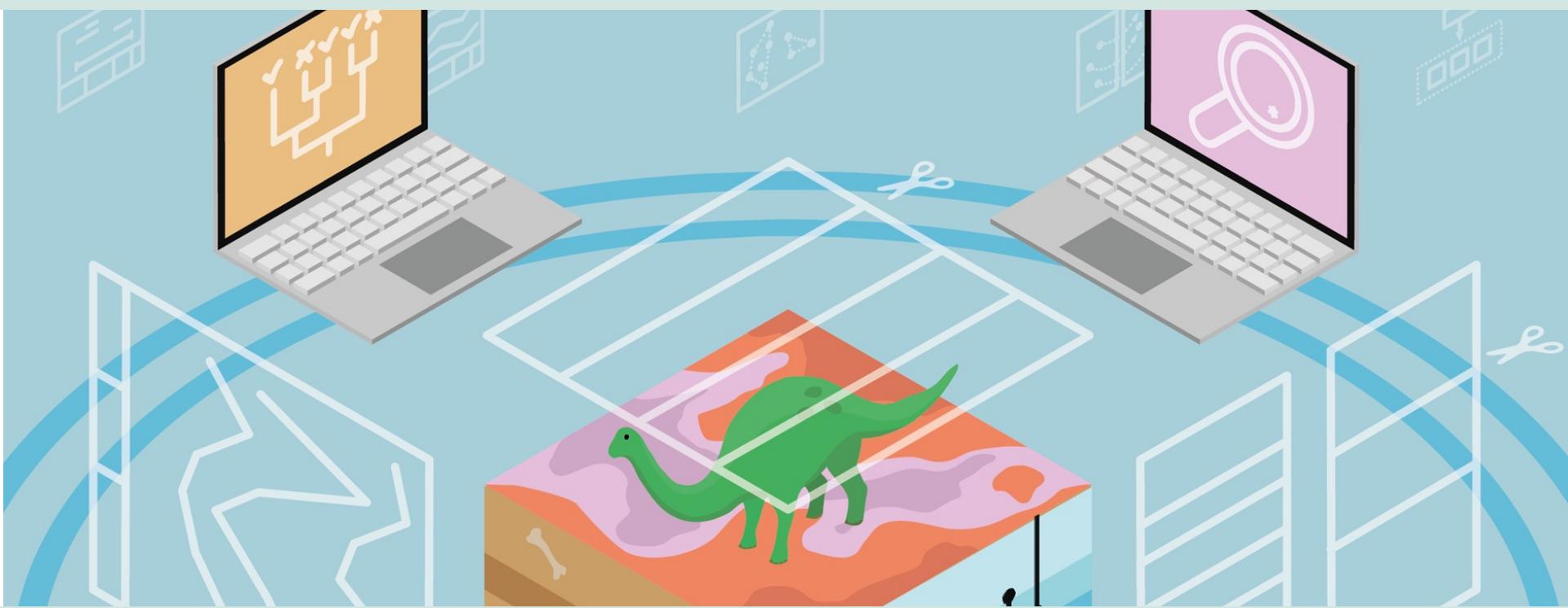


# PALAEOVERSE WORKSHOP: PALAEOBIOLOGY RESOURCES



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# INTRODUCTION

## AIMS

**To provide information about useful resources for data handling as well as general programming/palaeontology.**

## APPROACH

- Cover/summarise 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 to create a useful broader resource for palaeontologists.
  - If you have resources which you'd like to add, let me know and I'll put them on the workshop website ([christopherdaviddean@gmail.com](mailto:christopherdaviddean@gmail.com)) (or just talk to me during a break!)

# DATA ACQUISITION

# DATA ACQUISITION: OCCURRENCE DATABASES

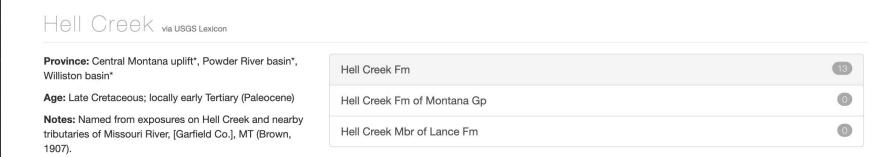
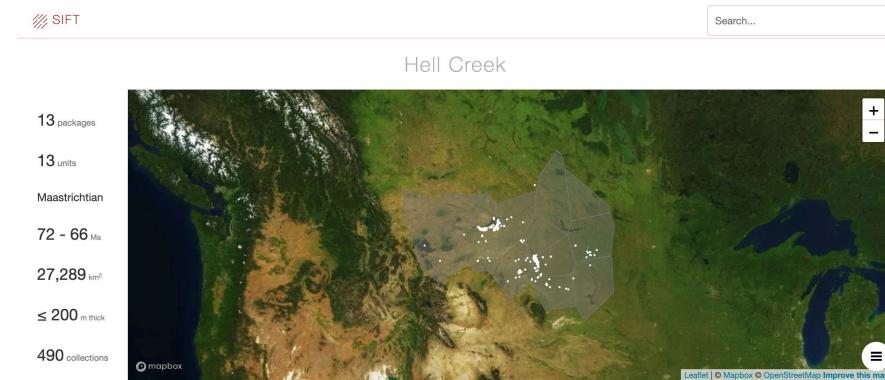
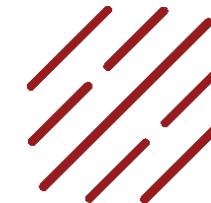
## Occurrence Databases

- 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://doi.org/10.1111/geb.13735>
- Phylacine – [http://megapast2future.github.io/PPHYLACINE\\_1.2/](http://megapast2future.github.io/PPHYLACINE_1.2/)
- PARED – <http://paleo-reefs.pal.uni-Erlangen.de>

# DATA ACQUISITION: COVARIATES

## Geological Databases

- 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.



