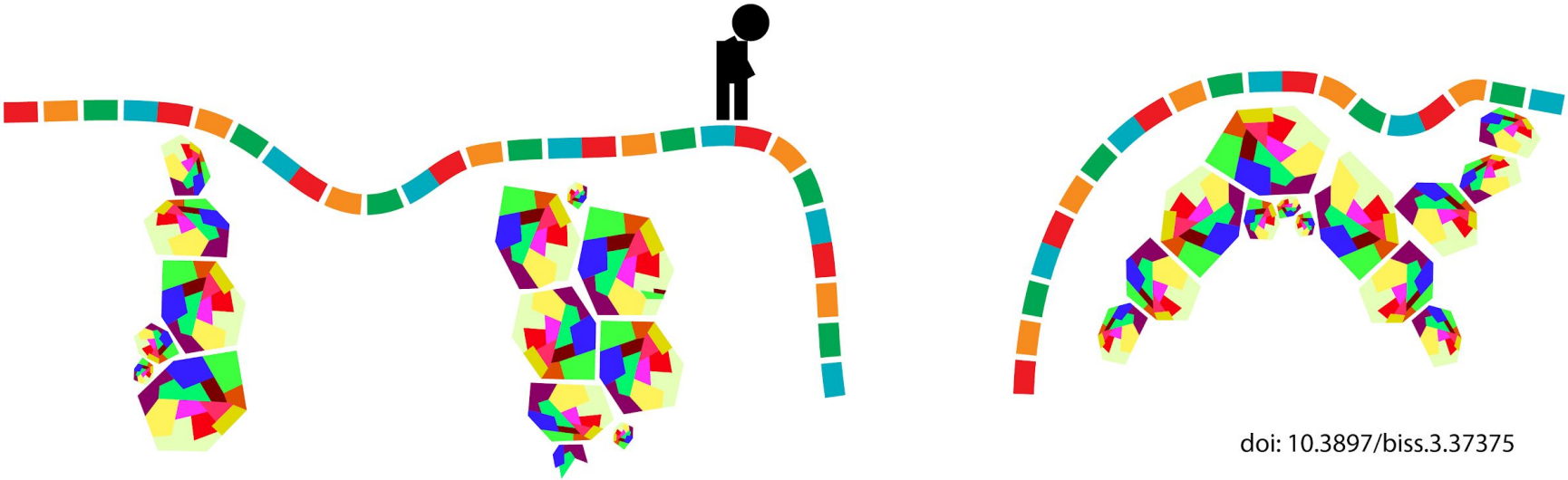
# Are Software Standards Possible for Biodiversity, and What Would They Mean to the Fractured Landscape of Biodiversity Virtual Research Environments?

