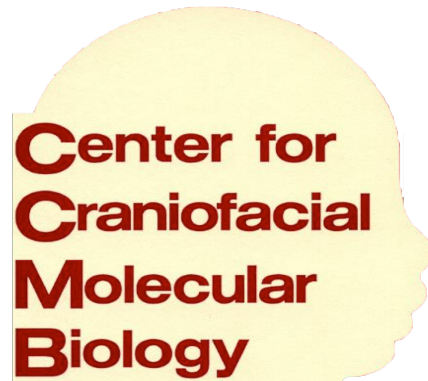


FaceBase 3: A Comprehensive Resource on Dental and Craniofacial Research

Rob Schuler, Carl Kesselman, Yang Chai

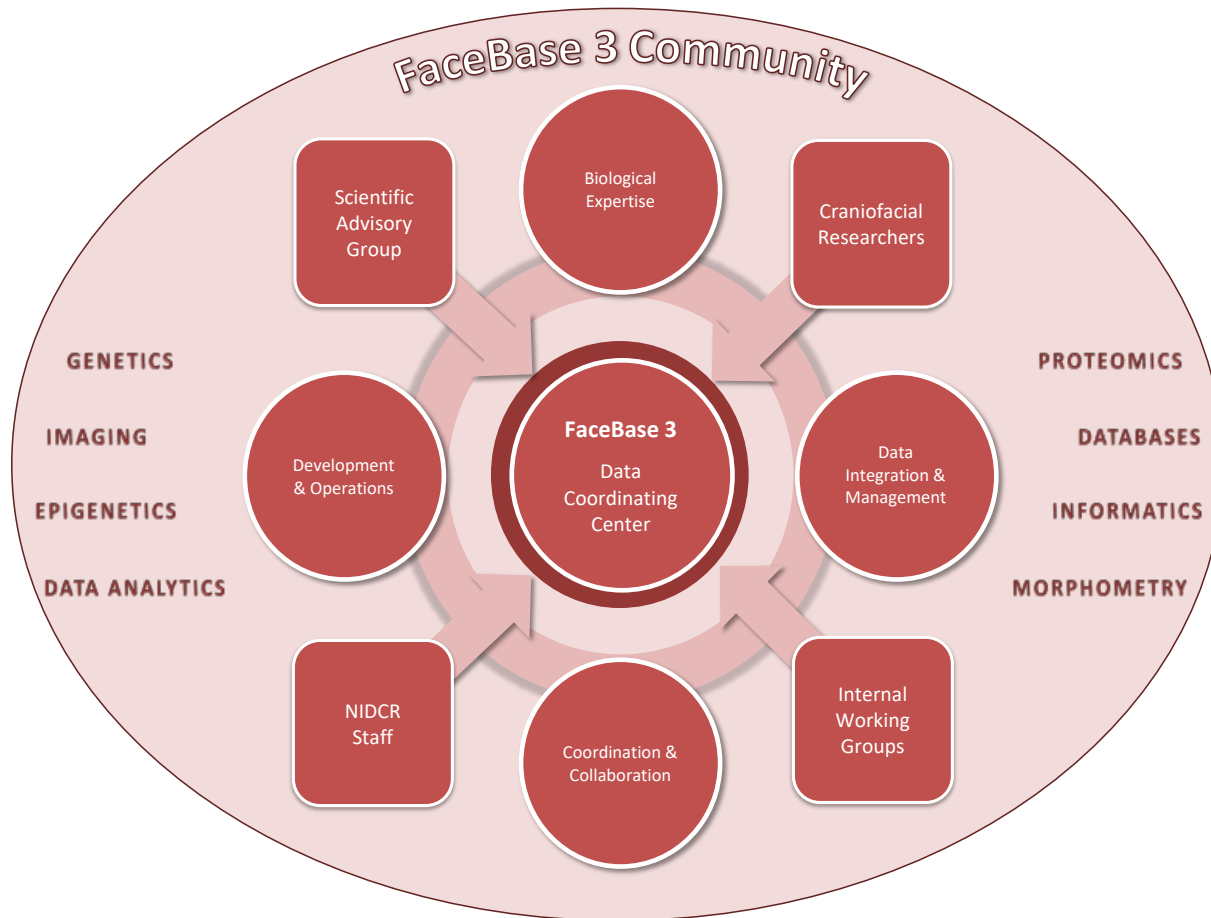
FaceBase Data Hub



Outline

- FaceBase 3 Overview
- Updates on resources available on FaceBase
- Sharing data through FaceBase

