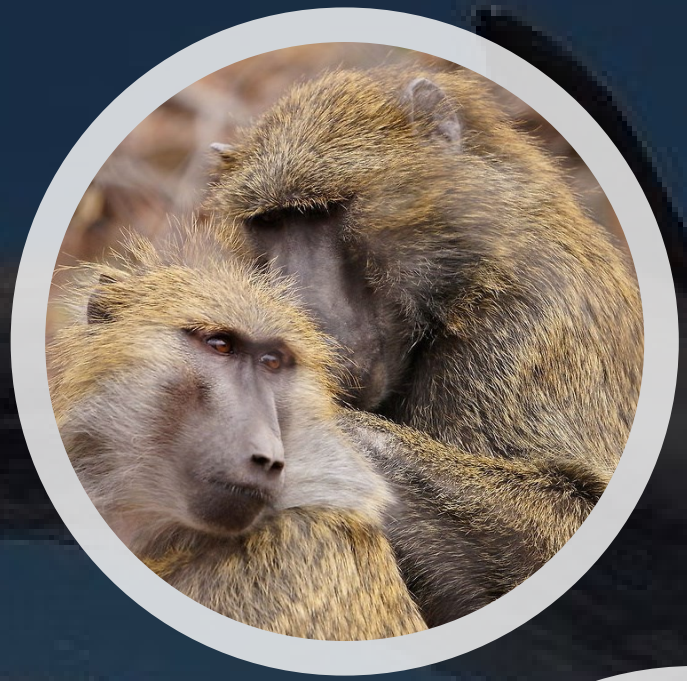
What stresses out California ground squirrels?

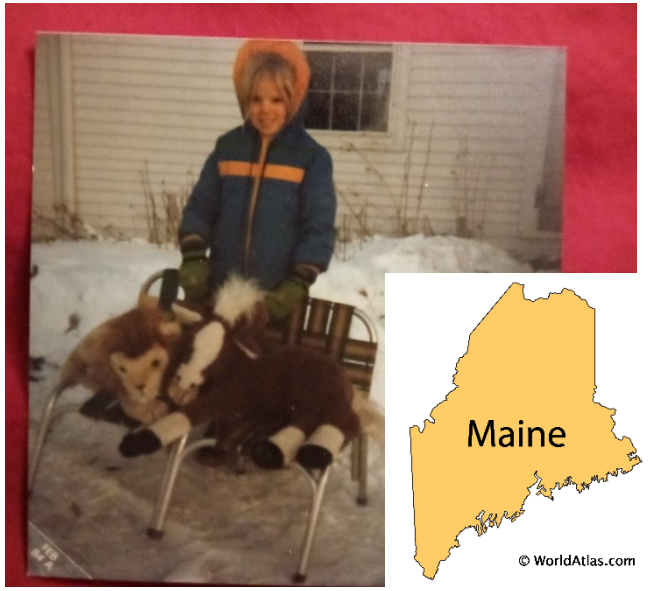
Dr. Jenn E. Smith, Biology Dept., U-Wisconsin – Eau Claire

