FACILITIES AND RESOURCES

This program will utilize the University of Utah's facilities and resources as well as collaborate with skilled faculty that will be instrumental for a successful program. The University of Utah Health Sciences (UUHS) supports and encourages collaboration among investigators from different departments and institutions. The assembled team for this innovative project is comprised of experienced mentors and advocates of increasing inclusion and diversity in biomedical research. The University of Utah enjoys a national standing among top research institutes, including worldwide research ties. The University promotes high academic standards and professional practice, while fostering creativity and diversity. State-of-the-art facilities are easily accessed by students, faculty and staff and the University employs experienced and diverse faculty.

This document describes the tangible and intangible resources that will directly contribute to the success of the proposed Utah PRIDE (UP) program.

Office, Meeting Facilities, and Housing

The Principal Investigators and all program personnel have offices located either on the University of Utah health sciences campus or within the adjacent University of Utah Research Park. All offices are equipped with personal computers, access to laser printer (HP LaserJet), software for writing (Microsoft Word, EndNote), statistical analysis, and high-speed internet access. The offices include adequate locked file storage and shelf space. Fax, phone, and copy facilities are readily accessible. A central secure computing facility is sponsored by the University and an Intranet network allows for secure high-speed, interactive terminal access, file transfer, electronic mail, and connections to University and World-Wide databases over the Internet. Per University of Utah policy, all laptops and removable drives are encrypted. Dr. John Phillips, the Contact Principal Investigator, has secure offices located with the School of Medicine building. Dr. Carrie Byington, the Principal Investigator, and Maria Torres, the Project Coordinator, have secure offices located in the Health Sciences Education Building adjacent to the School of Medicine.

Meeting Facilities: All meetings/trainings will be held at both the University of Utah Guest House and Heath Sciences Education Building (HSEB). Both building are within easy walking distance of each other and are fully equipped with wireless internet, AV capabilities, large and small conference rooms,

The HSEB building also has several rooms wired for facilitating teleconferencing, web-conferencing, and videoconferencing and currently maintains contractual agreements that provide access to communications platforms that facilitate meeting participation remotely.

Housing: The University of Utah Guest House (http://www.universityguesthouse.com/) is 300 yards from the School of Medicine Building. This facility is optimally designed for participants of the program. It is located within easy walking distance to the UTA Trax (commuter train) that goes into the heart of downtown Salt Lake City and to the Salt Lake City International Airport. The Guest House is ADA compliant and able accommodate the needs of all.

Institutional Resources and Facilities

The **University of Utah**, the only Research Level 1 institution in Utah, has a strong commitment to diversity and creating an environment that fosters the development of students and faculty from under represented populations.
Founded in 1850, the University is the oldest state university west of the Mississippi River and is a major regional education resource for the Intermountain West (comprising Utah, Idaho, Wyoming, Montana, and parts of Colorado and Nevada). The University currently teaches over 25,000 students (representing all 50 states and 102 foreign countries) in its extensive undergraduate and graduate programs and has a faculty of over 3,400 and a total employee roster of over 18,000. It offers 74 undergraduate majors, more than 50 teaching majors and minors, and graduate degrees in 93 disciplines. The University is the leading research institution in the Intermountain West and is ranked among the top research institutions in the U.S. by the National Science Foundation, with particular distinction in medicine, genetics, and engineering. All UP Program participants will have full access to the University of Utah's centers supporting minorities as well as to a wide

variety of community resources. As applicable to the UP Program participant, the resources available include volunteer activities, seminars, community engagement and mentorship, and social and academic support. The proposed program will also have access to these various resources for recruitment and advertisement. Listed below is a selection of some of the resources available.

The **University of Utah Health Sciences (UUHS)**, located on the east side of the University of Utah campus on the western edge of the Wasatch Mountains, contains a cluster of allied health science graduate schools, including the School of Medicine and the Colleges of Nursing, Health, and Pharmacy. The campus has undergone continuous growth and expansion. Huntsman Cancer Institute (opened 1999), Huntsman Cancer Hospital (2004), Eccles Institute of Human Genetics (1990), and Howard Hughes Medical Institute for Research in Human Genetics, are located in state-of-the-art research buildings adjacent to the School of Medicine. The Emma Eccles Jones Medical Science Building (opened Fall 2005), the Nora Eccles Harrison Cardiovascular Research and Training Institute, the Wintrobe Research Building, the Moran Eye Center (1993), the Medical Center Vivarium, and a seven-story building housing the Biopolymers Research Program (1994) are also directly adjacent to the School of Medicine on the Health Sciences Campus.

The University of Utah Hospitals and Clinics log more than 850,000 inpatient and outpatient visits annually, and every day more than 10,000 people pass through the front doors of University Hospital. It is the state's largest provider of ambulatory care services, with 80 general and specialty clinics for outpatients.

Center for Clinical and Translational Science (CCTS), formerly the General Clinical Research Center (GCRC), has been continuously funded since 1986 by the NIH National Center for Research Resources (Public Health Services Research grant no. M01RR00064). Dr. Donald McClain , who has provided his commitment to the proposed UP Program (see **Letter of Support**), is the Contact Principal Investigator for the CCTS and Dr. Carrie Byington, serves as Multi-Principal Investigator, and the Co-Director of the CCTS.

The CCTS builds on the University's strengths in genetics and bioinformatics to translate promising bench science into practices that improve human health. The Center serves as an academic home for clinical and translational research, developing innovative health services for the community and health researchers, and training a new generation of clinical and translational investigators. CCTS and its partners increase the visibility, volume, and quality of participatory research by connecting investigators at the University with other health care institutions, clinical practitioners, public health personnel, patients, and research participants. The Center also formally links research activities across systems that together provide health care coverage to 80% of Utah's population as well as patients in surrounding states.

The Utah CCTS has eight Core Facilities: 1) Biomedical Informatics; 2) Clinical Services Core; 3) **Community Outreach Translation**; 4) Pilot Studies; 5) Regulatory Knowledge and Research Ethics; 6) **Research Education, Training, and Career Development**; 7) Study Design and Biostatistics; and 8) Translational Technologies and Resources. Of these eight facilities, the proposed project will greatly utilize the following:

- **The CCTS Education and Training Core** supports the Masters of Science in Clinical Investigation (MSCI) and two K12 programs, one traditional and one for Translational Comparative Effectiveness Research (NIH/NCRR KM1CA156723 PI: Byington). The CCTS Education and Training Core is designed to enhance the development of future faculty members and to reengineer the training of future investigators in each step of clinical research, from the laboratory bench or basic population science research to the bedside and finally to practice in the community. The Core brings together faculty and trainees from basic science and clinical departments, the graduate and medical schools, academia, health care delivery, and the biopharmaceutical industry. The Program trains fellows and junior faculty over two years in core health services research skills. Recent workshops include Decision Analysis, Survival Analysis, and Propensity Scores. Further descriptions of CCTS Education and Training Core resources are:

- The **Master of Science in Clinical Investigation (MSCI) Program**, a NIH-funded (1K30HL04525) program at the University of Utah CCTS, is under the direction of Dr. Donald McClain. The training program targets physicians and provides didactic coursework and mentored research experience to guide their development as clinical investigators. The curriculum for the MSCI degree focuses on the theories, models, methods, and tools used by investigators who conduct bench-to-bedside and bedside-to-community translational research. The Utah CCTS MSCI curriculum courses and corresponding clinical research competency is shown in **Figure A**.

