagano PJ. CD47 and Nox1 Mediate Dynamic Fluid-Phase Macropinocytosis of Native LDL. Antioxid Redox Signal. 2017 Jan 31. doi: 10.1089/ars.2016.6834. [Epub ahead of print] PubMed PMID: 27958762.

Montecalvo A, Watkins SC, Orange J, Kane LP. Inducible turnover of optineurin regulates T cell activation. Mol Immunol. 2017 Feb 10;85:9-17. doi:10.1016/j.molimm.2017.01.027. [Epub ahead of print] PubMed PMID: 28192730.

Franks J, Wallace CT, Shibata M, Suga M, Erdman N, Stolz DB, Watkins SC. Correlative Fluorescence and Electron Microscopy in 3D-Scanning Electron Microscope Perspective. Curr Protoc Cytom. 2017 Apr 3;80:12.45.1-12.45.15. doi: 10.1002/cpcy.18. PubMed PMID: 28369763.

Yilmaz E, Watkins SC, Gold MS. Paclitaxel-induced increase in mitochondrial volume mediates dysregulation of intracellular Ca(2+) in putative nociceptive glabrous skin neurons from the rat. Cell Calcium. 2017 Mar;62:16-28. doi: 10.1016/j.ceca.2017.01.005. Epub 2017 Jan 16. PubMed PMID: 28109678; PubMed Central PMCID: PMC5365154.

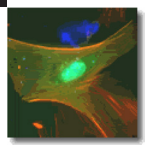
Wang Y, Ballou B, Schmidt BF, Andreko S, St Croix CM, Watkins SC, Bruchez MP. Affibody-targeted fluorogen activating protein for in vivo tumor imaging. Chem Commun (Camb). 2017 Feb 7;53(12):2001-2004. doi: 10.1039/c6cc09137g. PubMed PMID 28120951; PubMed Central PMCID: PMC5340305.

Muthuswamy R, Okada NJ, Jenkins FJ, McGuire K, McAuliffe PF, Zeh HJ, Bartlett DL, Wallace C, Watkins S, Henning JD, Bovbjerg DH, Kalinski P. Epinephrine promotes COX-2-dependent mmune suppression in myeloid cells and cancer tissues. Brain Behav Immun. 2017 May;62:78-86. Doi 10.1016/j.bbi.2017.02.008. Epub 2017 Feb 16. PubMed PMID: 28212885.

Watson AM, Rose AH, Gibson GA, Gardner CL, Sun C, Reed DS, Lam LKM, St Croix CM, Strick PL, Klimstra WB, Watkins SC. Ribbon scanning confocal for high-speed high-resolution volume imaging of brain. PLoS One. 2017 Jul 7;12(7):e0180486.doi: 10.1371/journal.pone.0180486. eCollection 2017. PubMed PMID: 28686653.

Weinstein AM, Chen L, Brzana EA, Patil PR, Taylor JL, Fabian KL, Wallace CT, Jones SD, Watkins SC, Lu B, Stroncek DF, Denning TL, Fu YX, Cohen PA, Storkus WJ. Tbet and IL-36γ cooperate in therapeutic DC-mediated promotion of ectopic lymphoid organogenesis in the tumor microenvironment. Oncoimmunology. 2017 Apr 28;6(6):e1322238. doi: 10.1080/2162402X.2017.1322238. eCollection 2017. PubMedbvPMID: 28680760; PubMed Central PMCID: PMC5486180.

Kinner-Bibeau LB, Sedlacek AL, Messmer MN, Watkins SC, Binder RJ. HSPs drive dichotomous T-cell immune responses via DNA methylome remodelling in antigen presenting cells. Nat Commun. 2017 May 31;8:15648. doi: 10.1038/ncomms15648. PubMed PMID: 28561043; PubMed Central PMCID: PMC5460028.