Organization and Mission

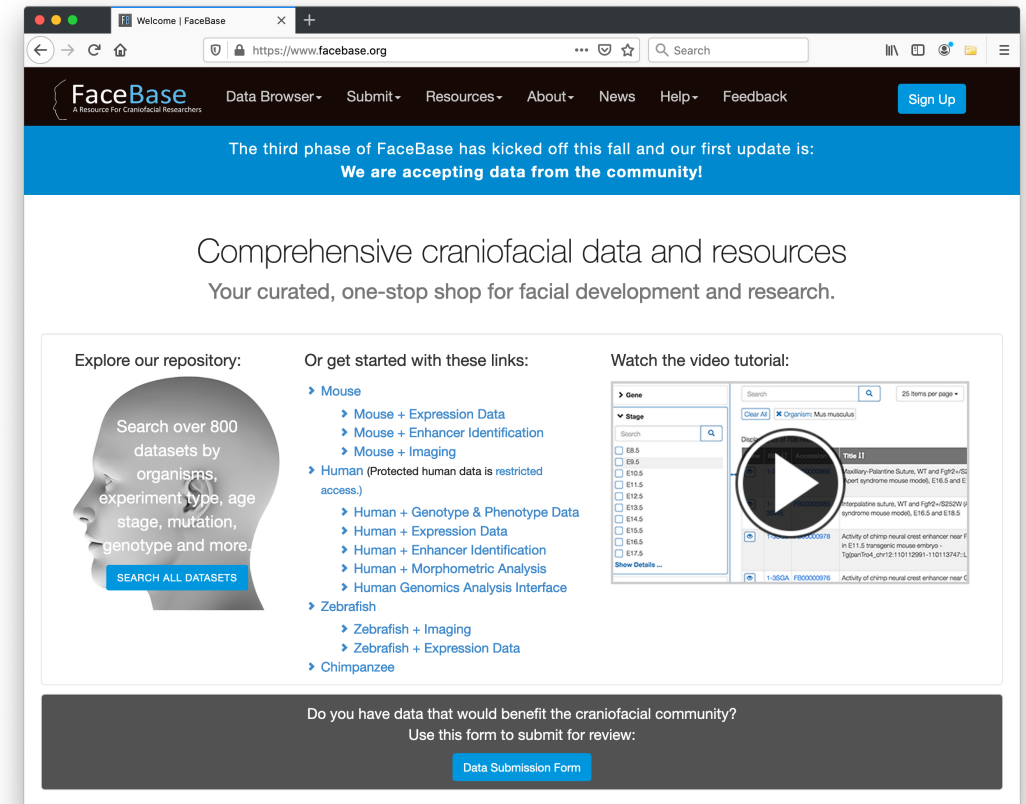


- To be a comprehensive resource on dental and craniofacial research -- fostering data sharing and curated resources.
- New objective to expand data to new experiment types, model organisms, and processes by engaging the whole community.
- FaceBase 3 is no longer a “hub and spoke” consortium but open to all researchers to participate.
- Comprised of a core team of craniofacial and computer science expertise w/ advisory and experts groups for oversight.

Status

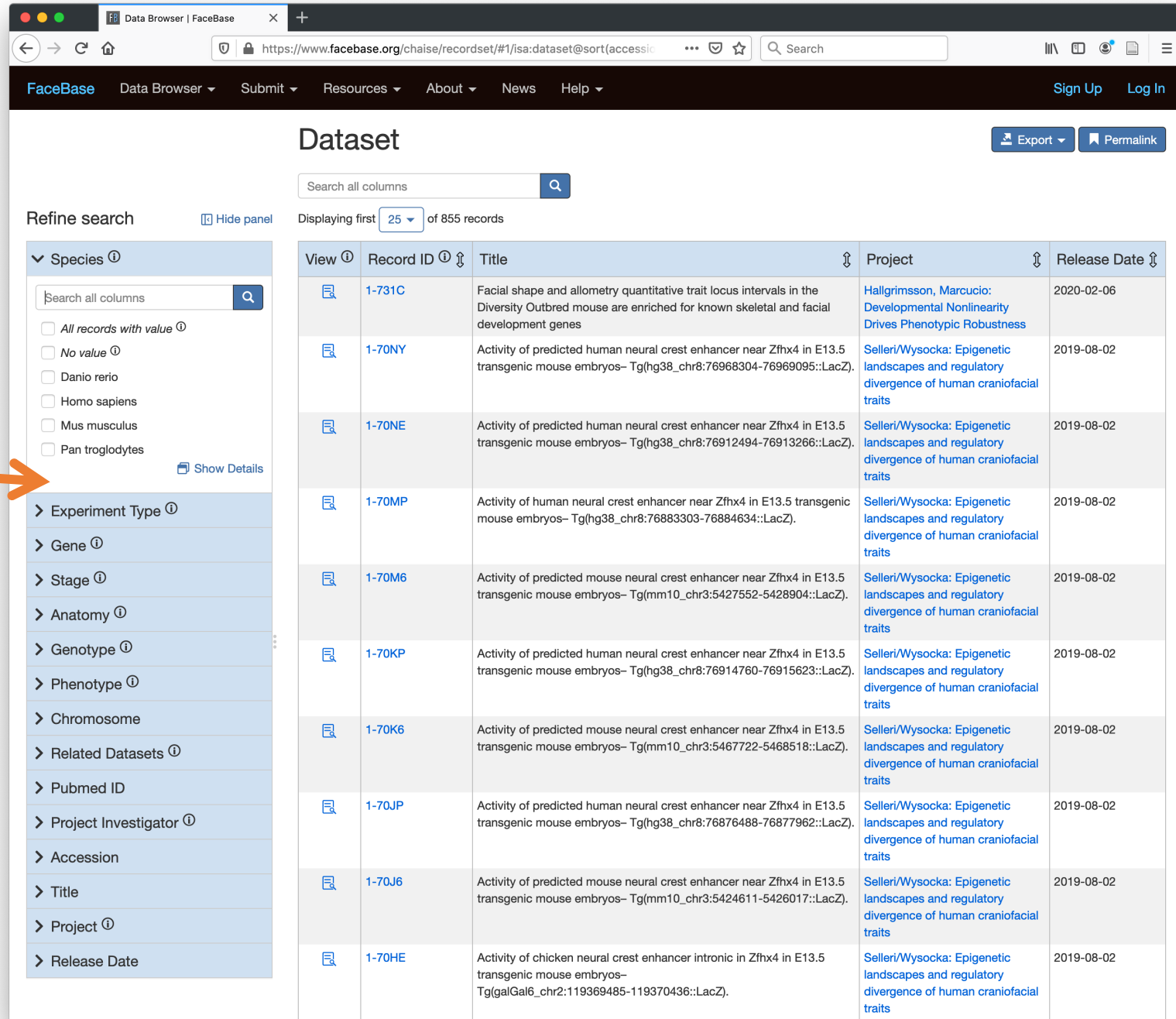
- 850+ Datasets and growing
 - 746 mouse, 70 human, 39 zebrafish, 2 other
 - 630+ imaging, 120 sequencing, and other experiment types
 - 700+ detailed experiment records
 - 3,100+ detailed biosample records
 - 3,900+ images, 3,700+ sequencing, 1,650+ tracks, and more (~10 TB)
- Usage statistics (last 6 months)
 - 7,700+ visitors, 21,000~ views
 - 695 downloads
 - 3,400+ image views
 - 84,000+ track reads

