How to Nurture Creativity and Progress in the Social Sciences:

Comment on the National Science Board s Draft Report

by

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Scientific progress in the physical sciences depends upon new and relevant data. And upon shortening each step in the cycle of acquiring and analyzing data, communicating the results, and the creative process to ask new questions and secure funds for the next research cycle. The same truths apply for progress in the social, behavioral, and economic sciences where the National Science Board holds a mandate for basic research and to inform policy makers and democratic decision making.

These comments respond to the draft Report on Science and Engineering Infrastructure for the 21st Century circulated for public comment by the National Science Board on December 4, 2002. They provide a brief description of five infrastructure investments for new data and more rapid research cycles to nurture creativity and accelerate progress in the social, behavioral, and economic sciences. These new capabilities can begin in the mid-size

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infrastructure category (costing between millions and tens of millions of dollars) that the draft Report (p. 7) rightly notes has been overlooked and recommends for increased funding. Before turning to these projects, let me make three observations about the current draft.

I. Three Observations

A.) Concerning surveys and input from the scientific community. The draft Report is inaccurate and misinformed (concerning the social, behavioral, and economic sciences - SBE) when it claims (p. 29) that there are many discipline-specific surveys, studies and reports that do this [i.e., provide a detailed examination of the opportunities and needs for each scientific discipline and field] quite well. I am unaware of any surveys, studies, and reports that do this for the SBE disciplines. I also think it is inaccurate and misleading to imply that the SBE disciplinary societies and/or their leading and most creative researchers have even been invited to provide input for this draft Report.

B.) Concerning input from policy makers and other user communities. The consultation with key user communities also appears to have been inadequate. The draft Report says that the Task Force on S & E Infrastructure consulted with other Federal agencies about the most promising future opportunities (p. 6). However I doubt that the user community

of policy makers for the social, behavioral, and economic sciences was consulted effectively. For example, the Secretary of HHS recently asked the Institute of Medicine to outline a research strategy to help his agency, and the American people, to understand and solve the problem of inadequate access and delivery of high quality medical care: Their Report, Fostering Rapid Advances in Health Care: Learning from System Demonstrations (November, 2002) is a simple illustration of the bold investment in new infrastructure that our most capable social scientists are likely to recommend, in any of the many areas of government responsibility, if they are asked.[2]

C.) Concerning a direct analysis of needs and opportunities. SBE disciplines are a small fraction of the NSF budget but their inhibited creativity and constrained progress can be disproportionately costly to American society and to our international goals. There are urgent national needs to monitor, understand, forecast, and make wise choices in a changing and uncertain human world. Yet the draft Report s recommended allocation of $18.9 billion for Future Needs and Opportunities across the next decade (Table 7, page 27) with only 2.6% of the total for SBE (v. 97.4% for the physical sciences) continues past imbalances that have contributed to emerging intellectual gaps in facing a changing world. Considering the extraordinary resources already spent for infrastructures in the physical

[2] Janet M. Corrigan, Ann Greiner, Shari M. Erickson (Ed.), Fostering Rapid Advances In Health Care: Learning From System Demonstrations. (Washington, DC: National Academies Press, 2002). Online at www.nas.edu

sciences, and the urgent national needs, might it not be time to shift the balance between the physical and human sciences in the other direction? Setting aside biotechnology and genome mapping, can the Task Force explain why, across the next decade, reversing the percentages might not be the wiser investment for human welfare?

An analysis of the gap between national needs and anticipated scientific performance is vital to wise planning. If NSF spent thirty years trying to send a probe to Mars and kept missing by hundreds of millions of miles - because of bad data and poor models - I think the NSB s planning would include a responsible assessment of new basic investments to improve this field of science. Especially if the errors of the Mars probes were getting worse.