# DATA ACQUISITION: COVARIATES

## Geological Databases

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

## Spatial Datasets

- 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](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/10.11175/JAMC-D-13-0356.I>

## Palaeogeographies

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

# DATA ACQUISITION

## Museums!

- Untapped resource of data
- Curators are the best!
- But... might have some accessibility issues.

### Palaeontology

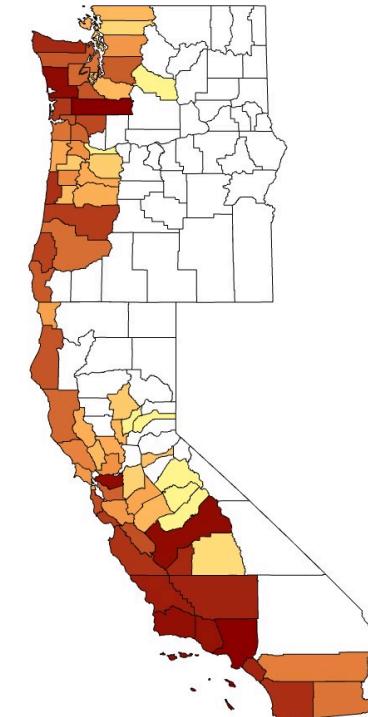
Quantifying the dark data in museum fossil collections as palaeontology undergoes a second digital revolution

C. R. Marshall<sup>1,2</sup>, S. Finnegan<sup>1,2</sup>, E. C. Clites<sup>2</sup>, P. A. Holroyd<sup>2</sup>, N. Bonuso<sup>3</sup>,  
C. Cortez<sup>4</sup>, E. Davis<sup>5,6</sup>, G. P. Dietl<sup>7,8</sup>, P. S. Druckenmiller<sup>9</sup>, R. C. Eng<sup>10</sup>,  
C. Garcia<sup>11</sup>, K. Estes-Smargiassi<sup>12</sup>, A. Hendy<sup>12</sup>, K. A. Hollis<sup>13</sup>, H. Little<sup>13</sup>,  
E. A. Nesbitt<sup>10</sup>, P. Roopnarine<sup>11</sup>, L. Skibinski<sup>7</sup>, J. Vendetti<sup>12</sup> and L. D. White<sup>2</sup>

(a) literature database



(b) museum collections



no. sites  
1000  
100  
10

# 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.

### 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](mailto:azaffos@email.arizona.edu)>

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

The screenshot shows the GitHub README page for the paleobioDB package. It includes a build status badge (green), codecov coverage (0%), download statistics (155/month), and a CRAN not published badge. The page title is 'paleobioDB' and it has an 'About' section stating: 'paleobioDB is a package for downloading, visualizing and processing data from Paleobiology Database.'

## WORLDCLIM

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

## Macrostrat

- Watch this space... (and maybe help us out?)

`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

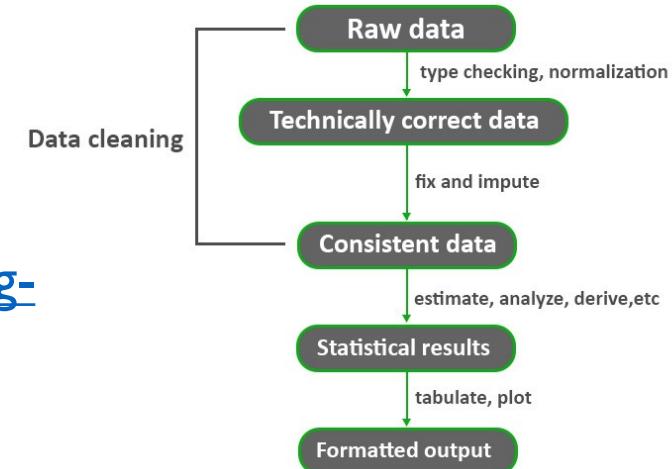
`name` Data set name, currently supported are 'GADM', 'countries', 'SRTM', 'alt', and 'worldclim'. See Details for more info

# DATA PREPARATION

# DATA PREPARATION

## 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%>
- 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

## Useful Palaeo 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



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, Sofia 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



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



RESEARCH ARTICLE | Open Access |

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

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

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

# DATA VISUALISATION

# DATA VISUALISATION: GRAPHS

## R Graph Gallery

- <https://r-graph-gallery.com/>



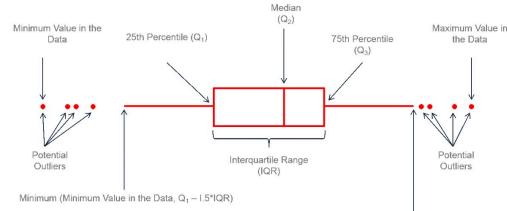
# DATA VISUALISATION: GRAPHS

## R Graph Gallery

### Boxplot



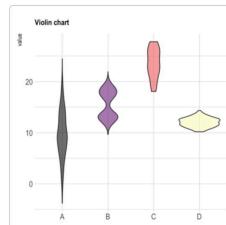
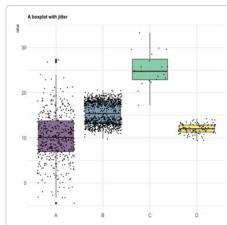
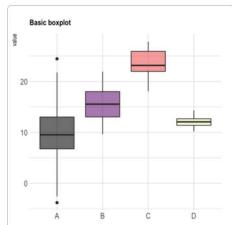
This is the [boxplot](#) section of the gallery. If you want to know more about this kind of chart, visit [data-to-viz.com](#). If you're looking for a simple way to implement it in R or [ggplot2](#), pick an example below. Note: this [online course](#) on ggplot2 covers several geometries including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



