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Ref: 09-F-1349

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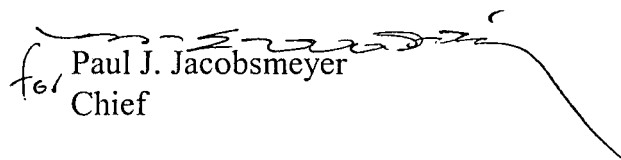
Dear Mr. Aftergood:

This is in response to your Freedom of Information Act (FOIA) request dated July 6, 2009, for a copy of "Science and Technology for National Security, Report No. JSR-08-146." We received your request on July 9, 2009, and assigned it FOIA case number 09-F-1349.

The Office of Director of Defense Research and Engineering (DDRE) has reviewed the requested document and Mr. Alan Shaffer, an Initial Denial Authority for DDRE, has determined that some of the information is exempt from release pursuant to U.S.C. § 552(b)(5), which pertains to information which is both predecisional and deliberative. The report in question contains subjective evaluations, opinions and recommendations which are currently being evaluated as to their impact on the planning and decision-making process.

If you are not satisfied with this action, you may appeal to the appellate authority, the Director of Administration and Management, Office of the Secretary of Defense. To submit your appeal, you should write directly to the Defense Freedom of Information Policy Office, ATTN: Mr. James Hogan, 1155 Defense Pentagon, Washington, D.C. 20101-1155. Your appeal should be postmarked within 60 calendar days of the date of this letter, should cite to case number 09-F-1349, and should be clearly marked "Freedom of Information Act Appeal"

Sincerely,


for Paul J. Jacobsmeyer
Chief

Enclosure:
As stated

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S&T for National Security

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May 2009

JSR-08-146

Distribution authorized to DOD only; Specific Authority; May 9, 2009.
Other requests for this document shall be referred to Department of Defense.

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Abstract

This study focuses on how best to structure basic research (BA1 or 6.1) within the DoD. The changing national and global context for basic research is reviewed and the rationale for basic research within the DoD is discussed. The present organizational and funding status of DoD research is also reviewed with particular emphasis on the role of DDR&E and observations about the program, personnel, and organization are offered. Recommendations are made aiming at bringing greater visibility and coherence to the BA1/6.1 program, improving the quality and connectivity of the DoD Lab and academic communities, and developing a high-quality S&T workforce.

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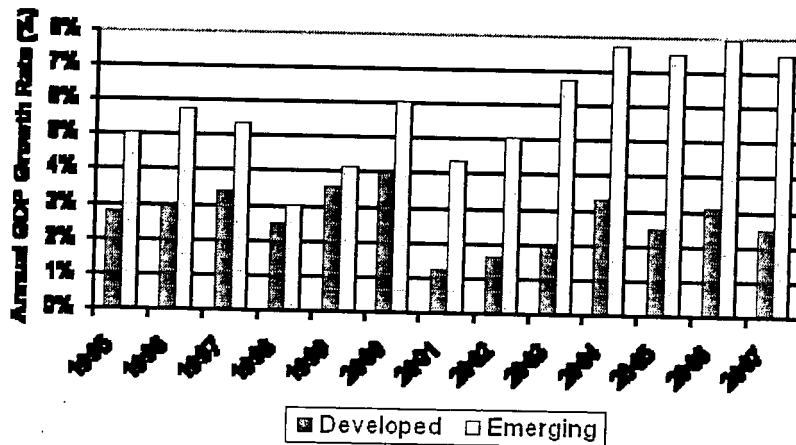
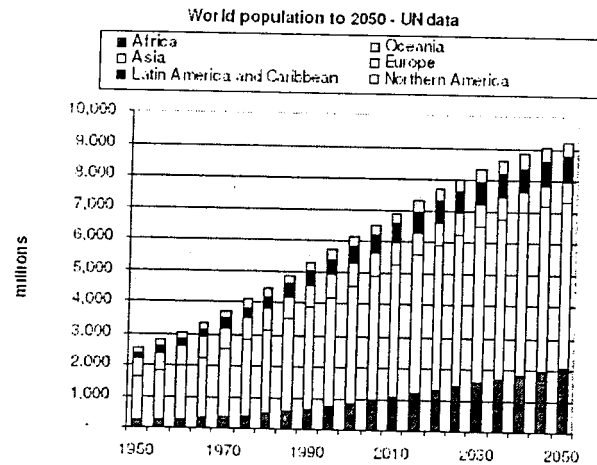
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2 CONTEXT FOR DOD BASIC RESEARCH

The topic of this report has been treated by others previously, so that there may be little expectation of our saying anything new. However, there are circumstances both inside and outside the DoD that distinguish the present time from the past, and now suggest the need for significant modifications in DoD S&T activities.