Three examples of the gap between national needs and anticipated SBE scientific performance can illustrate this point:

1.) Economic performance of the US economy. The recent recession has been damaging businesses, individual lives, and investments (including retirement assets) throughout the country, with devastating effects in the communications and computer industry. Corporate R&D expenditures have fallen; many states face deficits in the billions of dollars and have cut funds to their universities. Yet the recession was not accurately predicted by current economic models and measures

and it was made worse by incomplete and bad data that caused mistimed policies. The Congressional Budget Office, the leading professional association of business economists, and Alan Greenspan, Chairman of the Federal Reserve system, have raised alarms about the diminishing power of last-generation models and measures.[3] Surely the most elementary cost-benefit analysis, even focused solely on the interests of scientists and the scientific community, should lead the NSB to give one of its highest priorities to investments to restore traction to macroeconomics.[4]

Strategies to improve infrastructure and permit a wider range of researchers to prototype, acquire, and analyze new data are a basic step. Scientific economics does not operate by direct, real-world observation by individual researchers - a process of keen observation and shrewd generalization in the phrase used by the economist Robert Solow. Rather economists, as he notes, are modelers using quantitative data from existing government datasets.[5] Progress to understand and develop policy

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[3] For references and further discussion: Lloyd S. Etheredge, A Breakdown Crafted by Silences: Scientific Mismanagement and National Policy Error. Unpublished paper for NSF's Inspector General, September 2002. Online at www.policyscience.net. The NSF-supervised advisory system has worked poorly and, for example, excludes measures and needed statistical controls of several important policy relevant variables.

[4] The shift of federal revenues (from surplus to deficit) across the next decade exceeds, by at least an order of magnitude, the total budget that is being requested for new infrastructure across all of the sciences.

[5] Robert M. Solow, How Did Economics Get That Way and What Way Did It Get? Daedalus, 126:1 (Winter, 1977), pp. 39-58, p. 56.

for a changing economy will continue to be inhibited until NSF creates mechanisms for creative researchers to think outside older models and obtain new national data.

2.) Economic growth of UDCs. For forty years, and with more than $1 trillion, governments underwrote theories about economic development created by economists (with substantial NSF funding) but without a notable improvement in human lives. This may have been the greatest failure of science-based learning in history - which has burdened the lives of billions of people and damaged the global security environment for Americans as we enter the 21st century. In recent memory, tear gas filled the streets of Washington within several miles of the offices of the National Science Board, in protests at the burden of debt without an ability to repay. Where are the lessons from these decades of failure for NSF's next decade? The silence of the draft Report raises concern that the SBE Directorate is implicitly proposing a national policy to ignore forty years of intellectual failure and abandon the billions of people in the Third World. Surely the reverse strategy is the right political, moral, and scientific answer: the Report should include a plan for new investments in international observation sites, new data, and a multidisciplinary strategy to improve our understanding of economic development.[6]

[6] William Easterly, The Elusive Quest for Growth: Economists' Adventures and Misadventures in the Tropics (Cambridge, MA: MIT Press, 2001).

3.) Adverse trends in America s global security. Post 9/11, America has just undertaken the largest domestic reorganization of the federal government in history for Homeland Security. The events made dramatically clear that the idea of national security is outmoded and will become less viable with the growth of the weapons of the 21st century. The fate of the rest of mankind (including progress in economic development, human rights, changes in global culture, and other forces) affects us. Nor are the problems limited to several prominent personalities like Osama bin Laden or Saddam Hussein of Iraq or the current ruler of North Korea. There is unsettling evidence (published the day after this draft Report was completed) that, even if America is blameless, there are social, economic, and political forces that are shifting international public opinion against us.[7]

Is there a crisis? No. But the draft Report also should recognize the potential value of farsighted and prudent scientific investments in planning for the next decade. We have vivid early warnings, and the lead time to bring our most capable minds to an engagement with these trends. We should get underway. The best use of our scientific brainpower will require new data and new international sites and

[7] Adam Clymer, World Survey Says Negative Views of U.S. are Rising, The New York Times, December 5, 2002, p. A 11.

partnerships.[8]

II. Five Investments to Accelerate Progress

Below are five projects that will create shared multidisciplinary capabilities to acquire new data, improve creativity and scientific progress, and strengthen the productivity of current academic manpower in the social, behavioral, and economic sciences. They are A.) Partnership Centers for cross-cultural research; B.) Evidence-Based Policy Centers for domestic creativity and progress; C.) Centers for Content Analysis and International Studies; D.) Matching grants for national data; E.) Mini-grants for infrastructure and Internet services to begin online colloquia in each high priority field.

