



Global Genome Biodiversity Network – Infrastructure for Genomic Research

Jonathan Coddington

Executive Committee GGBN

**National Museum of Natural History,
Smithsonian Institution**



**Smithsonian
Institution**

CAROLI LINNÆI

EQUITIS DE STELLA POLARI,

ARCHIATRI REGII, MED. & BOTAN. PROFESS. UPSAL.;
ACAD. UPSAL. HOLMENS. PETROPOL. BEROL. IMPER.
LOND. MONSPEL. TOLOS. FLORENT. SOC.

SYSTEMA NATURÆ

PER

REGNA TRIA NATURÆ,

SECUNDUM

CLASSES, ORDINES,
GENERA, SPECIES,

CUM

CHARACTERIBUS, DIFFERENTIIS,
SYNONYMIS, LOCIS.

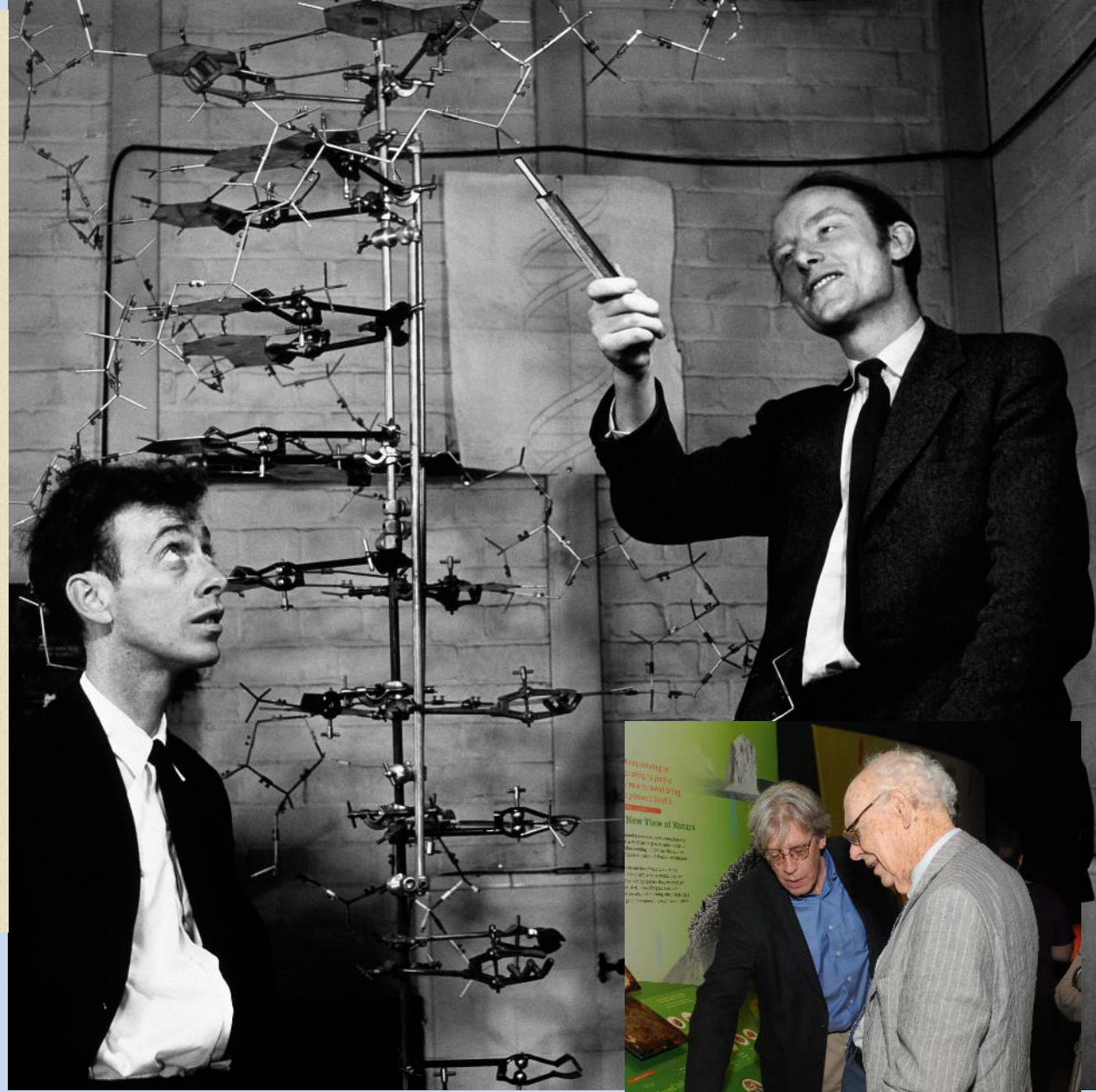
TOMUS I.