www.JenniferElaineSmith.com, SmitJenn@uwec.edu

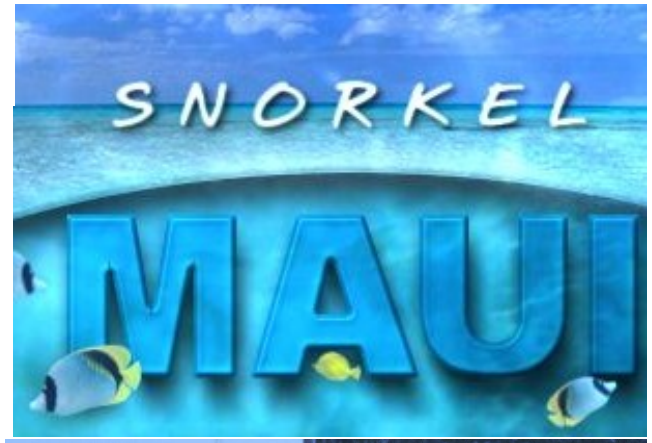


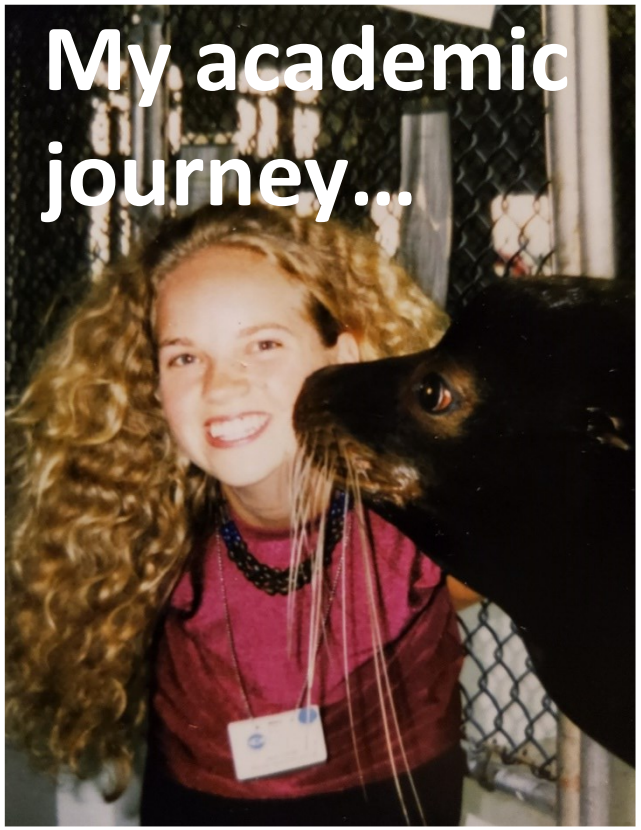


How do animals respond to changing environments?

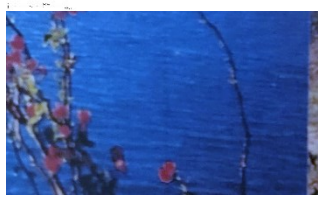


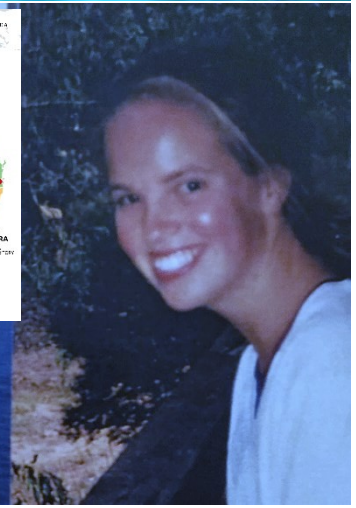
Maine
© WorldAtlas.com


SNORKEL
MAUI


My academic journey…


AUSTRALIA
NORTHERN TERRITORY
QUEENSLAND
WESTERN AUSTRALIA
SOUTH AUSTRALIA
NEW SOUTH WALES
VICTORIA
CANBERRA
TASMANIA





Oakland, California

Rocky Mountain Biological Laboratory, Colorado

Behavioral Ecology Project of California Ground Squirrels
(2013-present)

Team Squirrel

In this lab,

WE BELIEVE

SCIENCE
is real

LOVE
is love

BLACK LIVES
matter

FEMINISM
is for everyone

SQUIRRELS
are cool

IMMIGRANTS
are welcome

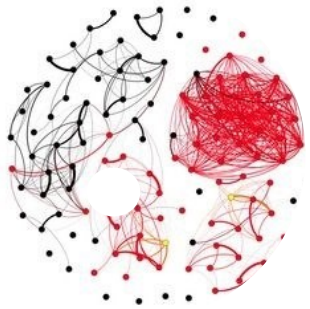
Smith Lab: www.jenniferelainesmith.com/team.html

