

# BISC 404: Ecology and Biodiversity



Ecology is a study of relationships:

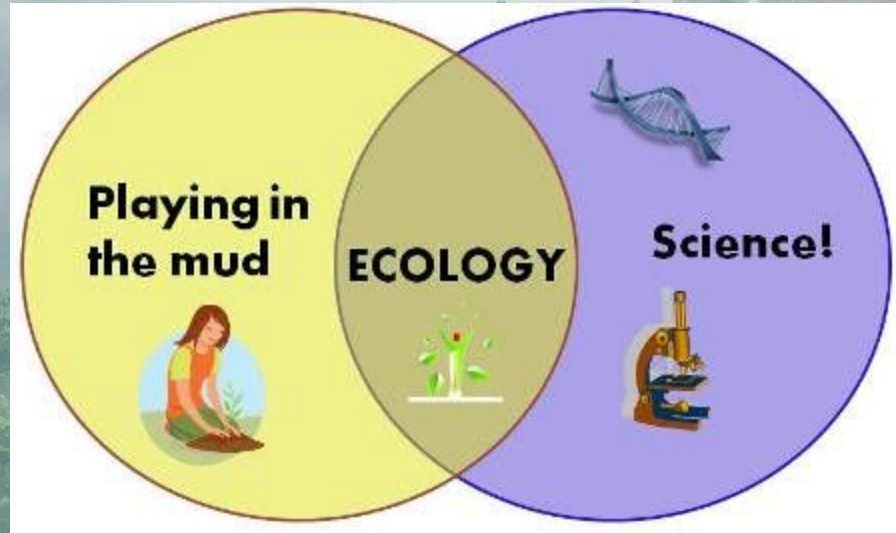
- Between organisms
- Between organisms and their environment





Ecology is studied across scales of space and time:

- Individual
- Population
- Community
- Ecosystem
- Biosphere

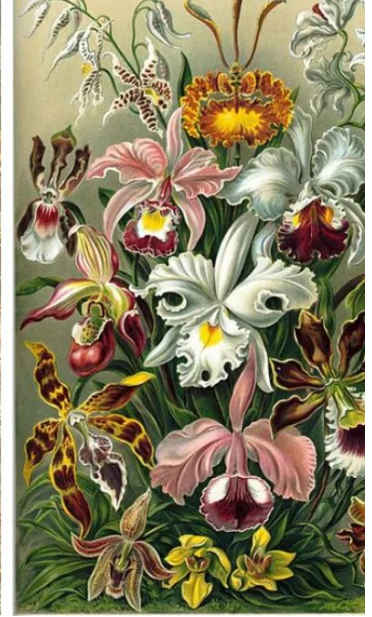
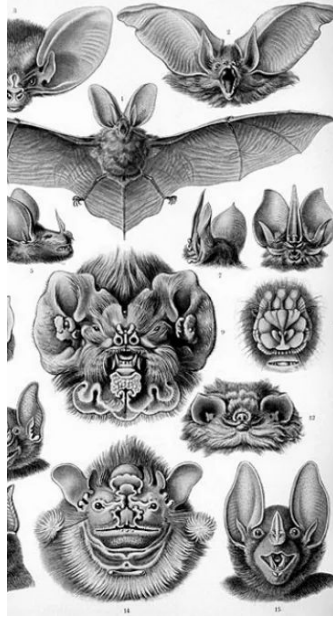


<https://girlsaregeeks.wordpress.com/2010/06/18/ecology-a-venn-diagram/>



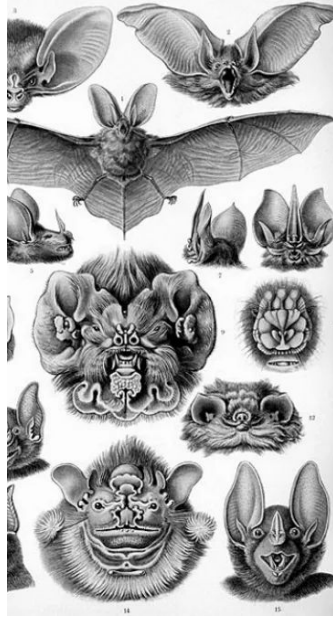
# Agenda

- Introductions
- How to read a scientific paper
- Resources
  - Course site
  - Discussion forum
  - R/Rstudio
  - Git/Github
  - Optional resources



# Agenda

- **Introductions**
- How to read a scientific paper
- Resources



# Charles Lehen

(lay - nun)

he / him / his

lehen@usc.edu

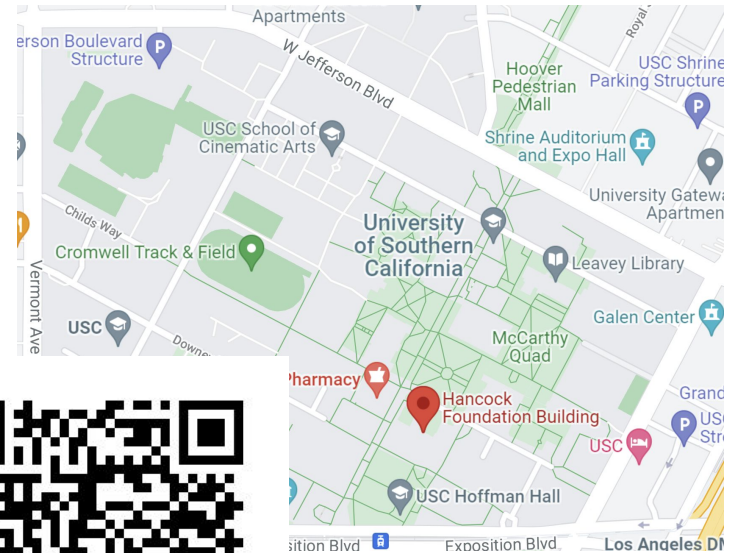
[business hours within 5 hours]

Integrative and Evolutionary Biology PhD Candidate

Office hours:

- Tuesdays 6:00-7:00pm virtual
- Wednesdays 5:00-6:00pm virtual and in-person
- By appointment

