Palaeoverse Workshop: Palaeobiology Resources

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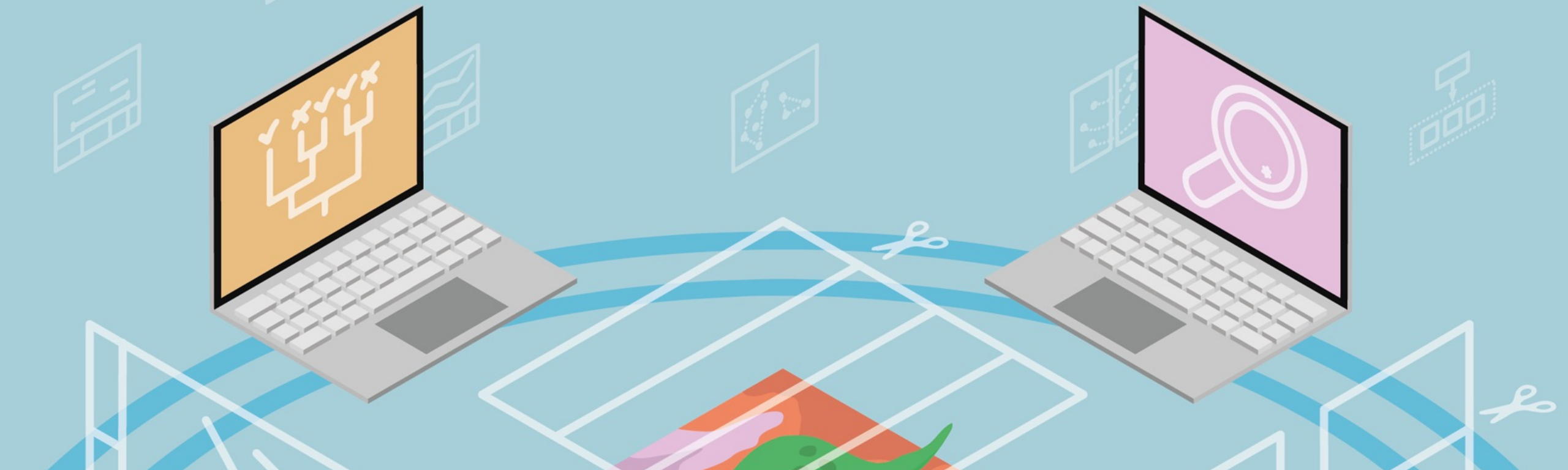


Introduction

Aims

To provide information about useful resources for data handling as well as general programming and paleontology.

Approach

- Cover/summarize the workshop topics, as well as further general information.
- Too many to go over in detail – have highlighted important ones.
- Just a starting point – aim to add to what is gathered here.
- Are available on the workshop website.

Palaeoverse Resources Database

Feel free to access, use, and add anything we've missed!

Data Acquisition

Data Acquisition: Occurrence Databases

- Paleobiology Database – http://paleobiodb.org
- Geobiodiversity database – http://giobiodiversity.com
- Neotoma – http://neotomadb.org
- GBIF – http://gbif.org
- iDigBio – http://idigbio.org
- Neptune – http://nsb.mfn-berlin.de
- BioDeepTime – http://dio.org/10.1111/geb.13735
- Phylacine – http://megapast2future.github.io/PPHYLACINE_1.2/
- PARED – http://paleo-reefs.pal.uni-Erlangen.de

Data Acquisition: Occurrence Databases

Dillon, E.M., Dunne, E.M., Womack, T.M., Kouvari, M., Larina, E., Claytor, J.R., Ivkić, A., Juhn, M., Carmona, P.S.M., Robson, S.V. and Saha, A., 2023. Challenges and directions in analytical paleobiology. *Paleobiology*, **49(3)**, 377-393.

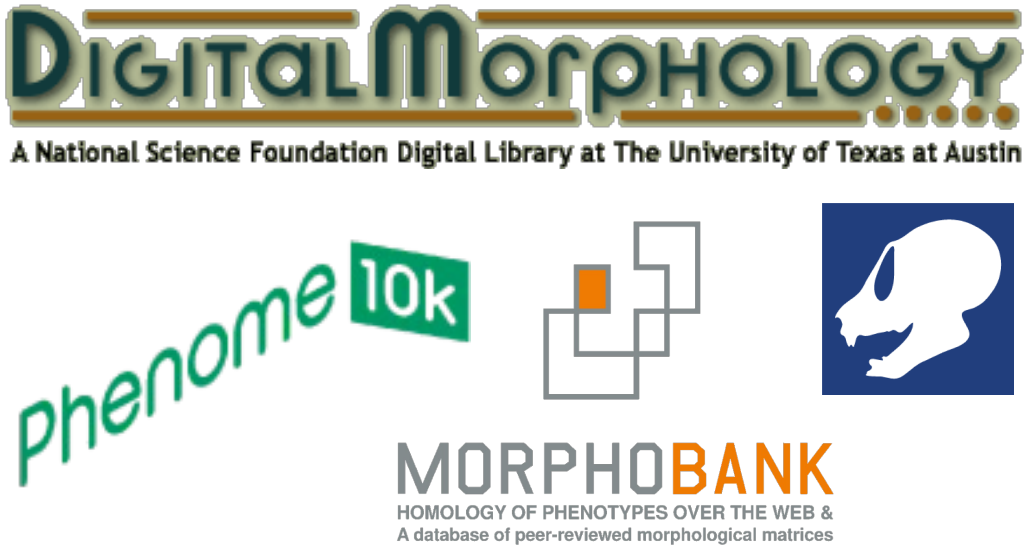
Supplementary Table 1. Examples of databases and online data portals used for paleobiological and (paleo)ecological research, along with their primary temporal, spatial, and taxonomic scope. N/A indicates that the corresponding information was either not applicable, undefined, or not readily available. The 'Modern' time period refers to last ~400 years unless otherwise specified. An additional list of databases has been compiled by PAGES at https://pastglobalchanges.org/science/data/ext-databases.

Name	Data Description	Temporal Scope	Spatial Scope	Taxonomic Scope	Website
AFORO (Shape Analysis of Fish Otoliths)	Sagitta otolith images and shape analysis	N/A	Global	Fish	http://aforo.cmima.csic.es/index.jsp
American Society of Mammalogists (ASM) Mammal Diversity Database	Taxonomic checklist of extant and recently extinct (since ~1500 CE) mammals	Modern	Global	Mammals	https://www.mammaldiversity.org/
Anthromes	Land cover data and maps showing global ecological patterns created by humans	Holocene – Modern	Global	N/A	https://anthroecology.org/datasets/
Arctic Data Center	Data and software repository for the Arctic section of National Science Foundation's Office of Polar Programs	Modern	Arctic	Multiple taxa	https://arcticdata.io/
Arctos	Biological specimen data	Modern	Global	Multiple taxa	https://arctosdb.org/
Biodiversity Atlas – India	Biodiversity data, including butterflies, moths, cicadas, mammals, birds, reptiles, amphibians, and odonates	Modern	India	Multiple taxa	https://www.bioatlasindia.org/bai-websites
Biodiversity Information Serving Our Nation (BISON)	Modern, historical, and fossil species occurrence data (subset of GBIF)	Precambrian – Phanerozoic	United States	Multiple taxa	https://bison.usgs.gov/
Biological and Chemical Oceanography Data Management Office (BCO-DMO)	Biological and chemical oceanography data	Modern	Global	N/A	https://www.bco-dmo.org/
BioTime	Species abundance time series data	Modern	Global	Multiple taxa	https://biotime.st-andrews.ac.uk
BugsCEP	Coleopteran occurrence and (paleo)ecological data	Quaternary	Global	Beetles	http://bugscep.com/
Catalogue of Life (COL)	Taxonomic classifications and catalogue of species	N/A	Global	Multiple taxa	https://www.catalogueoflife.org/

Data Acquisition: 3D Data and Trait Data

3D Data

- DigiMorph – http://digimorph.org
- Morphobank – http://morphobank.org
- Phenome10k – http://www.phenome10k.org
- Morphosource – http://morphosource.org