Anatomy of a boxplot - [Explanation](#) - [Image source](#)

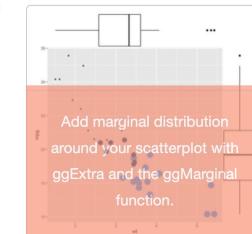
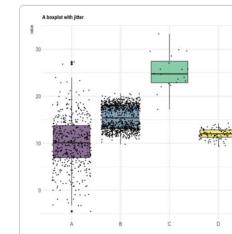
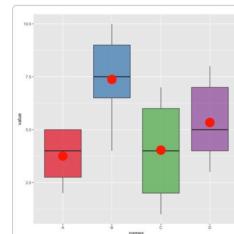
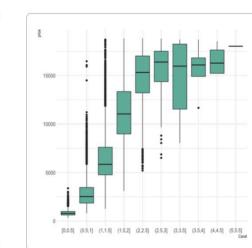
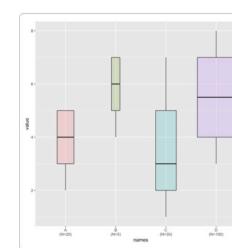
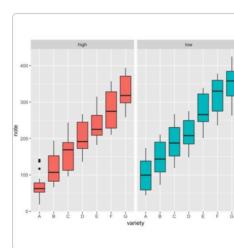
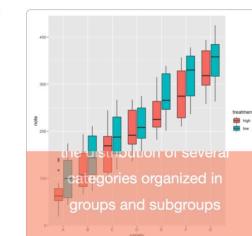
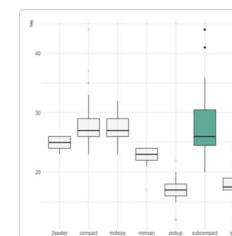
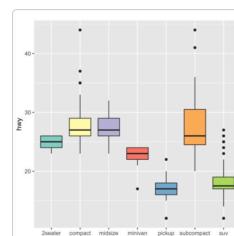
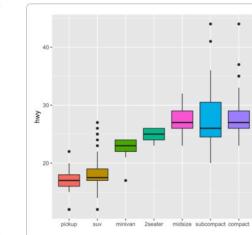
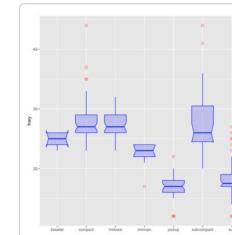
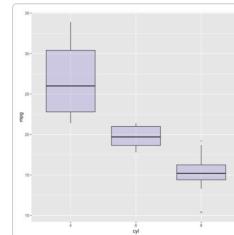
### WARNING

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 [ridgeline chart](#) instead.



### GGPLOT2

Boxplots 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

## Colorhunt

- <https://colorhunt.co/>

The screenshot shows the Colorhunt website interface. On the left, there's a sidebar with filters: 'New', 'Popular' (selected), 'Month', 'Year' (selected), 'All time', 'Random', 'Collection', 'Pastel', 'Vintage', 'Retro', 'Neon', and 'Gold'. A search bar at the top says 'Search palettes'. The main area displays a grid of color palettes. Each palette card includes a heart icon with a count (e.g., 25,798, 22,468, 20,137), a timestamp (e.g., 11 months, 10 months, 11 months, 7 months), and a 'Like this palette?' button. A blue line connects the third palette in the first row to a detailed view on the right. This detailed view shows a larger version of the palette with hex codes and RGB values for each color swatch. It also includes a 'Like this palette?' button with a count of 22,468, download and link options, and a timestamp of 11 months. Below the palette are color categories: Purple (#B1B2FF, rgb(177, 178, 255)), Blue (#AAC4FF, rgb(170, 196, 255)), Cream (#D2DAFF, rgb(210, 218, 255)), Light (#EEF1FF, rgb(238, 241, 255)), and others.

Color Hunt

Search palettes

New

Popular

Month

Year

All time

Random

Collection

Pastel

Vintage

Retro

Neon

Gold

25,798 11 months

22,468 11 months

20,137 11 months

19,332 10 months

18,434 11 months

18,398 7 months

Like this palette?

