

ORIP

OFFICE OF RESEARCH
INFRASTRUCTURE PROGRAMS



Infrastructure for Innovation

ORIP Strategic Plan

2016-2020

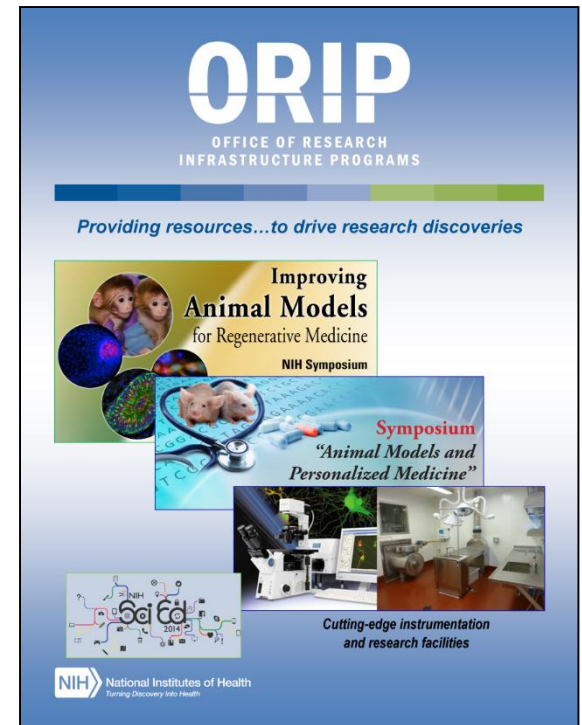


National Institutes of Health
Office of Research Infrastructure Programs



Office of Research Infrastructure Programs

- **ORIP established December 2011**
- Several former NCRR programs reassigned to ORIP
- **Mission: *Infrastructure for Innovation***
 - Research infrastructure
 - Research related resource programs
 - NIH's science education efforts



NIH/OD/DPCPSI/ORIP

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Division of Comparative Medicine

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Division of Construction and Instruments

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Office of Science Education

Tony Beck, PhD

ORIP FY 2015 Portfolio

Division of Comparative Medicine (DCM)

- Nonhuman Primate Resources
- Vertebrate & Invertebrate Animal Resources
- Genetic, Biological, & Other Resources
- Human Tissue and Organ Resource for Research
- Career Development

Division of Construction and Instruments (DCI)

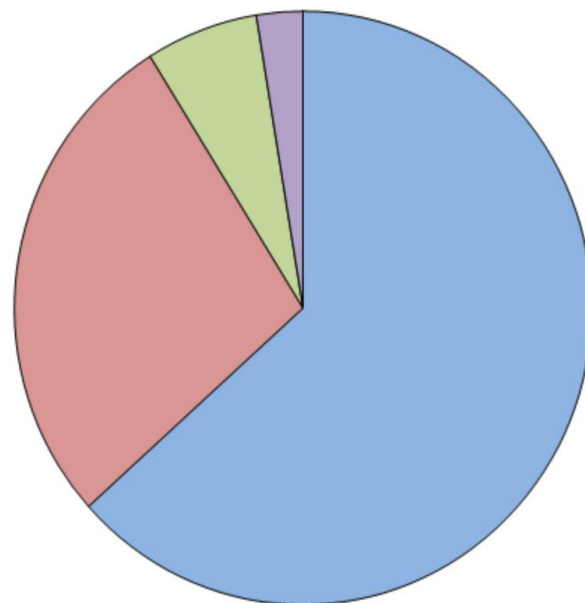
- Extramural Construction
- Research and Animal Facilities Improvement
- Shared and High-End Instrumentation Grants

Office of Science Education (OSE)

- Science Education Partnership Awards (SEPA)

Small Business Programs

- Related Small Business (SBIR/STTR) Grants



DCM- 63%	15 mechanisms, 221 grants
DCI- 28%	2 mechanisms, 129 grants
OSE- 6%	3 mechanisms, 66 grants
SBIR/STTR- 3%	2 mechanisms, 23 grants

