

Traits from Herbarium Specimens: Some Examples

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Phenological Data from Labels and Images

- Connections between ecology and phylogeny
- Using specimen images as sources of traits
 - e.g., phenology
 - Other traits from image
 - Traits from text on label
- Our example from Eastern Asia - Eastern North America

Specimens as a Source of Trait Data



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Making data and images of millions of biological specimens available on the web

109,836,467

Specimen Records

23,929,096

Media Records

1,556

Recordsets

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Why digitization matters

More about what we do and why



Digitization

Learn, share and develop best practices



Sharing Collections

Documentation on data ingestion



Working Groups

Join in, contribute, be part of the community



Proposals

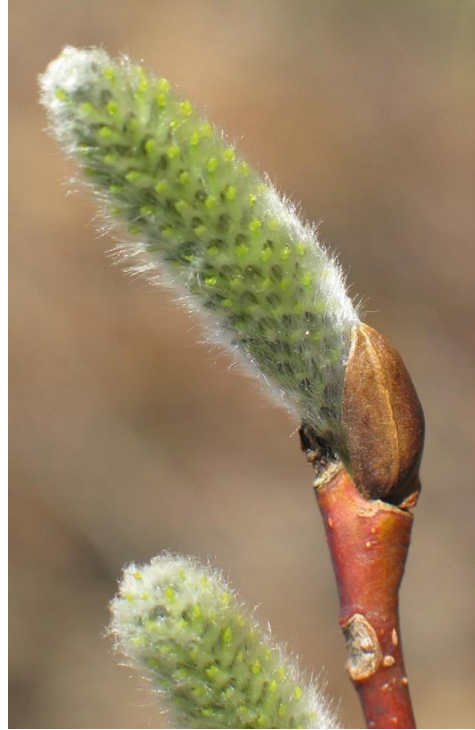
New tool and workshop ideas



Citizen Scientists

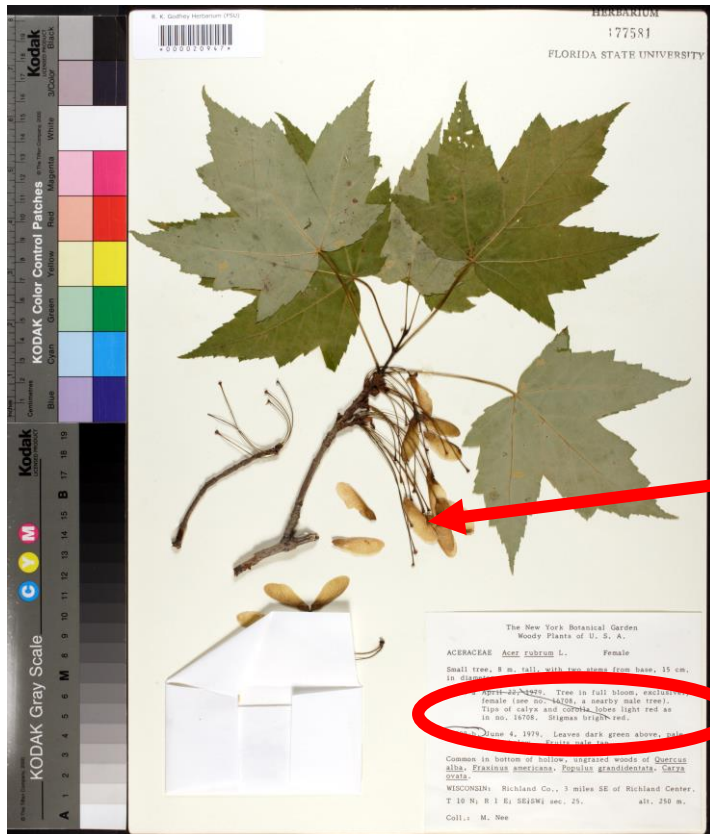
How can you help biological collections?