Core Courses[b]	Competency Areas[a]	Track One Courses[d]	Competency Areas[a]
MDCRC 6000 Introduction to Biostatistics[c]	VI	MDCRC 6200 Translational Medicine Symposium	XI, XII SI
MDCRC 6010 Introduction to Epidemiology[c]	II, III	MDCRC 6420 Genetics of Complex Diseases	I, SI
MDCRC 6020 Data Management[c]	IV, V, VII	MDCRC 6500 Gene Localization	I, SI
MDCRC 6030 Computer Practicum[c]	VI	MDCRC 6520 Biochemistry for Clinical Invest.	I, SI
MDCRC 6040 Design and Implem. of Clinical Trials	I, III, V, VI, SI	MDCRC 6530 Animal Models in Clinical Research	I, SI
MDCRC 6430 Bioethical Issues in Clinical Res.[c]	VIII	MDCRC 6550 Med into Grad into the Clinic	XII, SI
MDCRC 6440 Medical Genetics for Clinical Invest.[c]	I, XV	MDCRC 6800 Molecular Medicine Research Sem	I, SI
MDCRC 6450 Grant Writing	I, II, IX	NEUSC 6250 Molecular Biology Laboratory	I, SI
Track Two Courses[e]	**Competency Areas[a]**	**Cross-Program Courses[f]**	**Competency Areas[a]**
MDCRC 6110 Intermediate Epidemiology	II, III, IV, V	MDCRC 6150 Personalized Health Care	I, XI, XIII, SI
MDCRC 6120 Cost Effectiveness Analysis	III, V	MDCRC 6210 Regression Models	VI
MDCRC 6130 Introduction to Decision Analysis	III	MDCRC 6260 Practice-based Research Networks	XI, XII
MDCRC 6220 Survey Methods	IV, V	MDCRC 6320 Intro. to Genetic Epidemiology	III
MDCRC 6230 Health Services Research	II, III, VII, XIV	MDCRC 6340 Team Communication and Collaboration for Trans. Res.	XI, XII, XII
MDCRC 6270 Comparative Effectiveness Res.	III, VI, SI		
MDCRC 6310 Medical Diagnosis and Prognosis	VI		
MDCRC 6460 Patient Centered, Community Engaged Research	X, XIV		

a Competency areas as designated in the Strategic Goal Committee 2 report, Core Competencies in Clinical and Translational Science: I. Clinical and Translational Research Questions, II. Literature Critique, III. Study Design, IV. Research Implementation, V. Sources of Error, VI. Statistical Approaches, VII. Biomedical Informatics, VIII. Responsible Conduct of Research, IX. Scientific Communication, X. Cultural Diversity, XI. Translational Teamwork, XII. Leadership, XIII. Cross Disciplinary Training, XIV. Community Engagement, SI. Special Interest Competencies in Child Health, T1 Research, and Drug and Device Development.
b Required for all MSCI students.
c These courses comprise the intensive introductory session, offered over 6 weeks
d Required or elective courses for MSCI students choosing track 1, with a focus on competencies for bench-to-bedside translation.
e Required or elective courses for MSCI students choosing track 2, with a focus on competencies for bedside-to-community translation e.g. health services, clinical epidemiology, comparative effectiveness, and patient-centered outcomes research.
f Additional courses for MSCI students in both tracks.

Figure A. Utah CCTS MSCI Curriculum Courses and Corresponding Clinical Research Competency

- The **KL2 Mentored Career Development Scholar Program** is supported by the Utah CCTS and Primary Children's Medical Center Foundation (PCMCF). The training program offers mentored research and career development support for clinical junior investigators. Its goal is to stimulate innovative research initiatives and career development. The program is tailored to the research and career development needs of each scholar and offers didactic education, mentored research, interdisciplinary works-in-progress seminars, and team-building experiences. The overall goal is to foster translational research on clinically relevant questions enabling basic science findings to be more rapidly applied to clinical problems. The length of the program is 1 or 2 years, based on available funding. The CCTS Mentored Career Development Scholar Program is administered by Carrie Byington, MD, Co- Director of the Center for Clinical and Translational Science.

- The CCTS sponsors **K-Club**, a monthly lunchtime meeting for early-career clinical and translational researchers. Each meeting features a speaker who is preparing a grant application, which may be a career development award such as NIH individual K award proposal or VA Career Development award, or an independent research project proposal such as a first R01. The speaker presents his or her Specific Aims page to a group of peers and senior investigators and receives feedback about the science, career development plan, and writing. This is a safe environment for those early in their research careers to benefit from the expertise of senior investigators who want them to be successful. It also provides a venue for peer investigators to learn from each other. The CCTS K-Club meets the second Wednesday of each month at noon. All early-career clinical and translational investigators are encouraged to attend. An example of past presenters is shown in **Figure B**.

- **CCTS Biomedical Informatics Core** is directed by is Dr. Julio Facelli, Chair of the Department of Biomedical Informatics. Dr. Facelli is a Latino scientist and is also participating in the NIH funded BRIDGES program with the University of Texas at Brownsville, a BUILD applicant. The primary objective of the CCTS Biomedical Informatics Core is to create and sustain a *statewide* set of interconnected data resources that virtually link genotypic, phenotypic, genealogic, health care, environmental, and public health data from a disparate collection of sources. Because of the primacy of data-security, regulatory-compliance, and privacy issues, we propose to connect these resources in a measured, well-regulated way by tightly coupling the Biomedical Informatics Core and the Ethics Core of the CCTS. In order to ensure adoption, the work of this Core will be tightly linked to the Education and Community cores through the CCTS Executive Committee. The Biomedical Informatics Core combines the considerable informatics expertise from the University of Utah, Department of Biomedical Informatics, the Medical Informatics group at Intermountain Healthcare, and informatics researchers at the Salt Lake City VA Medical Center. The Core also utilizes various informatics and IT resources from the partner organizations, including the Utah Population Database, Huntsman Cancer Institute, Utah Department of Health, UU Health Sciences IT Services, and the Utah Health Information Network.

