

GAO Highlights

Highlights of [GAO-18-656](#), a report to the Subcommittee on Research and Technology, Committee on Science, Space, and Technology, House of Representatives

Why GAO Did This Study

Scientific and technological innovation contributes to U.S. economic competitiveness and prosperity. Federal agencies support transformational technological advances—those that result in new or significantly enhanced technologies—by, for example, funding research (nearly \$70 billion in obligations in fiscal year 2017).

GAO was asked to examine support for research that could lead to transformational technological advances. This report (1) describes federal agencies' and nonfederal entities' support for such research in selected areas, (2) examines federal agencies' coordination on this research, and (3) describes experts' views on considerations for maintaining U.S. competitiveness through such advances. GAO selected quantum computing and synthetic biology as examples of research areas that could lead to transformational technological advances. GAO reviewed agency documents and interviewed federal officials, subject matter experts, and stakeholders. GAO also worked with the National Academies of Sciences, Engineering, and Medicine to convene a meeting to solicit views from 19 experts selected from government, academia, and industry, among others.

What GAO Recommends

GAO recommends that the agencies leading the interagency quantum computing and synthetic biology groups take steps to fully implement leading collaboration practices. The agencies agreed with GAO's recommendations.

View [GAO-18-656](#). For more information, contact John Neumann at (202) 512-3841 or neumannj@gao.gov.

September 2018

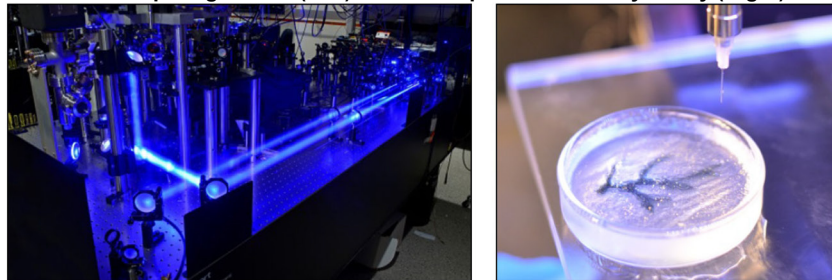
SCIENCE AND TECHNOLOGY

Considerations for Maintaining U.S. Competitiveness in Quantum Computing, Synthetic Biology, and Other Potentially Transformational Research Areas

What GAO Found

Multiple federal and nonfederal entities support research for transformational technological advances in the areas of quantum computing—the manipulation of bits of data using the behavior of individual atoms, molecules, or other quantum systems to potentially outperform supercomputers—and synthetic biology—the combination of biology and engineering to create or modify biological systems. GAO found that at least 6 agencies support quantum computing research; at least 10 agencies support synthetic biology research; and nonfederal entities, such as universities and businesses, support research in both areas.

Quantum Computing Device (Left) and 3D Bioprinted Coronary Artery (Right)



Sources: Massachusetts Institute of Technology Lincoln Laboratory (left) and Adam Feinberg, Carnegie Mellon University (right). | GAO-18-656

Agency officials said they coordinate on quantum computing and synthetic biology through efforts such as conferences and interagency groups, but GAO found that certain new efforts have not fully implemented selected leading collaboration practices. The quantum computing group, co-chaired by officials from 4 agencies, and the synthetic biology group, led by the National Science Foundation, have taken initial steps to implement some leading practices GAO identified that can enhance and sustain interagency collaboration. For example, both groups agreed to coordinate their research, and participating agencies documented agreement with the quantum computing group's purpose through a charter. However, the groups have not fully implemented other practices, such as agreeing on roles and responsibilities and identifying common outcomes, that could help ensure they effectively marshal agencies' efforts to maintain U.S. competitiveness in quantum computing and synthetic biology.

Experts identified considerations for maintaining U.S. competitiveness through transformational technological advances. The considerations broadly address federal and nonfederal entities' roles in supporting such advances and include:

- developing a strategic approach using consortia or other mechanisms to bring together potential partners;
- fostering an environment in which information is shared among researchers while also considering the risks of information sharing;
- focusing on technology development and commercialization, for example, by providing support across multiple stages of technology innovation; and
- strengthening the science and technology workforce through training, recruiting, and retaining talent.