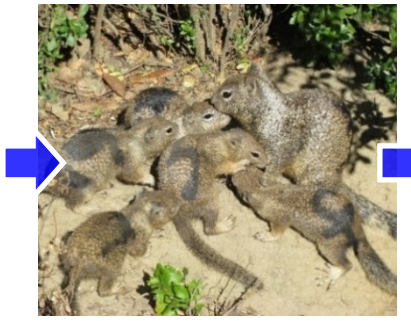
Physiology

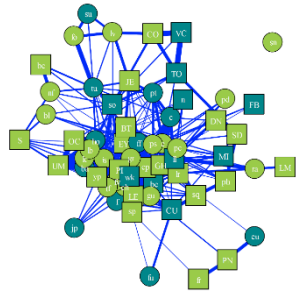
Behavior

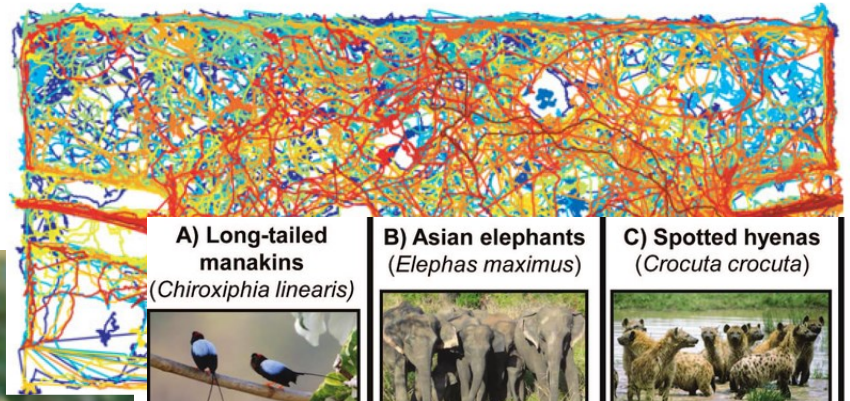
Ecology

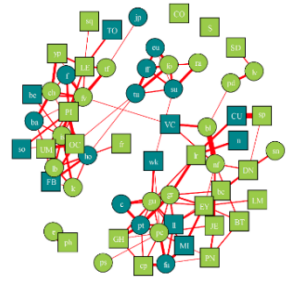
Using “Big Data” to track changes in social behavior over time!