Date	Speaker	Topic
April 10, 2013	Barbara Jones	Ceteris Paribus: Standardization versus Variation in Vulnerable Populations
March 13, 2013	Samuel Brown	HEALTHI: Humanizing the Experience of Acute Life-THreatening Illness
December 12, 2012	David Shprecher	Enteric alpha-synuclein as a marker of neurodegenerative disease risk
November 14, 2012	Richard Nelson	Using Economics and Epidemiology to Evaluate Decolonization for MRSA in the VA
December 12, 2012	David Shprecher	Enteric alpha-synuclein as a marker of neurodegenerative disease risk
November 14, 2012	Richard Nelson	Using Economics and Epidemiology to Evaluate Decolonization for MRSA in the VA
September 12, 2012	Lance Davidson	Mechanisms of Surgically-Induced Diabetes Remission
August 8, 2012	Peter Jones	MyRA Research Concierge/Informationist for the Center for Clinical and Translational Research
July 11, 2012	Brandon Zielinski	Brain Network Development in Normail and Autistic Children
June 13, 2012	Janet Jacobson	Examining the influence of different contraceptive methods, intercourse and semen on the female genital microbiome of reproductive aged women
May 9, 2012	Nelangi Pinto	Understanding barriers to improving prenatal detection of congenital heart disease

Figure B. Utah CCTS K-Club Past Presenters

- **The CCTS Community Outreach Translation Core (COTC)** The mission of the COTC is to support CCTS researchers and community leaders in becoming full partners in research projects that address researchers' interests and priority communities' health needs. The COTC provides consultation services to researchers and community members including identifying potential research and community partners, consultations with researchers about collaborating with communities, and developing community-engaged research methods. The also COTC promotes, implements and supports community-engaged translational and implementation science research, projects and scholarship by:
    1. Building the long-term, trust-based community partnerships that are needed to expeditiously and effectively conduct community-engaged translational and implementation science research
    2. Preparing community leaders and researchers to be full collaborators in research projects
    3. Working with researchers and communities to increase the number of CCTS-associated research projects that focus on community-engaged research or include this as a substantial component
    4. Providing a consultation service to researchers for proposal development and conducting research studies

Education and Mentoring Resources for Faculty and Medical Students

Led by Dr. Byington, Multi- PI for this application the University of Utah Office of Academic Affairs and Faculty Development and the Department of Pediatrics Research Enterprise demonstrates core values that support the success of its trainees and clinician-scientists Through continued community engagement and the robust research environment that includes basic laboratory- clinical-, translational-, comparative effectiveness-, and health services- research, the Department and the University is able to support multiple career development programs.

Summary Table of Relevant Faculty Career Development Programs (Described further below)	
Program Title	**Summary**
Vice President Clinical and Translational (VPCAT) Research Scholar Program (School of Medicine)	The goal of the VPCAT Research Scholar Program is to provide junior faculty opportunities to develop their clinical research skills under the direction of an appropriate mentor
The Academy of Medical and Science Educators	A Service Academy that supports faculty members with a focus on education of trainees at all levels. One of 40 in the US, our Academy focuses on educational scholarship.
The UUMG Quality Improvement Scholars	Clinical faculty participate in this semester long program to develop quality improvement charters with systems engineers that can be implemented in the University of Utah Health System.
Grant Writing Workshops	Four per year. These weekend retreats match junior grant writers with experienced faculty mentors to focus on improving applications. A mock-study section caps the program.
Pediatric Research Excellence Partnership (PREP) Office (Department of Pediatrics)	The PREP Office serves as an umbrella for multiple, pediatric research-related programs in Career Development, Research Education, Research and Grant Support Services, and Seminars, Workshops, and Conferences
The Pediatric Clinical and Translational (PCAT) Research Scholars Program (Department of Pediatrics)	PCAT is an intensive two-year research training program for investigators who conduct clinical and translational research.
Child Health Research Career Development Award (CHRCDA) K12 Program (Department of Pediatrics)	This NIH K12 award titled Genetic and Developmental Mechanisms of Pediatric Disease, funds 4-6 junior faculty per year ensuring them 75-80% protected time for research.
Translational Comparative Effectiveness Research (T-CER) Scholars Program (Department of Pediatrics)	The purpose of CER research is to improve health outcomes by developing and disseminating evidence-based information to patients, clinicians, and other decision-makers so that they can better respond to expressed needs about which interventions are most effective for which patients under specific circumstances.
Primary Children's Medical Center Foundation (PCMCF) Early Career Development Award (Department of Pediatrics)	The PCMC Foundation gifts the Department of Pediatrics $300,000 annually to fund an early career development grant program and the bi-annual Grant Writing Workshop. The award helps launch junior investigators' careers in child health and human development. The program supports pilot research projects that generate preliminary data and lead to future extramural funding.
Pediatric K24 Training Program (Department of Pediatrics)	The Pediatric K24 Training Program assists mid-career faculty in preparing applications for K24 awards (Mentored awards for mid-career faculty).
Mentored Program in Pediatric Research (Department of Pediatrics)	The goal of the Program is to pair 4th year med students interested in a pediatric career w/experienced mentors and academicians with expertise in pediatric research.

Education and Mentoring Resources for Undergraduate Students

The University of Utah recognizes the need to promote diversity in the biomedical and behavioral science workforce. It is a primary goal to provide research and educational experiences in biomedical and behavioral sciences for underrepresented students to better prepare them for highly-selective PhD or MD/PhD programs in biomedical or behavioral sciences.

Summary Table of Relevant Undergraduate Mentoring Programs	
Program Title	**Summary**
The Native American Research Internship (NARI) Program (Department of Pediatrics)	The Internship offers opportunities for Native American undergraduate junior and seniors who are interested in Biomedical and Health Science research. University of Utah ***Beacon of Excellence Awardee*** (2012) (http://prezi.com/jirikwd_ojfa/native-american-research-internship/)

The Academic Associates Program and University of Utah Minor in Clinical Investigation (Department of Pediatrics)	The Academic Associates Program offers several unique undergraduate courses where students learn about clinical research while they work as a research assistant. University of Utah ***Beacon of Excellence Awardee*** (2013). The program encompasses 6 undergraduate courses and has led to University of Utah minor in Pediatric Clinical Investigation (http://prezi.com/1dlkeexfcdzw/aca/)
Summer Undergraduate Research Access for Minorities Program (URAMP) (University of Utah Bioscience PhD Programs)	URAMP, which is designed specifically for under-represented undergraduates, goals are to enrich the science education and training of this student cohort and to help interested students to become competitive applicants for graduate education.
Summer Undergraduate Research Program (SURP) (University of Utah Bioscience PhD Programs)	SURP, which is designed to accept any applications from members of all racial and ethnic groups, goals are to enrich the science education and training of this student cohort and to help interested students to become competitive applicants for graduate education.
Utah Summer Undergraduate Research Program (USURP) (University of Utah Bioscience PhD Programs)	USURP, which is designed specifically for undergraduates who are Utah residents, goals are to enrich the science education and training of this student cohort and to help interested students to become competitive applicants for graduate education.

Resources Available for Elective One-on-One Trainings

University of Utah Health Sciences Research and Technology Cores

The Electron Microscopy Core Laboratory provides instruments and expertise to examine molecules, cells, and tissues via transmission and scanning electron microscopy. The laboratory is equipped to examine tissues and cells embedded in plastic and sectioned by an ultramicrotome. Molecular samples can be examined by negative stain or metal-coating. To examine biological samples in a native or more native state, the laboratory can freeze molecular, cellular, and tissue samples in plunge or high-pressure freezers. Three-dimensional structures can also be determined.

