

The Global Genome Initiative

Biodiversity genomics is at the forefront of innovation and discovery due to technological advances resulting from the sequencing of the human genome completed ten years ago. Genome-level information will revolutionize taxonomy, phylogeny, ecological research and monitoring, environmental change and health, biological conservation and wildlife management, invasive species management, agriculture, drug development, zoonotic disease forecasting, perhaps even aspects of national security. The biodiversity component of the Smithsonian mission focuses on basic research in taxonomy, phylogeny, ecology, and conservation. Biodiversity loss, habitat alteration, human demography, and rapid environmental change make these challenges particularly urgent. We realize that an actionable, synthetic, deep understanding of all of the genomes that constitute Life on Earth is now feasible. Technologies to obtain genomic samples in the field, to curate genomic collections and to make them accessible to the research community are still rudimentary. Because biodiverse countries now manage their own patrimony, only mutually beneficial peer collaborations and partnerships can realize these global research agendas. The Global Genome Initiative ([GGI](#))—organized by the Smithsonian Institution—is a multilateral, international collaboration **to preserve and understand the genomic diversity of life on Earth.**

Components

The infrastructure initiative builds on the existing strengths of collaborators to federate data and adopt community standards and best practices that respect and incorporate the rights of provider countries. Work toward this effort includes

- expanding and networking frozen collections;
- developing pipelines for capturing, processing, preserving, generating, and analyzing genomes;
- expanding biotechnology and bioinformatics capacity and
- training future genomic researchers and technicians.

The four key components of GGI advance:

- biodiversity research (e.g. genomic data answering major questions) and collecting;
- bioinformatics and biotechnology (managing data, new genomic tools);
- engagement (STEM education of future genomic scientists) and
- networking global museum-like biorepositories (preserving genome quality samples and living cell lines for future use).

Outcomes

- GGI will collect, verify, and barcode samples from phylogenetically strategic branches of Life, and Earth's ecosystems, by:
 - Leveraging question-driven, peer reviewed research on biodiversity, phylogeny, and ecology to accelerate the acquisition, amplification, barcoding, and sequencing of (vouchered) genomes of all ~10,000 taxonomic families in Phase I, half of the ~160,000 genera in Phase II, and potentially all living species as a long-term goal for Phase III;
 - Capitalizing on biogeographic patterns to increase collecting efficiency and to promote study of ecological interactions by privileging "Genomic Observatory" sites such as the terrestrial [Forest GEO](#), the [Tennenbaum Marine Observatories Network](#), and ex-situ conservation sites such as zoos and botanical gardens, and other areas as necessary, and
 - Advancing techniques to obtain genomic scale data from museum specimens.
- GGI will foster the [Global Genome Biodiversity Network](#) of the world's major biorepositories or biobanks by:
 - Supporting and expanding the GGBN Data Portal to aggregate and share genomic sample information;
 - Recruiting partners with different regional and taxonomic foci to broaden coverage;
 - Being a trusted, transparent network faithful to Access and Benefit Sharing principles (E.g. Nagoya Protocol) and
 - Developing best-practice standards for collecting, processing, assessing, preserving and managing samples.
- GGI will drive development of bioinformatics and technology tools to sequence and analyze genomes more economically by:
 - Attracting technology partners to the unique research questions GGI provides, such as the challenge of industrial-scale biodiversity genomics, including in legacy collections, the laboratory or the resulting data and their interpretation.
- GGI will engage the public, its partners, and the next generation of biodiversity genomic scientists by:
 - Publicizing a synthetic overview of GGI on the [GGI-EOL Data Portal](#) (taxon natural history data, genomes and sequences, genomic and classical collections, biogeography and phylogeny) and other venues;
 - Enhancing capacity for biodiversity genomics in emerging institutions;
 - Training the next generation through STEM programs, advanced fellowships and visiting scientist opportunities.

Contact

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