Written Public Comments Submitted to PCAST

October 14, 2021 to November 17, 2021

(Written Public Comments in order of date received)

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From: Matthew Miller <[redacted]>
To: MBX OSTP PCAST <MBX.OSTP.PCAST@ostp.eop.gov>
Sent: Tue 10/19/2021 2:40 PM
Subject: Public comment: Climate Change, Energy, and Environment Session

Thank you for an extraordinarily well-organized, informative, and constructive session. The sector experts' presentations followed by deep and insightful conversation with PCAST membership overcame many of the obvious drawbacks of a ZOOM session.

What is lacking, as highlighted by Michael Oppenheimer, Jesse Jenkins, and Erin Sikorsky, is the behavioral and social sciences expertise, both as presenters and as committee members, to assess the social factors that will be so critical actually to implement the societal changes necessary to address the multi-dimensional problem of climate change.

In my own area of expertise, I am concerned that fission has essentially been taken off the table as part of the portfolio of solutions going forward. My interest is fusion, inherently safe, ubiquitous, firm, dense power at scale, but maybe too late for (properly) ambitious deep de-carbonization schedules. But, just as shale gas can provide an off-ramp from coal while we develop renewables at scale, so could fission provide an off-ramp from shale gas to fusion at scale. However, there is apparently such fear of the lack of social license for fission, that all things nuclear have insufficient priority.

Best regards,

Matthew D. Miller
President
Stellar Energy Foundation
URL: https://www.stellarenergyfoundation.org
E-mail: [redacted]

From: Andrew Holland <[redacted]>
To: MBX OSTP PCAST <MBX.OSTP.PCAST@ostp.eop.gov>
Sent: Wed 10/20/2021 1:50 PM
Subject: Public Comment RE: October 19 PCAST meeting on Fusion Energy

To whom it may concern,

I write as the CEO of the Fusion Industry Association, the unified voice of the private fusion industry. We are excited to see the interest of the PCAST in learning more about fusion.

I attach the FIA's recommendations for how to create a new public-private partnership program, identified during the discussion as a key enabler of fusion breakthroughs, as well as an op-ed that I wrote in July which outlines why it is important we make these investments.

Both myself and our member companies are available for further meetings and discussion.

Andrew

Andrew Holland
Chief Executive Officer

Fusion Industry Association
Phone: [redacted]

FUSION INDUSTRY ASSOCIATION

June 2021

Accelerating Fusion Energy:

Creating a Milestone-Based Fusion Energy Development Program to immediately accelerate fusion energy in the U.S.

President Biden has made ambitious and important commitments to deal with climate change. The twin goals of net zero carbon for electricity by 2035 and net zero carbon for the economy by 2050 are necessary to meet the global challenge of climate change. They are also incredibly challenging. The burgeoning fusion industry is ready to meet that challenge through bold immediate action.

Fusion is dispatchable, safe, clean power that could be essential in achieving net zero carbon energy generation for society in a practical and economically competitive manner. However, America's global competitors are also racing to fusion power, which underscores the importance that the U.S. win the race to carbon-free commercial fusion power.

The Fusion Industry Association (FIA) is an association of 24 member companies working to commercialize fusion power on a timescale that matters for the climate crisis. Its membership consists of companies striving to build commercial fusion power plants, while its affiliate members are organizations that will build the broader fusion energy economy.

Private fusion companies have plans to build proof-of-concept machines, **capable of breakeven carbon-free fusion power, within this decade**. Commercial fusion power plants, using technology developed by FIA's members, will deliver clean energy on the grid in support of these ambitious decarbonization targets.

As the incoming Biden Administration considers proposals to stimulate the economy, re-establish American global leadership, and meet the challenge of climate change, nothing would capture the public's imagination more than an initiative to rapidly accelerate fusion energy research and development. The scientific basis to achieve breakthrough advances in fusion power are within our grasp: the time for investment is now and **a $1 billion Milestone-Based Fusion Energy Development Program within the upcoming infrastructure legislation would support the effort to build a new US-based fusion power industry.** The milestone-based development program was established in the recently passed Energy Act of 2020 and public funds would be **leveraged by private dollars** on a cost shared basis.

Building Momentum and Consensus for Fusion Energy Development

Over the last year, the American fusion community has completed a remarkable process of planning, prioritizing, and consensus building, all of which orients the American fusion program towards developing a new clean energy industry. The Community Plan for Fusion Energy and the Fusion Energy Sciences Advisory Committee report "Powering the Future: Fusion & Plasmas," both detail plans and priorities for how to achieve breakthroughs in fusion energy research, across different budget scenarios. Their approach was validated by the National Academies of Sciences report, "Bringing Fusion to the U.S. Grid", that shows how the United States can build a fusion energy pilot plant by 2035.

These reports were completed at the request of Congress and the Department of Energy. Validating these reports, Congress enacted Section 2008 of the Energy Act of 2020 on December 27, 2020, *"to effectively address the scientific and engineering challenges to building a cost competitive fusion power plant and to support the development of a competitive fusion power industry in the United States."*

A new Milestone-based Development Program was created by Section 2008 of the Consolidated Appropriations Act of 2021 (P.L 116-260). It is authorized by Section 307, subsection (i) of the Department of Energy Research and Innovation Act (42 U.S.C. 18645).

Recommendation: *A New Government Cost-Share Public-Private Partnership*

In the upcoming infrastructure bill, the FIA supports funding a new public-private partnership program that incorporates best practices from other productive partnerships such as NASA's Commercial Orbital Transportation System (COTS) and DOE's Small Modular Reactor (SMR) Licensing Technical Support and Advanced Reactor Demonstration cost-share programs.

The purpose of this program is to support the development of a US-based fusion power industry by researching and developing technologies leading to the construction of new full-scale fusion demonstration facilities. Our goal is to build demonstration facilities capable of making significant improvements in the performance of fusion systems and leading to the establishment of a new clean energy source for the nation.

This new performance-based program will directly reimburse private companies for the development of new US-based fusion capabilities over a fixed program period. Government dollars would be leveraged with substantial private sector cost share. Payments from the government would not be made until jointly established milestones throughout each company's trajectory have been completed by industry and verified by DOE; if industry participants failed to reach these agreed-upon milestones, no government payments would be made, and the government would have the option to redirect those funds elsewhere in the program. A simple application process would encourage a broad range of applicants and result in a portfolio of many participants with diverse technologies through a competitive process. Recent significant investments by the governments of China and the UK show their intent to be the first to commercialize fusion energy. A successful program launched now will ensure the U.S. takes the global lead in fusion energy with the demonstration of multiple commercial fusion energy technologies, an advantage that will last decades and result in a clean, safe electric power grid for generations to come.

Funding Request

In the upcoming infrastructure bill, the FIA requests **$1 billion** to establish and fund this new cost-share program. This fixed-length program would see outlay profile increase during the construction and operations phases, matched by the ramping up of capital spending over time from the private sector.

FIA members believe that this new public-private partnership program would be appropriate for stimulus funding for five reasons: (1) it is time limited, so it doesn't create an ongoing government commitment, (2) it is leveraged, so that government dollars bring in additional private dollars, (3) it is shovel-ready, with private companies ready to build today, (4) it will create thousands of high paying jobs as these companies construct and scale, and (5) it will increase the security, competitiveness, and stability of U.S. power generation over the long term.

FIA member companies and staff are available to brief you further. Please contact FIA CEO Andrew Holland at [redacted] for further details.

Building a Milestone-Based Public-Private Partnership

- The principles of the program are: limited government investment, with limited exposure to downside risk; broad-based portfolio approach to support many companies across the U.S. and diverse approaches; milestone payments; industry intellectual property rights; and minimization of government red-tape to allow for innovation.

- DOE and its national labs provide extensive knowledge and technical capabilities in fusion energy research and are recognized globally as leaders in R&D. This partnership program should provide for industry access to this national resource.

- The growing number of companies in the private fusion sector are demonstrating the ability to innovate and take ideas from the lab to the marketplace. They fully understand that not only must the technology work, it must also meet the market requirements for quality and costs. They will need to raise capital from energy investors to provide their cost share in this program. If the private sector doesn't get market traction, then public funding will not flow.

- The partnership agreements would include specific milestones to be completed by the private sector partners throughout the program. Government payments under the partnership would be made based upon completion of jointly established milestones or for expenses deemed reimbursable according to terms negotiated for each partnership. Milestone achievement is to be verified by DOE expert review.

- The private sector partners would be responsible for all cost and schedule overruns. DOE would also have the option to terminate the partnership agreement in the event the agreed-upon milestones are not met. This approach will minimize risk to taxpayers and incentivize industry to minimize costs and schedule delays.

- Best practices for this sort of partnership should be incorporated from prior successful programs such as NASA's Commercial Orbital Transportation System (COTS) and DOE's Small Modular Reactor (SMR) Licensing Technical Support and Advanced Reactor Demonstration cost-share programs. The experience of both the government and private sector in these programs demonstrate the value of the proposed guiding principles.

- Based on a survey of its members, the Fusion Industry Association found that our companies can **support a $1 billion cost-share program**, leveraged with additional private capital, to build integrated fusion test and demonstration facilities.

- If successful, this program would rapidly advance the country towards global leadership in a new industry, creating a unique clean-energy economy with unlimited global export potential and many high-quality jobs in technological hubs around the country.

Membership


generalfusion


Commonwealth
Fusion Systems


tae
TECHNOLOGIES


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ENERGY
LASER BORON FUSION


Helion Energy


tokamak
energy
a faster way to fusion


TFusion


TYPE ONE
ENERGY


first light


ALBOT


ZAP ENERGY


LPP FUSION


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PrincetonSATELLITE
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INNOVEN
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HORNE
TECHNOLOGIES


fuse


AGNI
FUSION ENERGY


EMC2


NK

Washington Examiner

OPINION

US must make an infrastructure investment in fusion energy

by Andrew Holland
July 13, 2021
https://www.washingtonexaminer.com/opinion/op-eds/us-must-make-an-infrastructure-investment-in-fusion-energy

Congress and President Joe Biden are right: We need to focus on rebuilding infrastructure. To be ready for the challenges of the 21st century, America can create the industries of the future while meeting the clean energy challenge to address climate change. In this decade, fusion energy will show that it's ready to move from scientific labs to commercial development.

Over the last several months, many member companies of the Fusion Industry Association, of which I am the CEO, have made major announcements about their fundraising, scientific results, and next steps. Commonwealth Fusion Systems began building its demonstration facility in Devens, Massachusetts. TAE technologies announced a successful scientific campaign and new fundraising of over $280 million to build its next experiment. Helion Energy revealed the results of its successful scientific campaign, reaching 100 million degrees Celsius. And General Fusion announced plans to build a fusion demonstration plant in the United Kingdom.

Over two years ago, as this remarkable progress toward fusion energy was coming into sight, the American fusion science program began a community planning process to organize itself to support the move toward fusion energy. Over two years of consensus-building across the public sector, private industry, and universities, American fusion scientists came to a consensus around their plans to move toward a pilot fusion power plant.

Congress responded to that program by passing a law that created new programs in the Department of Energy's Office of Fusion Energy Sciences, including public-private partnerships, that would accelerate fusion energy research and development. The National Academies of Sciences, the gold standard for American science, said that a fusion pilot plant could be built by 2035 but that planning work to create national teams consisting of the public and the private sector must start now. The FIA's member companies are aiming to move even faster.

Months later, though, the Biden administration has ignored these reports. The administration's 2022 budget does not include enough funding for fusion to begin the move toward commercial fusion energy. Even worse, the budget did nothing to create the new programs and partnerships called for by Congress or scientists.

The clear call to government action by scientists is being taken up by America's competitors. Across the Atlantic in the U.K., the government has announced its intention to create a pilot fusion power plant by 2040. Earlier this month, the Canadian company General Fusion, a member of the FIA, announced that it would build its fusion demonstration plant in the U.K., in partnership with the U.K. government. Importantly, the U.K. is also building a regulatory environment that will enable innovation, predictability, and public safety in fusion.

While the U.K. may be the early leader in the race to commercialize fusion energy, soon, an adversary could make the breakthroughs that would catalyze a new industry. China is investing billions of dollars into fusion energy, and it's seeing results. This year, their Experimental Advanced Superconducting Tokamak in Heifei set a world record for plasma confinement time and temperature by maintaining a temperature above 120 million degrees Celsius for over 100 seconds. The U.S. scientific program has no fusion facilities of comparable power. Additionally, a private Chinese company called ENN has rapidly made sizable investments into commercializing fusion energy.

If the U.S. loses this race to fusion power, it will have lost a new industry.

But supporting fusion energy is not just an investment in the future. Investing in fusion will create new, good jobs today as we build the facilities that will prove the science of fusion. It will create the high-tech industrial base that spawns spinoffs and a new era of prosperity.

The Congressional Fusion Energy Caucus, led by Rep. Don Beyer, a Virginia Democrat, is leading the charge in Congress to accelerate fusion commercialization. As Congress considers infrastructure legislation, fusion energy must be included. The FIA has proposed a $1 billion public-private partnership program that would accelerate fusion commercialization by investing in building new scientific demonstration plants here in the U.S. New funding should also be directed toward building new scientific facilities that are the best in the world. This spending would be leveraged with private dollars to catalyze a new industry that can lead the world.

When Biden introduced his infrastructure plan in March, he said: "If we act now, in 50 years, people are going to look back and say: 'This was the moment that America won the future.'" The economy of the future will be powered by clean, safe, sustainable fusion energy. Let's make the investment now to ensure that fusion is also "Made in America."

Andrew Holland is the Chief Executive Officer of the Fusion Industry Association. The FIA has 22 members working to develop fusion energy.

From: Robert Coullahan <[redacted]>
To: MBX OSTP PCAST <MBX.OSTP.PCAST@ostp.eop.gov>
Sent: Sunday, October 24, 2021 1:09 PM
Subject: [EXTERNAL] FW: Considerations for PCAST Response to POTUS - Question 1 Response Recommendations

TIME SENSITIVE CORRESPONDENCE

25 October 2021

Eric S. Lander, Ph.D., Frances H. Arnold, Ph.D., and Maria Zuber, Ph.D.
Co-Chairs
President's Council of Advisors on Science & Technology (PCAST)
725 17th Street NW (NEOB)
Washington, D.C. 20503

Dear Distinguished Colleagues:

This correspondence serves to transmit for your review and comment the enclosed paper providing input relevant to one of the five essential questions that President Biden has challenged the PCAST to answer regarding the future of American science and technology research, innovation, and societal benefits. Following below and at attachment is our input which we respectfully request you consider for the formulation of the Committee's response to Question #1 on Pandemic and Public Health. Under separate message cover and in the week ahead we will finalize and transmit our input in response to POTUS Questions #2-5. As practitioners in emergency medicine, virology, critical infrastructure protection, and emergency management we are compelled to provide this for your review in the hope it will be considered by and before the U.S. delegation alights at the Glasgow Conference.

Thank you.

Respectfully,

Steven J. Hatfill, M.D.
President and Founder
Asymmetric Biodiversity Studies and Observation Group (ABSOG)
[redacted]

Robert J. Coullahan, CEM
President
Readiness Resource Group Incorporated (RRG)
[redacted]

A Response to an Essential Question on Pandemic and Public Health for the President's Council of Advisors on Science & Technology (PCAST)

Purpose

This document offers a response to one of five crucial questions posed to the PCAST by the President of the United States in September of 2021. Respectfully, this response is provided to the PCAST at this time, in advance of the forthcoming Glasgow Conference, to offer an independent assessment and recommendation.

Our objective is to inform the PCAST membership and the U.S. delegation to the Glasgow Conference of available opportunities to strengthen the tool kit in responding to global-scale problems that threaten human development, health, safety, and survivability. We have been and will remain committed to restoring scientific integrity, ingenuity, and public trust as we design, develop, and implement enhancements that contribute to keeping America on the frontier of innovation and readiness.

The Questions

The President posed the following five essential questions to the PCAST:

- What can we learn from the pandemic to address our public health needs?
- How can we create bold new solutions to address climate change?
- How can we lead the world in new technologies?
- How do we guarantee innovation to benefit all Americans?
- How can we strengthen the American research and innovation enterprise?

Our response is segmented in two separate transmittals. This submission is focused on the first question that President Biden posed to the PCAST on pandemic and public health needs. A forthcoming submission addresses questions 2-5 and will focus on environmental mitigation, resilience, and advanced technology research and innovation.

Our Response

1. PANDEMIC LESSONS LEARNED

What can we learn from the pandemic to address our public health needs? That is, what can we learn from the pandemic about what is possible—or what ought to be possible— to address the widest range of needs related to our public health?

From the very start, mass vaccination was the wrong approach to take for the pandemic control of COVID-19.

The current mRNA vaccines, create only a short-term immunity to the original Wuhan and early Alpha and Beta clades of the SARS-CoV-2 virus, the causative agent of COVID-19. Both these Wuhan and Alpha viral clades are now essentially extinct. They have mutated into other SARS-CoV-2 variants that are now showing an ever-increasing mRNA vaccine resistance. The mRNA vaccines cannot reliably prevent infection with the dominant Delta clade of the COVID virus, and fully vaccinated individuals who become infected with COVID-19, can infect both the unvaccinated as well as other fully-vaccinated individuals.

- An Israeli study of 2.5 million patients and found that fully vaccinated individuals were 6 to 13 times more likely to get infected with some SARS-CoV-2 variants, than individuals that have developed a natural exposure from a previous COVID-19 infection. In addition, the risk of

developing symptomatic Covid was 27 times higher among fully-vaccinated individuals and their risk of hospitalization was 8 times higher, compared to individuals with a natural immunity.
- There are currently 79 international, high-quality, research papers demonstrating that infected, convalescent, COVID-19 cases possess a long-term protective immunity that is superior to that of COVID-19 mRNA vaccinated individuals. info@earlycovidcare.org

The original National Pandemic Plan for RNA respiratory viruses called for early outpatient treatment with safe antiviral drugs. Such drugs have been available since March 2020. A dysfunctional Food & Drug Administration (FDA) and the Centers for Disease Control & Prevention (CDC), fueled by conflicts of interest, incorrectly maligned Hydroxychloroquine (HCQ) for early outpatient treatment of COVID-19. Overwhelming evidence shows that a large proportion of the 727,000 US deaths could have been prevented with a national program of early 5-day course of outpatient treatment of COVID-19 with HCQ. This was intentional and the individuals involved in this are already identified in a legal document.