Small Animal Ultrasound Core laboratory provides access and training to state of the art, high resolution ultrasound equipment to allow the in vivo, non-destructive characterization of anatomy (structure) and physiology (function) in animal models. We are able to characterize fine structures (including early mouse embryos), rapid motion (including adult mouse heart at rates of 500 BPM and above), and serial changes in structure and function over time. With the addition of 3D and contrast imaging to our standard package of 2D, color and spectral Doppler, we have an almost unlimited number of applications of utility to any research laboratory working with animal models.

The Metabolomics Core Facility was established eight years ago by an NIDDK Center of Excellence in Molecular Hematology award. The Core uses mass spectrometry to quantitate all the low molecular weight metabolites including lipids found within blood components. The Core has developed analytical methods for serum, platelets, and red blood cells. We have experience in mentoring both junior faculty and medical students, participating with Jesse Rowley on a K01 development award in metabolomics analysis of platelets. We have recently mentored a URM medical student in developing a metabolomics assay for isolated red blood cells. Taken as a whole the Metabolomics Core is well suited in developing the skill necessary for Junior Faculty to succeed in future metabolic studies.

The Mass Spectrometry and Proteomics Core works closely with nearly 100 different University investigators to analyze samples for a diverse range of research applications. To a large degree, this core focuses on proteomics research projects, and the core is equipped with state-of-the-art instrumentation to characterize proteins, peptides, and post-translational modifications. Proteomics investigations play a major role in most health science research areas, including medical and cancer research, biochemistry, biology, genetics, hematology, and many others.

The DNA Sequencing Core offers several services to the local research community. We have a Qiagen Q24 pyrosequencer that can be used to cheaply interrogate large numbers of samples for individual SNPs or to assay methylation status at defined regions. We offer classic Sanger Sequencing using an Applied Biosystems 3730xl. We also offer Next Gen Sequencing (NGS) for sequencing smaller genomes, RNA Seq applications, and targeted resequencing. We are also wiling to support custom projects as needed by our customers.

The Genomics Core facility offers services covering real-time PCR for expression, genotyping, or quantitative needs. We also offer an Open Array platform for interrogating small to mid range SNP genotyping projects (12-256 SNPs at once) as well as larger expression projects. For larger genotyping work, we offer the Illumina iScan that can handle up to 5 million SNPs per Genome as well as genome wide methylation analysis. We are also willing to support legacy projects, like microarray profiling.

The NMR Core supports NMR-based science, in diverse research settings, at the University of Utah. We support researchers using NMR to characterize chemical synthesis projects, natural products, and to determine the three dimensional structures of proteins, nucleic acids, and their complexes. This information provides a foundation to further understand how biological molecules and their complexes are important in human disease.

The DNA/Peptide Core Facility provides investigators with standard and specialty oligonulcleotides and peptides. Specialty modifications include chromophore labeling, functional group modifications, and modified bases/amino acids. These synthetic products are used in a wide range of biochemical, molecular, and clinical applications. For example, primers and probes necessary for Q-PCR and synthetic peptides serving as antigens in ELISPOT assays are important tools to monitor immune responses from blood samples.

The Mouse Metabolic Phenotyping Core provides state-of-the-art analytical and phenotypical services to researchers inside and outside the University of Utah studying metabolic-related diseases such as diabetes and obesity, cancer, aging neurological and hematologic disorders. We have metabolic chambers that measure calorimetry, activity, and food/water consumption. We also provide body composition and body temperature monitoring. In addition, we use multiplexing technology for the assessment of serum and tissue analytes (hormones, lipids, cytokines and circulating factors…etc.). Finally, our core help the scientific community assess mitochondrial bioenergetics in various specimens (cells, muscle, brain and adipose sections, isolated islets and platelets) using the Seahorse XF24 analyzer.

The Drug Discovery Core at the University of Utah provides University researchers access to small molecule libraries for screening*, to equipment for automation, and to synthetic chemistry support for the characterization and validation of compounds for potential use as therapeutics, diagnostics and biological tools. The Core* currently has 3 commercial libraries available for screening. The first is the ChemBridge Diverset, a collection of 49,000 drug-like small molecules selected by 3D pharmacophore analysis. The second is the Microsource Spectrum Collection of 2000 bioactive compounds. The third consists of 160 well-characterized protein kinase inhibitors. However, the most valuable assets at the Core are the private collections. These consist of: a) the University of Utah Private Chemical Collection (UUPCC) containing 150,000 compounds, of which 75,000 are unique and not commercially available; b) 800 drug-like small molecules synthesized by the Chemistry Department at the University of Utah; and c) 240 marine natural products from the Medicinal Chemistry Department. All of these University collections are proprietary.

The CZAR (Centralized Zebrafish Animal Resource) facility provides state-of-the-art systems for housing, breeding, and doing experiments with zebrafish, an emerging vertebrate model system. It comprises 5000 fish tanks and redundant circulating water systems, and houses a large number of wildtype and mutant fish strains. It allows large genetic screens carried out as collaborations between multiple laboratories, and can provide animals and training for laboratories wishing to try pilot zebrafish experiments.

The Cell Imaging Facility provides training and consultation on the use of confocal microscopy, widefield automated microscopy, and software analysis tools for quantitative analysis of image data. The facility has two Olympus FV1000 Spectral confocals, two Nikon A1 confocals and a BD Pathway Confocal Bioimager. We have also added a new Nikon Ti automated microscope for live cell imaging. Automated microscopes with one of five different stage incubators are available (C02, temp., humidity) are also available for live cell imaging. Metamorph, Imaris and Volocity software are available for 2D and 3D analysis of image data.

Technology and Venture Commercialization Office: Since 1967, TVC has managed the university's intellectual property developed by faculty, staff, and students. Located in the University of Utah Research Park, which is directly adjoining the University of Utah Health Science (UUHS) campus, TVC has over 29 full-time employees whose roles are to support innovative faculty members who develop products or processes by

protecting their inventions. The office works with inventors acting as a bridge to coordinate efforts between industry, venture capitalists, and other funding sources to commercialize the University inventions. In order to provide the best services, the TVC includes specialists in licensing, business development, and legal matters, all of whom are widely experienced in commercializing technologies across an array of fields such as physical sciences, life sciences, and information technology. The Association of University Technology Managers (AUTM) 2012 Annual Survey ranked the University of Utah second among the top institutions in the country for startup formations. Using fiscal year 2011 data, the AUTM 2012 Annual Survey showed that the University of Utah 1) executed 81 technology licenses or options to companies wanting to develop University's technology; 2) received 237 disclosures of new inventions from faculty members; 3) filed 125 U.S. patent applications; and 4) secured 47 U.S. patents. This strong success is due, in most part, to the resources and infrastructure of the University of Utah's established technology commercialization offices.

The Associated Research and University Pathologists (ARUP) Laboratories: A major laboratory local and national esoteric reference laboratory owned by the University of Utah. ARUP is staffed by members of the University of Utah Department of Pathology. In addition to ARUP the Pathology Department boasts over 90 faculty members within varied and diverse clinical, research, and education programs. Under the leadership of Dr. Peter Jensen, the Department has been extremely successful. The Department shares a newly built 126,000 ft^2 building with the Department of Biochemistry and houses research programs in Immunology, Microbial Pathogenesis, Molecular Biology, and Cancer Biology. Basic research in the Department is centered in the Microbiology and Immunology Division, which includes research programs in molecular and cellular immunology, microbial pathogenesis, autoimmunity, gene regulation, hematopoiesis, stem cell modulation, vesicular trafficking, and iron transport (see Sherrie Perkins, **Letter of Support**).