Vujanovic L, Stahl EC, Pardee AD, Geller DA, Tsung A, Watkins SC, Gibson GA, Storkus WJ, Butterfield LH. Tumor-Derived α-Fetoprotein Directly Drives Human Natural Killer-Cell Activation and Subsequent Cell Death. Cancer Immunol Res. 2017 Jun;5(6):493-502. doi: 10.1158/2326-6066.CIR-16-0216. Epub 2017 May 3. PubMed PMID: 28468916.

Franks J, Wallace CT, Shibata M, Suga M, Erdman N, Stolz DB, Watkins SC. Correlative Fluorescence and Electron Microscopy in 3D-Scanning Electron Microscope Perspective. Curr Protoc Cytom. 2017 Apr 3;80:12.45.1-12.45.15. doi: 10.1002/cpcy.18. PubMed PMID: 28369763.

Nathan Yates, Ph.D.
Associate Professor

Edmunds LR, Sharma L, Wang H, Kang A, d'Souza S, Lu J, McLaughlin M, Dolezal JM, Gao X, Weintraub ST, Ding Y, Zeng X, Yates N, Prochownik EV. c-Myc and AMPK Control Cellular Energy Levels by Cooperatively Regulating Mitochondrial Structure and Function. 2015 Jul 31; 10(7):e0134049. PubMed PMID: 26230505.

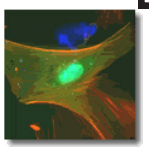
Hendrickson RC, Lee AY, Song Q, Liaw A, Wiener M, Paweletz CP, Seeburger JL, Li J, Meng F, Deyanova EG, Mazur MT, Settlage RE, Zhao X, Southwick K, Du Y, Holder D, Sachs JR, Laterza OF, Dallob A, Chappell DL, Snyder K, Modur V, King E, Joachim C, Bondarenko AY, Shearman M, Soper KA, Smith AD, Potter WZ, Koblan KS, Sachs AB, Yates NA. High Resolution Discovery Proteomics Reveals Candidate Disease Progression Markers of Alzheimer's Disease in Human Cerebrospinal Fluid. PLoS One. 2015 Aug 13; 10(8): e0135365. PubMed PMID: 26270474.

Needham S, Yates N, Barrientos R, Steel M, Lee M. Clinical and Pharmaceutical Solutions through Analysis (CPSA BRASIL 2015): on the way to innovation - pharmaceutical/analytical technology, regulation and knowledge management. Bioanalysis. 2015 Dec;7(23):2977-9. PubMed PMID: 26617112.

Kirkwood CM, MacDonald ML, Schempf TA, Vatsavayi AV, Ikonomovic MD, Koppel JL, Ding Y, Sun M, Kofler JK, Lopez OL, Yates NA, Sweet RA. Altered Levels of Visinin-Like Protein 1 Correspond to Regional Neuronal Loss in Alzheimer Disease and Frontotemporal Lobar Degeneration. Journal of Neuropathology & Experimental Neurology 2016 Jan 14. pii: nlv018. [Epub ahead of print] PubMed PMID: 26769253.

Edmunds LR, Otero PA, Sharma L, D'Souza S, Dolezal JM, David S, Lu J, Lamm L, Basantani M, Zhang P, Sipula IJ, Li L, Zeng X, Ding Y, Ding F, Beck ME, Vockley J, Monga SP, Kershaw EE, O'Doherty RM, Kratz LE, Yates NA, Goetzman EP, Scott D, Duncan AW, Prochownik EV. Abnormal Lipid Processing but Normal Long-term Repopulation Potential of myc-/- Hepatocytes. Oncotarget 2016 Apr 2

Gau D, Veon W, Zeng X, Yates N, Shroff SG, Koes DR, Roy P. Threonine 89 is an Important Residue of Profilin-1 that is Phosphorylated by Protein Kinase A. PLoS One. 2016 May 26; 11(5): e0156313. doi:10.1371/journal.pone.0156313. PMID: 27228149.



Stewart NA, Molina GF, Issa JP, Yates NA, Sosovicka M, Vieira AR, Line SR, Montgomery J, Gerlach RF. The identification of peptides by nanoLC-MS/MS from human surface tooth enamel following a simple acid etch extraction. Royal Society of Chemistry. 2016 May 28. DOI:10.1039/c6ra05120k.