- This requires an urgent special counsel investigation supported by the Government Accountability Office and directed by a select panel of outside biomedical COVID-19 experts to determine accountability of this pandemic fiasco.
- An urgent and fundamental reorganization of the CDC and the FDA is necessary.
- The FDA must return to the practice of conducting its own supervised clinical trials for any new drug approval.
- With the Prescription Drug User Fee Act (1992), the FDA moved from a fully taxpayer-funded entity to one funded through tax dollars and new prescription drug user fees. The FDA user fees must be replaced with full-funding of FDA mission such that the regulated industry is not underwriting the FDA staff and budget, an absolute conflict of interest when "Big Pharma" is bankrolling 45% of the FDA bureaucracy.
- Outside patent applications by all NIH employees should be prohibited.
- An outside review panel already exists, and their recommendations are to restore the EUA for HCQ for early outpatient treatment of COVID-19 as soon as possible.
- Two separate 40+ page documents support this action (available on request).

Biological Observatory

Understanding the sources of new viruses is critical to understanding how they emerge to cause human disease. However, at present there is no standardized "predictive" zoonotic viral surveillance system. New disease outbreaks must be reactively reconstructed after an outbreak has already occurred. This narrows the period where the control of a localized outbreak is still possible.

The successful early detection of new viruses spreading between animal hosts or vectors, could have major implications for global public health by triggering early mitigation efforts such as animal culling operations, (repeatedly seen in Avian Influenza outbreaks), as well as an early search for effective prophylactic drugs. Such a capability could also provide a much-needed lead time for new vaccine development and mobilization of the "surge" medical resources necessary to cope with the predicted outbreak of an emerging infectious disease (EID).

To develop a predictive capability for detecting viral species jumps, it is also important to consider where to look. An examination of a database of 335 EID origins from 1940 to 2004, demonstrated a non-random pattern of emerging RNA viral disease associated with "biodiversity hotspots" of the planet. These hotspots are defined by regions containing 1,500 endemic species of vascular plants with a loss at least 70% of their primary vegetation. There are 34 areas around the world that qualify under this definition, with nine other possible candidates. These hotspots are also home to the world's 1.2 billion poorest people.

Historical reviews have also shown that the majority of EID events caused by animal viruses have originated in wildlife rather than in domesticated animals, and that the wildlife "richness" in a particular area (a measure of the geographic distribution of 4,219 terrestrial mammalian species), is a significant predictor for EID origin. When plotted on a global map, the areas at greatest risk for zoonotic pathogen emergence are in the equatorial tropics.

When this sustained animal surveillance system is in place, a well-equipped waterborne research vessel could act as a "Microbial Observatory" to look for RNA "viral trafficking" between the different animal species in the selected rain forest areas. In addition to performing sustained viral surveillance of the region, the vessel will share its data and any collected virus samples with collaborating laboratories that specialize in whole viral genome sequencing for longitudinal genomic analyses. Collecting this data over time will help elucidate the actual molecular mechanisms that drive viral cross-species jumps into man.

Post polymerase chain reaction (PCR)-processed animal blood and tissue samples can be analyzed on-board the research vessel using a dedicated molecular biology laboratory. To monitor viral trafficking, the animal samples collected would be subjected to DNA Microarray analysis. The laboratory envisioned will be equipped with an Affymetrix Axiom® Microbiome DNA Microarray system, for example. This will allow identification to the species, strain and sequence level yielding a genetic profiling of all microorganisms present in a biological sample with a comprehensive coverage of over 11,000 organisms across five microbial domains: the archaea, the bacteria, fungi, protozoa, and viruses.

As of mid-2020 we see no evidence any other nation nor any privately-sponsored program is undertaking the essential work outlined here. ABSOG based in the U.S. is alone in this endeavor.

As part of a "viral forecasting" project, it is necessary to understand the ecology in the jungle areas under study. To accomplish this task, the Asymmetric Biodiversity Studies and Observation Group (ABSOG), a not-for-profit research organization is developing cooperative visiting scientist agreements with several other institutions. ABSOG is currently in the advanced design stage for implementation of the research vessel that will provide the floating laboratory capable of navigating the tropical regions of interest. The question for the family of nations is, who among them cares enough about this forward looking mission to support sponsorship of what to date has been a privately financed endeavor? Should the US Department of State, US Agency for International Development, or our US Department of Health and Human Services partner with this initiative? Perhaps the PCAST can inspire such action.

The Need for <u>Balanced</u> Investments in Vaccines and Therapeutics: Case in Point

The adverse impacts of policies and unbalanced investments are illustrated within this specific case in point, how the vaccine mandates have impacted our most elite military assets within our Special Operations Forces.

The Pfizer-BioNTech COVID-19 mRNA vaccine is now renamed *Comirnaty*. The two vaccines are identical but are considered to be different products. It is a shell game being played by Pfizer, The Pfizer / *Comirnaty* mRNA vaccine was originally stated to be 90.5% effective in preventing symptomatic COVID-19, with an efficacy of 88.9% with respect to preventing severe disease.[9] At this time, these figures are no longer true.

This vaccine and the other mRNA vaccines, create only a short-term immunity to the original Wuhan and early Alpha and Beta clades of the SARS-CoV-2 virus, the causative agent of COVID-19. **Both these Wuhan and Alpha viral clades are now essentially extinct. They have mutated into other SARS-CoV-2 variants that are now showing ever increasing mRNA vaccine resistance.**

Currently, the mRNA vaccines, cannot reliably prevent infection with the dominant Delta clade of the COVID virus,[1,2,] and fully vaccinated individuals who become infected with COVID-19, can infect both the unvaccinated as well as fully vaccinated individuals.[4]

A recent Israeli study shows that the risk of developing symptomatic COVID-19 is 27 times higher in fully-vaccinated individuals and their risk of hospitalization is 8 times higher compared to individuals with a natural immunity resulting from a natural infection. [5] In the United States, the increase in new COVID-19 cases is unrelated to the high level of vaccination across 2947 surveyed counties.[23] The same is now true in 68 other countries. Despite an estimated 60% - 70% of the U.S. population being vaccinated, infections and deaths surged in the summer of 2021.

The current COVID mRNA vaccines can neither reliably stop an individual from catching an infection with some new variants of the COVID virus, nor stop them from transmitting this infection to someone else. It was the wrong approach for the US to take for national pandemic control.

In response, the FDA downgraded the effectiveness of the Pfizer-BioNTech COVID-19 BNT162b 2/ *Comirnaty* mRNA preparation from "*providing immunity*," to simply helping to protect individuals against the severe composite outcomes of hospitalization and death. This was the actual data *that came out of the original initial clinical trials*.

Even this is now subject to question. Accumulating data from the United Kingdom and other areas indicates the Pfizer / *Comirnaty* and the other mRNA vaccines are not protecting against hospitalizations and death.

On 1 May 2021, the FDA purposely stopped counting the number of vaccine "*breakthrough*" infections in the United States unless they result in hospitalization or death. As a result, the current efficacy of the vaccines in preventing symptomatic illness is unknown because of a lack of data. What is clear, is that the Pfizer vaccine preparations are not reliably preventing infection or deaths.

- In Britain - 80% of people over 16 are fully vaccinated. Yet the data show that only about 25% of deaths in Britain are among the unvaccinated. [15,16]

- While the British data appears to have many potential confounders that limit the actual accuracy of this all-age comparison for death, the trend does appear to be real.

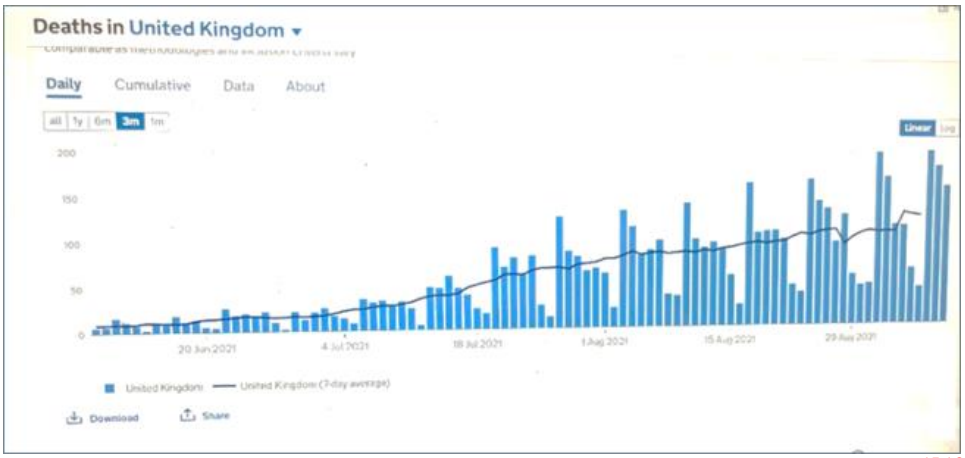

Figure 1. Public Health England Technical briefing 22, September 3, 2021.[15,16]

- In the U.S., despite errors in reporting and counting the number of vaccines administered, according to VAERS, the number of deaths per million vaccine doses has increased overall to more than 10-fold.[17]

- The British study also revealed that *vaccinated people over the age of 40* are now MORE likely to get COVID-19 than the unvaccinated. This reinforces the statement that vaccination mandates for individuals with natural immunity, introduces unnecessary risks without commensurate benefits—either to individuals or to the population as a whole.[16]

Realizing that their vaccination programs are not working, the British and Israelis are now considering dropping vaccine passports and halting the practice of making private businesses check vaccine status.

In contrast, an unvaccinated individual who contracts SARS-CoV-2 will develop a dramatically better immunity and cross-strain reactivity against COVID-19 variants, than an individual fully vaccinated with the Pfizer-BioNTech BioNTech BNT162b2 / *Comirnaty* mRNA preparation or other mRNA vaccine preparations.[10,11,12]

However, there is now considerable evidence that COVID-recovered individuals should NOT be vaccinated because they are at a higher risk of adverse effects if they are administered the current mRNA vaccines, compared to those not previously infected.[6,7,8]

The FDA is Incapable of Monitoring Vaccine Safety and Efficacy

On Aug. 21, 2021, the Temporary FDA Commissioner Janet Woodcock MD, gave full approval to the *Comirnaty* vaccine for COVID-19— for individuals 16 years of age and older. Roughly a year earlier, Dr. Woodcock had declared a conflict of interest and had recused herself from all mRNA vaccine decisions.

- Her summary announcement states: "*as the first FDA-approved COVID-19 vaccine, the public can be very confident that this vaccine meets the high standards for safety, effectiveness, and manufacturing quality the FDA requires of an approved product.*"

- The U.S. Centers for Disease Control and Prevention (CDC) also states that the COVID-19 mRNA vaccines are safe and effective "*under the most intense safety monitoring in United States history.*"

The FDA and CDC statements on high standards for mRNA safety and effectiveness are untrue.

The original FDA Approval Letter for the Pfizer vaccine had a final vaccine approval date not scheduled until 2024. Yet on 23 August 2021, the Pfizer-BioNTech COVID-19 BNT162b 2/ *Comirnaty* mRNA preparation was FDA approved - **without a panel review.**

This was despite growing evidence of possible vaccine-induced miscarriages, myocarditis in young males, dissemination of the vaccine nanoparticles from the injection site into the general circulation, vaccine-associated heart attacks, strokes, the suggestions of possible Antibody Dependent Enhancement (ADE) of infection, an increasing number of serious neurological and cardiac conditions, as well as vaccine-related deaths.

- In reality, the U.S. lacks an effective surveillance system that can rapidly and accurately detect vaccine injuries and deaths. Instead, the FDA has been forced to rely on an antiquated 32-year-old passive data collection mechanisms, primarily the *Vaccine Adverse Event Reporting System* (VAERS), to determine if the experimental mRNA vaccines are effective and if they are causing serious harm.

- The accuracy of VAERS in the past has been highly variable depending on the vaccine and adverse vaccine effects involved.

For example, VAERS was only able to capture 12% of the cases of a serious paralyzing condition (Guillain-Barré Syndrome) during the 2012-13 influenza season, and only an estimated 15% to 55% detection rate of all the cases occurring during the 2009 H1N1 influenza vaccine administration. The system is typified by gross under-reporting of other adverse vaccine events .[13]

- In a letter to Pfizer dated 23 August 2021 concerning its COVID-19 mRNA vaccine**,** the FDA admitted that it was incapable of tracking adverse mRNA vaccine side effects when it stated:

  "Furthermore, the pharmacovigilance system that FDA is required to maintain under section 505(k)(3) of the FDA is not sufficient to assess these serious risks". [14]

- The FDA has now shifted the responsibility for adverse event detection over to Pfizer as part of its agreement to license the *Comirnaty* mRNA preparation for COVID-19.[14] Allowing a manufacturer to be responsible for collecting the side effects caused by its own product does not seem to be the best thing to do to ensure accuracy. Between January 2003 and December 2016, Pfizer paid almost $3 billion in inflation-adjusted financial penalties for illegal activities, meted out by state and federal authorities.

- Both the CDC and the FDA are using incomplete data and demonstrating unreasonable bias in their pro-vaccine decisions. They are not erring on the side of caution.

The Experimental mRNA Vaccine Trials Were Rushed and Incomplete

The now identified role of SARS-CoV-2 "Spike" glycoprotein in inducing the capillary inflammation that is characteristic of COVID-19 infection, is extremely relevant given that the Pfizer-BioNTech COVID-19 BNT162b 2/ *Comirnaty* mRNA vaccine and other types of mRNA vaccine preparations, induce the manufacture of Spike glycoprotein in the cells of its recipients.

- The lack of proper testing and review of the animal biodistribution data for the Pfizer mRNA vaccine preparation prior to clinical trials, ignored data showing the rapid spread of the mRNA nanoparticles of the vaccine from the initial injection site into other tissues throughout the body .[18]

- Following vaccine nanoparticle injection, the test animals began to produce spike protein markers on the surface of the cells in the regional lymph nodes, the bone marrow, the lining of the systemic capillaries, lungs, liver, spleen, adrenal glands, and gonads.[18]

- The presence and pathological significance of this animal biodistribution data in humans is poorly documented, but it must be noted that the Pfizer/BioNTech vaccines introduce mRNA into multiple cell types throughout the body which then make a modified SARS-CoV-2 Spike Protein on their cell surface to trigger an immune response.

- The viral Spike Protein is linked to several serious pathophysiological developments in COVID-19.[17] This fact was not recognized during vaccine development and scientists did not understand the human risks of this protein when they included its mRNA code into so-called "vaccines".

What is certain, is that the original FDA Emergency Use Authorization was based on safety data generated from human trials lasting less than 3.5 months. As the U.S. mass vaccination program progressed, it has been accompanied by an abnormally high rate of real-world serious adverse effects, including deaths.

As early as February 2021, some scientists were calling for a halt to the mass vaccination program. **In their first four months, these experimental COVID-19 "vaccines" accumulated more deaths and severe adverse events than all the other vaccines combined in VAERS's entire 30-year history.**

Despite continuing calls for caution, the risks of SARS-CoV-2 vaccination continue to be minimized or ignored by health organizations and government authorities.[17] This has raised serious major conflicts between the leadership of the FDA and some of its scientists.[19]

The current mRNA vaccines are not reliably protecting individuals from infection or infection transmission. The rate of occurrence of adverse effects and the wide range of the types of adverse effects reported to date, demonstrate the need for a better understanding of the benefits / risks of mass vaccination.

Still emerging data suggests that the Pfizer mRNA vaccine may have the potential to cause vaccine-driven disease enhancement and a reprograming of the human immune system.[20, 21] This raises serious questions regarding the long-term effects of any vaccine based on the mRNA of the dangerous Spike Protein.[22]

Summary

The scientific discovery of vaccines represents one of the major advances in public health. However, the COVID-19 virus is not like the viruses that cause mumps, rubella, measles, smallpox, yellow fever, and polio, which mutate slowly. In contrast, the COVID-19 virus mutates quickly, and until a universal coronavirus vaccine can be found, the virus will always be one step ahead of new vaccine development.

Fully vaccinated individuals are contracting and spreading COVID-19 on a large scale.

- In 68 surveyed nations there is no relationship between the percentage of population vaccinated and the reduction of new COVID-19 cases during an infection cycle.

- In the United States, the increases in new COVID-19 cases are abnormally unrelated to the high levels of vaccination across 2947 surveyed counties.[23]

The current COVID mRNA vaccines can neither reliably stop an individual from catching an infection with some new variants of the COVID virus, nor stop them from transmitting this infection to someone else. It was the wrong approach for the US to take for national pandemic control.

Nevertheless, on 24 August 2021, after a supposedly careful consultation with medical experts and military leaders and with the support of the White House, the current Sec Def Lloyd J. Austin III stated that mandatory COVID-19 vaccinations for service members are necessary to protect the health and readiness of the force**.**

- This policy demonstrates a profound, deep, misunderstanding of the COVID-19 virus, the mRNA vaccines, and the current COVID-19 pandemic.

- In reality, the current mandatory vaccination mandate will not reliably protect the health of our U.S. Special Operations air, naval and ground forces and the intelligence agencies that support them.

- Instead, this mandate has the potential to generate new COVID variant clades and cause both short and long-term incapacitating side effects within the age group that typifies Special Operations soldiers and contractors.

- Alternatively, it may increase the severity of COVID-19 in some fully vaccinated personnel who are later infected with one of the continuously evolving SARS-CoV-2 viral clades.

While there is no clear evidence yet of vaccine-related autoimmunity and immunopathology, given the short initial follow-up of the early vaccine volunteers, it is unlikely such serious adverse effects would have been observed during clinical trials.