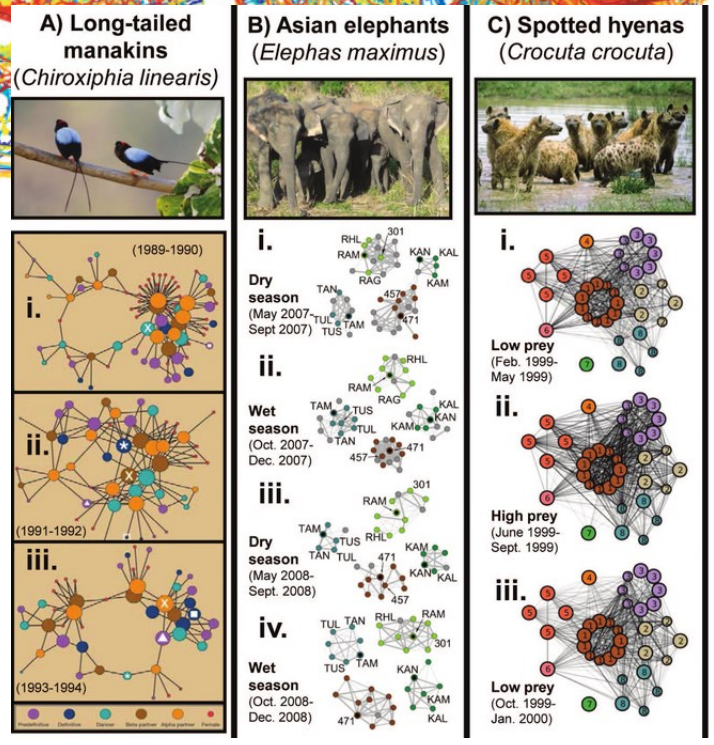


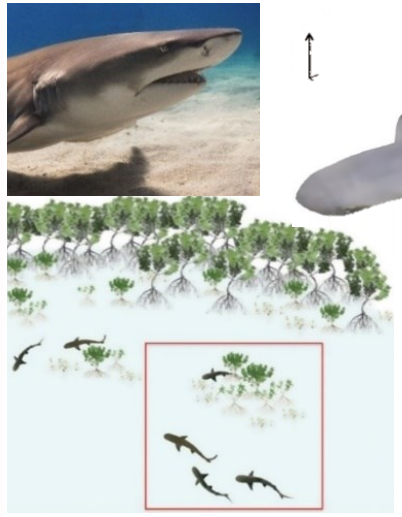


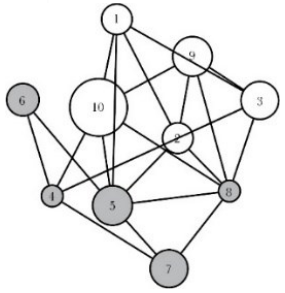




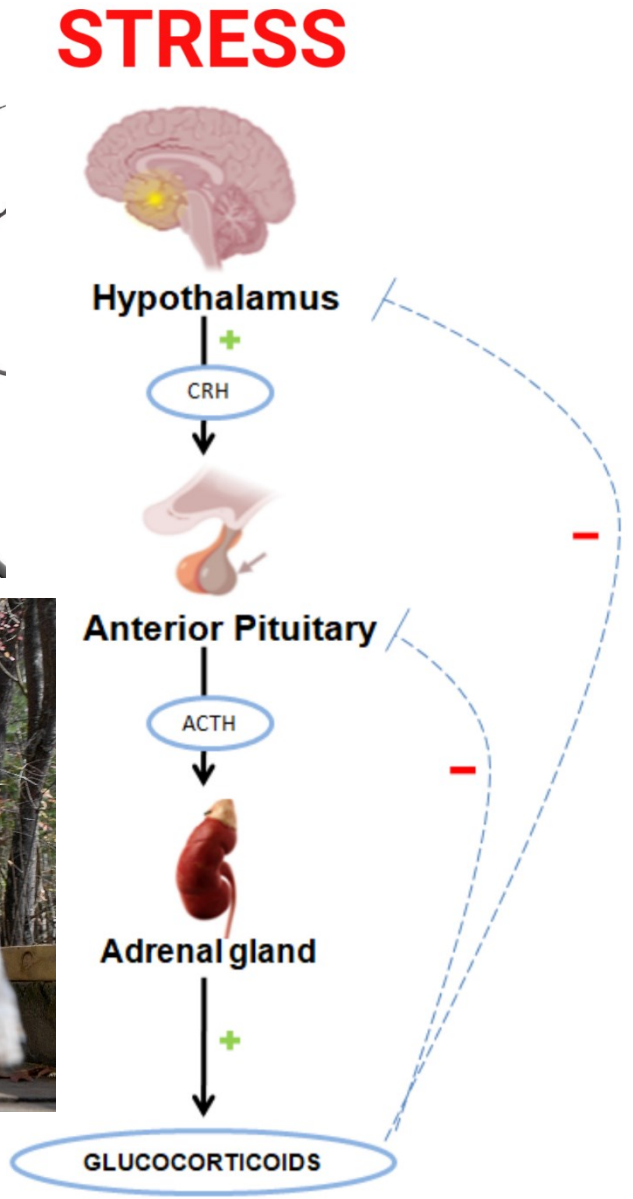




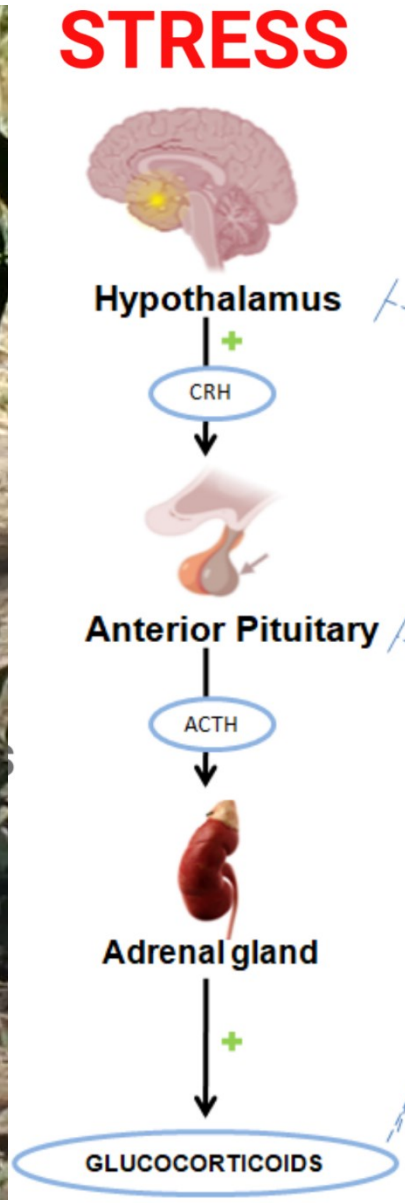




