



Brief history of *Functional Annotation of ANimal Genomes (FAANG)*-- *Goals and Opportunities*

Organic growth of FAANG during 2014-2023

Current FAANG contributors + new members= 603 (Jan 2024)



Join FAANG (it's free!)
Visit: www.faang.org

Email us:
faang@iastate.edu

100 authors
Current Biology 2015



2024 membership map

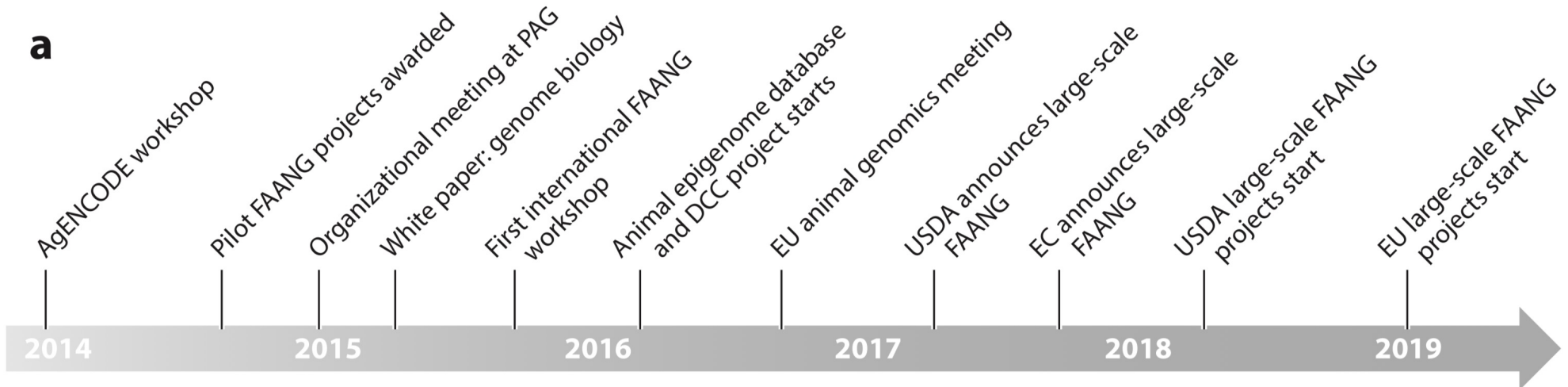
Recent Reviews: Giuffra & Tuggle, *Ann Rev Anim Biosci.* 2019
Clark et al. *Genome Biol.* 2020



FAANG timeline

- Workshop in January 2014
- Livestock Genomics conference Fall 2014
- Organizational meeting in Jan 2015 in San Diego
- White paper published in 2015
 - As of January 2024, [158 citations](#)
- [2015 DC Workshop to kick off FAANG](#)

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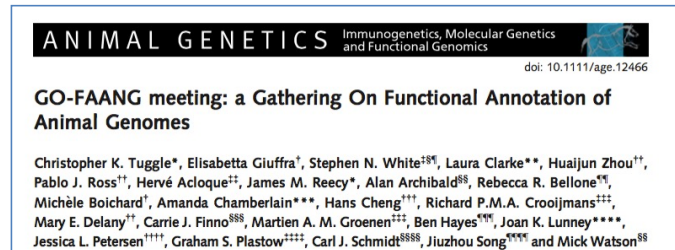
Giuffra, Tuggle, et al., *Annual Reviews in Animal Biosciences* 2019



Gathering On FAANG Workshop October 7-8, 2015 National Academy of Sciences Building Washington, DC

- 100 attendees
- Plenary talks and Breakout sessions
- **6 funding agencies presented talks**
- Meeting Report Published OA
- Set in motion organizing **calls for funding** for FAANG projects in US and Europe
 - RFP in 2017 at USDA Animal Genome
- **EU Workshop in 2016**
 - RFP 2018 in EU Horizon 2020