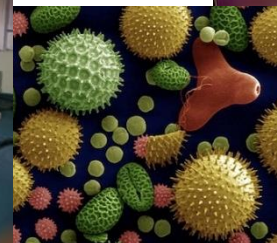
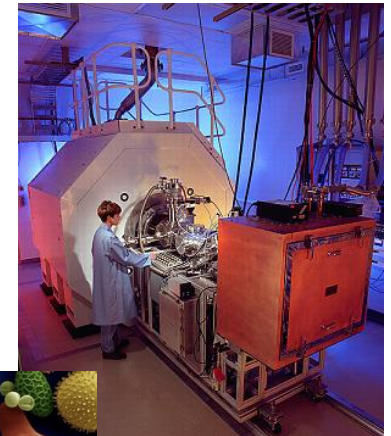
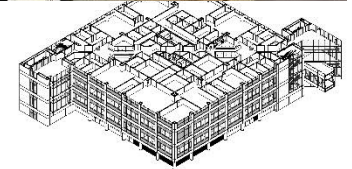
Division of Comparative Medicine

- Centers and resource related research projects
 - National Primate Research Centers, other NHP resources (e.g., SPF macaques, baboons, squirrel monkeys, marmosets, vervets)
 - Mutant Mouse Resource & Research Center, Knockout Mouse Phenotyping Program
 - National Swine Resource and Research Center
 - Zebrafish International Research Center, other aquatic model resources (marine slugs, frogs, salamanders)
 - Technology development
- Research program grants
 - Investigator-initiated hypothesis-driven awards
- Veterinary scientist training and career development programs
 - Institutional and individual National Research Service Awards
 - Career development awards



Division of Construction and Instruments

- Construction awards
 - Modernize animal research facilities
- Shared Instrumentation Grant (SIG) & High-End Instrumentation (HEI) Programs
 - Fund expensive state-of-the-art, commercially available instruments or integrated systems used on a shared basis
 - SIG– \$50K-\$600K
 - HEI– \$600K-\$2M



Office of Science Education/SEPA

Science Education Partnership Awards (SEPA)

- Establish partnerships between scientists and educators.
- Pre-K to grade 12 education resources to increase the number of urban, rural, and minority students considering research careers
- Science center and museum exhibits increase public health literacy

Green States = IDeA States; Red and Blue symbols are SEPA school and museum awards, respectively.



Pathway to the Plan

- **Planning Process 2014-2015**
- Focus groups with NIH staff
 - November-December 2014
- Extramural Management Program Committee
 - January 2015
- Public requests for information (RFIs)
 - February 2015
- External stakeholder conferences
 - July 2015 – Dr. Terry Magnuson
Dr. Keith Reimann



ORIP Thematic Areas

- High Priority Areas
- Theme 1 - Developing models of human diseases
- Theme 2 - Accelerating discovery with state-of-the-art instrumentation
- Theme 3 - Training and diversifying the biomedical workforce



ORIP Thematic Areas

The ORIP Strategic Plan research infrastructure high-priority thematic areas are

1. Developing models of human diseases
2. Accelerating research discoveries by providing access to state-of-the-art instrumentation
3. Training and diversifying the biomedical workforce

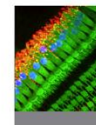
ORIP supports an intellectual infrastructure for biomedical research through the creation of models of human disease using animals and cultured cells and management of the infrastructure required to maintain, distribute, and utilize these models. Examples of supported animal models include rodents, such as mice and rats; nonhuman primates of different sizes and origins; other mammalian species, such as pigs; aquatic models, such as fish, frogs, and salamanders; and invertebrates, such as fruit flies, nematodes, and protozoa. ORIP maintains these resources at specific centers that make these critical disease models readily available to researchers.