Phenology: Bud Burst, Flowering, Fruiting



Phenological Data from Labels and Images

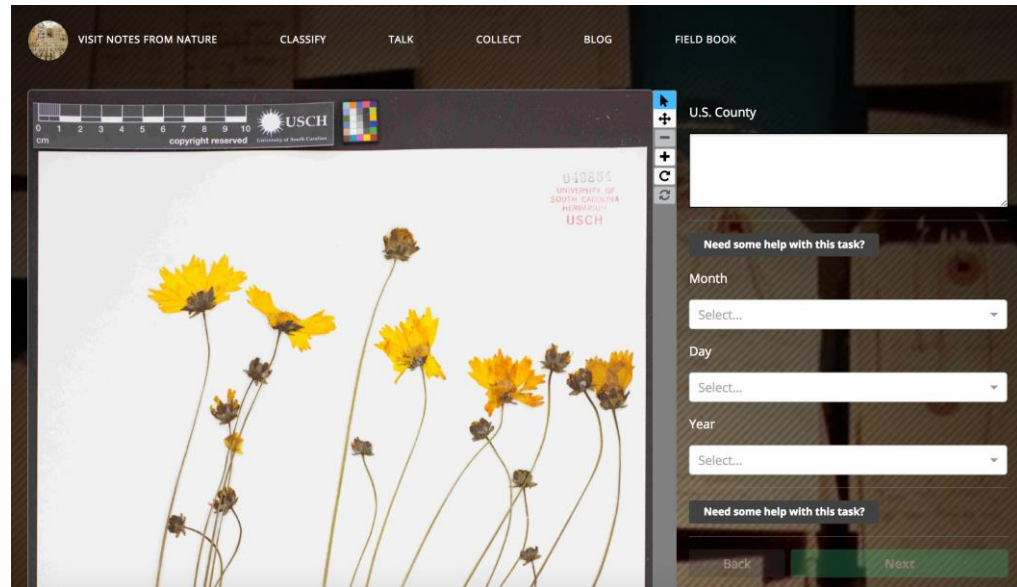
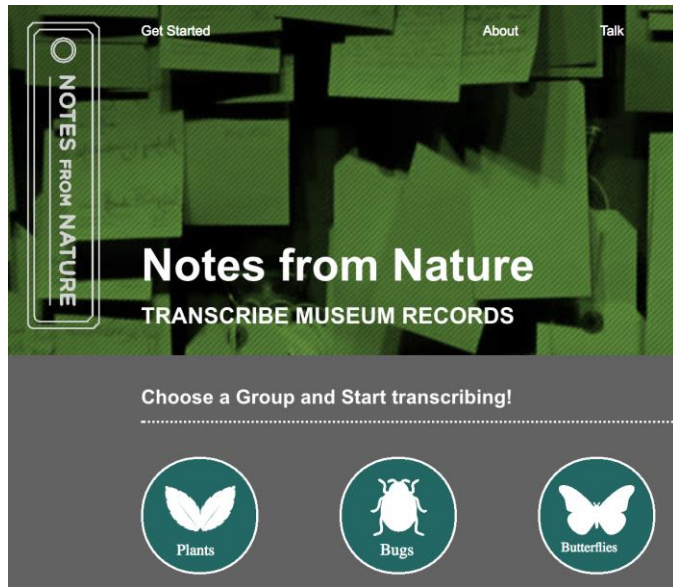
Phenological data - as described in label notes



“tree in full fruit...”

