A Critique of

"The Science and Engineering Workforce-Realizing America's Potential"

by the National Science Board
National Science Foundation
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PREFACE:

The National Science Foundation and its National Science Board (a Board of Directors) is a U. S. Government sponsored and supported organization charged with assuring that the US has an adequate Science and Engineering Workforce. The Board is comprised of three groups of 8 directors having successive six year terms spaced two years. The 2004 group has 6 College or University Professors or Presidents, one Chief Technology Officer and one retired General Manager of Technology Partnerships. The 2006 group has 7 College or University Professors or Presidents and one Senior Scientist and Head of Climate Change & Research Section, National Center for Atmospheric Research. Of the 2008 group, 7 are College or University Professors or Presidents and one is an Educational Science Consultant. In summary. The policy making board of the National Science Foundation is heavily dominated by educators whose fundamental interest is in producing more educational output without concern for its need. The National Science Foundation administration implements the policies of the National Science Board. The government's interest is in producing more than enough Scientists and Engineers in order to keep program costs down. The National Science Foundation implements government policy. Statements of current or impending shortages by those with conflicts of interest should be rejected.

The NSB Executive Summary

NSB: Science and technology have been and will continue to be engines of US economic growth and national security. Excellence in discovery and innovation in science and engineering (S&E) derive from an ample and well-educated workforce - skilled practitioners with two-and four-year degrees and beyond, researchers and educators with advanced degrees, and pre college teachers of mathematics and science. The future strength of the US S&E workforce is imperiled by two long-term trends:

AEA: The NSB is asserting that it has a right and a capability to engage in long term forecasting Such a capability is seriously questioned by an April 8 1992 House of Representatives Subcommittee on Science, Space and Technology hearing investigating an NSF "Shortfall" paper promoted by the previous NSF Director Erich Bloch where the paper was characterized as false and seriously flawed.

> "*NSF Gets Raked Over The Coals On Engineer 'Shortfall' Study*"
> By Decland Conroy, Monday, April 13, 1992, NEW TECHNOLOGY WEEK
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> "*Unfortunately, NSF's former director Erich Bloch used the figures repeatedly in speeches for levering more federal money for education--and for the foundation. The studies themselves were titled "Future Scarcities of Scientists and*

Engineers; Problems and Solutions."

"*Scientist Shortfall a Myth-NSF Study Seriously Flawed, Panel is Told*" by Boyce Rensberger, April 9, 1992, WASHINGTON POST

"The familiar claim that the United States faces a major shortage of scientists and engineers--often cited by National Science Foundation officials when seeking budget increases--is false and was based on a seriously flawed NSF study, seven scientists, engineers and government officials told a congressional subcommittee yesterday.

AEA: Considering the past history of the forecasting credibility of NSF, no consideration should be given to any statement of impending inadequacy of supply of S&E's.

NSB: Global competition for S&E talent is intensifying, such that the United States may not be able to rely on the international S&E labor market to fill unmet skill needs;

AEA: There is no good evidence that there is a high level of international competition in the international S&E labor market. The best indicator of the excess supply is the wage rates in India, China, Vietnam, Poland, Russia and other eastern European countries to see where there is substantial excess S&E talent. Even in the US, where normal BLS unemployment rates for S&E's are 1.7-1.8%, they have been averaging over 5% for several years. The displacement however is 3.2 times as great with the US now having S&E displacement at the 15% level. The US should not tap the international S&E labor market until the US displaced are absorbed. The S&E workforce problem is not one of inadequate supply but one of inadequate demand.

NSB: The number of native-born S&E graduates entering the workforce is likely to decline unless the Nation intervenes to improve success in educating S&E students from all demographic groups, especially those that have been underrepresented in S&E careers.

AEA: The number of S&E graduates entering the workforce has already been declining due to the intervention of the Nation through acts of Congress in creating excess supplies through work visas thereby depressing demand for native-born S&E graduates. The NSB fails to treat the massive effects of work visas for foreigners on demand for all native-born S&E graduates. The effects are especially severe for the affected minorities such as females, blacks and Hispanics. Foreign contracting organizations frequently employ all H-1B or L-1 Visa holders and discriminate against all native born S&E's violating US anti discrimination law with impunity. The NSB is derelict in not having influenced government policy that ended up displacing US workers with foreign workers that specially impacted minorities. .More than anything, the NSB is derelict in ignoring the influence of demand as the driving force in making S&E career preparation choices.

NSB: The National Science Board has examined these issues and finds that national-level action is needed to ensure our country's capacity in S&E in an increasingly competitive and changing global labor market. The Federal Government has primary responsibility to lead the Nation in a coordinated response to meet our long-term needs for science and engineering skills in the US workforce

AEA: NSB has no credibility in trend forecasting and tragically does not know that it is not credible The fear that foreign S&E talent would become unavailable has evaporated with the increase in off-shoring. As the NSB report was being disseminated, the trend to outsourcing everything was becoming evident, adding to the importing of talent. The NSB has characterized the important problem as one of an impending difficulty in finding sufficient S&E talent when the real problem is one of sufficient opportunities for large excess

supplies of US talent. The absurdity of their concern about the adequacy of supply is obvious when observing their complete ignoring of demand on the most important element for motivating students to study science and engineering, that is, potential for careers. Below is a verified report (as of Feb. 6, 2004) by Lou Dobbs of CNN of US companies that are outsourcing jobs. He has been building the list for the last few months and adds 3 or 4 new names a day. One area of India now claims to have 400,000 IT jobs compared to 300,00 in Silicon Valley.