ORIP's Shared Instrumentation Grant (SIG) program provides researchers funded by any NIH IC state-of-the-art instruments essential for biomedical research. Without access to appropriate modern tools and equipment, it is impossible to conduct pioneering research, to bring forward basic science discoveries, or to design the translational implementation of these studies. This program provides funding for expensive shared instruments that otherwise would not be available to many researchers.

ORIP also supports human infrastructure for biomedical research by investing in the next generation of creative minds. ORIP provides support for veterinary scientists to join the biomedical research enterprise and supports science education for pre-kindergarten through grade 12 (P-12) students, with an emphasis on reaching students from underserved communities.

Theme 1: Developing Models of Human Diseases

- **Strategy 1**
- **Expand and ensure access to animal models**
 - Evaluate & support traditional and non-traditional animal models
 - Promote new technologies to improve generation, preservation, and distribution of models
 - Partner with ICs to create strategies and tools to enhance model selection



Expand and ensure access to animal models.

ORIP's disease models program supports the development of new and improved animal models that complement those traditionally used to study human diseases. In addition to the generation of new model systems, it is equally important to ensure that animal models are all readily available for distribution in research studies today, as well as preserved for use by future scientists.

The number and complexity of disease models—naturally occurring, induced, and genetically engineered—are increasing much faster than our ability to effectively access and use the new information to speed life-saving therapies to the clinic. A critical need exists for the creation of innovative knowledge generation and retrieval systems to give translational researchers the ability to analyze the full spectrum of clinically relevant model systems (animal models, cell and organ cultures, tissue and organ chips, and computational methods) and select the most appropriate models for their research. To facilitate the development and ensure the availability of critical animal models, ORIP will

- Continually evaluate the utility of and provide sustained support for valued traditional and nontraditional animal models.
- Evaluate and promote the application of new technologies to improve generation, preservation, and distribution of rodent, nonhuman primate (NHP), aquatic, and other models.
- Partner with NIH ICs to develop the creation of information retrieval platforms, knowledge systems, and data repositories to assist scientists in the selection and use of models of human disease.

Theme 1: Developing Models of Human Diseases

- **Strategy 2**

- **Develop and enhance human disease models and research-related resource programs**

- **Help animal models become precise and predictive of human pathologies**

- **Promote phenotyping and annotation of human disease model systems**



Strategy 2

Continue developing and enhancing human disease models and research-related resource programs to advance medical research.

Today's biomedical researchers have a wide variety of model systems from which to choose when studying human biology and disease states. Therapeutic approaches can be tested for effectiveness in animal models prior to their introduction into human clinical trials. The advent of new technologies that permit the construction of a mouse with a human immune system has resulted in opportunities to further develop model systems that are more precise and predictive of human pathologies. To ensure that disease models co-evolve with technologies, knowledge of human biology, and the needs of the research community, ORIP will:

- Identify opportunities and challenges for animal models to become precise and predictive models of human pathologies.
- Promote phenotyping and annotation of human disease model systems.



"Therapeutic approaches can be tested for effectiveness in animal models prior to their introduction into human clinical trials."

Theme 1: Developing Models of Human Diseases

- **Strategy 3**
- **Improve the reproducibility of research using disease models**
 - Train investigators on protocols that influence reproducibility and validation
 - SBIR/STTR developed online training
 - Foster relationships between groups with expertise in reproducibility
 - Tools to enhance the reproducibility of specific disease models



Explore ways to improve the reproducibility of research using disease models.

Reproducible research is essential for scientific progress. Preclinical investigations are particularly susceptible to reproducibility issues, as many factors are experimentally manipulated to understand the biological system under study. Examples include experimental design factors, such as environmental (diet, temperature) and biological qualities (genetic background, sex), that can affect the reproducibility of animal- and cell-based disease models. To enhance the reproducibility of biomedical research, ORIP will

"Make strategic investments... to enhance the reproducibility of specific disease models..."