The actual long-term effects of the mRNA vaccines remain completely unknown at this time and their existence cannot be ruled out.

- In addition, there are now serious new questions involving fertility effects, the Long-Post Vaccination Syndrome and immune system reprogramming with the loss of Natural Killer lymphocyte populations and a possible susceptibility to cancer. All of these questions still require urgent research.

The current national mass vaccination program is not working, and thousands of Americans have been seriously injured or died from mRNA vaccine administration. The true figures are unknown as a result of the continuing failure of the CDC and FDA to develop an effective monitoring system.

In addition, since May 1, 2021, the FDA and CDC has intentionally stopped recording the number of vaccine failures.

The soldiers comprising the air, sea, and ground U.S. Special Operations forces and their supporting military intelligence and technical systems, are strategic assets that require months to select and train, and several more years to acquire experience in their specialized operational and supportive tasks.

There is a fear of the mRNA vaccines among the special operations and military intelligence communities, especially when the immune status of soldiers with previous infections are ignored and they are mandated to get the vaccines. Consequently, hundreds of soldiers and civilian contractors may take the choice of leaving their units completely or take an early retirement, rather than be vaccinated with a vaccine that is no longer protective and can elicit .potential serious side-effects including death.

Special Operations soldiers require a level of individual fitness that should not be compromised by experimental mRNA vaccines that lack a guarantee of only minimal side effects. Especially when effective, verified, and safe COVID-19 drug treatments are available. Special operations encompass an age group that already has a low age-related risk for serious injury and death from a COVID-19 infection. A risk that is further reduced by the use of effective anti-viral medications.

Recommendations:

- COVID-19 infection is unequivocally **a treatable condition**. Early treatment with one of several antiviral drugs at the first onset of symptoms shows a 100 % benefit in quickly moderating COVID-19 infection.[17, 25]
- Early *multi-drug-therapy* for even high-risk older patients results in an 85% reduction in COVID-19 hospitalization and death [17,25]
- Safe antiviral drug prophylaxis is also available for units and dependents if the situation demands. [26]

Consequently, it is recommended that the U.S. Joint Special Operations Command and National Military Intelligence forces should return to the original U.S. National Pandemic Plan for Respiratory Viruses.

This would entail:

1. Continuous on-site unit-surveillance for early viral outbreak cases using FDA-certified thermal camera systems.

2. Group soldier/contractor education for COVID signs and symptoms, together with a central 1-800 Nurse Triage Line.

3. This phone Triage Line will operate in conjunction with small on-site facility clinics for rapid PCR diagnosis and rapid early outpatient treatment using safe, effective, antiviral drugs with the brief home quarantine of COVID-19 cases and post-exposure treatment of dependents and other close contacts.

4. Unlike a mass vaccination program with ineffective mRNA vaccines, early drug treatment protocols can control community transmission and minimize infection severity, while allowing personnel to develop a broad, cross-reactive natural immunity to future COVID-19 clades.

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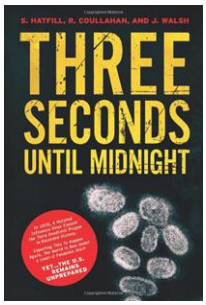

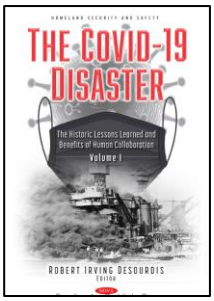

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CONTACT COORDINATES

Respectfully Submitted on 25 October 2021 by the undersigned.

Steven J. Hatfill, M.D.
President and Founder
Asymmetric Biodiversity Studies and Observation Group (ABSOG)
[redacted]

Robert J. Coullahan, CEM, CPP
President
Readiness Resource Group Incorporated (RRG)
[redacted]

Appendix A
Biographical Summaries

Steven J. Hatfill, M.D.

Dr. Steven Hatfill is a specialist physician and a virologist with master's degrees in Microbiology, Medical Biochemistry, and Experimental Hematology. His medical fellowships include Oxford University, the National Institutes of Health in Bethesda, and the National Research Council where he studied the Ebola Virus at the US Army Institute for Infectious Diseases at Fort Detrick. He is board eligible in Hematological Pathology. His background includes chemical weapon demilitarization training at Aberdeen Proving Ground and national certification as an instructor for the Nunn-Lugar Domestic Preparedness program. In 2000 he underwent training/certification as a UN Weapons Inspector for UNMOVIC. In 2015, he trained and helped to establish the Rapid Hemorrhagic Fever Response Teams for the National Medical Disaster Unit in Kenya, Africa. He is an Adjunct Assistant Professor in both the Department of Clinical Research as well as the Department of Microbiology, Immunology, and Tropical Medicine at a leading medical school.

He has over 20 published research papers in peer-reviewed scientific journals. Medical Research Fellowships included 1995 Senior Scientist, Oxford University Nuffield Department of Pathology, Oxford, England; 1997 National Institutes of Health, IRTA Fellowship, Bethesda, MD; and, 1998 National Research Council, Senior Research Associate Program, Fort Detrick, MD.

He was certified as a United Nations Weapon Inspector. He developed and delivered specialized training to U.S. Special Operations Command, DIA, USAF, United Nations UNMOVIC, and State Department, among other specialized teams and government agencies. From 2005to the present Dr. Hatfill supports the Combat Medical Training of Naval Special Warfare (NSW) Units; research and development of advanced combat medical equipment; and serves as a contract medical instructor in Tactical Combat Casualty Care (TCCC) throughout the U.S. and Canadian Special Operations community. He completed Workup and Deployment an Overwinter Physician: 27th SANAE Antarctic Expedition; April 1985-February 1987.

Dr. Hatfill is a Senior Fellow at the London Center for Policy Analysis and the lead author of "*Three Seconds Until Midnight*" prophetically published months before the US COVID-19 outbreak. From February 2020 until the 2021 transition, he served daily as an outside medical and scientific advisor for COVID-19 to the Executive Office of the President of the United States. Dr. Hatfill has been appointed as an adjunct assistant professor at The George Washington University Medical Center, Department of Microbiology, Immunology, and Tropical Medicine (GW-MITM). This is in addition to his long-standing appointment in the George Washington University Medical Center Department of Emergency Medicine. He is a resident of Washington, D.C.

Asymmetric Biodiversity Studies and Observation Group (ABSOG)

The Asymmetric Biodiversity Studies and Observation Group (ABSOG) will conduct long-duration environmental surveys in select subtropical / tropical geographical areas of the world situated between Latitude 300 North to Latitude 300 South. The tropical jungle represents a unique environment. Scientific operations conducted within jungle terrain are complicated by communication difficulties, heat with high humidity, tropical diseases, fast water crossings, difficulty in resupply, difficult overland movements, and local inhabitants. To familiarize scientists and medical researchers operating in these geographical locales, ABSOG has developed a variety of total immersion jungle environmental training programs.

The purpose of ABSOG's environmental surveys will be the collection and taxonomical identification of new species of plants and insects, the assessment of environmental contamination caused by select man-made chemicals, the identification of potential anticancer compounds in collected plant specimens, and the discovery of new species of antibiotic producing bacteria and fungi. A major goal of the ABSOG is to discover new antibiotic compounds effective

against multidrug-resistant strains of *Acinetobacter baumannii*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Staphlococcal aureus*, and *Mycobacterium tuberculosis* (TB).

Robert J. Coullahan, CEM, CPP

Mr. Coullahan is the President of Readiness Resource Group Incorporated (RRG), a veteran-owned business which he founded in 2007 (www.readinessresource.net). He has over 40 years of experience in national preparedness, critical infrastructure protection, and advanced technology development and integration. He leads programs supporting FEMA, National Guard, DTRA, the Nevada National Security Site, and National Laboratories and OGAs. Bob served in the National Capital Region for over 24 years leading programs in emergency management, critical infrastructure protection and security. For RRG he serves in multiple technical program leadership roles including on the DOE DarkNet grid security program, for programs at the Nevada National Security Site and with the Defense Threat Reduction Agency. He is the co-author of the book *Three Seconds Until Midnight* (2019) which presaged pandemic preparedness needs and documented advanced solutions for improvements.

He served 20 years with Science Applications International Corporation (SAIC), a $10 billion national security contractor, where he was Senior Vice President overseeing the Homeland Security Operation. For SAIC (www.saic.com) he led complex programs in emergency management, command, control, communications, intelligence, surveillance, and reconnaissance; crisis management; security management; transportation security; and homeland security. He was Program manager for the White House Y2K Information Coordination Center. Mr. Coullahan served as Co-Chair, Infectious Diseases Working Group (under a U.S. Department of State program initiative for global disaster information sharing). He worked directly with the Department of Defense Armed Forces Medical Intelligence Center (AFMIC), Fort Detrick, MD in leading the working group. For HHS he served as program manager for the AHRQ Bioterrorism Initiative, where he led a team developing plans for the application of the Incident Command System (ICS) to public health and emergency medical response. He developed plans for CBRN and Improvised Nuclear Device (IND) response and recovery operations.

Mr. Coullahan served 5 years as Vice President and Director of Government & International Programs for the federally funded (NASA-sponsored) Consortium for International Earth Science Information Network (CIESIN), a consortium focused on environmental security and disaster assistance applications. It was designated the World Data Center-A for Human Interactions in the Environment based on a rigorous scientific peer-review by the US National Academy of Sciences and the International Council of Scientific Unions. He testified before the United States Congress on matters of environmental security and disaster management. In his 9 years of U.S. Army duty, he supported missile systems in the Republic of Korea, and operational test and evaluation at Redstone Arsenal and White Sands Missile Range.

Mr. Coullahan attended Rutgers University, earned his bachelor's degree from the University of California, and he holds an M.S. in Telecommunications and an M.A. in Security Management from The George Washington University. He has been a contributing author to 8 books on national preparedness, homeland security, critical infrastructure protection, and technology R&D. He served on the Board of Advisors for the USAF AFwerX innovation and research entity. He is board certified in emergency management (CEM) and security management (CPP). He was a certified emergency medical technician (EMT-A) in the State of California. Current TS/SCI and Q. Bob lives with his wife of 40 years, Irene, in University Place, Washington.

Readiness Resource Group Incorporated (RRG)

RRG is a veteran-owned small business (VOSB) based in Las Vegas, Nevada now in the 15th year of continuous operation. RRG's core business is in national security and emergency preparedness services. The company executes programs in planning, training, and exercises for homeland security; critical infrastructure protection; test and evaluation of technologies for emergency responders; assessments and advanced technology integration for response, recovery, mitigation, and resilience. RRG supports Department of Defense, Department of Energy, National Laboratories, and state and local agencies in a wide range of readiness and research domains.

From: Jessica Morton [redacted]
Sent: Monday, October 25, 2021 11:39 AM
To: MBX OSTP PCAST <MBX.OSTP.PCAST@ostp.eop.gov>; [redacted]
Subject: [EXTERNAL] Following up re request for correction of information under the IQA: DOJ Statement on Forensics

Attached please find a letter sent on behalf of the Union of Concerned Scientists. We represent UCS in its June 24, 2021 Information Quality Act petition to the Department of Justice, which requested that DOJ retract an unsigned statement entitled "United States Department of Justice Statement on the PCAST Report: *Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods*." As we explained in that petition, the DOJ Statement, which rejects the PCAST's conclusions, risks putting innocent people at risk of invalid convictions. We therefore wish to ensure that all new members of the PCAST are aware of the DOJ Statement's efforts to undermine its prior report.

Under the IQA, DOJ is required to thoroughly review the information contained in the Statement, provide a point-by-point response, and determine what corrective action is warranted. The statutory deadline for DOJ's response was Friday, October 22--now **past due**.

Please feel free to reach out with any questions.

All the best,
Jessica

--
Jessica Morton
Senior Counsel | Democracy Forward
[redacted]

655 15th Street NW, Suite 800
Washington, DC 20005

Via FedEx and E-mail

October 25, 2021

President's Council of Advisors on Science and Technology
Office of Science and Technology Policy
Executive Office of the President
Eisenhower Executive Office Building
1650 Pennsylvania Avenue NW
Washington, DC 20504
pcast@ostp.eop.gov

Re: *DOJ Statement on PCAST Report Regarding Forensic Science*

Dear Members of the President's Council of Advisors on Science and Technology:

On behalf of the Union of Concerned Scientists, Democracy Forward Foundation writes to call to your attention the attached Request for Correction of Information we submitted to the U.S. Department of Justice on June 24. In the attached request, we petitioned DOJ pursuant to the Information Quality Act to retract an unsigned statement entitled "United States Department of Justice Statement on the PCAST Report: *Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods*,"[1] which was posted to the DOJ website with a press release on January 13, 2021.[2]

The Trump-era DOJ Statement criticizes a 2016 Report by the President's Council of Advisors on Science and Technology, which assessed the state of forensic science, found certain forensic techniques to be insufficiently supported by scientific

[1] United States Department of Justice Statement on the PCAST Report: *Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods*, *available at* https://www.justice.gov/olp/page/file/1352496/download ("DOJ Statement").

[2] Press Release, DOJ Office of Public Affairs, Justice Department Publishes Statement on 2016 President's Council of Advisors on Science and Technology Report (Jan. 13, 2021), *available at* https://www.justice.gov/opa/pr/justice-department-publishes-statement-2016-presidents-council-advisors-science-and.

studies, and offered recommendations to improve their validity.[3] Of particular significance, the PCAST Report determined that bitemark analysis is severely flawed and unlikely to be scientifically validated.

As explained in the attached petition, the DOJ Statement purports to show that certain non-dispositive portions of the PCAST Report are "fundamentally incorrect." As we demonstrate, however, the DOJ Statement does not provide a substantive, scientific response to the PCAST's findings. And, more critically, the DOJ Statement puts innocent people at risk of invalid convictions—a tragedy falling most heavily on people of color—by implying that DOJ does not believe forensic techniques should be improved as recommended by the PCAST.

Given the PCAST's significant work to ameliorate serious issues with forensic techniques, we wanted to ensure that all new members are aware of the DOJ Statement's efforts to undermine the PCAST Report. Although the Information Quality Act requires DOJ to thoroughly review the information contained in the Statement, provide a point-by-point response, and determine what corrective action is warranted, we have yet to receive any response to our request. The statutory deadline for DOJ's response was Friday, October 22—now **past due**.

We are happy to discuss the errors pervading the DOJ Statement should that be of interest. We have also attached here a news article relating to these issues to provide further context. Please do not hesitate to contact us at jmorton@democracyforward.org, sspence@democracyforward.org, or (202) 448-9090.

Sincerely,

/s/ Jessica Anne Morton
Jessica Anne Morton, Senior Counsel
Democracy Forward Foundation

/s/ Samara M. Spence
Samara M. Spence, Senior Counsel
Democracy Forward Foundation

Counsel for the Union of Concerned Scientists

cc: Lisa Monaco, Deputy Attorney General, U.S. Department of Justice
Kevin Jones, Acting Assistant Attorney General, Office of Legal Policy, U.S. Department of Justice

[3] *See* PCAST, Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods (Sept. 2016), *available at* https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/PCAST/pcast_forensic_science_report_final.pdf ("PCAST Report").

Melinda Rogers, Deputy Assistant Attorney General for Information Resource Management
Dr. Eric Lander, Presidential Science Advisor; Director, Office of Science and Technology Policy
Dr. Alondra Nelson, Deputy Director for Science and Society, Office of Science and Technology Policy

655 15th Street NW, Suite 800
Washington, DC 20005

Via FedEx and E-mail

June 24, 2021

U.S. Department of Justice
Office of the Attorney General
Office of Legal Policy
950 Pennsylvania Avenue NW
Washington, DC 20530-001

Re: *Request for Correction Under the Information Quality Act*

To whom it may concern:

On behalf of the Union of Concerned Scientists, Democracy Forward Foundation respectfully submits this Request for Correction of Information pursuant to the Information Quality Act. We request that the U.S. Department of Justice retract an unsigned statement entitled "United States Department of Justice Statement on the PCAST Report: *Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods*,"[1] which was posted to the DOJ website with a press release on January 13, 2021.[2]

The DOJ Statement criticizes a 2016 Report by the President's Council of Advisors on Science and Technology, or "PCAST," which assessed the state of forensic science, found certain forensic techniques to be insufficiently supported by scientific studies, and offered recommendations to improve their validity.[3] Of particular significance, the PCAST Report determined that bitemark analysis is

[1] United States Department of Justice Statement on the PCAST Report: *Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods*, *available at* https://www.justice.gov/olp/page/file/1352496/download) ("DOJ Statement" or "Statement").

[2] Press Release, DOJ Office of Public Affairs, Justice Department Publishes Statement on 2016 President's Council of Advisors on Science and Technology Report (Jan. 13, 2021), *available at* https://www.justice.gov/opa/pr/justice-department-publishes-statement-2016-presidents-council-advisors-science-and) ("DOJ Press Release").

[3] *See* PCAST, Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods (Sept. 2016), *available at* https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/PCAST/pcast_forensic_science_report_final.pdf ("PCAST Report" or "Report").

severely flawed and unlikely to be able to be scientifically validated. The DOJ Statement purports to show that recommendations in the Report about how forensic science should be classified as a discipline and that commonly accepted scientific criteria should be used to validate forensic techniques are "fundamentally incorrect." But the DOJ Statement is *not* a substantive, scientific response to the PCAST's recommendations. It does not defend any forensic techniques based on merit or data, offer any scientifically based alternative approach, or even recognize the scientific problems identified in the Report. Instead, the Statement focuses on the margins, fixating on the Report's terminology and a handful of inconsequential citations. This is not a legitimate way to engage in scientific disagreement, much less under the auspices of the Department of Justice.

These flaws render the Statement unlawful under the Information Quality Act—which requires information promulgated by the government to be accurate, objective, and unbiased—and inconsistent with President Biden's recent scientific integrity memorandum requiring agencies to fairly represent scientific disagreement.[4] In response to this request, the IQA requires DOJ to thoroughly review the information contained in the Statement and determine what corrective action is warranted. Given the errors that pervade the Statement, immediate withdrawal of the Statement is required.

