Statement of
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Before the
Subcommittee on Research and Education
Committee on Science and Technology
United States House of Representatives

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Mr. Chairman and members of the Subcommittee, I am pleased to have the opportunity to testify before you today. My name is Floyd Kvamme and I am the co-chair of the President's Council of Advisors on Science and Technology (or PCAST), which was designated by Executive Order as the National Nanotechnology Advisory Panel called for by the 21st Century Nanotechnology Research and Development Act of 2003.

PCAST comprises a group from academia, industry, and other entities with experience in leading successful science and technology enterprises. My remarks today are my own, but based on my conversations with fellow PCAST members, I am confident that they feel similarly on the issues under discussion today.

As part of its second review, PCAST is taking a close look at the environmental, health, and safety (EHS) aspects of the National Nanotechnology Initiative (NNI). I co-chair the PCAST subcommittee performing that review, along with Nance Dicciani from Honeywell Corporation, who brings years of experience in the chemical industry and a personal commitment to the importance of responsible development of materials. The Council has received input from a wide range of perspectives, including from a technical advisory group (or TAG) made up of more than 60 leading academic and industry experts from a broad cross-section of disciplines related to nanotechnology, including two of my co-witnesses here today.

Based on PCAST discussions and meetings, input from the TAG, and my own talks with researchers at universities and in small and large companies, the main points I want to make in response to the Subcommittee's questions are:

1. The NNI approach for identifying and addressing research needed to understand and manage the potential risks associated with engineered nanomaterials appears sound and appropriate.

2. Research to understand EHS implications should remain integrated with the broader portfolio of nanotechnology R&D.

It is important to note that the terms "nanotechnology" and "nanomaterial" do not refer to a single material or even class of materials. Rather, the terms refer to a broad spectrum of engineered materials with unique nanoscale-dependent properties. Each individual nanomaterial will have a benefit-to-risk ratio that depends on the material's specific characteristics and intended application.

Federal investment in nanoscale science and engineering research remains money well spent. PCAST's assessments show that the U.S. is a leader in nanotechnology research and innovation. Solar cell technology, improved materials, energy storage, and medicine are just some of the areas sure to reap the benefits—economic and societal—from nano advances. To do so, there also needs to be investment in research for understanding and overcoming—that is, managing or designing out—the potential risks. As someone said in a recent PCAST discussion, we need to be "cautious, not precautious." My own experience at the outset of the semiconductor industry in the 1960s and '70s taught me that EHS risks are part of any new technology. But they are risks that can be addressed.

Already, research is shedding light on some of the questions being asked. Specifically, a study at Purdue on the environmental impact of manufactured nanoparticles on ordinary soil showed no negative effects; Georgia Tech scientists are doing similar work. Researchers at Dayton University are working on the health and safety aspects of the use of nanodiamonds as drug delivery vehicles with encouraging results. University of Oregon chemists are looking at the use of nanomaterials to clean up toxic groundwater contaminants that have until now been difficult to remove. In vivo tests at Rice University have found no immediate adverse health effects from carbon nanotubes injected directly into the bloodstream and that the liver seems to collect these materials effectively for excretion. These and many other studies are increasing the body of knowledge on EHS implications and providing useful information on the responsible use of various nanomaterials. The collection and dissemination of this research is an important essential function of the NNI, as noted in our first report.

Our TAG survey shows broad consensus with respect to the role of the Federal government in supporting nanotechnology-related EHS research. The majority of respondents are eager to see the NNI continue its pro-active approach and expand research support.

The interagency approach is effective. I have reviewed the September 2006 report (EHS Research Needs for Engineered Nanoscale Materials), as well as the more recently released interim document, prioritizing the needs. These documents cast the wide net necessary to address the array of nanotechnology-related EHS issues and are good descriptions of the broad research needs. Thus, I believe the interagency process will lead to a sound research strategy. Some have called for there to be a separate office established to plan and fund EHS research related to nanotechnology. While this might provide a sense of

stronger management, I do not believe that it is the best way to reduce uncertainty about potential risks to health or the environment. As I mentioned earlier, the field of "nano" is broad and the risk-benefit assessment is complex. The best way to address this complexity is by utilizing all of the expertise of the Federal agencies in a coordinated fashion. The National Nanotechnology Coordination Office and the interagency NEHI Working Group appear to be the optimal approach at this time. Creating a separate office would not just add bureaucracy, it would risk losing the collaborative community of experts from agencies like EPA, FDA, NIOSH, NIST, and NIH.

Funding increases for EHS research across the Federal agencies are of the right scale and indicate a steady increase in capacity to conduct the necessary research. Funding increases (from $38M in 2006 to $59M requested in 2008) are encouraging and indicate a steady increase in capacity. In general, increasing funding too rapidly does not lead to equivalent increases in high quality research. It is crucial to note that EHS research also depends on advances in non-EHS areas, such as instrumentation development and basic research on nanomaterials.

Development of nanotechnology in a responsible manner, especially at the early stages, will be expedited by integration of EHS research with broader basic and applied research. The NNI should continue to fund cutting-edge research in all areas, including for EHS. Applications-oriented research may well lead to information about EHS. Rather than setting arbitrary funding levels or percentages of total spending as a guideline for the EHS budget, NNI agencies should focus on addressing the identified EHS research priorities while at the same time investing in world-class applications research. In addition, the NNI agencies should continue their efforts to coordinate the entire portfolio of applications and implications research to leverage and optimize progress in both.

In summary, at this point in our review, I am pleased with the amount of coordination taking place among the agencies through the NNI. Their approach appears to leverage the expertise and related efforts across the government (e.g. work to assess risks of diesel exhaust and other incidental nanomaterials).

I expect the current planning and coordination process will lead to a well thought out plan for nanotechnology EHS research across NNI member agencies. While there is much to be done, the process is not broken. In fact, the coordination process used at the NNCO and the similar process used to manage Networking and Information Technology Research and Development are so effective, they could well be considered models for similar coordination in fields such as K-12 education where spending for hundreds of programs is spread over many agencies without any formal mechanism whereby the spending agencies might be informed of activities in their sister government departments.

The Council is eager to see the final nanotechnology EHS research strategy, and strongly encourages the Nanotechnology Environmental and Health Implications working group (NEHI) to complete its work as expeditiously as possible – hopefully in time for an assessment in our upcoming report.

Biography of E. Floyd Kvamme
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Floyd Kvamme is a Partner at Kleiner Perkins Caufield & Byers, a high technology venture capital firm. He is responsible for the development of high technology companies from early start-up to publicly traded phase. Mr. Kvamme currently serves on the boards of Brio Technology, Gemfire, Harmonic, National Semiconductor, Photon Dynamics, Power Integrations, and Silicon Genesis. Mr. Kvamme was one of five members of the team that began at National Semiconductor in 1967, serving as its General Manager of Semiconductor Operations and building it into a billion-dollar company. He served as President of the National Advanced Systems subsidiary, which designed, manufactured and marketed large computer systems. In 1982 he became Executive Vice President of Sales and Marketing for Apple Computer. While at Apple, his responsibilities included worldwide sales, marketing, distribution and support. He holds two degrees in Engineering; a BS in Electrical Engineering from the University of California at Berkeley and an MSE specializing in Semiconductor Electronics from Syracuse University.