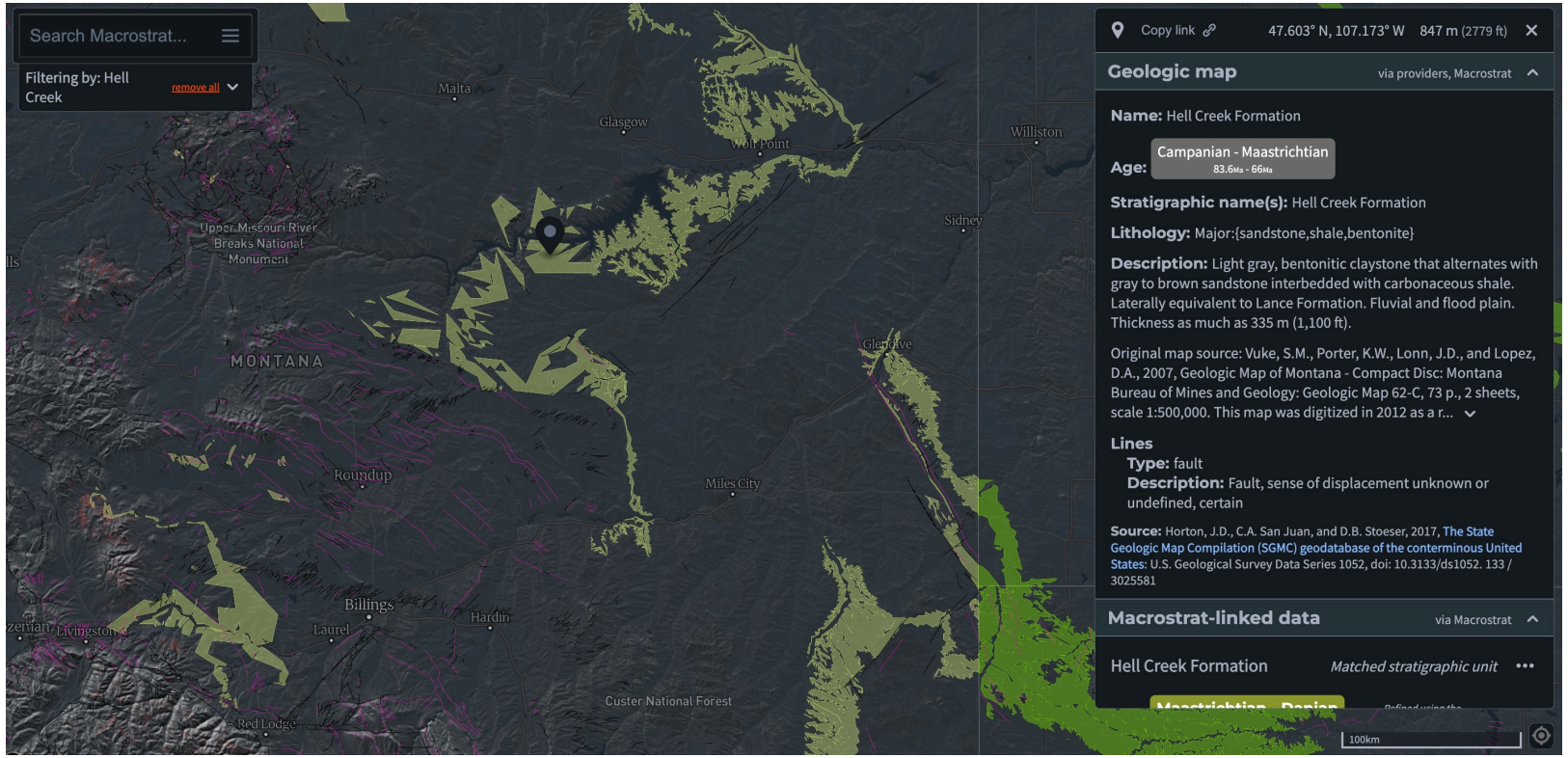


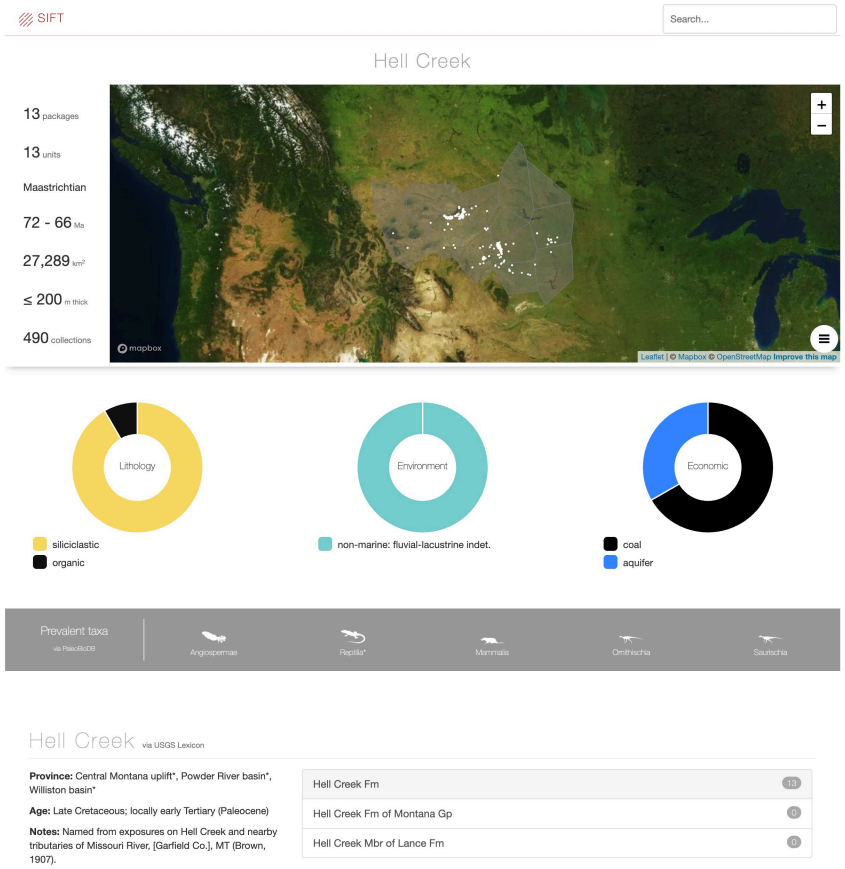
Trait Data

- Open Traits Network – https://opentraits.org
- Coral Trait Database – https://www.coraltraits.org/

Data Acquisition: Covariates

- Macrostrat – http://macrostrat.org
  - Provides both spatial outcrop and other associated information (e.g. lithology, palaeoenvironment, time interval, associated fossils etc.)
  - Mainly North America focused, but does include global information.
  - Accessed via API – but check out Bethany's poster!





Data Acquisition: Covariates

Geological Data

- Mindat – https://www.mindat.org/
- USGS Geologic Maps – https://mrdata.usgs.gov/geology/state/

Spatial Data

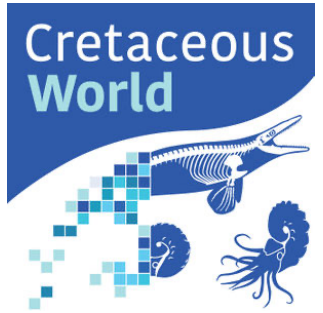
- WorldClim – http://worldclim.org
- Worldwide land cover – http://esa-worldcover.org/en
- Digital Elevation Maps – https://www.usgs.gov/centers/eros/science/usgs-eros-archive-digital-elevation-global-30-arc-second-elevation-gtopo30?qt-science_center_objects=0#qt-science_center_objects
- Global Maximum Green Vegetation Fraction – https://doi.org/10.1175/JAMC-D-13-0356.1
- PAGES list of databases – https://pastglobalchanges.org/science/data/databases

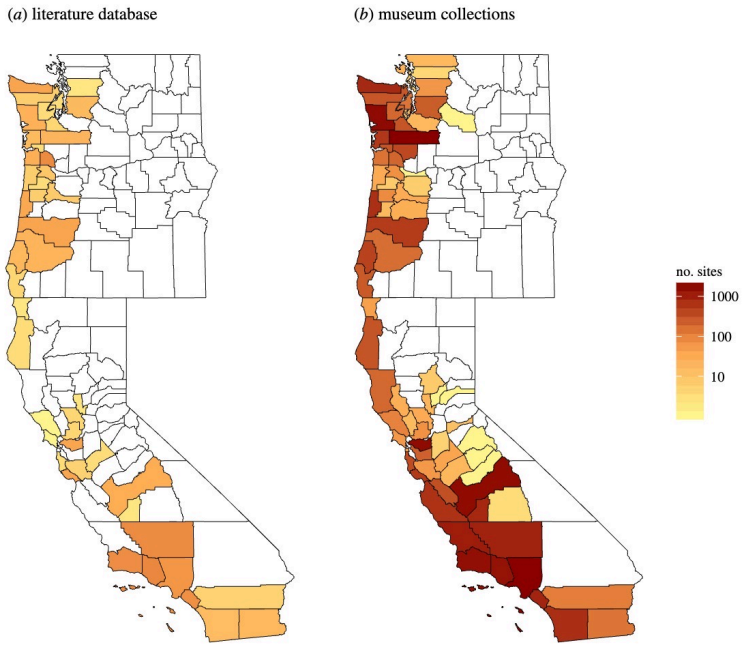
Palaeogeography

- Deep Time Maps – https://deeptimemaps.com/about-us/ (paid)
- Paleomap Project – http://www.scotese.com/ (Free!)

Data Acquisition: Museums

- Can be untapped resource of data
- Online specimen databases available
  - e.g. http://www.fishnet2.net/
- Broad digitization efforts
  - Digital Atlas of Ancient Life https://www.digitalatlasofancientlife.org/
- Curators are the best!
- But… might have some accessibility issues.





Research article

Quantifying the dark data in museum fossil collections as palaeontology undergoes a second digital revolution

C. R. Marshall ✉, S. Finnegan, E. C. Clites, P. A. Holroyd, N. Bonuso, C. Cortez, E. Davis, G. P. Dietl, P. S. Druckenmiller, R. C. Eng, C. Garcia, K. Estes-Smargiassi, A. Hendy, K. A. Hollis, H. Little, E. A. Nesbitt, P. Roopnarine, L. Skibinski, J. Vendetti and L. D. White

Published: 05 September 2018 | https://doi.org/10.1098/rsbl.2018.0431

Data Acquisition: Packages

Paleobiology Database

- velociraptr: Fossil Analysis
  - Downloads and helps clean Paleobiology Database data.
- PaleobioDB
  - Same functionality as velociraptr, but as of recently no longer available on CRAN.

WORLDCLIM

- Can be directly obtained by getData() function of ‘raster’ package.

Macrostrat

- Check out Bethany’s poster!

Package ‘velociraptr’

October 12, 2022

Type Package

Title Fossil Analysis

Version 1.1.0

Author Andrew A. Zaffos

Maintainer Andrew A Zaffos <azaffos@email.arizona.edu>

Description Functions for downloading, reshaping, culling, cleaning, and analyzing fossil data from the Paleobiology Database <https://paleobiodb.org>.

README.md

Build Status | codecov 0% | downloads 155/month | CRAN not published

paleobioDB

About

`paleobioDB` is a package for downloading, visualizing and processing data from Paleobiology Database.

getData {raster} R Documentation

Get geographic data

Description

Get geographic data for anywhere in the world. Data are read from files that are first downloaded if necessary. Function `ccodes` returns country names and the ISO codes

Usage

```
getData(name, download=TRUE, path="", ...)
ccodes()
```

Arguments

`name`	Data set name, currently supported are 'GADM', 'countries', 'SRTM', 'alt', and 'worldclim'. See Details for more info

Data Acquisition: Standards and Policies

- FAIR Guiding Principles (Findability, Accessibility, Interoperability, Reusability) – https://fairsharing.org
- TRUST Principles for digital repositories (Transparency, Responsibility, User focus, Sustainability and Technology) –
  - Lin, D., Crabtree, J., Dillo, I., Downs, R.R., Edmunds, R., Giaretta, D., De Giusti, M., L'Hours, H., Hugo, W., Jenkyns, R. and Khodiyar, V., 2020. The TRUST Principles for digital repositories. *Scientific Data*, **7(1)**, pp.1-5.
- DataONE – https://www.dataone.org
- Open Science Framework – https://osf.io

FAIRsharing.org
standards, databases, policies

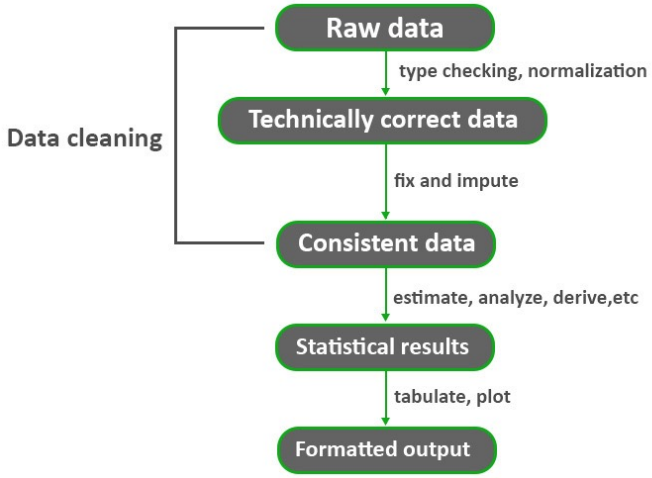
OSF

Data Preparation

Data Cleaning

General Advice

- Data Cleaning in Data Science: Process, Benefits and Tools – https://www.knowledgehut.com/blog/data-science/data-cleaning#what-is-data-cleaning-in-data-science?-%C2%
- Tidy-ing Data – https://www.dataone.org/webinars/tidy-ing-your-data-simple-steps-reproducible-research/
- R Cheat Sheets – e.g. https://posit.co/resources/cheatsheets/
- But… best practice is doing it!