I. The DOJ Statement is Subject to the IQA.

The DOJ Statement is subject to the standards set forth in the Information Quality Act. The Information Quality Act requires that information disseminated to the public by federal agencies—including DOJ—be accurate, reliable, and unbiased. The IQA therefore directs the Office of Management and Budget to promulgate guidance to federal agencies "for ensuring and maximizing the quality, objectivity, utility, and integrity of information" they disseminate.[5] And, in turn, federal agencies must issue guidelines promoting those same values and establishing administrative mechanisms allowing "affected persons to seek and obtain correction of information maintained and disseminated by the agency that does not comply with the guidelines."[6] Pursuant to these directives, both OMB[7] and

[4] Joseph R. Biden, Jr., Mem. on Restoring Trust in Government Through Scientific Integrity and Evidence-Based Policymaking (Jan. 27, 2021), https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/memorandum-on-restoring-trust-in-government-through-scientific-integrity-and-evidence-based-policymaking/ ("Science Integrity Memo"); Executive Order 14,007, President's Council of Advisors on Science and Technology (Jan. 27, 2021).

[5] Consolidated Appropriations Act, FY 2001, Pub. L. No. 106-554, § 515(a), 114 Stat. 2763, 2763A-153 & 154, 44 U.S.C. § 3516, note.

[6] *Id.* § 515(b)(2).

[7] *See* Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies; Republication, 67 Fed. Reg. 8451 (Feb. 22, 2002); OMB, M-05-03, Final Information Quality Bulletin for Peer Review (Dec. 16, 2004), https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/memoranda/2005/m05-03.pdf ("OMB

DOJ[8] have promulgated guidelines establishing information quality standards. The DOJ guidelines state that they "appl[y] to all information disseminated by DOJ, and DOJ-initiated or sponsored dissemination of information."[9]

Under these standards, the IQA applies to the DOJ Statement. The Statement not only appears on DOJ's website; its public dissemination was heralded by a press release.[10] Because the Statement contains information disseminated by the Department—and none of the ten listed exemptions apply[11]—the Statement is subject to the IQA.

As such, the Statement must meet certain quality standards, encompassing objectivity, utility, and integrity. DOJ has defined "objectivity" to require that information is "accurate, reliable, and unbiased as a matter of presentation and substance."[12] "Utility" refers to "how users might use the data, whether for its intended use or other purposes."[13] And "integrity" ensures that the information is "protected from unauthorized access, corruption, or revision."[14]

The Statement, moreover, is subject to "additional scrutiny" because it contains "'influential' information."[15] Under the DOJ guidance, "[i]nfluential information is scientific, financial, or statistical information expected to have a genuinely clear and substantial impact at the national level, or on major public and private policy decisions as they relate to federal justice issues."[16] A "clear and substantial impact," in turn, is "one that has a high probability of occurring."[17] As DOJ's own press release makes clear, DOJ intended for the Statement to have a "clear and substantial impact" on courts' use of the PCAST report to evaluate expert witness testimony.[18] Indeed, the press release frames the Statement specifically as a response to court action.[19] The Statement is therefore subject to additional

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Bulletin"); OMB, M-19-15, Improving Implementation of the Information Quality Act (Apr. 24, 2019), https://www.whitehouse.gov/wp-content/uploads/2019/04/M-19-15.pdf.

[8] U.S. Dep't of Justice, Information Quality (Oct. 13, 2020), https://www.justice.gov/information-quality ("DOJ Guidelines)".

[9] *Id.*

[10] DOJ Press Release, *supra* n.2.

[11] *See* DOJ Guidelines, *supra* n.8.

[12] *See id.*

[13] *Id.*

[14] *Id.*

[15] *Id.*

[16] *Id.*

[17] *Id.*

[18] *See* DOJ Press Release, *supra* n.2.

[19] *Id.*; *see also* DOJ Statement, *supra* n.1, at 2 & n.9.

scrutiny, including compliance with OMB's Information Quality Bulletin for Peer Review.[20]

II. The DOJ Statement, a "Response" to the 2016 PCAST Report, Raises Scientific Integrity Concerns.

The PCAST is "an advisory group of the Nation's leading scientists and engineers," appointed to provide the President and federal agencies with input from non-government experts.[21] The PCAST provides scientific analyses and recommendations for which an understanding of science, technology, and innovation would strengthen government policy decisions.[22] It was originally established in 2001 by then-President Bush and has been re-chartered several times, most recently by President Biden.[23]

Over the years, the PCAST has generated reports on such matters as government-owned broadband technology,[24] reengineering the influenza vaccine to prevent pandemic,[25] and the use of science to ensure access to safe drinking water.[26] The work of the PCAST has been broadly supported by the scientific community.[27]

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[20] DOJ Guidelines, *supra* n.8; *see also* OMB Bulletin, *supra* n.7.

[21] *See* PCAST Report, *supra* n.3, at iv.

[22] Office of Science and Technology Policy, About PCAST, https://obamawhitehouse.archives.gov/administration/eop/ostp/pcast/about (last visited June 8, 2021).

[23] Executive Order 13,226 § 1 (Sept. 30, 2001); Executive Order 13,539 § 1 (Apr. 21, 2010); Executive Order 13,895 § 2 (Oct. 22, 2019); Executive Order 14,007 §§ 1, 2, 3(a) (Jan. 27, 2021) (instructing all agencies to seek advice from the PCSAT's "scientists, engineers, and other experts" on "the best available science" and "matters involving scientific and technological information that is needed to inform public policy").

[24] PCAST, Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth (July 2012), *available at* https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/pcast_spectrum_report_final_july_20_2012.pdf.

[25] PCAST, Report to the President on Reengineering the Influenza Vaccine Production Enterprise to Meet the Challenges of Pandemic Influenza (Aug. 2010), *available at* https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/PCAST-Influenza-Vaccinology-Report.pdf.

[26] PCAST, Science and Technology to Ensure the Safety of the Nation's Drinking Water (Dec. 2016), *available at* https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/PCAST/pcast_drinking_water_final_report_20161221.pdf.

[27] The American Society of Mechanical Engineers, "Biden Re-Establishes the President's Council of Advisors on Science and Technology (PCAST)" (Feb. 1, 2021), https://www.asme.org/government-relations/capitol-update/biden-re-establishes-the-presidents-council-of-advisors-on-science-and-technology (favorably referencing PCAST work concerning use of engineering principles in public policy).

A. *The 2016 PCAST Report Found that Some Forensic Techniques Are Not Rooted in Sound Scientific Principles and Recommended Areas for Improvement.*

In 2009, the National Research Council published a report on the state of forensic science.[28] The report "described a disturbing pattern of deficiencies common to many of the forensic methods routinely used in the criminal justice system, most importantly a lack of rigorous and appropriate studies establishing their scientific validity."[29] In response to the report, DOJ and the National Institute of Standards and Technology (NIST) established the National Commission on Forensic Science, a group of 32 people tasked with advising the Attorney General on forensic science.[30] Around this time, investigative reporting likewise revealed serious flaws in the use in criminal prosecutions of certain forensic science techniques, such as hair analysis, which involved an examiner visually comparing a hair found at a crime scene to a sample from a known source.[31] This led DOJ and the FBI to entirely abandon hair analysis, acknowledging that "nearly every examiner in an elite FBI forensic unit gave flawed testimony in almost all trials in which they offered evidence against criminal defendants over more than a two-decade period before 2000," including cases that resulted in thirty-two defendants being sentenced to death.[32]

Building on these efforts, President Obama asked the PCAST to explore ways to strengthen forensic science, with a focus on its use in the legal system.[33] In September 2016, the PCAST issued its report, assessing several forensic "feature-comparison" methods—"that is, methods that attempt to determine whether an evidentiary sample (e.g., from a crime scene) is or is not associated with a potential 'source' sample (e.g., from a suspect), based on the presence of similar patterns, impressions, or other features in the sample and the source."[34] After an extensive review of 2,000 studies and input from forensic scientists, judges, prosecutors, defense attorneys, and others, the PCAST determined that some forensic techniques

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[28] Nat'l Research Council of the Nat'l Academies, *Strengthening Forensic Science in the United States: A Path Forward* (2009).

[29] PCAST Report, *supra* n.3, at 22.

[30] *Id.*

[31] News Hub, *Investigative Reporter Hsu Discusses 'Uncovering Forensic Flaws' at Law Review Symposium* (Apr. 6, 2018), https://news.gsu.edu/2018/04/06/investigative-reporter-hsu-discusses-uncovering-forensic-flaws-at-law-review-symposium/.

[32] Spencer S. Hsu, *FBI admits flaws in hair analysis over decades*, Wash. Post (Apr. 18, 2015), https://www.washingtonpost.com/local/crime/fbi-overstated-forensic-hair-matches-in-nearly-all-criminal-trials-for-decades/2015/04/18/39c8d8c6-e515-11e4-b510-962fcfabc310_story.html?utm_term=.dca012c7f043.

[33] PCAST Report, *supra* n.3, at 22.

[34] *Id.* at 1

used in criminal investigations and trials are not rooted in sound scientific principles.[35]

The PCAST Report had two primary goals. First, the Report provided recommendations for scientific standards that should be used to determine the validity and reliability of feature comparison techniques.[36] The PCAST recommended a set of criteria, including that the technique be subjected to empirical testing that is "repeatable and reproducible" and that estimates a technique's accuracy.[37] For "objective" techniques (i.e., procedures that use standardized and quantifiable detail such that little human judgment is involved), the Report found that validity could be established by measuring the technique's accuracy, reproducibility, and consistency.[38] For "subjective" techniques (i.e., those involving human judgment, such as visually comparing evidence to determine if it matches a sample), the Report cautioned that careful scrutiny is necessary because "they are especially vulnerable to human error, inconsistency across examiners, and cognitive bias."[39] According to the Report, subjective techniques should be validated using "black box" studies in which many examiners review the same evidence so that an error rate can be determined.[40] Without estimates of accuracy rates, the Report found that an examiner's statement that one sample is similar to another is scientifically meaningless.[41]

Second, the Report evaluated specific forensic methods to assess whether they have been scientifically established to be valid and reliable.[42] For some techniques—namely, DNA analysis, latent fingerprints, and firearms analysis—the Report identified strengths and weaknesses in the literature and recommended areas for improvement, including additional research and options for converting subjective techniques to objective ones.[43] The Report found other techniques to be lacking in sufficient scientific support to establish their validity. For example, the PCAST identified no reliable study showing the validity of methods for determining that a footprint came from a *specific* piece of footwear (as opposed to class characteristics of the shoe, like its size).[44]

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[35] *Id*. at 2.

[36] *Id*. at 1.

[37] *Id*. at 5.

[38] *Id*.

[39] *Id*.

[40] *Id*. at 5–6.

[41] *Id*. at 6.

[42] *Id*. at 1.

[43] *Id*. at 7–10.

[44] *Id*. at 12–13.

The Report found bitemark analysis to be particularly problematic.[45] This is because "[f]ew studies" and "no appropriate black-box studies" have been conducted to show the technique's validity.[46] Of the studies that have been conducted, "the observed false-positive rates were very high" and several of the studies were designed in a way "likely to *under*estimate" the rate of false positives.[47] The Report further noted that "available scientific evidence strongly suggests that examiners not only cannot identify the source of bitemarks with reasonable accuracy, they cannot even consistently agree on whether an injury is a human bitemark."[48] The PCAST found "the prospects of developing bitemark analysis into a scientifically valid method to be low."[49]

Although the PCAST Report built on prior studies criticizing weaknesses in the scientific underpinnings of forensic feature comparison techniques, the Report garnered significant attention from scientists, lawyers, and judges. The director of the Center for Statistics and Applications in Forensic Evidence encouraged DOJ to work with a large group of independent scientists to "push the science forward."[50] Legal experts called on courts to more carefully scrutinize courtroom use of forensic evidence.[51] The Fordham University School of Law convened a symposium on how the Judicial Conference Advisory Committee should respond to challenges in the reliability of feature-comparison expert testimony, such as latent fingerprints, ballistics, and bitemark analysis.[52] And Daniel Capra, a professor at Fordham University, proposed a revision to the Federal Rules of Evidence that would require an expert testifying based on forensic analysis to prove that the method used is repeatable, reproducible, and accurate for its intended use.[53] DOJ, too, took notice. In a statement to the Wall Street Journal, then-Attorney General Loretta Lynch said that DOJ "will not be adopting the recommendations related to the admissibility of forensic science evidence," but acknowledged the PCAST Report's "contribution to the field of scientific inquiry."[54] And President Obama emphasized

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[45] *Id*. at 8–9.

[46] *Id*. at 9.

[47] *Id.* (emphasis in original).

[48] *Id*. (emphasis omitted).

[49] *Id*.

[50] Nicole Wetsman, *Most Forensic Science Is Bogus. Will New Federal Rules Help?*, Gizmodo (Mar. 16, 2018), https://gizmodo.com/most-forensic-science-is-bogus-will-new-federal-rules-1823801909.

[51] Innocence Project, "Legal Experts to Courts: 'We Must Do a Better Job' Scrutinizing Forensic Evidence Before Considering Admissibility" (July 24, 2017), https://innocenceproject.org/ninth-circuit-judicial-conference/.

[52] Daniel J. Capra, *Foreword: Symposium on Forensic Expert Testimony, Daubert, and Rule 702*, 86 Fordham L. Rev. 1459 (2018).

[53] *Id*. at 1460.

[54] Gary Fields, *White House Advisory Council Report Is Critical of Forensics Used in Criminal Trials*, The Wall St. J. (Sept. 20, 2016), https://www.wsj.com/articles/white-house-advisory-council-releases-report-critical-of-forensics-used-in-criminal-trials-1474394743.

the need to "improve the reliability of forensic evidence and assure that justice is served."[55]

B. *The DOJ Statement Purports to Show That Scientific Claims in the PCAST Report Are Incorrect Without Invoking Any Scientific Basis for Its Criticisms or Responding to the Report's Primary Conclusions.*

In 2017, the Department moved away from its reliance on scientific experts for improving forensic science. DOJ allowed its National Commission on Forensic Science to terminate—over the objections of several commissioners[56]—and replaced the thirty-two experts (including thirteen scientists)[57] on that federal advisory committee with a single career prosecutor, Ted Hunt, as a "Senior Advisor on Forensics."[58] Soon afterward, Mr. Hunt published an article purporting to "clarify the DOJ's position" in response to the PCAST Report.[59] The article criticized the PCAST Report's "use of the term foundational validity, its views on error rates, and the proposed application of these concepts to forensic feature-comparison methods."[60]

On January 13, 2021, the Department issued the DOJ Statement that is the subject of this request as a link in a press release.[61] The Statement is unsigned and unattributed. On its face, the Statement responds to scientific statements in the PCAST Report. It does not, however, state whether scientists contributed to or reviewed the Statement. It appears to have been written, at least in part, by a lawyer.[62]

After noting that "a number of recent federal and state court opinions have cited the [PCAST] Report as support for limiting the admissibility of

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[55] Barack Obama, *The President's Role in Advancing Criminal Justice Reform*, 130 Harv. L. Rev. 811, 860 (2017).

[56] *Scientists on national commission urge panel be renewed in letter to Attorney General*, Wash. Post (Apr. 6, 2017), http://apps.washingtonpost.com/g/documents/local/scientists-on-national-commission-urge-panel-be-renewed-in-letter-to-attorney-general/2404/.

[57] *See* PCAST Report, *supra* n.3, at 22.

[58] DOJ Archives, National Commission on Forensic Science, https://www.justice.gov/archives/ncfs (last visited Apr. 29, 2021); DOJ Press Release, "Justice Department Announces Plans to Advance Forensic Science" (Aug. 7, 2017), https://www.justice.gov/opa/pr/justice-department-announces-plans-advance-forensic-science.

[59] Ted Robert Hunt, *Scientific Validity and Error Rates: A Short Response to the PCAST Report*, 86 Fordham L. Rev. 24, 26 (2017).

[60] *Id*.

[61] DOJ Press Release, *supra* n.2.

[62] *See infra* III.C.

firearms/toolmarks evidence in criminal cases,"[63] the Statement purports to show that three claims that it ascribes to the PCAST Report are "fundamentally incorrect":

> 1) that traditional forensic pattern comparison disciplines, as currently practiced, are part of the scientific field of metrology; 2) that the validation of pattern comparison methods can only be accomplished by strict adherence to a non-severable set of experimental design criteria; and 3) that error rates for forensic pattern comparison methods can only be established through "appropriately designed" black box studies.[64]

These criticisms are based on quibbles over terminology and a handful of citations. While the Statement nibbles around the edges of the PCAST Report, it never directly responds to the Report's recommendations for improving validation of forensic techniques or its conclusion that bitemark analysis is too flawed to be validated at all.

III. The DOJ Statement Fails to Satisfy the Objectivity, Utility, or Integrity Standards of the IQA.

The DOJ Statement is impermissible under the IQA and must not bear the imprimatur of DOJ. It fails by any measure of objectivity because it contains information that is inaccurate, unreliable, and biased in both presentation and substance. These errors permeate the Statement. The Statement additionally fails the utility test because it purports to undermine scientific analyses and recommendations while not addressing the Report's fundamental critiques and is highly susceptible to misuse by prosecutors and judges. Finally, the Statement fails to meet the integrity standard because it is unsigned and unverifiable. Taken together, these errors render the Statement unusable as a summary of scientific information or a response to a scientific document.

A. *The Statement Inaccurately Represents the Content, Conclusions, and Purpose of the PCAST Report.*

The Statement is replete with factual errors that mischaracterize the PCAST Report and sow needless confusion about the scientific basis of the Report's conclusions.

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[63] DOJ Statement, *supra* n.1, at 1–2; *see also* DOJ Press Release, *supra* n.2 (noting that "several courts have recently limited the scope of opinion testimony").

[64] DOJ Statement, *supra* n.1, at 1 (emphasis omitted).