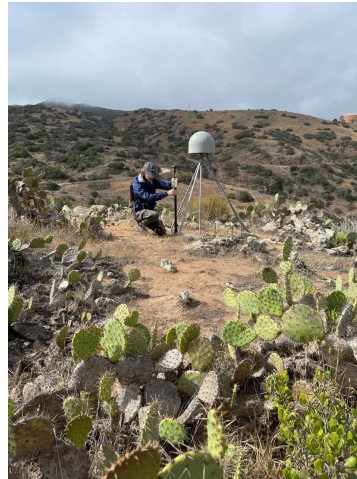
## Office: AHF B10G





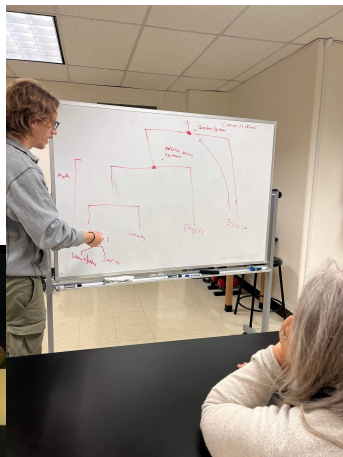








The Human Animal



Wonderkids



### USC Wonderkids - Fall 2023 -

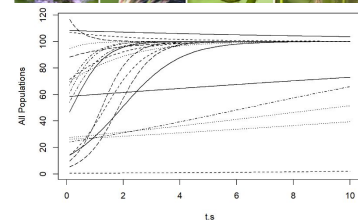
29 views · 3 months ago



The first week of Fall 2023 focused on the

## Welcome to BISC 404: Ecology and Biodiversity!

AUTHOR  
Charles Lehnen and Melissa Guzman



### Table of contents

- Lab Content
- Lab 1 - How to read a scientific paper
- Lab 2 - Introduction to R/Rstudio and Git/Github
- Lab 3 - Population Growth
- Lab 4 - Predator/Prey Models
- Lab 5 - Competition
- Lab 6 - Island Biogeography Theory and Metapopulations
- Lab 7 - Introduction to Taxonomy and Phylogenies
- Lab 8 - Lemur Phylogenies
- Additional Resources

### Table of contents

- Models
- 1) Exponential/Density-independent Population Growth
- 2) Logistic/Density-Dependent Population Growth
- 3) Continuous Logistic Population Growth
- Introduction to Simulations
- References

Other Formats  
PDF

### Introduction to Simulations

Among other uses, simulations can give us an alternative approach to prediction. We continue to monitor our transects on the ship and store our data in the `tr10b10kvs.rds` data file.

`.Rds` and `.Rda` files in R  
`.rds` and `.rda` (or `.Rds`) files are used to store data natively in R.

The main advantage of `.rds` files is that they can contain a variety of data in a single file (objects, plots, functions, `naclae`, etc.), however when loading a `.rds` file you run the risk of over-writing existing objects.

Ecology & Biodiversity



My goal this semester is to inspire students to:

- Get excited about ecology and biodiversity!
- Gain a stronger confidence in approaching scientific questions
- Gain practical computational skills that will be useful across fields of study

# Introduce your neighbor!

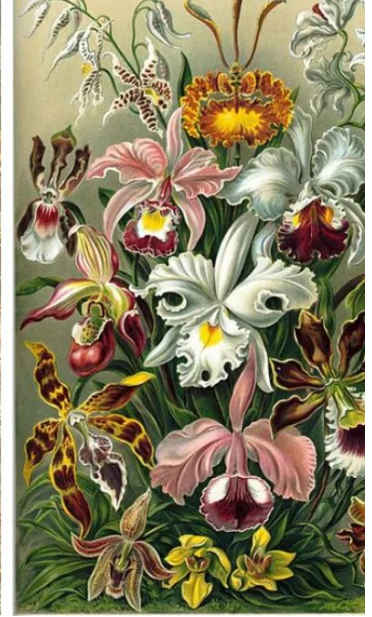
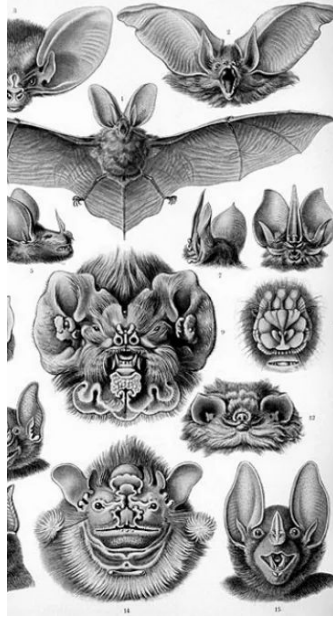
1. What's your preferred name?
2. What year are you and what's your major?
3. What was the most recent biology course you took?
4. What do you hope to gain from this class? (no wrong answers)
5. Restaurant you recommend in LA?





# Agenda

- Introductions
- **How to read a scientific paper**
- Resources



# What is a Scientific Paper?

## **Preclinical testing of anti-human CD28 Fab' antibody in a novel nonhuman primate (NHP) small animal rodent model of xenogenic graft-versus-host disease (GVHD)**

**Keli L. Hippen<sup>1</sup>, Benjamin Watkins<sup>2</sup>, Victor Tkachev<sup>3</sup>, Amanda M. Lemire<sup>1</sup>, Charles Lehnen<sup>1</sup>, Megan J. Riddle<sup>1</sup>, Karnail Singh<sup>2</sup>, Angela Panoskaltis-Mortari<sup>1</sup>, Bernard Vanhove<sup>4,5</sup>, Jakub Tolar<sup>1</sup>, Leslie S. Kean<sup>#3</sup>, and Bruce R. Blazar<sup>#1</sup>**

<sup>1</sup>Department of Pediatrics, Division of Hematology/Oncology and Blood and Marrow Transplantation, University of Minnesota; Minneapolis, MN USA 55455

<sup>2</sup>Aflac Cancer and Blood Disorders Center, Children's Healthcare of Atlanta, Emory University, Atlanta GA

<sup>3</sup>Ben Towne Center for Childhood Cancer Research, Seattle Children's Research Institute, Seattle WA, the University of Washington, Seattle WA, and the Fred Hutchinson Cancer Research Center, Seattle WA

<sup>4</sup>INSERM, UMR 1064-Center for Research in Transplantation and Immunology, Nantes, F44093 France; ITUN, CHU Nantes, Nantes, F44093 France; University of Nantes, Nantes, F44093 France

<sup>5</sup>Effimune SA, Nantes, France

<sup>6</sup>Department of Medicine, Division of Hematology/Oncology and Transplantation, University of Minnesota; Minneapolis, MN USA 55455

<sup>#</sup> These authors contributed equally to this work.