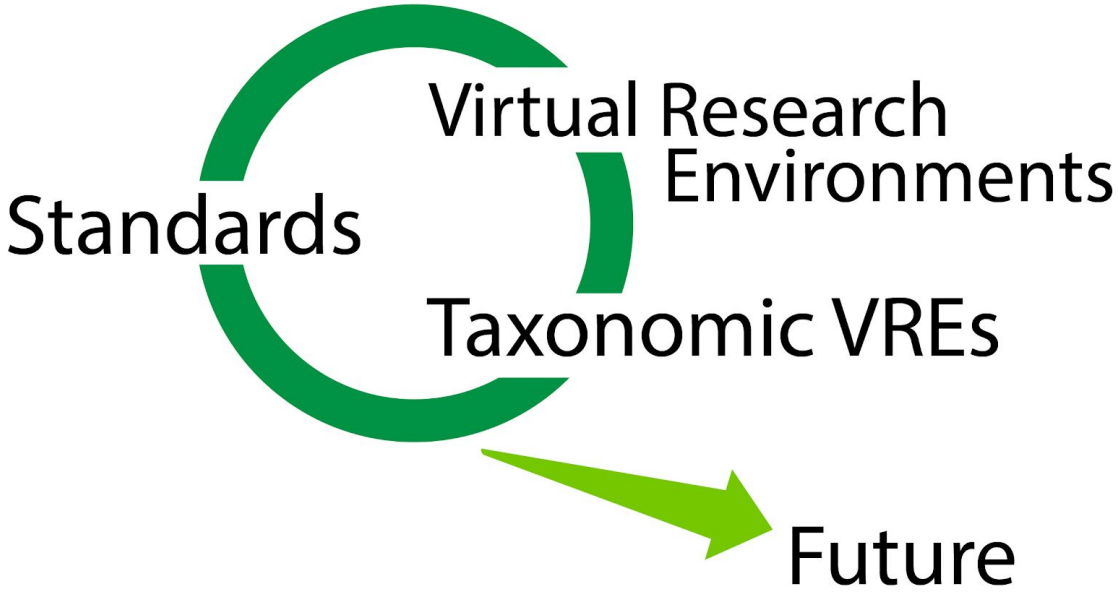
Biodiversity Next, 2019

Matt Yoder

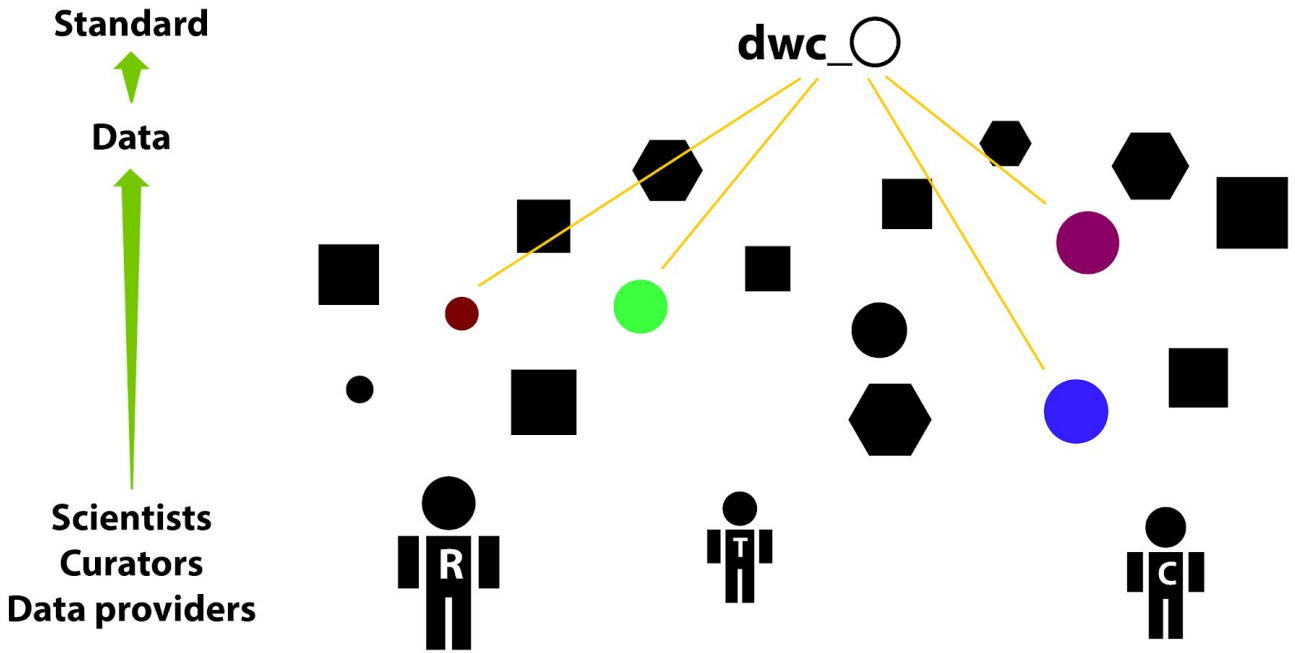


doi: 10.3897/biss.3.37375

# Outline


Virtual Research
Environments
Standards
Taxonomic VREs
Future

# How do standards come to be?



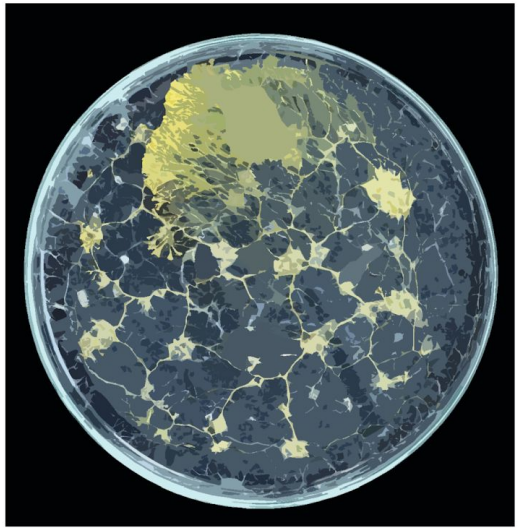

FFT:

Standards are born from diversity.

