



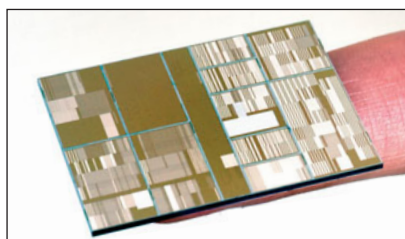
White House calls for nanotechnology-inspired grand challenges

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Understanding and precisely controlling the properties of materials at the nanoscale could lead to innovations that impact nearly every industry. Over the past 15 years, the US National Nanotechnology Initiative (NNI) has fueled significant breakthroughs that have led to nanomaterials for catalysts, batteries, solar cells, electronics, and medical devices.

Now, to take the original NNI goals further, the US White House is requesting ideas for grand challenges that could be solved using nanotechnology. The Office of Science and Technology (OSTP) issued a Request for Information (RFI) seeking suggestions for *Nanotechnology-Inspired Grand Challenges for the Next Decade* on June 17.

The White House defines Grand Challenges as “ambitious but achievable goals that harness nanoscience, nanotechnology, and innovation to solve important national or global problems and have the potential to capture the public’s imagination.” The RFI is a result of the most recent review of the NNI by the President’s Council of Advisors on Science and Technology (PCAST).



One of the nanotechnology-inspired grand challenges suggested by the White House is to create computer chips that are 100 times faster yet consume less power. This picture shows a computer chip with 7-nm transistors that IBM made by using silicon-germanium instead of silicon. The technology could enable up to 20 billion transistors on a fingernail-sized chip. Credit: Darryl Bautista/Feature Photo Service/IBM.

As opposed to the NNI, which fostered basic research in nanotechnology, the focus of the Grand Challenges will be on complex nanosystems and commercialization of federally funded nanotechnology research. “A positive economic outcome would presumably be viewed as part of the success of any program,” said Paul Weiss, Director of the California NanoSystems Institute at the University of California–Los Angeles.

Bringing innovations to fruition in the market requires interdisciplinary teams that can address challenges across various technical and business domains. The NNI laid the groundwork for innovation by bringing together experts in many different areas, Weiss said. “We set ourselves up to know each other’s languages and approaches and used that to our advantage across the field.” It will be exciting to see whether this outcome of the NNI can now drive commercialization through the Grand Challenges framework, he added.

According to the OSTP, effective Grand Challenges should have measurable end points, advance fundamental scientific knowledge, drive the need for collaboration, catalyze the transition of a technology from laboratory to market, and be exciting enough to motivate decision makers.

The RFI mentions six examples of potential challenges that the nanotechnology research and development community could achieve by 2025. These include:

- create computer chips that are 100 times faster yet consume less power;
- manufacture atomically precise materials with 50 times the strength of aluminum at half the weight and the same cost; and
- reduce the cost of turning seawater into drinkable water.

Respondents were asked to submit their proposals by July 16. They could propose a new idea for a grand challenge

or a variation of one of the six examples in the RFI. For each proposal, they had to address some general questions, such as why it is important to invest in the challenge; what potential metrics and milestones could be used to measure intermediate progress; and why the challenge is worth pursuing now.

Marlowe Newman, Communications Director for the National Nanotechnology Coordination Office, says that the responses received are currently under review. The OSTP may select a few ideas to announce this fall, possibly in partnerships with other organizations.

US President Barack Obama first put forward the idea for Grand Challenges in April 2013 as part of his Strategy for American Innovation, calling on companies, universities, foundations, and philanthropists to identify and pursue ambitious goals. At the time, the OSTP had put together formal advisory groups consisting of scientific leaders to identify grand challenges in their respective fields. This led to programs such as the BRAIN Initiative, which aims to revolutionize our understanding of the human mind.

The nanotechnology grand challenge RFI widens the scope of ideas considered. This time, the OSTP is seeking ideas not only from researchers and scientific professionals, but also any interested members of the public. “This isn’t a specific grand challenge,” Weiss said. “I see it as crowdsourcing grand challenges. This has opened up the opportunity for the community and public more generally. So the challenge to the community is to come up with good problems and then move into those areas and do something important. With sustained and supported effort, we should be able to do that.”

Nanotechnologists and materials scientists Weiss knows have had discussions and put groups together in response to the Grand Challenges proposal, he said. “There’s an imperative for people who have ideas and are thinking big about an impact on the world to respond,” he said. “I hope people in the materials research community who’ve been thinking deeply about problems their entire careers respond and give a set of actionable ideas.”

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