



The Global Genome Initiative

Preserving the Genomic Diversity of Life on Earth

Genomics is shaping the future of biodiversity research, just as the Human Genome Project reshaped biomedical research. The Smithsonian-led Global Genome Initiative is enabling this research through an international collaboration to collect, cryo-preserve, verify, and provide open access to information about the genomic biodiversity of life on earth.

Biodiversity at Risk

Genomes are key to basic research, and may contain solutions to many pressing problems important to human welfare. Less than 17% of the estimated 11 million species on earth are known. At the same time, habitat loss, extinction, and climate change threaten to eliminate species before we even know they exist.

Conservationists are preserving species by setting aside protected areas and through captive breeding programs for endangered species. Traditional taxonomists have been preserving specimens in natural history museums and herbaria for centuries to record the biological diversity we see among organisms. To expand this knowledge, biodiversity scientists of the future will need entire genomes of species sampled from all major evolutionary branches of life. Today's scientific community has a responsibility to sample and preserve this diversity for the future.





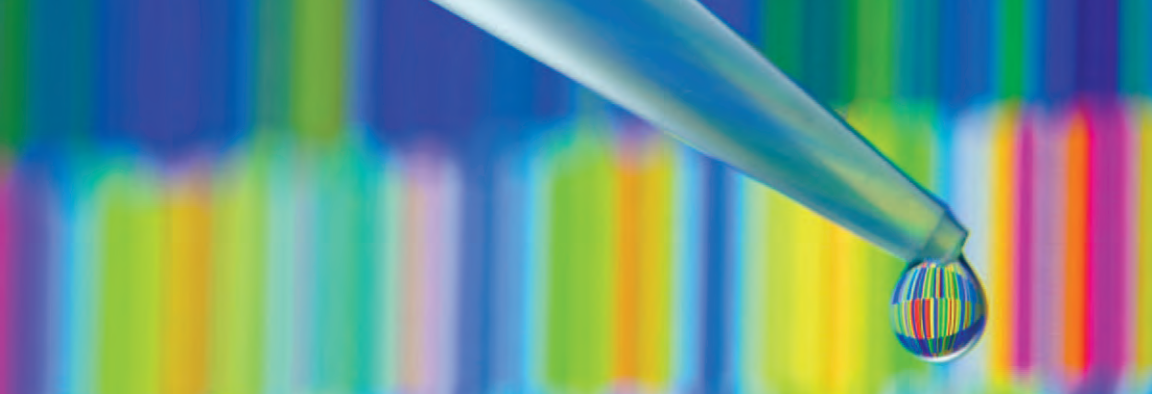
What sequencing the human genome is doing for human medicine, the Global Genome Initiative will do for biodiversity research.

Natural history museums and other research institutions around the world are meeting this challenge by adding new capabilities to their traditional strengths. They are establishing biorepositories to store genome-quality samples under ultra-cold conditions, building advanced laboratories capable of high-throughput sequencing, and developing informatics tools capable of handling unprecedented volumes of data. Moreover, biotechnology is getting cheaper and faster every year.

Safeguarding Earth's Genomes

If we could link existing biorepositories via networked databases, we could minimize duplicate collecting, ensure that synoptic samples of all of life are obtained, and maximize global accessibility to genomic collections. The Global Genome Initiative (GGI) fulfills this need. GGI partner biorepositories and research organizations will collect, cryo-preserve, verify and study genomic diversity and increase access to genomic information from the major branches of the Tree of Life—expanding the knowledge of life on our planet.

BIODIVERSITY COLLECTING AND RESEARCH Preserving genomic diversity starts with phylogenetically informed collecting. Although legacy genomic collections certainly document substantial portions of Earth's biodiversity, no complete collection or global list of genome-quality samples and voucher specimens exist. Strategic sampling guided by scientific, societal, and conservation priorities will be used by GGI partners to capture most of life's genomic diversity, with a single sample from each of the less than two hundred thousand known genera needed to achieve this goal. Many of these genera can be collected through targeted sampling in relatively few geographic areas.



PRESERVATION AND APPROPRIATE ACCESS AND BENEFIT

SHARING International collaborative science depends on trustworthy, responsible access to these genomic collections that respects the sovereignty of nations where collecting may occur. GGI is working through a new consortium of biorepositories and research organizations—the Global Genome Biodiversity Network—to cryo-preserve genomic samples and to adopt ethical standards and best practices that meet the requirements of the *Convention on Biological Diversity and the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization*.

BIOTECHNOLOGY AND BIOINFORMATICS Sequencing Earth's genomes requires the integration of genomic samples, biotechnology, and bioinformatics. Using biotechnology, GGI will assure that these genomic samples are preserved and not degraded from field to freezer to sequencing, and safeguard this critical investment in the future of biodiversity research. Increased investment in bioinformatics will facilitate the analysis of sequence data in order to understand large data sets and to pose and answer new research questions.

ENGAGEMENT The future of genomics requires a well trained workforce, fostered through fellowships across partner organizations, and career pathways within organizations. In each of these facets, GGI will create these opportunities, build collections management capacity in emerging countries and become a public voice to communicate the relevance of genomic research.

GGI Core Strengths

- ▶ Biodiversity research
- ▶ Global research sites
- ▶ Collecting
- ▶ Cryopreserving
- ▶ Training



“We should judge every scrap of biodiversity as priceless while we learn to use it and come to understand what it means to humanity”

—E.O. Wilson, Professor Emeritus, Harvard University



Expected Outcomes

- ▶ A collection of genome-quality specimens that represent the major taxonomic branches (Families and Genera) of the Tree of Life, with 50 percent of the branches cryo-preserved, available for research, and in a growing reference library of Earth’s genomes.
- ▶ An expanding global network of biodiversity biorepositories.
- ▶ Genomic snapshots of Earth’s ecosystems: coastal, freshwater, deserts, prairies, coral reefs, etc.
- ▶ International guidelines that respect the rights of individual countries and ensure they have access to genomic samples of their native flora and fauna.
- ▶ Increased bioinformatics and technological capacity—particularly in developing countries—to store, sequence, and research genomes.
- ▶ New training opportunities and career pathways for the next generation of genomics researchers and technicians.

Global Genome Initiative
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