### **Abstract**

**Background**—Graft-versus-host disease (GVHD) is a severe complication of hematopoietic stem cell transplantation. Current therapies to prevent alloreactive T cell activation largely cause generalized immunosuppression and may result in adverse drug, anti-leukemia and anti-pathogen responses. Recently, several immunomodulatory therapeutics have been developed that show efficacy in maintaining anti-leukemia responses while inhibiting GVHD in murine models. To analyze efficacy and better understand immunological tolerance, escape mechanisms, and side-

*Hippen, Keli L., et al. "Preclinical testing of anti-human CD28 Fab antibody in a novel nonhuman primate (NHP) small animal rodent model of xenogenic graft-versus-host disease (GVHD)." Transplantation 100.12 (2016): 2630.*



# What is a Scientific Paper?

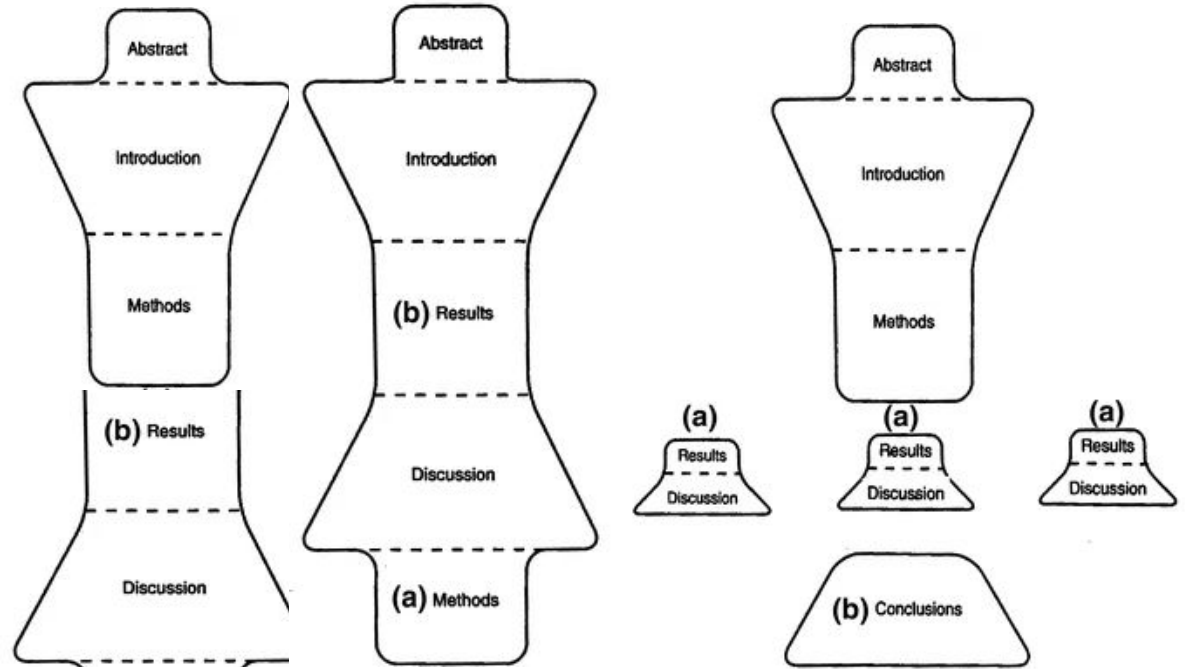


<https://www.connectedpapers.com/main/66a4ebc628b4fa45fcc1d4250d1fc402b881f7bc/Dnv-ers-of-arthropod-biodiversity-in-an-urban-ecosystem/graph>

# How to Read a Paper

## 1. How are papers organized?

- Summary or Abstract
- Introduction
- Materials and Methods
- Results
- Discussion



Englander, Karen. "Writing the Five Principal Sections: Abstract, Introduction, Methods, Results and Discussion." *Writing and Publishing Science Research Papers in English*. Springer, Dordrecht, 2014. 39-55.

# How to Read a Paper



1. How are papers organized? Why are papers organized this way?
2. How do I prepare to read a paper, particularly in an area not so familiar to me?
3. What difficulties can I expect?
4. How do I understand and evaluate the contents of the paper?

## Lab Content

### Lab 1 - How to read a scientific paper

- Handouts
  - [How to Read a Scientific Paper - PDF](#)
  - [Lab 2 Images - Download](#)
  - [Git/Github - Download](#)
  - [Git/Github \(solutions\)](#)
  - [ChatGPT - Download](#)
  - [ChatGPT \(solutions\)](#)

Lab 2

[https://charleslehnen.github.io/BISC\\_404\\_Ecology\\_and\\_Biodiversity/](https://charleslehnen.github.io/BISC_404_Ecology_and_Biodiversity/)

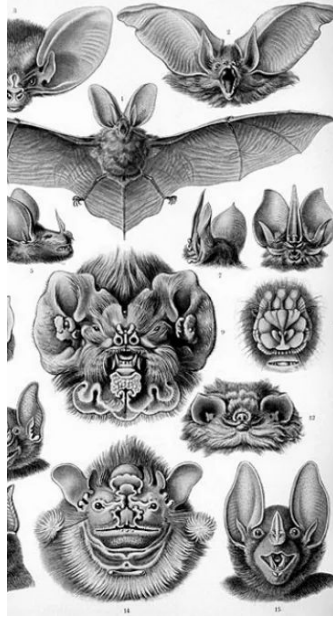
Table of contents

- Lab Content
  - [Lab 1 - How to read a scientific paper](#)
  - Lab 2
  - Lab 3
  - Lab 4
  - Lab 5
  - Lab 6
  - Lab 7
  - Lab 8
  - Lab 9