A.) Partnership Centers for Cross-Cultural Research

Serious and reflective social scientists have been concerned for several decades that NSF-funded research with American subjects is a limited and potentially biased foundation for social science. (This may be especially true of fields like social psychology, which are based almost exclusively on experiments conducted with convenient subjects - i.e., Ameri-

[8] We do not know if our best scientists will disagree with the data and ideas that will be presented to policy makers by the CIA and intelligence community but it is prudent to have their independent observation and thinking via NSF. And, in a democracy, it also is critical to have strong programs of university-based research, expertise (e.g., trained observers who actually have direct international experience and evidence) and open publications that can engage wider discussion and lay the groundwork for long-term policies, built with public support.

can college undergraduates who are required to participate as part of their enrollment in introductory psychology courses.)[9]

However, right now, organizing basic multi-cultural/international comparisons is almost impossibly difficult for individual researchers.

A simple solution to the problem that would enrich almost any research design is to invest in NSF Partnership Centers for Social Research in a selected group of foreign countries. These Centers would have open (call) contracts to provide research services at pre-negotiated prices. A simple checkbox for cross-cultural replications could be a standard feature of NSF grant applications. The basic step for cross-cultural data would be as simple as a physician ordering laboratory tests. The Principal Investigator's grant would, if approved, automatically receive additional funding for replication by these international contractors; the Principal Investigator also would receive funds for international travel to supervise the work.

For rapid scientific progress, the options should assure maximum discrepancy - e.g., cultures and sub-populations with the greatest distance from standard American subjects.

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[9] E.g., Kenneth Gergen, Social Psychology as History, Journal of Personality and Social Psychology, 26, 1973, pp. 309-320.

NSF Partnership Centers might be established in India; in the former Soviet Union; in Africa; in the Arab Middle East; in China. Given the low research costs (e.g., for survey research; or for paid adult subjects) in many underdeveloped and mid-tier foreign countries, and favorable exchange rates, a great deal might be learned at small cost.[10] (It may surprise the National Science Board to learn that it is almost impossible to read any American psychology or economics or voting behavior textbook and learn if leading theories are universally valid - i.e., if peoples in the Arab Middle East, or China, or India, essentially think, or feel, behave economically, or vote in any way that is much different from Americans.[11] They may - or may not. It would be a wise investment to make it easy to acquire relevant data and learn the answer.

B.) Evidence-Based Policy Centers for Domestic Progress

NSF is entrusted with the responsibility for rapid scientific progress to inform public policy but the practical results have become disappointing in recent decades. An investment in a new network of Evidence-Based Policy Centers can solve this problem.

The new Evidence-Based Policy Centers will be established by competitive, five-year,

[10] For securing adult subjects from advanced English-speaking countries the current exchange rates with New Zealand, Australia, and Canada provide an almost 2:1 multiple for NSF funds.

[11] In the long run, the greatest threats to American national security are likely to arise from countries with the greatest cultural distance.

grants like other NSF Centers. The Centers will receive research questions from policy makers at all levels, including state and local officials; from civic groups; and from individual citizens (including scientists from all fields, in their capacity as citizens.) Advisory committees will rank the questions and the Centers will develop the research designs and begin to answer them.

The rankings will be published on the Internet. The criteria to rank the questions will be established by the National Science Board. For example:

1.) the commonality of the question;

2.) the potential benefits of knowing the answer;

3.) the existence of unexplained variations, new ideas, or theoretical disputes suggesting that research can be productive;

4.) the availability of existing research that can be drawn upon;

5.) The cost to answer the question that makes it prohibitive for civic groups or local and state governments to undertake the research themselves.

Any researchable & worthwhile question can be submitted: benchmarking and explaining best practices; reviews of published literature; or requiring original data. To assure civic benefits, each question-poser should have a plan to use the answer.