EDITIO DECIMA, REFORMATA.

Cum Privilegio S:æ R:æ M:tis Sveciæ.

HOLMIÆ,

IMPENSIS DIRECT. LAURENTII SALVII,
1758.



1758

1953

2016

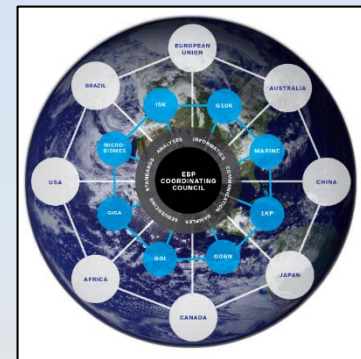
The Challenge: Sample Access

– Needs:

- High-quality
- Good metadata
- Legal

– Sample info dispersed

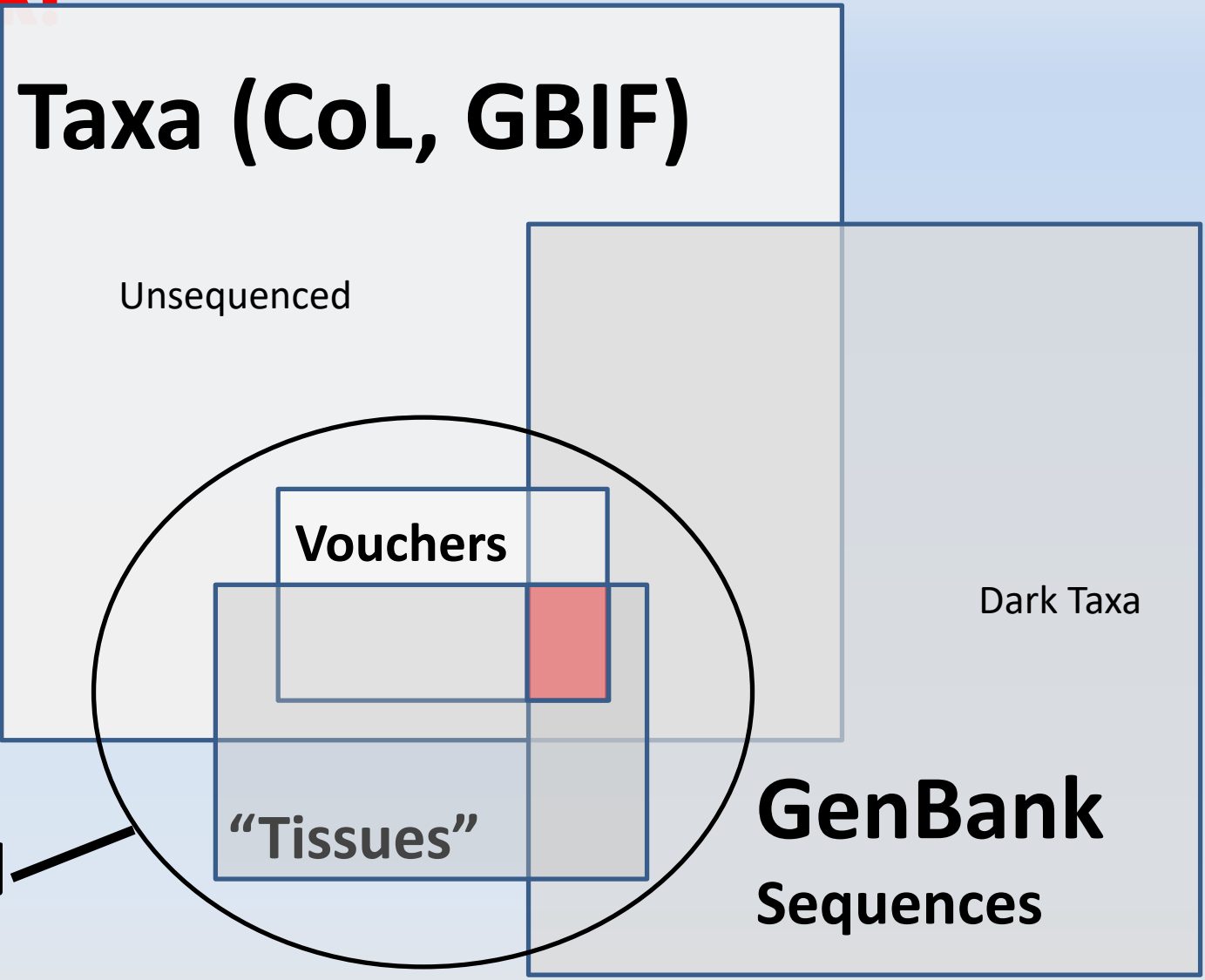
- Hard to find
- Heterogeneous
- Ambiguous quality & provenance





Sequences: OK! Specimens: OK! Tissues Not

OK!