- Develop research resources to train investigators on protocols that influence reproducibility and validation of models of human diseases.
- Explore the use of online learning and the Small Business Innovation Research/ Small Business Technology Transfer (STTR) programs to promote training in reproducibility.
- Foster relationships between intramural and extramural groups with expertise in improving the rigor of research using animal models.
- Make strategic investments into infrastructure tools to enhance the reproducibility of specific disease models (e.g., implementation of rigorous health monitoring programs).

Theme 1: Developing Models of Human Diseases

- **Strategy 4**
- Modernize and improve animal research facilities to enhance animal maintenance and care
 - Support the *Animal Facilities Improvement Program*
 - Support specialized facilities that meet emerging research needs
 - Use SBIR/STTR to bring new animal care technologies to biomedical research



Strategy 4

Support the modernization and improvements of animal research facilities to enhance animal maintenance and care.

Biomedical researchers require high-quality, disease-free animals and specialized animal research facilities. ORIP's Animal Facility Improvement Program provides funds to institutions to modernize animal research facilities through alterations and renovations and to purchase equipment for animal resource centers. To ensure modernization and improvement of animal research facilities, ORIP will

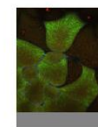
- Continue to support the Animal Facilities Improvement Program in collaboration with NIH ICs and other Federal agencies.
- Provide support for specialized animal facilities, such as a gnotobiotic facility or surgical suite, to meet the emerging research needs of NIH-supported investigators.
- Submit applications for SBIR/STTR to bring new animal care technologies to biomedical research.



"...specialized animal facilities... to meet the emerging needs of NIH-supported investigators."

Theme 2: Accelerating Discovery with State-of-the-Art Instrumentation

- **Strategy 1**
- Optimize the instrumentation program management
 - Implement metrics for program evaluation
 - Modify requirements and administration to increase cost effectiveness and utility
 - New program guidelines for SIG & HEI



Optimize the instrumentation program through forward-looking program management.

Over the years, the demand for different technologies has changed, both as new tools have become available and as the particular focus of scientific efforts has shifted. It is necessary that the instrumentation program remains responsive to these evolving needs of the community. To ensure the Program's continued broad reach and important benefits, CIRP will

- Implement improved metrics to evaluate the instrumentation program.
- Modify the program's requirements and administration to augment its cost-effectiveness and utility for the biomedical research community.
- Update program guidelines to serve the needs of SIG and HEI users.

"...necessary that the instrumentation program remains responsive to ... evolving needs of the community..."

Theme 2: Accelerating Discovery with State-of-the-Art Instrumentation

- **Strategy 2**
- Provide access to state-of-the-art instrumentation
 - Support technologies needed by the biomedical research community
 - Partner with NIH ICs to leverage resources and extend the reach of the program

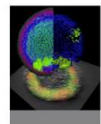


Strategy 2

Continue accelerating research discoveries by providing access to state-of-the-art instrumentation.

The ORIP's S10 Program has served the extramural NIH research community well for more than 25 years. Instruments funded by the S10 Program enable work conducted by all NIH ICs at hundreds of research institutions nationwide. The importance of the program for advancing basic science discoveries and their translational implementation is well recognized by the biomedical research community. To continue this record of accelerating research discoveries, ORIP will

- Provide support for technologies needed by the biomedical research community.
- Partner with NIH ICs to leverage resources and extend the reach of the program.



"Instruments funded by the... Program enable work supported by all NIH ICs at hundreds of institutions..."

Theme 3: Training and Diversifying the Biomedical Workforce

• Strategy 1

- Train veterinary scientists as translational researchers
 - Identify skills needed for research
 - Capitalize on special expertise of veterinary scientists
 - Promote MD/DVM collaborations
 - Train veterinary scientists to integrate findings across model species
 - Support dual degree training programs for veterinary scientists



Train veterinary scientists as translational researchers.

