

December 14, 2020

Executive Summary

On behalf of the American Physical Society (APS), I congratulate you on your election as the 46th President of the United States. The accompanying letter outlines policy recommendations that focus on current critical issues that impact American R&D. Many of our recommendations align with plans you offered during the campaign and can be executed immediately, within your first 100 days in office, or as part of your initial budget request to Congress. Their implementation would dramatically improve the current state of America's scientific enterprise and put us on a trajectory to emerge from the pandemic prepared to both compete and cooperate with our global counterparts.

Recommendations that map to the four priority areas outlined by your transition team include:

- providing supplemental funding of at least \$26 billion, as outlined in the RISE Act, for the federal science agencies in any future COVID relief legislation;
- implementing policies that make the United States a destination of choice for international students and scholars and ensure that employers are able to recruit and hire talented individuals from around the world;
- implementing policies aimed at developing a diverse 21st century STEM workforce with an inclusive innovation infrastructure; and
- including robust investments for basic scientific research as a central component to plans to address climate change and improving regulations and monitoring to reduce methane emissions, one of the most egregious contributors to climate change.

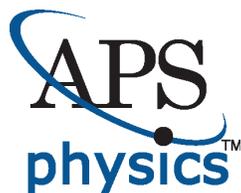
Additionally, to help your Administration develop policies that will improve our R&D ecosystem, we strongly encourage you to appoint a cabinet-level Special Assistant to the President for Science and Technology early in your administration and promptly fill and utilize the existing executive branch structures charged with advising on and implementing policies impacting America's scientific ecosystem, including the Office of Science and Technology Policy (OSTP), the National Science and Technology Council (NSTC), and the President's Council of Advisors on Science and Technology (PCAST). Doing so will ensure that science and technology is responsibly and effectively represented in policymaking in the White House.

Sincerely,

A handwritten signature in blue ink that reads "Philip H. Bucksbaum". The signature is written in a cursive style.

Philip H. Bucksbaum
President, American Physical Society

enclosure: full letter



President

Philip H. Bucksbaum

Stanford University and
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American Physical Society

December 14, 2020

President-Elect Joe Biden
Presidential Transition Headquarters
1401 Constitution Avenue NW
Washington, DC 20230

Dear President-Elect Biden:

On behalf of the American Physical Society (APS) – the largest physics membership organization in the United States with more than 54,000 members throughout academia, the national laboratories and the private sector – I congratulate you on your election as the 46th President of the United States. We applaud your initial set of priorities aimed at addressing some of the nation’s critical issues. As you lay the foundation for your Administration, we ask that you consider the policy recommendations outlined below aimed at strengthening America’s scientific enterprise. Additionally, we urge you and your Administration to set a bold path to return the United States to its position of global leadership in science, technology and innovation.

Throughout our 121-year history, APS members have participated in the federal government. Members have served in both Republican and Democratic Administrations, as Secretary of Defense, Secretary of Energy, Science Advisor to the President, Director of the Central Intelligence Agency and as Members of Congress, as well as leadership positions in federal research agencies. We will continue to serve as a resource as you select individuals to serve in your Administration.

Today, our nation faces pressing challenges, and America’s science ecosystem – the network of people, research institutions, national laboratories, scientific user facilities and companies that drive American discovery and innovation – can help address many of the most urgent issues. The techniques used to determine the structure of SARS-CoV2 and the RT-PCR method used for testing are based on physics discoveries. Recent physics advances also enable single-cell genome sequencing, which is critical for cancer and genome-based medicine. Additionally, efficient solar cells, LED lighting and the sensors used in wind technology all rely directly on recent physics discoveries.

To meet today’s challenges requires a strong partnership between the scientific community and the federal government. By appointing a cabinet-level Special Assistant to the President for Science and Technology early in your administration and nominating this person to serve as Director of the Office of

Science and Technology Policy (OSTP), you can ensure that science and technology is responsibly and effectively represented in policymaking in the White House. Furthermore, promptly filling and utilizing the existing executive branch structures charged with advising on and implementing science and technology policies, including OSTP, the National Science and Technology Council (NSTC), and the President's Council of Advisors on Science and Technology (PCAST), will strengthen our research and development (R&D) ecosystem.

America's scientific enterprise operates best when the federal government implements policies that balance national security and the research requirements of open science; create an inclusive innovation infrastructure that expands research capacity and enables broad participation in STEM; foster more diverse, equitable and inclusive laboratories and work environments throughout STEM fields; and make our country a destination of choice for the world's best and brightest minds. Additionally, our research and innovation rely on robust and sustained federal funding for R&D across the federal science agencies, including the Department of Energy (DOE) Office of Science, the Department of Defense (DOD) Basic Research Organizations, the National Institute of Standards and Technology (NIST) and the National Science Foundation (NSF).