#B1B2FF #AAC4FF #D2DAFF #EEF1FF

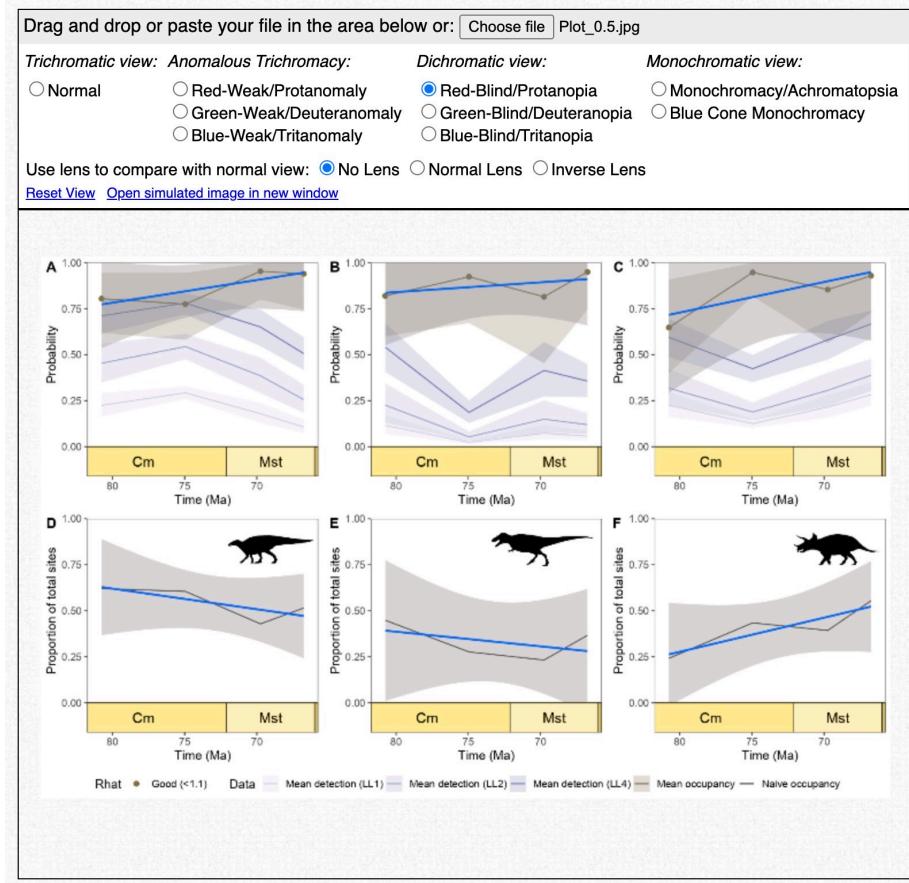
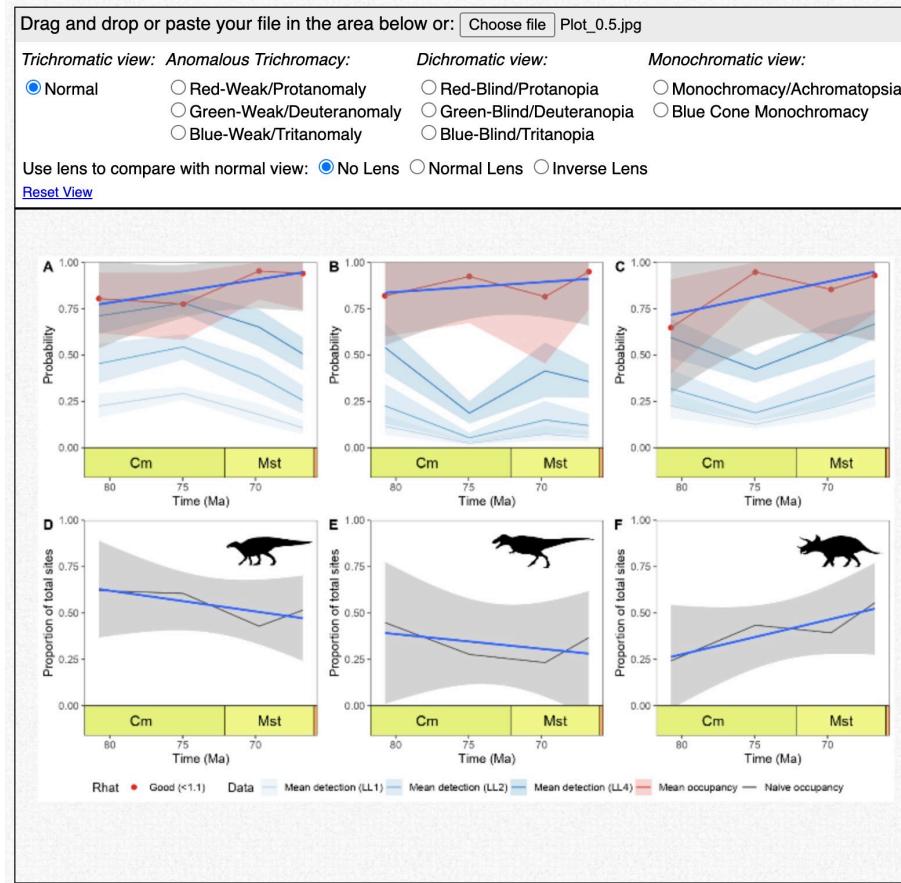
rgb(177, 178, 255) rgb(170, 196, 255) rgb(210, 218, 255) rgb(238, 241, 255)

Purple Blue Cream Light Pastel Cold Sky

# 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

## Palettes

- **viridis**
- **RColorBrewer**
- **colorspace**
- **wesanderson**
- **ggsci**

## Royal Society ‘Best Practices for Data Visualisation’ guide

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

## Vector graphics package – Inkscape

- <https://inkscape.org/>

## Raster Graphics package – GIMP

- <https://www.gimp.org/>

# WRITING FUNCTIONS

# WRITING FUNCTIONS: GENERAL RESOURCES

## A good cover-all intro

- Mastering Software Development in R: Functions –  
<https://bookdown.org/rdpeng/RProgDA/functions.html>