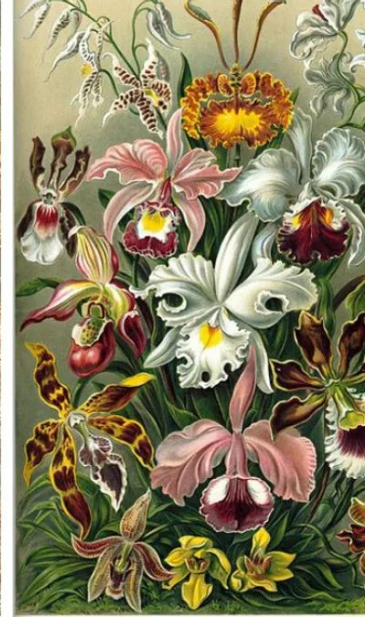
# Agenda

- Introductions
- How to read a scientific paper
- **Resources**



# Assignments

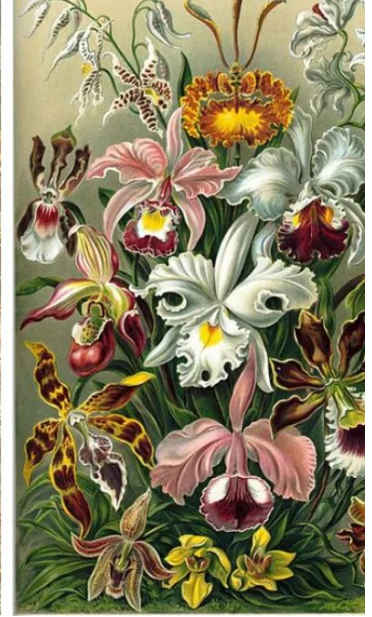
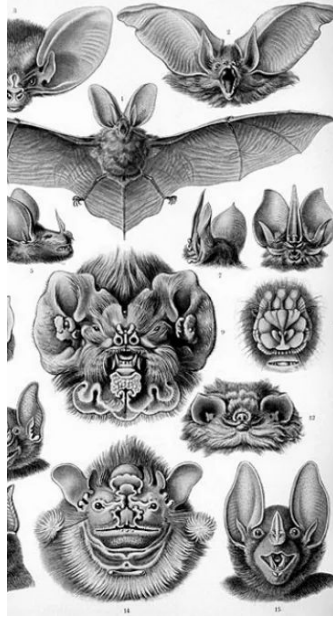
1. R/Rstudio downloaded
2. Git/Github downloaded
3. Github shared with me
4. R/Rstudio and Git/Github integrated
5. Github repo organized





# Resources

- **Course site**
- Discussion forum
- R/Rstudio
- Git/Github
- Optional resources



# [https://charleslehnem.github.io/BISC\\_404\\_Ecology\\_and\\_Biodiversity/](https://charleslehnem.github.io/BISC_404_Ecology_and_Biodiversity/)

Welcome to BISC 499: Ecology and Biodiversity!

AUTHOR  
Charles Lehnen and Melissa Guzman



## Table of contents

### Lab Content

Lab 2 - Introduction to R

Lab 3 - Population Growth

Lab 4 - Introduction to Interspecies Interactions

Lab 5 - Metapopulations and Biodiversity

Lab 6 - Morphological Diversity and Diversification

Lab 7 - Introduction to Taxonomy and Phylogenies

Lab 8 - Lemur Phylogenies

Additional Resources





# Resources

- Course site
- **Discussion forum**
- R/Rstudio
- Git/Github
- Optional Resources

## Discussions

Settings Help

Discussions List Subscriptions Group and Section Restrictions Statistics

New

More Actions

Filter by: Unread Unapproved

Collapse All Forums

Lab Homework Discussions

Topic

Lab 1

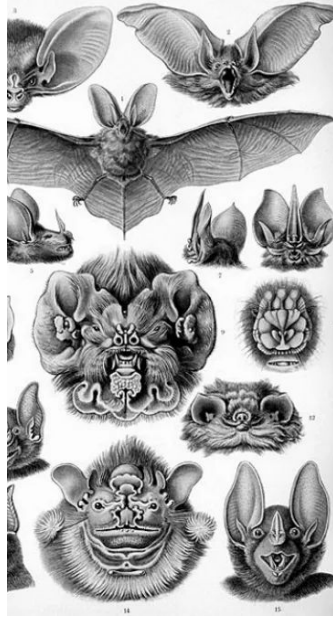
Lab 2



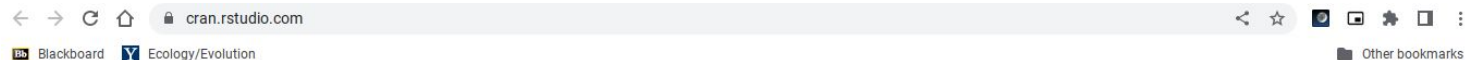
<https://brightspace.usc.edu/d2l/le/176117/discussions/List?dst=1>

# Resources

- Course site
- Discussion forum
- **R/Rstudio**
- Git/Github
- Optional Resources



# R/Rstudio: *cran.rstudio.com*



CRAN

[Mirrors](#)

[What's new?](#)

[Search](#)

[CRAN Team](#)

About R

[R Homepage](#)

[The R Journal](#)

Software

[R Sources](#)

[R Binaries](#)

[Packages](#)

[Task Views](#)

[Other](#)

Documentation

[Manuals](#)

[FAQs](#)

[Contributed](#)

## The Comprehensive R Archive Network

### Download and Install R

Precompiled binary distributions of the base system and contributed packages, **Windows and Mac** users most likely want one of these versions of R:

- [Download R for Linux \(Debian, Fedora/Redhat, Ubuntu\)](#)
- [Download R for macOS](#)
- [Download R for Windows](#)

R is part of many Linux distributions, you should check with your Linux package management system in addition to the link above.

### Source Code for all Platforms

Windows and Mac users most likely want to download the precompiled binaries listed in the upper box, not the source code. The sources have to be compiled before you can use them. If you do not know what this means, you probably do not want to do it!

- The latest release (2022-10-31, Innocent and Trusting) [R-4.2.2.tar.gz](#), read [what's new](#) in the latest version.
- Sources of [R alpha and beta releases](#) (daily snapshots, created only in time periods before a planned release).
- Daily snapshots of current patched and development versions are [available here](#). Please read about [new features and bug fixes](#) before filing corresponding feature requests or bug reports.
- Source code of older versions of R is [available here](#).
- Contributed extension [packages](#)

### Questions About R

- If you have questions about R like how to download and install the software, or what the license terms are, please read our [answers to frequently asked questions](#) before you send an email.

What are R and CRAN?



<https://posit.co/download/rstudio-desktop/>

## 1: Install R

RStudio requires R 3.3.0+. Choose a version of R that matches your computer's operating system.

