

Using Digital Images and Data in Botanical Research

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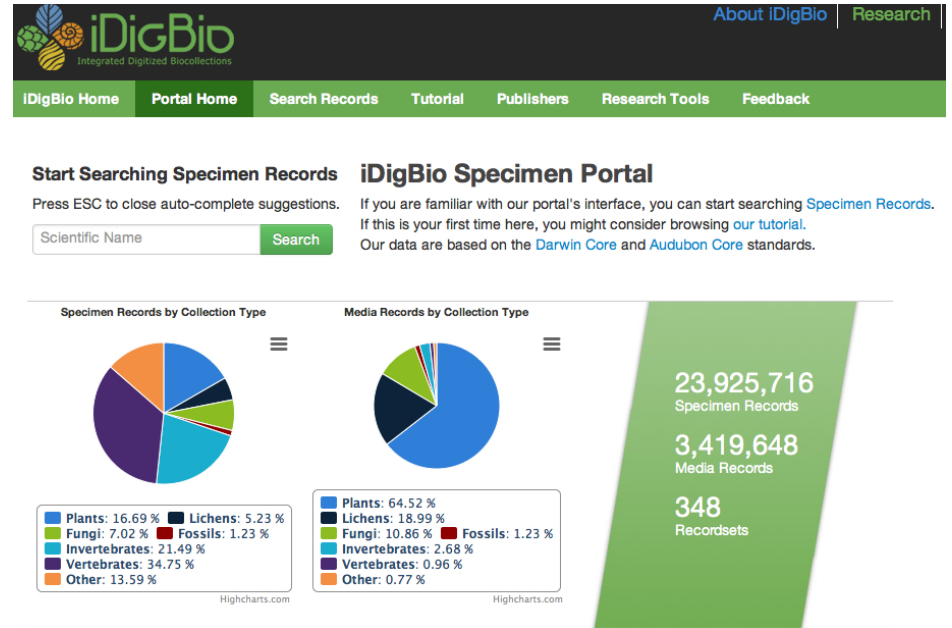
Collections: The Library of Life

>1600 natural history
collections
in the US alone
1-2 billion specimens
in the US
3-4 billion specimens
worldwide



Research @ iDigBio

- Specimen portal



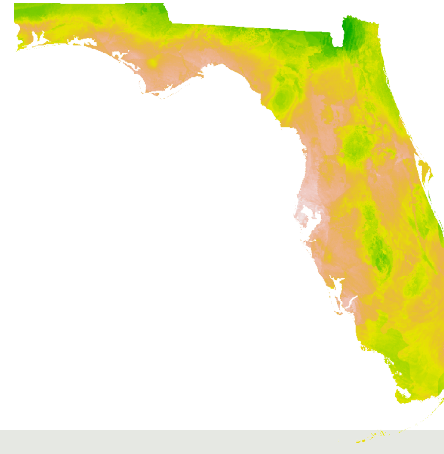
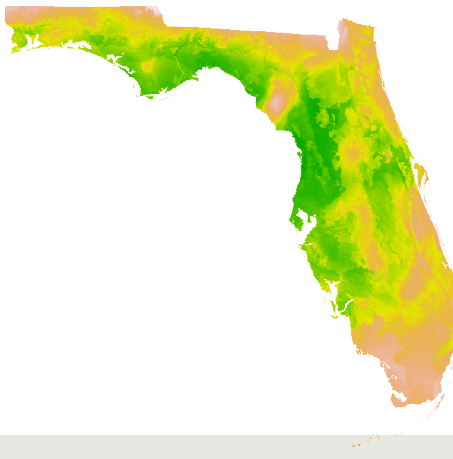
The screenshot shows the iDigBio Specimen Portal interface. At the top, there is a navigation bar with links for 'iDigBio Home', 'Portal Home', 'Search Records', 'Tutorial', 'Publishers', 'Research Tools', and 'Feedback'. Below the navigation bar, there is a search section titled 'Start Searching Specimen Records' with a search box labeled 'Scientific Name' and a 'Search' button. To the right of the search box, there is a brief introduction to the portal and a note about data standards.

Below the search section, there are two pie charts showing the distribution of records by collection type. The first chart is titled 'Specimen Records by Collection Type' and the second is titled 'Media Records by Collection Type'. Both charts show a similar distribution of records across various biological groups.