GGBN

**GenBank
Sequences**

- **Established Platforms:**
 - GBIF, NCBI, EMBL, DDBJ, EOL...
- **Standard Data Models:**
 - Darwin Core, ABCD, MIxS...
- **Open Source Software:**



**NOTHING
COMPARABLE
FOR TISSUES,
DNA, etc**



History and Framework

- **Founded in 2011**
- **Botanic Garden and Botanical Museum Berlin (Technical)**
- **Smithsonian (General)**
- **MOU, Terms of Reference**
- **Core, Associate, Observer members**
- **Museums, Gardens, Zoos, Biorepositories**



- **Quality standards, best practice, transparency**
 - **Data Model & Standardized vocabulary**
 - **Reciprocal links with other aggregators (GBIF, GenBank)**
 - **Technical support**
 - **ABS Guidance**
- **Visibility, impact of genetic collections**
- **Biobanking document library**
- **Funding opportunities**
- **Networking**





GGBN Data Standard



GGBN Data Standard v1

Search

Log in

Page
Discussion

View
View source
History

What links here
Related changes
Special pages
Printable version
Permanent link

www.ggbn.org/ggbn/Main_Page

This page describes the GGBN Data Standard version 1 (v1), released on 04. October 2016.

Citation: Droege et al. (2016): The Global Genome Biodiversity Network (GGBN) Standard Specification. DATABASE. doi: [10.1093/database/baw125](https://doi.org/10.1093/database/baw125)

Note: Ongoing discussions and updates of the GGBN Data Standard will be documented at http://terms.tdwg.org/GGBN_Data_Standard

The GGBN Data Standard is intended to be used with ABCD or Darwin Core and is not a stand-alone solution! Implementations are available for both ABCD and [DarwinCore-Archive](#). For ABCD two implementations have been made. One for single species samples [ABCDGGBN](#) and one for environmental samples [ABCDGGBN-Enviro](#). Please check out the [TDWG wiki](#) for updates.

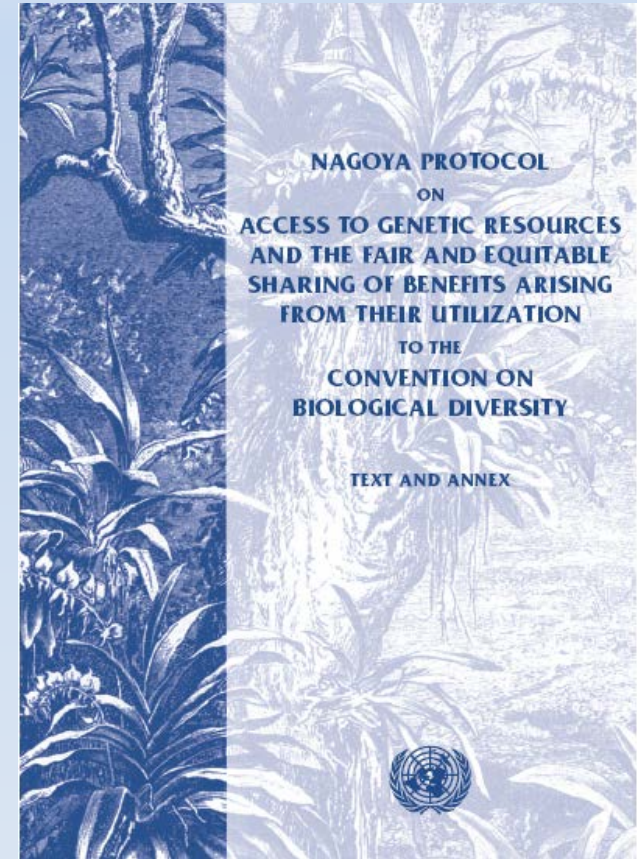
A new stable version of the standard will be released earliest at the end of 2019.

