

To: NSF ART for the Biden-Harris Transition Team

From: Paula Szkody, President of the American Astronomical Society *Paula Szkody*

Date: 21 December 2020

RE: Priorities/Issues for the Incoming Biden-Harris Administration

On behalf of the over 7,800 members of the American Astronomical Society, we appreciate the opportunity to share our perspectives on the key priorities and challenges for the astronomical sciences at the beginning of the Biden-Harris Administration. The United States has long been a leader in the astronomical sciences, but we have recently fallen behind in key areas. We look forward to working with the new Administration to return the U.S. to the front of cutting-edge science and exploration, led by a diverse and inclusive work force. Astronomy has long been a STEM gateway science and many of our members who are trained as astronomical researchers go on to work in other fields, well equipped to succeed in the jobs of the future.

Overall Federal Support for R&D

As you know, federal funding for R&D as a fraction of U.S. GDP has been in decline for decades¹, limiting the pace of discovery, the training of new scientists, and the development of technology. One symptom of this decline is that the success rate of proposals for funding programs has dropped to an unsustainably low level, with excellent-rated proposals going unfunded. The scientists who write these proposals depend on federal funding to support the early career researchers who work for them. This funding issue has affected the astronomical sciences in almost all cases. The Trump Administration submitted budgets with cuts across most science programs, and thankfully the Congress has rejected most of those proposals.

We support emergency federal spending to address the immediate public health and economic crisis facing the Nation. In fact, the pandemic has hit early career scientists comparatively hard. The programs and agency policies that explicitly support them need extra support or we risk losing a substantial portion of this generation of researchers.

In the midst of this emergency spending, we trust that the Biden-Harris Administration will also find a way to address longer-term challenges. In particular, we encourage you to submit budget requests—beginning with FY2022—that fund the President-Elect’s bold “Innovate in America” plan to invest an additional \$300B in R&D and over four years. We urge the Administration to also support core disciplinary and interdisciplinary research with these funds.

Setting Priorities in the Astronomical Sciences

The National Academies carry out Decadal Surveys to assess the field and workforce and to prioritize new programs, facilities, and missions. The recommendations of the decadal surveys

¹ National Center for Science and Engineering Statistics, National Patterns of R&D Resources (annual series)

represent the broadest possible community-based consensus and impact the investment decisions of the science agencies over long periods of time. The next Astronomy and Astrophysics Decadal Survey (Astro2020) is expected to be released by Summer 2021. The Planetary Science and Astrobiology Decadal Survey is underway and expected by 2023. The Solar and Space Physics Decadal Survey mid-term review was recently completed.² The National Science Foundation (NSF) co-sponsors all three, and we urge the Administration's support for the recommendations in these touchstone reports.

Priorities for the Astronomical Sciences at NSF

Funding

The NSF is the sole federal steward for ground-based astronomy in the United States, so the relative strength or weakness of NSF funding is a critical determinate in the long-term health of the entire discipline. Despite significant capital investments from philanthropic and state sources into the U.S. system of optical ground-based observatories, stagnant NSF funding has resulted in a U.S. effort that has or soon will cede its long-standing global leadership position to the well-funded European Southern Observatory. On the other hand, ground-based radio astronomy remains a global leader thanks to relatively recent major investments by the NSF.

Mid-Scale Infrastructure

The MSIP (mid-scale infrastructure program) of NSF's Astronomical Sciences division has been under-funded compared to the level recommended by the 2010 Astronomy and Astrophysics Decadal Survey.³ The Decadal specifically recommended a mid-scale program *separate* from the NSF-wide MSRI (mid-scale research infrastructure) program to be funded at \$40 million a year. Due to funding constraints, NSF's execution of this vision has been variable and not in line with the parameters outlined in the report.⁴

MREFC Reform

A 2018 National Science Board report examined the crisis in building new cutting-edge major research facilities while also maintaining healthy grants programs.⁵ As you may know, the NSF budgetary model for building major facilities has not included agency-wide funding to operate these major facilities following construction; rather, the sponsoring research division/directorate is expected to identify full operations costs. In an era of robust annual increases for these divisions, this arrangement works well. However, we have not been in such an era for some time and the arrangement has broken down. Divisions are no longer able to finance the operations of cutting-edge facilities without significant cuts to competitive grants programs.^{6,7}

² Review of Progress Toward Implementing the Decadal Survey - Solar and Space Physics: A Science for a Technological Society

³ New Worlds, New Horizons in Astronomy and Astrophysics 2010 Decadal Survey (PDF page 38, document page 3) second in order of priority for ground-based recommendations

⁴ AAAC Report 2020 page 5: Findings and Recommendation 29-30

⁵ NSB Report: Study of Operations and Maintenance Costs for NSF Facilities, Executive Summary on page 6

⁶ AAAC Report 2020 page 6: Findings and Recommendation 32-34

⁷ Decadal Survey for Solar and Space Physics Midterm Assessment 2020 page 139: Findings 3.6-3.8

Innovative policy solutions are needed. NSF's Facility Operations Transition pilot program is a worthy experiment with bicameral Congressional support. The Astro2020 Decadal Survey is examining the issue and we hope that the Administration will head its guidance.