2.1 The Changing Geopolitical Scene

As shown in the two graphs below, we are roughly mid-way through an almost-quadrupling of the global population within a century. And barring catastrophe, the next few decades will see a significant economic rise of 1/3 of humanity. With the globalization of economic activity, this evolution will necessarily diminish the fractional US economic, and perhaps political, influence; it is untenable that 5% of the World's population will continue to account for 25% of its consumption and economic activity. The ever increasing competition for resources might lead to conflicts in regions where none are envisaged today.

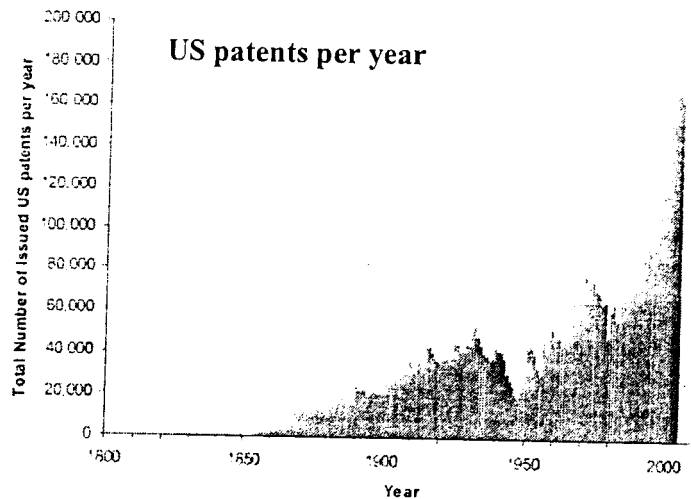


2.2 The Changing National Security Mission

It is trite, but nevertheless true, that the past two decades have seen significant changes in the world: the shift from a bipolar to a multipolar scene, the proliferation of WMD capability, the rise of terrorism, and many situations in which soft power seems more appropriate than hard (although not always more effective). The US armed forces seem to function more often as police and peacekeepers in a coalition of many, rather than as warfighters. And new aspects of national security have emerged (e.g., energy security, climate change).

2.3 The Accelerating Advance of Technology

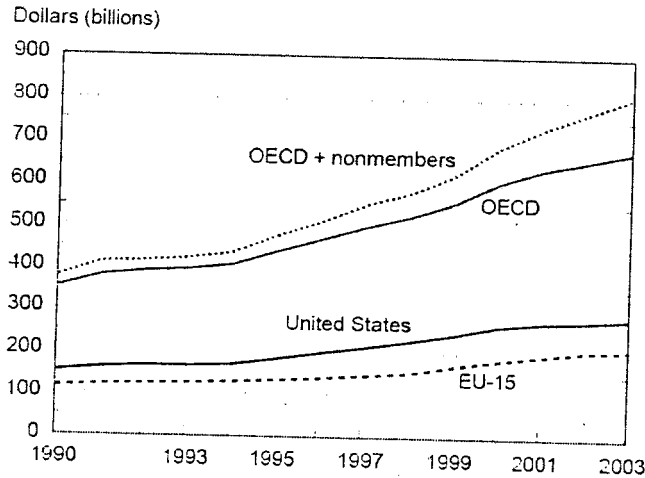
The following graph showing the number of US patents issued each year suggests that technology is not only advancing, but it is accelerating. It is important to keep in mind that most patents do not represent basic research, but are applications that are built on results from basic research.



The forefronts of technology are also changing: Information Technology (the ability to acquire, transmit, process, and store data) has come of age, while the Biosciences and Materials Science are advancing rapidly. Micro- and nanotechnology may yet well harbor basic-science surprises, and informed observers of neuroscience believe that remarkable developments will occur in that field during the next few decades.

