

**Genetics Society of America Response to NIH Request for Information
FY 2016-2020 Strategic Plan for the Office of Research Infrastructure Programs: Division of
Comparative Medicine and Division of Construction and Instruments Programs**

[Request for Information \(NOT-OD-15-056\)](#) • [Response Form](#)

Submitted March 16, 2015

Responses are limited to 1,500 characters per topic. All responses must be submitted by March 16, 2015.

Disease Models, Informational Resources, and Other Resources

Disease models, informational resources and other resources that should be modified or expanded in parallel with ongoing advances in biomedical research

The Genetics Society of America (GSA) emphasizes the importance of model organisms for advancing knowledge in biomedical research. We believe that continued investment in model organisms—and the resources needed for supporting this research—is one of the most effective and efficient ways for NIH to continue to advance our understanding of living systems and improvement in human health.

Model organism researchers depend upon shared community resources that serve the entire community, including stock centers and model organism databases, several of which depend upon ORIP funding. The long-term and consistent support of these community resources has been a crucial component of the strength and success of biomedical research in the United States and assures its future vigor. Centralized stock centers and databases provide optimal resource sharing that maximizes the return on the investments made by NIH and other government agencies. These community resources provide “off-the-shelf” research tools and thus increase the efficiency and speed of hypothesis-driven research supported by other grants. In addition, NIH support for these community resources allows them to operate on an open access model, thus assuring that all researchers have the tools they need for discovery. Lastly, the stock centers and databases serve to preserve strains of research organisms and associated data well beyond the length of the original grant.

Emerging topics and technologies relating to animal resources and/or husbandry, disease models, informational resources, and other resources that should be targeted by DCM/ORIP program areas, workshops, and conferences

The Genetics Society of America (GSA) believes that continued investment in model organism research and resources is an effective and efficient way to advance progress in biomedical research. We stress that many advancements first pioneered in model systems led to application in a diverse array of model systems. This includes significant advances in understanding of disease models, informational and informatics resources, and more. For example, the CRISPR/Cas9 system has proven a revolutionary technology in a number of model organism species.

As such, GSA is supportive of investment that would help advance the study of model systems. Moreover, the Society supports investigator-initiated ideas that emerge from the community of experts, rather than a focus on top-down approaches.

Emphasis and prioritization that should be given to the following major topics which have traditionally been covered by DCM/ORIP:

Fundamental biology of animal model systems, including but not limited to, genetics, physiology, behavior and interaction with the environment, with the intent of comparison with analogous disease-related systems in humans.

The Genetics Society of America (GSA) believes that one of the most effective ways to advance progress in biomedical research is enhanced investment in understanding the fundamental biology of model systems. As such, we urge continued and expanded focus on model organism research and resources.

The research community continues to collect more evidence about the shared biology among all living species, meaning that the work we do in a variety of model systems is likely to translate directly to improving our understanding of our own biology. Indeed, many fundamental discoveries with direct application to human health were first identified in model systems—and ongoing research in model systems such as *Drosophila melanogaster* and *C. elegans* is leading to advancement on human conditions from cancer to alcoholism to Alzheimer's disease.

The knowledge that we gain from studying experimentally tractable model systems has yielded foundational insight on genes, pathways, diseases, and other aspects of basic biology that have direct application to human health. Indeed, there is little way to understand the function of genes *in vivo* without the use of model systems. The need for continued investment in this area only continues to increase as we seek to understand gene function and identify the genetic causes and variants of disease.

Development and characterization of genetically-modified and natural animal models for human biology and disease in response to the well-defined biomedical needs.

The Genetics Society of America (GSA) believes that model organisms are an essential component to the study of human biology and disease as they allow researchers to study the function of genes *in vivo*. Development and characterization of models for human disease in a variety of model organisms is one of the most effective ways for us to advance our understanding of human disease.

Methods and tools for identifying, developing, screening and preserving animal models.

The Genetics Society of America (GSA) emphasizes the importance of technology development to increase the effectiveness and efficiency of work with model organisms. Among the key advantages of working with these model systems is the ability to develop and use new technologies to accelerate the path of research. For example, the recent application of CRISPR/Cas9 technology has had a transformative impact on research across a wide range of model systems.

Model systems also often provide a mechanism to maintain and even preserve living model organism stocks to help ensure consistency and reproducibility of research results across labs and over time. Several stock centers provide a central repository and resource that serves the entire research community—and continued support for such centers is crucial.

Reproductive and genome modification projects to improve methods for producing genetically-modified animals and preserving biological materials, including germplasm and stem cells.