Useful General Packages

- janitor
  - Automatic cleaning of column headings
  - Removes empty rows/columns and duplicate records.
- Data.validator
  - Create a report that shows which records don't fulfil a chosen criteria.
  - Quick checking of potential issues in dataset.

Data Preparation: Packages

- Palaeoverse (obviously!)
- CoordinateCleaner
  - Flags issues with co-ordinates and dating imprecisions.
  - Palaeo and modern data.
  - Example from the PBDB: 6.3% records are potentially problematic.
- Fossilbrush
  - Advanced version of ‘tax_check’ in palaeoverse.
  - Stratigraphic outlier detection.
  - Specifically for palaeo data.

Methods in Ecology and Evolution | BRITISH ECOLOGICAL SOCIETY

APPLICATION | Open Access

palaeoverse: A community-driven R package to support palaeobiological analysis

Lewis A. Jones, William Gearty, Bethany J. Allen, Kilian Eichenseer, Christopher D. Dean, Sofía Galván, Miranta Kouvari, Pedro L. Godoy, Cecily S. C. Nicholl, Lucas Buffan, Erin M. Dillon ... See all authors

First published: 13 April 2023 | https://doi.org/10.1111/2041-210X.14099 | Citations: 2

Methods in Ecology and Evolution | BRITISH ECOLOGICAL SOCIETY

APPLICATION | Open Access

CoordinateCleaner: Standardized cleaning of occurrence records from biological collection databases

Alexander Zizka, Daniele Silvestro, Tobias Andermann, Josué Azevedo, Camila Duarte Ritter, Daniel Edler, Harith Farooq, Andrei Herdean, María Ariza, Ruud Scharn ... See all authors

First published: 20 January 2019 | https://doi.org/10.1111/2041-210X.13152 | Citations: 294

Methods in Ecology and Evolution | BRITISH ECOLOGICAL SOCIETY

RESEARCH ARTICLE | Open Access

***fossilbrush*: An R package for automated detection and resolution of anomalies in palaeontological occurrence data**

Joseph T. Flannery-Sutherland, Nussaïbah B. Raja, Ádám T. Kocsis, Wolfgang Kiessling

First published: 26 August 2022 | https://doi.org/10.1111/2041-210X.13966 | Citations: 2

Data Preparation: Packages and Other Tools

Dillon, E.M., Dunne, E.M., Womack, T.M., Kouvari, M., Larina, E., Claytor, J.R., Ivkić, A., Juhn, M., Carmona, P.S.M., Robson, S.V. and Saha, A., 2023. Challenges and directions in analytical paleobiology. *Paleobiology*, **49(3)**, 377-393.

Supplementary Table 2. Examples of programming packages and tools that are commonly used to analyze and visualize paleo data. Tools are grouped by their primary functionality.
*Tools listed without an associated programming language are either standalone or cross-platform software.

Topic	Description	Tool (Programming Language)*	Reference
Paleobiology and Paleoecology	Paleo data retrieval	neotoma2 (R); paleobioDB (R); ridigbio (R)	Goring et al. 2015; Varela et al. 2015; Michonneau et al. 2022
Paleobiology and Paleoecology	Cleaning, standardization, and analysis of biodiversity data	divDyn (R); divvy (R); fossil (R); fossilbrush (R); kerneval (R); iNEXT (R); palaeoverse (R); PyRate (Python)	Kocsis et al. 2019; Antell 2022; Vavrek 2011; Flannery-Sutherland et al. 2022; Antell et al. 2021; Hsieh et al. 2016; Jones et al. 2022; Silvestro et al. 2014
Paleobiology and Paleoecology	Capture-mark-recapture techniques	Compadre (R); MARK; RMARK (R)	Starrfelt 2021; White and Burnham 1999; Laake 2013
Paleobiology and Paleoecology	Modeling (paleo)ecological and (paleo)climate time series data	gam (R); gratia (R); mgcv (R); pyleoclim (Python); R-Ratepol (R)	Hastie 2020; Simpson 2022a; Wood 2017; Khider et al. 2019; Mottl et al. 2021
Paleobiology and Paleoecology	Exploring causality using paleo time series data	layeranalyzer (R); multispatialCCM (R); rEDM (R); RTransferEntropy (R)	Reitan and Liow 2019; Clark et al. 2015; Park et al. 2022; Behrendt et al. 2019
Paleobiology and Paleoecology	Overview of time series analysis	CRAN Task View: Time Series Analysis (R)	Hyndman and Killick 2022
Paleobiology and Paleoecology	Species distribution and ecological niche modeling	dismo (R); Maxent; modleR (R); sdm (R)	Hijmans et al. 2021; Phillips et al. 2004; Sánchez-Tapia et al. 2020; Naimi and Araújo 2016
Paleobiology and Paleoecology	Sediment-archived proxy reconstructions and paleoecological analyses	analogue (R); rioja (R); sedproxy (R)	Simpson 2007; Juggins 2020; Dolman and Laepple 2018
Paleobiology and Paleoecology	Analyzing multivariate (paleo)ecological community data	ade4 (R); BiodiversityR (R); dispRity (R); mvabund (R); vegan (R)	Dray and Dufour 2007; Kindt and Coe 2005; Guillerme 2018; Wang et al. 2012; Oksansen et al. 2020
Paleobiology and Paleoecology	Overview of ecological and environmental data analysis tools	CRAN Task View: Analysis of Ecological and Environmental Data (R)	Simpson 2022b
Paleobiology and Paleoecology	Paleo data visualization	deeptime (R); geoscale (R)	Gearty 2022; Bell 2015
Geology, Geography, and Stratigraphy	Spatial data processing and paleogeographic reconstruction	chronosphere (R); CoordinateCleaner (R); GEOmap (R); GPlates; pyGPlates (Python); terra (R)	Kocsis et al. 2021; Zizka et al. 2020; Lees 2018; Müller et al. 2018; Hijmans et al. 2022

Data Visualisation

Data Visualisation: Graphs

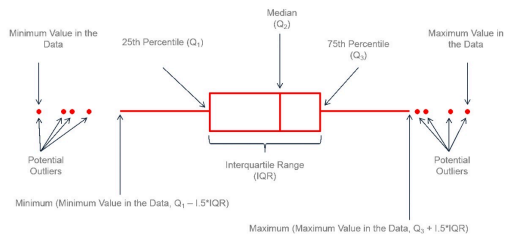
R Graph Gallery https://r-graph-gallery.com/

Data Visualisation: Graphs

R Graph Gallery

Boxplot

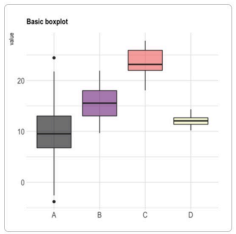
This is the boxplot section of the gallery. If you want to know more about this kind of chart, visit data-to-viz.com. If you're looking for a simple way to implement it in R or ggplot2, pick an example below. Note: this online course on ggplot2 covers several geometries including `geom_boxplot`

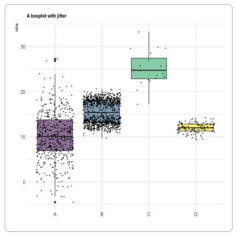


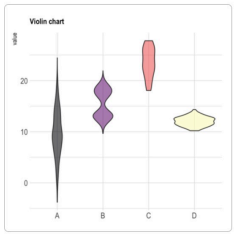
Anatomy of a boxplot - Explanation - Image source

WARNING

Boxplot is probably the most commonly used chart type to compare distribution of several groups. However, you should keep in mind that data distribution is hidden behind each box. For instance, a normal distribution could look exactly the same as a bimodal distribution. Please read more explanation on this matter, and consider a violin plot or a ridgline chart instead.

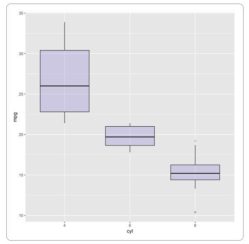


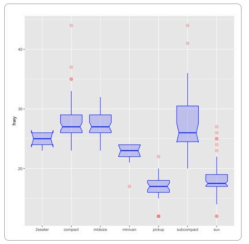


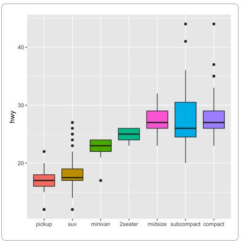


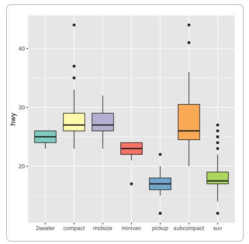
GGPLOT2

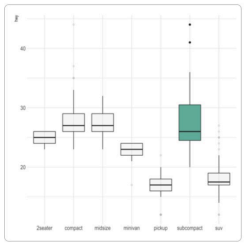
Boxplot are built thanks to the `geom_boxplot()` geom of `ggplot2`. See its basic usage on the first example below. Note that reordering groups is an important step to get a more insightful figure. Also, showing individual data points with jittering is a good way to avoid hiding the underlying distribution.

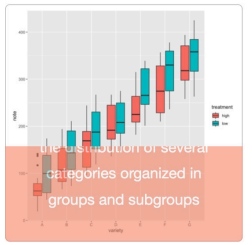


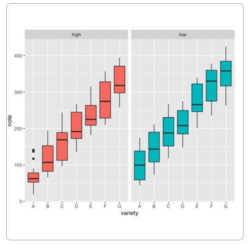


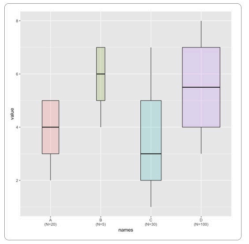


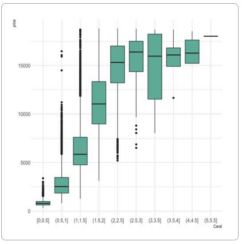


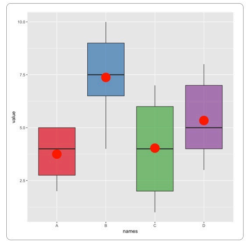


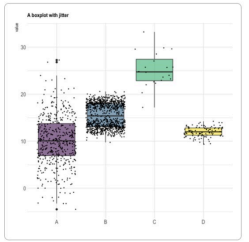


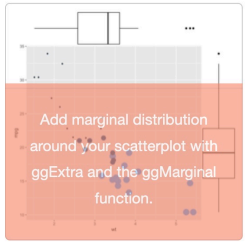












Data Visualisation: Graphs

Plotly https://plotly.com/r/

plotly | Graphing Libraries

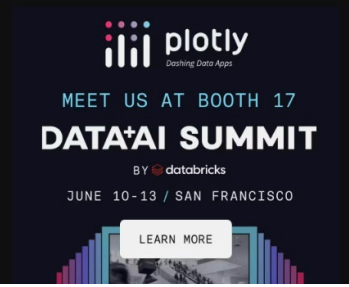
Search...