On the right side of the interface, there is a green vertical bar displaying the total number of records:

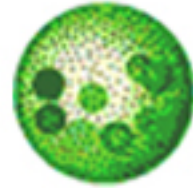
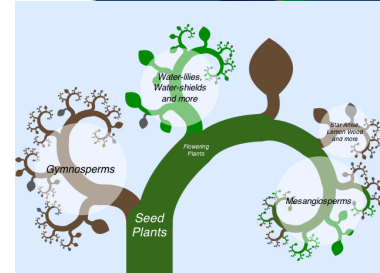
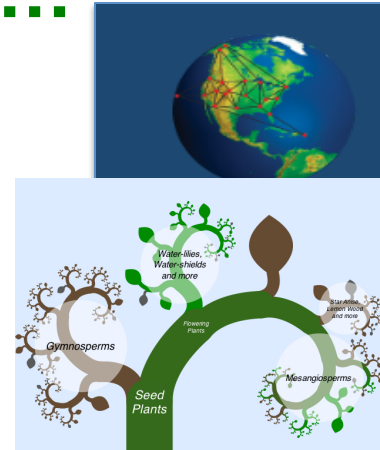
- 23,925,716 Specimen Records
- 3,419,648 Media Records
- 348 Recordsets

- Computational workflows



Linking Collections to...

- Phylogeny
- Ecology
- Paleontology
- Living Collections
- Genomics
- Other Repositories



UTEX



Ecological Niche Modeling: locality information

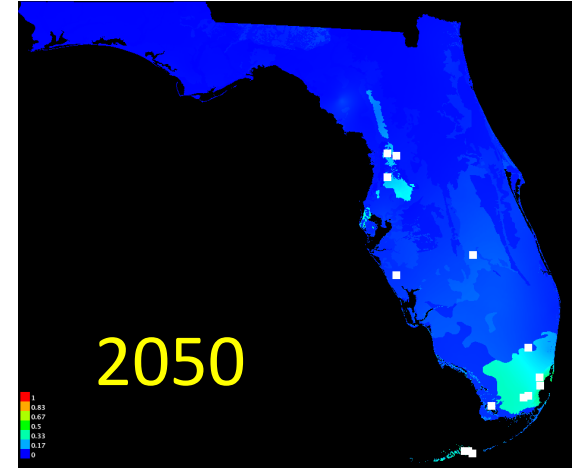
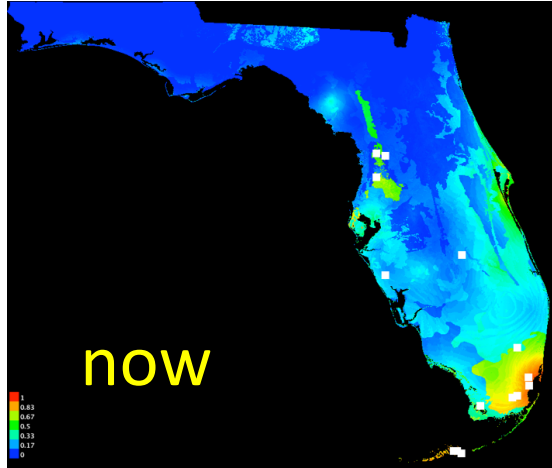


GEOLocate  29.65, -82.32

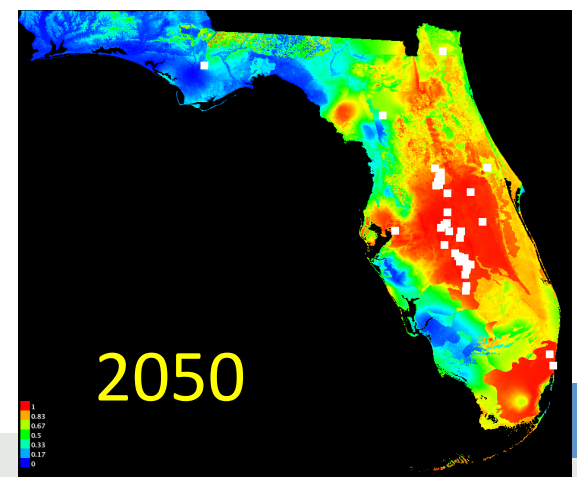
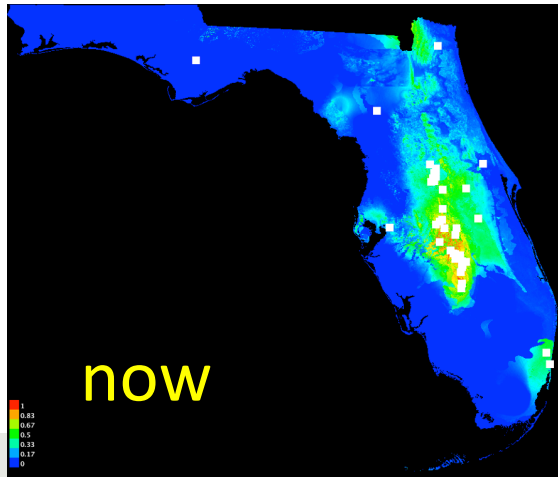
number,dwc:preparations,dwc:identifica-
tionVerificationStatus,idigbio:subfamily,i-
digbio:preparationCount,fcc:pickedBy,d-
wc:eventRemarks,dwc:VerbatimEventDa-
te,dwc:associatedReferences,idigbio:end-
angeredStatus,dwc:locationAccordingTo,
dwc:georeferenceSources,dwc:associate-
dSequences,dwc:formation,dwc:higherC-
lassification,dwc:catalogNumber,dwc:ve-
rbatimSRS,dwc:higherGeography,dwc:in-
dividualCount,dwc:decimalLongitude,dw-
c:datasetName,dwc:month,dwc:georefe-
rencedBy,dwc:eventTime,dwc:identifica-
tionQualifier,idigbio:

Responses to Climate Change: past, present, future

Abildgaardia ovata (flatspike sedge)

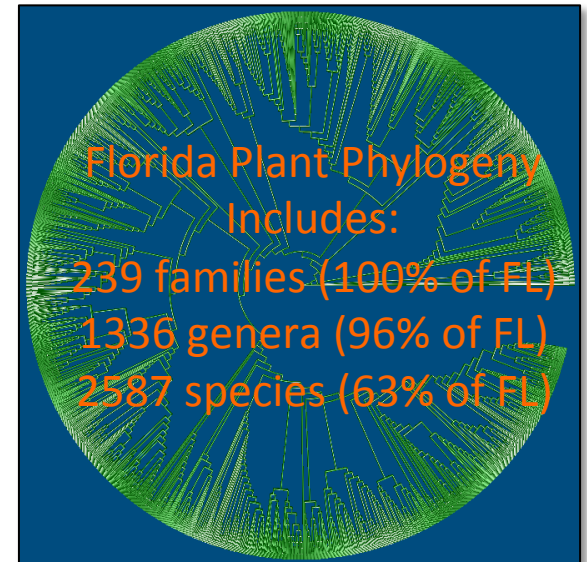


Prunus geniculata (scrub plum)



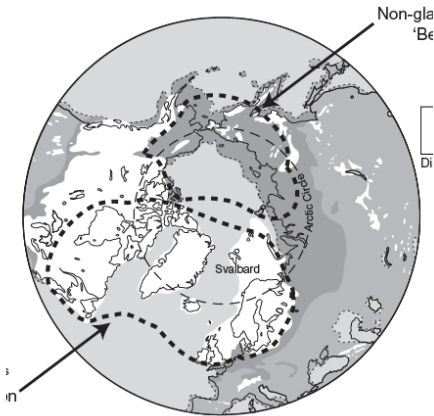
Florida Plant Diversity in a Changing Climate

Integrating herbarium specimen data, ENM, climate change models, and phylogeny



Charlotte Germain-Aubrey

Distributions of Polyploids and their Diploid Progenitors



- Do polyploids have broader 'ecological amplitude' and/or ranges than diploid parents?
- ENM for polyploids and parents
- Predicted distributions under models of climate change
 - Will polyploids and diploids respond in similar ways?



Blaine Marchant

Linking to Phylogeny

The screenshot shows the OneZoom website interface. At the top is a navigation bar with the following links: OneZoom, Home, Embed, Software, Impacts, News, About, Gallery, and Future. The main content area features a stylized phylogenetic tree diagram. The tree is rooted in a thick green stem labeled "Seed Plants". From this stem, three main branches emerge: a brown branch on the left labeled "Gymnosperms", a central green branch labeled "Flowering Plants", and a brown branch on the right labeled "Mesangiosperms". The "Flowering Plants" branch further divides into two sub-branches: a green one labeled "Water-lilies, Water-shields and more" and a brown one labeled "Star Anise, Lemon Wood and more". The "Mesangiosperms" branch also divides into two sub-branches: a green one labeled "Mesangiosperms" and a brown one labeled "Star Anise, Lemon Wood and more". At the bottom of the screenshot, a dark grey bar contains the text "Click to see how OneZoom works".

OneZoom Home Embed Software Impacts News About Gallery Future

Water-lilies, Water-shields and more

Star Anise, Lemon Wood and more

Gymnosperms

Flowering Plants

Mesangiosperms

Seed Plants

Click to see how OneZoom works

PhyloJIVE

Links biodiversity data to trees
Joe Miller & Garry Jolley-Rogers
phylojive.ala.org.au/



[Species](#) [Locations](#) [Collections](#) [Mapping & analysis](#) [Data sets](#) [Blogs](#) [Get involved](#)

[Home](#) → [Phylojive](#)

Phylojive

PhyloJive ([Phy](#)logeny [J](#)avascript [I](#)nformation [V](#)isualiser and [E](#)xplorer) is a web based application that places biodiversity information aggregated from many sources onto compact phylogenetic trees.