The GGBN Data Standard is a set of terms and controlled vocabularies designed to represent sample facts. It does not cover e.g., scientific name, geography, or physiological facts. This allows combining the GGBN Data Standard with other complementary standards, such as [DwC](#), [ABCD](#) or [MxS](#). Potentially, the standard can be used not only for non-human genomic samples but also human samples. It builds upon existing standards commonly used within the communities extending them with the capability to exchange data on tissue, environmental and DNA sample as well as sequences. The GGBN Data Standard incorporates all molecular terms of [MxS](#) and



ABS Best Practices

- **Access and Benefit Sharing (ABS) Compliance**
 - **Guidance documentation**
 - **Code of Conduct**
 - **Statement of Use of Genomic Material**
 - **Best Practice**
 - **Example Material Transfer Agreements**
 - **GGBN Data Standard permit vocabulary**



* **Consortium of European Taxonomic Facilities**

** **Society for the Preservation of Natural History Collections**

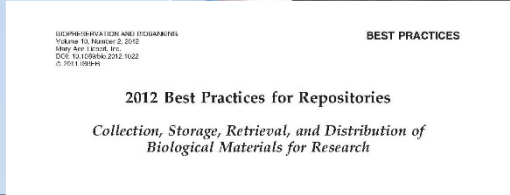


Best Practices

Recommendation for Biorepositories

- Collaboration with I
- Submitted April 201
- May 2017, in rev

* International Society for Biological and Environmental Repositories
ISBER 4th edition





Data Portal



Samples	
DNA	127828
Tissues	256995
Enviros	74
Repositories	17
Vouchers	
Cultures	21589
eVouchers	2
Specimens	105853
Unknown	6021
Collections	16
Taxa	
Families	1933
Genera	9652
Species	28158
Total	
	518362

News

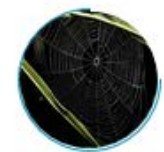
- 16. August 2016 - GGBN 2016 Conference Presentations now Available
- 08. August 2016 - Entomological Collections Network Joins GGBN
- 02. August 2016 - GGBN - now on Twitter and Facebook
- 28. July 2016 - Korea National Research Resource Center Joins GGBN
- 20. June 2016 - GGBN - a botanical perspective paper published in Annals of Botany
- 18. June 2016 - Museum für Naturkunde (MfN) makes its genomic collections available via GGBN
- 16. June 2016 - Zoology Museum (QCAZ) at Catholic University of Ecuador makes its genomic collections available via GGBN
- 14. June 2016 - Natural History Museum at the University of Oslo (NHMO) makes its genomic collections available via GGBN
- 06. June 2016 - GBIF & GGBN survey on DNA and biodiversity
- 06. June 2016 - Institute of Vertebrate Biology, Academy of Sciences of the Czech Republic makes its genomic collections available via GGBN
- 31. May 2016 - Natural History Museum of Denmark makes its genomic collections available via GGBN
- 25. May 2016 - GGBN Conference: Full Program Now Available