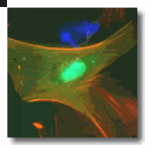
Sweet RA, MacDonald ML, Kirkwood CM, Ding Y, Schempf T, Jones-Laughner J, Kofler J, Ikonomovic MD, Lopez OL, Fitz NF, Koldamova R, Yates NA. Apolipoprotein E*4 (A POE*4) Genotype is Associated with Altered levels of glutamate signaling protein and synaptic co-expression. Networks in the Prefrontal Cortex in Mild to Moderate Alzheimer Disease. Mol Cell Proteomics. 2016 Jul;15(7):2252-62. PMID: 27103636.

Chen WC, Wang Z, Missinato MA, Park DW, Long DW, Liu HJ, Zeng X, Yates NA, Kim K, Wang Y. Decellularized zebrafish cardiac extracellular matrix induces mammalian heart regeneration. Sci Adv. 2016 Nov 18;2(11):e1600844. doi: 10.1126/sciadv.1600844. eCollection 2016 Nov. PubMed PMID: 28138518; PubMed Central PMCID: PMC5262469.

Braganza A, Li J, Zeng X, Yates NA, Dey NB, Andrews J, Clark J, Zamani L, Wang X, St. Croix C, O'Sullivan R, Garcia-Exposito L, Brodsky JL, Sobol RW. UBE3B is a calmodulin-regulated, mitochondria-associated E3 ubiquitin ligase. J Biol Chem. 2017 Feb 10;292(6):2470-2484. doi: 10.1074/jbc.M116.766824. Epub 2016 Dec 21. PubMed PMID: 28003368; PubMed Central PMCID: PMC5313114.

Tan R, Nakajima S, Wang Q, Sun H, Xue J, Wu J, Hellwig S, Zeng X, Yates NA, Smithgall TE, Lei M, Jiang Y, Levine AS, Su B, Lan L. Nek7 Protects Telomeres from Oxidative DNA Damage by Phosphorylation and Stabilization of TRF1. Mol Cell. 2017 Mar 2; 65(5):818-831.e5. doi 10.1016/j.molcel.2017.01.015. Epub 2017 Feb 16. PubMed PMID:28216227

Khetarpal SA, Zeng X, Millar JS, Vitali C, Somasundara AVH, Zanoni P, Landro JA, Barucci N, Zavadoski WJ, Sun Z, de Haard H, Toth IV, Peloso GM, Natarajan P, Cuchel M, Lund-Katz S, Phillips MC, Tall AR, Kathiresan S, DaSilva-Jardine P, Yates NA, Rader DJ. A human APOC3 missense variant and monoclonal antibody accelerate apoC-III clearance and lower triglyceride-rich lipoprotein levels. Nat Med. 2017 Aug 21. doi: 10.1038/nm.4390. [Epub ahead of print]

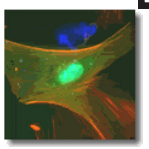


Executive Summary for the Cell Biology FY2017 Business Plan

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 seven 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. This year two new primary faculty, Drs. Yi Shi and St. Croix, joined the Department. 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 FY2018 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 FY18. 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 opportunities. There is also a strong confidence in continuing excellence of the established programs in the Department.

The Department's operating budget for fiscal year 2018 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 transportr 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 such as Journal of cell Science (Ford), Scientific Reports (Sorkin), Development (Hong), Current Opinions in cell Biology (Hammond and Hong) and others.

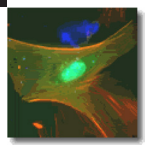
Membrane trafficking is a particular strength of the Department with research covering the entire spectrum of traffic-related issues from general mechanisms of protein and lipid trafficking, endocytosis and membrane organelle biogenesis, to cargo-specific mechanisms of anterograde and endocytic trafficking 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, Yates, Stolz, St. Croix), and the competitive renewal of NIH grants (Hong, Sorkin). All tenure-stream Assistant Professors, except Yi Shi who just arrived, 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 new recruit, Dr. Yi Shi joined the Department in January 2017. His research is focused on structure-0functional analysis of macromolecular complexes using cross-linking mass-spectrometry.