# Standard what?!

1 DWC field - sex

12,0000 Distinct values!?!!!

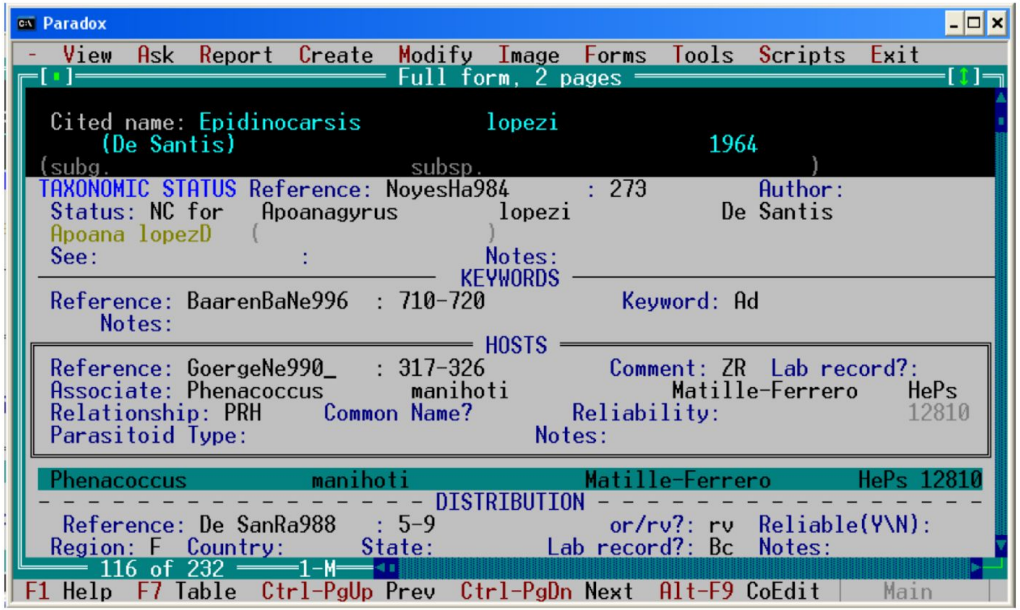


720- yes! 12k? Likely not.

The Blob, derived from image by Paris Museum

FFT: https://github.com/tdwg/dwc-qa/blob/master/data/idigbioDistinctValues/iDigBio_distinct_sex_01-03-17.csv - **Thanks IDigDeb!**

# ... no standard applications either




FFT:

Some VREs are nearing 3 decades old

# “Taxonomic” VREs

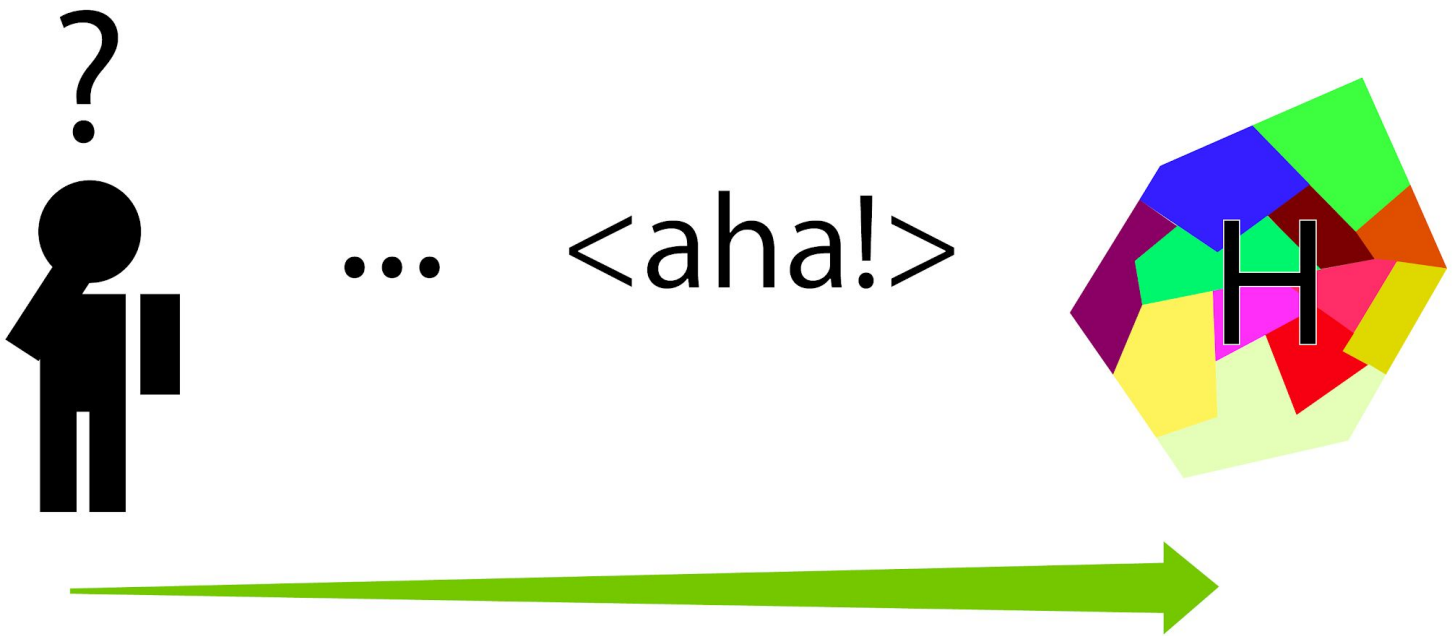
***For the purposes of discussion integrate at least 4 of these things:***

manage specimens and generate material examined sections
track complex taxonomic nomenclature, exporting publication ready catalogs
create keys and interactive keys
include image databases
capture matrix data to produce phylogenies or generate taxon descriptions
contain built in reference managers
track collecting events, localities, field-notes
track type specimens
create anatomy ontologies
act as endpoints for URIs
*...much more*

FFT:

That’s a lot of stuff.

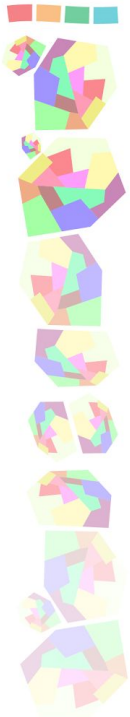
# Integrated hypotheses are the foundations of biology




FFT:

Taxonomists are truly remarkable integrators.