First, the Statement generally attacks the PCAST Report's recommendations for improving validation of forensic techniques and determining their error rates, but without addressing the Report's key analytic points, offering any alternatives or even acknowledging the problem that gave rise to the PCAST Report in the first place.[65] The PCAST Report—along with the National Academy of Sciences and President Obama—identified a serious problem with the quality of forensic evidence used in criminal prosecution.[66] Without disputing the existence of that problem, the DOJ Statement simply attempts to sweep away the PCAST Report's contributions.[67] Taken together, this gives the false impression that improved validation methods and more accurate information about the error rates of forensic techniques are not desirable as a way to elevate forensic science to a discipline accepted by the wider scientific community. It implies that *no* recommendations from that Report should be implemented.

This ignores the National Academy of Sciences' conclusion that "[m]uch forensic evidence . . . is introduced in criminal trials without any meaningful scientific validation, determination of error rates, or reliability testing to explain the limits of the discipline."[68] The Statement's unwillingness to engage with—or even admit to—the problem that led to the analysis in the PCAST Report undermines the objectivity of the Department's conclusion. The Statement fails to acknowledge that forensic science—like any other scientific discipline—is subject to uncertainties and may need to change and develop over time.

The Statement likewise criticizes some of the PCAST Report's recommendations for being unsupported by precedent in the forensic field without acknowledging that the Report has, necessarily, made recommendations for practices that are not yet in place. For example, the Statement complains that the Report does not "cite a single authority" requiring the recommended validation methods for forensic techniques.[69] But complaints that the PCAST Report does not sufficiently cite to examples where these practices already exist fundamentally miss the point of the Report: that such practices are missing. The Statement cannot undermine the PCAST's conclusion that additional steps are necessary by pointing out that those steps have not been taken before. Such argument fails to meet the standards of the IQA.

Second, the Statement responds to what it claims is the PCAST Report's conclusion that error rates for feature comparison analysis should be solely

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[65] *Id.* at 9–21.

[66] *See generally id.*

[67] *See generally id.*

[68] Nat'l Research Council, *Strengthening Forensic Science in the United States: A Path Forward* 107–08 (2009).

[69] DOJ Statement, *supra* n.1, at 5, 11.

determined using black box studies.[70] Relying on a "well-known academic psychologist," the Statement argues that "no single error rate is generally applicable to all laboratories, all examiners" in the forensic science context, that a reference error rate does not necessarily reflect the error rate in actual practice, and that this "raises larger questions about the overall external validity of black box studies."[71]

This inaccurately characterizes the PCAST Report as requiring a single error rate applicable to all laboratories, all examiners, and all cases.[72] It does not. Rather, the PCAST Report recommended that the validity of subjective methods of feature comparison analysis can be established through a single *method*: empirical black box studies.[73] In such studies, numerous examiners are asked to compare samples, and the study tracks the overall error rate of that practice across examiners and samples.[74] The point is not to assume that every examiner will behave precisely the same way; if that were the case, there would be no need to have such a large number of examiners for any given black box study.[75] Rather, a black box study is useful to demonstrate whether a particular field of comparison study can be reliable as a baseline. For instance, if a properly run black box study showed a 75% error rate in ballistic comparison, that would be probative information. The overall error rate would not necessarily undermine every use of ballistic analysis, but it could provide context. An individual ballistics analyzer could argue, for example, that she is in the upper quartile of her colleagues. The Statement improperly collapses those two steps of analysis. Across scientific disciplines, there are accepted practices and standard protocols across laboratories: suggesting that individual labs should be able to validate their own methods, as the Statement does, is simply not how science works.[76]

Third, the Statement's criticisms of the PCAST Report's recommended criteria for scientifically valid studies are based on an inaccurate representation of the PCAST's sources. The Statement takes issue with the PCAST Report's six recommended criteria for appropriately designed black box studies that should be used to validate forensic techniques (e.g., that the examiners should lack advance

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[70] *Id.* at 15.

[71] *Id.* at 15–17.

[72] *See* DOJ Statement, *supra* n.1, at 15, 22.

[73] PCAST Report at 49.

[74] *Id.* at 49–50.

[75] For instance, the PCAST report cites an FBI study involving 169 examiners and 744 pairs of fingerprints for comparison. *Id.* at 50.

[76] Indeed, an author of one of the papers the DOJ Statement cites in support of its position has subsequently disavowed the DOJ Statement, noting that "[a]ttacking the use of error rates is attacking scientific measurement," and suggesting that the DOJ is "giving up on science." *See* Jules Epstein, *"Trumpian" Forensics*, Advocacy & Evidence Resources, Temple University Beasley School of Law, https://www2.law.temple.edu/aer/trumpian-forensics/ (quoting Itiel Dror).

access to the correct answer, and that their conclusions should be reproducible).[77] In this regard, the Statement acknowledges that none of these six criteria are themselves "novel or controversial";[78] indeed, they are basic scientific method processes.[79] Nevertheless, the Statement complains that the PCAST Report is wrong to propose all six of those non-controversial criteria be used together at the same time because, the Statement argues, requiring those criteria is "inconsonant" with an FDA document, a guideline from the International Organization for Standardization ("ISO"), and other generally accepted academic standards.[80] This is untrue.

Setting aside the question of whether any inconsistency with a single FDA document could undermine a set of recommendations for improving forensic research, the Statement is simply wrong to say there is an inconsistency in the first place. Under the FDA's guidance, "no single experimental design is either essential or required," and the evidence required may vary according to different characteristics.[81] That view is fully consistent with the broad criteria the PCAST Report recommends. Under the PCAST Report's criteria, there is room for variation, including, for instance, the precise sample size.[82] Setting forth uncontroversial boundaries—such as requiring that studies be conducted by disinterested parties—to improve evidence unrelated to FDA's statutory scheme is hardly creating a template for a "single experimental design."

Similarly, the Statement does not identify any real inconsistency with the ISO's requirements for testing laboratories, known as ISO 17025.[83] The Statement argues that "[i]n contrast to the PCAST's prescriptive stance, ISO does not dictate *how* labs must validate their methods, *which* criteria must be employed, or *what* experimental design must be followed."[84] But again, the Statement overstates the degree to which the baseline criteria the PCAST Report recommends would hem in a lab's experimental design: the recommendations would provide a floor, not a ceiling. For example, the recommendation that a sample collection be "large enough to provide appropriate estimates of the error rates" does not set a specific number or

[77] DOJ Statement, *supra* n.1, at 10–15.

[78] *Id*. at 11.

[79] *See generally* Scott E. Maxwell, Harold D. Delaney & Ken Kelley, *Designing Experiments and Analyzing Data: A Model Comparison Perspective* (3d ed. 2018).

[80] DOJ Statement, *supra* n.1, at 10–15.

[81] *Id.* at 12.

[82] *See* PCAST Report, *supra* n.3, at 153 (noting that "[t]he confidence bound for proportions depends on the sample size in the empirical study").

[83] *See* Int'l Org. for Standardization, *ISO/IEC 17025 – General Requirements for the Competence of Testing and Calibration Laboratories* (2017), *available at* https://www.iso.org/publication/PUB100424.html.

[84] DOJ Statement, *supra* n.1, at 13 (emphasis in original).

experimental design.[85] And a lack of more exacting criteria in *existing* lab standards is wholly consistent with the PCAST's mission to *improve* a field of science it found to be lacking in rigorous standards. The fact that ISO guidelines—which apply to all sorts of labs outside the feature comparison field—could be construed to have less stringent guidance does not undermine the validity of the PCAST's recommendations. The Statement's suggestion otherwise is misleading.

As part of this criticism, the Statement also reports that the American Association for the Advancement of Science "disagreed with PCAST's premise."[86] This is verifiably false: in fact, the AAAS issued a statement specifically clarifying its "complete agreement" with the PCAST Report "on the necessity of direct empirical testing to assess the accuracy of a forensic science method."[87]

Fourth, the Statement quibbles over whether feature comparison techniques constitute metrology (that is, "the science of measurement and its application"[88]). The Statement asserts that feature comparison methods are not metrology[89]—and then concludes that, because that premise is incorrect, the PCAST report's guidance for standards for scientific validity fall, too.[90] This is inaccurate and misleadingly suggests that only the field of metrology must meet standards for scientific validity.

As an initial matter, the Statement is incorrect in its conclusion that forensic feature comparison methods cannot constitute "metrology." It ignores not only the expertise of the PCAST itself, but also a growing body of literature addressing that very question.[91] As one scientist recently put it, the DOJ Statement's claim "that

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[85] *Id.* at 10.

[86] *Id.* at 15.

[87] William C. Thompson, Am. Ass'n for the Advancement of Science, *AAAS, PCAST and Validation: Questions and Answers*, 1, https://www.aaas.org/sites/default/files/QA%20AAAS%20and%20PCAST%20Reports.pdf?vxYqKK65CN0k0FKrAiDtUE64PdZuw5YT.

[88] *See* PCAST Report, *supra* n.3, at 23 (quoting *International Vocabulary of Metrology – Basic and General Concepts and Associated Terms* (VIM 3d ed. 2012)).

[89] DOJ Statement, *supra* n.1, at 9.

[90] *Id.* at 2.

[91] *See, e.g.*, Giuseppe Schirripa Spagnolo et al., *Forensic Metrology: Uncertainty of Measurements in Forensic Analysis*, 20th Int'l Measurement Confederation TC4 Int'l Symposium, 391 (2014), https://www.imeko.org/publications/tc4-2014/IMEKO-TC4-2014-367.pdf ("The uncertainty associated with forensic scientific investigation . . . is an emerging Branch in Metrology."); Anne L. Plant & Robert J. Hanisch, *Reproducibility in Science: A Metrology Perspective*, Harvard Data Sci. Rev. Issue 2.4, 2 (Dec. 16, 2020), https://hdsr.mitpress.mit.edu/pub/0r4v4k4z/release/1 (noting that although "[m]easurement science has been traditionally applied to physical measurements . . . the thought process of measurement science is broadly applicable"); John Song & Xianping Liu, *A Review of NIST Projects in Surface and Topography Metrology for Firearm Evidence Identification in Forensic Science*, 1 J. Sci. & Ind. Metrology, no. 4, 2016, https://metrology.imedpub.com/a-review-of-nist-projects-in-surface-andtopography-metrology-for-firearm-evidenceidentification-in-forensic-

visual patterns are not measured by the human brain" is a "surprising scientific assertion."[92] To "those uninformed about how sensory systems actually work, the process of feature comparison looks as though nothing has actually been measured and the result is attributed to unaccountable 'visual analyses.'"[93] But the measurement "operations performed by a pattern examiner's brain" and a forensic instrument "are functionally identical."[94] "Forensic science thus surely qualifies as metrology."[95] And, of course, comparing a forensic sample to a standard exemplar necessarily requires some degree of measurement.[96] For example, "every time a firearms examiner talks about the 1950s article on the six marks in series, that's essentially a quantitative assessment, and all the discussion of 3D technology is all quantitative as well."[97] So, at minimum, feature comparison relies on at least some component of metrology.

But more critically, the Statement is incorrect in its suggestion that the PCAST report's conclusions rise and fall with a question of categorization. Even if forensic feature comparison methods are not metrology (and the Statement never says which scientific field, with its concomitant standards and protocols, they do fit within), that categorization cannot and does not obviate the application of rigorous scientific standards recommended by the PCAST. Instead, it underscores the problem the Report illuminates: the necessity of those standards to provide a context for the appropriate evaluation of forensic conclusions.[98] The core point of the PCAST Report is that the current feature comparison methods require more rigor. And the Statement ignores those possibilities.[99] The Statement's dodge of

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science.pdf (describing NIST's development of standard reference bullets and cartridge cases as "metrology").

[92] Thomas D. Albright, *The US Department of Justice stumbles on visual perception*, 118 PNAS No. 24, at 2 (2021).

[93] *Id.* at 3.

[94] *Id.* at 4.

[95] *Id.*

[96] *See* Int'l Laboratory Accreditation Cooperation, *Guidelines for Forensic Science Laboratories* § 5.4.5.1 (2002), http://www.sadcmet.org/SADCWaterLab/Archived_Reports/2006%20Reports%20and%20Docs/Ilac-g19.pdf (explaining that "[a]ll technical procedures used by a forensic science laboratory must be fully validated before being used on case-work" and that "[m]ethods may be validated by comparison with other established methods using certified reference material . . . or materials of known characteristics").

[97] Testimony of David Faigman (Feb. 5, 2021), *People* v. *Auimatagi*, Case No. 19-4995 (Yolo County, Cal. Super. Ct.), at 82:12–15.

[98] *See id.* at 82:8–11 ("So there's sort of opening critiques about it not being, you know, quantitative really misses the point, and that is that it ought to be quantitative.").

[99] For example, NIST is developing metrological techniques relating to how fingerprints change over time, *see* NIST, *Forensic technique to measure mechanical properties of evidence*, ScienceDaily (Nov. 1, 2016), https://www.sciencedaily.com/releases/2016/11/161101111628.htm, and researching solutions to "fundamental metrological barriers" to three-dimensional ballistic imaging, *see* Nat'l Inst. of Justice, *A Metrology Foundation for 3D Ballistics Imaging* (Dec. 15, 2020),

any meaningful evaluation of the rigor of current feature comparison methods undermines its objection about terminology.[100]

B. *The Statement Is Misleading as a Purported Representation of Scientific Disagreement.*

Taken together, the Statement merely tugs at the edges of the PCAST Report, quibbling with some of its citations.[101] As laid out above, many of these criticisms are themselves unsubstantiated and factually inaccurate. But more troublingly, these minor challenges are presented as if they are cause for disavowal of the PCAST's entire project. The Statement purports to show that certain claims of a scientific nature in the PCAST Report are "fundamentally incorrect,"[102] suggesting to the ordinary reader that the Statement is simply another entry in a longstanding scientific debate among experts. But in reality, the Statement is not responding to science in scientific terms, but with legal argumentation about subsidiary points. The Statement does not propose any data-driven defense of current forensic techniques, nor propose any alternative to the PCAST recommendations for ensuring the accuracy of feature comparison methods used in the courtroom. The Statement thus carries a significant risk of misleading the public as to the current state of scientific discourse regarding forensic techniques, which consistently calls for greater investigation and ever-more-developed techniques for accuracy, and as to the degree to which currently used forensic techniques have been sufficiently validated.

C. *The Statement Is Unsigned, Unattributed, and Unverifiable.*

The DOJ Statement is also inherently unreliable because it is unsigned, unattributed, and unverifiable. It does not bear a signature, like other typical Department documents (such as a Guidance Document or Policy Statement).[103] A

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https://nij.ojp.gov/funding/awards/2016-dnr-6257-2. *See also* John M. Butler et al., *NIST Scientific Foundation Reviews*, NIST (Dec. 18, 2020), https://www.nist.gov/publications/nist-scientific-foundation-reviews (describing NIST's plans to conduct reviews of DNA mixture interpretation, bitemark analysis, digital evidence, and firearms examination to identify information supporting current methods and practices, as well as knowledge gaps).

[100] *See* Itiel E. Dror & Nicholas Scurich, *(Mis)use of scientific measurements in forensic science*, Forensic Sc. Int'l: Synergy 2 (2020) 333, 333 ("Without quantification, science is restricted, perhaps even non-existent . . . . Not only is quantification a basic requirement to conduct scientific inquiry, but it is also critical for communicating the finds. This is especially important in a domain such as forensic science, where science is used as evidence in court. . . . One critical measurement metric in all sciences, and in forensic science in particular, are error rates . . . .").

[101] DOJ Statement, *supra* n.1, at 2.

[102] *Id.* at 1.

[103] *E.g.*, DOJ, Guidance Documents, https://www.justice.gov/guidance (last visited June 9, 2021); Randolph D. Moss, Acting Assistant Attorney General, Office of Legal Counsel, "Authority of the

reader cannot determine the extent—if any—of scientists' involvement in the drafting, and therefore cannot assess whether the Statement's criticisms of the PCAST Report are rooted in scientific disagreement or legal advocacy (much less whether the Statement underwent the peer review required by the OMB IQA guidelines). The public, and courts, are therefore prevented from confirming the expertise of any contributor or understanding the extent to which these opinions are shared by scientists.

And these concerns are compounded here because portions of the Statement are verbatim or nearly identical to large portions of the law review article published by the career prosecutor who replaced DOJ's scientific advisory committee.[104] The Statement's failure to acknowledge authorship prevents the public from understanding whether and to what extent it is engaged in a scientific—or legal—debate. It is, therefore, biased "as a matter of presentation" and fails the integrity standard because the public has no appropriate opportunity to analyze whether scientists' views were taken into account. And the possibility that it was in fact written by a lawyer with a prosecutorial agenda renders the Statement susceptible to corruption.

D. *The Statement Is Highly Influential and Susceptible to Misuse.*

The Statement avers that its purpose is for the Department to "offer[] its view on" the allegedly incorrect claims in the PCAST Report.[105] It does not expressly say whether the Department believes that any of the forensic techniques discussed are valid or that additional research is discouraged. Yet, that is exactly the takeaway of some prosecutors, courts, and even foreign countries. And the Statement is already having a "genuinely clear and substantial impact" in the courtroom and beyond.[106]

Although the Statement has been available for only four months, prosecutors across jurisdictions in the United States have already identified it to courts as supporting the validity of forensic techniques they seek to introduce. Prosecutors in

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United States to Enter Settlements Limiting the Future Exercise of Executive Branch Discretion" (June 15, 1999), *available at* https://www.justice.gov/file/19516/download (the "Moss Memo").

[104] *Compare, e.g.*, DOJ Statement, *supra* n.1, at 13 ("ISO generally defines validation as 'confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled.'" and "In contrast to PCAST's prescriptive stance, ISO does not dictate *how* labs must validate their methods, *which* criteria must be employed, or *what* experimental design must be followed.") *with* Hunt, 86 Fordham L. Rev. at 29 ("ISO generally defines validation as 'confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled.'" and "In direct contrast to PCAST's validation litmus test, the ISO does not prescribe *how* labs must validate their methods, *which* criteria must be included, or *what* experimental design must be used.").