Explore GGBN

Repositories



Search



Documents



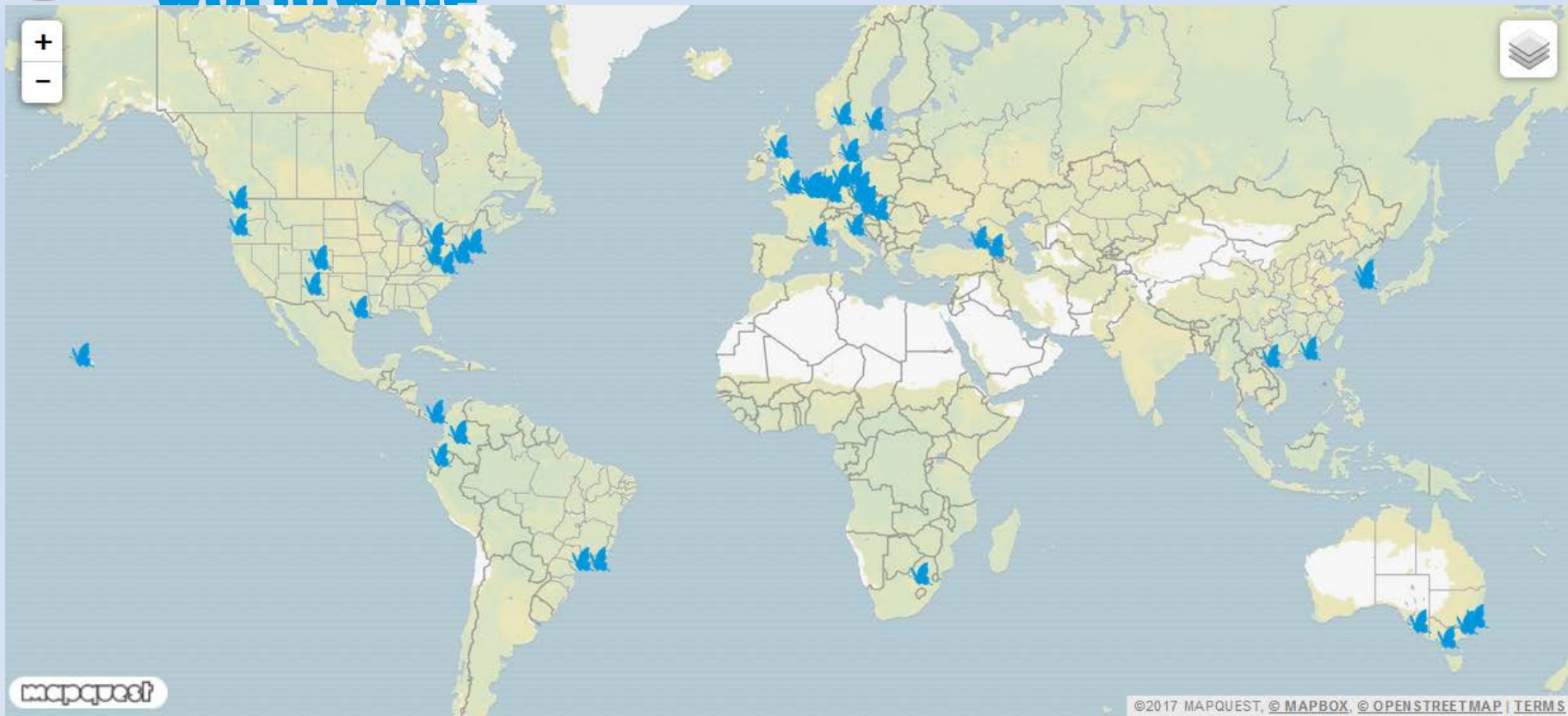
About



[Cookies Information](#)



Today: 59 GGBN members, 20 countries worldwide



©2017 MAPQUEST, © MAPBOX, © OPENSTREETMAP | TERMS

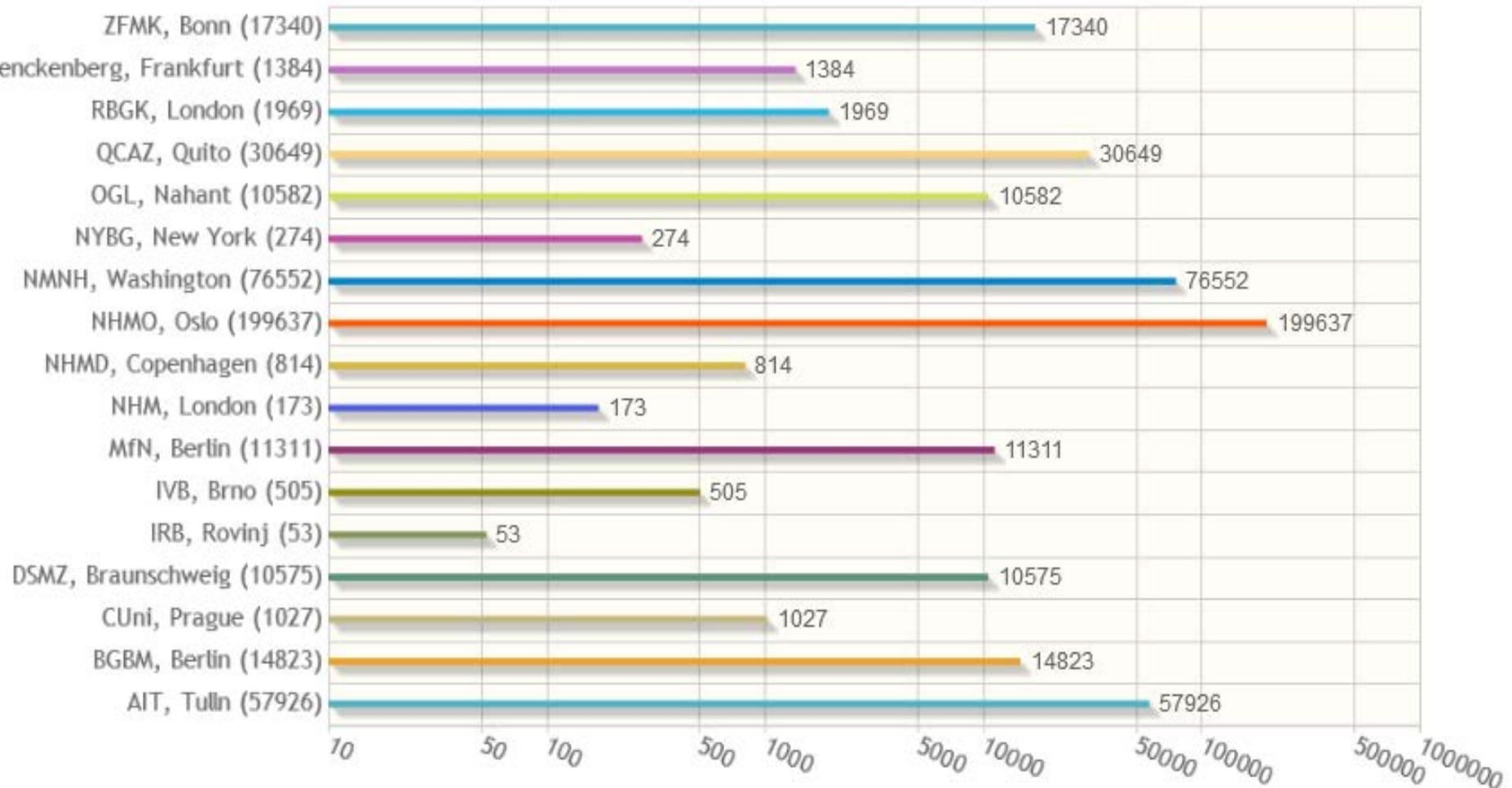
The collage includes logos for the following institutions and organizations:

- HUMBOLDT
- DSMZ
- Australian museum
- SENKENBERG world of biodiversity
- MUSEUM VICTORIA
- Kew ROYAL BOTANIC GARDENS
- South Australian Museum
- museum für naturkunde berlin
- BCCM GREAT GEORGE STREET
- CHINA NATIONAL GENEBANK
- ROYAL ONTARIO MUSEUM
- Museum of Southwestern Biology
- HUNGARIAN NATURAL HISTORY MUSEUM
- GBIF
- AIT TOMORROW TODAY
- AFRDI
- ECN Entomological Collections Network
- NRF NZG National Research Foundation National Zoological Gardens of South Africa
- SENKENBERG world of biodiversity
- Uio : Natural History Museum University of Oslo
- NATURAL HISTORY MUSEUM OF OSLO
- European, Middle Eastern & African Society for Conservation and Taxidermy
- COLCIENCIAS
- TODOS POR UN NUEVO PAIS
- UNICAMP
- INSTITUTE OF VERTEBRATE BIOLOGY ACADEMY OF SCIENCES OF CHINA
- MUSEUM OF COMPARATIVE ZOOLOGY HARVARD UNIVERSITY
- isber INTERNATIONAL SOCIETY FOR BIOLOGICAL AND ENVIRONMENTAL SCIENTISTS
- ATM AGRICULTURE & LIFE SCIENCES TEXAS A&M UNIVERSITY
- AMERICAN MUSEUM OF NATURAL HISTORY
- Smithsonian National Museum of Natural History
- MUSEO DE ZOOLOGIA QCAZ
- DENVER MUSEUM OF NATURE & SCIENCE
- DENVER BOTANIC GARDENS
- VSMN
- NATURAL HISTORY MUSEUM

Repositories (17 push data)