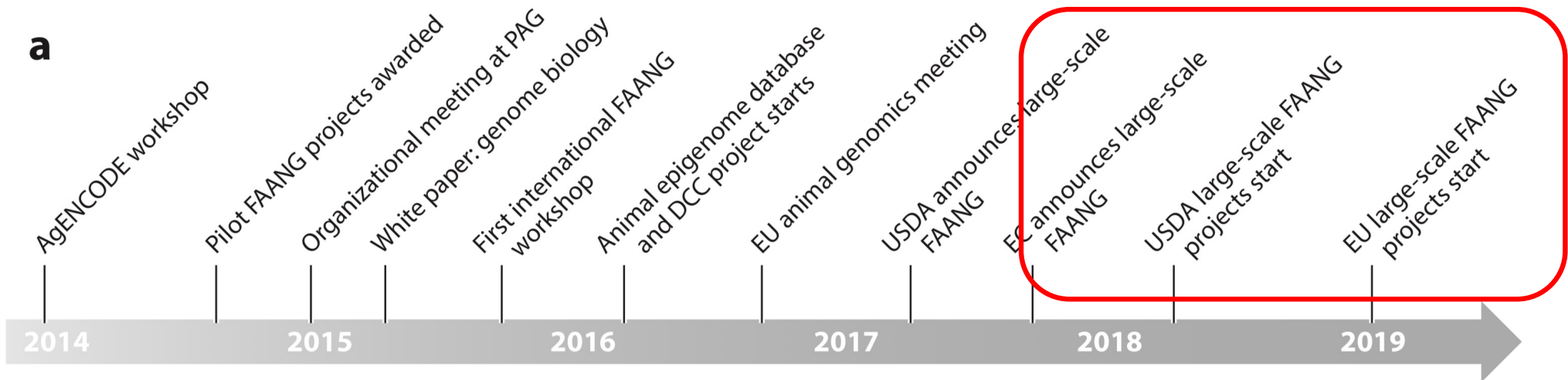
***More than \$40 Million awarded
world-wide for FAANG research***





FAANG large scale projects take off!

- **Phase I**
 - **Emphasis on establishing reference datasets for healthy adults**
 - **Few biological replicates, no treatments**
 - **Validate metadata toolboxes and analytical pipelines**
- **Phase II**
 - **Expand biological states- treatments, developmental stage, genetic variation**



Giuffra, Tuggle, et al., *Annual Reviews in Animal Biosciences* 2019

FAANG 2.0: Genome Biology white paper

Review > Genome Biol. 2020 Nov 24;21(1):285. doi: 10.1186/s13059-020-02197-8.

From FAANG to fork: application of highly annotated genomes to improve farmed animal production