The project is the brainchild of [Garry Jolley-Rogers](#) and [Joe Miller](#) and was developed by Temi Varghese and [Garry Jolley-Rogers](#) as part of the [Taxonomy Research & Information Network \(TRIN\)](#) – see the [original project page](#), [original code repository](#) and [ALA code repository](#). The ALA has contributed to the PhyloJive codebase to integrate a number of web services: occurrence data, maps and character data from Identify Life. This work has been undertaken with help and advice from [Joe Miller](#).

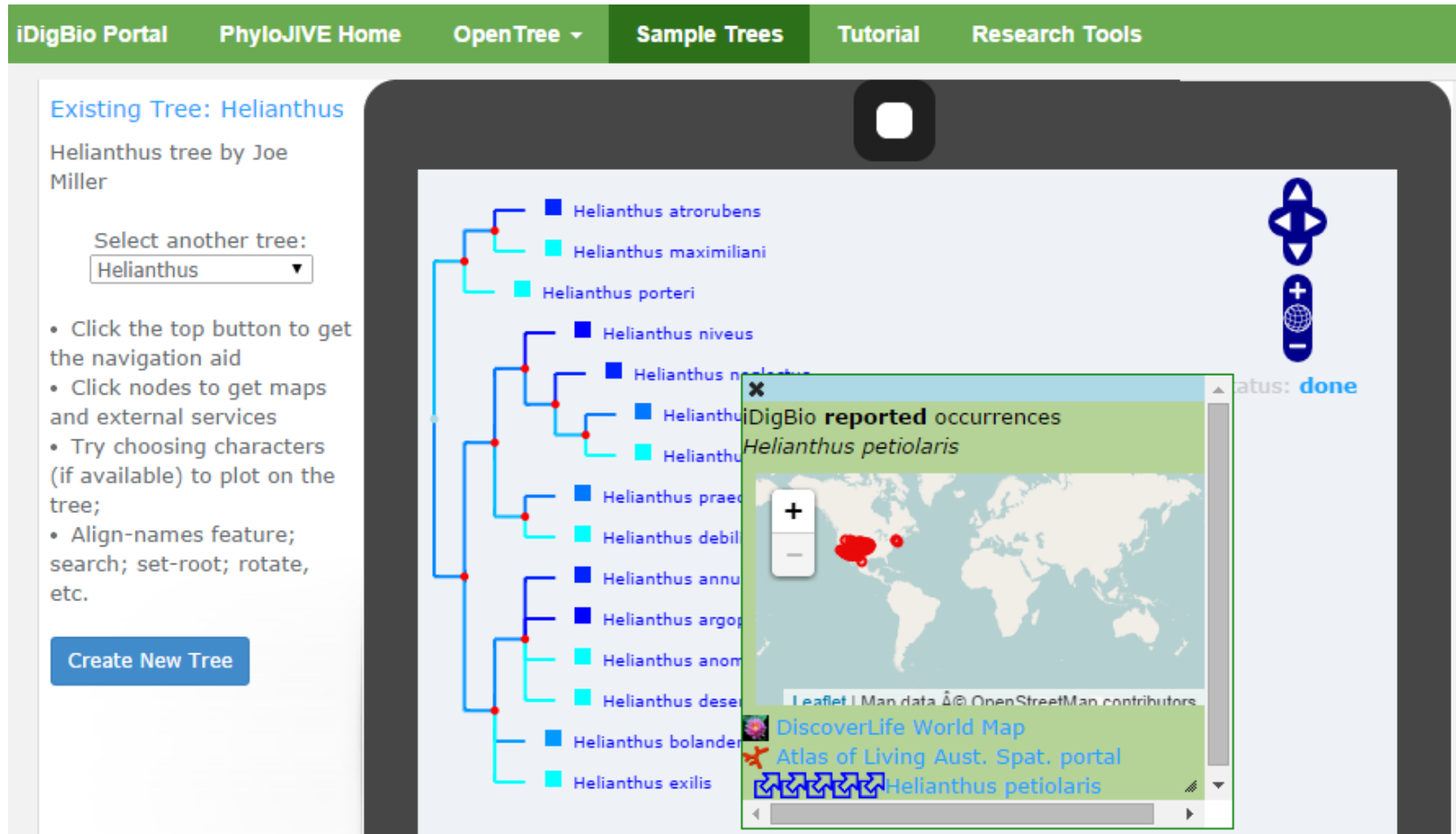
The [getting started](#) page outlines the steps for creating a new phylogenetic tree and contains demo data sets that can be used to get up and running.



A. buxifolia

Source: Australian Plant
Image Index
Image by: Macdonald, C.