# Taxonomic VREs are lifetime companions



a taxonomic VRE can take

30 years to build

10 years to migrate

FFT: Demographics are leading to an increasing numbers of retiring VREs

# Origin of the Taxonomic VRE

CMS model

Wiki model

DWC model

Relational model

Open source Web

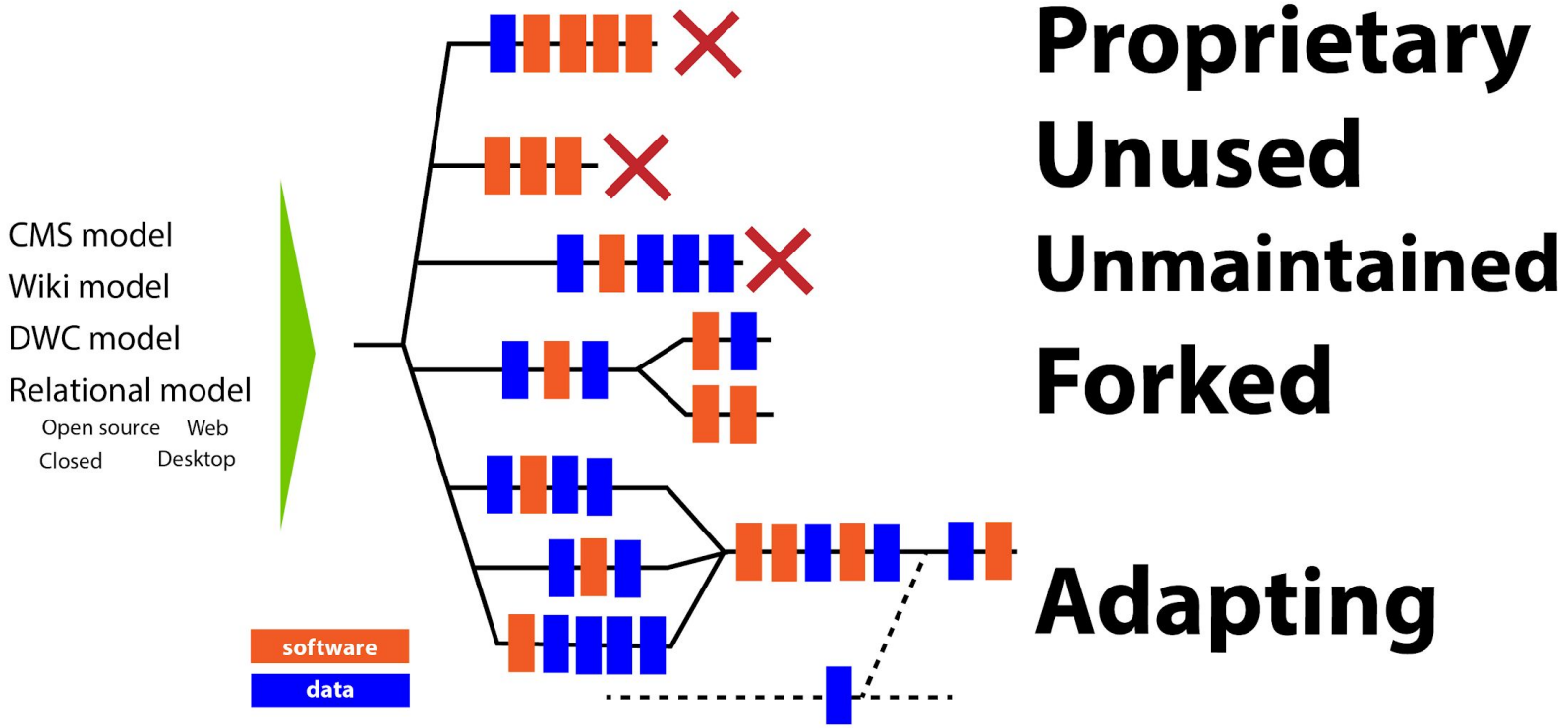
Closed Desktop

**ALL BUILT BY TAXONOMISTS**

FFT:

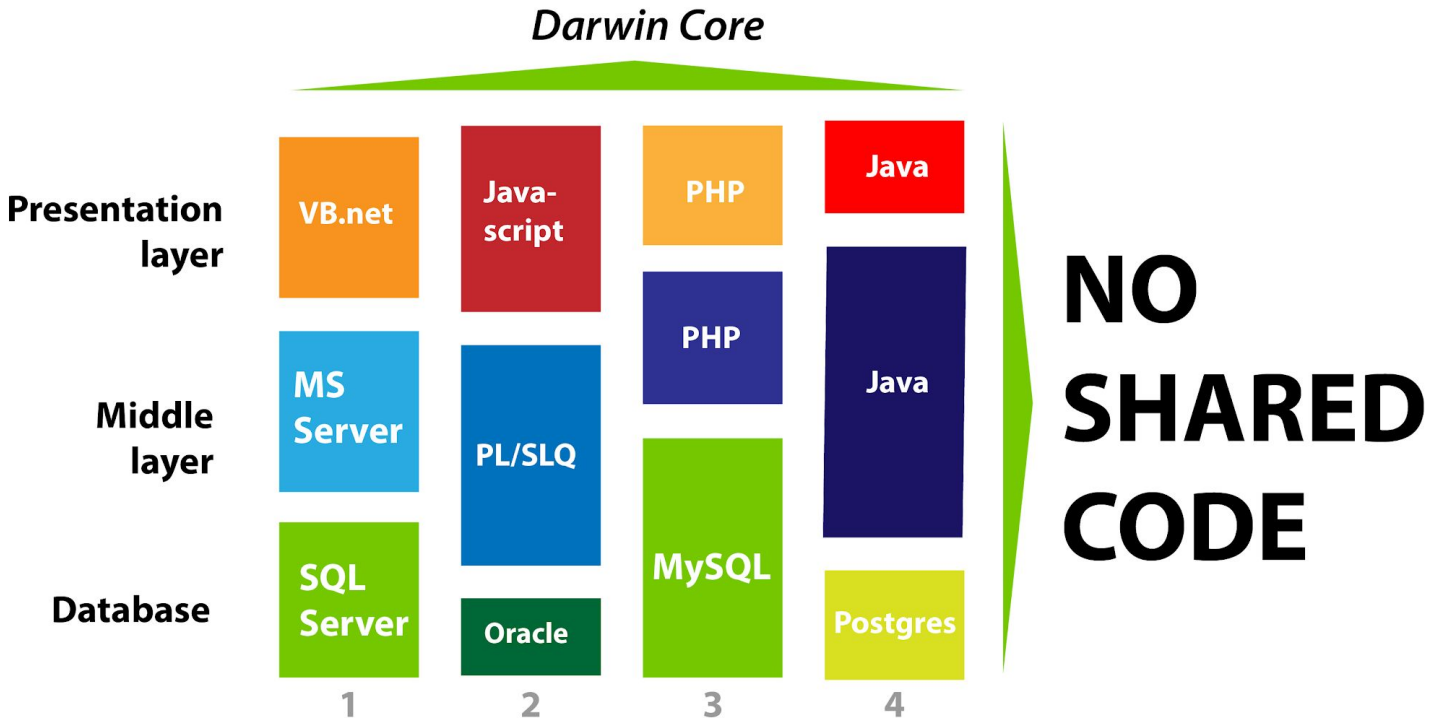
Where do taxonomists find time to do taxonomy?

# Taxonomic VRE "speciation" and evolution




FFT: What would the software/data "tree" that optimizes science/innovation look like?