[105] DOJ Statement, *supra* n.1, at 2.

[106] *See* DOJ Guidelines, *supra* n.8.

at least five cases, ranging from New York to Chicago to Oregon, have already cited the DOJ Statement or introduced it into evidence.[107] And so, in turn, have courts. In one of those cases, prosecutors filed a motion asking the court to pre-approve the wording of certain phrases they intended to elicit from their firearms examiners at trial—one of which was supported by a citation to the DOJ Statement—and the court granted the motion.[108] Prosecutors can misuse the Statement precisely because of its connection to DOJ.[109]

The misuse of the Statement is not limited to the United States: foreign legal systems are also treating the Statement as an authoritative validation of forensic techniques, in reliance on DOJ's reputation. For example, an Israeli committee on the prevention of false convictions recently published an interim report on forensic science. The Israeli report noted that, although it had reviewed the PCAST report, it did so bearing in mind the recent criticisms from the DOJ Statement.[110]

As long as the Statement remains on the DOJ website and appears to carry the Department's support, the number of these examples will continue to grow. And as courts rely on the Statement's erroneous content, it will become enshrined into precedent, where the Statement's inaccuracies will affect not merely scientific discourse, but the liberty of criminal defendants. And in doing so, the Statement is likely to amplify the inequity that already pervades our criminal justice system.[111] A complete and swift retraction is therefore necessary to prevent misuse of the Department's work.

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[107] *See, e.g.*, *People* v. *Auimatagi*, Case No. CR-2019-4995-1 (Yolo County, Cal. Super. Ct.) (Feb. 4, 2021); *State* v. *Barquet*, Case No. 18CR77354 (Multnomah County, Or. Cir. Ct.); *People* v. *Hopkins*, Case No. 4258-2016 (N.Y. Sup. Ct.); *People* v. *Williams*, Case No. 20CR0369401 (Cook County, Ill. Cir. Ct.); *People* v. *Winfield*, Case No. 15CR14066-01 (Cook County, Ill. Cir. Ct.).

[108] See State's List of Proposed Expert Opinion Statements; Second Motion to Clarify Ruling on Defense Motion No. 21, at 4 & n.9, *State* v. *Barquet*, Case No. 18CR77354 (Feb. 8, 2021 Multnomah County, Or. Cir. Ct.); Order Clarifying November 12, 2020 Order on Defense Motion to Limit or Ban Testimony by State's Firearms Examiners (Defense Motion #21), at 2, *State* v. *Barquet*, Case No. 18CR77354 (Apr. 15, 2021 Multnomah County, Or. Cir. Ct.).

[109] *See* Tr. of Evidentiary Hearing (Feb. 4, 2021), *People* v. *Auimatagi*, Case No. 19-4995 (Yolo County, Cal. Super. Ct.), at 58:23–25 ("So that's the United States Department of Justice issuing criticism for what PCAST said would need to qualify for foundational validity; is that correct?").

[110] *See* Israeli Public Committee on the Prevention of False Convictions and Their Correction, *Interim Report on Forensic Evidence* (March 2021).

[111] *See, e.g.*, The Sentencing Project, *Report to the United Nations on Racial Disparities in the U.S. Criminal Justice System*, 1 (Apr. 19, 2018), https://www.sentencingproject.org/publications/un-report-on-racial-disparities/ (noting that African-American adults are 5.9 times as likely to be incarcerated than white adults).

IV. The Union of Concerned Scientists Is an Affected Person.

Any "affected person" is entitled to request correction or retraction of agency documents that fail to meet the IQA's standards.[112] Both the OMB and DOJ guidelines have interpreted the IQA to allow any member of "the public" to submit a request for correction.[113] As a member of the public, the Union of Concerned Scientists is an affected person under the IQA.

The DOJ Guidelines further require the requester to explain how it is harmed and how correction will benefit the requester. The Union of Concerned Scientists is a science advocacy organization that works to promote the rigorous, independent use of science to solve the world's problems, and the Center for Science and Democracy within UCS has a mission of working to ensure that independent science can inform public decision-making without interference or undue influence. The DOJ Statement undermines the basic scientific principles that the Union of Concerned Scientists promotes and threatens the work of its members, including forensic scientists and researchers. Retraction will ensure that rigorous and independent forensic science can appropriately inform legal decisions without the confusion caused by the seemingly authoritative, but misleading, DOJ Statement.

V. Under a Recent Presidential Memorandum, the Department Is Also Required to Review the Statement Because It Distorts the Conclusions of the PCAST Report and Fails to Fairly Represent or Resolve Scientific Disagreements.

Within days of taking office, President Biden reestablished the federal government's commitment to scientific integrity through multiple government memoranda and Executive Orders. One memorandum in particular requires the Department to reassess the DOJ Statement in light of scientific integrity concerns, independent of the review required under the IQA. President Biden's Science Integrity Memo announced the Administration's official policy of "mak[ing] evidence-based decisions guided by the best available science."[114] As relevant here, heads of agencies must review and, if necessary, update "any website content," "agency reports," or "other agency materials issued or published since January 20, 2017, that are inconsistent with the principles set forth in this memorandum and that remain in use by the agency or its stakeholders."[115]

As explained above, the DOJ Statement is inconsistent with the Administration's principles because it distorts the scientific analyses and

[112] *See* Pub. L. No. 106-554, § 515(b)(2)(B).

[113] *See* OMB Bulletin, M-19-15, *supra* n.7, at 9; DOJ Guidelines, *supra* n.8.

[114] Science Integrity Memo, *supra* n.4.

[115] *Id*. § 3(c)(iv).

conclusions in the PCAST Report and fails to fairly represent or resolve disagreements about its scientific methods and conclusions. Because this "agency material[]" is still in use both by DOJ prosecutors and other parties (including judges, state prosecutors, and foreign governments) that rely on DOJ materials, the Department must review and rescind it.

VI. Conclusion and Relief Requested

"[I]t has become increasingly clear that forensic practices that rely on human judgment often implicate the wrong people. . . . Indeed, thousands of innocent person-years have been spent behind bars for this reason, the majority of these quashed lives being men of color."[116] It is thus especially important that DOJ ensure that the forensic techniques it relies upon, as well as those it endorses, are based on the best available science. This means the Department should take seriously concerns like those raised in the PCAST Report. And when the Department disagrees with a recommendation, it should engage with the scientific community based on data and a transparent acknowledgement of the limitations of techniques currently in use. The DOJ Statement fails to do that.

* * *

Under the IQA, in response to this request for correction, DOJ is required to "[c]onduct a thorough review of the information being challenged, the processes that were used to create and disseminate the information and the conformity of the information and processes with OMB, DOJ and SLO & HoC policy, guidelines, and procedures," and "[p]rovide a point-by-point response addressing data quality arguments."[117] DOJ must further determine what corrective action is warranted, taking into account the "nature and timeliness of the information and factors, [sic] such as the significance and magnitude of the error."[118]

Given the Statement's failure to comply with the IQA, the large-scale errors that permeate the Statement, and the significant risks that the misinformation it distributes will undermine confidence in our criminal justice system, the Union of Concerned Scientists requests that the Department fully retract the Statement within 120 days. Should you have any questions, please do not hesitate to contact us at jmorton@democracyforward.org, sspence@democracyforward.org, or (202) 448-9090.

[116] Albright, *supra* n.92, at 1.

[117] DOJ Guidelines, *supra* n.8.

[118] *Id.*

Sincerely,

/s/ Jessica Anne Morton
Jessica Anne Morton, Senior Counsel
Democracy Forward Foundation

/s/ Samara M. Spence
Samara M. Spence, Senior Counsel
Democracy Forward Foundation

Counsel for the Union of Concerned Scientists

cc: Lisa Monaco, Deputy Attorney General, U.S. Department of Justice
Kevin Jones, Acting Assistant Attorney General, Office of Legal Policy, U.S. Department of Justice
Melinda Rogers, Deputy Assistant Attorney General for Information Resource Management
Dr. Eric Lander, Presidential Science Advisor; Director, Office of Science and Technology Policy
Dr. Alondra Nelson, Deputy Director for Science and Society, Office of Science and Technology Policy
Frances H. Arnold, Ph.D., Co-Chair of the PCAST
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THE INTERCEPT ›

Annotations

Advocates Challenge Mysterious Justice Department Statement That Undercuts Forensic Science Reform

AUGUST 08, 2021

In the final days of the Trump administration, a curious press release appeared on the Justice Department's website announcing the publication of a statement in response to a nearly five-year-old report that critiqued a handful of forensic science practices.

The 2016 report from the President's Council of Advisors on Science and Technology, or PCAST, concluded that a number of forensic feature-comparison methods — including bite-mark, footwear, and firearms analysis — lacked scientific validity and reliability.

Forensic feature-comparison methods involve practitioners taking a piece of evidence and visually comparing it to an exemplar to determine if they match. An apparent bite mark found on a victim, for example, might be compared to the dentition of a suspect. The problem, the PCAST found, was that while these pattern-matching practices have been used as evidence for decades, they have little, if any, scientific underpinning. They haven't been empirically proven valid and lack meaningful error rates. The council concluded that some of these practices, like bite-mark analysis, should be abandoned, while others, like firearms analysis, should be subjected to further scientific scrutiny — and, if used as evidence in the interim, that judges and juries should be told of their limitations.

"Without appropriate estimates of accuracy," the report read, "an examiner's statement that two samples are similar — or even distinguishable — is scientifically meaningless: It has no probative value and considerable potential for prejudicial impact."

This did not go over well with many forensic practitioners and prosecutors, who were quick to criticize the report's conclusions. They argued that these forensic practices weren't suited to testing by traditional scientific methods, they'd been working just fine, and the criminal legal system would flounder without them.

But the PCAST caught the attention of others too. Defense attorneys and reform-minded forensic practitioners have long decried the fallibility of traditional forensic practices, which were developed by police, not scientists. According to the National Registry of Exonerations, roughly a quarter of the more than 2,800 wrongful convictions cataloged since 1989 involved false or

misleading forensic evidence. Defense attorneys began to cite the PCAST report in efforts to block the introduction of certain forensic evidence in their criminal cases.

It was amid all this that on January 13, 2021, the Justice Department announced the publication of its belated official response to the PCAST. The unsigned statement blasted the report's conclusions as wrongheaded and incorrect, encouraging judges to reject them. To date, the department has indicated that it is sticking to this position.

Now, Democracy Forward and the Union of Concerned Scientists are asking the Justice Department to rescind the statement, which they say runs afoul of the federal Information Quality Act requirement that information disseminated by the government be accurate, reliable, and unbiased. "Retraction will ensure that rigorous and independent forensic science can appropriately inform legal decisions," the groups wrote in a letter, "without the confusion caused by the seemingly authoritative, but misleading, DOJ statement."

And, the groups say, lives may depend on the agency doing so. "When our government makes decisions that ignore the best available science, it can result in real harm," Jacob Carter, a senior scientist with the UCS Center for Science and Democracy, said in a press release. "One of the clearest examples is the way the use of dubious forensic evidence could put an innocent person in prison."

The Problem With Ballistic Evidence

The murder case against Scott Goodwin-Bey hinged on forensic evidence.

In 2015, Goodwin-Bey was charged with the shooting deaths of four people inside a room at the Economy Inn on the north side of Springfield, Missouri. Police said Goodwin-Bey believed that the four had been talking to the cops about his drug use.

On balance, the evidence against him was weak, and Goodwin-Bey maintained his innocence. There was an informant who was apparently in the motel room at the time of the killings, who claimed that he was not involved and instead threw suspicion onto Goodwin-Bey. And there was a gun that Goodwin-Bey allegedly gave to a convenience store clerk two weeks after the crime. The cops confiscated the gun and arrested Goodwin-Bey.

It was the gun that would make or break the state's case. At the motel, investigators had found 13 shell casings and 11 fired bullets, which were collected for analysis. The question was whether forensic examiners could connect the gun to the crime.

Firearms examination, a branch of "toolmark analysis," involves forensic practitioners taking spent bullets and shell casings and trying to match them to a suspected crime weapon.

There are two levels of inquiry. First, examiners look for so-called class characteristics, like whether the caliber of the bullet collected at the crime scene matches the caliber of the weapon. If the bullet is a .38, for example, and the gun is a .22, they can't be related because a weapon can't fire a bullet of a diameter larger than its barrel. Then there's rifling, the pattern carved into the gun's barrel during manufacturing, which spins a bullet when it's fired to increase accuracy (think of how a quarterback throws a football). The twist is oriented either right or left and comprised of raised and lowered portions of metal called lands and grooves. After a bullet is fired, it generally retains impressions of the rifling from the gun that fired it. So if the impressions on a bullet from a crime scene don't match the rifling on the suspected gun, you know that gun didn't fire those bullets.

Then things get more complicated. If a bullet and gun share class characteristics, firearms analysts will look for other similarities by using a comparison microscope, for example, to inspect a crime scene bullet and a bullet test-fired in the lab from the suspected gun. At this point they're looking for details they call "individual characteristics." Tiny imperfections in a gun barrel could leave impressions on both bullets, say, a scratch to the

lands or other defects that examiners claim are unique to a particular weapon. If an examiner sees those things, they'll often declare a match.

In the Goodwin-Bey case, the state said the forensic examination matched his gun to the crime scene evidence. But the defense challenged this, citing the PCAST report. When it comes to individual characteristics, the report concluded, firearms analysis is neither scientifically valid nor reliable and lacks meaningful error rates — how often an examiner gets it wrong. The PCAST reported finding only one well-designed empirical study, which revealed an error rate that could be as high as 1 in 46.

State Circuit Judge Calvin Holden held a hearing to decide whether the evidence would be allowed. In December 2016, just weeks before Goodwin-Bey was slated to be tried, Holden ruled mostly in Goodwin-Bey's favor. "The problem with ballistic evidence is that it is all subjective. There have been no large scientific studies to determine an error rate. The peer community is almost exclusively law enforcement. It is not scientific," he wrote. "Toolmark identification is a very valuable investigative tool. However, that is where it should stay, in the area of law enforcement, not in the courts."

But he didn't toss the evidence altogether: Instead of declaring a match — for which Holden concluded there was no scientific support — the examiner could tell the jury that based on class characteristics, the gun could not be excluded as the murder weapon. "The court very reluctantly will allow the state's lab person to testify, but only to the point that this gun could not be eliminated as the source of the bullet," the judge wrote. Shortly thereafter, prosecutors dropped the murder charges against Goodwin-Bey.

The Scourge of Wrongful Conviction

The Goodwin-Bey case appears to have been the first in which a judge cited the conclusions of the PCAST report to block the state from using firearms evidence. In the intervening years, at least nine additional favorable rulings have curtailed the use of such evidence.

Maneka Sinha, an assistant professor of law at the University of Maryland, spent a decade with the Public Defender Service for the District of Columbia. As head of the office's nationally known Forensic Practice Group, she worked on another case challenging the use of firearms analysis. The question was essentially the same as in the Goodwin-Bey case: Would the state be able to argue that forensics could match shell casings from a crime to a particular gun and put its defendant, Marquette Tibbs, at the scene? The defense team said no; at best, the state could say that the gun could not be excluded as the murder weapon. "Because there's not sufficient scientific support to go any further than that," Sinha told The Intercept. At a subsequent hearing, "the goal was to lay bare the flaws with … the discipline as a whole," she added. "And I think we did that."

In September 2019, Associate Judge Todd Edelman agreed. "Based largely on the inability of the published studies in the field to establish an error rate, the absence of an objective standard for identification, and the lack of acceptance of the discipline's foundational validity outside of the community of firearms and toolmark examiners," he wrote, the evidence must be limited to a conclusion that "the firearm cannot be excluded as the source of the casing."

The rulings continued into 2020. And then, in January 2021, the Justice Department statement popped up — in direct response to rulings that limited firearms evidence. "Formally addressing PCAST's incorrect claims has become increasingly important," it read, "as a number of recent federal and state court opinions have cited the report as support for limiting the admissibility of firearms/toolmarks evidence in criminal cases." The statement went on to make three assertions, none of which are grounded in science.

The most fundamental was that forensic matching practices don't belong to the field known as "metrology," the science of measurement. According to the Justice Department, metrology doesn't apply to methods like firearms analysis because practitioners don't really measure anything. Instead, they only use their eyes. "As their reflexive description makes clear, forensic pattern comparison methods *compare* the features/characteristics and overall patterns of a questioned sample to a known source," the statement asserted. "They do not *measure* them."

The statement also rejected as too stringent the PCAST's conclusions that studies seeking to validate forensic practices should adhere to a set of basic scientific principles and error rates should be established through well-designed black-box studies that test examiners' accuracy.

As the PCAST report riled up a section of the forensics community, so too did the Justice Department's response. Its point about metrology drew a stinging rebuke from Thomas D. Albright, director of the Salk Institute for Biological Studies' Vision Center Laboratory, which researches how the brain measures visual information.

In a piece published in the Proceedings of the National Academy of Sciences, Albright explained why the Justice Department's assertion was wrong. "This may seem like a semantic argument of little consequence, but I maintain that it reflects a longstanding and deep-seated misunderstanding within the forensic science community about how people make decisions," he wrote. The notion that patterns in forensics are not measured but only visually analyzed, he argued, is absurd. "To wit, biological senses employed by human observers measure and discriminate the physical properties of sensory stimuli by simple and well-established rules," he wrote. "This understanding encourages new ways of thinking about and improving the accuracy of forensic feature comparison thereby limiting the scourge of wrongful conviction."

To be fair, this isn't the first time that the Justice Department has looked sideways at the PCAST report. Not long after it was released, then-Attorney General Loretta Lynch said the department would decline to adopt its recommendations. But there's a critical difference between what Lynch said and the January statement, according to Sinha. "There's no surprise to us that …. Lynch was not going to adopt the findings at the end of the day. This helps them get convictions," she said. "What she didn't go so far as to say was that what the PCAST has done is scientifically unsupportable. That it's bogus, and they've got it all wrong, which is effectively what this statement tries to do."