## Style Guides

- Tidyverse (snake\_case) – <https://style.tidyverse.org/functions.html>
- Google (CamelCase) – <https://google.github.io/styleguide/Rguide.html>

## Other Useful Info

- Testing basics – <https://r-pkgs.org/testing-basics.html>
- Environments – <https://adv-r.hadley.nz/environments.html>
- Scoping Rules – <https://bookdown.org/rdpeng/rprogdatascience/scoping-rules-of-r.html>

# WRITING FUNCTIONS: PACKAGES

## Useful Packages

- **roxygen2**
  - Allows semi-automated documentation of functions when making a package.
  - Puts comments in a .Rd file that is used for function documentation.
- **lintr**
  - Package for sorting static code.
  - Checks adherence to a given style, syntax errors and possible semantic issues.
- **testthat**
  - Provides functions to easily test your functions to ensure that they are working properly.



# GENERAL PALAEONTOLOGY RESOURCES

# GENERAL PALAEONTOLOGY RESOURCES

<http://palaeoverse.org>



Palaeoverse   Overview   About us   R Packages   Directory   Grant Track   Community   Contribute   News



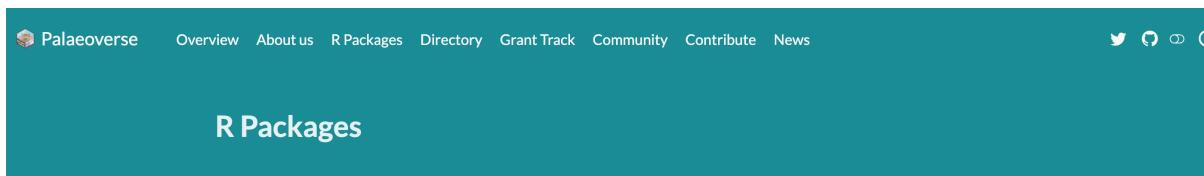
## Welcome to Palaeoverse

A Resource Hub for Palaeobiologists

Palaeoverse is an initiative which aims to bring the palaeobiology community together to share resources, reach agreed standards, and improve reproducibility in palaeobiological research.



# GENERAL PALAEONTOLOGY RESOURCES



The screenshot shows the 'R Packages' section of the Palaeoverse website. At the top, there's a navigation bar with links to 'Palaeoverse', 'Overview', 'About us', 'R Packages', 'Directory', 'Grant Track', 'Community', 'Contribute', and 'News'. To the right of the navigation are social media icons for Twitter, GitHub, and LinkedIn, along with a magnifying glass icon for search. Below the navigation, the title 'R Packages' is displayed in a large, bold, white font against a teal background.

## R Packages

On this page

R Packages

Cheat sheets

## R Packages



### palaeoverse

DOI 10.5281/zenodo.8270741 | downloads 2871 | CRAN 1.2.1

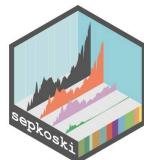
palaeoverse provides functionality to support data preparation and exploration for palaeobiological analyses, improving code reproducibility and accessibility. The aim of the palaeoverse R package is to bring the palaeobiological community together to establish agreed standards. [Go to site...](#)



### rphylopic

downloads 24K | CRAN 1.2.0

rphylopic allows users to add silhouettes of organisms from the PhyloPic website to plots generated in base R and ggplot2. rphylopic was originally developed and maintained by Scott Chamberlain. From ver. 1.0.0, the package is now developed and maintained by the Palaeoverse team. [Go to site...](#)



### sepkoski

DOI 10.5281/zenodo.7342194 | downloads 1557 | CRAN 0.0.1

sepkoski provides access to Sepkoski's fossil marine animal genera compendium (Sepkoski, 2002). The aim of the package is to offer a light and easily-accessible solution to working with Sepkoski's compendium to support teaching exercises. [Go to site...](#)

## Cheat sheets



This is a screenshot of the 'cheat sheet' for the palaeoverse package. It has a light blue header with the package name and a QR code. The main content is organized into sections: 'General utility functions', 'Preprocess for temporal analyses', 'Prepare for spatial analyses', 'Prepare for spatial analyses', 'Process an occurrence dataset', 'Process an occurrence dataset', 'Process an occurrence dataset', and 'Explore datasets'. Each section contains several command examples with their descriptions.



This is a screenshot of the 'cheat sheet' for the rphylopic package. It has a light blue header with the package name and a QR code. The main content is organized into sections: 'Getting started', 'Adding silhouettes to plots', 'Modifying silhouettes', and 'Saving and sharing'. Each section contains several command examples with their descriptions.

