

The NSF Scientific Collections Survey: A Brief Overview of Findings

March 17, 2009

National Science Foundation

Dr. Judith Skog, Division Director, Division of Biological Infrastructure

Dr. Richard M. McCourt, Program Director, Division of Environmental Biology

Ms. Jessica Corman, Science Assistant, Division of Environmental Biology

Introduction

Scientific collections created and used in basic research are an integral part of the nation's scientific infrastructure. They hold specimens of plants, animals, microbes, fossils, minerals and other artifacts that together comprise a national legacy of biological diversity. Such collections are an essential resource to a broad range of scientists, including systematists, evolutionary biologists, ecologists, resource managers, educators, and environmental health researchers. Because the National Science Foundation (NSF) supports basic research projects in all fields of science and engineering, it has a stake in ensuring that collections created during the conduct of NSF-supported research are well-maintained and accessible to researchers through the use of modern technology and bioinformatics.

NSF supports collections through specific programs such as the Biological Research Collections Program and the Major Research Instrumentation Program, as well as indirectly through support for new collaborations and networks, imaging activities, improved access through the web, storage upgrades, and the incorporation of specimens from other collections. Furthermore, NSF expects that the projects it funds will provide direct access to the data obtained from scientific collections.

NSF is a member of the Interagency Working Group on Scientific Collections (IWGSC), which was tasked by the Committee on Science (COS) of the National Science and Technology Council (NSTC) with developing a comprehensive report on the current status of Federally owned and supported scientific collections in response to concerns over the condition of Federally owned and supported object-based scientific collections. To prepare

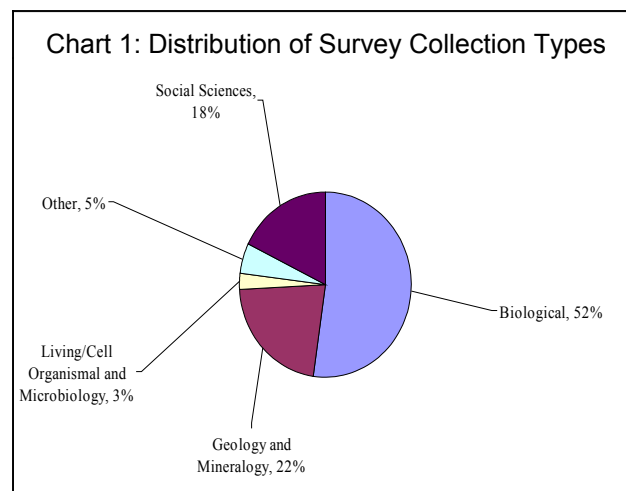
this report, the IWGSC conducted a survey of Federal agencies to collect information on, and report on, the scope, size, and condition of their scientific collections.*

Because NSF funds institutions to conduct research that involves collecting new specimens and supports improvements to collections but does not directly maintain scientific collections, NSF conducted a separate survey to assess the status of collections at a sample of institutions

that currently receive or have received NSF support since 1985. The results of the NSF survey will complement the data in the IWGSC's report.

Using its awards database, NSF identified 339 collection managers and 137 institutional administrators at 147 institutions that received support for collections since 1985 and invited them to participate in the survey. Seventy percent of the collection managers and 51% of the institutional administrators responded to the survey.

The survey asked respondents to provide information on all of their scientific collections, not just those receiving NSF-funds. As a result, they provided information on 611 collections in five broad categories: biological, geological and mineralogical, social sciences, living/cell organismal, microbiological, and other collection types (see Chart 1).



* The IWGSC survey is available at http://www.ostp.gov/galleries/NSTC/%20Reports/Revision_1-22_09_CL.pdf.

Overview of Survey Results

Collection Affiliation. The majority (66%) of the respondents are **affiliated** with a four-year college or university, while 25% are affiliated with a private non-profit organization.

Funding. Respondents report that more than half of the collections (52%) received some **Federal funding**; however, only 10% receive enough funds to support 50% or more of their collections. Chart 2 illustrates the percentage of collections by type that receive Federal funds.

Thirty-eight percent of the collections received NSF funding for improvement, more than from any other Federal agency. The majority of collections receiving support were of biological specimens.

When asked to consider all funding sources, respondents anticipate that almost half (49%) of their collections will experience erosion or decrease in funding over the next five years.