www.facebase.org



Data browser

- “Faceted Search” helps you find datasets using specific filters on species, experiment type, and other key attributes.
- Filters dynamically adjust to show you what is available – no “dead ends”
- [Data Browser Link](#)

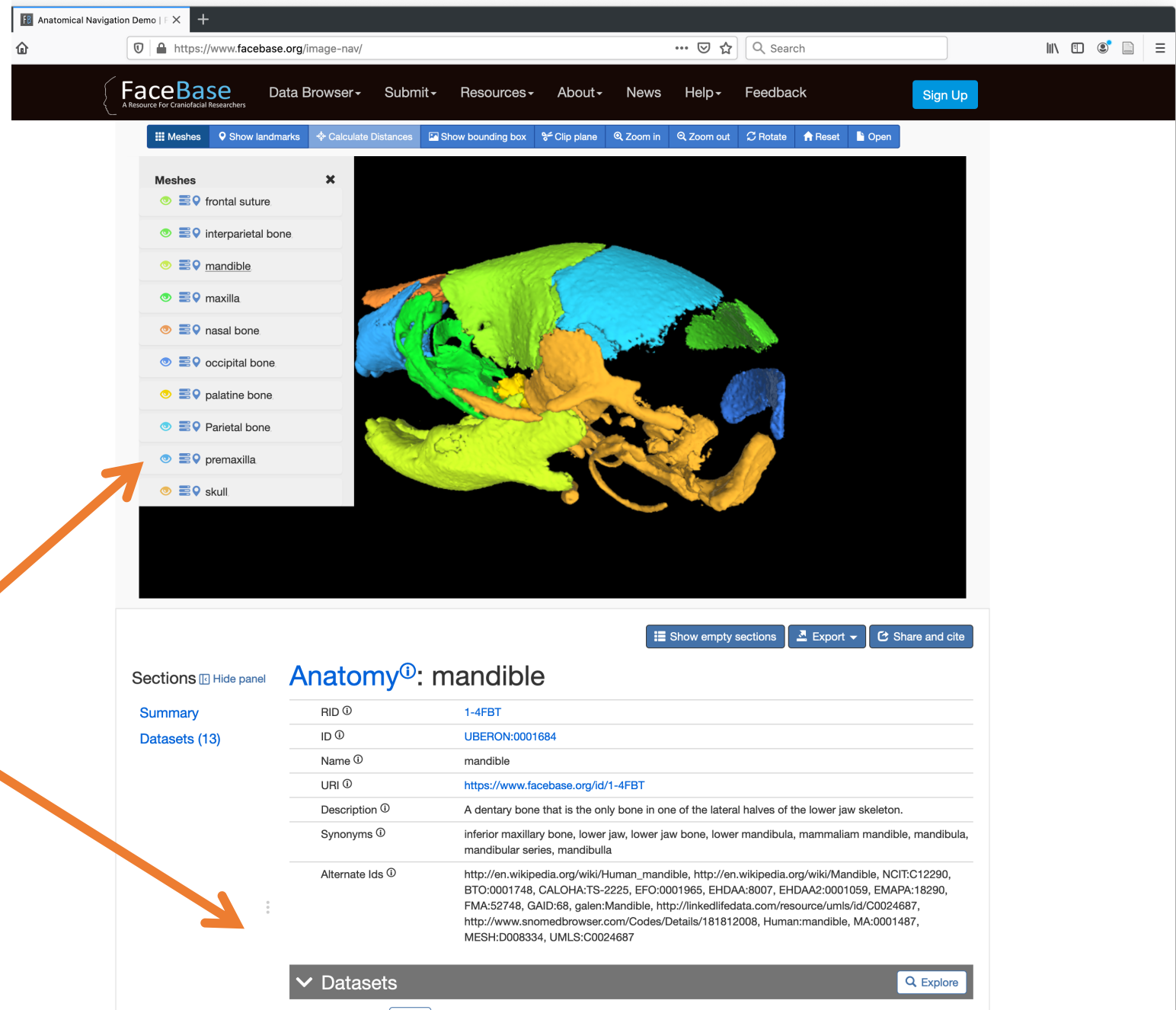


The screenshot displays the FaceBase Data Browser interface. The top navigation bar includes the FaceBase logo, a 'Data Browser' dropdown, and links for 'Submit', 'Resources', 'About', 'News', 'Help', 'Sign Up', and 'Log In'. The main heading is 'Dataset'. Below it, there's a search bar for 'Search all columns' and a status 'Displaying first 25 of 855 records'. On the left, a 'Refine search' panel is visible, featuring a 'Species' filter with a search bar and a list of species: 'All records with value', 'No value', 'Danio rerio', 'Homo sapiens', 'Mus musculus', and 'Pan troglodytes'. Below this is a 'Show Details' button. The main table has columns: 'View', 'Record ID', 'Title', 'Project', and 'Release Date'. The table lists 10 records, each with a document icon, a record ID (e.g., 1-731C, 1-70NY), a title describing the study, a project name (e.g., Hallgrimsson, Marcucio; Selleri/Wysocka), and a release date (e.g., 2020-02-06, 2019-08-02).

View	Record ID	Title	Project	Release Date
	1-731C	Facial shape and allometry quantitative trait locus intervals in the Diversity Outbred mouse are enriched for known skeletal and facial development genes	Hallgrimsson, Marcucio: Developmental Nonlinearity Drives Phenotypic Robustness	2020-02-06
	1-70NY	Activity of predicted human neural crest enhancer near Zfhx4 in E13.5 transgenic mouse embryos- Tg(hg38_chr8:76968304-76969095::LacZ).	Selleri/Wysocka: Epigenetic landscapes and regulatory divergence of human craniofacial traits	2019-08-02
	1-70NE	Activity of predicted human neural crest enhancer near Zfhx4 in E13.5 transgenic mouse embryos- Tg(hg38_chr8:76912494-76913266::LacZ).	Selleri/Wysocka: Epigenetic landscapes and regulatory divergence of human craniofacial traits	2019-08-02