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3Com,3M,Accenture,Adaptec,Adobe Systems,Advanced Energy Industries,AMD,Aetna
A.G. Edwards,Agere Systems, Agilent Tech, AIG, Alamo Rent A Car, Albertson's, Alliance Semiconductor,
Allstate, Alpha Thought Global, Amazon.com,
American Express, American Management Systems, American Standard, Amphenol Corp.
Analog Devices, Andrew Corp., AOL, Applied Materials, A.T. Cross Company, AT&T
AT&T Wireless, A.T. Kearney, Avanade, Avery Dennison
Bank of America, Bank of New York, Bank One, BearingPoint, Bear Stearns, Bechtel
BellSouth, Best Buy, Black & Decker, BMC Software, Boeing, Brocade, Bumble Bee
Cadence Design Systems, Capital One, Carrier, Cendant, Cerner Corporation,
Charles Schwab, ChevronTexaco, Ciena, Cigna, Circuit City, Inc., Cisco Systems, Citigroup, Coca-Cola,
Comcast Holdings, Computer Associates,
Computer Sciences Corporation, Continental Airlines, Convergys, Cooper Tire & Rubber
Cooper Tools, COVAD Comm., CSX, Cummins
Dell Computer, Delta Air Lines, Direct TV, Discover, Document Sciences Corp.,
Dow Chemical, DuPont,
Earthlink, Eastman Kodak, Eaton Corporation, EDS, Electroglas, Electronics for Imaging
Eli Lilly, EMC, Emerson Electric, En Pointe Technologies, Equifax, Ernst & Young
Evolving Systems, Expedia, ExxonMobil
Fair Isaac, Fedders Corporation, Fidelity Investments, First American Title Ins., First Data
Fluor, Ford Motor, Franklin Mint
Gateway, GE Capital, General Electric, GlobespanVirata, Goldman Sachs, Goodrich, Google, Greenpoint
Mortgage, Guardian Life Insurance
The Hartford Financial Services Group, HealthAxis, Hewitt Associates, Hewlett-Packard
The Holmes Group, HSN, Humana
IBM, IndyMac Bankcorp, Infogain, Innodata Isogen, Intel, Intl. Paper, Intuit
ITT Educational Services
Jabil Circuit, Jacobs Engineering, Jacuzzi, JDS Uniphase, Johnson Controls,
Johnson & Johnson, JPMorgan Chase, Juniper Networks
KANA Software, Kaiser Permanente, Keane, KeyCorp, KLA-Tencor, Kwikset
Lawson Software, Lehman Brothers, Levi Strauss, Lexmark International, Lifescan
Lillian Vernon, Linksys, Lionbridge Technologies, Lockheed Martin, Lowe's, Lucent
Maritz, Marshall Fields, Mattel, Maytag, McDATA Corporation, Medtronic, Mellon Bank
Merrill Corporation, Merrill Lynch, Metasolv, MetLife, Microsoft, Monsanto,
Morgan Stanley, Motorola
Nabco, National City Corporation, National Life, National Semiconductor,
NCR Corporation, NETGEAR, Network Associates, Newell Rubbermaid
New York Life Insurance Co., Northwest Airlines
Office Depot, Ohio Art, ON Semiconductor, Oracle, OshKosh B'Gosh, Otis Elevator Co.
Owens Corning
palmOne, Parker-Hannifin, Parsons E&C, Pearson Digital Learning,
Pericom Semiconductor, Perot Systems, Pfizer, Pitney Bowes, Planar Systems,
Portal Software, Pratt & Whitney, Primus Telecom, Procter & Gamble,
Providian Financial, Prudential Insurance
Qwest Comm.

Rainbow Technologies, Radio Shack, Raytheon Aircraft, Regence Group, Rohm & Haas
RR Donnelley & Sons, Russell Corporation
SAIC, Sanmina-SCI, SBC Comm, SEI Investments, Siebel Systems, Sikorsky,
SMC Networks, Solectron, Sovereign Bancorp, Sprint, Sprint PCS, Starkist Seafood
State Farm Insurance, State Street, StorageTek, SunTrust Banks, Supra Telecom, SurePrep, The Sutherland Group, Sykes Enterprises, ynygy
Target, Tecumseh, Telcordia, TeleTech, Tellabs, Texas Inst.,
Thrivent Financial for Lutherans, Time Warner, Toys "R" Us, Triquint Semiconductor
TRW Automotive, Tyco Electronics, Tyco Intl,
Union Pacific Railroad, Unisys, United Online, United Tech.
VA Software, Veritas, Verizon, VF Corporation
Wachovia Bank, Washington Group Intl., Washington Mutual, WellChoice, Werner Co.
West Corporation, Weyerhaeuser, Whirlpool, Wolverine World Wide, Wyeth
Yahoo!