- With this new research infrastructure each Congressional Committee and the American people will receive, each year, quantitative measures of national progress in the social sciences and the civic benefits. They will know the number of questions submitted; how many have been answered in the past year; how many await funding; the link between new appropriations and further progress. De facto the Centers will be mechanisms to organize user communities and political support for social science, and Congress will know the constituencies being served. They also will help the entire scientific community, acting as citizens and question-posers, to bring the benefit of their training to public policy.

I think the idea - that citizens can ask questions and have a partnership with NSF to learn the answers - will catch on, and the Centers will grow rapidly. There is a lot of brainpower that can be brought online; and capable policy-shaping people in state, city, and county government or active in civic life who will use the new NSF-organized research service. (With new technology, even amateurs in astronomy can rival professionals in the quality of the questions that they ask.)[12] Today, we have people who have been to college

[12] Timothy Ferris, Seeing in the Dark (New York: Simon and Schuster, 2002).

(and minds that have mastered calculus) who have, as citizens in public affairs, almost nothing with which to work. Looking back five years from now, and evaluating the EBP Center infrastructure investment, I think the National Science Board may be surprised by the ability of civilians (i.e., people - including scientists in the physical sciences - who are not professional social scientists) to ask astute, creative, and productive research questions about human behavior.

For example:

- Today, if a local PTA wants to know the best drug-use prevention or violence-reduction programs in the country, and to understand the key elements, they cannot find the answer in their local library. With this initiative, local PTAs across the country can get the answer online.

- Today, the comparative evaluation of software for science and mathematics education is a laborious and almost impossible task for local and state school systems. But EBP Centers can design and organize large-scale experiments and identify which programs, and different learning styles, are best suited to different students.

- If civic groups want to follow-up the comparative data on the performance of nursing homes, published recently by HHS, and learn the most effective ways to improve

performance in their communities, they will have a mechanism to get high-priority research.

The (peer-reviewed) answers will be posted on the Internet. Centers can specialize, solicit questions, build research programs, and develop liaison services with their constituencies.

The National Science Board can view a successful example of this idea, which has received strong bipartisan support, in the work of the twelve Evidence-Based Practice Centers in the US and Canada operated by the Agency for Healthcare Research and Quality at HHS (www.ahrq.gov).

C.) Centers for Content Analysis and International Studies

In the 1930s an early development in social science was to apply quantitative methods to the analysis of communications in the mass media. The first researchers did the work by hand and then began to use computers in the 1950s. But punch-card technology and limited online memory and processing capacity limited the research, almost exclusively, to simple frequency counts. The researchers did not have the technology to ask more sophisticated questions. Pioneers in the field contributed to a summary volume (published in 1959) and then, for the most part, moved-on to other research. Their volume was a message-in-a-

bottle to future generations, recording their initial steps to build a new multidisciplinary method, a foundation that could be revisited, for renewed progress, when technology improved.[13]

Today, content analysis is a research method that is needed and whose time has come: With the spread of democratic and semi-democratic societies there is a tidal wave of new communications being generated in all countries; and television and radio programming that is independent of state control and reflecting (and affecting) social processes and images of domestic and international political issues. It is likely that, in a sense, a great more is happening in the world. As one effect, the acceleration due to new communication technology may accelerate political organizing. In a world where human rights remain problematic for billions of people, and injustice and discrimination are ubiquitous, it is worth recalling that the invention of the printing press turned the criticisms of an unknown priest in an obscure part of Northern Europe into the Reformation and Counter-Reformation, and set Europe ablaze.

Yet as the production of communications has achieved exponential growth, American

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[13] Ithiel de Sola Pool (Ed.) Trends in Content Analysis. (Urbana IL: University of Illinois Press, 1959). See also Ithiel de Sola Pool, Content Analysis and the Intelligence Function (1969), reprinted in Lloyd S. Etheredge (Ed.) Humane Politics and Methods of Inquiry (New Brunswick, NJ: Transaction Books, 2000), pp. 19-41.

research libraries have halted the growth of new print acquisitions. And any hope that even our largest libraries will acquire, archive, and index television is an impossible dream. The barriers affect not only American social scientists trying to understand other countries, but social scientists in every country without an ability to acquire, codify, and use a growing flood of potential data in their own countries and regions.