	1-70MP	Activity of human neural crest enhancer near Zfhx4 in E13.5 transgenic mouse embryos- Tg(hg38_chr8:76883303-76884634::LacZ).	Selleri/Wysocka: Epigenetic landscapes and regulatory divergence of human craniofacial traits	2019-08-02
	1-70M6	Activity of predicted mouse neural crest enhancer near Zfhx4 in E13.5 transgenic mouse embryos- Tg(mm10_chr3:5427552-5428904::LacZ).	Selleri/Wysocka: Epigenetic landscapes and regulatory divergence of human craniofacial traits	2019-08-02
	1-70KP	Activity of predicted human neural crest enhancer near Zfhx4 in E13.5 transgenic mouse embryos- Tg(hg38_chr8:76914760-76915623::LacZ).	Selleri/Wysocka: Epigenetic landscapes and regulatory divergence of human craniofacial traits	2019-08-02
	1-70K6	Activity of predicted mouse neural crest enhancer near Zfhx4 in E13.5 transgenic mouse embryos- Tg(mm10_chr3:5467722-5468518::LacZ).	Selleri/Wysocka: Epigenetic landscapes and regulatory divergence of human craniofacial traits	2019-08-02
	1-70JP	Activity of predicted human neural crest enhancer near Zfhx4 in E13.5 transgenic mouse embryos- Tg(hg38_chr8:76876488-76877962::LacZ).	Selleri/Wysocka: Epigenetic landscapes and regulatory divergence of human craniofacial traits	2019-08-02
	1-70J6	Activity of predicted mouse neural crest enhancer near Zfhx4 in E13.5 transgenic mouse embryos- Tg(mm10_chr3:5424611-5426017::LacZ).	Selleri/Wysocka: Epigenetic landscapes and regulatory divergence of human craniofacial traits	2019-08-02
	1-70HE	Activity of chicken neural crest enhancer intronic in Zfhx4 in E13.5 transgenic mouse embryos- Tg(galGal6_chr2:119369485-119370436::LacZ).	Selleri/Wysocka: Epigenetic landscapes and regulatory divergence of human craniofacial traits	2019-08-02

Anatomical search

- Increasing focus on visually-guided anatomical search.
- Currently based on E18.5 wild type mouse model, but working toward other species and stages.
- **Linked to anatomical terms** and all datasets that are annotated with the term.
- [Image Navigation Link](#)
- [Example Zebrafish Dataset Link](#)