Although the Genetics Society of America (GSA) appreciates the need to develop new technologies, we feel that there are many robust techniques already in place for model organisms. Moreover, new advancements in these areas often emerge from serendipitous discovery and the creativity of the community, rather than targeted goal-directed funding programs.

Development of new experimental and bioinformatics methods for mapping functional association networks in model organisms, such as physical protein interaction networks, signaling pathways and gene regulatory networks affected in human disease conditions.

The Genetics Society of America (GSA) stresses the importance of continued investment in these areas. The development and maintenance of bioinformatics resources not only helps provide central access to research results and interactions, but also enables the community to use the same research infrastructure, helping ensure consistency and reproducibility between different labs.

We add that investments in model organism resources have often paved the way for similar resources across a variety of systems. For example, bioinformatics resources such as FlyBase and WormBase—for the *Drosophila* and *C. elegans* communities, respectively—have pioneered a number of innovations that increase the utility of such resources and the effectiveness of bioinformatics tools for advancing science more generally.

Complementary approaches to use of animal models such as simulations of physiological and pathophysiological processes

The Genetics Society of America (GSA) does not believe this to be a high priority as it is difficult to effectively model living systems completely. Rather, we stress the need for continued and expanded investment in model organisms.

Indeed, one of the key characteristics of model organisms is that they provide an effective and efficient *in vivo* model. There are numerous examples of invertebrate models for human disease leading to advances in fundamental understanding of mammalian biology. Because of the shared biology among all living systems, it is most cost-effective to invest in research and facilities to support research in these simpler systems.

Instead of the development of simulations, we would rather see expanded investment in model organisms, including the development and validation of non-human models of human disease.

Training

Challenges and opportunities that should be considered for research training and career development programs targeting biomedical researchers who are pursuing or already have a veterinary degree, including integration of veterinary scientists into the biomedical research enterprise.

GSA did not submit comments on this topic.

Physical Infrastructure

New technologies and specialized animal care equipment the DCI G20 Program should target; comments can include programs to strengthen the rigor of research protocols and enhance reproducibility of experimental results;

The Genetics Society of America (GSA) recognizes the opportunity to further refine and enhance the development of new technologies for animal care and welcomes the willingness of ORIP to follow the lead of the community in realizing these opportunities.

Physical Infrastructure: Program structures to achieve efficiency and maximize the benefit of its limited funds in improving well-being of animals and easing their maintenance, in the context of your biomedical research needs.

The Genetics Society of America (GSA) believes that stock centers provide a low-cost investment that benefits the entire community. For example, the Caenorhabditis Genetics Center hosts more than 18,000 strains in its collection, serving nearly 1,400 laboratories just this past year—and the Bloomington Drosophila Stock Center maintains more than 54,000 stocks and strains and distributed over 235,000 subcultures in the past year.

If these central resources were not being sustained with public support—including through ORIP—the maintenance and exchange of stocks would be the responsibility of individual laboratories; this would not only cost significantly more, but would lead to significant delays and the loss of mechanisms to ensure the consistency of strains and stocks. In addition, stock centers allow the maintenance and exchange of research stocks and strains beyond the length of the grant that may have funded their initial isolation—and even the tenure of the investigators. This enables NIH to recover a return on its initial investment for years to come.

Additional Comments

The Genetics Society of America (GSA) appreciates the support ORIP has provided to the model organism community, including sponsorship of community stock centers. We strongly encourage ORIP to continue and expand this support, as we believe that continued investment in model organisms is one of the most effective and efficient ways to advance biomedical research. Moreover, we stress the importance of providing centralized support to the research community—including through stock centers and model organism databases—in a way that maximizes the efficiency, transparency, and sustainability of the research enterprise.



ABOUT GSA: Founded in 1931, the [Genetics Society of America](http://www.genetics-gsa.org) (GSA) is a professional scientific society with more than 5,000 members worldwide working to deepen our understanding of the living world by advancing the field of genetics, from the molecular to the population level. GSA promotes research and fosters communication through a number of GSA-sponsored conferences including regular meetings that focus on particular model organisms. GSA publishes two peer-edited scholarly journals: *GENETICS*, which has published high quality original research across the breadth of the field since 1916, and *G3: Genes|Genomes|Genetics*, an open-access journal launched in 2011 to disseminate high quality foundational research in genetics and genomics. The Society also has a deep commitment to education and fostering the next generation of scholars in the field. For more information about GSA, please visit www.genetics-gsa.org. Also follow GSA on Facebook at facebook.com/GeneticsGSA and on Twitter [@GeneticsGSA](https://twitter.com/GeneticsGSA).