▼ Quick Reference

- Getting Started
- Is Plotly Free?
- Figure Reference
- ggplot2 integration
- Dash for R
- GitHub
- community.plotly.com

▼ Examples

- Fundamentals
- Basic Charts



R ▾ Forum Pricing Dash Star 2,514

Plotly R Open Source Graphing Library

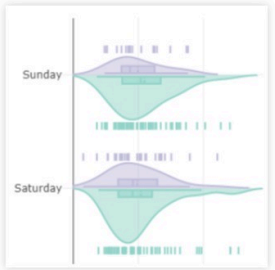
Plotly's R graphing library makes interactive, publication-quality graphs. Examples of how to make line plots, scatter plots, area charts, bar charts, error bars, box plots, histograms, heatmaps, subplots, multiple-axes, and 3D (WebGL based) charts.

Plotly.R is free and open source and you can view the source, report issues or contribute on GitHub.

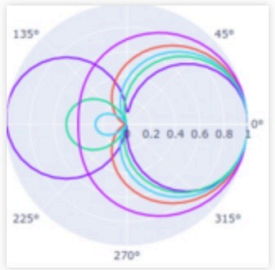
Deploy R AI Dash apps on private Kubernetes clusters: Pricing | Demo | Overview | AI App Services

Fundamentals

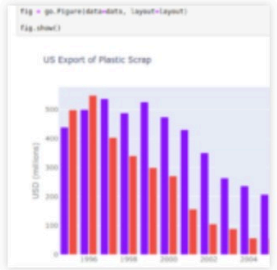
More Fundamentals »



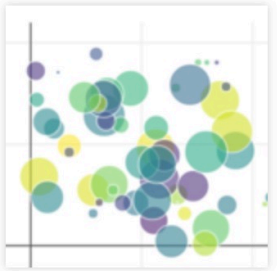
The Figure Data Structure



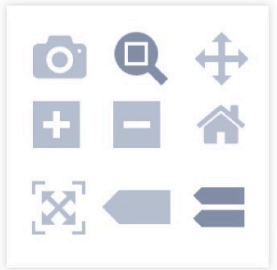
Creating and Updating Figures



Displaying Figures



Exporting Graphs as Static Images

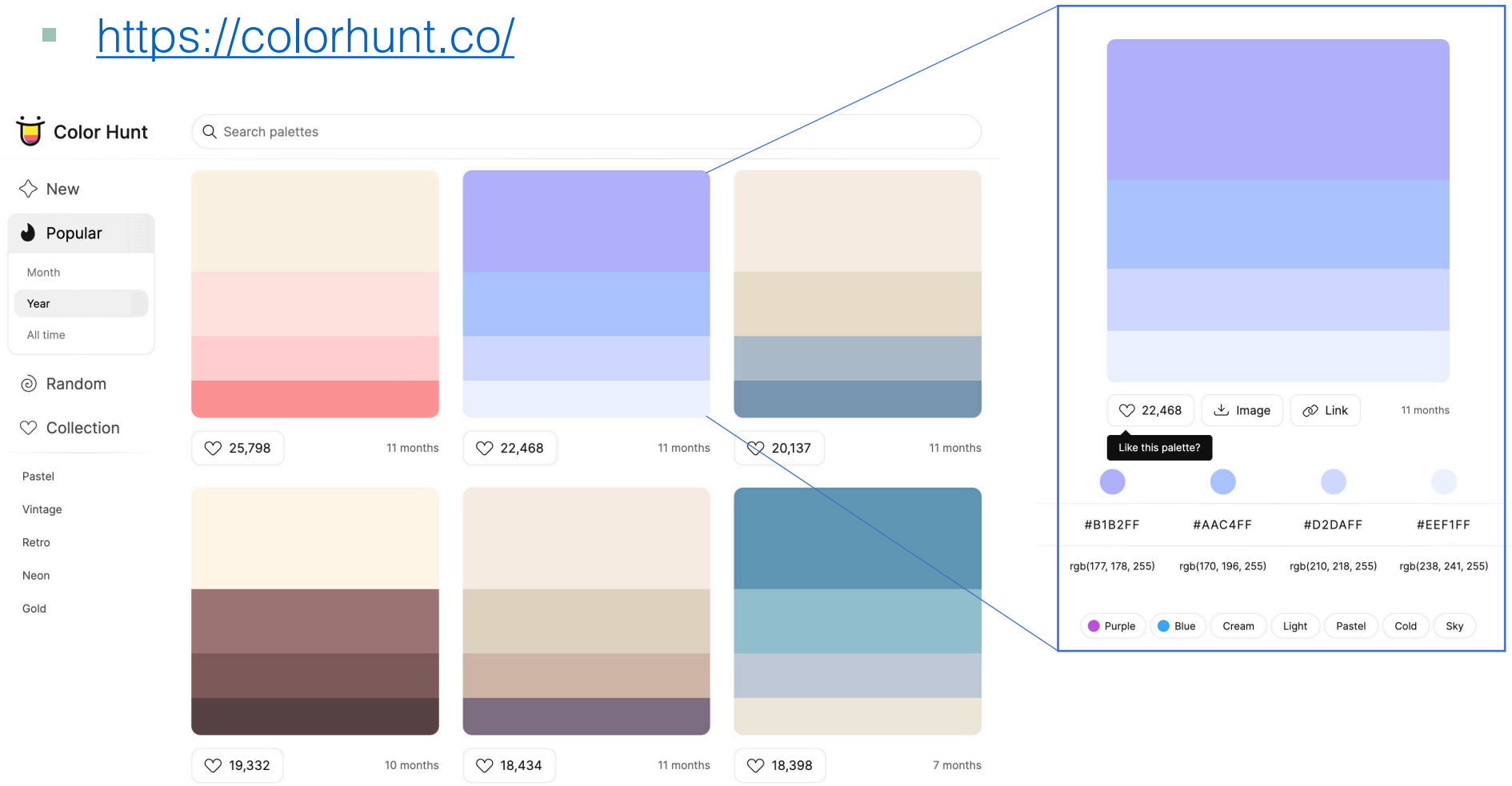


Configuration

Data Visualisation: Color

Colorhunt

- https://colorhunt.co/



Data Visualisation: Color

Authors:

Mateusz Krzyziński

Paweł Wojciechowski

Artur Żółkowski

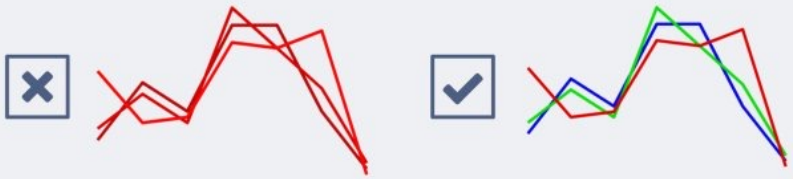
RULES

INTUITIVENESS

Use intuitive colors. When choosing them, consider what associations do they evoke.
If possible, use colors that audience will associate with your data anyway.

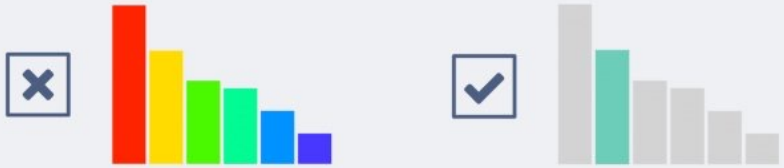
CLARITY

Use colors to make the data easier to read. Make sure your audience will be able to distinguish between the items shown in the visualization.



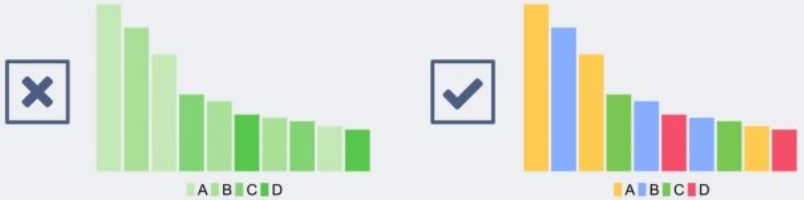
MODERATION

Use colors in moderation. For a simple dataset, a single color is preferable.
Use color as a strategic tool to highlight the important parts of your visual.



CLASSIFICATION

Don't use a gradient color palette for categories.
And the other way round - different colors for same measurement.

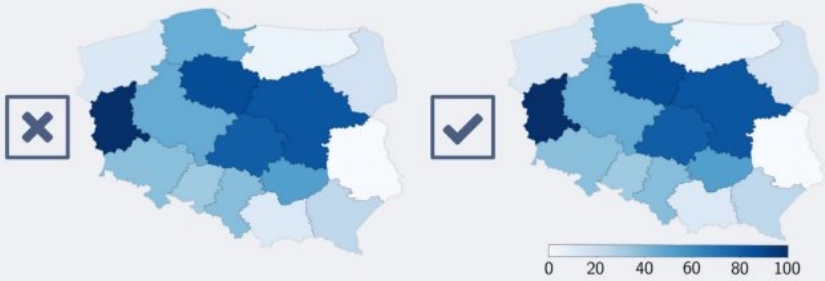


CONSISTENCY

Use colors consistently. Change colors if you want your audience to feel the change for the specific reason, but never simply for the sake of novelty.

EXPLAINABILITY

Make sure to explain to your audience what exactly used colors mean.
Remember to create a color key.



Data Visualisation: Color

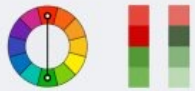
Authors:
Mateusz Krzyziński
Paweł Wojciechowski
Artur Żółkowski

COLOR SCHEMES

Monochromatic - the simplest formula for harmony is monochromatic. Consists of different shades of one hue. Not a good choice if we want to highlight something.

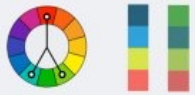
Analogous - this scheme is composed of colors that are next to each other on the wheel. Usually they match up pretty well, making elegant and clear look.