FaceBase
A Resource For Craniofacial Researchers

Data Browser ▾ Submit ▾ Resources ▾ About ▾ News ▾ Help ▾ Feedback ▾ Sign Up

Meshes Show landmarks Calculate Distances Show bounding box Clip plane Zoom in Zoom out Rotate Reset Open

Meshes

- frontal suture
- interparietal bone
- mandible
- maxilla
- nasal bone
- occipital bone
- palatine bone
- Parietal bone
- premaxilla
- skull

Sections Hide panel

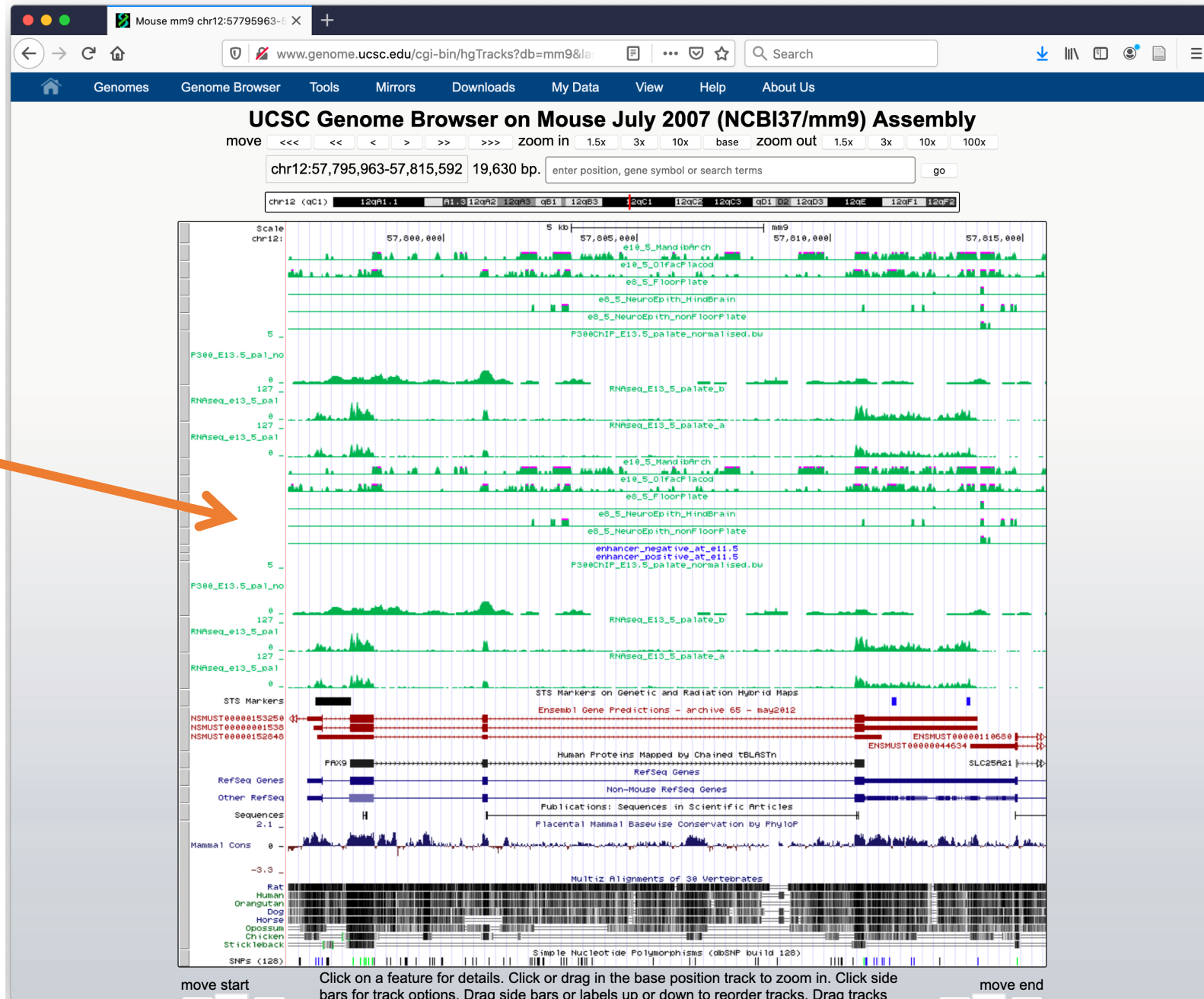
Anatomy: mandible

RID	1-4FBT
ID	UBERON:0001684
Name	mandible
URI	https://www.facebase.org/id/1-4FBT
Description	A dentary bone that is the only bone in one of the lateral halves of the lower jaw skeleton.
Synonyms	inferior maxillary bone, lower jaw, lower jaw bone, lower mandibula, mammalian mandible, mandibula, mandibular series, mandibulla
Alternate Ids	http://en.wikipedia.org/wiki/Human_mandible , http://en.wikipedia.org/wiki/Mandible , NCIT:C12290, BTO:0001748, CALOHA:TS-2225, EFO:0001965, EHDAA:8007, EHDAA2:0001059, EMAPA:18290, FMA:52748, GAID:68, galen:Mandible, http://linkedlifedata.com/resource/umls/id/C0024687 , http://www.snomedbrowser.com/Codes/Details/181812008 , Human:mandible, MA:0001487, MESH:D008334, UMLS:C0024687