With this policy framework, we ask you to consider the recommendations outlined below, which focus on current critical issues that impact American R&D. Many of our recommendations align with plans you offered during the campaign and can be executed immediately, within your first 100 days in office, or as part of your initial budget request to Congress. Their implementation would dramatically improve the current state of America's scientific enterprise and put us on a trajectory to emerge from the pandemic prepared to both compete and cooperate with our global counterparts.

Stimulus Support for Scientific Community

The pandemic has affected nearly every segment of our research enterprise, reducing or suspending many non-COVID-related research activities and disrupting our STEM talent pipeline. Our international competitors are already taking steps to restore and also enhance their national research and educational programs after the pandemic ends. These challenges place at risk the future health of US science and its supporting workforce. The federal government must provide the support necessary to fully restore our R&D capabilities, which are essential both to maintain our global leadership and grow our innovation-based economy.

Recommendation: Provide supplemental funding of at least \$26 billion, as outlined in the RISE Act, for the federal science agencies in any future COVID relief legislation.

International Collaborations & Research Security

Science is a global venture. Today, international facilities and collaborations are essential to conduct leading-edge research in many fields. The United States benefits from being a reliable partner in these shared ventures – made possible by a free flow of information and scientists – and they can improve our relationships abroad. Open exchange of information is essential for progress in fundamental science, and it has been critical to our country's success in scientific research. Increasingly, however, national security concerns have led to consideration of significant restrictions on cooperation and collaboration with our international counterparts, which could jeopardize US leadership in research and innovation. While some areas of research must employ controls, the benefits of openness in research and of the inclusion of talented foreign researchers dictate against broad federal measures that would wall off areas of precompetitive fundamental research.

Recommendation: To help achieve an appropriate balance between national security and the research requirements of open science, Presidential Directive NSDD-189 should be reaffirmed. The directive states that fundamental research is defined as research that is meant to be published in the open literature and that

the products of fundamental research should remain unrestricted “to the maximum extent possible.” Classification should be used if control of particular fundamental research is required for national security.

Visas and Immigration

For more than half a century, the United States has been the premier destination for top global talent. Our nation’s ability to recruit the best and brightest minds from around the world to study and work here serves as a competitive advantage and helps the United States maintain its global leadership in cutting-edge scientific research and state-of-the-art technology development. But now, the United States is losing its allure. During the last few years, for example, as documented in recent reports and data, the United States has seen a significant decline in its ability to attract talented international students. With that decline comes substantial economic risk for the United States, as top international students and scientists are now choosing to go to competitor countries to study, to seed innovation and to build businesses.

Recommendation: The following actions should be taken to help return the United States to a destination of choice for international students and scholars and ensure that employers are able to recruit and hire talented individuals from around the world:

1. Immediately place a moratorium on the proposed rule “Establishing a Fixed Time Period of Admission and an Extension of Stay Procedure for Nonimmigrant Academic Students, Exchange Visitors, and Representatives of Foreign Information Media,” which is currently under development.
2. Immediately reverse the interim final rule referenced as DOL Docket No. ETA-2020-0006, implemented by the previous administration, which is designed to inflate the salaries of H-1B visa holders and employment-based immigrants to the extent that their services are priced out of the US labor market.
3. Work to reverse the deleterious effects on the R&D workforce of Presidential Proclamation 10052 put forward by the previous administration.
4. Support and implement policies that allow international students applying for an F-1 visa to indicate they would like to stay in the United States after graduation and provide them a clear path to a green card should they choose to stay and work here.

Domestic Workforce

While there has been progress, the participation of women and racial and ethnic minorities in the US scientific and technical workforce does not reflect the diversity of our population. We are failing to capitalize on one of our nation’s key competitive advantages – its diversity. This hurts the US R&D enterprise by depriving it of diverse perspectives that boost innovation and productivity. A diverse and inclusive 21st century STEM workforce with broad participation from initial innovations all the way to the marketplace is essential to enhance our economic competitiveness and address societal needs.

Broad participation in university-based research is known to have a strong effect on workforce diversification. Yet, historically most federal research funding has been distributed to a fraction of our country’s research universities. Two-thirds of the nation’s underrepresented minority (URM) students have little or no opportunity to engage in research while in school and, therefore, miss the opportunity to join the workforce of emerging industries, including quantum information science and artificial intelligence.

Studies also reveal systemic cultural aspects of our research environments that inhibit gender, ethnic, and even regional diversity. This lack of representation cannot be solely attributed to inequities in education or the workforce pipeline, but they have a similar effect in stifling innovation.