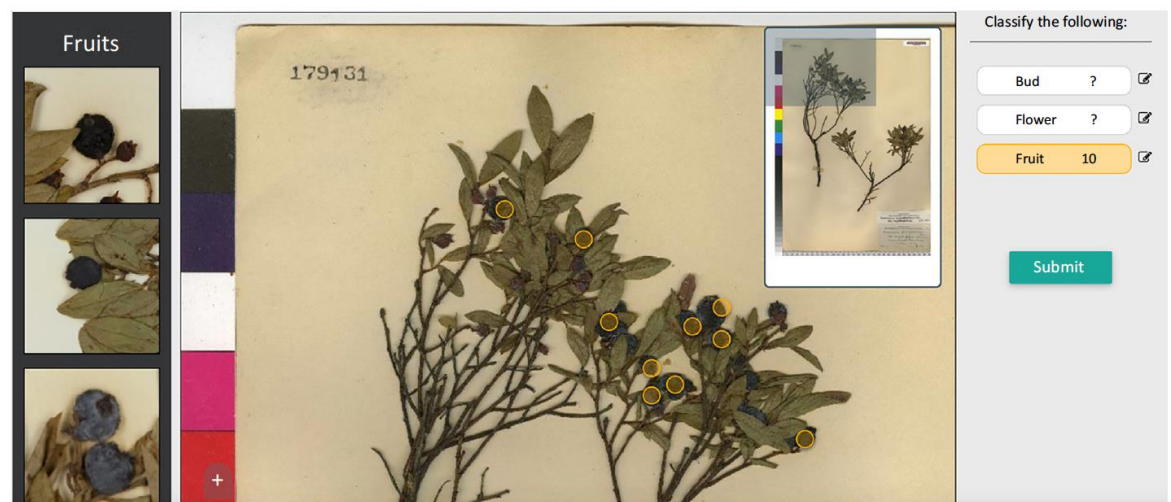
or from image itself

Phenology: Engaging Citizen Scientists



Notes from Nature
Guralnick, Allen, et al.

CrowdCurio, in
Willis et al. 2017



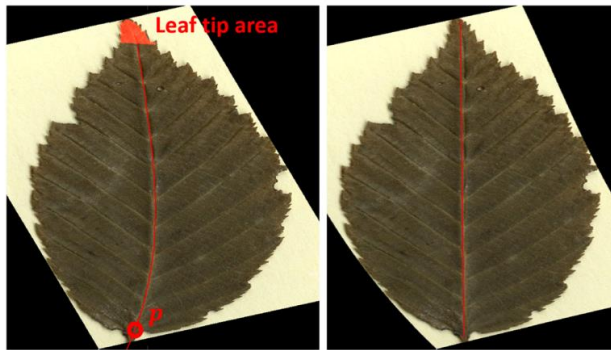
Traits from Labels, Images, & Text

Machine Learning: Herbarium specimens

Classifying German trees to species

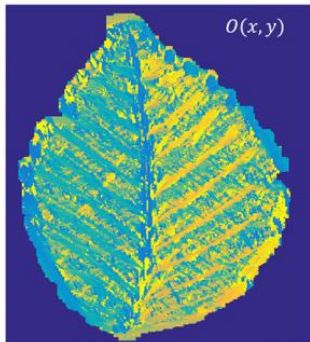
Leaf shape, venation

85% accuracy

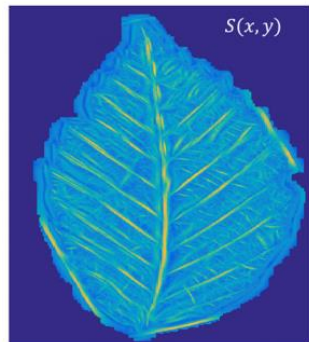


(a)

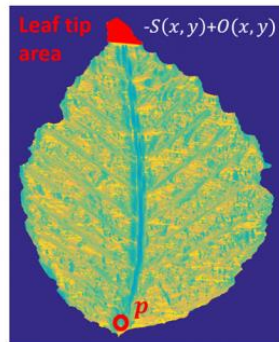
(b)