Huntsman Cancer Institute (HCI) is the only National Cancer Institute (NCI)-Designated Cancer Center in the Intermountain West, the center recently underwent a rigorous NCI review process and was ranked as "excellent," bordering outstanding. Institutional resources and commitment was rated as "outstanding." The Cancer Center directly manages more than 500,000 square feet of laboratory, clinical research, population research, clinical care, and education/community outreach space. In addition, Cancer Center activities, including research and shared resources, are supported by allocation of wet and dry laboratory space on the University of Utah campus. Faculty at HCI are fortunate to have outstanding facilities to support cancer research, with several new buildings and state-of-the-art research equipment acquisitions that continue the tradition of excellence in cancer facilities. HCI has features of both a freestanding and a matrix Cancer Center. Dedicated HCI facilities include the 225,000-square-foot research building opened in 1999 as well as a 276,344-square-foot cancer specialty hospital opened in 2004 that comprise the core of our "cancer campus," serving as the focal point for cancer-related clinical and research activities.

Eccles Institute of Human Genetics, University of Utah: Dedicated in 1990, the George and Dolores Eccles Institute of Human Genetics is the focal point for genetic research at the University of Utah. Scientists at the Institute collaborate on genetics projects with faculty throughout the University. Much of the University's success in genetic research comes from working with Utah families. Because Utahns tend to have large families and keep extensive genealogy records, they are ideal partners for investigating human genetics. The Institute houses several programs, including:

- Genetic Science Learning Center -- an outreach education program for high school and undergraduate students and teachers
- Department of Human Genetics -- graduate education and faculty in modern molecular genetics
- University of Utah Molecular Medicine Program (U2M2) -- an interdepartmental effort to strengthen the interface between clinical application and basic genetic research
- Graduate Program in Genetic Counseling -- a master's level program that prepares students for a career in genetic counseling
- Utah Genome Depot -- a resource integrating gene sequence and polymorphism data into individually annotated gene models

Animal Research Facilities: The University supports an AALAC-approved comprehensive animal research facility. This facility is centrally located in the Health Sciences, with physical connections to most of the buildings in the Center. The animal research facility includes animal operating rooms and barrier facilities needed for support and containment of transgenic animals and animals with targeted gene disruptions.

Because of the compact nature of the Health Sciences, with bridges connecting most of the buildings, the majority of research animals are housed in this central facility. However, additional AALAC-approved satellite facilities are located in other parts of the campus.

Biohazardous Materials: The acquisition and disposition of radioisotopes and other biohazardous materials is provided to all laboratories at the University through the Office of Environmental Health and Safety. Special courses are offered by this office on the use of radioisotopes and other potentially toxic substances used in biomedical research.

Libraries: Two library facilities supported by the University are accessible to all faculty and trainees. These include the Eccles Health Sciences Library, devoted exclusively to biomedical journals and located within the Health Sciences campus, and the Marriott Library, a more extensive general university library, located on the undergraduate campus adjacent to the medical center. The University Libraries have site license subscriptions providing online access to all of the major biomedical journals. UP Participants will have full access to both library facilities during their time on campus.

The Utah Population Database (UPDB) holds approximately 20 million records in which an extensive set of Utah genealogies is linked to large sets of medical records (including cancer records) and other types of data. It supports more than 100 research projects and is a rich research resource for genetic, epidemiological, demographic, and public health studies. In addition to genealogies and Cancer Registry data from Utah and Idaho, the UPDB is linked to inpatient hospital records and vital records, including Utah death certificates. These data allow the identification of familial clustering of cancer. Studies may have a research design that incorporates kinship/pedigree structure or that uses a case control outcomes approach. Software has been developed that readily provides researchers information about cancer risk, segregation patterns, and pedigree size.

Research Electronic Data Capture (REDCap): **REDCap (Research Electronic Data Capture):** REDCap is a secure, web-based application designed exclusively to support data capture for research studies (**Figure C**). REDCap provides: 1) an intuitive interface for data entry (with data validation); 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages (SPSS, SAS, Stata, R); 4) procedures for importing data from external sources; and 5) advanced features, such as branching logic and calculated fields. REDCap contains restful-API capacity, enabling seamless integration of data with other platforms. Starting as a Vanderbilt initiative, the REDCap consortium has grown extensively over the last 5 years and is comprised of many different types of organizations with 543 consortium sites, 56,400 studies, and over 74,000 unique end-users.

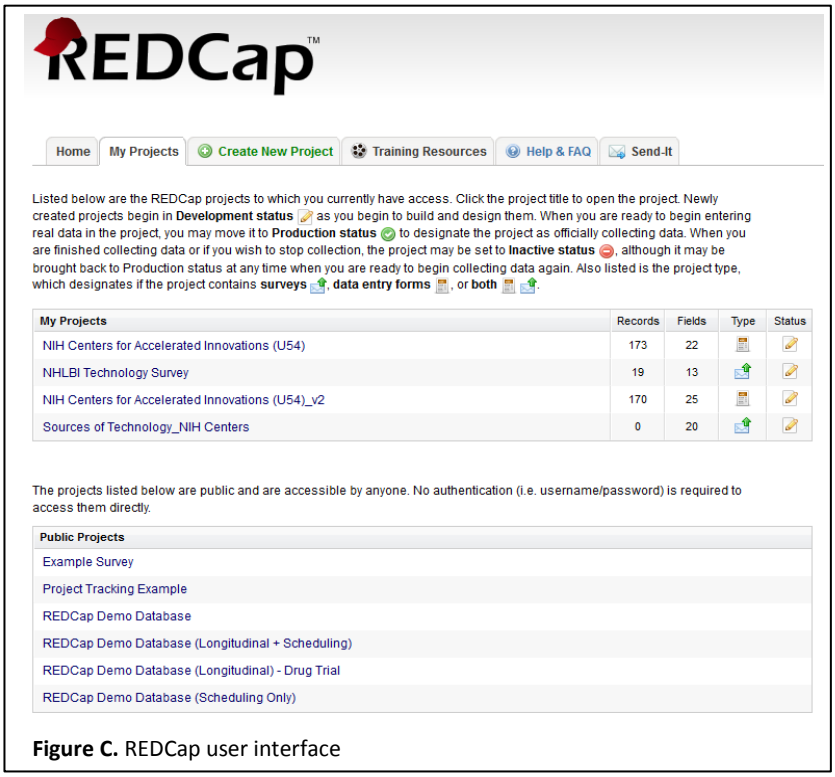

Figure C. REDCap user interface

NIH RePORTER: is a searchable database of federally funded biomedical research projects conducted at universities, hospitals, and other research institutions, maintained by the National Institutes of Health. The Report Expenditures and Results tool allows users to search a repository of NIH-funded research projects and access publications and patents resulting from NIH funding.

