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Celebrating the 150th Anniversary of the National Academy of Sciences

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On March 3, 2013 the National Academy of Sciences will be 150 years old. Its creation in 1863 represents part of a dramatic series of federal actions that positioned the United States of America for a bright future. In 1862, Congress passed and President Lincoln signed the Morrill Act, creating Land Grant Colleges, providing federal land grants for the use of the new colleges and allowing the land assets to be sold to support higher education. The Morrill Act created many universities, including the University of Illinois and the University of Nebraska, and it supported some preexisting colleges such as Pennsylvania State University and the University of Wisconsin. Private colleges such as the Massachusetts Institute of Technology and briefly, Yale University, also gained support through the Morrill Act. The Act enabled a large increase in the capability of the United States to provide higher education for its population and for scientific and technical research in the coming generations. Also in 1862, Congress authorized the completion of the Transcontinental Railroad. On January 1, 1863, while the United States was mired in its bitter Civil War, President Lincoln issued the Emancipation Proclamation. Soon thereafter, President Lincoln and Congress took another major step to advance the young nation: The creation of the NAS in 1863, a bold and effective measure to elevate American science and to incorporate science into the future capabilities of the United States.*

The NAS was given the charge to provide scientific analysis and advice to the United States government and to help to plan new federal agencies, the capabilities of which would be needed by the government. The NAS was created as a private, nonprofit, independent organization, and was explicitly given a mission to assist the government; it remains so today. It is remarkable that a government would create and respect such an external and independent organization.

The adoption of the Morrill Act and the creation of the NAS were presciently aimed at a future in which science and technology

would be essential to the development of the nation, a future in which higher education would enable this capability while enriching lives for its citizens. The adoption and implementation of these two brilliant concepts in the midst of the Civil War was a strong affirmation that a single nation would emerge after that war, and that this nation would have world-class ambitions.

Today, the NAS continues to respond to its original charge, even as its mission has grown broader, commensurate with a science-based modern society.[†] I summarize the missions of the NAS today. They are to:

- validate scientific excellence,
- enhance the vitality of the scientific enterprise,
- guide public policy with science and
- communicate the nature, values and judgments of science to government and the public.

NAS members participate in each of these missions, and in several of them the contributions of other active and respected experts are also essential. Let me provide a few examples of each of these missions.

The NAS validates scientific excellence in a number of ways, two of which are by electing individuals to NAS membership and by awarding scientific prizes. Election to the NAS is determined by votes of its members. The NAS has complete autonomy in determining its own numbers as well as the criteria for election of members and foreign associates. The election process is taken very seriously by NAS members, and the amount of discussion, documentation and deliberation that goes into each election is very impressive by any standard. While the process is never perfect, NAS membership is highly prized and respected both in the United States and abroad. Criteria continue to evolve and include questions of balance such as the relative weights given to consequential lifetime research achievements compared to individual episodes of remarkable research discovery. Similarly, NAS prizes and awards set examples of creativity, achievement and commitment to high standards—for science, and for society at large. In all of



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these pursuits the NAS seeks to validate scientific excellence in many fields of science, regardless of gender, geography, race or age.

The challenge of enhancing the vitality of the scientific enterprise is a continuing one in every country of the world. Toward this goal, the Academy is proud to publish the *Proceedings of the National Academy of Sciences of the United States of America* (PNAS). PNAS was founded in 1914, largely to provide a communication channel for the contributions of NAS members and for scientific progress of which NAS members had become aware. The journal has evolved to satisfy the requirements of today's scientific world, for example, by providing rapid communication of research results. PNAS publishes peer-reviewed papers in virtually all fields of science and provides access to this information to scientists and interested parties everywhere via the World Wide Web.

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*Events of 1862 and 1863 are described in the Winter 2012 issue of the *Carnegie Reporter* (1).

[†]The mission of the NAS is reviewed in my 2006 annual speech to NAS members: Cicerone RJ, The Mission of NAS: Timeless and Timely, NAS Annual Meeting, April 24, 2006, Washington, DC.



The painting by Albert Herter depicts President Abraham Lincoln and the signing of the Academy charter of March 3, 1863. Left to right: Benjamin Peirce, Alexander Dallas Bache, Joseph Henry, Louis Agassiz, Lincoln, Senator Henry Wilson, Charles H. Davis, and Benjamin Apthorp Gould.