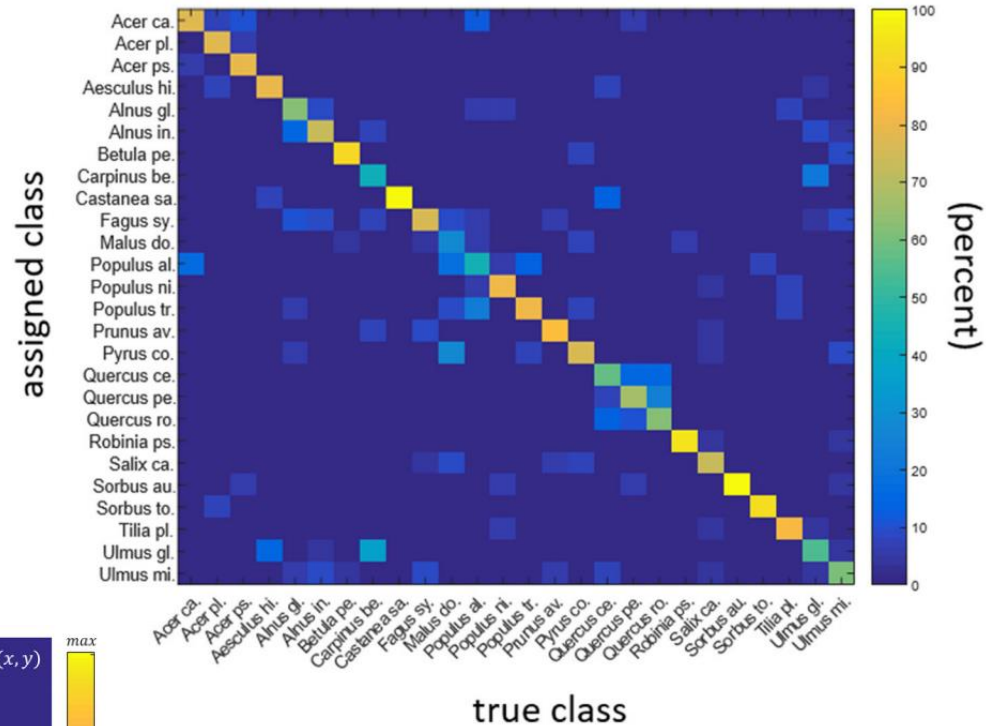
(a)



(b)



(c)



Unger et al. 2016

Phenology: Images & Machine Learning



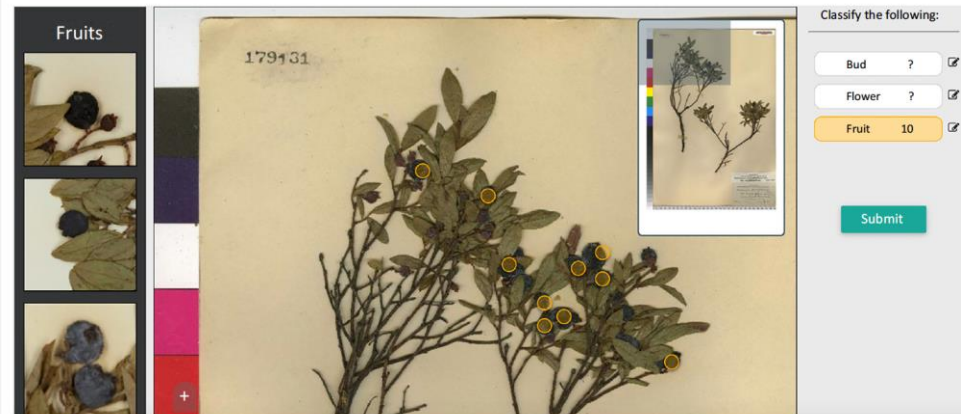
Plant ID; P. Bonnet et al.

Ellwood, Nelson, Pearson,
Sweeney, Soltis et al.