PhyloJIVE instance in iDigBio



The screenshot displays the iDigBio Portal interface for a PhyloJIVE instance. The navigation bar includes links for iDigBio Portal, PhyloJIVE Home, OpenTree, Sample Trees (selected), Tutorial, and Research Tools. The main content area shows an 'Existing Tree: Helianthus' by Joe Miller. A dropdown menu allows selecting another tree from the 'Helianthus' genus. A list of species is shown on the left, including Helianthus atrorubens, Helianthus maximiliani, Helianthus porteri, Helianthus niveus, Helianthus mollis, Helianthus scaberrimus, Helianthus praecox, Helianthus debilis, Helianthus annuus, Helianthus argophyllus, Helianthus anomus, Helianthus desertorum, Helianthus bolanderi, and Helianthus exilis. A map window is open, showing 'reported occurrences' for Helianthus petiolaris in the western United States. The map includes a search bar, zoom controls, and a status bar with the text 'status: done'. The map data is attributed to Leaflet and OpenStreetMap contributors. Links for DiscoverLife World Map, Atlas of Living Aust. Spat. portal, and Helianthus petiolaris are also visible.

- Developed by Garry Jolley-Rogers, Joe Miller, and Temi Varghese
- Integrates biodiversity data with phylogeny
- <http://phylojive.acis.ufl.edu/>

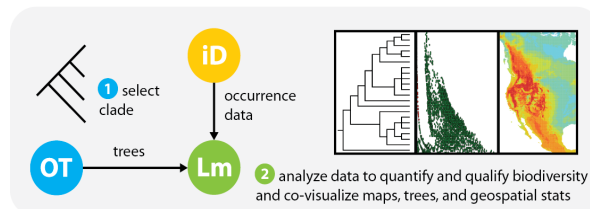
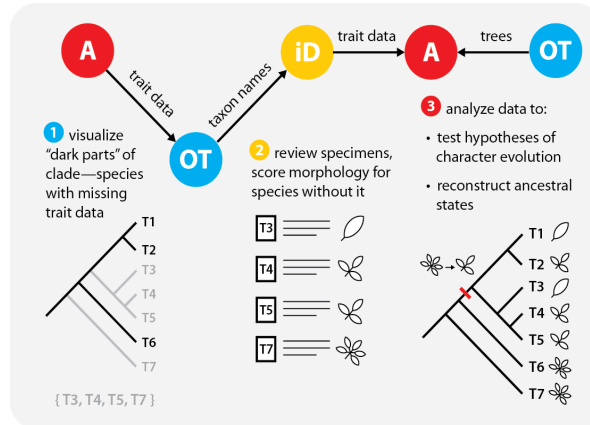
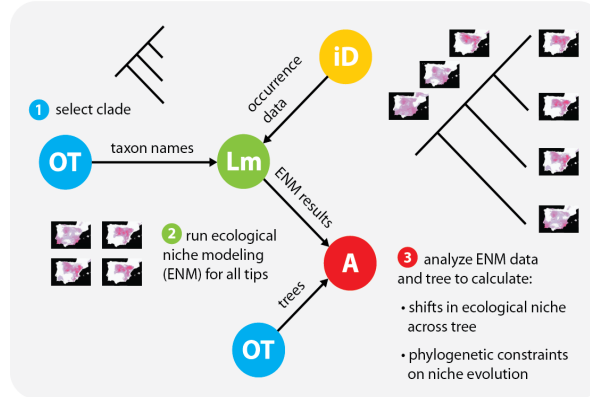
A. Matsunaga

Connecting Trees, Specimens, Tools, Data



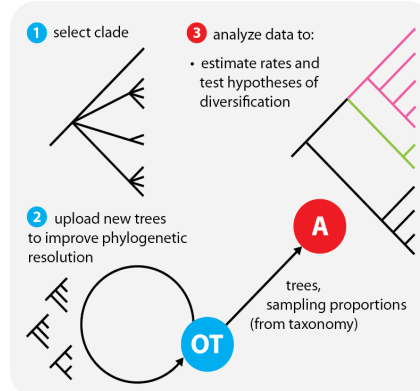
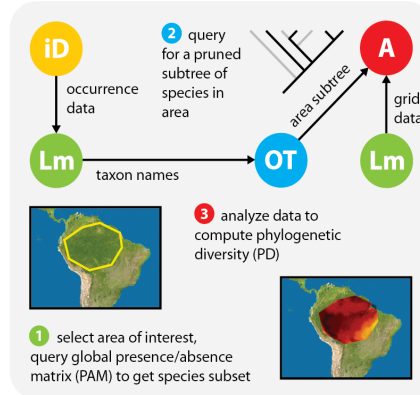
Connecting Trees, Specimens, Tools, Data