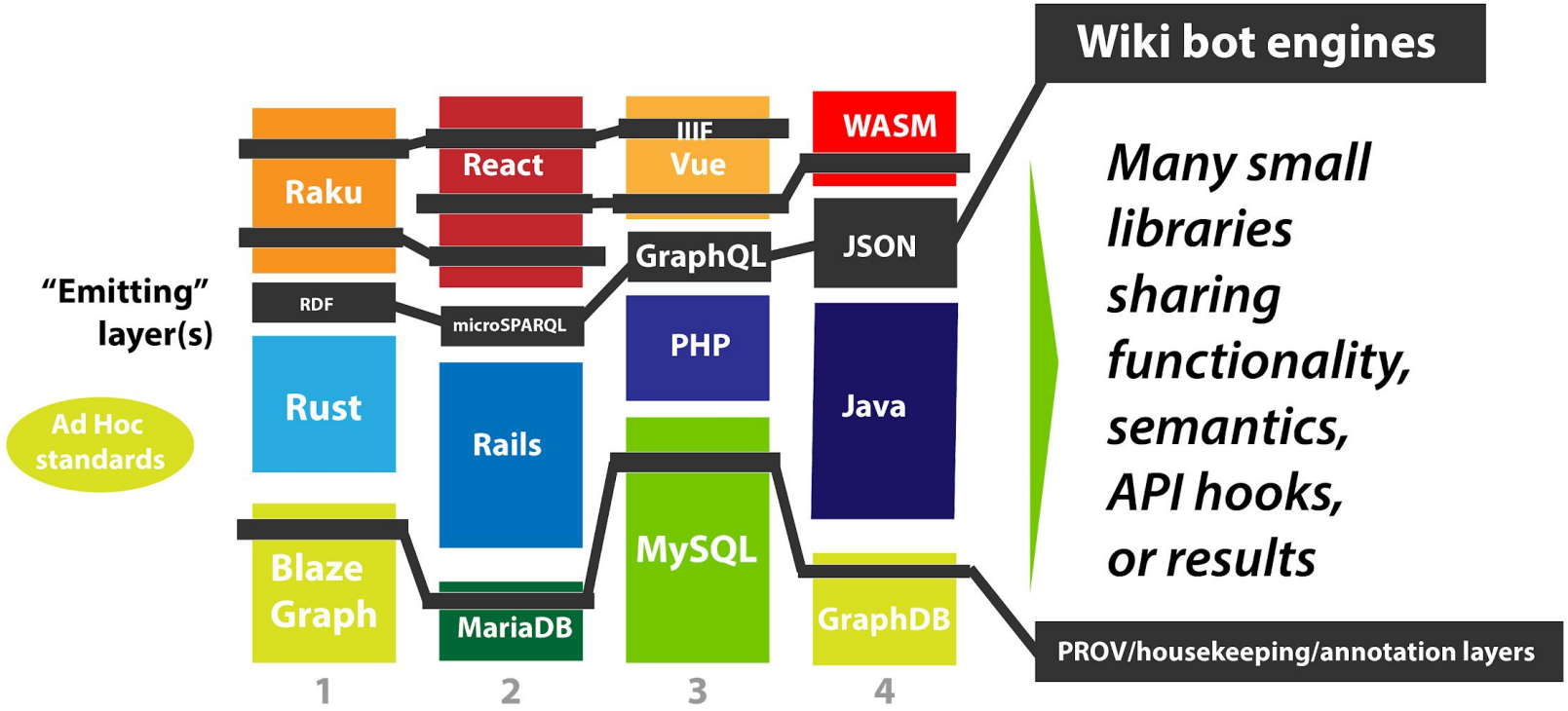
# The fractured landscape of taxonomic VREs




FFT:

That's a lot of software engineering.

# Fusing fractures with (standard?) Shared code




FFT: Artisanal development with gene sharing prevents mono-culture, i.e. at-risk software.

# 10 Principles for better VREs

1 - Facilitate scientific processes

*unapologetically an expert system*

2 - Does computer stuff well

3 - Embrace iteration

4 - Proactive

*facilitate discovery*

*predict next steps / anticipate needs*

*guide you to error correction*

5- Live bearing (= "Born Digital")

6- Meaning > Efficiency > Appearance

7- Has cumulative outcomes (learns)

8- Intrusion decreases and augmentation increases with use

9- Task delegating

10- Answer competency questions

FFT: Is a Wiki a VRE? A reference manager? A georeferencing utility?