Personnel

In our opinion, the absence of a Senate-confirmed Deputy Director has hampered the work and influence of NSF in the political spheres of the Executive and Legislative Branches. The appointment of a chief operating officer in the interim seems to have worked well internally at the Foundation, but our concern is with relationships external to the Foundation. We encourage the Biden-Harris team to prioritize this appointment.

Dark and Radio Quiet Skies

The astronomical sciences are threatened by the recent, rapid proliferation of low earth orbit satellite constellations which, if implemented as proposed, would severely impact existing and future ground-based observatories by interfering with sky images.⁸⁹ International efforts to address this problem are already underway at the UN Office of Outer Space Affairs.¹⁰ We applaud the Astronomical Science Division changes to expand the remit of the two-person spectrum management office to include non-radio wavelengths, but we encourage the new Administration to support the work of the career staff with more White House political level support in discussions with other agencies (e.g., NTIA and FCC) and the private sector.

Innovation in how we use the *radio* spectrum will be critical to the future success of both industry and the scientific disciplines that need to share the spectrum with them, and we applaud NSF initiatives in this domain. These initiatives are worthy of top-level support.

Space Weather

The PROSWIFT Act, signed into law in October, outlines a national strategy for forecasting and safeguarding against space weather events. Space weather forecasting requires a combination of data and underlying basic research, much of which is supported by the NSF. We encourage the Administration to fully fund these efforts.

Transparency Issues

- Success rates: There appears to be a policy at NSF that prohibits the public release of program-specific success rate data. For example, program officers are no longer allowed to present these data to advisory committees and the National Science Board no longer publishes these data by division as part of its annual merit review reports. We strongly urge that this this policy be reversed.
- Enacted budget data: NSF does not publish prior year enacted appropriation levels until the release of the subsequent year Presidential budget request. Other agencies, such as NASA, share this data with advisory committees and others as soon as the

⁸ SATCON1 Report

⁹ AAAC Report 2020 page 4: Findings and Recommendation 16-20

¹⁰ https://www.unoosa.org/oosa/events/data/2020/dark_and_quiet_skies_for_science_and_society.html

Appropriations Committees approve the operating/current plan following each annual appropriation. NSF needs to do the same.

- Demographic data: In order to assess the effectiveness of programs to increase diversity in our discipline, we must understand the demographics data on proposal selections, hiring, observing time awards, and paper citations would a much clearer picture of the state of our profession.¹¹ We encourage the Administration to revisit the policies restricting the release of these data.

A Strong and Inclusive Scientific Community

The strongest research and teaching community is one where all members of society actively engage in equitable practices. The STEM fields have sought to achieve this equity, and great progress has been made toward gender parity in the astronomical sciences. However, the astronomical sciences' efforts to improve racial and ethnic diversity have not yet been nearly as successful. We encourage top-level support for the following NSF-related initiatives to help improve the retention of astronomical scientists from underrepresented groups:¹²

Expand Masters-to-PhD bridge programs: In these bridge programs, Historically Black Colleges and Universities or Minority Serving Institutions partner with PhD-granting institutions. These programs have been tremendously successful in training and placing talented students in PhD programs, where they have thrived. We need more of these programs across the country, and at scale, so we recommend that federal support for them be greatly expanded.¹³

Implement the provisions in H.R. 2528: the STEM Opportunities Act of 2019 included provisions related to the appropriate role for NSF in adjusting how graduate students are mentored based on National Academies' studies.

Broaden the NSF INCLUDES Program: The Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science program (NSF INCLUDES), provides a collaborative infrastructure for broadening participation. We encourage the transition team to look at expanding this program to other science agencies.¹⁴

The United States as an Attractive Destination for Scientists

The U.S. scientific enterprise has greatly benefitted from attracting and retaining the most talented and highly skilled students and PhDs from around the world. The harmful travel, visa, and immigration actions of Trump Administration need to be reversed as soon as possible.¹⁵

¹¹ Decadal Survey for Solar and Space Physics Midterm Assessment 2020 page 142: Findings 5.5, 6.3, and 6.4

¹² National Science Board: Vision 2030 page 17

¹³ National Science Board: The Skilled Technical Workforce page 27: "The Power of Partnerships: Universities and Community/Technical Colleges

¹⁴ AAAC Report 2020 page 5: Recommendation 25 encourages NASA, NSF, and DOE to adopt joint priorities and policies

¹⁵ National Science Board: Vision 2030 pages 17 and 19