Machine Learning: Phenology



Automated scoring:
vegetative
flowering
fruiting



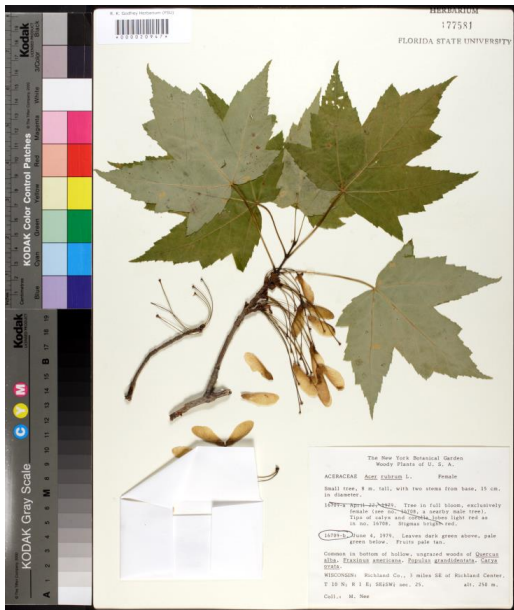
Plant Functional Traits



Limited data:

- species
- traits
- individuals

Traits from Labels, Images, & Text



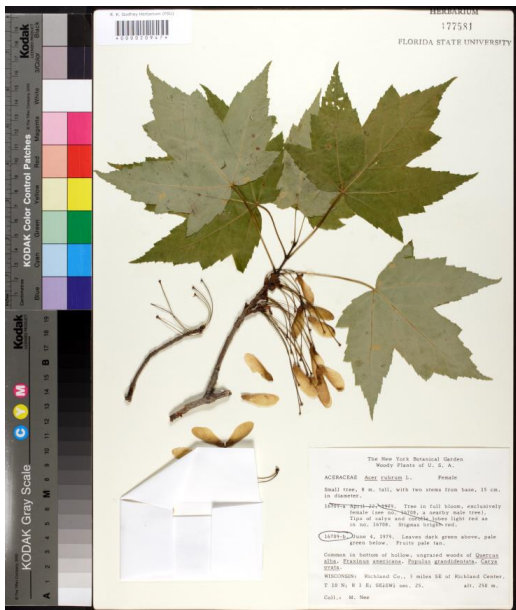
Photosynthetic Pathway
Respiration Leaf Area Nfixation Capacity
SLA Regeneration Capacity Plant Lifespan
Wood Density Growth Form
Phenology Type Leaf N
Leaf P Leaf Longevity Photosynthetic Capacity
Max Plant Height Seed Mass



Limited data:

- species
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Traits from Labels, Images, & Text



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



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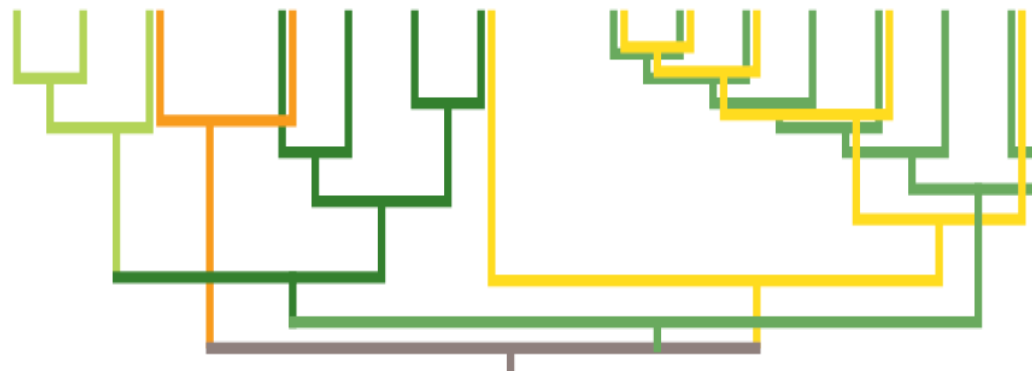
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Scientific Name Common Name
 Submit Name Reset Submit Name Reset

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 Simplify plant identification with the new application [KeyBase](#), which filters keys based on Jepson regions:
 Use filtered keys

Index to accepted names and synonyms:
 I A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 0 1 2 3 4 5 6 7 8 9

eFlora Tools
 Glossary Table of families and genera Key to families



Traits from Labels, Images, & Text

- Correlations of plant functional traits
- Over- and underdispersion of traits:
 - Are traits phylogenetically conserved or broader properties of communities?
 - Implications for long-term health of communities