SiVal Funding Search Database: is a comprehensive database equipping research institutions, funders and policymakers with rich content, powerful analytics and actionable insights. The program integrates institutional and external data sources with information from Scopus, the largest abstract and citation database, and the trusted standard among researchers and data analysts. With more than 4,000 international sponsors, providing more than 20,000 active opportunities, there are many funding opportunities for which researchers are eligible. All University staff have access to this funding database through The University of Utah's Eccles Library.

Research Administration Training Series (RATS): The University of Utah Office of the Vice President for Research conducts several ongoing education and training activities designed to keep the University research community informed about current trends and issues throughout the broad field of research administration. The education and training opportunities are designed to support, develop and maintain a standardized body of knowledge and best practice methodology for all research personnel at the University of Utah. RATS curriculum includes traditional classes and lectures, interactive workshops, online instruction and educational resources provided to ensure compliance with federal regulations and to enhance the overall productivity of researchers. RATS offers courses culminating in a Responsible Conduct of Research (RCR) Certificate, which has been designed to meet all NIH and NSF RCR requirements for trainees. The RCR Certificate acknowledges study of the ethical issues involved in research and is designed to promote RCR instruction in areas such as animal welfare, authorship, collaborative science, conflict of interest, data management, human subject protection, mentor/mentee responsibilities, peer review, and research misconduct.

In order to succeed at the graduate level, students must be equipped to write in a professional manner. **The University Writing Center (UWC)** and the **Vice President for Research** are proud to offer convenient assistance for students and faculty in the writing process through the **Writing Fellow Program (WFP)**. The WFP is able to provide group and/or individual writing consultations for ***UP*** Program participants. The WFP provides qualified consultants that are trained to address the needs of writers at all stages of their development. These consultants go through adequate training necessary to assist writers in all disciplines and through the many different writing projects necessary for success. The UWC and WFP assist students and faculty in developing a writing process, learning to assess their own written texts, and strategizing different ways to approach writing projects. The WFP provides assistance with conference papers, curriculum vitae, resume, research proposals, paper abstracts, personal statements, and preparation for the GRE writing test. Furthermore, UWC will sponsor and co-sponsor programs with the WFP and other interested programs, such as the ***UP*** Program, each semester on teaching writing effectively. The UWC and WFP have agreed to provide assistance specifically for ***UP*** Program participant writing objectives. Participants learn about relevant topics, including grammar and style, plagiarism, addressing instructors' feedback, and working effectively with classmates in their courses. The instruction is designed to help students in the sciences develop the skills needed for scientific research and communication. It provides participants with the opportunity to write in the variety of forms that they are likely to encounter in their professional lives (i.e., proposals, reports, presentations) in a scientific context.

University of Utah and Community Resources for Minorities

All participants will have full access to the University of Utah's minority support facilities as well as to a wide variety of community resources. As applicable, the resources available include volunteer activities, seminars, community engagement and mentorship, and social and academic support. The proposed program will also have access to these various resources for recruitment and advertisement. Listed below is a selection of some of the resources available.

The **Office for Student Equity and Diversity (SED)** is the student programming and support division of the University of Utah Office for Equity and Diversity. The SED provides leadership, education and coordination of all student diversity support programs, initiatives and cultural events. Collectively, SED serves over 3,000 students annually who self-identify as Lesbian Gay Bisexual Transgender (LGBT) and/or historically underrepresented students of color. The primary focus of the SED is on the retention of underrepresented students during their time at the University of Utah, and as such, provide programs for students' academic and personal success, and their social and cultural enrichment.

The living mission of the **Center for Ethnic Student Affairs (CESA)** is to provide support to students of color at the University of Utah. While primarily serving the needs of African American, American Indian, Asian American, Latina-Latino, and Pacific Islander students, CESA promotes an environment of acceptance that honors all forms of diversity. The center is committed to providing programming that assists students in navigating cultural, economic, social, and institutional barriers in order to achieve academic excellence. CESA provides programs and resources to assist students in achieving their academic goals and staff members are committed to identifying resources across the campus available to students for their success.

The **Black Graduate Student Association (BGSA)** at the University of Utah was founded in 2009 to support Black graduate and professional students. Based upon the following principles: support, validation, network, and community, this organization is dedicated to improving the status of students of African descent in higher education by systematically identifying and addressing their needs and concerns.

The **Inter-Tribal Student Association (ITSA)** is an association that promotes greater unity and understanding among American Indian (AI) students. The mission of ITSA is to: 1) orient American Indian students to matriculation at the University of Utah and life in the surrounding Salt Lake City community; 2) advocate the needs and concerns of the American Indians in the larger university structure and in the Salt Lake City community; and 3) promote student involvement in American Indian culture awareness and promoting positive social activities to enhance greater student involvement and interest in the organization.

The **Society of Native American Graduate Students (SNAGS)** at the University of Utah was founded in 2011 to support Native American graduate and professional students. Based upon the following principles: support, validation, network, and community, SNAGS is dedicated to improving the status of students of Native American descent in higher education by systematically identifying and addressing their needs and concerns. SNAGS' objectives are to provide academic and professional resources that will enhance the academic and career success of current graduate and professional students; to recognize the accomplishments of our members and their academic achievement; to support and organize activities to foster the development of a network, service, and academic excellence for the Native American graduate student community; to assist in the retention and recruitment of Native American students and to develop aspiring academicians and practitioners.

The **Pacific Islander Student Association (PISA)** is an organization created for Pacific Islander and underrepresented students to aid in the enhancement of their academic, mental, personal, and social progression. PISA seeks to provide a space for its members to articulate their experiences and share their individual cultures with each other and the larger university and community populations, which in turn will serve as an avenue to promote and establish cultural solidarity, diversity, tolerance, and respect. PISA believes that advocating and focusing on the empowerment of students will become the catalyst for building future leaders in our respective communities.

The **Women’s Resource Center (WRC)** at the University of Utah serves as the central resource for educational and support services for women. Honoring the complexities of women’s identities, the WRC facilitates choices and changes through programs, counseling, and training grounded in a commitment to advance social justice and equality.

The **Lesbian Gay Bisexual Transgender Resource Center (LGBT)** seeks to provide a safe environment for students, faculty, staff, alumni, and community members to promote, educate, and develop programs centering on sexual orientation and gender identity. The LGBT provides a comprehensive range of education, information, and advocacy services and provides educational and social programs, support services, and resources intended to: 1) raise awareness regarding lesbian, gay, bisexual and transgender issues; 2) affirm lesbian, gay, bisexual and transgender identities and lives by fostering a safe, inclusive, multicultural environment for the University's LGBT community; 3) support the academic mission of the University of Utah by promoting the inclusion of LGBT topics in the curriculum and other academic programs; and 4) build linkages with other LGBT organizations and allied programs through outreach and community development efforts.

The **Center for Disability Services (CDS)** is the designated campus agency to assist students with

disabilities. The Center provides accommodations and support for the educational development of students with disabilities. CDS strives to improve understanding and acceptance of students with disabilities throughout the University Community. A cooperative relationship is maintained with relevant campus departments to ensure the University of Utah complies with federal and state regulations regarding students with disabilities.