Datasets Explore

Genome browser

- FaceBase Track Hub viewed on UCSC Genome Browser
- Each FaceBase dataset w/ tracks has embedded Genome Browser
- Metadata links users back to FaceBase from UCSC Browser
- [Example Dataset Link](#)



Data citation

- **Digital Object Identifier (DOI)** as stable, persistent, citable references to all FaceBase datasets
- **Data citations** formatted per leading publishers' standards and downloadable to reference managers (BibTex format)
- Proper citation improves the **dissemination** of FaceBase data
- Structured metadata records improve the **reproducibility** and **reuse** of FaceBase data.
- [Dataset Link](#)

FaceBase Data Browser | FaceBase

https://www.facebase.org/chaise/record/#1/isa:dataset/RID=2ARP

FaceBase Data Browser Submit Resources About News Help Sign Up Log In

Dataset: Intermaxillary suture, WT and Fgfr2+/S252W (Apert syndrome mouse model), E16.5 and E18.5

Show side panel

Record ID	2ARP
Accession	FB00000938
DOI	10.25550/2ARP
Title	Intermaxillary suture, WT and Fgfr2+/S252W (Apert syndrome mouse model), E16.5 and E18.5
Description	RNA-Seq library from intermaxillary suture and maxillary mesenchyme of E16.5 and E18.5 mice, at replicates (1-5), of the suture mesenchyme (SM), replicate 1, suture mesenchyme.
Contributors	<ul style="list-style-type: none">Gregory J. JabsEthylin JabsHarm Van Bokkum
Project	Holmes/Van Bokkum
Species	mouse
Experiment Type	RNA-seq assay
Gene	Fgfr2
Stage	<ul style="list-style-type: none">E16.5E18.5TS24TS26
Anatomy	intermaxillary suture
Mouse Genetic Background	C57BL/6J
Gender	male organism
Genotype	<ul style="list-style-type: none">Fgfr2+/S252W; EIIA-CreWild type

Warning The displayed content may be stale due to recent changes made by other users. You may wish to review the changes prior to sharing the [live link](#) below. Or, you may share the older content using the [versioned link](#).

Share

Close

Share Link

Versioned Link (11 hours ago)

<https://www.facebase.org/id/2ARP@2SW-QTZY-FF0J>

Live Link

<https://www.facebase.org/id/2ARP>

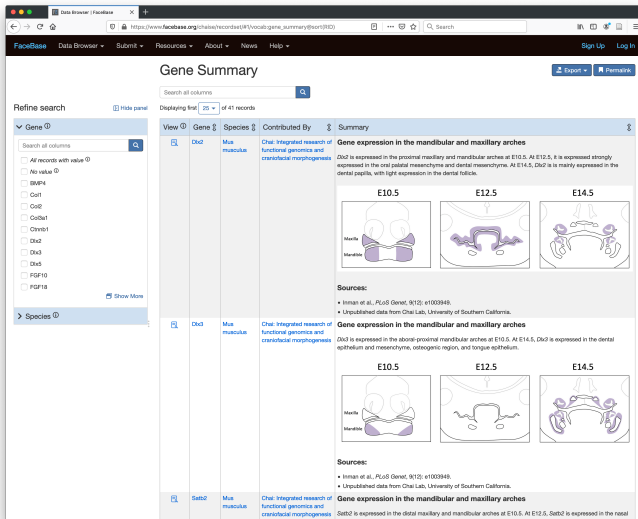
Data Citation

Holmes/Van Bakel/Jabs. Intermaxillary suture, WT and Fgfr2+/S252W (Apert syndrome mouse model), E16.5 and E18.5. FaceBase Consortium <https://doi.org/10.25550/2ARP> (2018).

Download Data Citation:

BibTex

DOI



Single Cell Sequencing - Coronal Suture
Dataset**Warning** Your login session has expired. You are not logged in.

Record ID	3TYP
Accession	FB00000970
DOI	10.25550/3TYP
Title	Single Cell Sequencing - Coronal Suture, Wild Type, E18.5 and P10.
Description	Single Cell RNA-Seq libraries were generated from the coronal suture ©. All libraries are available in the FaceBase Consortium Single Cell Gene Expression (Version 2) database.

• [Gregg Holm](#)

Share

X

Share Link

Versioned Link (a day ago) 📄

<https://www.facebase.org/id/3TYP@2SB-5XHY-AJEA>

Live Link 📄

<https://www.facebase.org/id/3TYP>

Data Citation

Holmes/Van Bakel/Jabs. Single Cell Sequencing - Coronal Suture, Wild Type, E18.5 and P10. *FaceBase Consortium* <https://doi.org/10.25550/3TYP> (2018).