I think it is obvious that we should begin to build Centers for Content Analysis and International Studies, at several sites, in the US and around the world. There is an extraordinary list of tasks - ranging from library-like tasks of setting priorities and acquiring and digitizing selections of the new flows of communications, to the development of new content analysis engines, computer software packages for all of the social sciences, with capabilities for these new tasks of inference similar to the investment in SAS, SPSS, and related technologies for numerical quantitative data. The Centers should be established with competitive and renewable grants: applicants might be invited to specialize - e.g., a consortium of research libraries might develop options and initial projects for online resources; a multi-disciplinary center of social and computer scientists, and humanists, might work on the design of powerful and flexible software.

Most social science research makes inferences from an analysis of communications, but doing such tasks rigorously will require the solution of many difficult problems. We know

that the earlier technological barriers have been mitigated; we probably can infer that, even if it is done with the simple frequency counts of an earlier generation, quantitative content analysis is likely to draw new researchers. But we do not know what we can learn, only that we are dealing with a combination of opportunities and needs that should be part of NSF's infrastructure investment across the next decade.

Earlier, I discussed the changing image of the US and Americans: this is one dependent variable that might be observed and understood, to our benefit, with the help of new content analysis technology. Especially so during the next decade when, limited by undergraduate enrollments and a changing age structure, there are a very limited number of social scientists to study these questions and whose time can be used more efficiently by shared online resources. We also can use this technology to begin to monitor and understand the psychological/subjective component of globalization. Globalization can be studied by economists (e.g., as flows of money or products - blue jeans and Coca Cola are ubiquitous). But the problem of cultural change is more complex: Are traditional ways of being Arab or Chinese changing fundamentally? Is there rapid convergence toward a secular, cosmopolitan sensibility? Or - just as new cable television channels in the US led to the rise of televangelists and the organizing of a new Religious Right - is there a retreat into tribalism? The Lexus and the Olive Tree is the title of a book about these opposing

tensions and trends by a remarkable observer, Thomas Friedman of the New York Times.[14] Yet we need observations by more than one man; and just as physical scientists can benefit from knowing if a hole in the ozone layer above the South Pole is growing, or if the orbits of the planets are changing, so thoughtful and serious people in all countries can benefit from good data and deeper understanding of a globalizing and uncertain world.

D.) Matching Grants For National Data

It may surprise the National Science Board to learn that, in many sub-fields of social science, there is little data acquired routinely from national samples. In the study of American elections for example, NSF provides funds only for one sampling frame, competition is intense, and an extraordinary investment of time and energy by a group of researchers typically is required even to ask a small number of questions. (In macroeconomics even this limited capacity for innovation may be unavailable, as most researchers are restricted by the concepts and measures of government-supplied datasets.) By contrast, a better use of scientific manpower is to assure that all of the social science faculty members at our major research universities have the data resources they need for themselves, and their students, to be productively engaged in state-of-the-art research. By this standard, there is a large and unacceptable gap.

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[14] Thomas L. Friedman, The Lexus and the Olive Tree: Understanding Globalization (New York: Farrar, Straus, Giroux, 1999).

In the physical sciences, even a basic laboratory for a junior faculty member is assumed to justify an investment of several hundred thousand dollars. By contrast, universities do not make similar basic investments for the productive use of time by social science faculty.

A simple step to revolutionize data resources and progress in social science would be to provide NSF matching funds for an initial five years to universities to underwrite national sampling frames. These data-generating facilities could be used routinely for research by a university's faculty members and graduate students in the social sciences.[15]

A matching grant system could be prudent because, if a university's own funds are used, it will have an incentive to use the national sampling capabilities wisely.[16] There also are competitive benefits to universities that participate: if Princeton (for example) suddenly guarantees all faculty members in the social sciences the ability to secure free national sample data for their research, Princeton becomes (overnight) the competitive leader for hiring the best faculty members who are (otherwise) starved for data if they remain at other universities. And Princeton's graduates, with doctoral theses and evidence from new, national-level, sampling data will have a competitive advantage on the job market.