[DOWNLOAD AND INSTALL R](#)

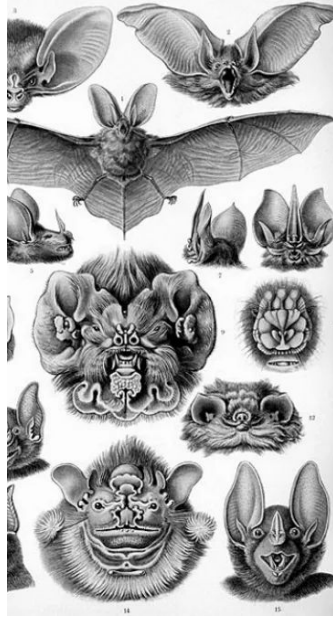
## 2: Install RStudio

[DOWNLOAD RSTUDIO DESKTOP FOR WINDOWS](#)

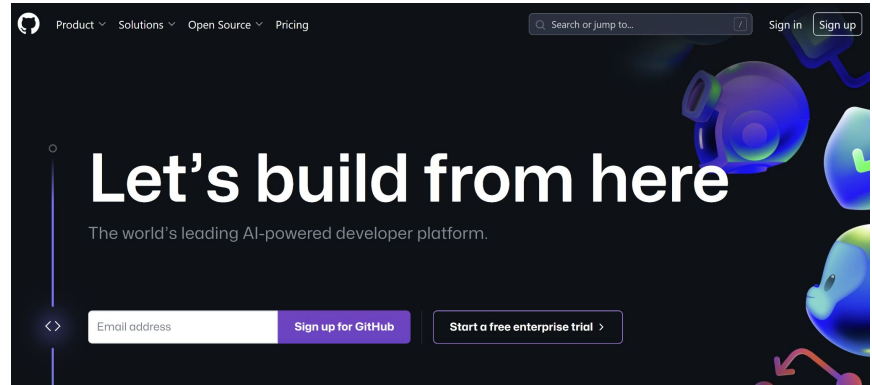
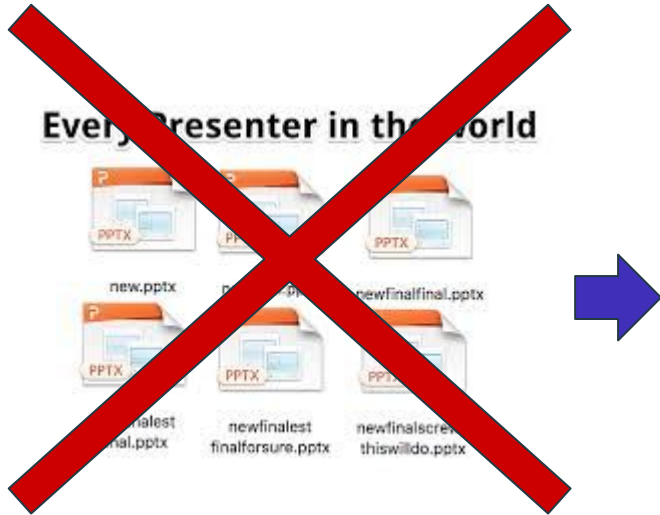
Size: 215.66 MB | [SHA-256: 93C7F307](#) | Version: 2023.12.0+369 | Released: 2023-12-20

# Resources

- Course site
- Discussion forum
- R/Rstudio
- **Git/Github**
- Optional Resources



<https://github.com/>





# Introduction to Git/GitHub

```
<div style="text-align:center;">  
    
    
</div>
```

html

In this lab, we will explore the fundamentals of Git and GitHub, crucial tools for modern-day software development and data science. Git is a distributed version control system that enables you to track changes in your codebase, collaborate with others, and maintain a history of changes to your project.

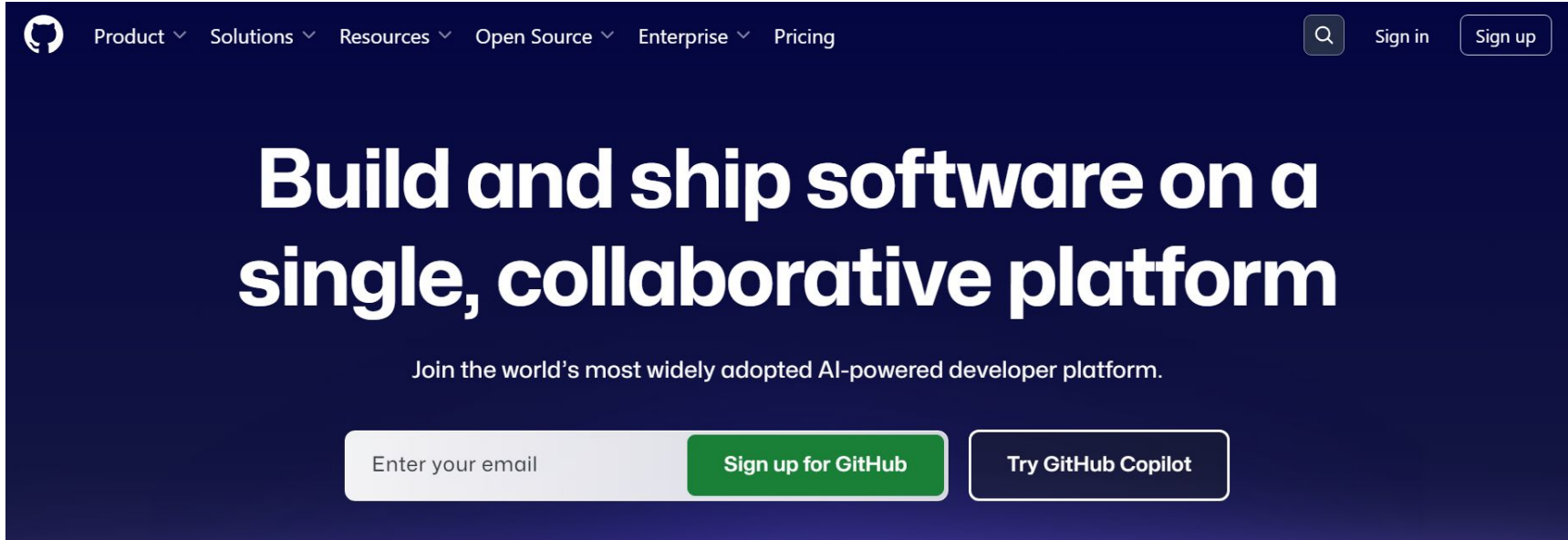
This is not a comprehensive guide to Git/Github, but should introduce you to the basics.

## Git vs. GitHub

While Git and GitHub are often mentioned together, they are distinct entities:

- **Git**: A version control system that runs locally on your computer. You can use Git without GitHub to

https://github.com/

A screenshot of the GitHub homepage. The header is dark blue with the GitHub logo on the left and navigation links: Product, Solutions, Resources, Open Source, Enterprise, and Pricing. On the right, there is a search icon, a 'Sign in' link, and a 'Sign up' button. The main content area features a large white headline: 'Build and ship software on a single, collaborative platform'. Below this is a sub-headline: 'Join the world's most widely adopted AI-powered developer platform.' At the bottom, there are three input fields: a light gray field for 'Enter your email', a green 'Sign up for GitHub' button, and a white 'Try GitHub Copilot' button.