And the stakes are high, Sinha said. Where something like bite-mark evidence is rarely used, firearms evidence is all but ubiquitous. So rejecting the PCAST recommendations on shoring up forensic analysis in the field has real consequences.

The Justice Department's response, Sinha wrote in Slate, "was a smoke-and-mirrors attempt to use the credibility of the federal government to prop up the uncritical use of flawed forensic science that has contributed to hundreds of wrongful convictions."

Unsigned, Unattributed, Unverifiable

Even as Albright and others began to sound the alarm about the content of the Justice Department's statement, there remained an open question: Who wrote it? Oddly, the official statement had no author attached. But all signs point to one man: Ted Hunt.

Back when Barack Obama was president, there were a few hopeful indications that forensics reform might be in play. Not long after he was inaugurated, the National Academy of Sciences released its long-awaited study of forensics practices. A precursor to the PCAST report, it was equally

unsparing in its assessment that, save for DNA analysis, "no forensic method has been rigorously shown to have the capacity to consistently, and with a high degree of certainty, demonstrate a connection between evidence and a particular individual or source."

In the wake of the NAS report, the Obama administration launched the National Commission on Forensic Science, a 32-member panel chosen from across disciplines, including science and law, to "enhance the practice and improve the reliability of forensic science." Although the group's work was plodding, incremental, and not entirely satisfying, it was at least moving toward something.

But with the election of President Donald Trump, all momentum ceased. Trump installed Sen. Jeff Sessions, a noted opponent of forensics reform, as attorney general. Sessions folded the commission and in its place named Hunt, a career prosecutor from Kansas City, Missouri, as the head of a mysterious Justice Department forensics working group that never seemed to get off the ground. Hunt had been on the commission; he was one of just two members to vote against a recommendation that forensic practitioners standardize the language they use in reporting their results and avoid language that might overstate or exaggerate their findings — the kind of language judges in the firearms cases barred.

In 2017, Hunt penned an article for the Fordham Law Review titled "A Short Response to the PCAST Report." It had much the same tone and hit some of the same notes as the Justice Department's official statement. So it wasn't as though people didn't have an idea that Hunt was behind the Trump administration's response to the PCAST report. But no one has been

able to say for sure who is to blame. Hunt did not return a message requesting comment.

The fact that the Justice Department's statement was anonymous is among a host of problems raised by the UCS and Democracy Forward, which on June 24 filed a 20-page letter asking the department to immediately pull the statement off its website while it conducts a thorough review and decides what should be done to correct it.

The demand draws on the Information Quality Act and the requirement that "influential information" that is "expected to have a genuinely clear and substantial impact at the national level" undergo peer review before release. Because the statement is "unsigned, unattributed, and unverifiable," according to the letter, "the public, and courts, are therefore prevented from confirming the expertise of any contributor or understanding the extent to which these opinions are shared by scientists."

"The possibility that it was in fact written by a lawyer with a prosecutorial agenda," the letter adds, "renders the statement susceptible to corruption."

Jessica Morton, senior counsel with Democracy Forward, says the Justice Department's statement is dangerous. "I think the potential damage is enormous. Whenever a statement is coming from the United States Department of Justice, it carries more weight than a statement coming from elsewhere," she said. "Once it becomes enshrined in precedent … scientific techniques that don't meet the standards to merit the name can become tools to continue incarcerating people, including people who may be innocent."

Where the PCAST was meant to encourage reform in forensic practices — reforms that, to date, have largely failed to materialize — the Justice Department's response was specifically intended to influence the courts to reject challenges to forensic evidence. The statement says as much in noting that it comes on the heels of firearms evidence rulings in cases like Goodwin-Bey and Tibbs. According to the advocates' letter, the agency's statement has already been used in at least five criminal cases across the country to sidestep judicial scrutiny of forensic firearms evidence.

"And the implication of that, I think, is that the DOJ thinks it's just fine that certain forensic techniques don't really hold up from a scientific perspective," said Samara Spence, another senior counsel with Democracy Forward. "And it implies that DOJ doesn't think that the validity of these techniques needs to be improved. It seems like an endorsement of the status quo in a vote against improving something that scientists have been saying is flawed for years."

The Information Quality Act gives the Justice Department 120 days from the filing of the letter to review and take action on the groups' request.

In an email to The Intercept, Dena Iverson, principal deputy director of the Justice Department's Office of Public Affairs, said the position laid out in the statement remains the agency's stance. "The department's January statement provides a detailed explication of a position that has remained unchanged since publication of the PCAST report in 2016," she wrote. Iverson did not say who authored the statement.

The Justice Department's current position is in direct conflict with promises President Joe Biden made earlier this year. After he was inaugurated, the administration posted a lengthy memorandum for executive departments and agency heads titled "Restoring Trust in Government Through Scientific Integrity and Evidence-Based Policymaking." In the memo, Biden announced that his administration would make "evidence-based decisions guided by the best available science and data."

"Scientific findings should never be distorted or influenced by political considerations," Biden wrote.

Advocates say the administration's directives mean that the Justice Department's statement must be rescinded. "I mean, at a bare minimum it should be taken down," Sinha said. But it's been up for nearly eight months now, so she thinks more should be done to counteract the damage it's already done. "The right thing to do is replace it with a statement acknowledging the importance of the PCAST report and acknowledging a commitment to … scientific integrity," she said. "Apply that to criminal justice, once and for all."

content. In today's climate of widespread misinformation, Outline empowers readers to verify the facts.

October 25, 2021

Office of Science, Department of Energy
President's Council of Advisors on Science and Technology (PCAST)
ATTN: Dr. Sarah Domnitz, Designated Federal Officer, PCAST

Re: DOE-HQ-2021-0001
Via electronic submission to *PCAST@ostp.eop.gov*

To the President's Council of Advisors on Science and Technology,

Founded in 1883, ASTA's mission is to enhance the development and use of quality seed worldwide. Its membership consists of nearly 700 companies involved in seed production and distribution, plant breeding, and related industries in North America. ASTA members research, develop, produce, and distribute all varieties of seeds – including row crops, vegetables, flowers, grasses, forages, cereals and conservation seeds. ASTA member's seed-products support agricultural producers of food products and farm commodities in the U.S. and around the world. ASTA promotes the development of better seed to produce better crops for a better quality of life.

Today's food and agriculture system faces unprecedented challenges, from climate change to a growing population, and rapidly evolving pests and diseases. Continued innovation in plant breeding and seed variety development are crucial to ensuring long-term economic, social, and environmental sustainability. The seed industry is founded on innovation, and innovation is a part of everything we do – from plant breeding and seed treatments, to soil health and habitat restoration. Better seed means better life, for everyone.

ASTA is pleased to provide these comments to the President's Council of Advisors on Science and Technology (PCAST) ahead of their virtual meeting on combatting and adapting to climate change, including ongoing work within individual federal agencies, implications for national security, and achieving net zero emissions by 2050.

Combatting and Adapting to Climate Change

Plant Breeding Innovation

The development and commercialization of innovative plant varieties is already playing a significant role in assisting U.S. agriculture in reducing greenhouse gas emissions. Further crop improvements using new precision breeding methods, including gene editing, can hasten these positive trends. Seed companies are investing an average of 15% of sales income back into research and development annually, signaling a strong commitment to new innovation.

The robust intellectual property rights protection available in the U.S., whether patents, plant variety protection, or trade secrets, enables plant breeders to make these significant investments in new innovation with the assurance that their products and methods are protected.

ASTA members are committed to investing in research and development and depend on it to deliver products to farmers that address constantly evolving and interlocking threats from changing climate and evolving disease and pest pressures. An increasingly warming climate means an increase in disease intensity, mutation rates, and the evolution of pests and diseases in areas where they formerly didn't exist. In the face of these challenges, innovation in plant breeding and seed related treatments are necessary to protect productivity. New, improved plant varieties enable farmers to grow more food on less land, providing sustainable intensification and avoiding the expansion of land under agriculture.

Public funding for agriculture research is critical to innovation. An area of federal investment that is not well-known but critically important is the USDA Agricultural Research Service National Plant Germplasm System (NPGS), which collects, stores, and maintains unique plant germplasm from around the world. Plant breeders worldwide use these genetic materials to breed new plant varieties that can resist pests, diseases and environmental stresses. Modest additional investments in the NPGS would undoubtedly help researchers uncover new sources of climate solutions.

Investment in research, development, and deployment of innovative plant breeding methods will provide tools for plant breeders to develop new varieties in years instead of decades. We must prioritize the development of evolving plant breeding methods to address the critical environmental challenges facing today's food production system for the future of our planet, our health and our food. Cutting-edge plant breeding methods enhance the efficiency and effectives of plant breeders' ability to develop varieties of crops that have a significant positive environmental impact. According to the Food and Agriculture Organization of the United Nations, food produced for human consumption that is lost or wasted globally amounts to nearly 1.3 billion tons of food waste per year – about 8% of greenhouse gas emissions. Plant breeders are using gene editing to develop new crop varieties specifically designed to improve shelf life and cut the amount of food wasted. By making a small change to a potato's DNA, for instance, researchers are able to reduce bruising and browning. The new characteristic could eliminate 1.5 billion pounds of wasted potatoes, addressing food waste challenges as well as environmental impacts.

Additionally, public/private collaborations are critical in advancing climate-smart agricultural and forestry practices. Appropriate policies can incentivize investments in plant breeding innovation, such as gene editing, while creating new jobs and market opportunities, and boosting sustainability along the entire agriculture and food value chain. We have seen evidence of this through several research efforts at land-grant universities and research institutes. For example:

> UC Davis: Researchers have discovered a wild lettuce variety that is capable of germinating at dry, high temperatures, which holds significant value given warming

global temperatures. Using gene editing, it's been shown possible to develop varieties capable of thriving in warmer global temperatures.

University of Florida: Researchers conducted a survey to observe the effects of citrus greening disease on citrus production. The Florida citrus industry and its position in the global citrus market is being jeopardized by a bacterial disease known as Huanglongbing (HLB) or citrus greening. The disease reduces yield, fruit size and quality, and increases tree mortality and cost of production. Since HLB was first found in 2005, researchers have reported that orange acreage and yield in Florida have decreased by 26% and 42%, respectively. Citrus growers need long-term, sustainable solutions. There is no question that plant breeding innovation holds the key. Using gene editing, researchers are working on developing citrus trees that are resistant, if not immune, to citrus greening, the bacteria that causes it, and the insect that spreads it. Innovation is enabling us to potentially do in years what would previously only have been possible in decades, or longer.

The Salk Institute in San Diego: Researchers are engineering crops to have more prominent roots made of a natural waxy substance called suberin—found in cork and cantaloupe rinds—which effectively captures carbon and is resistant to decomposition. The roots would store CO2, and when farmers harvest their crops in the fall, the deep-buried roots and the carbon they have sequestered would stay in the soil for years.

New York University: A $4 million grant through the Plane Genome Research Project has allowed NYU to address drought tolerance in rice. With decreasing land and water resources available to meet the future needs of humanity, gene editing has been used to develop rice lines that can be grown using saline water, with no changes to any other genes and no deleterious changes on any other aspects of planet yield and performance. These advancements, achieved in large part through plant breeding innovation, are necessary to meet the needs of our nation and the world.

Better seed allows farmers to grow more, using less land and fewer resources; and in turn, provides consumers with access to wider varieties of safe, affordable, and nutritious foods. Plant breeding holds the key to addressing many of our collective global challenges – from health and nutrition to hunger and climate change. The public and private sectors have an important role to play. It's critical that we continue moving forward, through a robust investment in research, development and education, to drive forward the next generation of innovative solutions to meet the emerging challenges of tomorrow.

Environmental and Conservation Seed

The seed industry plays an important role in providing quality seed for land restoration, rehabilitation, reclamation and conservation. Environmental and conservation seed helps to restore lands devastated by wildfires, natural disasters, and invasive weeds. It serves as the foundation of healthy landscapes, contributing to stable ecosystems and economies, while providing critical erosion-control and biodiversity benefits.

Cover Crops

Cover crops are an important means of increasing soil health, retention, and resiliency, improving farmer productivity, and enhancing carbon sequestration. ASTA members are working to develop new varieties of cover crops that address a range of issues including improving water infiltration to address excessive moisture, nitrogen fixation to reduce run-off, weed suppression to reduce herbicide use and soil health. ASTA has prioritized communication with its members surrounding cover crop adoption, focusing on training needs and education. There is a widespread concern surrounding practical impediments that are preventing cover crops from becoming more widely adopted. Farmers may not be aware of the benefits of cover crops or may lack the technical know-how to incorporate them into their operations. Several entities are conducting education and training for farmers on the use of cover crops, but additional funding is needed to heighten these initiatives. Minimizing bureaucratic hurdles for enrolling in the U.S. Department of Agriculture (USDA) programs and multi-year contracts will further encourage producers to use beneficial conservation practices. Lastly, additional funding is needed to make sure that farmers have access to the programs that offset cover crop expenses.

Seed Treatments

The USDA and the US EPA should continue to ensure that producers have the tools needed to promote resiliency, including seed treatments. Seed treatments help protect the developing seed genetics during its most vulnerable times – at planting and germination. The treatment's highly targeted, precise approach means less impact on the surrounding environment. This is one of the many valuable and innovative tools that enable America's farmers to be more productive, while using less land – that's a win for farmer's bottom line and a win for the environment. Continued innovations in seed treatments will allow farmers to meet new and emerging challenges while realizing healthy yields – all while protecting our land and natural resources for the future.

Public/Private Sector Collaborations

A long-standing example of public/private sector collaboration is the Germplasm Enhancement of Maize (GEM) project which is a cooperative effort of the USDA's Agricultural Research Service (ARS), land-grant universities, and the seed industry. GEM's objective is to widen the germplasm base of commercial hybrid corn in the U.S. through the introduction and incorporation of novel and useful germplasm gathered from around the globe.

Another example of successful public/private collaboration is the National Turfgrass Evaluation Program (NTEP). Similar collaborations should be established to increase awareness of opportunities and breeding needs in the cover crop sector.

The public and private breeding sectors and the agricultural producers of our food, feed, fiber and fuel supply could benefit from increased collaboration opportunities. Potential examples of collaborations that could begin and endure over the 2021-2050 timeframe are:

- Devising new crop rotation systems that introduce new crops into existing rotation patterns

- Identifying cover crop systems that fit into the growing season of the more northern latitudes that struggle to establish cover crops prior to the first freeze
- Modeling cropping systems and predicting durability of a range of pest solutions
- Identifying species that have substantial genetic vulnerabilities to pests due to the lack of genetic diversity and determining solutions to address those vulnerabilities
- Initiating collaborations, similar to the GEM, for other crop species, where the private sector enables collaboration with the germplasm, as well as in-kind support, and the public sector leads the "pre-breeding" efforts to diversify the species
- Increasing the strategic education of future public/private sector planbt breeding/agriculture employees with forward looking goals of developing skill sets needed for the next generation
- Increasing the number of employees that shift from the public to the private sector ,and vice versa, through revised sabbatical systems or planned employment shifts, including private sector sabbaticals where scientists visit universities and USDA facilities

Ongoing Work Within Individual Federal Agencies

Consistent and Transparent Communication

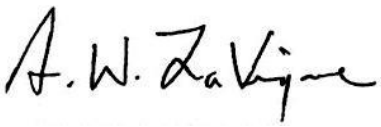
In order to maximize the benefits of innovations in plant breeding, there needs to be a rational and clear path to commercialization for new plant varieties that does not include unnecessary duplicative requirements or processes among the three U.S. regulatory agencies: the USDA, Food and Drug Administration (FDA), and Environmental Protection Agency (EPA). Historically, under the Coordinated Framework for Regulation of Biotechnology, USDA, FDA and EPA have each served a specific function in ensuring the health of our food and the environment. ASTA encourages the U.S. government to ensure alignment in risk-based policies around plant products of newer breeding methods across these three federal agencies. Lack of consistency and science-based regulation among the agencies will stifle research investments and activity, create uncertainty on commercialization of new varieties, and prohibit widespread access for public sector scientists to these evolving tools and the array of critical benefits they hold for society now and in the future.

One of the key barriers to application of innovative plant breeding methods is gaining the trust of consumers in accepting these innovative solutions. Therefore, communication across the value chain – public and private – about the value and benefits of these solutions continues to be critical. Regulatory burdens that are not justified by risk and science will also hinder the realization of plant breeding innovations. Potential regulatory burden includes policies that inhibit the flow of and the ability to access germplasm from accessions in other countries.

The Federal agencies and the private sector should collaboratively identify challenges and solutions to minimize duplicative regulatory burdens hindering commercial product development and marketing through innovative technologies such as genome editing. Joint efforts should be made to educate policy agencies in the U.S. and globally regarding the safety of enabling technologies that increase plant performance.

Again, ASTA appreciates the opportunity to provide a response to PCAST, and looks forward to continued collaboration on these critically important issues.

Sincerely,



Andrew W. LaVigne
President and CEO

Ruth Charney, PhD
President
[redacted]

October 29, 2021

Dr. Eric S. Lander
Director, White House Office of Science and Technology Policy
Co-Chair, President's Council of Advisors on Science and Technology

Dr. Frances Arnold
Linus Pauling Professor of Chemical Engineering, Bioengineering, and Biochemistry
California Institute of Technology
Co-Chair, President's Council of Advisors on Science and Technology

Dr. Maria Zuber
Vice President for Research and E.A. Griswold Professor of Geophysics
Massachusetts Institute of Technology
Co-Chair, President's Council of Advisors on Science and Technology

Dear Drs. Arnold, Lander, Zuber, and other members of the President's Council of Advisors on Science and Technology,

We are pleased to see the members of PCAST announced, and look forward to serving as a resource.

In December of 2020, the AMS submitted a document to OSTP titled "Priorities for the National Science Foundation," which gives two key ways for the agency to support mathematics:

- invest in fundamental research, and
- invest in the next generation of research scientists.

The document makes an eloquent case for the importance of research in the mathematical sciences to advance science, technology, and medicine. In particular, mathematics—both theoretical and applied—will be essential in mitigating climate change, and preparing for future pandemics and other threats to the health of humanity. The rationale for investing in fundamental research in mathematics remains unchanged from December 2020.