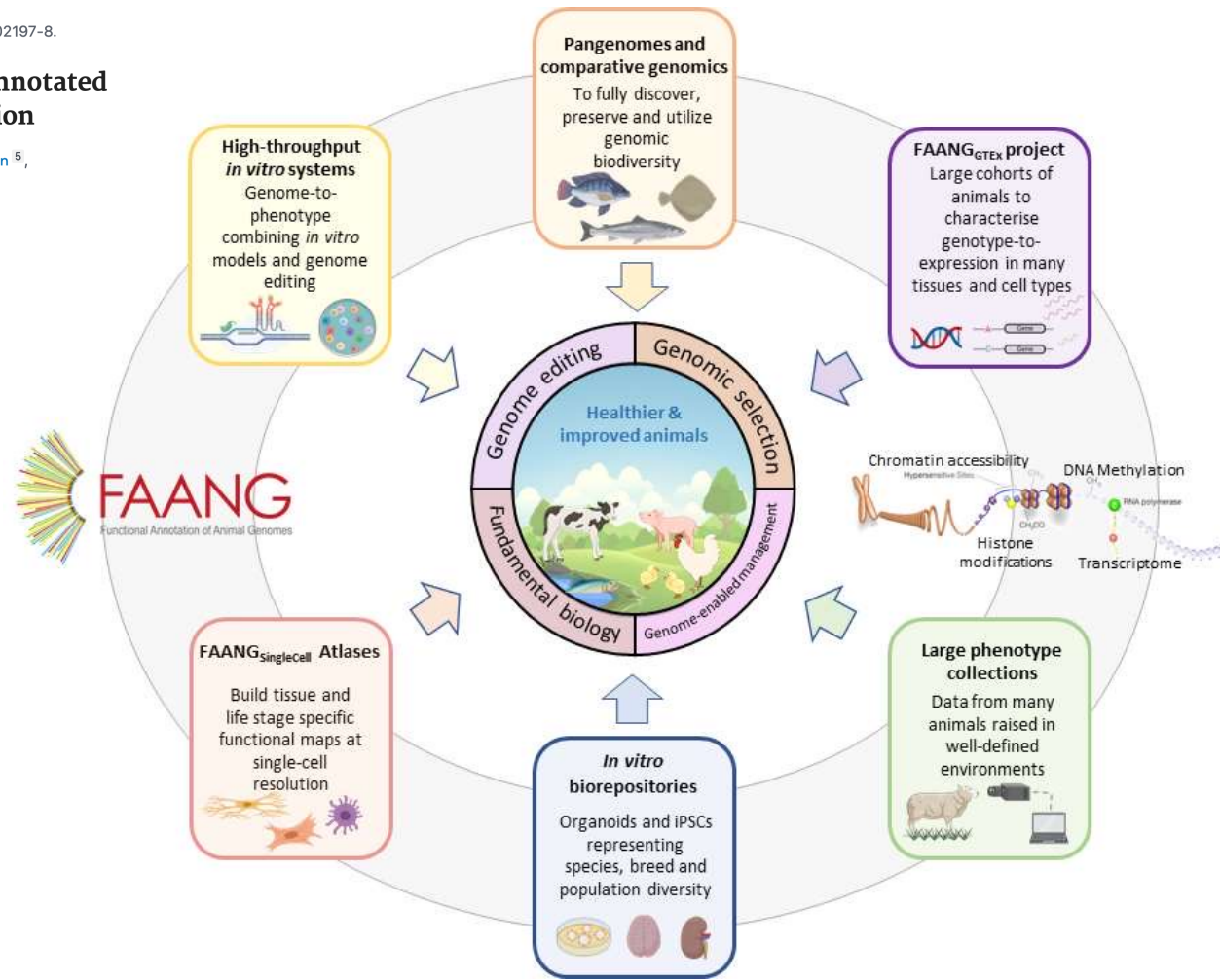
Emily L Clark¹, Alan L Archibald², Hans D Daetwyler^{3,4}, Martien A M Groenen⁵, Peter W Harrison⁶, Ross D Houston², Christa Kühn^{7,8}, Sigbjørn Lien⁹, Daniel J Macqueen², James M Reecy¹⁰, Diego Robledo², Mick Watson², Christopher K Tuggle¹⁰, Elisabetta Giuffra¹¹

FAANG Task Forces

- Accelerate creation and use of FAANG data
- Direct linking to application

Join Task Forces!

- FAANGPrediction
- metaFAIR
- FarmGTEX
- FAANGSingleCell
- FAANGCompGen
- HTP-DS



The EuroFAANG H2020 cluster of individually funded projects



Research aims

- ✓ Increase efficiency through precision breeding
- ✓ Increase disease resistance
- ✓ Minimise environmental impact

Joint strategies

- ✓ Communication & Dissemination
- ✓ Training
- ✓ Research Methodology



More recently funded
EuroFAANG Research Infrastructure
Project



The EuroFAANG RI Project – A European infrastructure for farmed animal genotype to phenotype research

Horizon Europe infrastructure concept development project

Run time: 2023 - 2025

Coordinator: FBN, Germany

Co-Coordinator: University of Edinburgh, United Kingdom

Includes many activities to build the RI concept:

- Summer school on cellular models at INRAE Sept 2023
- ‘Think tanks’ on *in vitro* systems and genome editing
- Biobanking and other surveys
- Stakeholder workshops and global networking events
- Establishing an Elixir community for ‘Domestic Animal Genomes and Phenomes’

Aim: Establish the concept for an infrastructure to facilitate research and innovation for genotype to phenotype research in farmed animals to achieve sustainable, efficient and socially accepted farmed animal production in Europe



EuroFAANG Workshop at the EAAP Meeting in Lyon, France, August 2023



Measuring success: lots of data created and deposited!



> Front Genet. 2021 Jun 17:12:639238. doi: 10.3389/fgene.2021.639238. eCollection 2021.