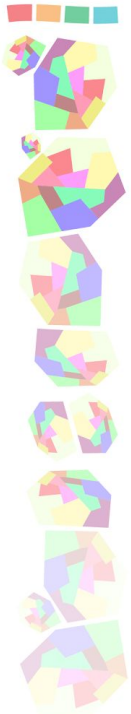
# Application 1st consequences for standards

Not ratified until implemented (hopefully 2x)

Standard building opportunities galore:

- Functional testing
- Software widget/library
  *e.g. Label printing widget*
- Combinatoric validations
  *if A and B linked, then need C*
- Accessibility (human)
- Competency questions (link question to standard to application)
  *e.g. tool is not enough to publish a valid new species*

Gold standards



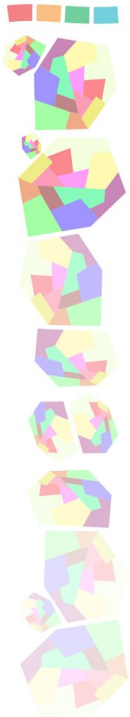
**David Shorthouse**
@dpsSpiders

Does your web-based biodiversity informatics project do functional testing with seleniumhq.org? Make a video! #BiodiversitySelenium

2:49pm · 6 Jul 2017 · Twitter for Mac

FFT: Science is iterative, therefor standard development is as well.

# Gradual exposure via familiar spaces ...



**Semantic traits!!!!**

Citation metrics!!!

resolvable identifiers

SLAM

Machine learning

VR

WASM

Collaboration!

SEQUENCE EVERYTHING!

Citizen science

Virtual museums

Minimum information

graph database

**JSON-LD**

Wiki-data

DWC Extensions

LSIDs

?

triple stores

Distributed systems

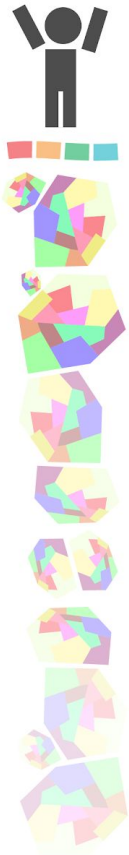
FAIR

SPARQL endpoints

Essential biodiveristy variables

FFT:

No technology scales to Biodiversity.

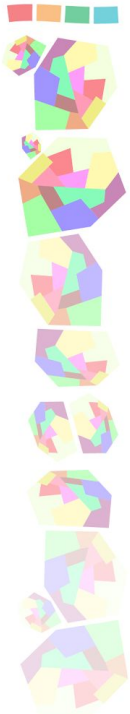


# TaxonWorks

FFT:

This is a cliff hanger.

# Thanks



TaxonWorks collaborators (see homepage)

Biodiversity Next attendees that lent an ear

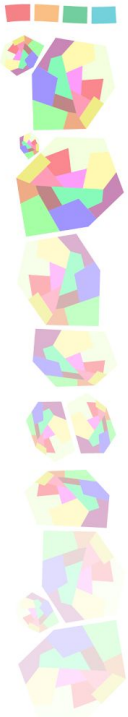
Species File Group

NSF ABI-1356381: “Collaborative Research: ABI Innovation: Rapid prototyping of semantic enhancements to biodiversity informatics platforms”, https://doi.org/10.5281/zenodo.1409244

... we’re hiring (UI/UX, community manager)

FFT:

Hang in there, it’s the last day.



# Still here? Fine, some recommendations that were cut:

Plan for immediate obsolesence, every feature your VRE has an out, at least in concept

Force collaboration

Write more javascript and scripting languages, given your user's a fighting chance of affecting change.

Write more APIs.

Coding user roles, constraints and restrictions means you like dictators.

Invest in new taxonomists, give them new tools.

Don't worry about it (the impending Apocalypse), describe your species, digitize your specimens, and drink a warm drink.

Who needs standards if R savy students feast on JSON?

Data aggrivators become data aggregtators when applications fix problems before they escape.

FFT:

Do other's do this?