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[15] In the long-run, if the experiment is successful, all universities might be permitted to include their share of such national sampling frames in their overhead rates.

[16] Universities might receive up to $500,000 per year for their faculty and students with a 20% match, and an additional $500,000 per year for a 30% match.

To reduce costs, each participating college or university could subcontract the management of its national sampling frames to an established infrastructure institution (e.g., Michigan, Berkeley, NORC, Gallup) that could compete to offer their professional services. Subcontracting would reduce infrastructure costs and also permit these leading Centers to offer outreach services and professional consulting to improve the framing of questions. The Centers could play an active role to combine research questions from different researchers at different universities, to expand the useful information to each.

As I suggested above, the ability to experiment with new ideas and national measures may have an immediate and beneficial impact on macroeconomics where the need for creativity is becoming urgent. Permitting faculty members across several disciplines, and graduate students, at each major research university to acquire data to test new ideas about macroeconomic issues, quickly and at an affordable cost, can help the creative ferment and accelerate progress.[17]

E.) An Internet service and mini-grants for online colloquia.

Accelerating the creative process may be possible on a global scale, and it also may be possible to reduce the length of time between the analysis of data and designing the next research cycle. A remarkably good idea is now underway at www.videocast.nih.gov. Each of

[17] Lloyd Etheredge, A Breakdown Crafted by Silences . . . op. cit.

the constituent Institutes at the National Institutes of Health provides its colloquia and lecture series to a central Internet service in a standard format. These, in turn, are Webcast to interested researchers throughout the US and worldwide and placed online for video-on-demand retrieval. NIH organizes its lectures and conferences to be an international crossroads of state-of-the-art ideas and the new service is climbing the charts in the international biomedical world, with more than 1,200 events online and 200+ events scheduled. De facto the regularly-scheduled lecture series are becoming global research colloquia to accelerate the transfer of knowledge and the fast and free exchange of ideas among researchers, 1-2 years before print publication.

While there are compelling merits to the draft Report's recommendations for ever-more-advanced communication infrastructures, the NIH model suggests that there can be benefits for scientific progress (potentially rapid, revolutionary, and global) from modest additional investments to use the current technologies.

It would be straightforward for NSF to establish a central service similar to the NIH model to accelerate progress in the behavioral, social, and economic sciences (or, indeed, for all research fields.) And to provide mini-grants by which research centers in many countries could, automatically, provide conferences or colloquia series of international interest, in standard format, to a central office. [The service also could be contracted to AAAS; or to

an established nonprofit initiative like the University of Washington's www.research channel.org; or organized separately by professional societies or leading Centers.][18]

Scientists use a range of print and non-print methods for communication and creative discussion and there is a great deal of experimentation to be done about the best use of the Internet's emerging multimedia, interactive, and global capabilities in different fields. However the costs of travel to international research conferences can be prohibitive, especially for researchers outside the most advanced industrial countries.[19] Thus there are good reasons to believe that online colloquia could be especially helpful to linkup Centers and researchers at international sites. A capability to acquire programming of international interest from many sites internationally, in each field, also could accelerate global collaboration and the creative process. NSF's new initiatives to study democratization and globalization are among those that could benefit immediately from the Internet service and mini-grant investments. It also could be worthwhile to begin initial projects for online research colloquia to accelerate progress in high priority sub-fields, such as the promotion of human

[18]The marginal cost to record and digitize a one-hour presentation is probably about 2.5 hours of professional time. Perhaps $150 - $200 in the US. A $10,000 mini-grant to each participating research center (an equipment grant of $5,000 plus a recording/ digitizing grant of $5,000) could quickly build an exciting critical mass of global colloquia. Centers or institutions in other countries with any tie to NSF or US government research projects also would be eligible for mini-grants.

[19] Even in these countries, the funds available for international travel by SBE disciplines can be a small fraction of resources in the physical sciences.

rights, the forecasting and peaceful resolution of ethnic conflict, and improved models for macroeconomic policy in advanced industrial countries and economic development in UDCs.

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