The FAANG Data Portal: Global, Open-Access, "FAIR", and Richly Validated Genotype to Phenotype Data for High-Quality Functional Annotation of Animal Genomes

Peter W Harrison ¹, Alexey Sokolov ¹, Akshatha Nayak ¹, Jun Fan ¹, Daniel Zerbino ¹, Guy Cochrane ¹, Paul Filcek ¹

Data Portal

FAANG is the Functional Annotation of ANimal Genomes project. We are working to understand the genotype to phenotype link in domesticated animals.

This data portal will help find and browse FAANG's data. Let us know what you think at faang-dcc@ebi.ac.uk.

Using this site

The [Organisms](#) page lets you search for any organism in the FAANG data set. We use the individual animal that has contributed a biological specimen. Click an item in the list to see

The [Specimens](#) page lets you search for any specimen in the FAANG data set. We use the biological material originating from a particular organism. Click an item in the list to see full

The [Dataset](#) page lets you search for any dataset in the FAANG data set. We use the term "dataset" to mean the Study concept used in ENA (also referred as a Project). Click an item in the list to see full details of the dataset.

The [File](#) page lets you search for any experiment files in the FAANG data set. We use the term "file" to mean any experiment assay file that has been submitted to a public archive. Click an item in the list to see full details of the file.

The [Search](#) page lets you search across different types of data tables. It enables custom search allowing you to join tables and select specific columns. Click an item in the results list to see full details.

Summary Stats (FAANG only)

15 Species
17,920 Specimens
55,924 Files
156 Datasets

156 Datasets

54 RNA-seq
29 ChIP-seq
24 ATAC-seq
12 miRNA-seq
7 Whole Genome seq
6 Hi-C
5 CAGE
3 ISO-seq
2 snATAC-seq

It's good to share

FAANG is committed to the FAANG Data Sharing

FAANG is also committed to providing analysis results to provide access to the wider community.



The FAANG Data Coordination Centre has received funding from the [European Union's Horizon 2020](#) research and innovation program under Grant Agreement Nos. 815668, 817923 and 817998, and also from the [Biotechnology and Biological Sciences Research Council](#) under Grant Agreement No. BB/N019563/1.



Collaboration prior to publication requires trust and trust is easier with rules on sharing!

*Purpose: **Rapid sharing** of the sample metadata and raw data generated by the consortium with the wider community is a priority and **has great value.***

All FAANG public data are released under Fort Lauderdale and Toronto principles:

For FAANG data producers:

All sample metadata and raw data will be submitted to the public archives, without any hold until publication date, *as soon as possible after sampling or data generation and initial quality control checks.*

For FAANG data consumers:

FAANG data creators provide these data pre-publication to encourage data reuse. *They reserve the right to first publication of the results obtained from using a dataset in genome wide analysis.* If you are unsure if you are allowed to publish on a dataset, please contact the FAANG Data Coordination Centre and FAANG consortium.



Functional Annotation of ANimal Genomes (FAANG) Project
— A coordinated international action to accelerate Genome to Phenome