# GENERAL PALAEONTOLOGY RESOURCES



Overview About us R Packages Directory Grant Track Community Contribute News



## 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.

On this page

[Map view](#)

[Table view](#)

### Map view



# GENERAL PALAEONTOLOGY RESOURCES

Show 30 entries

Search:

Type	Title	Contact	Institution	Country	Description
Conference	<a href="#">Crossing the Palaeontological-Ecological Gap</a>	<a href="#">CPEG 2023 Committee</a>	Vilnius University	Lithuania	This hybrid conference will bring together ecologists, palaeontologists, Earth system scientists, and biogeographers who are interested in fundamental drivers, as well as applications of (palaeo)ecological patterns in understanding past and present, as well as preserving biological diversity, and ecosystem functions for the future.
Lab	<a href="#">Vertebrate Palaeontology UCL</a>	<a href="#">Philip Mannion</a>	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.
Conference	<a href="#">14th Symposium of the International Fossil Coral and Reef Society (IFCRS)</a>	<a href="#">Jarosław Stolarski</a>	International Fossil Coral and Reef Society	Poland	The aim of the conference is to promote the latest results of coral reef research conducted from a unique paleontological perspective. The IFCRS conferences (13 editions to date) are the most important global forum for scientists studying fossil corals, reefs and reef organisms in the contexts of climate change and the evolution of coral reef biodiversity.
Lab	<a href="#">PaleoLab USP-RP</a>	<a href="#">Max Langer</a>	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	<a href="#">Geozentrum Nordbayern</a>	<a href="#">Wolfgang Kiessling</a>	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	<a href="#">Bristol Palaeobiology Group</a>	<a href="#">Emily Rayfield</a>	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	<a href="#">Computational Evolution</a>	<a href="#">Tanja Stadler</a>	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	<a href="#">Mapas Lab</a>	<a href="#">Sara Varela</a>	Universidade de Vigo	Spain	We are a group of scientists working on paleoclimatology, paleontology, evolution, and ecology, investigating ancient life paleobiogeographic dynamics.
Conference	<a href="#">PalAss Annual Meeting 2023</a>	<a href="#">Alex Liu</a>	University of Cambridge	England	The 67th Annual Meeting of the Palaeontological Association will be held at the University of Cambridge from 11th to 15th September 2023.
Lab	<a href="#">Earth Surface Science Institute</a>	<a href="#">Tracy Aze</a>	University of Leeds	UK	ESSI a multidisciplinary research group whose research strengths lie in environmental geochemistry, reconstructions of past environments, biological evolution and extinction through Earth history, palaeoclimate and biogeochemical modelling, experimental, isotope and organic chemistry, and water and land quality.

Showing 1 to 10 of 10 entries

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1

Next

# GENERAL PALAEONTOLOGY RESOURCES

Palaeoverse Overview About us R Packages Directory Grant Track Community Contribute News 

## 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 stage	Award	Research costs	Duration	Deadline
<a href="#">Research Project Grant</a>	Leverhulme	Worldwide	UK	See eligibility	up to GBP 500,000	up to 25% of award	up to 5 years	March, September, December
<a href="#">Ambizione Fellowship</a>	SNSF	Worldwide	Switzerland	0-4 years post-PhD	CHF 400,000	CHF 400,000	2-4 years	October
<a href="#">SNSF Starting Grant</a>	SNSF	Worldwide	Switzerland	2-8 years post-PhD	CHF 1,800,000	CHF 1,800,000	5 years	February
<a href="#">Humboldt Research Fellowship</a>	Joint-funded	Worldwide (exl. Germany)	Germany	post-PhD	up to EUR 76,080	EUR 19,200	up to 2 years	March, July, November
<a href="#">JSPS Postdoctoral Fellowship</a>	JSPS	See eligibility	Japan	0-6 years post-PhD	JPY 8,888,000	See details	up to 2 years	March
<a href="#">Newton International Fellowships</a>	Royal Society/British Academy	See eligibility	UK	0-7 years post-PhD	GBP 60,000	See details	up to 2 years	January
<a href="#">Early Career Fellowship</a>	Leverhulme	See eligibility	UK	0-4 years post-PhD	up to GBP 156,000	GBP 18,000	up to 3 years	February
<a href="#">International Fellowship</a>	Leverhulme	UK-resident	Worldwide	See eligibility	GBP 50,000	See details	up to 2 years	April
<a href="#">Doctoral Scholarships</a>	Leverhulme	UK-institution	UK	See eligibility	GBP 2,150,000	GBP 2,150,000	up to 8 years	June
<a href="#">Research Fellowship</a>	Leverhulme	UK-resident	UK	See eligibility	GBP 65,000	GBP 65,000	up to 2 years	See details
<a href="#">Vice-Chancellor's Fellowship</a>	University of Northumbria	Any	UK	post-PhD	GBP 43,413 - 63,672 salary p.a.	See details	3 years	February
<a href="#">Anniversary Fellowship</a>	University of Southampton	Any	UK	post-PhD	GBP 33,314 - 40,931 salary p.a.	GBP 10,000 p.a.	3 years	February
<a href="#">1851 Research Fellowship</a>	Royal Commission for the Exhibition of 1851	Any	UK	end of PhD or post-PhD	postdoc pay scale salary	GBP 10,000 p.a.	3 years	January
<a href="#">Walter Benjamin Programme</a>	DFG	Germany-institution (see details)	Worldwide	post-PhD	See details	See details	up to 2 years	Anytime
<a href="#">Marie Skłodowska-Curie Actions</a>	European Comission	Any / EU	Any / EU	0-8 years post-PhD	See details	See details	1-3 years	April
<a href="#">Branco Weiss Fellowship</a>	ETH Zurich	Any	Worldwide	0-5 years post-PhD	CHF 500,000	included in award	5 years	January
<a href="#">Lindemann Trust fellowship</a>	Lindemann Trust	Any	USA	post-PhD	\$100,000	none	2 years	February
<a href="#">Fulbright US Scholar Program</a>	Fulbright Scholars	US citizens	Worldwide	See eligibility	See details	See details	See details	February, September
<a href="#">START Programme</a>	FWF	Any	Austria	2-8 years post-PhD	EUR 800,000 - 1,000,000	See details	5 years	September
<a href="#">ESPRIT Programme</a>	FWF	Any	Austria	0-5 years post-PhD	salary and project costs	up to EUR 25,000 p.a.	3 years	none
<a href="#">Erwin Schrödinger Fellowship</a>	FWF	Austria-resident	Worldwide (outside Austria)	end of PhD or post-PhD	salary and project costs	up to EUR 12,000 p.a.	up to 3 years	none
<a href="#">Future Leaders Fellowship</a>	UKRI	worldwide	UK	post-PhD	See details	See details	up to 4 years	July