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, St. Croix and Stolz were awarded NIH shared instrumentation grant to fund a new confocal 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 UP, 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) and is 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. Two students graduated in 2016, taking position as postdoctoral fellows. 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, Neuroscience among others.

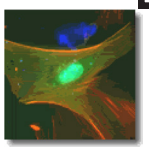
New Biomedical master's Program (BMP). Faculty in the Department together with the Department of Pharmacology launched a new BMP program in September 2017. At least four faculty will be teaching didactic courses, Dr. Peter Drain will serve as the Director of Academic Affairs, and Dr. Sorkin will be a 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

While not a problem at the present time, limited research space will likely become a weakness of the program in the future. Because of budgetary issues some space in BST South was temporarily rented to another department. We will commit major efforts to rearrange the space in BST South to allow for growth of the research programs of the new and current faculty located in this area.



Two of the CBP faculty Drs. Thorne and Leuba are located in the Hillman Cancer Center. There is clear separation from the rest of the Department leading to a lesser engagement of these three laboratories in the main activities of the Department.

Opportunities

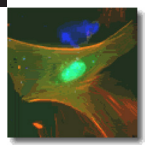
The vision of the chair and the leadership of the School, is to focus our research program towards basic cell biology and build a premier Department of Cell Biology. The key to accomplishing this task is the recruitment of new dynamic and creative faculty, and continue to support productive mid-career 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 to shape the future of the department, while achieving a healthy balance of junior and senior faculty members, 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

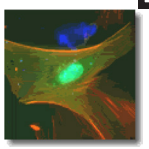
The steady decrease in federal and private funding opportunities to support basic cell biology research will continue to be the most significant threat during next several years. Several senior faculty are currently struggling with sustaining level of funding necessary to support their research programs. 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.



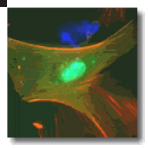
Cell Biology FY2018 Fiscal Issues

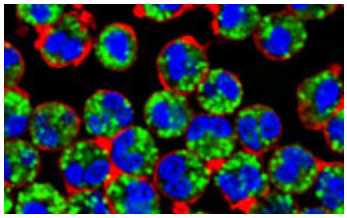
The main budgetary issue that faced the Department in the FY17 budget was maintaining the extramural funding of the faculty at the level necessary to support their research program and as required by the SOM Policies. Our goal is to increase the funding level of previous years. Main efforts will be devoted 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 2017 Budget

	University	UPP and Other	Total Budget FY 2017
Revenue			
Patient Care	$ -	$ -	$ -
Grant:			
Directs	3,278,854	-	3,278,854
Indirects	1,314,065	-	1,314,065
Hospital Contract	-	-	-
School of Medicine	3,563,049		3,563,049
VAMC		-	-
Other	395,134	-	395,134
Total Revenue	$ 8,551,102	$ -	$ 8,551,102
Expenses			
Salaries and Fringe Benefits:			
Faculty	$ 3,068,319	$ -	$ 3,068,319
Non-Faculty	2,592,779	-	2,592,779
Malpractice Insurance		-	-
Space Rental	195,682	-	195,682
UPP Overhead		-	-
University Overhead	2,346,558		2,346,558
Other Operating Expenses	347,764	-	347,764
Total Operating Expenses	$ 8,551,102	$ -	$ 8,551,102
Excess Revenue over Expenses	$ -	$ -	$ -
Capital Equipment/Improvements	$ -	$ -	$ -
Fund Balances			
University Restricted Accounts as of 6/30/17	$ 3,525,780	$ -	$ 3,525,780
University Endowments as of 6/30/17	395,134		395,134
UPP Fund Balance as of 6/30/17		-	-
UPMC Endowments as of 6/30/17		-	-
UPMC SPF Accounts as of 6/30/17		-	-
Total Fund Balances	$ 3,565,314	$ -	$ 3,565,314





Thank you for your kind attention.