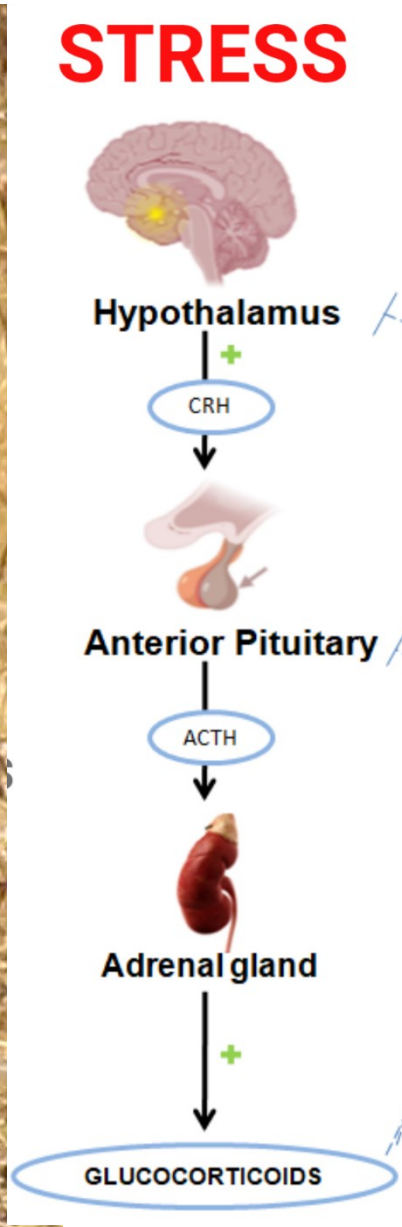
TODAY: What stresses out wildlife in semi-urban parks?



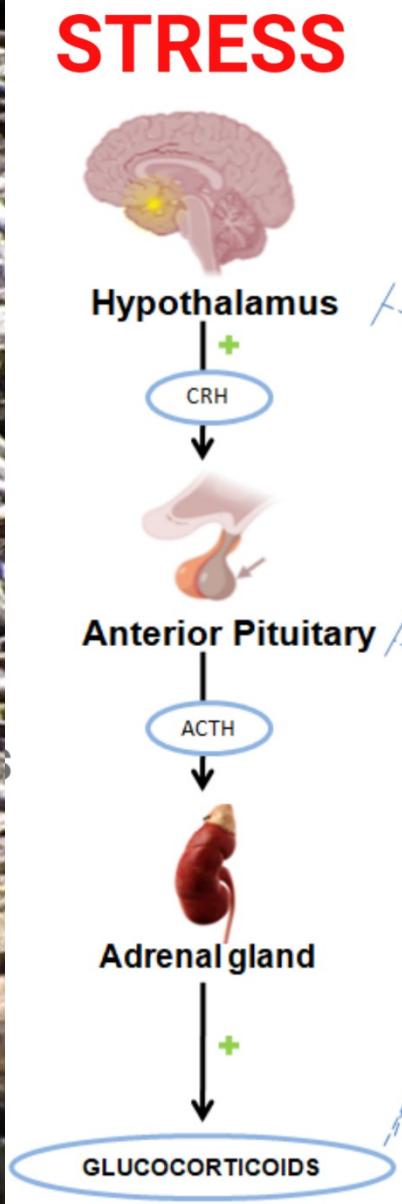
Predator sightings! – rattlesnakes & tail flagging



