



NATIONAL SCIENCE FOUNDATION
2415 EISENHOWER AVENUE
ALEXANDRIA, VIRGINIA 22314

NSF 22-016

Dear Colleague Letter: Organismal Systems and Infection Biology (OSIB)

November 19, 2021

Dear Colleagues:

Infection and infection-like processes are ubiquitous in the natural world. Infectious agents have traditionally included bacteria, viruses, fungi, and prions. However, the study of diverse infective agents, such as mobile genetic elements, parasitoids, and specialized insect herbivores and their hosts, may have important features in common with these traditional agents. Further, the mechanisms of infection that result in non-pathogenic outcomes, including interactions that could be neutral or beneficial, and the co-evolutionary dynamics of the host and other organisms that maintain these relationships over long-standing interactions share important commonalities with disease processes. The goal of this announcement is to call for new, integrative approaches to understanding the spatial and temporal dynamics and the nature of host-infectious agent interactions in different contexts (e.g., across developmental, endocrine, physiological, social, or environmental contexts), across different scales (e.g., subcellular to organismal, ancient to present-day scales), with alternative outcomes (mutualistic, parasitic, pathogenic, etc.), and in non-model (or understudied) systems.

Coupled with the need to broaden the definition of infection biology is an equally important need to understand the diversity of immunity in non-traditional organisms and the myriad of factors that shape how organisms respond to infections. Scale, environment, host and parental history, host genomes, microbiomes, and previous infections all critically influence how the immune system functions and the organismal outcomes to infection – i.e., the infection phenotypes. Like infection biology, immunity has traditionally been most closely studied in a restricted set of species and conditions. The COVID-19 pandemic makes clear that we have a pressing need to understand infection biology more generally. Additionally, we are at a point in time at which technology allows us to broaden organismal studies of infection dramatically and to gain a better understanding of symbiotic relationships and of parasitic infections in diverse organisms and contexts. Results stemming from these research areas

will provide new insights into the mechanisms that determine the spatial and temporal dynamics of infectious processes and organismal immunity and, ultimately, will improve our ability to predict and control infection to the benefit of human societies and natural environments.

DESCRIPTION OF THE OPPORTUNITY

With this Dear Colleague Letter (DCL) the Division of Integrative and Organismal Systems (IOS) is calling for proposals that build on our ongoing programs to move forward our understanding of infection processes in natural systems. All study systems are appropriate, except those that focus solely on human diseases. Proposals that focus on building a mechanistic understanding are encouraged. Comparative approaches to the study of immune systems, in a phylogenetic context, are also encouraged; these studies are expected to discover conserved and convergent immune responses or cell types. Proposals that focus on interactions between immune responses and other physiological, developmental, neural and behavioral phenotypes are well suited to this call. Below are some examples; they are not intended to constitute a comprehensive list.

EXAMPLES INCLUDE

- Investigation of interspecific variation in host responses to infection across a clade
- Evolutionary history of immune mechanisms and function, or immune cell or system diversity, including origins of individual immune system components
- Parental effects and interactions or social and/or environmental experiences that determine infection outcomes
- Behaviors responsible for, or manipulated by, infectious agent(s)
- Infection effects on the neural-immune system with consequences for development, neural function in adults, and organismal behavior
- Developmental transitions during an organism's lifespan and the interplay between immune system components and physiological processes
- Systems biology approaches to understand integrated organismal immunity and how immunity maps from genotype-to-immune phenotypes

In addition to research proposals, we invite Workshop/Conference proposals to foster new research directions in these areas, as well as proposals for Research Coordination Networks (RCNs) that would bring together disparate data to generate new insights and new research directions.

Research proposals should be submitted to the IOS program most-closely related to the proposed activities through the [IOS Core Programs solicitation](#) (NSF 21-506), the [Plant-Biotic Interactions](#) (NSF 20-576), the [Plant Genome Research Program](#) (NSF 21-507), or the [Enabling Discovery through Genomics](#) (NSF 21-546) solicitation. Proposals for [Research](#)

Coordination Networks (RCN) should be prepared and submitted consistent with the guidelines in the RCN solicitation. Proposals for conferences must be prepared and submitted in accordance with the guidance for Conference Proposals contained in Chapter II.E.9 of the NSF Proposal and Award Policies and Procedures Guide (PAPPG). In addition to any solicitation or PAPPG specific requirements, titles should start with "OSIB:".

Researchers are strongly encouraged to consult with IOS Program Directors in the IOS program most closely related to the proposed activities as determined by the primary questions being asked and the hypotheses being tested prior to submitting a proposal.

General questions concerning this opportunity should be directed to Joanna Shisler at jshisler@nsf.gov.

Sincerely,

Joanne S. Tornow
Assistant Director
Directorate for Biological Sciences