However respondents are generally optimistic about **future funding** from specific funding sources. They anticipate that most (81%) of the collections that received endowment funding will receive significant funding increases, while over half (52%) of the collections that received Federal grants and contracts anticipate

significant increases. Likewise, most (85%) of the collections that received private funds are expecting to see significant funding increases.*

On the other hand, almost all (91%) of the collections that received industrial grants and contracts expected to experience significant decreases in funding. Two-thirds of collections that received state funds and 62% of those that

* This survey was completed in April 2008 prior to the economic downturn for investments, and participants' responses were likely more optimistic than they would be at present. Given the deterioration of the economy and the precipitous declines in the stock market that occurred in late 2008 following the completion of the survey, respondents may have reason to be less sanguine about the possibilities of increased funding in the near future. Evidence of this fact can be seen in the Natural Science Collections Alliance assessment of the economic impact of collection funding (NSCA report on collections and the economy, http://www.aibs.org/public-policy-reports/2008_11_24.html)

received county or municipal funding expected to be subject to funding cuts.

Collection Composition With regard to the **duplication of collections**, three-quarters of the collections contain up to 25% unique and unduplicated specimens. Most of the duplicated collections predate 1990 and document taxonomic and genomic diversity or a unique aspect of geography. This historical record is, of course, irreplaceable.

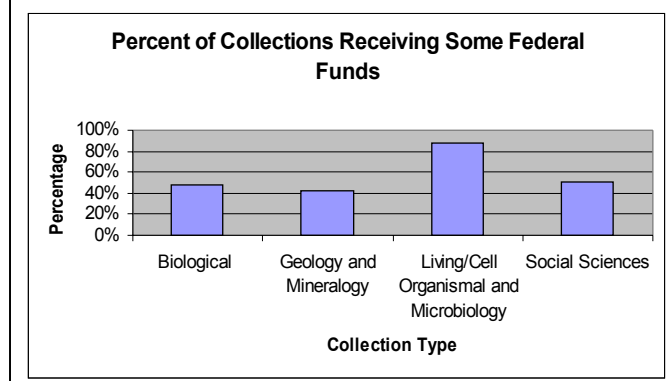
The survey documented some interesting **changes in collections since 2000**. Nearly 75% of the collections have expanded through specimen acquisition, and over half of this growth was a result of collections made by research staff and students and donations (including orphaned

collections). Forty percent of the collections have received orphaned collections deaccessioned by other organizations. Nearly three-quarters of the respondents anticipate that the rate of change to the size of their collections will be constant over the next five years. Eighteen percent of respondents anticipate an increase in the current rate of change, while 10% anticipate a decrease.

Collections on **long-term loan** may be at risk if the institutions housing them lack the resources or the incentive to preserve them. Asked to indicate whether they had received any long term loans of significance since 2000, 11% of respondents indicated that they either had a long-term loan in backlog (i.e., awaiting accessioning) or had incorporated one into their collections, while 6% said that they had made such a loan. More than half of the collections that are incorporated or in the backlog are Federally owned.

Staffing Forty-five percent of respondents report that **staff size** is stable, while 38% report declines due to attrition, and 17% report increases in staff size. More than half of the collections have between one and five full-time dedicated staff, and slightly less than half of the collections have permanent part-time staff. In addition, most collections have temporary part-time paid staff as well as part time paid students and part-time volunteers. While half of the respondents indicated that their current collections staff levels are insufficient to meet the operational needs of their units, most (60%) anticipate filling staff vacancies over the next five years and 18% plan to add positions. **However,**

Chart 2: Percent of Collections Receiving Some Federal Funds, by Collection Type



they also reported that finding and retaining qualified staff are their most important staffing-related challenges.

Accessibility Respondents reported that additional processing staff is their greatest need for improving the physical **accessibility of scientific collections**. Eighty percent of social science collections are reported to be mostly accessible (that is, half or more of the collection contents are accessible to professional researchers), followed by 62% of the living/cell organismal and microbiology collections, 59% of the biological collections, 58% of the geology and mineralogy collections. The majority of collections were at least partially catalogued online, with only 10% entirely uncatalogued and/or unavailable online. However, the online accessibility of collections remains a challenge: two thirds of the collections have less than 75% of their collection data online. Images are less accessible than other data: more than 90% of collections have less than 10% of their holdings represented online in digital images.

Facilities With regard to the adequacy of **collections facilities**, 43% of respondents report that the space available for their collections is adequate to accommodate the next five years of projected collection growth. However, this statistic varies by collection type: while 50% of biological collections are reported to have adequate space, only 36% of geological and mineralogy collections, 33% of social science collections, and 25% of living/cell organismal and microbiological collections are reported to have sufficient space to accommodate additions to the collections over the next five years.

On-site storage is the major reported need for those collections with inadequate storage space, while renovation

and humidity controls are the most-identified needs for collections stored under inadequate or unacceptable conditions. Only 20% of respondents report that all of their collections areas and/or building systems meet generally accepted guidelines for collection housing within the scientific area (see <http://www.spnhc.org/>).