Download Data Citation:

[BibTex](#)[View All Related Records](#) [Export](#) [Share](#)

Contents

[Main](#)[Contributors \(3\)](#)[Organism \(1\)](#)[Experiment Type \(1\)](#)[Stage \(3\)](#)[Anatomy \(1\)](#)[↔ Mouse Genetic Background \(1\)](#)[Genotype \(1\)](#)

Why share your data?

[Example Dataset Link](#)

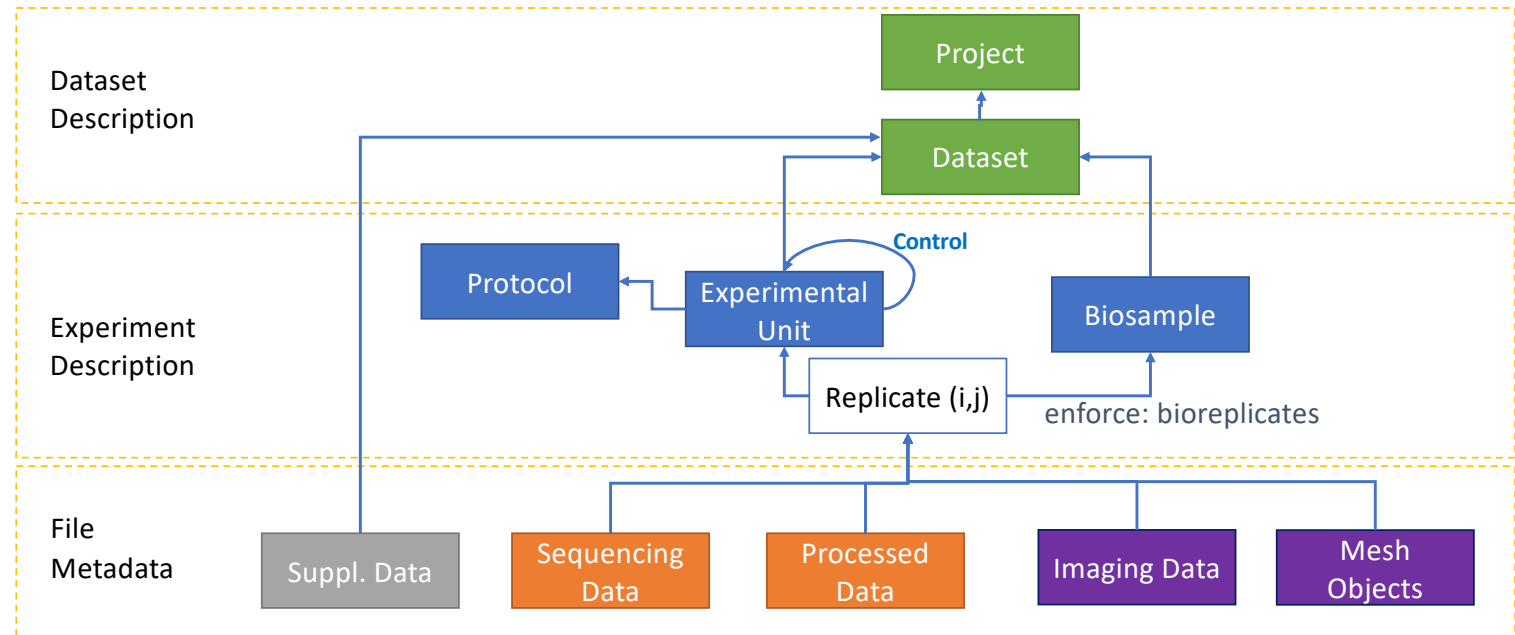
- Dedicated focus on craniofacial development
- Increase the visibility and impact of your research
- Cross-reference with publication
- Satisfy data sharing requirements for grants and publications
- Data are “published” like first-class academic works

What data are we prioritizing?

- Human, mouse, zebrafish, additionally chick and xenopus
- Gaps in existing data
 - More data on cell populations
 - Facial GWAS
 - Mouse histology, gene expression of e8.5-e10.5
 - Detailed stage transcriptional and epigenetic analysis of zebrafish and mice
- New data types
 - Single-cell RNA seq
 - Human and murine dental development
 - Spatial transcriptomics
 - Curated resource lists – antibodies, recombinant proteins, small molecules that have been authenticated for their utility in craniofacial research