Recommendation: The following actions should be taken to help create a STEM workforce that more closely reflects the diversity of our nation:

1. Immediately rescind Executive Order 13950 put forward by the previous administration and replace it with effective programs of training and education on diversity and inclusion.
2. Develop incentives for our top research universities to create meaningful lasting partnerships that strengthen the research capacity at emerging research institutions, including minority-serving institutions (MSIs), tribal colleges and universities (TCUs), historically black colleges and universities (HBCUs), and the colleges and universities with smaller research activities, which are often in underserved states.
3. Encourage the federal science agencies to adjust grant application requirements as appropriate to account for the current pandemic's disproportionate impact on female principal investigators.

Nuclear Threat Reduction

The global threat from nuclear weapons remains grave and is worsening. The world arsenal still contains approximately 10,000 operational nuclear warheads, with an explosive power of about 200,000 Hiroshima bombs. Although the number of warheads is less than during the Cold War, recent actions by nations that possess nuclear weapons have heightened our risk of nuclear catastrophe. The withdrawal from arms control treaties, new threats to nuclear weapons by cyber-attack, the increasingly complex web of relations and hostilities between nuclear weapons states, and the massive modernization of nuclear forces in the United States and Russia, as well as China, are igniting a deadly new arms race.

Recommendation: The following practical steps should be taken to reduce the nuclear threat:

1. Sign a five-year extension of the New Strategic Arms Reduction Treaty (New START). Without this extension, the treaty will expire on February 5, 2021, leaving the United States and Russia without any nuclear arms limitations treaty or agreement in place for the first time in nearly fifty years. A decision by the presidents of the United States and Russia to extend New START would provide additional time and a stable foundation for further potential negotiations with Russia and potentially with China on new and more ambitious arms control arrangements. It also would contribute to the fulfillment of their disarmament obligations and commitments under Article VI of the Treaty on the Nonproliferation of Nuclear Weapons (NPT).
2. Suspend all plans enacted by the previous Administration to prepare and proceed with a nuclear weapons test. The United States' Stockpile Stewarding Program has "allowed DOE and DOD to certify the safety, security, and effectiveness of the U.S. nuclear weapons stockpile to the President without the use of nuclear explosive testing" for the last 23 years, according to the National Nuclear Security Administration's FY 2020 Stockpile Stewardship and Management Plan.
3. Strengthen US leadership in multinational efforts to curb global proliferation of nuclear weapons.

Climate Change

Earth's climate is changing. This critical issue poses the risk of significant environmental, social and economic disruptions around the globe. Multiple lines of evidence strongly support the finding that anthropogenic greenhouse gases have become the dominant driver of global climate warming observed since the mid-twentieth century. Moreover, the deduction that human-induced alterations to many principal components of the climate system are accelerating is supported by the preponderance of observational evidence. The potential consequences of climate change are great, and the actions taken over the next decade or two will determine human influences on the climate for centuries to millennia.

Achieving your ambitious goal of net-zero emissions, economy-wide, by no later than 2050 requires significant technological advances across our energy systems, which will have the potential to transform

associated industries. Such advances are rooted in scientific discoveries that come from the basic research supported by our federal science agencies. Providing robust investments in scientific research today is the key to unlocking the innovative technologies that we need tomorrow.

In addition to developing new low- or zero-carbon energy technologies, we must also take the necessary steps to accurately monitor and effectively curb current greenhouse gas emissions. For example, one of the most egregious contributors to climate change is methane, a more potent heat-trapping gas than carbon dioxide (CO₂). Recent scientific studies have shown that negative environmental impact of methane is significantly higher than previously estimated, with its 100-year global warming potential increasing by 14 percent above the value provided by the Intergovernmental Panel on Climate Change (IPCC) in its 2013 Assessment. When there is insufficient transport available to carry methane away from an oil or gas drilling site to centers for treatment for commercial purposes, the methane is burned on-site, a process known as “flaring.” Currently, state regulatory bodies rely on oil and gas producers to self-report the amounts of methane flared, as well as fugitive methane releases. Knowing with precision the nature of gaseous products associated with flaring will enable enforcement strategies that can reduce or eliminate this significant source of heat trapping gases and provide health warnings associated with toxic emissions.

Recommendation: The following actions should be taken to reduce the emissions, and ultimately the concentration, of greenhouse gases:

1. Include robust investments for basic scientific research across the appropriate federal science agencies as a central component to your plans to address climate change.
2. Reverse the previous administration’s final rule published on September 14, 2020 titled “Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources Review” and return to the methane regulations established under the Obama Administration. Additionally, your administration should begin a process to accurately assess methane emissions as a means to curb emissions of this potent greenhouse gas. This should be undertaken as part of a national policy to achieve or exceed the target set by the Paris Climate Agreement of emissions reduction of 26 to 28 percent below our 2005 levels by 2025.

Please do not hesitate to contact APS through Mark Elsesser (elsesser@aps.org; 202.662.8170) at our Office of Government Affairs if you have any questions, require additional information or would like to discuss our recommendations further.

Thank you for your time and consideration.

Sincerely,



Philip H. Bucksbaum
President, American Physical Society