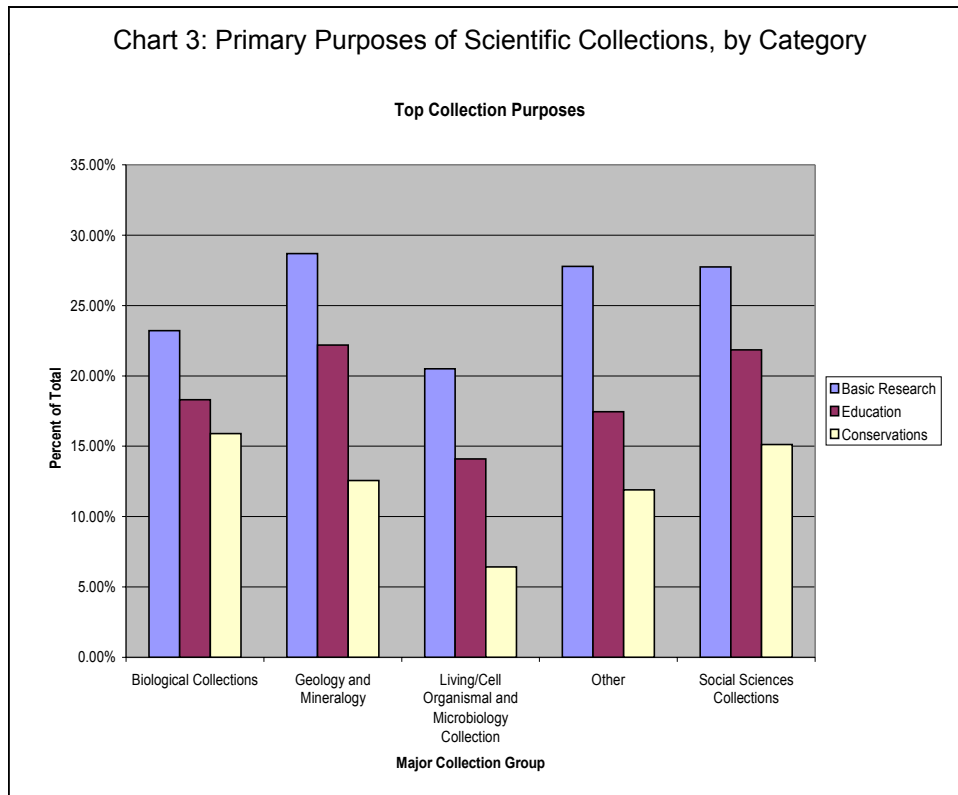
Collection Use Respondents were asked to indicate the **primary purposes of their collections**. For all major collection categories, respondents cited basic research

followed by education as the primary purposes of their scientific collections. Conservation was the third most cited purpose for all major collection categories except living/cell organismal and microbiology collections, which gave biomedical research as the third most cited purpose (see Chart 3).

Some Critical Issues The NSF survey of scientific collections

identified a number of issues that were also identified by the IWGSC survey, including coordination and networking, staffing and education, and risk of data loss. In addition, the survey highlighted factors such as:

- Costs associated with replacing collections and the impossibility of replacing certain ones (e.g., due to habitat loss),
- Requirements for duplication and backup of collections at different sites,
- Opportunities for discovering the processes underlying biological and geological variability,
- Reduction of the risk of catastrophic loss by the preservation of a pool of genetic variability, and
- Coordination and interoperability of data networks critical for effective use of collections in research.



Concluding Remarks

The current status and outlook for non-Federal scientific collections as reported by the NSF survey respondents is mixed. Although many collections are reported to be adequately staffed and maintained, and prospects for consistent growth and funding are expected, an equal number of collections are understaffed, unsatisfactorily maintained, underfunded, and insecure in their future. The results from the NSF survey combined with those of the

IWGSC survey document the current condition of this valuable national scientific resource, and they provide an empirical base from which can be developed new policies that are designed to preserve and increase the value of these scientific collections as well as to improve access to them by researchers for future scientific endeavors.

Preliminary Findings from the NSF Survey Of Object-Based Scientific Collections: 2008

Prepared by the IDA Science and Technology Policy Institute

Pamela Ebert Flattau

Margaret Boeckmann

Paul Lagasse

Nyema Mitchell

Darius Singpurwalla

For the National Science Foundation

The NSF Survey of Object-Based Scientific Collections: 2008 is available online at http://www.nsf.gov/bio/pubs/reports/prelim_findings_sc_2008.pdf. The appendix is available online at http://www.nsf.gov/bio/pubs/reports/appendix_prelim_findings_sc.xls.

This work was conducted under task order OSTP-20-0002.28 by the Science and Technology Policy Institute (STPI) of the Institute for Defense Analyses under Contract Number OIA-0408601 in support of the Director of the National Science Foundation.

This publication does not indicate an endorsement by the White House Office of Science and Technology Policy (OSTP) or by the National Science Foundation (NSF), nor should the contents be construed as reflecting the official position of that office and agency.