Complementary - uses two colors which are opposite on the color wheel. With saturated colors makes very vibrant look. Try to tone down colors to avoid overvibrance, by adjusting saturation and lightness/darkness. Do not use with text with saturated colours.



Triadic - uses three colors that evently spaced on the color wheel. Makes that none of colors is dominant and quite vibrant look.

Split-Complementary - variation of complementary scheme. Uses base color and two adjacent to its complementary color. Often this scheme is more pleasant to the eye than usual complementary scheme.



Tetradic - this scheme consists of four colors, two of them are complementary to other two. Choosing one color as dominant and the rest as accents, gives the best result.

Remember! Do not stick strictly to colors imposed by a scheme. These patterns are just starting points, you can create your own variations based on schemes above. Check also: paletton.com

PRO TIPS

The color grey is the most important color in data visualization.

The use of color should always be an intentional decision. Never let your tool make this important decision for you!

After creating your visualization, close your eyes and then look back at it, taking note of where your eyes are drawn first. Is it where you want your audience to focus?

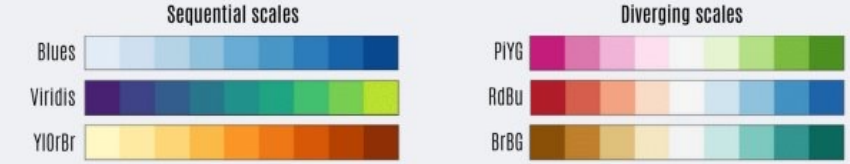
When picking colors consider the connotations colors have in other cultures.
You can check: informationisbeautiful.net/visualizations/colours-in-cultures

Remember about color deficiency issues (color blindness).
You can check: projects.susielu.com/viz-palette

COLOR PALETTES

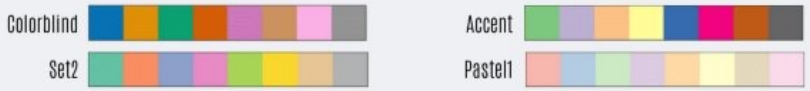
QUANTITATIVE DATA - SEQUENTIAL OR DIVERGING COLORS

Color is used show variations in the data. The palette contains a sequence of colors that clearly indicate which values are larger or smaller than which other ones (sequential scale). It can also visualize the deviation of data values in one of two directions relative to a neutral midpoint (diverging scale). Diverging scale can be viewed as two merged sequential scales.



CATEGORICAL DATA - QUALITATIVE COLORS

Color is used to separate areas into distinct categories. The palette should consist of colors as distinct from one another as possible. The maximum number of categories that can be displayed is about 12 (practically speaking, probably fewer).



All examples are available in Seaborn library. Check also: medialab.github.io/iwanthue/

USAGE GUIDELINES

Authors:
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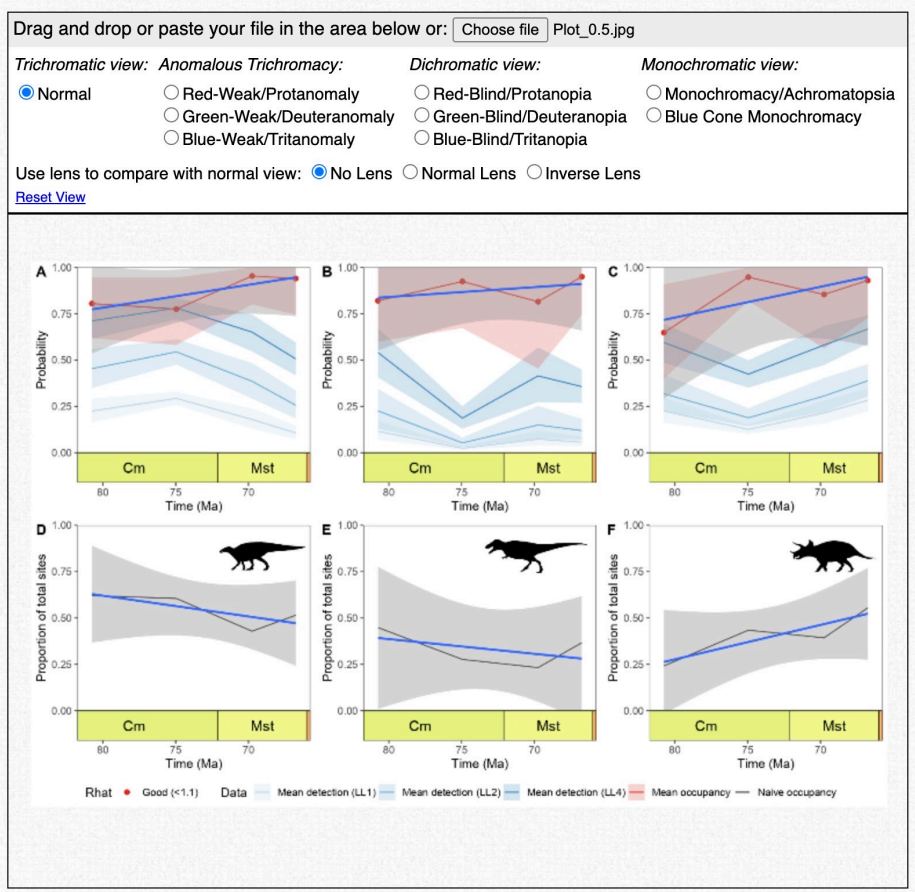
Paweł Wojciechowski
Artur Żółkowski

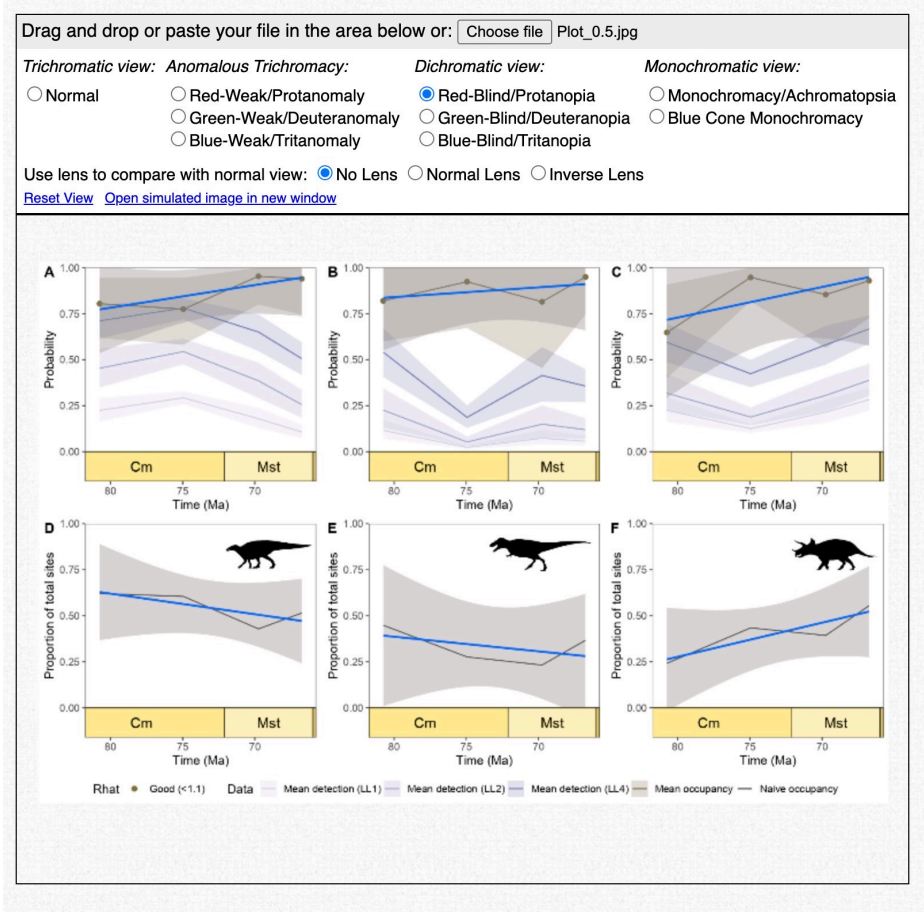
Warsaw University of Technology
Faculty of Mathematics and Information Science

Data Visualisation: Accessibility

COBLIS – Colour Blindness Simulator

- https://www.color-blindness.com/coblis-color-blindness-simulator/





Data Visualisation: Packages and Software

Important Packages

- ggplot2 – the staple!
- Lattice – multivariate data
- Scatterplot3d – 3D
- highcharter – R wrapper for Highcharts javascript library
- plotly – contour plots, candlestick charts
- Rgl – 3D plots
- eyedroppeR – select colors within R environment