Product ▾ Solutions ▾ Resources ▾ Open Source ▾ Enterprise ▾ Pricing

Search Sign in Sign up

# Build and ship software on a single, collaborative platform

Join the world's most widely adopted AI-powered developer platform.

Enter your email Sign up for GitHub Try GitHub Copilot

Create account with your **USC** email address

# R/Rstudio: *GitHub* integration

## Create a new repository

A repository contains all project files, including the revision history. Already have a project repository elsewhere? [Import a repository.](#)

Required fields are marked with an asterisk (\*).

Owner \*  Repository name \*

✓ You new repository will be created as YOUR\_NAME\_BISC\_404\_Ecology - Biodiversity.  
The repository name can only contain ASCII letters, digits, and the characters ., -, and \_

Great repository names are short and memorable. Need inspiration? How about [fuzzy-octo-fiesta](#) ?

Description (optional)

Public  
Anyone on the internet can see this repository. You choose who can commit.

Private  
You choose who can see and commit to this repository.

Initialize this repository with:  
 Add a README file  
This is where you can write a long description for your project. [Learn more about READMEs.](#)

Add .gitignore

Choose which files not to track from a list of templates. [Learn more about ignoring files.](#)

Choose a license

A license tells others what they can and can't do with your code. [Learn more about licenses.](#)

This will set `main` as the default branch. Change the default name in your [settings](#).



# R/Rstudio: *GitHub integration*

<> Code Issues Pull requests Actions Projects Wiki Security Insights Settings

General

## General

Access

Collaborators

Moderation options

Repository name

BISC\_404\_Ecology\_and\_Biodiversi ✓

Rename

Template repository

Only those with access to this repository can view it.

[Manage](#)

1 has access to this repository. [1 collaborator.](#)

Collaborators

Code and automation

Branches

Tags

Rules

Actions

Webhooks

Environments

Codespaces

### Manage access

Q CharlesLehnen



CharlesLehnen

Already has access to this repository

Select a collaborator above

Add people

Type

<https://desktop.github.com/download/>

**GitHub  
Desktop**

[Download](#)

[Release Notes](#)

[Help](#)


## Download GitHub Desktop






Focus on what matters instead of fighting with Git. Whether you're new to Git or a seasoned user, GitHub Desktop simplifies your development workflow.

Be sure to clone to a location you will remember and that makes sense!

### Clone a repository ×

GitHub.com	GitHub Enterprise	URL
------------	-------------------	-----

   
**Your repositories**

-  CharlesLehnen/BISC\_404\_Ecology\_and\_Biodiversity
-  CharlesLehnen/BISC\_589-Statistical\_Methods\_for\_Environmental\_Scientists
-  CharlesLehnen/California\_Insect\_Barcoding\_Initiative\_predictive\_analysis
-  CharlesLehnen/DSCI\_550\_Data\_Science\_at\_Scale
-  CharlesLehnen/FlyPi

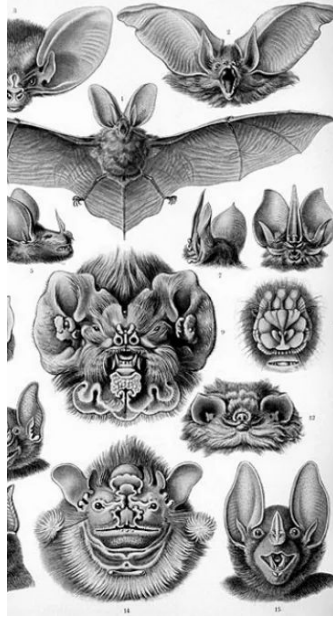
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Local path



# Resources

- Course site
- Discussion forum
- R/Rstudio
- Git/Github
- **Optional resources**

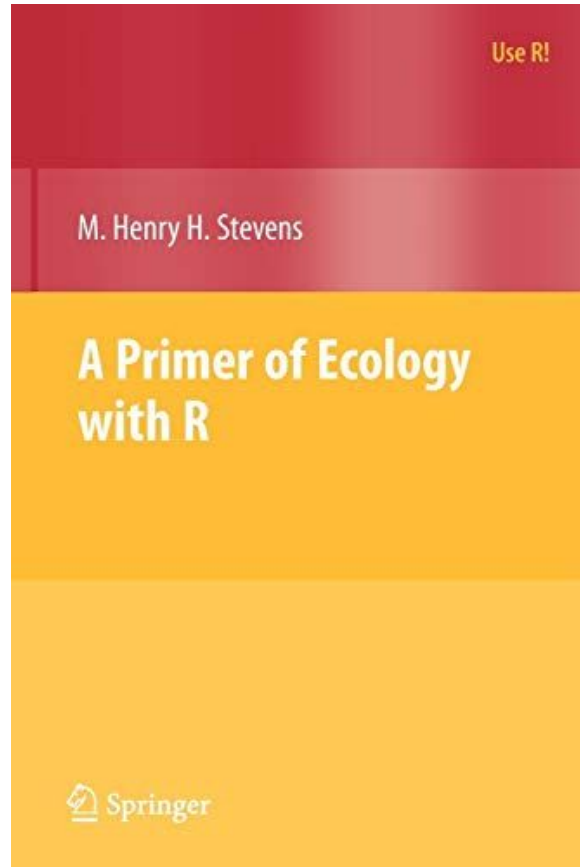


# Optional Resource

*A Primer of Ecology with R*

*Martin Henry H. Stevens*

<http://www.cas.miamioh.edu/~stevenmh/stevens-2009-part.pdf>



# Optional Resource

The screenshot shows the StackExchange website interface. At the top, there is a navigation bar with the StackExchange logo, links for 'Tour', 'About Us', and 'Meta', a search bar labeled 'Search all sites', and a 'Log in' button. Below the navigation bar, the main header features the StackExchange logo on the left and links for 'All Sites', 'Top Users', and 'Digests' on the right. A large light blue promotional banner is centered on the page, titled 'Stack Exchange Q&A communities are different. Here's how:'. The banner contains three columns of text and icons: 1. 'Expert communities.' with an icon of speech bubbles, stating 'Each of our 182 communities is built by people passionate about a focused topic.' 2. 'The right answer. Right on top.' with an icon of a post and a '36' vote count, stating 'Experts like you can vote on posts, so the most helpful answers are easy to find.' 3. 'Share knowledge. Earn trust.' with an icon of a checkmark and '+200', stating 'Earn reputation and additional privileges for posts others find helpful.' Below the banner is an orange 'Learn more' button. At the bottom of the page, there is a 'hot real-time' indicator and a 'Today's Featured Site' section showing the WordPress Development Stack Overflow site.