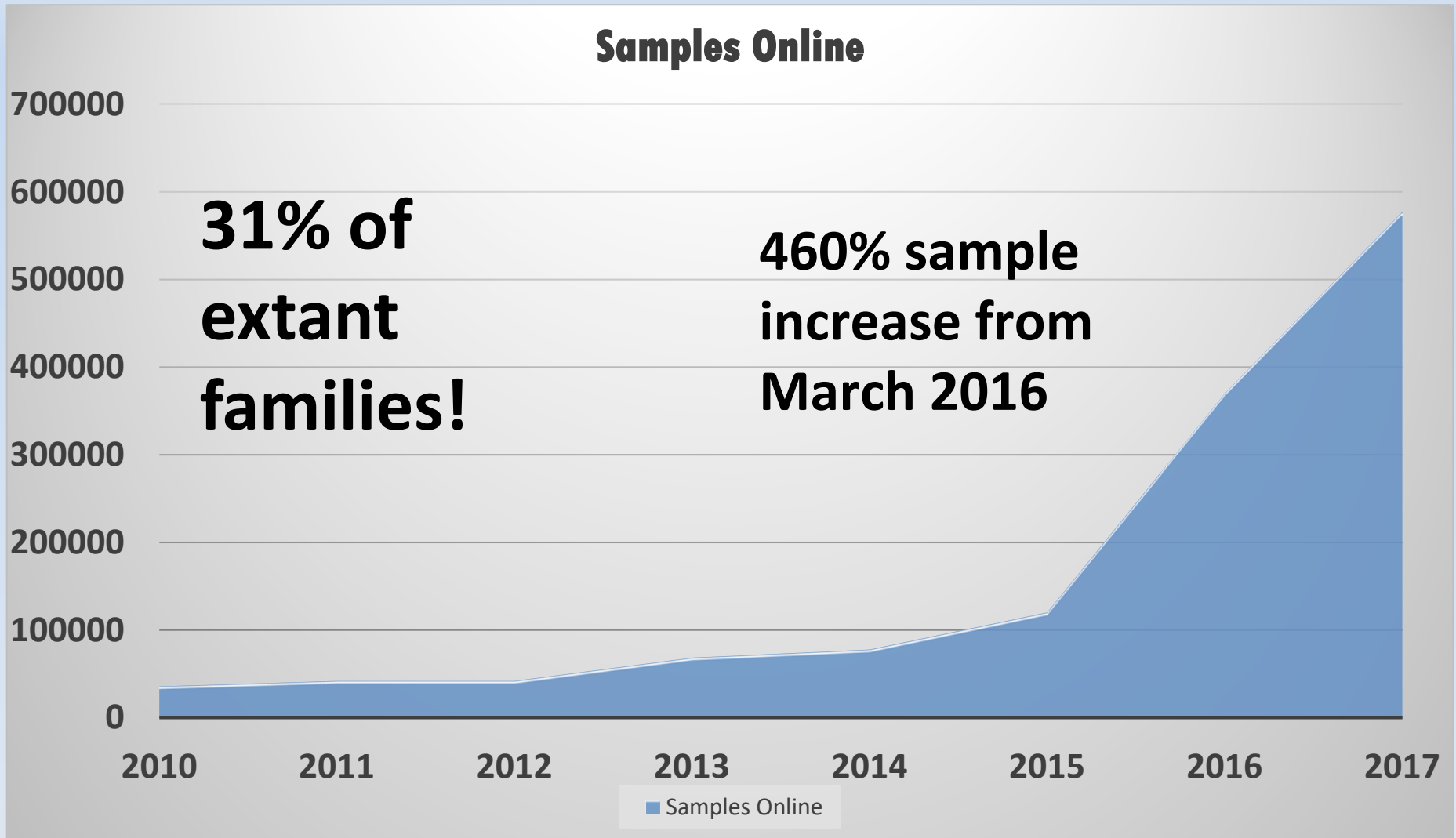
Global statistics **Repositories** No. samples No. taxa

Number of DNA, tissue or environmental sample records (including multiple samples from the same specimen).
Display with logarithmic scale.