AEA: The above 250 companies expanding at the rate of 3 or 4 a day represent a major collapsing of demand for S&E talent in the US that has not been considered by NSB.

Critique of NSB Chapter One

Introduction: The Challenge for US Science and Engineering

NSB: Serious problems lie ahead that may threaten our long-term prosperity and national security. These include: Flat or reduced domestic student interest in critical areas, such as engineering and the physical, and mathematical sciences, as shown by data for bachelors degrees;

AEA: Those S&E specialties indicated are essentially flat, but Compute Science shows healthy growth in the face of significant competition from an influx of H-1B's and L-1's
Ten years of increasing S&E temporary immigration has corrupted the demand so as to discourage domestic workers from completing their S&E education.

NSB: Large increases in retirements from the S&E workforce projected over the next two decades

AEA: The S&E workforce bulge like other population bulges will never make it to the retirement stage. They will be eliminated by downsizing or early retirement and we will end up with the normal 1 ½ to 2% retiring at 65.

NSB: Projected rapid growth in S&E occupations over the next decade, at three times the rate of all occupations

AEA: The growth projections are pipe dreams based on trend projections from data based on the 1990's dot com kind of trends. There is no post 2000 reality cranked into their analysis.

NSB: Anticipated growth in the need for American citizens with S&E skills in jobs related to national security, following September 11, 2001

AEA: There is no apparent binge in spending on homeland security at the federal level.

NSB: Severe pressure on State and local budgets for education of the future S&E workforce.

AEA: While State and local budgets are tight, employment oriented programs are generally funded. On the other hand Programs such as Computer Science that until recently had class sizes of 85 now have class sizes of 15, cancellations and freeing of funds for other programs. They have rapidly adjusted to monumental excess supply.

Chapter Two

The Global and Domestic Contexts: Global Competition for the Science and Engineering Workforce

NSB: Governments throughout the world recognize that a high-skill S&E workforce is essential for economic strength. Countries beyond the United States have been taking action to increase the capacity of their higher education systems, attract foreign students and workers, and raise the attractiveness to their own citizenry of staying home or returning from abroad to serve growing national economies and research enterprises..

AEA: They then go into an extended treatment of the societies and educational systems that are expanding to produce large numbers of S&E's significantly exceeding the rates produced in the US. It is understandable that they can do so when they get their act together and have the population bases that have not been exploited. The question that the report does not answer is whether or not there will be need for the rapidly expanding supply of international talent. The fact that other societies are using more of their S&E's has little effect upon the adequacy of supply in the United States. Their own data shows underutilized US populations of females, Blacks, Hispanics and American Indians.There are large numbers of female underrepresented S&E candidates (51,607). There are another 35,000 of underrepresented minorities that are not obtaining S&E degrees. If the effort were placed on females as has been done at MIT where almost half of the classes are female, that resource would not be wasted. Additionally, recent years have seen retrenchment in domestic S&E employment ending in the displacement of hundreds of thousands.

Chapter Three

Findings and Recommendations

NSB: The National Science Board's findings and recommendations focus on national workforce policies in five areas:

* Undergraduate education in science and engineering;
* Advanced education in science and engineering;
* Knowledge base on the science and engineering workforce;
* Pre-college teaching workforce for mathematics, science and technology; and
* US engagement in the international science and engineering workforce.

AEA: The extensive review of what the FEDERAL Government must do to cure the ills of the educational system that is somehow under-funded by those currently responsible. Everywhere the treatment is based upon the Nation's NEEDS that are never quantified.
If one were to accept the needs as real then one would expect action to have been taken to hold down tuition inflation by subsidies or some other means but such is not the case with private college tuition almost doubling in a decade. It is well known that past NSF actions to promote PHd expansion led to a long term glut and a shift to temporary rather than tenure track positions.

Conclusions

NSB: The Federal Government must enact policies and programs that include:

A broad-ranging effort at all levels of education to attract, develop, and retain in the S&E workforce American-born scientists and engineers drawn aggressively from all demographic groups, and

National efforts to enrich the US workforce capabilities through opportunities for US students and professionals to participate in international science and engineering and through continued contributions by the best S&E students and professionals from other countries.

AEA: It has certainly been shown that inadequate attention has been paid to attracting, developing and retaining all levels of the American-born S&E workforce and that must be changed. Past policies have tended to discriminate against the American-born in many cases. In the study, no case has been made for enrichment opportunities for the US students participation in international science and engineering. The promotion of continued contributions by the best S&E students and professionals from other countries should be stricken from the conclusions as a policy recommendation that would continue the most devastating destruction of opportunities for American-born S&E advanced degree student

AEA: Considering the damage the NSF and the Federal Government has done to the S&E labor market in the past, the best recommendation to be made is that both should stop manipulating the market, the NSF by stopping preferential grants and the Federal Government by stopping preferential work visa and immigration categories and let the free market work.