Palettes

- viridis
- RColorBrewer
- colorspace
- wesanderson
- ggsci

Royal Society 'Best Practices for Data Visualisation' guide

https://royal-statistical-society.github.io/datavisguide/

Free Vector graphics package – Inkscape

https://inkscape.org/

Free Raster Graphics package – GIMP

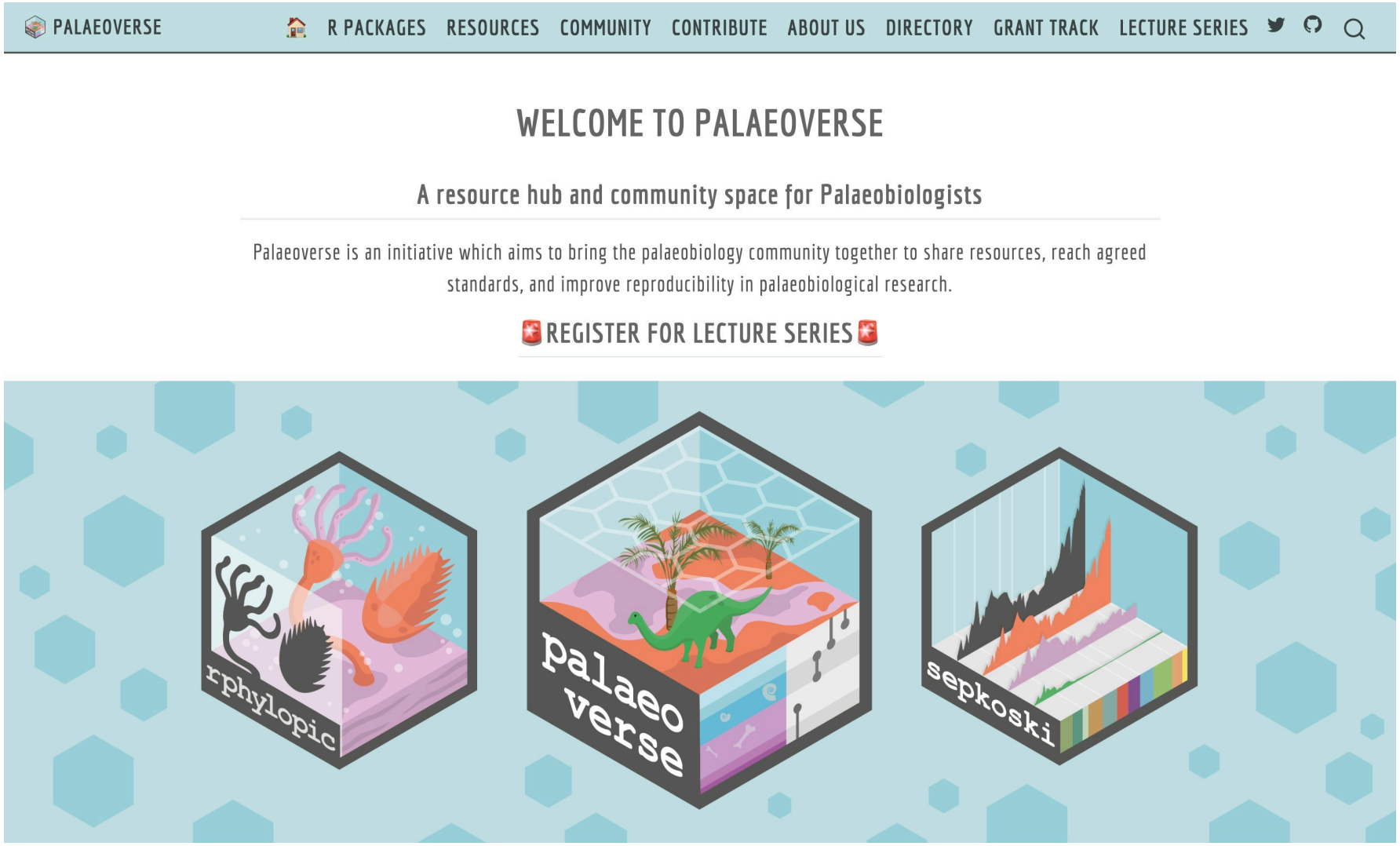
https://www.gimp.org/

Data Visualisation: Packages and Software

General Palaeontology Resources

Palaeontology Resources

http://palaeoverse.org



Palaeontology Resources

PALAEOVERSE R PACKAGES RESOURCES COMMUNITY CONTRIBUTE ABOUT US DIRECTORY GRANT TRACK LECTURE SERIES

PALAEOVERSE DIRECTORY

Welcome to the Palaeoverse Directory! This resource is provided to promote the communication of upcoming conferences, workshops, and vacancies. It also provides a register of research labs and their research focus. We hope that this resource will foster networking and collaboration across the globe.

If you wish to register an upcoming conference, workshop, vacancy or your lab, please complete the **submission form**.

Posts shared here do not imply endorsement from the Palaeoverse team and we can hold no responsibility for any interactions you make via this service. If you face any issues or have any concerns about current postings, please contact a member of the Palaeoverse team.

MAP VIEW

PALAEOVERSE R PACKAGES RESOURCES COMMUNITY CONTRIBUTE ABOUT US DIRECTORY GRANT TRACK LECTURE SERIES

TABLE VIEW

Show 10 entries

Search:

Type	Title	Contact	Institution	Country	Description
Conference	The Palaeontological Association Annual Meeting 2024	Emma Dunne	Friedrich-Alexander-Universität (FAU) Erlangen-Nürnberg	Germany	The 68th Annual Meeting of the Palaeontological Association will be held at Friedrich-Alexander-Universität (FAU) Erlangen-Nürnberg, in the city of Erlangen in northern Bavaria, Germany. This will be the first time that the Annual Meeting will take place in Germany.
Conference	Progressive Palaeontology 2024	Kirsten Flett	University of Bristol	UK	The annual, free-to-register Progressive Palaeontology (ProgPal) conference organised by students for students is being held in Bristol in June 2024. This conference is aimed at early career researchers to give them the opportunity to present their work and network in a relaxed environment amongst their peers.
Conference	7th International Palaeontological Congress	IPC7 Organisers	Cape Town International Convention Centre	South Africa	The 7th International Palaeontological Congress (IPC7) will be held in South Africa in 2026. The meeting will be held during the height of our very pleasant summer season at the Cape Town International Convention Centre (CTICC) between the 30 November - 3 December.
Conference	12th North American Paleontological Convention	Matt Friedman	University of Michigan	USA	Save the date for the upcoming 12th North American Paleontological Convention, which will be held at the University of Michigan from June 17-21, 2024. NAPC brings together professionals, graduate and undergraduate students, amateur paleontologists, and interested members of the public from all over the world. The meeting covers all branches of paleontology, including vertebrate, invertebrate, paleobotany, micropaleontology, paleo-related organic and inorganic geochemistry, paleoecology, paleoclimatology, and astrobiology, and provides a forum for exchanging research findings, defining future directions, and fostering relaxed interactions within the paleontological community at large. We plan to feature a wide variety of symposia and topical sessions, along with associated workshops and other forums, varied field trips, and technical workshops. We are excited to offer a diverse program and look forward to welcoming you to the University of Michigan in 2024!
Lab	Conservation Palaeobiology and Historical Ecology	Martin Zuschin	University of Vienna	Austria	We study modern environments and their very young fossil record to define ecological baselines for the differentiation of anthropogenic and non-anthropogenic change and to set realistic targets for the restoration of disturbed ecosystems. We use the older geologic record including now-extinct taxa to study biotic responses to environmental change that is beyond conditions observed today and to strengthen the ecological theory underlying conservation practice. For this purpose we concentrate on modern and fossil marine ecosystems and we use geohistorical records (e.g., fossils, sediment cores, geochemical data among others) to study biotic responses to environmental disturbances.
Lab	Vertebrate Palaeontology UCL	Philip Mannion	University College London	UK	We reconstruct patterns of ancient biodiversity through time and space in an attempt to better understand how past continental configurations and climatic changes constrained the evolution and distribution of ancient biodiversity, with relevance to predicting the long-term responses of climatically-threatened living organisms. This incorporates cutting-edge quantitative methods to elucidate the biogeographic history of fossil groups. Our work includes the characterisation of statistical relationships between deep time biodiversity and the geological biases that can obscure our understanding of macroevolutionary patterns, as well as subsampling and modelling approaches to ameliorate these biases.
Lab	PaleoLab USP-RP	Max Langer	University of São Paulo	Brazil	We study evolution, systematics and morphology of extinct organisms, with a special focus on vertebrates. We do lots of field works in many region of Brazil and other countries, collecting and describing new taxa. We are also interested in macroevolution, describing long-term patterns. PIs: Max Langer and Annie Hsiou.
Lab	Geozentrum Nordbayern	Wolfgang Kiessling	Friedrich-Alexander-Universität	Germany	In section Paleobiology and Paleoenvironments, we study the evolution of ecosystems over long timescales. We deduce the environmental factors which significantly influenced the emergence and disappearance of communities throughout Earth's history, alongside predicting the effects of modern day anthropogenic climate change on future ecosystems.
Lab	Bristol Palaeobiology Group	Emily Rayfield	University of Bristol	UK	The Bristol Palaeobiology Research Group includes eight members of academic staff together with large numbers of research fellows, postdocs, PhD students, and Masters students.
Lab	Computational Evolution	Tanja Stadler	ETH Zurich	Switzerland	The Computational Evolution group works on inferring the past state (i.e. the phylogenetic tree) of macroevolutionary processes, together with inferring the past speciation and extinction dynamics, particularly via the fossilized birth-death process.
Lab	Mapas Lab	Sara Varela	Universidade de Vigo	Spain	We are a group of scientists working on paleoclimatology, paleontology, evolution, and ecology, investigating ancient life paleobiogeographic dynamics.

Showing 1 to 11 of 11 entries

Previous 1 Next

Get involved with Palaeoverse Code of Conduct

Palaeontology Resources

PALAEOVERSE R PACKAGES RESOURCES COMMUNITY CONTRIBUTE ABOUT US DIRECTORY GRANT TRACK LECTURE SERIES

GRANT TRACK

Welcome to **Grant Track**! Grant Track is an online community database of research funding schemes and grants for Palaeobiologists. This framework is provided to support the community in easily keeping track of upcoming and available funding opportunities. To contribute to the database, please complete the following **submission form**. If you notice any issues with the database, please contact **Kilian Eichenseer** or **Lewis A. Jones**.

An important note: we strive to make sure all the data here is up-to-date and accurate. However, please always check official information via funders' websites. We hold no responsibility for missed deadlines.

Show 30 entries

Search:

Name	Funder	Applicant	Host	Career sta
Research Project Grant	Leverhulme	Worldwide	UK	See eligibility
Ambizione Fellowship	SNSF	Worldwide	Switzerland	0–4 years post-
SNSF Starting Grant	SNSF	Worldwide	Switzerland	2–8 years post-
Humboldt Research Fellowship	Joint-funded	Worldwide (exl. Germany)	Germany	post-PhD
JSPS Postdoctoral Fellowship	JSPS	See eligibility	Japan	0–6 years post-
Newton International Fellowships	Royal Society/British Academy	See eligibility	UK	0–7 years post-
Early Career Fellowship	Leverhulme	See eligibility	UK	0–4 years post-
International Fellowship	Leverhulme	UK-resident	Worldwide	See eligibility
Doctoral Scholarships	Leverhulme	UK-institution	UK	See eligibility
Research Fellowship	Leverhulme	UK-resident	UK	See eligibility

Palaeontology Resources

☆ palaeoverse 28 members

1–10 of 10

Welcome to the Palaeoverse Google Group!
This is a community space for palaeobiologists to share ideas and resources, advertise opportunities, and network with colleagues.
This is an unmoderated group, but please be kind to others. Harassment of individuals will result in removal from this space.
Questions regarding the palaeoverse R package are welcome here. Please raise specific issues or bugs via GitHub (https://github.com/palaeoverse-community/palaeoverse)

jones...@g... , ... tom.h...@g...	21	**Job vacancies** — PDRA Palaeoclimate Modeller at the University of Leicester, UK Deadline 13th August 2...	24 Jul	☆
daniel...@yah... , willg...@g...	3	**Issue while setting a custom 'tick_at' position with axis_geo_phylo {palaeoverse}** — Hi Will, I installed th...	13 Jul	☆
jones...@gma... , ... Bethany ...	4	**New publications** — Ten simple rules for teaching yourself R (Lawlor et al., 2023): https://doi.org/10.137...	25 May	☆
luza....@gm... , jones...@gm...	4	**How the 'bin_space' generate cell ids?** — Hi André, No problem—happy to help! Glad you got it sorted. Be...	23 May	☆
jones...@gmail... , Bethany ...	9	**Workshops** — Palaeoverse Coworking Session - May 26th 07:00 UTC Want to know more about Palaeove...	22 May	☆
jones...@gm... , ... Bethany ...	12	**Conferences** — Across the End Permian "Great Extinction", a celebration of Dr. Aymon Baud's research	16 May	☆
jones...@gm..., emdil...@gm...	4	**Funding** — Hi everyone! A quick note that the Marie Skłodowska-Curie Actions postdoctoral fellowships ...	24 Apr	☆
orfa...@gm... , ... willg...@gm...	6	**Questions re: palaeoverse R package functions** — Hi Will, I will do as you say. Thank you again! :) Kindly, ...	16 Feb	☆
jones...@gmail.com		**Resources** — Please use this conversation thread to share resources with the community.	23/11/2022	☆