The AMS is currently devoting a great deal of attention to the next generation of research scientists, and making the science and technology ecosystem more diverse, equitable and inclusive. We are faced with two interconnected and daunting challenges: the immediate issues arising from the pandemic, which have had an unfortunate impact on many early-career scientists, and the longer-term obstacles to expanding the STEM pipeline for

engaging a more diverse group of scientists and mathematicians. To address these challenges, in the aforementioned document we urged Congress and the NSF to invest in

- programs that support graduate students and new PhDs during the remainder of and in the aftermath of the pandemic,
- programs that promote connections between minority serving institutions and research universities,
- programs designed to engage the "missing millions"—to find and encourage students from diverse backgrounds to pursue careers in STEM and simultaneously to improve our academic climate to assure students are supported through all stages of their education.

These programs will reinvigorate our STEM enterprise and ensure its long-term health, and help the United States remain globally competitive across STEM fields.

We attach for your consideration the December 2020 document outlining AMS priorities for the NSF.

The AMS' education activities and advocacy efforts typically focus on graduate and undergraduate programs. At the same time, as one of the world's largest professional societies of mathematicians, we are often central in conversations on a broader range of topics within mathematical sciences education. The AMS Committee on Education, notably, provides a forum for the full range of mathematics education issues facing the nation. As one example, and in response to a number of proposed changes to high-school and early undergraduate mathematical sciences curriculum, the AMS Committee on Education is hosting an early 2022 town hall on the issue for sharing, learning, and helping the community find common ground.

To help address structural inequities in STEM, we would be happy to talk with PCAST about mathematical sciences education and efforts to improve curriculum, accessibility, and pathways (including bridges and on-ramps). We are cognizant that the third 5-year STEM education plan—as mandated by the America COMPETES Act—will occur soon, and we are happy to help in whatever capacity is needed.

Thank you—as always—for your service, and thank you for kindly reading this letter. We are ready to assist as a resource in any way PCAST would find useful.

Sincerely,

Ruth Charney
President, American Mathematical Society

AMS American Mathematical Society
Advancing research. Creating connections.

December 2020

Priorities for the National Science Foundation

Founded in 1888, the American Mathematical Society (AMS) is dedicated to advancing the interests of mathematical research and scholarship and connecting the diverse global mathematical community. We do this through our book and journal publications, meetings and conferences, database of research publications[1] that goes back to the early 1800s, professional services, advocacy, and awareness programs.

The AMS has 30,000 individual members worldwide and supports mathematical scientists at every career stage.

The AMS advocates for increased and sustained funding for the National Science Foundation (NSF). The NSF supports more fundamental research in the mathematical sciences—and done at colleges and universities—than any other federal agency.[2] A significant increase in Congressional appropriations would help address the effects of years of high-quality grant proposals that go unfunded due to limited funding. Those unmet needs continue. A 2019 National Science Board report[3] stated that in fiscal year 2018, "approximately $3.4 billion was requested for declined proposals that were rated Very Good or higher in the merit review process." This accounts for about 5440 declined proposals at the NSF. The U.S. is leaving potentially transformative scientific research unfunded, while other countries are making significant investments.

The applications of advances in theoretical science, including theory of mathematics, occur on a time scale that means the investment is often hard to justify in the short run.

In the next section we give an overview of our two priorities. The second, and final section offers a discussion of existing funding mechanisms for mathematicians.

AMS Priorities for the National Science Foundation

1. **Invest in fundamental research.**
2. **Invest in the next generation of research scientists.**

[1] https://mathscinet.ams.org/mathscinet

[2] See Figures 5B-13 and 5B-15 at https://ncses.nsf.gov/pubs/nsb20202/academic-r-d-in-the-united-states

[3] https://www.nsf.gov/nsb/publications/2020/nsb202013.pdf

Photo by Katie Awkerr, Atlanta Convention Photography

Invest in fundamental research

Fundamental research in mathematics touches on all of the scientific priorities of the Biden-Harris agenda. As examples, mathematicians model the spread of pandemics and help assess the efficacy of vaccine programs; we produce basic research needed for advances in artificial intelligence and machine learning; and—as described below—mathematicians' theoretical work underpins imaging technologies used to detect diseases, including cancer.

Mathematics research is at the extreme for long-term payoff. Correct mathematical results are as valid today as they will be in 30 and even 300 years. Equally, correct results from 300 years ago are still valid.

The applications of advances in theoretical science, including theory of mathematics, occur on a timescale that means the investment is often hard to justify in the short run.

And yet if we look back to the success, as opposed to ahead to when we expect success, the investment in fundamental research has had huge payoffs.

According to a recent study on journal usage, mathematics is at the extreme for the life of journal articles. Across all subject disciplines, journal half-lives peaked between two and four years. Seventeen percent of all journals had usage half-lives that exceeded six years, however, with mathematics journals at the extreme—36% of the mathematics journals examined had usage half-lives exceeding six years.[4]

Correct mathematics is never *replaced* by newer, correct mathematics. Instead, it is *augmented* by deeper mathematics.

Here are two examples of NSF mathematics investments whose benefits to society were not known at time of investment:

1. Public-key cryptography was initially based on the question of factoring numbers into their prime factors. Number theory is central to commerce and defense.

   Diffie and Hellman's groundbreaking 1976 paper created the concepts of public key cryptography and digital signatures and solved the key exchange problem.[5] Their key exchange protocol was the first and remains one of the most frequently used in a range of today's different security protocols. This work was partially supported by NSF Grant ENG 10173. According to Google scholar, this paper has been cited almost 20,000 times, and the number of citations to it has grown over the decades since it was published; in each year since 2005, over 700 authors have cited this paper.

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[4] See the AMS Open Access Primer: http://www.ams.org/government/AMSPrimerOnOpenAccessGlossary.3-13-19RMH.pdf

[5] Diffie, W. and Hellman, M. "New Directions in Cryptography." IEEE Trans. Info. Th. 22, 644-654, 1976.

It took until the 1990s to realize the applications of the Diffie-Hellman paper and subsequent work on public key cryptography to the internet, e-commerce, and finance.

Today, research in public key cryptography remains vital to national security as industries and governments around the world compete to build a high-functioning quantum computer. National Institute of Standards and Technology (NIST) has organized a competition to develop and standardize the post-quantum public key cryptography that will have to replace the systems currently in use.[6]

2 MRI scans are crucial tools in modern medicine: 40 million scans are performed yearly in the U.S. MRIs are essential in some fields:

- Neurologists seek to pinpoint brain tumors or study demyelinating diseases and dementia.
- MRIs play an important role in the diagnosis of cancer and the planning of treatment; they are one of the most effective tools for early detection of cancer.

MRI technology underwent a revolution accelerated in 2017 when the FDA approved two new MRI devices which dramatically speed up important MRI applications, from 8x to 16x. Siemens' technology (CS Cardiac Cine) allows movies of the beating heart; GE's technology (HyperSense) allows rapid 3D imaging, for example of the brain. Pediatric MRI scan times can be reduced in representative tasks from 8 minutes to 70 seconds, while preserving the diagnostic quality of images. Children with conditions that require repeated imaging benefit tremendously, as they can thus be imaged successfully and comfortably with far less frequent use of sedation.

In the mid-2000s, David Donoho (Stanford) and his NSF-funded postdoc Jared Tanner (now at Oxford) studied this problem. Their NSF funding enabled fundamental research in high-dimensional geometry, which is at the heart of the mathematics revolutionizing MRI and other imaging—compressed sensing. Their work developed over the next decade, culminating in the aforementioned 2017 FDA approval. The work continues, and continues to have impact in many image reconstruction areas, including MRI imaging. NSF-funded mathematics research and NIH funding of cognate disciplines played a key role in these developments.

[6] https://www.nist.gov/news-events/news/2020/07/nists-post-quantum-cryptography-program-enters-selection-round

The opening years of the twenty-first century have been remarkable ones for the mathematical sciences. The imaging advancement described above is just one success. For many more examples, as well as an overview of the vitality of the discipline more broadly, we recommend:

National Research Council. 2013. *The Mathematical Sciences in 2025*. Washington, DC: The National Academies Press. https://doi.org/10.17226/15269.

National Research Council. 2012. *Fueling Innovation and Discovery: The Mathematical Sciences in the 21st Century*. Washington, DC: The National Academies Press. https://doi.org/10.17226/13373. (This is a summary of the findings which appear, in full, in the first resource.)

Invest in the next generation of research scientists

We are at a critical time for building and ensuring a stable STEM workforce of the future, a challenge exacerbated by the COVID-19 pandemic. Becoming a PhD STEM researcher requires focus and dedication; the work is demanding. The public perception of higher education has become increasingly negative, while respect for science is eroding. And the COVID-19 pandemic has deferred and even derailed students' dreams and plans. It is harder than ever to choose and pursue a career in STEM.

The AMS is deeply concerned about workforce development and the U.S. ability to support new PhDs and other early career scientists. As we consider our own programs, and anticipate a renewed interest and investment in the STEM workforce from the Biden-Harris administration, we believe it is important to:

- **attract new students to STEM fields;**
- **continue to engage the ones already in the pipeline;**
- **diversify STEM fields along all axes, including race, gender, and geography;**
- **work toward racial equity in science;**
- **train students for a wide variety of careers;**

and, at this point in time,

- **support new PhDs in the current depressed job market.**

Investment in the mathematical sciences benefits all STEM fields. Students from all sciences and engineering fields take multiple mathematics courses as undergraduates. Social scientists study statistics and, increasingly, more additional mathematics. Efforts to diversify our field will thus have payoff in all fields, as math teachers and professors teach many more students across fields than do those from the other sciences.

Investment in training mathematicians directly benefits the U.S. government; the National Security Agency (NSA) is said to be the largest single employer of PhD mathematicians in the country.[7] NSA mathematicians work on research in a wide variety of math fields, not only in ones we might identify as related to the NSA mission.

It is vitally important that the NSF is able to support graduate students, post-doctoral fellows, and other early career scientists, who are disproportionately affected by the COVID-19 pandemic and are most likely to have had their career goals deferred or derailed. At this challenging time, we cannot risk losing a generation of scientists who leave the field and never return.

It might be useful to reflect on what happened in 2009. Using regular appropriations, NSF's Division of Mathematical Sciences (DMS) created 45 new postdoctoral fellowships.[8] For these 45 new positions created, almost 800 math PhDs applied. Further, using funds delivered by the American Recovery and Reinvestment Act of 2009, the NSF was successful at increasing the number of Faculty Early Career Development Program (CAREER) and Graduate Research Fellowship Program (GRFP) awardees. We are hoping to have similar funding soon, to help early career scientists bridge the gap between graduate school and tenure-track positions.

Increased funding, in the longer term, for Mathematical Sciences Postdoctoral Research Fellowships (MSPRF), is recommended.[9]

The AMS hosts MathJobs.org.[10] This is *the* place where PhD mathematicians look for jobs. We have good data, including monthly and weekly postings of new jobs. Here are a few data points, that tell a story:

In 2019, a total of 2019 jobs were posted on MathJobs.org. As of the end of October 2020, the number of new job postings was approximately 1200. We would expect most positions to be posted at that point in the year. But, one could argue that the year isn't yet over. We can, then, consider some comparisons of monthly postings, showing that postings over the past few months are down sharply from what they were a year ago:

# of new jobs posted, 2019		# of new jobs posted, 2020
August	**185**	**93**
September	**287**	**158**
October	**434**	**270**

These are the months we expect most jobs to be posted. Our hiring cycle works on the academic cycle—most jobs begin in September, with hiring done throughout the previous fall and during the first few months of the year.

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[7] https://www.careerrookie.com/company/National-Security-Agency--NSA-/chm0q5741bfmcp80jcf

[8] https://www.msri.org/web/msri/about-msri/news/msri-in-the-media/177https:/www.msri.org/web/msri/about-msri/news/msri-in-the-media/177

[9] https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5301&org=DMS&from=home

[10] https://mathjobs.org/

We are at a critical time for building and ensuring a stable STEM workforce of the future, a challenge exacerbated by the COVID-19 pandemic.

Almost all (but not all) of the positions posted on MathJobs.org are for academic positions. To put these numbers in context, 1960 individuals received PhDs in the mathematical sciences (mathematics, applied mathematics, statistics, biostatistics) at U.S. institutions during the period July 1, 2017 through June 30, 2018. About 67% of the cohort took jobs in academia (33% in government, business, industry). About 30% of the cohort entered postdoc positions.

The pandemic is disproportionately affecting women. We are seeing evidence that the productivity of women has been drastically affected because women tend to be the ones that take care of things with family (both children and elderly people).[11] Even if we stop the tenure clock and make other accommodations, this research slowdown is going to delay the progress of women in their careers, while most men will move forward. It will negatively affect already existing salary disparities. The NSF may be able to offer programs to offset this problem.

In addition to negative impacts on already established researchers and new PhDs, the pandemic is negatively affecting students. Many graduate programs are freezing or at least "pausing" graduate admissions in mathematics. Columbia University provides one example.[12] Graduate admissions are a moving target, and it is impossible to get hard statistics to capture the situation. However, there are crowd-sourcing efforts in the community, trying to collect information about and understand the landscape. To adopt to the current situation, many graduate programs are not requiring the Graduate Record Examinations (GRE) for incoming students; Brown University graduate student Emily Winn is curating a Google doc with information about which programs have GRE requirements, including which programs are waiving requirements this year.[13] The AMS maintains a listserv for Directors of Graduate Programs. On that listserv there has been discussion of this topic. Here is one comment, from the Director of Graduate Studies at an east-coast university: "*We are not suspending admissions, however our department did extend all of deadlines for graduate students by one year last Spring and the current job market for students hoping to finish PhD this year looks terrible, so it is very unclear how many spots we will have available for new admissions.*" The listserv comments are not vetted, but we get the clear impression that this is the case in many math departments. And, each spot taken by a student who would otherwise graduate and leave for a job is one that cannot be offered to a first-year graduate student.

[11] https://www.nytimes.com/2020/10/06/science/covid-universities-women.html?referringSource=articleShare

[12] https://www.math.columbia.edu/2020/09/21/pause-in-graduate-admissions/

[13] See: https://docs.google.com/spreadsheets/d/1hmdO7af3-lLvtJQO-szayG6blTvAYBQ1JcYXFZ_6apE/edit#gid=0. Emily is an NSF-funded graduate student: http://emilytwinn.com/

Specific Funding Mechanisms

The AMS urges increased funding for the Mathematical Sciences Research Institutes, a funding mechanism of the Division of Mathematical Sciences (DMS). These institutes play a critical role advancing research and building and sustaining the mathematical sciences community. Mathematics is one of the few NSF-funded fields in which the majority of PhD scientists work in academia, and programming at the institutes often includes the opportunity for us to interact with industry; indeed, some focus programming on this interaction. The institutes play a significant and important role broadening participation in the mathematical sciences, and institute programming includes many workshops aimed at doing so. These observations, and the hope for a greater number of institutes, echo the 2020 DMS Committee of Visitors report.[14] Additionally, Congress has voiced its support—the Senate Committee on Appropriations, in their FY2021 CJS Explanatory Statement, "recognizes the importance of the NSF Mathematical Sciences Institutes across the country, which provide important basic research in multiple fields."[15]

We note that DMS award size is the smallest of any division at the NSF.[16] The single most important mechanism for NSF support of graduate students is—indirectly—through research grants (including individual investigator awards). This support is essential to advancing mathematical sciences. Here are some quotes from three notable AMS members:

> *"I have used my NSF grant to support my graduate students in the summer. They each usually get one, maybe two summers worth of funding, so it's not a huge portion of the budget. But it is essential for their graduate study. If they do not get the support, they end up teaching during the summer. On the other hand, with my NSF support, they have an entire three months to focus solely on their research, including the opportunity to attend a conference or two where they meet peers and senior members of the field who can give them guidance about their research and their career. For my students, the summer support has been invaluable."*
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> —**Tara Holm**, *Cornell University, past chair of the AMS Committee on Education*

[14] Presented at the November 30, 2020 Mathematical & Physical Sciences Advisory Committee (MPSAC) meeting.

[15] https://www.appropriations.senate.gov/news/committee-releases-fy21-bills-in-effort-to-advance-process-produce-bipartisan-results

[16] https://dellweb.bfa.nsf.gov/awdfr3/default.asp

> *"The teaching load for graduate students can be high–especially given the economics and teaching scale at state schools. Being supported from grants, even for a summer, provides students the opportunity to focus on research, especially for students already in candidacy. Post candidacy is a critical time for graduate education. The number of GRFs is modest as compared to the total graduate enrollment at even Research I universities. Grant support opportunities serve a larger population and so support a more diverse population."*
>
> —**Scott Wolpert**, *University of Maryland, past chair of the AMS Committee on Science Policy*

> *"Graduate student funds in my NSF grants supported graduate students by offering them occasional release time during the academic year. This was usually a half-time RA for a semester. Typically, this support was given during students' 4th year (when they are achieving progress on their thesis research) and/or in the Fall semester of their 5th year (when they prepare job applications). Graduate student funds in my grants also supported graduate student travel. These funds were very helpful and constructive, helping my students complete their thesis in a timely manner and obtain their first post-PhD position."*
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> —**Eric Friedlander**, *University of Southern California, past AMS President*

Support for graduate students through research grants can increase the diversity of the pool of PhD mathematicians. Because there are relatively few Graduate Research Fellowship Program (GRFP) awards, and these are only available to students early in graduate school, only those who know to apply will, and only those graduate students who look strong early on have a chance of getting a GRFP award. Prospective graduate students (and those in their first years of graduate school) who attend(ed) a small undergraduate institution, those without strong undergraduate training, and those without a good understanding of "the system" may get into graduate school and only after a year or two begin to shine. These individuals are completely left out of the GRFP pool, as their undergraduate professors may not know about available funding. Even if they do apply, their applications may look weaker than those who have access to more advanced coursework during their undergraduate years.

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