EXAMPLE WORKFLOWS:



RESOURCES:

- Lm** Lifemapper
 - ecological niche modeling
 - biodiversity and range analysis
 - visualization
- A** Arbor
 - evolutionary models
 - comparative methods
 - visualization
- OT** Open Tree of Life
 - phylogenies
 - taxonomy / names
 - visualization
- iD** iDigBio
 - trait data
 - specimen data / images
 - fossil data / images



Connecting Trees, Specimens, Tools, Data

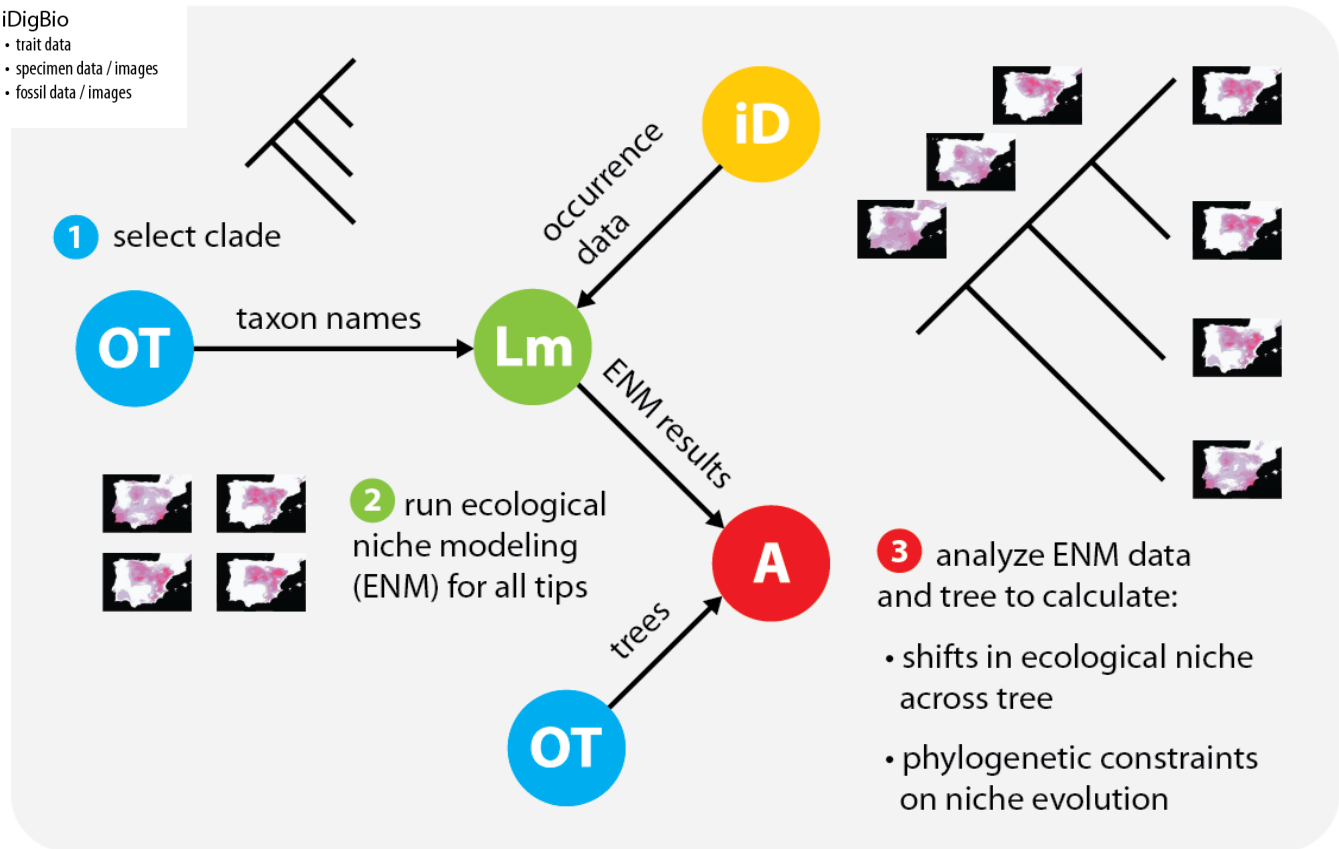
RESOURCES:

- Lm** Lifemapper
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- A** Arbor
- evolutionary models
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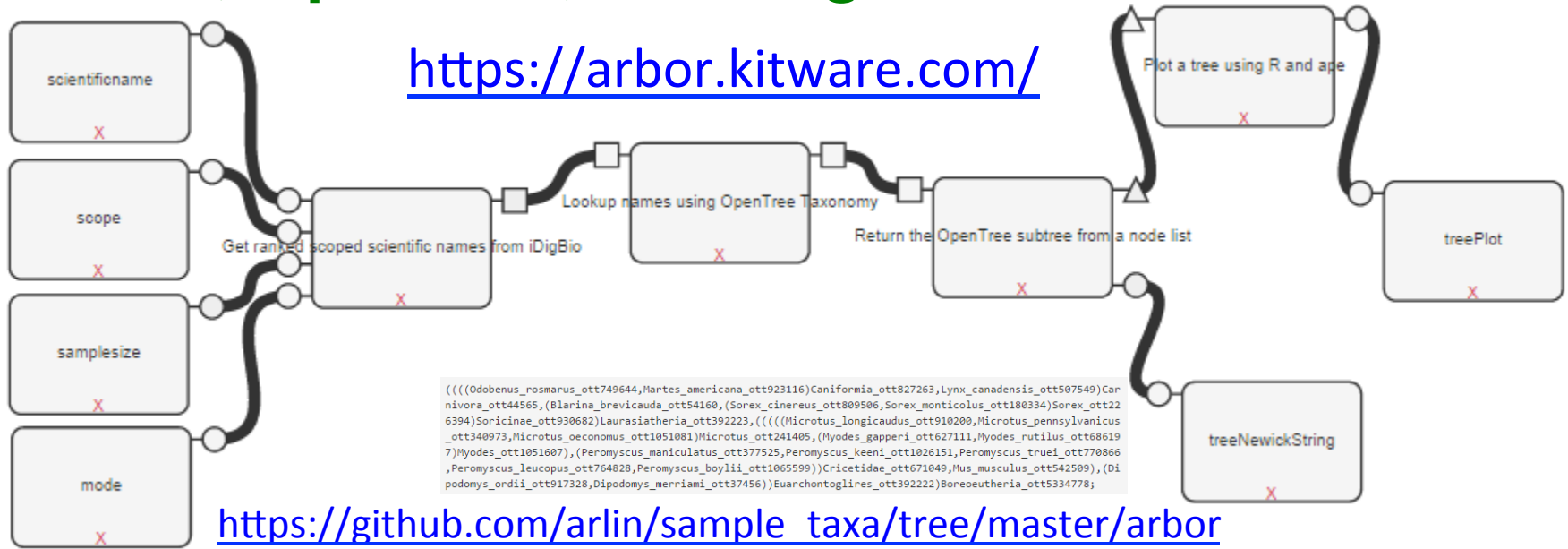
- OT** Open Tree of Life
- phylogenies
 - taxonomy / names
 - visualization

- iD** iDigBio
- trait data
 - specimen data / images
 - fossil data / images



Arbor, OpenTree, and iDigBio

<https://arbor.kitware.com/>



https://github.com/arlin/sample_taxa/tree/master/arbor

Workflow to get an induced tree from a configurable iDigBio query

scientificname
Mammalia

scope
_all

samplesize
20

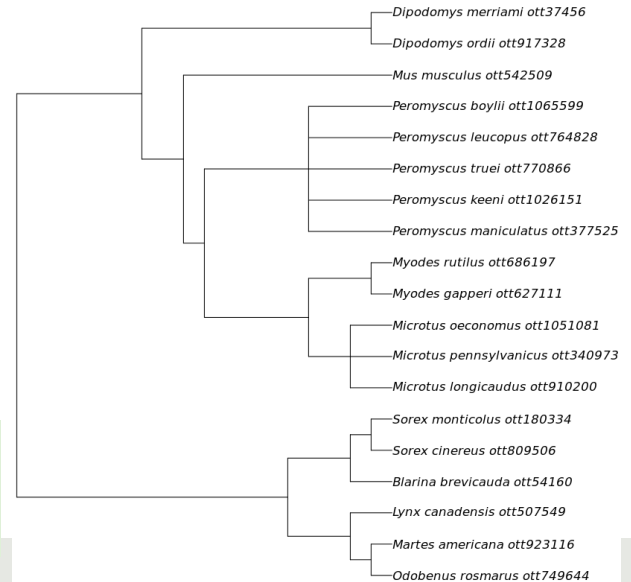
mode
top

Run Close

```

1 {
2   "query": {
3     "query_string": {
4       "default_field": "order",
5       "query": "rodentia"
6     }
7   },
8   "aggregations": {
9     "my_agg": {
10      "terms": {
11        "field": "scientificname",
12        "size": 100
13      }
14    }
15  }
16 }
  
```

- Success! Produced the following outputs:
- Workflow to get an induced tree from a configurable iDigBio query treeNewickString [string]
 - Workflow to get an induced tree from a configurable iDigBio query treePlot [image]