StackExchange

Tour About Us Meta Search all sites Log in

All Sites Top Users Digests

**Stack Exchange Q&A communities are different. Here's how:**

**Expert communities.**  
Each of our 182 communities is built by people passionate about a focused topic.

**The right answer. Right on top.**  
Experts like you can vote on posts, so the most helpful answers are easy to find.

**Share knowledge. Earn trust.**  
Earn reputation and additional privileges for posts others find helpful.

[Learn more](#)

hot real-time Today's Featured Site

WordPress Development Stack

How to avoid writing a 'good but not great' reference letter



# Optional Resource

 ChatGPT 4o mini ▾

Log in

Sign up

## What can I help with?

Message ChatGPT



Make a plan



Summarize text



Help me write



Get advice

More

By messaging ChatGPT, you agree to our [Terms](#) and have read our [Privacy Policy](#).

?

# Assignments

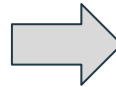
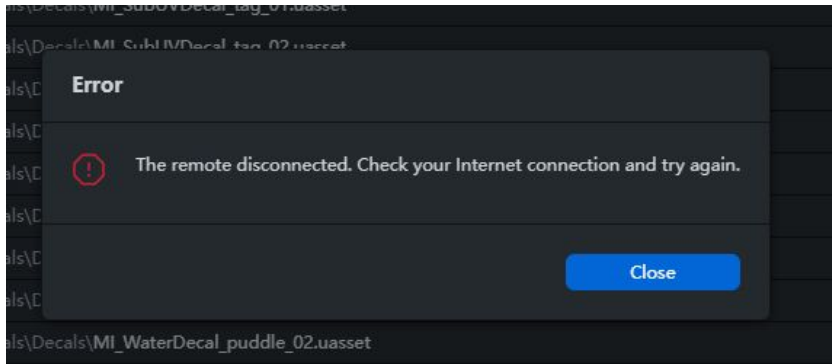
1. R/Rstudio downloaded
2. Git/Github downloaded
3. Github shared with me
4. R/Rstudio and Git/Github integrated
5. Github repo organized



# Appendix



# GitHub Troubleshooting



In terminal: `git config --global http.postBuffer 157286400`

CC

38

CRASH COURSE HISTORY OF SCIENCE

# ECOLOGY



## R/Rstudio: *GitHub integration*

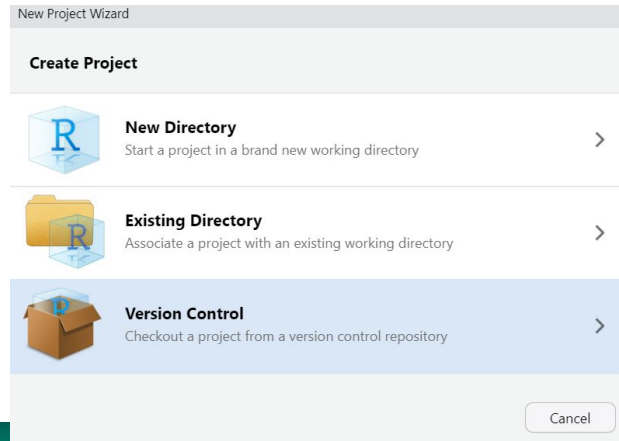
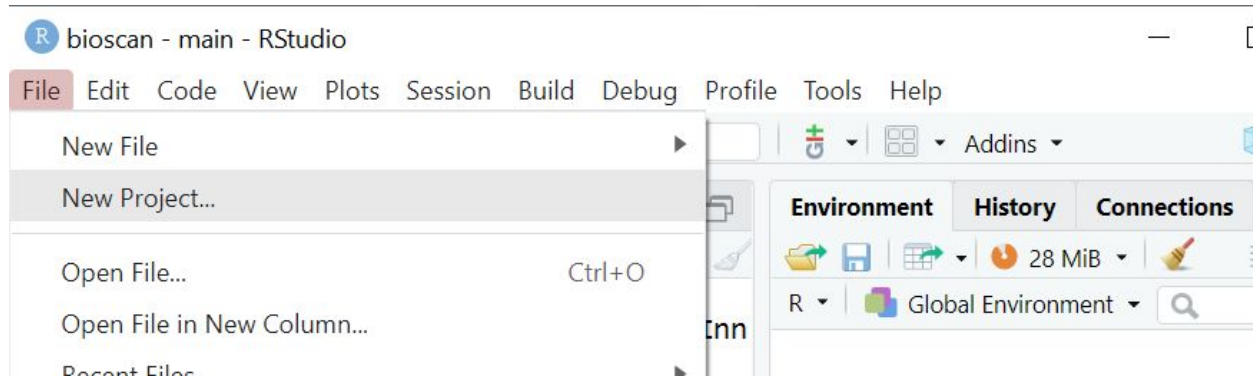
Download and install Git with default settings

- Windows: <https://git-scm.com/download/win>
- Mac:  
<https://central.github.com/deployments/desktop/desktop/latest/darwin>

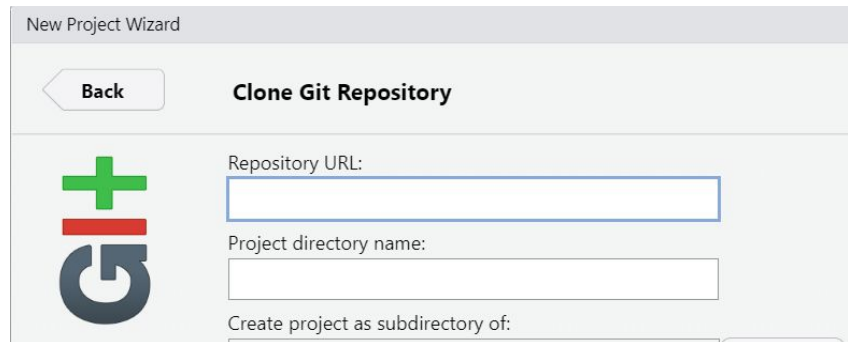
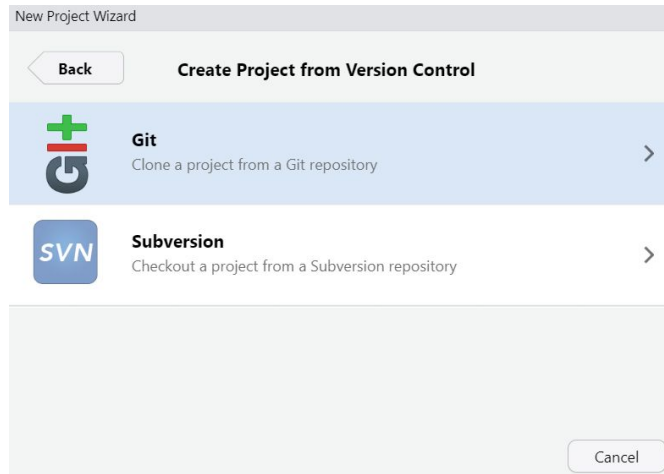
*(I also like Github Desktop too, but is optional)*