Palaeontology Resources

http://paleonet.org

Palaeontology Resources

http://lists.paleonet.org/mailman/listinfo/paleonet

October 2022 Archives by thread

- **Messages sorted by:** [subject] [author] [date]
- **More info on this list...**

Starting: *Tue Oct 4 22:41:31 GMT 2022*
Ending: *Sun Oct 30 15:50:20 GMT 2022*
Messages: 25

- Paleonet: 500hr contractor fossil preparator, Dickinson ND *Denver Fowler*
- Paleonet: Advances in X-ray tomography and visualization of fossils *Stergios Zarkogiannis*
- Paleonet: Paleobotany fellowships - NPS & PS program *Christy Visaggi*
  - Paleonet: Paleobotany fellowships - NPS & PS program *Mary & John Pojeta*
- Paleonet: Session on Conservation Paleobiology at the XXI INQUA congress - July 2023 *Silvia Danise*
- Paleonet: Paleolimnology session at the XXI INQUA congress - July 2023 *Ludvig Loewemark*
- Paleonet: position open *Schweitzer, Carrie*
- Paleonet: Assistant Professor in Sedimentary Geology (JPF01653) *Nigel Hughes*
- Paleonet: PhD and junior Postdoc opportunities at UGent (Belgium) via regional FWO funding *Thijs Vandenbroucke*
- Paleonet: synonymy *Joseph Fabiny*
  - Paleonet: synonymy *Franz-Josef Lindemann*
    - Paleonet: synonymy *Kustatscher Evelyn*
    - Paleonet: synonymy *Joseph Fabiny*
      - Paleonet: synonymy *Franz-Josef Lindemann*
      - Paleonet: synonymy *Kustatscher Evelyn*
      - Paleonet: synonymy *Joseph Fabiny*
      - Paleonet: synonymy *Franz-Josef Lindemann*
      - Paleonet: synonymy *Joseph Fabiny*
- Paleonet: Blog and a request *Plotnick, Roy E*
  - Paleonet: Blog and a request *Thomas, Ellen*
    - Paleonet: Blog and a request *Plotnick, Roy E*
- Paleonet: Q-Mare Seminar #6: Dr. Jan Steger *O'Dea, Aaron*
- Paleonet: Portuguese paleo article *Thomas Hegna*
  - Paleonet: Portuguese paleo article *Pedro A. Viegas*
- Paleonet: Earth Science Women's Network Event - Demystifying the NERC Independent Research Fellowships: Interviews, November 24th 2022 *Earth Science Women's Network Events*

Palaeontology Resources

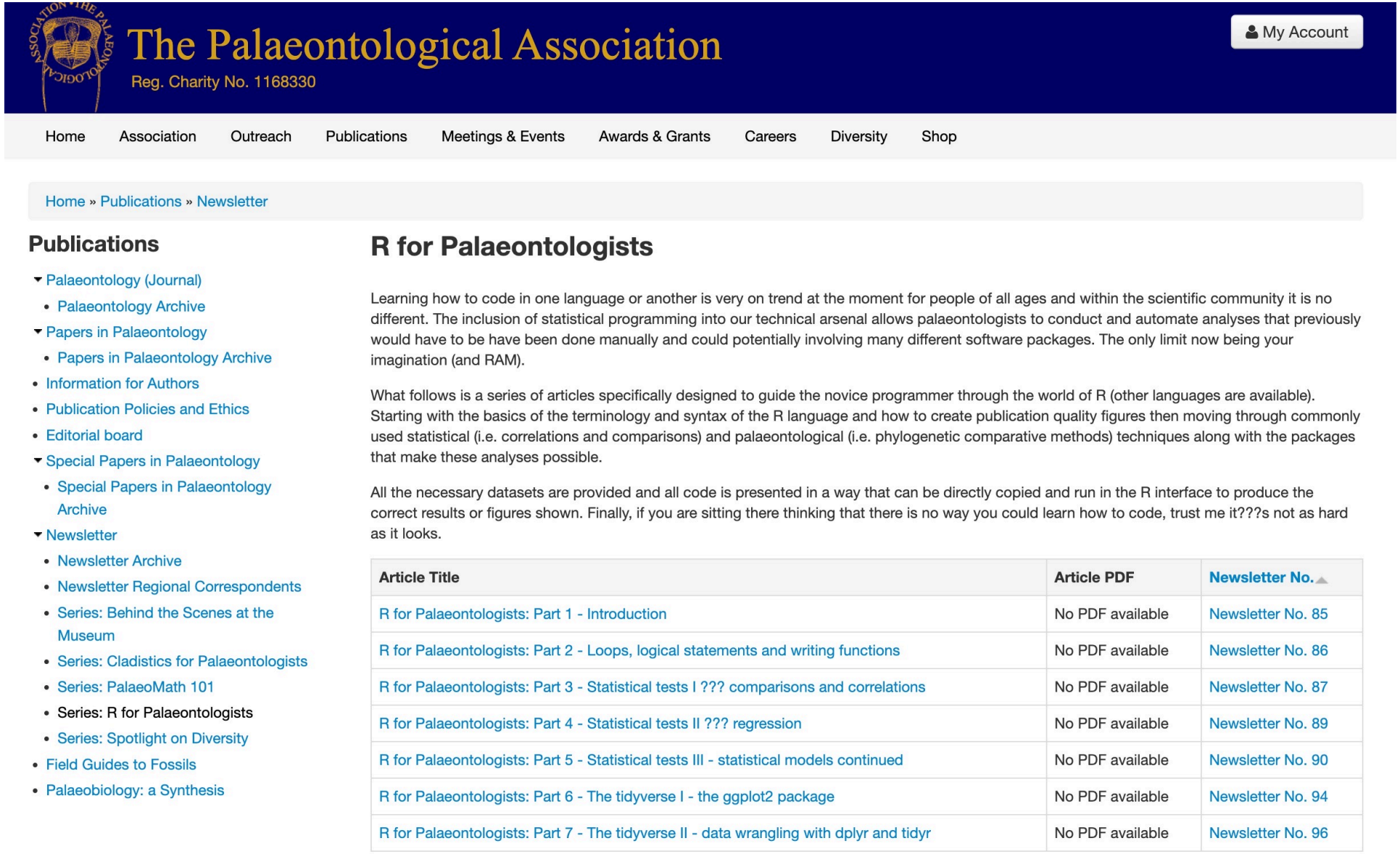
Associations, Societies and Networks

- Paleontology Society – https://www.paleosoc.org/
- Palaeontological Association – https://www.palass.org/
- PAGES (Past Global Changes) Network – https://pastglobalchanges.org/
- Conservation Paleobiology Network – https://conservationpaleorcn.org/
- Earth Science Women's Network – https://eswnonline.org/
- PaleoSynthesis – https://www.paleosynthesis.nat.fau.de/

Provide:

- Guides
- Relevant news
- Grants and Grant Information
- Outreach opportunities

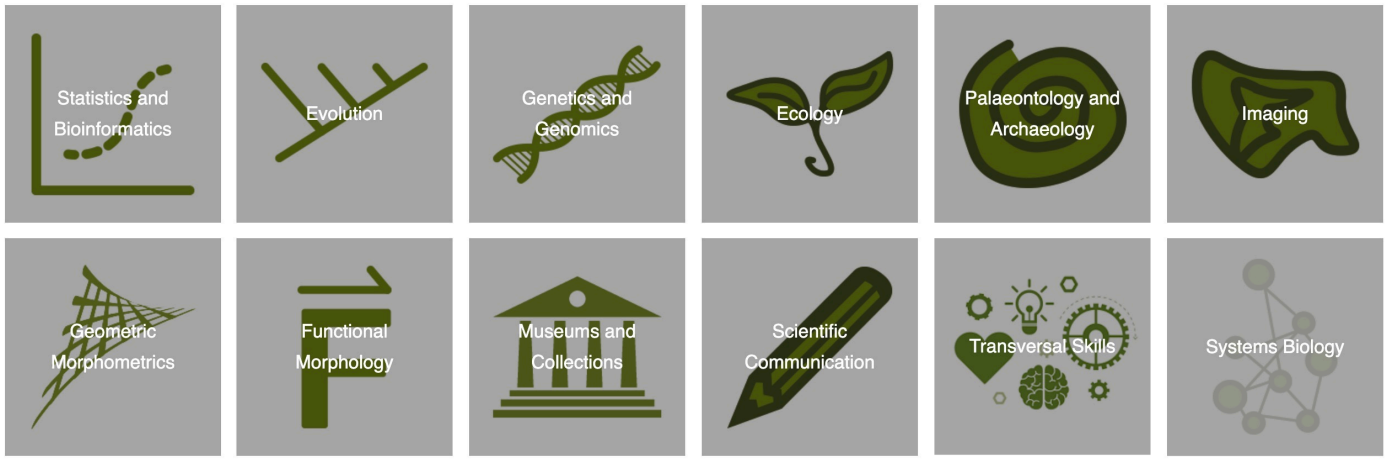
Palaeontology Resources



Palaeontology Resources

Workshops and Courses

- Analytical Paleo Workshop – https://www.cnidaria.nat.uni-erlangen.de/shortcourse/
- Physalia courses – https://www.physalia-courses.org/
- PaleoCAMP – https://paleoclimate.camp/
- Transmitting Science workshops – https://www.transmittingscience.com/



General Programming Resources

Programming Resources

CRAN Task Views

- Lists and descriptions of helpful packages for specific fields/purposes.