Supporting Young Native Americans to Pursue Science Education (SYNAPSE): SACNAS, the Confederated Goshute Tribes, Navajo Nation, Northwestern Band of Shoshone, Paiute Tribe, Skull Valley Band of Goshute Indians, Ute Indian Tribe, and Ute Mountain Ute Tribe-White Mesa, University of Utah, Salt Lake Community College, and the State Office of Education have joined efforts to promote science, technology, engineering, and mathematics (STEM) careers to 30 promising AI students on reservations and in urban areas.

The **Lowell Bennion Community Service Center** was dedicated in 1987 by Chase Peterson, President of the University of Utah. He stated, “No university can rest merely with the transmission of old or the generation of new knowledge. It must also help students reach out to larger opportunities and responsibilities. That is what the Bennion Center is all about.” Students have been doing just that – directing projects designed to address an identified community need, usually in partnership with an existing public or private agency. Projects that served elderly people, youth, and special populations were among the first programs offered, and still provide the bulk of our volunteer opportunities. The Bennion Center adheres to a team approach to recruiting, training, and selecting issues on which to focus. Through student leadership, volunteer participation grew dramatically (from 546 to 1,409 volunteers) in the first year. During the 2008-2009 academic year 8,625 Bennion Center volunteers dedicated 173,504 hours of community service.

The **University Counseling Center (UCC)** offers opportunities for personal development that will lead to enhanced learning and contribution to the University. The UCC facilitates and supports the educational mission of the University of Utah through its developmental, preventive, and therapeutic services and programs that promote the intellectual, emotional, cultural, and social development of students, staff, and faculty. The Center consistently strives to integrate multiculturalism into the everyday functioning and structure of the agency, including the individual, service, training, organizational, and administrative levels. It also provides consultation and outreach for University academic and administrative department in areas of career development, student wellness, multicultural topics, student success, communication skills, as well as serving individual student needs.

Thematically Related Sources of Support

5T32HD007491 Yost (PI) 09/29/1995-04/13/2017
NIH/NICHD Annual Direct Cost: $253,526

Developmental Biology Training Program

Goals: This program provides support for training exceptional predoctoral and postdoctoral scientists in the field of Developmental Biology. The program consists of individualized research training under the guidance of 48 faculty members who work in one of six PhD degree-granting departments within the University. The program director and interdepartmental Advisory Committee members select trainees, monitor their progress, and organize training program activities. Training is provided in a broad range of areas including gene regulation, cell differentiation, growth and morphogenesis, signal transduction, and developmental genetics. Prospective PhD trainees are admitted to graduate school through the Molecular Biology and Neuroscience Graduate Programs, which dictate the core curriculum of the first year. Predoctoral and postdoctoral trainees are selected based on excellence in research and are supported for up to three years for predoctoral trainees and two years for postdoctoral trainees. The participation of six departments provides a diverse interdisciplinary training in Developmental Biology. A coherent structure is provided by the wide variety of interdepartmental activities fostered by the Molecular Biology and Neurosciences Programs, as well as the long history of cooperation and collaboration within the University community. All trainees are required to take a scientific ethics course, participate in an ongoing journal club related to developmental biology, take an advanced course in developmental biology, participate in and present a seminar in the Developmental Biology Discussion Group, participate in and present a research-based talk at an Annual Training Program Retreat, and host an outside seminar speaker. This is supplemented with vigorous seminar programs and inter-

laboratory research-in-progress group meetings to ensure that the trainees receive a strong training in developmental biology, preparing them to direct their own independent research programs. The biochemical pathways that act during development also play important roles in human health and disease. For example, the programmed cell death pathway was first analyzed for its role in C. elegans development, as was much of the insulin pathway. These studies lead to the discovery of molecules that have now been implicated in human diseases such as cancer, diabetes, and most recently aging (e.g., caspases, FOXO transcription factors). Therefore, analysis of developmental processes, and training young scientists in the field of development, should prove indispensable for improving human health.

5T32GM007464 Grunwald (PI) 07/01/1977-06/30/2015
NIH/NIGMS Annual Direct Cost: $296,166

Training Program in Genetics

Goals: Training is provided by a collection of 56 faculty mentors distributed between seven departments at the School of Medicine and the College of Science. The participating faculty members are a highly interactive group which has demonstrated its ability to train students and work together productively. They work together through this training program, through the campus-wide Combined Program in Molecular Biology and through a complex network of shared teaching, journal clubs and scientific collaborations. The requested training grant continuation helps support graduate student training in the area of genetics and contributes to our ability to provide students with a broad education in all areas of genetics. The training program provides cohesion for students and faculty in the areas of genetics. The program identifies outstanding students working on some aspect of genetics, and brings them into a group with other genetics students and the collective genetics faculty where a broad range of topics in current genetics research is discussed. Their research success is promoted by multiple opportunities to talk about their projects, as well as getting critical feedback about their research. A major feature of this training program is its yearly retreat at which the entire group of trainees is brought together with faculty members and an outside speaker. At this meeting, students present their ongoing work and benefit from in-depth discussion, suggestions and critique. A series of regular presentations by both inside and outside speakers comprises a second important training activity. A successful part of this series is seminars by former students supported by this training grant, who provide valuable mentoring. Trainee selection is based primarily on demonstrated excellence. In addition, effort is made to represent the entire breadth of genetics research underway here. One of the outstanding traditions of Utah's genetics program has been its breadth, and we promote interaction between those using mechanistic and population-based research genetic approaches. Trainees are selected from the pool of graduate students recruited and given formal course work by a Campus-wide Combined Molecular Biology Program. This program advertises our general graduate program, screens applicants and teaches a set of four courses required by all students in the program. Students admitted through this program spend their first year doing course work and four lab rotations after which they choose a thesis advisor and become administratively associated with that advisor's department. Only after starting their thesis research and passing their qualifying examination are they eligible to apply for training grant support.

5T32DK007115 Kaplan (PI) (Past PI - Kushner) 07/01/1975-06/30/2015
NIH/NIDDK Annual Direct Cost: $463,920

Research Training in Hematology

Goals: This is a University of Utah's Research Training in Hematology Program, a program established in 1943 by Dr. M.M. Wintrobe. Twenty-four faculty members serve as research preceptors for trainees, and the faculty consists of both physician-scientists and basic scientists from the Departments of Medicine, Biochemistry, Chemistry, Human Genetics, Oncological Sciences, Pathology, and Pediatrics. Research groups participating in the Training Program include the Molecular Regulation of Metal and Heme Metabolism and the Hematopoiesis-Cell Differentiation Group. The special attribute of this multidisciplinary training program is the faculty with which trainees can interact, with both basic and clinical investigators. The unifying element is the common objective to train post-doctoral fellows and graduate students who can conduct studies at the cutting edge of hematologic research. In our program, physician-trainees interact with basic science post-doctoral trainees and graduate students every day, and this interaction promotes an expanded view of hematologic research for both groups of post-doctoral fellows and the graduate students working in the laboratories of the training faculty. A plan is presented to expand the pre-doctoral Training Program by incorporating a newly created University of Utah Med-into-Grad Program. This program is designed to transform basic science graduate education by integrating intensive, clinically-relevant education into pre-doctoral training. The

program will permit graduate students to obtain dual degrees, a department-specific PhD degree and a medical school-wide Master of Science in clinical investigation. The application requests support for six pre-doctoral trainees and six post-doctoral fellows (a mixture of physician-trainees and PhD post-doctoral trainees).

