Double down on federal science spending

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Our New Year's resolutions were interrupted this year by a **cataclysmic and violent kickoff**. Who can concentrate on exercise, weight loss, better organization, or a dry January with all that happening? We are now returning to pandemic "normal" with the

expanding COVID-19 immunization of first responders, frontline medical workers, and now, **some others**.

Reflection on the trail of pandemic carnage behind us and the uncertain path ahead reveals the need for strong science. It is urgent to strengthen investment in the science force and the tools needed to avoid or recover from disasters. Although there are many sources of potential disagreement between political parties, we feel that a strategic bipartisan goal for 2021 must be to double federal science investment by 2025 and double it again by 2030.

Why Invest in Science?

Why invest in science when there are critical needs for other avenues of economic recovery? In order to have a fighting chance against the terrible social cost of the next disaster, or **permutations of this one**, the U.S. needs to up its game by increasing scientific tools and talent. Recently, several have spoken of the pandemic as a **war**. If we are to win scientific combat, we need the troops and the armaments to prevail.

Millions have died from HIV since the 1980s. Only **six of the hundreds of vaccine candidates** reached safety and efficacy clinical trials, but none have been very effective in long-term studies. Due to dedicated work of scientists and deep stores of accumulated scientific knowledge, scientists just accomplished **10 to 12 years of work** in 10 to 12 months with the COVID-19 vaccines. This was possible because our government invested in creating deep wells of knowledge in virology, immunology, computer sciences, molecular biology, chemistry, gene expression, enzymology, ecosystems, microbiomes, pharmacology, pathology, and other sciences.

New Knowledge Built from Investment in Science

This new knowledge was built through decades of patient federal investment in fundamental science, asking and answering questions often understood by few and linking one discovery to others. Three emerging COVID-19 vaccines after a year and dozens more being tested show dividends from federal science investment saving thousands of lives.

We are grateful to the scientists, grad students, and technicians who have been working day and night to develop COVID-19 vaccines and treatments. Pharmaceutical companies release vaccines, but they are developed by real people leveraging public knowledge. These skills and tools were decades in the making.

Over the last 50 years, voters and the U.S. government have wisely **invested** in creating deep biomedical knowledge about recognizing causes and responses to the spread of disease, new treatments, and medications. Support for science by U.S. citizens and a bipartisan team of congressional champions created the defensive bulwark enabling our nation's hopes for getting past this pandemic.

As of 29 January, 37 vaccine teams of translational and applied scientists had vaccines in phase one clinical trials to determine safe dosage, 24 teams were in phase two tests of treatment effectiveness, and 20 were in large-scale phase three trials to ascertain the safety and effectiveness of treatments after public release. More than 4,500 treatment tests are **underway**.

These experimental vaccines and treatments work in several different ways by many different routes, but all aim for the same preventative goal. Although **COVID-19 variants** may add difficulty, by some time in 2021, we expect valid data and careful analyses to give us all useful treatments against COVID-19, saving thousands of lives.

Few will meet the scientists behind the many COVID-19 projects and clinical trials or the people behind our nation's scientific funding agencies. But evidence that science may be substantially underfunded in agencies like the National Science Foundation is verified by the thousands of imaginative research grant proposals **declined** for lack of funds and the thousands of willing and able Americans **who cannot afford a science education**.

Double the Training, Research Budgets

We call on the new administration and Congress to acknowledge the strategic role of federal investment in the science enterprise by doubling the training and research budgets of science funding agencies over the next five years and doubling them again by the end of the decade.

In this promising new year, warm the winter of fear and despair. Imagine for a few minutes the happiest ending to the COVID-19 agony. You can hardly imagine the scenario without recognizing the unsung scientist heroines and heroes.

Our resolution will bring the prospect of brighter days through building the knowledge and skills needed to save our lives. We call on our political leaders and all who hope for an end to this global pandemic to put redoubling science investment on their 2021 wish list.

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