The FAANG Data Sharing Statement

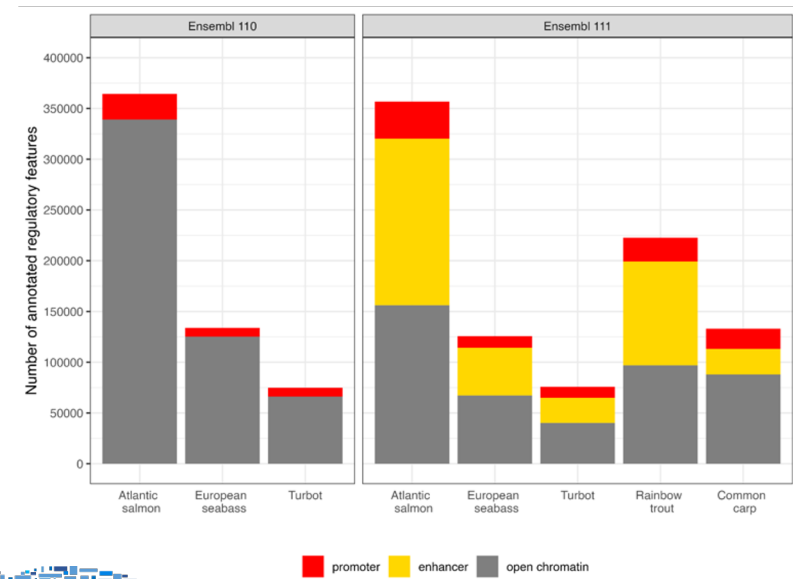
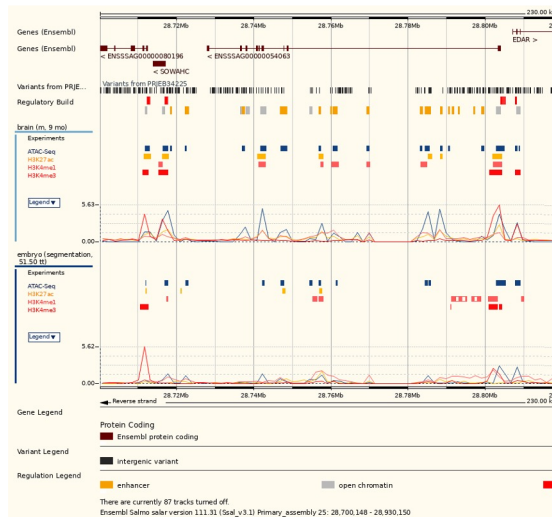
Version 2.0
(December 1, 2021)

<https://www.animalgenome.org/community/FAANG/data-share-principle>



Measuring success- FAANG Data driving Ensembl annotations

- Broad, deep, open and richly described FAANG data driving new and updated Ensembl annotations.
- In collaboration with EuroFAANG projects, Ensembl has released the regulatory annotations for Chicken, Pig and 5 commercially important fish.



promoter enhancer open chromatin



Measuring success- FAANG papers published

PubMed search for “FAANG” returned 43 relevant results*

Review/correspondence

(3 reviews, white paper, meeting report)

Listed below if created or used FAANG data:

Bioinformatic Resources:

FAANG Data Portal	Harrison et al. 2021
AgAnimalGenomes	Triant et al. 2021
TAGADA	Kurylo et al. 2023

Tissue Resources

INRA-UC pilots	Tixier-Bouchard et al. 2021
Horse (mares)	Burns et al. 2018
Horse (stallions)	Donnelly et al. 2021

*** Only if FAANG acronym used in paper!**

Multi-species

Foissac et al. 2019
Kern et al. 2021
Robic et al. 2021
De Vos et al. 2023
Halstead et al. 2020

Individual species (multi-species not counted)

Horse	6 papers
Cattle	4 papers
Sheep	4 papers
Pig	3 papers
Chicken	1 paper
Sea bream	1 paper
Flatfish	1 paper
Goat	1 paper
Buffalo	1 paper



What is needed for FAANG to succeed in the next 10 years?

Need

Complete and publish existing “resource” project results

Organize second-level analyses

- Comparative
 - Fxn through evo conservation/diversity
- Demonstrate value for sustainable genetic improvement
 - Test data inclusion into models
 - Population-level testing
- Enliven Task Force efforts
 - collaborate across Task Forces

Sustain a FAANG community infrastructure for:

- Data sharing
- Communication within FAANG
- Communicate to the public

Action to accomplish

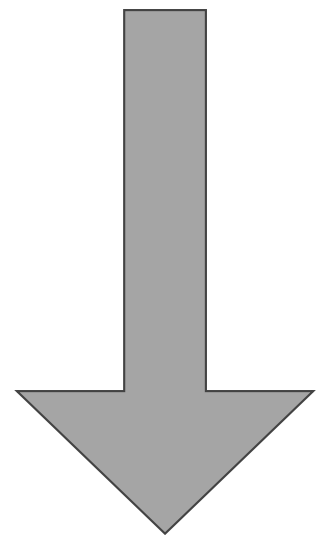
Finish analyses and complete manuscripts!

Hold topic-specific Workshop(s) to organize effort?



International Research Consortium?

Increasing organizational complexity!





Acknowledgments

All FAANG Consortium members!

Major Funding Sources



Many project-specific/species-specific funders