5T32AI055434 Weis (PI) 07/01/2003-06/30/2015
NIH/NIAID Annual Direct Cost: $258,366

Training Program in Microbial Pathogenesis

Goals: The first five years of this award successfully accomplished the goals of enhancing and promoting Microbial Pathogenesis at the University of Utah and providing new training opportunities for graduate students and postdoctoral fellows. An integrated approach, involving laboratories from different departments and disciplines, has resulted in a high level of scientific exchange for the trainees. Faculty with foundations in microbiology, immunology and host responses, infectious disease/epidemiology, HIV biology, ecology of pathogen transmission, and genetics of susceptibility to pathogens, now interact on a regular basis at Training Grant-sponsored events. The first period of the award has resulted in: 1) the development of new courses in Microbial Pathogenesis and Immunology; 2) increased interaction of trainees with speakers at the Microbial Pathogenesis Seminar Series; 3) formation of a new journal club in Microbial Pathogenesis; and 4) the initiation of an Annual Training Grant Retreat with trainee presentations and those of outside expert speakers. These programs have extended to the Microbial Pathogenesis community as a whole. This resubmission provides greater emphasis on plans for monitoring trainee success and program activities, and in preparing trainees for future careers in Microbial Pathogenesis. This included internal and external reviews, and formal feedback from trainees and mentors. We continue to emphasize the importance of scientifically rigorous publications, along with numerous opportunities for academic and career advice. Trainees are prepared to impact important areas of health and research including emerging infectious diseases, molecular genetics of host-pathogen interactions, molecular virology and epidemiology, and involvement of immune responses in host defense and pathological outcomes of infection. AH trainees who have left the Training Grant currently hold positions in research or academics. Based on the success of the first award, we are requesting continued support for 3 pre-doctoral and 3 postdoctoral trainees.

5T32DC008553 Lucero (PI) 07/01/2006-06/30/2016
NIH/NIDCD Annual Direct Cost: $199,692

Predoctoral Interdepartmental Training Program in Neuroscience

Goals: The Program consists of structured interdisciplinary training in neuroscience followed by individualized research training under the guidance of 56 faculty members who work in one of 13 academic departments participating in the Neuroscience Program. The Program Director and interdepartmental Directorate will select the trainees, monitor their progress, and select and oversee the training faculty. Training will be provided in a broad range of areas including cellular neuroscience, molecular neuroscience, neurobiology of disease, brain and behavior, and developmental neurobiology. Prospective predoctoral trainees are admitted by the interdepartmental admissions committee of the Program in Neuroscience. During their first two years, PhD students must take a series of interdepartmental core courses, perform laboratory rotations (with opportunities to work in both academic and industrial settings), and complete their PhD qualifying examinations. A research advisor and thesis project are chosen after their first year. The majority of training will focus on individual research projects. The participation of 13 departments provides the opportunity for diverse interdisciplinary training in Neuroscience. A coherent structure is provided by the wide variety of interdepartmental activities sponsored by the Program in Neuroscience, as well as the long history of cooperation within the Neuroscience community here. In addition, all trainees will participate in a Responsible Conduct of Research course, a course in Scientific Writing and Speaking, and an annual retreat and regular research symposia where they will share their research results. This will be supplemented with vigorous seminar programs, journal clubs, and inter-laboratory research-in-progress group meetings to ensure that our students receive strong training in neuroscience, preparing them to contribute effectively to high-quality research programs.

U2M2G Li (PI) 04/01/2010-03/31/2014
Howard Hughes Medical Institute (HHMI) Annual Direct Cost: $175,000

HHMI – University of Utah Med into Grad Program

Goals: A transformative approach to basic science doctoral education is required to accelerate the pace at which discoveries in the life sciences and bioengineering are translated into interventions that improve human health. PhD-scientists are facing new and greater challenges. Meeting these challenges demands that basic

scientists have an understanding of the fundamentals of human biology and medicine, and the tools to function in the multidisciplinary teams required for successful translational initiatives. The HHMI Med into Grad program at the University of Utah (U2M2G) provides the didactic, mentoring and stipend support to train this new breed of PhD scientists. We have developed and implemented a core curriculum to teach the fundamentals of human biology, pathophysiology and molecular medicine to all interested basic science PhD students matriculating in the Programs in Molecular Biology, Biological Chemistry, Neuroscience or Bioengineering. The interdisciplinary Molecular Biology and Biological Chemistry programs have faculty and trainees in multiple departments within the College of Medicine (Human Genetics, Biochemistry, Pathology, Neurobiology and Anatomy, Oncological Sciences), the College of Science (Biology and Chemistry), and the College of Pharmacy (Pharmaceutical and Medicinal Chemistry). A complete U2M2G training program with stipend support is offered on a competitive basis. U2M2G activities and mentoring are integrated seamlessly with department-based requirements in order to provide comprehensive medical science education that will assist pre-doctoral students at each step of their graduate work, from preliminary examinations and thesis research, to developing long-term lines of investigation with an eye to translation and relevance to human disease. The U2M2G activities build upon unique educational and entrepreneurial initiatives at the University that support translation of basic discoveries; these include the Center for Clinical and Translational Sciences Clinical-scientist education program (NIH CCTS), the Utah Science Technology and Research initiative (USTAR), the Lassonde New Venture Development Center, and the Community of Faculty Entrepreneurs (CFE), as well as our MD/PhD and Medical Student Research Programs. Clinicians, physician- and basic- scientists, bioengineers, USTAR faculty, entrepreneurs, and faculty in the Schools of Bioengineering, Business and Law all collaborate to teach the core courses and mentor trainees in multiple contexts.

1R25MD006781 Byington (PI) 07/09/2011-03/31/2016
NIH/NIMHD Annual Direct Cost: $208,660

Native American Summer Research Internship in Maternal and Child Health

Goals: The proposed Internship, based on community engagement, is designed to provide a holistic approach to supporting academic, career, and personal development of American (AI) Indian students interested in biomedical careers related to maternal or child health. Students will be mentored by scientists and physicians working on maternal child health issues in the Salt Lake Community. The goals of this program are to address the educational disparity AIs face compared to the majority population and to increase the diversity in U.S. the health and scientific workforce by supporting the academic and experiential development of undergraduate AI students.

1R25HL108828 Byington (PI) 06/15/2011-05/31/2016
NIH/NHLBI Annual Direct Cost: $62,212

Native American Short-Term Undergraduate Research Education Program in Children's Health

Goals: The Specific Aims of this proposal are to develop a unique research training opportunity in research related to heart, lung, and blood research for undergraduate Native American students. Students will participate in basic laboratory science and will have some opportunity for shadowing some clinicians engaged in practices related to cardiology, pulmonology, and oncology.