

Don't ignore the infrastructure

Large-scale research facilities and new technology development have been essential to answering difficult, often intransigent scientific questions that would otherwise be inaccessible. The recent exciting discovery of gravitational waves by the Laser Interferometer Gravitational-Wave Observatory (LIGO) is but one of many startling findings that argue for major investments in large- and mid-scale instrumentation development. But such instruments and facilities are just one type of infrastructure that urgently needs investment. Routine laboratories that underpin most scientific activity are equally critical to progress, but in many cases have long been neglected and are deteriorating. A comprehensive strategy for updating these facilities and other infrastructure elements is essential for accelerating scientific momentum.

The need to repair and upgrade research infrastructure is an issue for every country. As the European Strategy Forum on Research Infrastructure argued in their March 2016 report, future prosperity depends in part on attention to the “life cycle” of scientific infrastructure. In the United States, the situation has been studied in some depth. One recent example is a plan proposed in December 2015 by the U.S. National Science Foundation (NSF) to overhaul its Antarctic Research Station at McMurdo (a cost of \$300 million). This was in response to a blue-ribbon panel convened by NSF that argued that such an investment was essential for maintaining the pace of Antarctic research. The panel also called for support of a fleet of multipurpose icebreakers to ensure polar research at a world-class scale. As for more “routine” facilities, according to the latest version of NSF’s biennial Survey of Science and Engineering Research Facilities, America’s academic institutions invested over \$3.7 billion in fiscal year (FY) 2012–2013 to revitalize science and engineering research labs, but at least another \$8.3 billion is still needed. Using different survey methods, a study

released in October 2015 by the Association of Public and Land Grant Universities concluded that reversing deferred but critical maintenance of U.S. agricultural research laboratories and pilot facilities alone would cost \$3.2 billion. Modernizing research farm facilities would add another \$1.25 billion.

Updating current core research facilities is often seen as less glamorous than funding new major equipment and shareable facilities, but it is equally critical to any strategic plan for future science. This point was made well by the Department of Energy’s FY 2016 Budget

Request to Congress that asked for funds to upgrade facilities at the National Laboratories (as does the FY 2017 request, now wending its way through Congress).

The magnitude of the overall costs to revitalize the country’s research facilities means that no single stakeholder in the scientific enterprise can meet the needs alone. What is required is an organized partnership among research universities; local, state, and federal governments; private foundations; and private industry, all of which have a substantial stake in the future of science. A first step would be for leadership from either a governmental or nongovernmental organization to convene an influential group of

partners and launch a comprehensive assessment of the nation’s current research infrastructure. This should be followed by an action plan that lays out how the various partners will contribute to meet those needs. An inexact but relevant example may be the sequence of efforts set in motion by the U.S. National Academies’ 2007 report *Rising Above the Gathering Storm*.

The magnitude of collaborative effort needed to sustain the infrastructure is indeed daunting, and asking for major investment from the public and private sectors in the current budget climate may seem unrealistic. But allowing research facilities to crumble will inevitably stall the great scientific momentum enjoyed over the past 150 years.

– Alan I. Leshner



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Icebreaker in McMurdo Sound

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