Veterinary scientists, biomedical scientists with a veterinary degree, can offer a distinct perspective and expertise to translational biomedical research through their comparative understanding of disease models. Veterinary scientists can make unique recommendations regarding the development, refinement, and reproducibility of disease models and optimize laboratory animal maintenance and care. However, because hurdles continue to impede the entry of veterinarians into basic and applied research careers, ORIP will:

- Identify and address challenges and opportunities for veterinary scientists to acquire the skills needed to participate in biomedical research.
- Collaborate with NIH ICs to develop programs that capitalize on the specialized expertise of veterinary scientists (e.g., pathology, emerging infectious diseases, and epidemiology).
- Promote biomedical research collaborations between physicians and veterinary scientists.
- Train veterinary scientists to lead activities that integrate biomedical findings across model species (e.g., multidisciplinary training programs).
- Support dual-degree training programs for veterinary scientists.

Theme 3: Training and Diversifying the Biomedical Workforce

- **Strategy 2**
- Support workforce diversity through pre-kindergarten to grade 12 (P-12) STEM education
 - Provide career and educational resources or training for P-12 teachers and students from underserved communities
 - Introduce scientific thinking into early P-12 education
 - Develop “apps” and *Serious STEM Games* for P-12 problem solving skills



Support workforce diversity through P-12 STEM education.

The NIH is committed to attracting biomedical researchers from a diverse range of cultural and ethnic backgrounds. To recruit individuals from groups underrepresented in biomedical research, ORIP will

- Use the Science Education Partnership Award (SEPA) Program to provide information on career opportunities, educational resources, and training for targeted P-12 students and teachers.
- Support the development of approaches that introduce children to scientific thinking and problem solving early in their education.
- Support the development of mobile apps and *Serious STEM Game* resources for P-12 students, to foster scientific thinking and problem solving.



"SEPA... supports information on career opportunities, educational resources, and training... for students and teachers..."

Theme 3: Training and Diversifying the Biomedical Workforce

- **Strategy 3**
- Continue rigorous evaluation of SEPA grants
 - Continue to increase evaluation rigor requirements for SEPA grants
 - Develop new evaluation metrics
 - Publish evaluation outcomes



Strategy 3



Promote rigorous educational evaluations of SEPA grants.

Federally sponsored STEM education programs, at all levels, are increasingly being asked to demonstrate evidence of effectiveness. ORIP will encourage SEPA grant recipients to conduct increasingly rigorous evaluations of their programs. A description of a project's evaluation plans will be required in the application and will be considered by the study section when determining an impact score. To encourage grantees to go beyond "traditional" evaluation measures, ORIP will require SEPA grant recipients to

- "...encourage SEPA grant recipients to conduct increasingly rigorous evaluations of their programs."
- Conduct rigorous assessments that can demonstrate the effectiveness of their projects.
- Publish the outcomes of their evaluations.

Theme 3: Training and Diversifying the Biomedical Workforce

- **Strategy 4**
- Help teachers, mentors and parents improve student interest in science
 - Place students and teachers into laboratory settings
 - Engage graduate students in part-time P-12 teaching
 - Encourage “near-peer” mentoring
 - Develop the SEPA website as a source of materials to help teachers and parents enhance STEM education



Help teachers, mentors, and parents improve student interest in science.

Teachers, mentors, and parents all make important contributions to student interest in science. To facilitate contributions from a diverse group of role models and mentors by providing specific opportunities and support for teachers, college students, and others, ORIP will

- Support the placement of students and teachers into research laboratory settings that facilitate better science teaching and learning when they return to the classroom.
- Support the development of programs that engage graduate students in teaching part time as a means of exploring alternate careers as P-12 educators.
- Encourage the participation of mentors who are similar in age, gender, and race to the participating students.
- Develop materials and resources for the SEPA website (<http://www.nihsepa.org>) that help teachers and parents enhance STEM education.



"encourage the participation of mentors who are similar in age, gender, and race to the participating students."

Conclusions

- **ORIP's first strategic plan 2016 – 2020**
- Emphasis on trans-NIH activities
- Emphasis on precision and reproducibility
- Emphasis on improving shared resources