Future of Research (FoR):
Studying the infrastructure of science to advocate for an efficient, productive enterprise

Organizational Mission Statement
FoR's mission is to improve the scientific research enterprise. We aim to engage many voices to discuss the core values of the research community, use those values to identify appropriate metrics to assess the current system, and to inspire data-driven change. We will translate the outcomes of those discussions into action by lobbying for cultural and institutional changes at universities, research centers and at federal funding centers such as the NSF and NIH.

FoR as an organization
FoR is currently an association of early career researchers across the U.S. We are the first group to successfully include early career researchers in the national conversation. Our first symposium, in Boston in 2014, identified problems and proposed solutions through discussions, and generated a White Paper on the issue. We have amassed expertise and data on the scientific enterprise comparable to better-established national groups, are engaged in discussions about the future of research and now wish to study the system.

Creation of a non-profit organization is an immediate goal. Requested funding will allow us to establish a secure non-profit organization that will build the infrastructure necessary to achieve the early goals of continuing to promote grassroots discussions and carry out initial studies and preparation of products to lobby for change.

Overarching themes
The FoR non-profit will *identify appropriate metrics* in science to *evaluate the efficiency and productivity* of the scientific enterprise. We will then use this information *to advocate* for any necessary changes to science, including a possible new vision for the way science operates. There is an active discussion in the U.S. and internationally about whether the scientific research endeavor functions as productively as it could do or should do. Until now, the debate has been grounded in the subjective personal experiences of individual researchers, and there is little rigorous, data-driven evaluation of the system's efficacy.

The current measure of productivity in science is publication in high-impact factor journals, but we believe that this metric is too narrow to fully describe the positive impact of researchers' work on broader society. We will expand evaluation to include other factors such as *reproducibility*; *scientific literacy and education*; *economic benefits* from creation of companies as a direct result of research; *benefits to patients*; and *equal access to data* provided by "open science" practices. We wish to identify incentives and metrics associated with scientific productivity in order to inform and advocate for policy changes that improve the scientific enterprise.

We view the scientific enterprise not only as a means to generate academic faculty, but also to create a more broadly defined scientific community. This broader conception of a scientific community must also account for diversity across multiple axes. Training systems represent one axis in which the conventional linear pipeline (PhD to postdoc to faculty) must be remodeled within a novel and multifaceted scientific endeavor in which scientists can move between spheres such as academia and industry in a collaborative and integrative manner. A diverse scientific enterprise will also rely on a diverse population encompassing many perspectives and we view the remodeling of training as necessarily generating a diverse scientific community. Identifying how best to generate such a scientific enterprise and advocating for the necessary changes will be part of our long-term goal.

The work of FoR will benefit from collaboration with "Rescuing Biomedical Research," a group also funded by the Open Philanthropy Project, but will differ in focus. We perceive the work of Rescuing Biomedical Research as facilitating the cultural changes required within the biomedical establishment. FoR, in contrast, aims to provide new ideas and insights from the junior scientists working in "the trenches" of science.

Executive Director: Day-to-Day Operation

The day-to-day operations for the Executive Director will, in the first instance, fall into 2 categories: *Infrastructure* and *Research Communication/Advocacy*.

Infrastructure

Currently, FoR is comprised of multiple regional groups of volunteers located in Boston, San Francisco, Chicago, and New York. To coordinate the efforts of these groups, and to engage the participation of other interested parties, the organization needs a home for its internal and external communications. AAAS's Trellis can provide the discussion forum to allow FoR's regional chapters to communicate with one another and to engage with the broader scientific community. Development of a Trellis site for FoR is currently underway and will be expanded in coming year. Additionally, Trellis's Community Engagement Fellows Program provides an opportunity to fund the activities of the Executive Director of FoR. The Executive Director will therefore apply for this fellowship, as well as other relevant funding opportunities to ensure the long-term financial stability of the organization.

The Executive Director will take full responsibility for ensuring that resources are provided for the organization. This will involve securing funding through small and large project grants, and soliciting donations from supportive organizations and parties.