Example: Phylogenetics

- https://cran.r-project.org/web/views/Phylogenetics.html

CRAN Task View: Phylogenetics

Maintainer:	William Gearty, Brian O'Meara, Jacob Berv, Gustavo A. Ballen, Diniz Ferreira, Hilmar Lapp, Lars Schmitz, Martin R. Smith, Nathan S. Upham, Jonathan A. Nations
Contact:	willgearty at gmail.com
Version:	2023-04-03
URL:	https://CRAN.R-project.org/view=Phylogenetics
Source:	https://github.com/cran-task-views/Phylogenetics/
Contributions:	Suggestions and improvements for this task view are very welcome and can be made through issues or pull requests on GitHub or via e-mail to the maintainer address. For further details see the Contributing guide.
Citation:	William Gearty, Brian O'Meara, Jacob Berv, Gustavo A. Ballen, Diniz Ferreira, Hilmar Lapp, Lars Schmitz, Martin R. Smith, Nathan S. Upham, Jonathan A. Nations (2023). CRAN Task View: Phylogenetics. Version 2023-04-03. URL https://CRAN.R-project.org/view=Phylogenetics.
Installation:	The packages from this task view can be installed automatically using the ctv package. For example, `ctv::install.views("Phylogenetics", coreOnly = TRUE)` installs all the core packages or `ctv::update.views("Phylogenetics")` installs all packages that are not yet installed and up-to-date. See the CRAN Task View Initiative for more details.

Overview

The history of life unfolds within a phylogenetic context, and phylogenetic trees (often shortened to "trees") are developed to represent this evolutionary history. Comparative phylogenetic methods are statistical approaches for analyzing historical patterns along such phylogenetic trees. This task view describes R packages that (i) facilitate the handling, manipulation and analysis of phylogenetic trees; (ii) implement comparative phylogenetic methods; (iii) apply phylogenetic methods to specific disciplines. This is an active research area and much of the information is subject to change. Many important packages are not on CRAN: either they were formerly on CRAN and were later archived (for example, if they failed to incorporate necessary changes as R is updated) or they are developed elsewhere and are not yet available on CRAN. Such packages may be found on GitHub, R-Forge, Bioconductor, or authors' websites. At least ten packages start as phy* in this domain, including two pairs of similarly named packages (phytools and phylotools, phylobase and phybase); users are encouraged to read and distinguish carefully between package names.

Programming Resources

Example: Phylogenetics

Working with trees in R

Getting trees into R

- phylobase and its lighter weight sibling rncl can use the Nexus Class Library to read NEXUS, Newick, and other tree formats.
- treebase can search for and load trees from the online tree repository TreeBASE.
- RNeXML can read, write, and process metadata for the NeXML format.
- TreeTools can read trees from external files in TNT format and NEXUS format, including extensions to the Nexus format not supported by ape, and metadata from MorphoBank.
- ips can load trees from BEAST, MrBayes, and other phylogenetics programs. This package can be used to parse the node support and other values from BEAST or MrBayes output.
- phylotate can read and write ape-compatible phylogenetic trees in NEXUS and Newick formats, while preserving annotations.
- phyext2 can read and write various tree formats, including simmap formats.
- rotl can pull in a synthetic tree and individual study trees from the Open Tree of Life project.
- The treeio package can read trees in Newick, Nexus, New Hampshire eXtended format (NHX), jplace and Phylip formats and data output from BEAST, EPA, HyPhy, MrBayes, PAML, PHYLDOG, pplacer, r8s, RAxML and RevBayes.
- phylogram can convert Newick files into dendrogram objects.
- dendextend can manipulate such dendrogram objects.
- phytools can read and write trees in simple Newick and Nexus format, as well as `"simmap"` trees with an encoded discrete character.

Tree manipulation

- phylobase has functions for traversing a tree (e.g., getting all descendants from a particular node specified by just two of its descendants).
- geiger can prune trees and data to an overlapping set of taxa. It can be also used to perform branch length scaling using ACDC; Pagel's (1999) lambda, delta and kappa parameters; and the Ornstein-Uhlenbeck alpha parameter (for ultrametric trees only). It can also be used to prune extinct taxa.
- TreeTools has functions to quantify and manipulate tree shape and balance, including the application of constraints; and to measure the phylogenetic information content of trees.
- Rogue identifies wildcard taxa, generating more informative summary trees.
- tidytree can convert a tree object to a tidy data frame and has other tidy approaches to manipulate tree data.
- evobiR can do fuzzy matching of names (to allow some differences).
- SigTree finds branches that are responsive to some treatment, while allowing correction for multiple comparisons.
- dendextend can manipulate dendrograms, including subdividing trees, adding leaves, and more.
- apex *(archived)* can handle multiple gene DNA alignments making their use and analysis for tree inference easier in ape and phangorn.
- aphid can weight sequences based on a phylogeny and can use hidden Markov models (HMMs) for a variety of purposes including multiple sequence alignment.
- phangorn and TreeSearch can perform tree rearrangements (NNI, SPR, and TBR).
- paleotree has functions for manipulating trees based on sampling issues that arise with fossil taxa as well as more universal transformations.
- dendextend can manipulate dendrograms, including subdividing trees, adding leaves, and more.
- castor can be used to manipulate extremely large trees (up to millions of tips).
- phytools can slice a tree at a pre-specified point, add taxa randomly to a tree, add species to genera, bind a single tip to a tree or two trees together, collapse clades on a tree using a clickable interface, perform midpoint rooting, paint a user-specified discrete character regime onto a tree to create a `"simmap"` object by various methods, convert a tree with a mapped character into a simple `"phylo"` object with unbranching nodes or a root edge into a single unbranching node, and other things.

Tree visualization

- ape, adephylo, phylobase, phytools, ouch, and dendextend have functions for plotting trees; several of these have options for branch or taxon coloring based on some criterion (ancestral state, tree structure, etc.). In addition, phytools has substantial functionality to plot comparative data at the tips of the tree, graph the results of comparative analyses, and plot co-phylogenies.
- paleoPhylo and paleotree are specialized for drawing paleobiological phylogenies.
- viper can be used to annotate phylogenies with branch support, HPD intervals, and more.
- The popular R visualization package ggplot2 can be extended by ggtree and ggtreeExtra to visualize phylogenies, and a geological timescale can be added using deeptime.
- strap can be used to add a geological timescale to a phylogeny, along with stratigraphic ranges.
- idendr0 can be used to interactively explore trees (as dendrograms).
- phylocanvas is a widget for "htmlwidgets" that enables embedding of phylogenetic trees using the phylocanvas javascript library.
- ggmuller allows plotting a phylogeny along with frequency dynamics.
- RPANDA can be used to plot the spectral density and eigenvalues of a phylogeny.
- diversitree has an unexported function called "plot2.phylo()" which allows for the production of very lightweight PDF outputs of speciose trees (can be called via `diversitree:::plot2.phylo()`).

Programming Resources

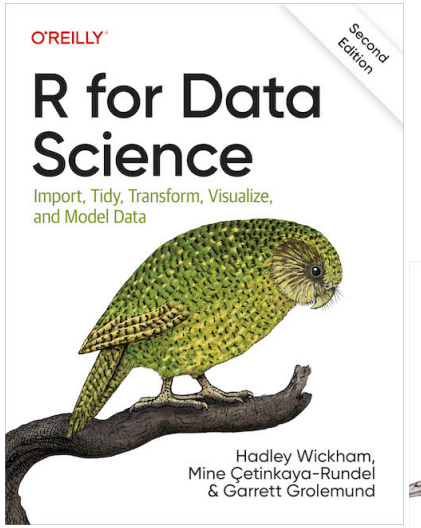
Other Useful Task Views

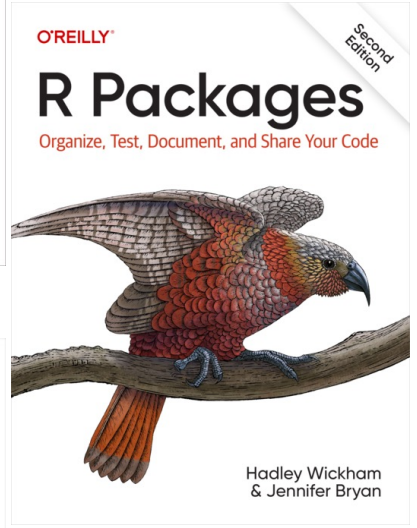
- Spatial data – https://cran.r-project.org/web/views/Spatial.html
- Ecological and Environmental Data – https://cran.r-project.org/web/views/Environmetrics.html
- Time series analysis – https://cran.r-project.org/web/views/TimeSeries.html
- Palaeontology – we're working on it!

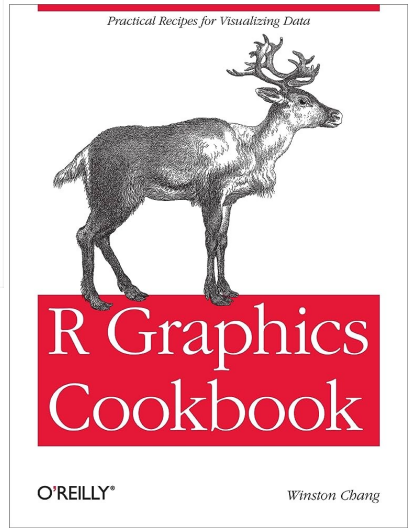
Programming Resources

Free R Books

- R for Data Science – https://r4ds.hadley.nz/
  - General overview of how to carry out data analysis using R
- R Packages – https://r-pkgs.org/
  - Complete guide to making R packages
- Hands-On Programming with R – https://rstudio-education.github.io/hopr/
  - An overview of R as a programming language, to guide complete beginners
- Cookbook for R – http://www.cookbook-r.com/
  - Quick start guide for solving specific issues in R
- An Introduction to R – https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf
  - A broad introduction to the R environment



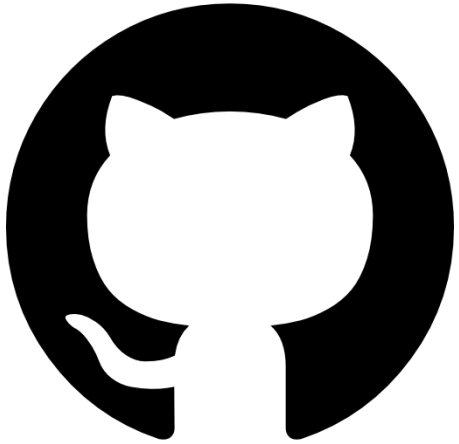




Problem Solving Tips

Stackoverflow

ChatGPT



Github

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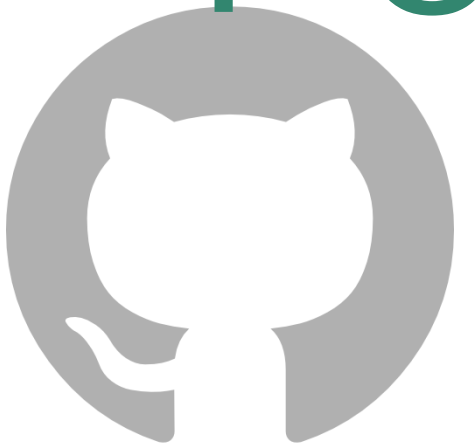
People!!!



Github

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