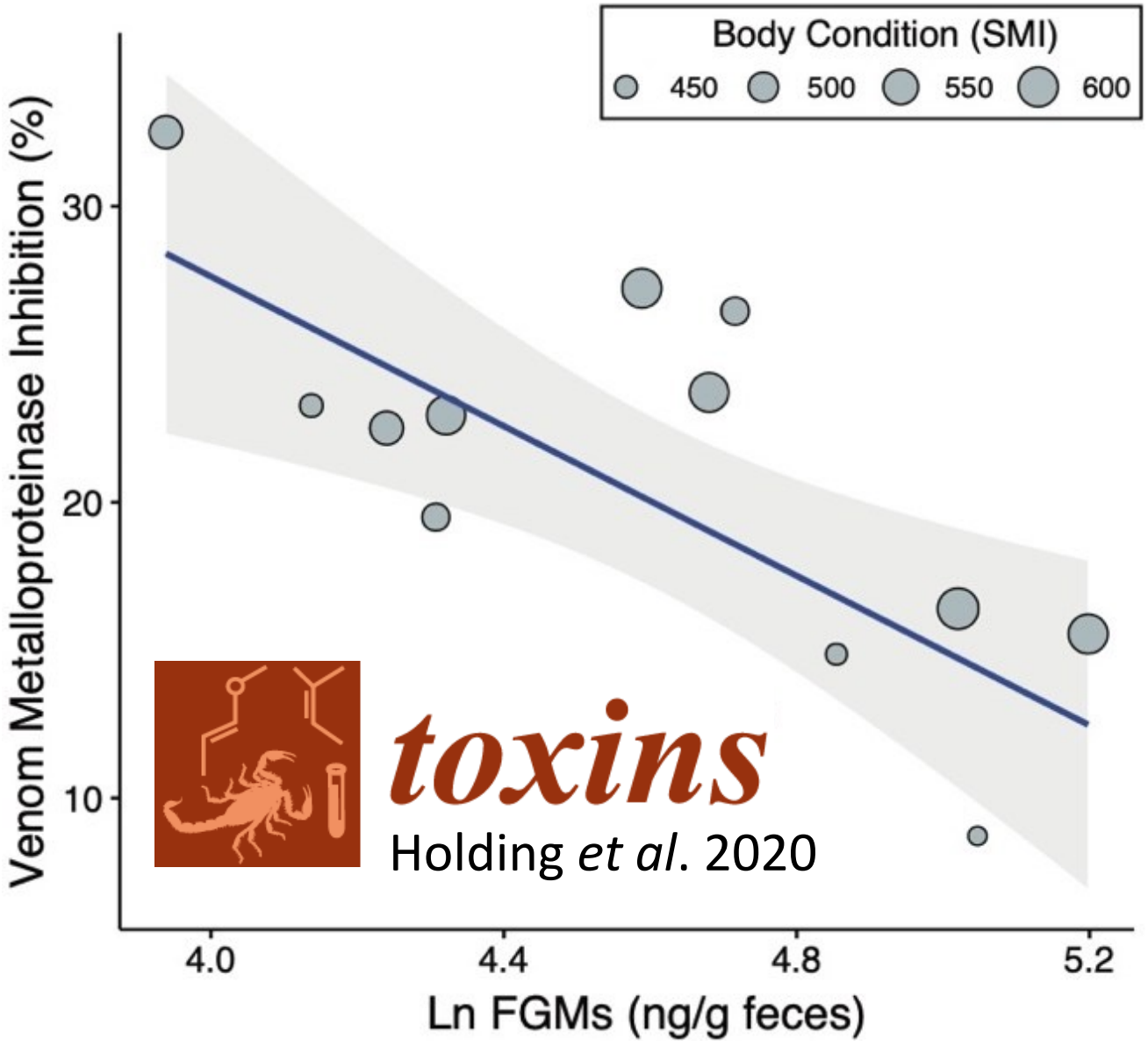
Predator sightings! – alarm calls towards coyotes!



Natural predators are stressors – rattlesnakes!