Research Communication/Advocacy

The Executive Director will spearhead the research projects described below and disseminate the results in a variety of forms including white papers (for research councils, grant-awarding institutions, and philanthropic foundations), academic publications, conference presentations and workshops. The Executive Director will also develop literature targeted to policy-makers, materials for conversation with industry, and other materials for distribution to all levels of the scientific community and the public.

FoR not only creates its own regional symposia to foster discussion, but also presents workshops at national and international meetings and working groups including (but not limited to) the FOBGAPT meetings at University of Michigan (May 2015), the ASBMB Sustaining Discovery Working Group in DC (February 2016), the ASAPBio publishing summit at HHMI (February 2016), the National Postdoctoral Association Annual Meetings (March 2015, 2016), the NatureJobs Career Expos in Boston (March 2015, 2016) and is engaged in ongoing work with Rescuing Biomedical Research.

The ultimate goal of this communication is to educate policy makers and the public about concrete policy steps that should be taken to improve the scientific research enterprise.

Short-term projects

By the end of the first year of funding, the Executive Director will aim to complete the research for the following projects:

Which nations have the most effective scientific research systems?

This will utilize a recent UNESCO report as a primary source of comparison to identify potential successes and failures in various scientific systems around the world.

What are best practices for efficient science across scientific disciplines?

A comparison of active discussions in various fields across science, engineering, mathematics and technology of successes and failures in the systems used by each field, and incorporating these fields into a discussion that is dominated by biomedicine to explore diverse perspectives and solutions.

What should undergraduates and grad students know before beginning their scientific careers?

Materials, such as a guide to graduate school and careers, in cooperation with those trying to raise career awareness in science, to help students consider how they can best contribute to science.

Medium-term projects

These projects, slightly larger in scope, will be undertaken as longer 1-3 year projects, with the assistance of additional staff employed as part of the Year 2 capacity-building component:

How much competition is too much competition?
We will encourage institutions to administer the Survey of Organizational Research Climate (SOuRCe) and will collect and assess the data to ask how much science should be competitive and/or collaborative, and to test areas where these qualities could be beneficial or harmful.

Would increasing the number of staff scientists improve research?
One of the consensus recommendations in academia is that scientific research should rely on staff scientists rather than trainees. The conversation surrounding staff scientists focuses on the issues of funding a labor workforce but has not addressed whether efficiency could be affected by replacing a temporary trainee workforce with a longer-term, permanent experienced workforce and whether potentially those benefits could offset the immediate obvious economic difference. This project will quantitatively analyze existing datasets and carry out analysis of productivity of entire labs with and without staff scientists, as well as of individual researchers at different levels. There will also be a qualitative aspect, in creating a survey of experiences, perceptions and perspectives of current staff scientists, to discover what being a staff scientist is, and what "staff scientist" should mean.

Long-term project

This project is the overall vision of the organization. It will be driven by the Executive Director with cooperation and collaboration throughout the national organization:

A grand vision of the scientific enterprise
In coordination with the international scientific community, we will work to reconstruct and diversify the scientific pipeline. For this to work we must identify how to evaluate an efficient and productive scientific enterprise. We will then advocate and facilitate the advocacy of others for the incorporation of these metrics. We seek to improve the research system by increasing the diversity of thought, backgrounds and experiences, and representation of all. The Executive Director will coordinate an international summit similar in scope to the Asilomar Conference on DNA of 1975, or the NAS/NAM Human Genome Editing Summit of 2015.

Budget proposal

Tier 1: Establish organizational infrastructure & mission-critical project execution
$155,000 per year for 3 years.
Salary for Executive Director; Travel costs to bring 2 people to 10 meetings a year; Office rental/space/coworking space; Operational costs of non-profit.
Tier 1 total: $465,000

Tier 2: Capacity building (begins year 2)
$100,000 per year for 2 years to employ a part-time event coordinator and a part-time data scientist.
Tier 2 total: $200,000 (Tiers 1 & 2: $665,000 over three years)

Tier 3: Capacity building and project expansion (year 3):
$100,000 to plan and provide an international summit on the scientific enterprise.
Tier 3 total: $100,000 (Tiers 1, 2 & 3: $765,000 over three years)