The journal is highly selective; PNAS publishes approximately 20% of all Direct Submissions. Another feature of PNAS is that all final decisions on manuscripts are made by editors who are NAS members and active scientists, in contrast to the practice in many of today's journals that permit editorial staff members to make those decisions.

The NAS attempts to enhance the vitality of the scientific enterprise in other ways as well. For example, NAS convenes the multidisciplinary Kavli Frontiers of Science symposia for young research leaders from around the world, and it addresses contemporary and future issues in human resources for science, issues in K–12 science education, and government funding for scientific research. Importantly, NAS also reports on scientific ethics, data transparency and access to research data.

Most of the contributions of the NAS toward guiding public policy with science are provided through the National Research Council (NRC). The NRC was created by the NAS Council in 1916 at the request of President Woodrow Wilson, who gave permanent status to the NRC through a 1918 Executive Order. Today, the NRC is essentially the operating arm of the NAS, working collaboratively with the National Academy of Engineering (NAE) (created in 1964) and the Institute of Medicine (IOM) (created in 1970). Occasionally, one of the three academies will issue its own reports, for example, the

NAS booklets on the science and teaching of evolution (2–4). Generally however, requests from federal government agencies and departments are acted upon by the NRC. This mechanism engages the united efforts of communities of scientists, engineers and medical experts in a common endeavor and consensus is sought. In many other countries the efforts of these communities are fragmented and sometimes competitive. NRC studies, projects and reports are products of a broad scientific community drawn not only from NAS, NAE and IOM members but also from many other highly qualified volunteers who serve as equals in the process of producing reports.

A key source of the value and credibility of NRC reports is its peer-review process. The NRC process requires the reviewers of NRC reports to ensure that scientific evidence is presented for a report's conclusions and that value-laden opinions are minimized and, if presented, are identified. Requests to the NAS and NRC for studies and analyses are directed to us by individual United States Representatives and Senators, by committees of the House and Senate, by federal govern-

ment departments and agencies, including the White House, and occasionally by state governments and private foundations.

In conducting and reporting its investigations the NAS/NRC strives to be nonpartisan, not just bipartisan. This characteristic, and the fact that committee members and reviewers contribute their services without compensation, maintains and enhances the credibility of the NAS and of NRC projects. The reports achieve societal impact in many ways, for example, by being the subject of Congressional briefings and hearings, by achieving wide distribution through the media, the press and the Web, and by being the focus of public presentations by our committee chairs and members.

The NAS also strives to communicate the nature, values and judgments of science to government and the public through a range of activities. We conduct symposia on individual issues and topics in contemporary science including the topic of effective communications in science. We distribute reports without cost on the Web as well as through sales of printed volumes, and we issue tutorial publications on a range of topics based on previous NRC reports, for example, on energy, infectious diseases, and climate change. Lectures open to the public are presented frequently at the NAS Building, the Keck Center, the Koshland Science Museum in Washington, DC, the Beckman Center in Irvine, CA, as well as at the Jonsson Center in Woods Hole, MA. The NAS Council and officers also issue public statements on important issues of the day, some of which are presented jointly with other academies from around the world.

The mission of the NAS has evolved and grown as science has progressed and as the nation and the world have become ever more dependent on science. The NAS is staunchly independent and widely respected nationally and internationally. It is an increasingly valuable institution, one that is worthy of our contributions of time, expertise and support. I am confident that the NAS will continue to adapt by embodying the qualities needed to meet the challenges of the future.

1 Deutsch A (2012) Lincoln's legacy: land-grant colleges and universities. *Carnegie Reporter* 7(1):2–11.

2 Committee on Science and Creationism, National Academy of Sciences (1984) *Science and Creationism: A View from the National Academy of Sciences* (The National Academies Press, Washington, DC).

3 Steering Committee on Science and Creationism, National Academy of Sciences (1999) *Science and Creationism: A View from the National Academy of Sciences* (The National Academies Press, Washington, DC), 2nd Ed.

4 National Academy of Sciences and Institute of Medicine (2008) *Science, Evolution, and Creationism* (The National Academies Press, Washington, DC).