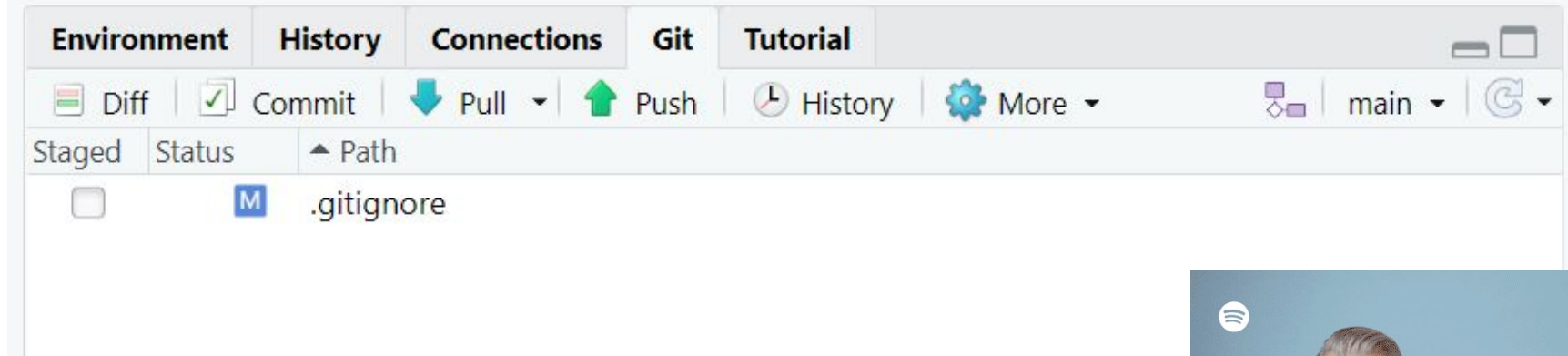
# R/Rstudio: *GitHub* integration



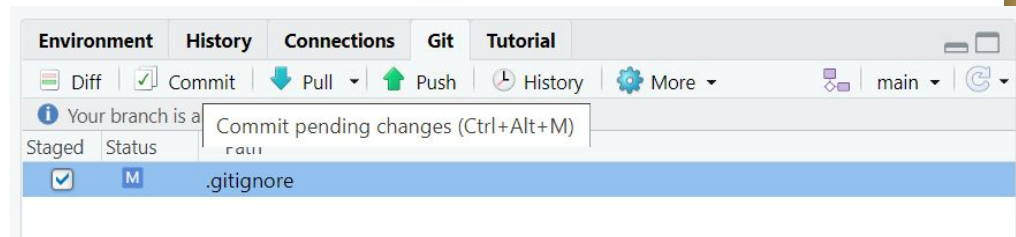
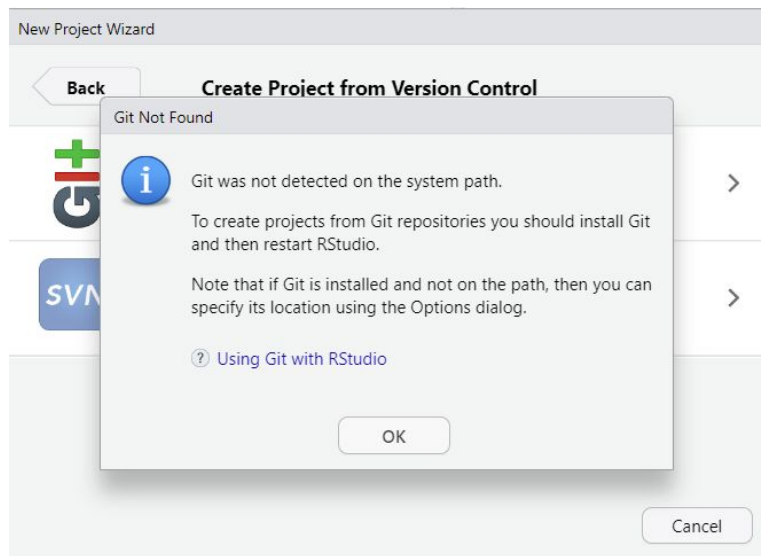
# R/Rstudio: *GitHub* integration



# R/Rstudio: *GitHub integration*



# R/Rstudio: *GitHub* integration troubleshooting



- Then download git separately:  
<https://github.com/git-guides/install-git>



# R/Rstudio: *GitHub* integration troubleshooting

```
19:00:28: *** Please tell me who you are.
```

Run

```
git config --global user.email "you@example.com"  
git config --global user.name "Your Name"
```

- Then:
  - 1) Open your command line
  - 2) Copy/paste in: `git config --global user.email`  
`"you@example.com"`
  - 3) Replace the text in quotes with the email you used to sign up for Github with
  - 4) Press enter
  - 5) Repeat with your username

# R/Rstudio: *GitHub* integration troubleshooting

```
>>> /usr/bin/git push origin HEAD:refs/heads/main
remote: Support for password authentication was removed on August 13, 2021.
remote: Please see https://docs.github.com/en/get-started/getting-started-with-git/about-remote-repositories#cloning-with-https-urls for information on currently recommended modes of authentication.
fatal: Authentication failed for 'https://github.com/amkaspar1/Bisc_404_Ecology_and_Biodiversity.git'
```



This is how I solved, step by step

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1. Click on your Profile Icon (top-right on Github website)
2. Settings
3. Developer settings (bottom-left)
4. Personal access tokens
5. fine-grained tokens
6. "Generate new token"
7. Write a Token name
8. Pick an expiration date from the menu or a custom one
9. Repository access> All repositories
10. Open "Repository permissions" menu
11. Look for the "Contents" row
12. From the menu at right select "Access> Read and Write"
13. "Generate token" (bottom-left)

Try to push in Rstudio. When prompted for your Github password, paste in this token instead