GGBN Online Sample Growth





Eukaryotic Biodiversity

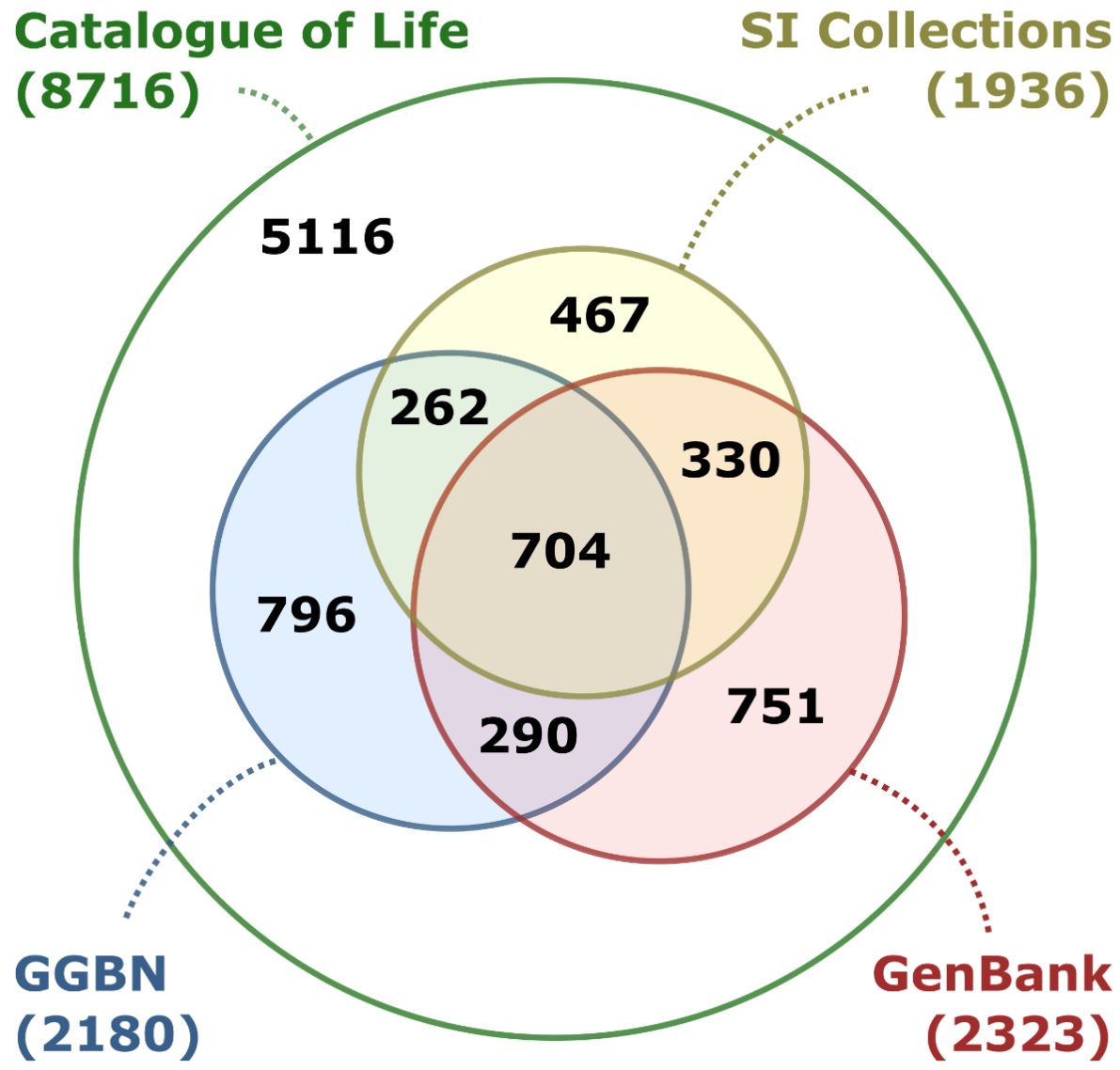
- **Domains:** 3 (Eubacteria, Archaea, Eukarya)
- **Kingdoms:** 5 (animal, plant, fungi, chromista and protozoa)
- **Phyla:** 61 (35 animal; 10 plant; 2 fungi; 14 chromists+protozoa)
- **Classes:** 266
- **Orders:** 1253
- **Families:** 8,716-9,330
- **Genera:** 140,000-200,000
- **Species:** 1.9 million known (est. 10-15 M)

Sources: Global Genome Initiative Knowledge Portal (Jonathan Coddington); Catalog of Life (Luisa Abuca) & Yuli Rosko



Gap Analysis

Families





Families mostly Singletons! (2180)

N Families	N_BioBanks	Percent
1,591	N_BioBanks=1	0.73
414	N_BioBanks=2	0.19
109	N_BioBanks=3	0.05
43	N_BioBanks=4	0.02
21	N_BioBanks=5	0.01
2	N_BioBanks=6	0.00



Discoverability, Best Practices, Scale &

Integration

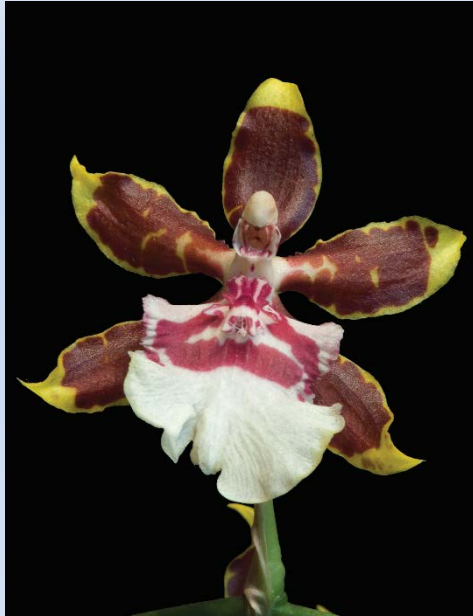
- **Increase discoverability**
 - **Biorepositories (new/existing)**
 - **Aggregators (e.g. iDigBio, VertNet):**
 - **GGBN data standard**
 - **Standard usage statistics**



Sequencing portals



Thank you



<http://www.ggbn.org>

<http://lists.fu-berlin.de/listinfo/GGBN-info/>

<https://twitter.com/GGBNOutreach>

<https://www.facebook.com/ggbnoutreach>

GGBN Executive Committee

GGBN Members

GGBN Collaborators

GGBN Task Forces

DFG

SYNTHESYS

ISBER & ESBB

NSF

GGI