Showing 1 to 22 of 22 entries

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# GENERAL PALAEONTOLOGY RESOURCES

☆ palaeoverse 28 members

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## 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): <a href="https://doi.org/10.137...">https://doi.org/10.137...</a>	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	

# GENERAL PALAEONTOLOGY RESOURCES

<http://paleonet.org>

[Home](#) [Listserver User's Guide](#) [Position Listings](#) [Useful Links](#) [PaleoNet Blog](#) [PaleoNet & Me](#) [Contact](#)

A large, detailed illustration of a sauropod's hand and forearm reaching out from the left side of the frame. The hand has four long fingers and a small thumb. The background consists of rolling hills and mountains under a cloudy sky.

The PaleoNet Pages

*A communications system for paleontologists.*

# GENERAL 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*
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      - [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*

# GENERAL PALAEONTOLOGY RESOURCES

## Associations and Societies

- Examples:
  - Palaeontological Association
  - Paleontology Society
  - Geological Society
- Provide:
  - Guides
  - Relevant News
  - Grants and Grant Information
  - Outreach opportunities



The  
Geological  
Society

# GENERAL PALAEONTOLOGY RESOURCES



## The Palaeontological Association

Reg. Charity No. 1168330

My Account

Home    Association    Outreach    Publications    Meetings & Events    Awards & Grants    Careers    Diversity    Shop

Home » Publications » Newsletter

### Publications

- ▼ Palaeontology (Journal)
  - Palaeontology Archive
- ▼ Papers in Palaeontology
  - Papers in Palaeontology Archive
- Information for Authors
- Publication Policies and Ethics
- Editorial board
- ▼ Special Papers in Palaeontology
  - Special Papers in Palaeontology Archive
- ▼ Newsletter
  - Newsletter Archive
  - Newsletter Regional Correspondents
  - Series: Behind the Scenes at the Museum
  - Series: Cladistics for Palaeontologists
  - Series: PalaeoMath 101
  - Series: R for Palaeontologists
  - Series: Spotlight on Diversity
  - Field Guides to Fossils
  - Palaeobiology: a Synthesis

### R for Palaeontologists

Learning how to code in one language or another is very on trend at the moment for people of all ages and within the scientific community it is no different. The inclusion of statistical programming into our technical arsenal allows palaeontologists to conduct and automate analyses that previously would have to be done manually and could potentially involve many different software packages. The only limit now being your imagination (and RAM).

What follows is a series of articles specifically designed to guide the novice programmer through the world of R (other languages are available). Starting with the basics of the terminology and syntax of the R language and how to create publication quality figures then moving through commonly used statistical (i.e. correlations and comparisons) and palaeontological (i.e. phylogenetic comparative methods) techniques along with the packages that make these analyses possible.

All the necessary datasets are provided and all code is presented in a way that can be directly copied and run in the R interface to produce the correct results or figures shown. Finally, if you are sitting there thinking that there is no way you could learn how to code, trust me it???s not as hard as it looks.

Article Title	Article PDF	Newsletter No. ▲
R for Palaeontologists: Part 1 - Introduction	No PDF available	Newsletter No. 85
R for Palaeontologists: Part 2 - Loops, logical statements and writing functions	No PDF available	Newsletter No. 86
R for Palaeontologists: Part 3 - Statistical tests I ??? comparisons and correlations	No PDF available	Newsletter No. 87
R for Palaeontologists: Part 4 - Statistical tests II ??? regression	No PDF available	Newsletter No. 89
R for Palaeontologists: Part 5 - Statistical tests III - statistical models continued	No PDF available	Newsletter No. 90
R for Palaeontologists: Part 6 - The tidyverse I - the ggplot2 package	No PDF available	Newsletter No. 94
R for Palaeontologists: Part 7 - The tidyverse II - data wrangling with dplyr and tidyr	No PDF available	Newsletter No. 96

# GENERAL PROGRAMMING RESOURCES

# GENERAL 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.

# GENERAL PROGRAMMING RESOURCES

## Example: Phylogenetics

### Working with trees in R

#### Getting trees into R

- [phylobase](#) and its lighter weight sibling [ncl](#) 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](#).
- [RNXML](#) 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.
- [phylotree](#) can read and write [ape](#)-compatible phylogenetic trees in NEXUS and Newick formats, while preserving annotations.
- [phext2](#) 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 Phylophil formats and data output from BEAST, EPA, HyPhy, MrBayes, PAML, PHYLDODG, 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 dendograms, including subdividing trees, adding leaves, and more.
- [ape](#) ([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 dendograms, 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 dendograms).
- [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()`).