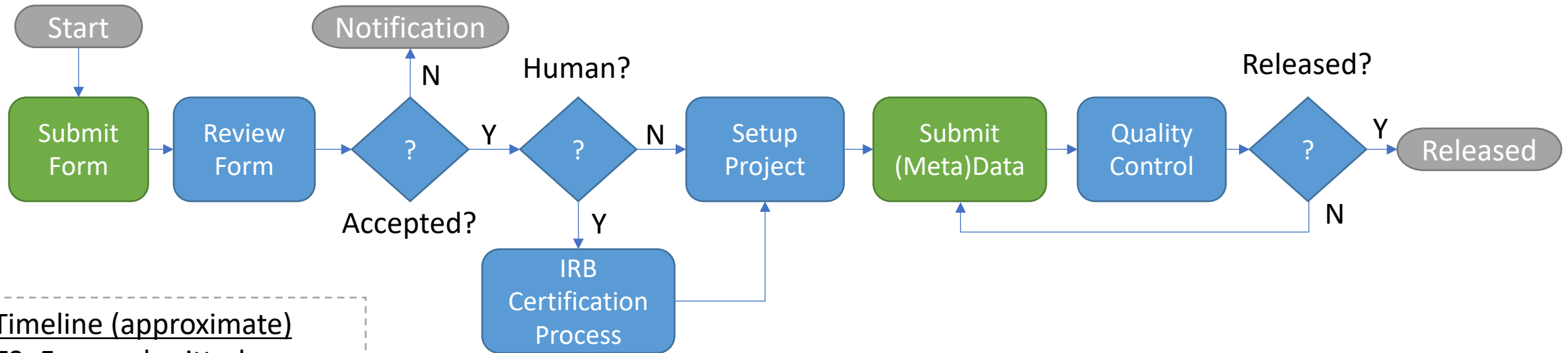
<https://www.facebase.org/submit/data-priorities/>

How are data organized?



- Dataset: the primary collection of data
- Experiment: generic experiment type (-omic, imaging, etc.)
- Biosample: details of specimen used
- Various Data: files and file metadata linked into the model

How to submit data to FaceBase?



Timeline (approximate)

T0: Form submitted

T+2 weeks: Review decision

T+3 weeks: Project setup

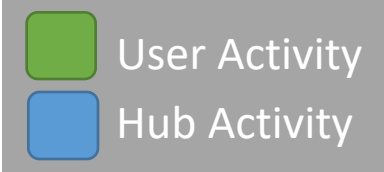
T+5 weeks: Submit data*

T+6 weeks: QC review

* Based on user averages

IRB Certification Process

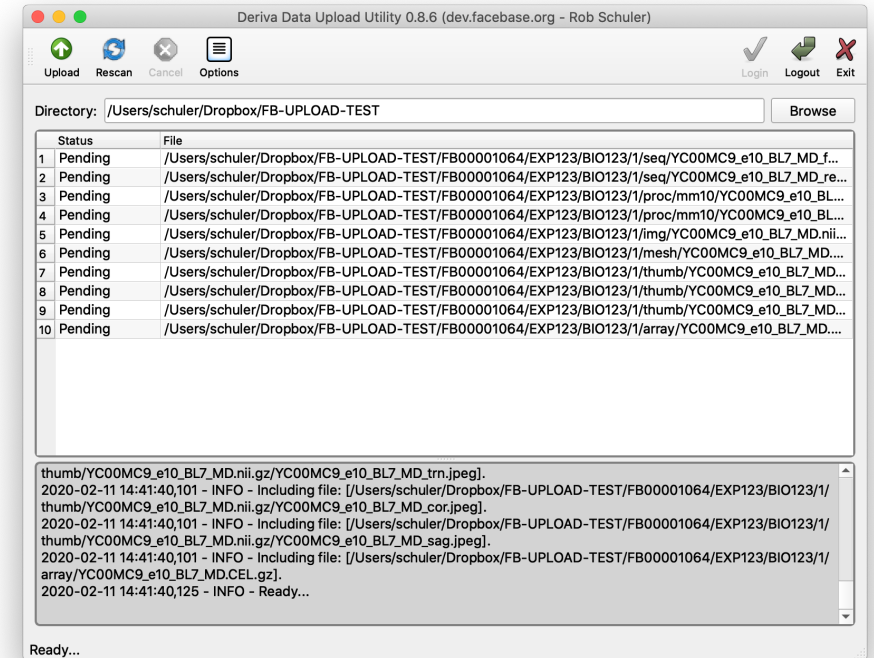
- Individual level data classified as human subjects
- Requires USC certification of your IRB decision
- Tracks are not considered restricted data
- Timeline TBD



What tools are available for curation?

The screenshot shows the 'Edit Biosample' web form in a browser. The form is titled 'Edit Biosample' and has a 'Submit' button. It contains two columns of input fields for recording sample information. The first column is for 'Record Number 1' and the second for 'Record Number 2'. Fields include Dataset, Local Identifier, Species, Specimen, Gene, Genotype, Strain, Mutation, Stage, Anatomy, Origin, Phenotype, Gender, Litter, and Collection Date. Many fields have dropdown menus or checkboxes. A note at the top left says '* Indicates required field'.

(1) Online data entry and file submission forms



(2) Graphical desktop applications for bulk data upload (mac, windows, linux)

(3) Command-line clients (mac, windows, linux) and **(4)** Python APIs (not pictured)

Researchers have submitted their own datasets with 100s to 1000s of files, usually in a few days

More information...

- Website: www.facebase.org
- Data submissions: www.facebase.org/submit/submitting-data
- Feedback: [Link from website menubar](#)
- Contact us: help@facebase.org
- Sponsor: NIH / NIDCR (U01DE028729)
- Leadership (Co-PIs): Carl Kesselman; Yang Chai
- Team: Rob Schuler (CS & Technical); Bridget Samuels (Biocuration); Alejandro Bugacov (Data); Cris Williams (Communications); Joe Hacia (Bioinformatics); Thach Vu Ho (Data curation)



Poster
#73