2.4 The Globalization of Technology

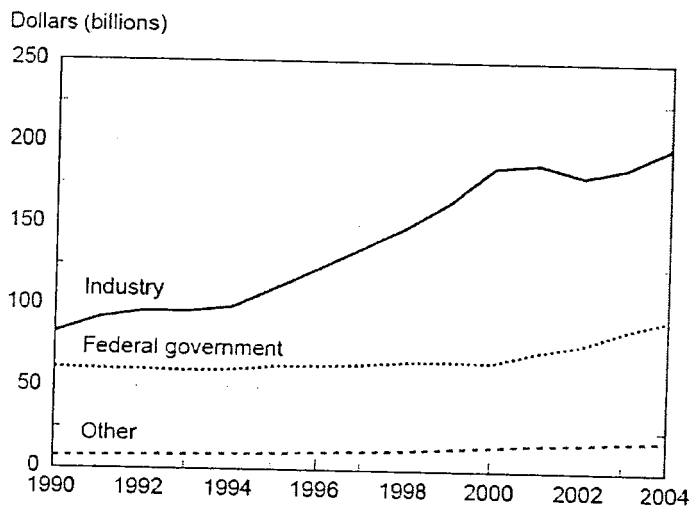
The investment in science and technology and the fraction and quality of engineering development work done abroad is increasing, as suggested by the trends in R&D expenditures are shown below (OECD is the Organization for Economic Development and Cooperation, comprising the countries commonly taken to be the Developed World). Areas in which the US had no competition a decade ago are no longer US-based monopolies.³



2.5 The Rise and Spread of Commercial Technology

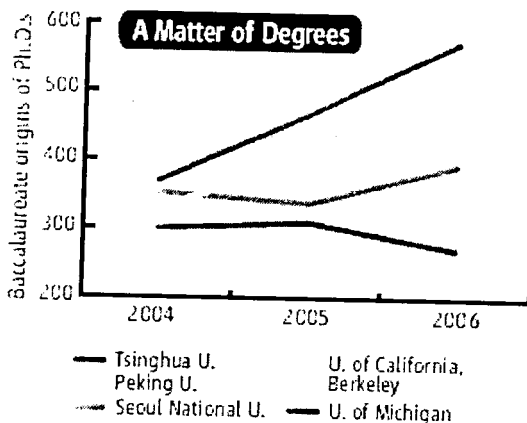
Classified technology is a decreasing fraction of the whole. In the past DoD-supported R&D led to the creation of many new technologies (e.g., supercomputing). But DoD R&D activities (which are the great majority of Federal expenditures) are now so small relative to the whole (see chart below) that in general the Department is much more reactive to, and adoptive of, commercial developments, rather than proactive in seeding and developing them.

³ In this respect, the recent implementation of the ITAR/EAR environment has arguably hurt the US, with foreign nations forced to develop parallel capabilities they could no longer acquire from the US. Synthetic Aperture Radar (SAR) and large light-weight antennas in space provide interesting examples. Coupled with an increasingly ponderous government contracting and program management, the present environment has led to a decreased space-launch cadence to a perilous level, for example, creating a possibly subcritical US capability in an area vital to national security.



2.6 The Changing Technology Talent Pool

The decline of S&T interest among Developed World youth is well-documented and much discussed. There are larger numbers of interested students in the Developing World, but even there one sees incipient signs of fall-off. The chart below (from Science magazine, July 11, 2008, vol. 321, pg. 185) shows that Peking and Tsinghua Universities have now overtaken Berkeley and Michigan as the largest undergraduate alma maters of PhD recipients in the US.



These trends are gradual and secular, with few milestones to mark their advance. Consequently, they can be dismissed or ignored as only one version of a highly uncertain future. But they are sufficiently broad and real that they must be taken seriously, for they imply profound changes in US National Security posture, missions, and technology needs.

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It is not within our scope to consider the entire National Security response to these drivers; we can only hope that other groups are doing so. However, we consider this factual landscape as essential context for our considerations of DoD basic research.⁴

⁴ A further perspective on changes since the Golden Age of DoD Basic Research some 60 year ago can be found in Appendix I.

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