# GENERAL PROGRAMMING RESOURCES

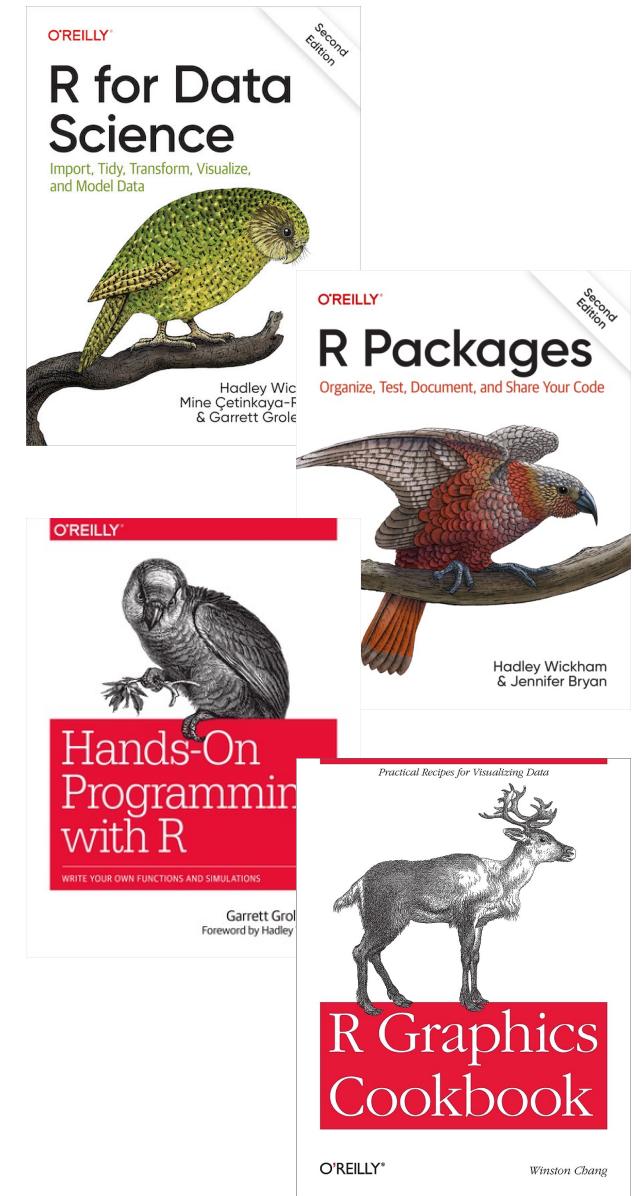
## Other Useful Task Views

- 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!!

# GENERAL 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



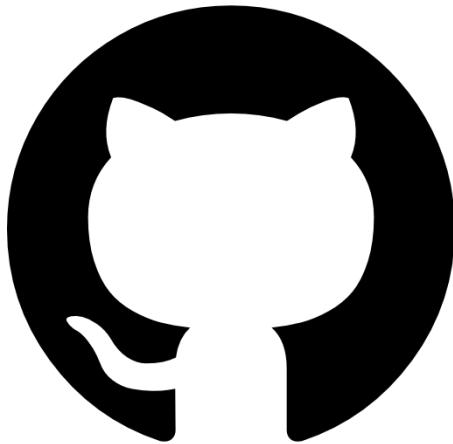
# PROBLEM SOLVING TIPS



Stackoverflow



ChatGPT

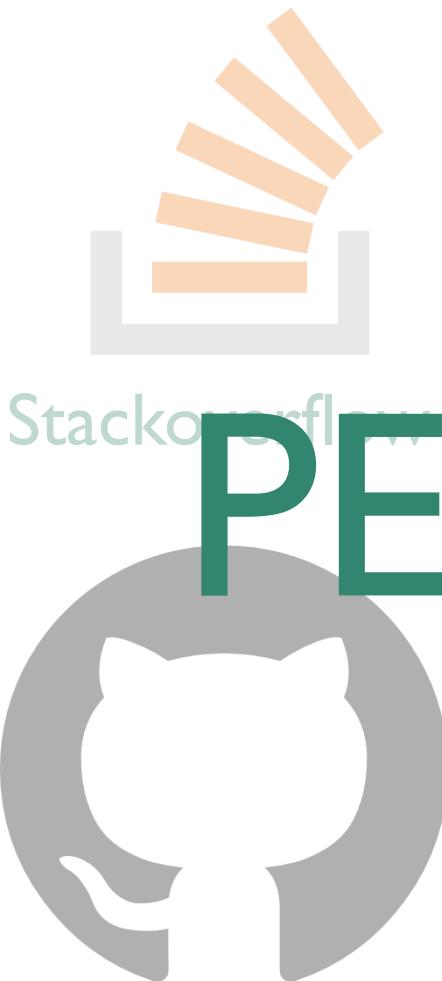


Github



Google Groups

# PROBLEM SOLVING TIPS

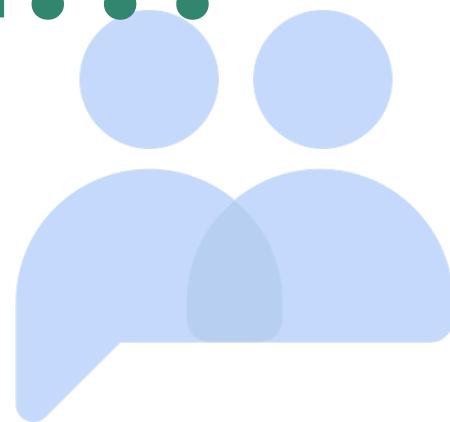


Stackoverflow

# PEOPLE!!!



ChatGPT



Google Groups

Github