TRY

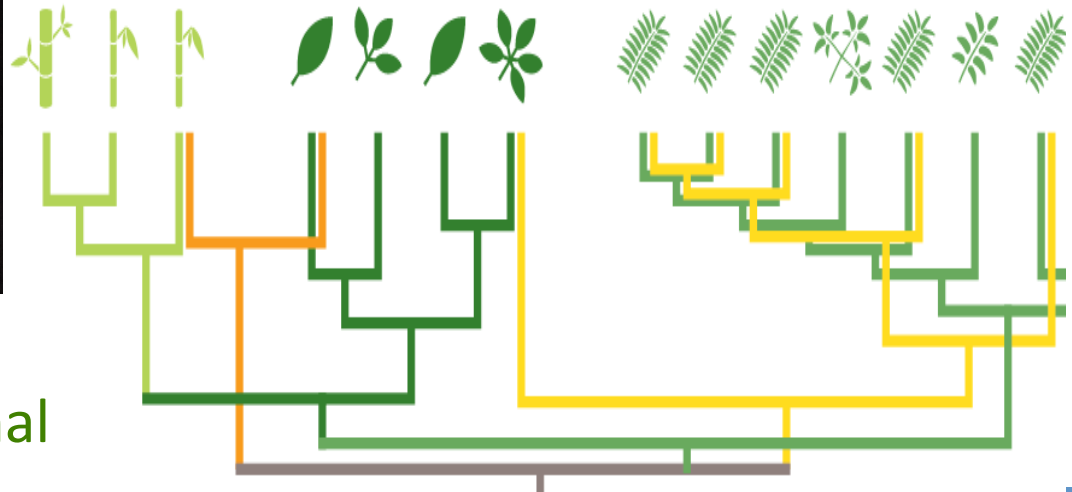
Plant Trait Database

PhotosyntheticPathway
Respiration LeafArea NfixationCapacity
SLA RegenerationCapacity PlantLifespan
WoodDensity GrowthForm
PhenologyType LeafN
LeafP LeafLongevity PhotosyntheticCapacity
MaxPlantHeight SeedMass

Using Images to Infer Functional Traits

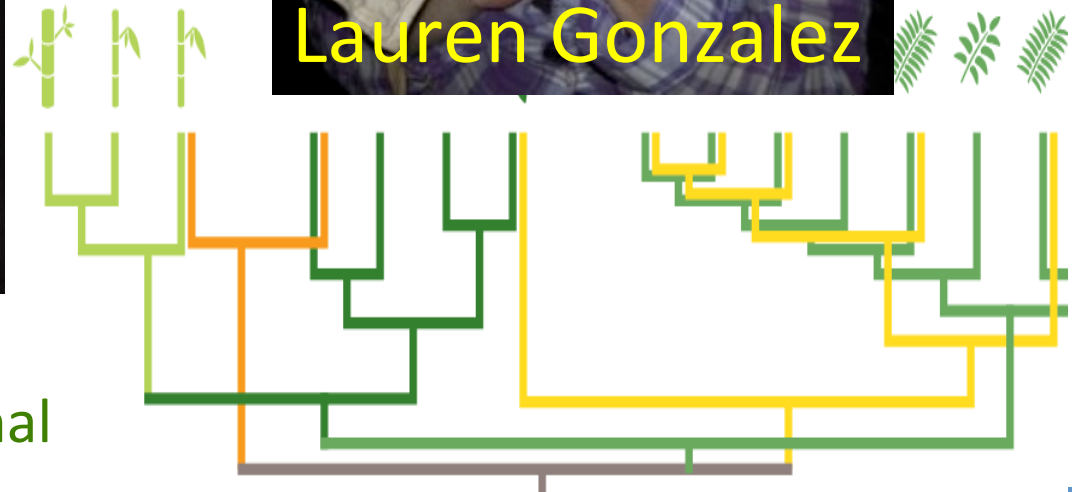


Photosynthetic Pathway
 Respiration Leaf Area Nfixation Capacity
 SLA Regeneration Capacity Plant Lifespan
 Wood Density Growth Form
 Phenology Type Leaf N
 Leaf P Leaf Longevity Photosynthetic Capacity
 Max Plant Height Seed Mass



Connect to ecology
 Evolution of plant functional
 traits

Using Images to Infer Functional Traits



Connect to ecology
Evolution of plant functional
traits

Many Uses for Specimen Data in Research

- Connections to other resources, e.g. GenBank
- Ecological Niche Modeling
- Integration with phylogeny, e.g. PhyloJIVE
- Complex integration of phylogeny, specimens, ENM, other heterogeneous data
- Images as sources of traits for ecological studies
- Others???

Thank you!



www.idigbio.org

psoltis@flmnh.ufl.edu



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<webcal://www.idigbio.org/events-calendar/export.ics>