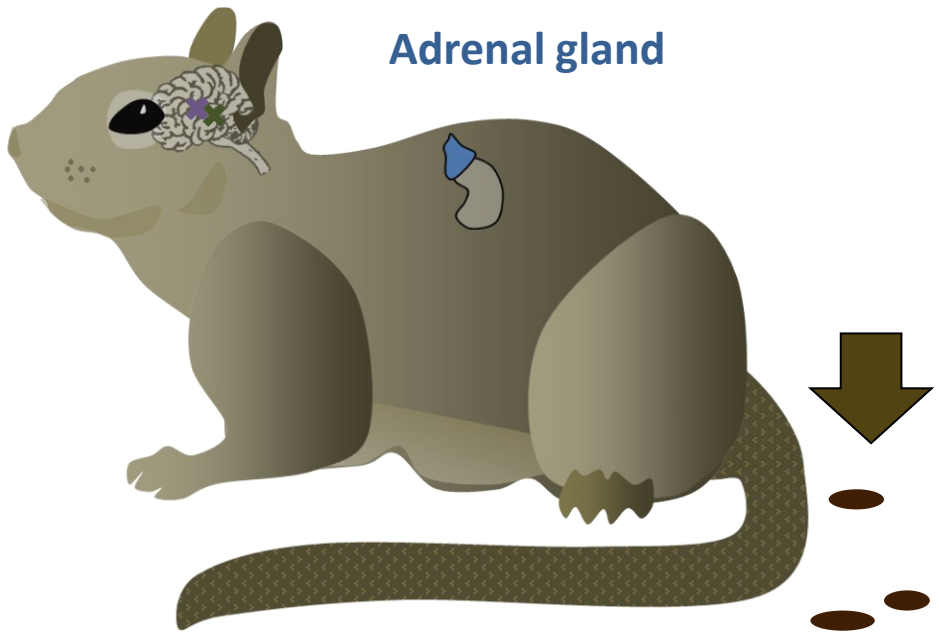


“Stressed” squirrels less resistant to rattlesnake venom



How do we measure “stress” from feces?

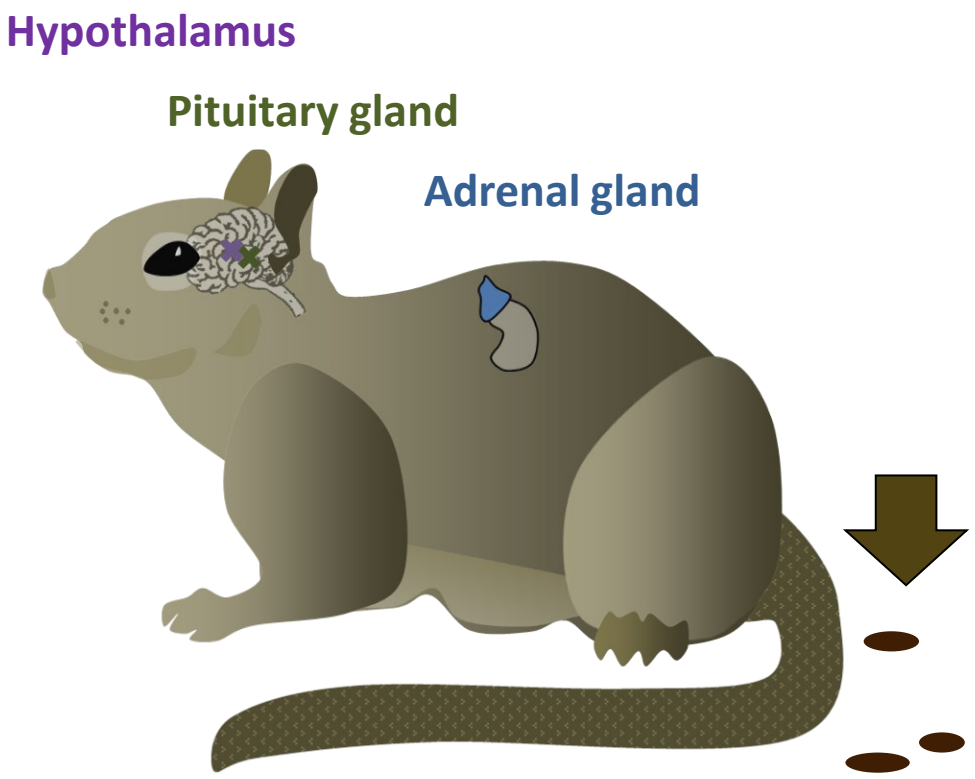
Hypo-thalamus → Pituitary gland → Adrenal glands → Glucocorticoids in: blood → feces



Fecal sample

How do we measure “stress” from feces?

Hypo-thalamus → Pituitary gland → Adrenal glands → Glucocorticoids in: blood → feces

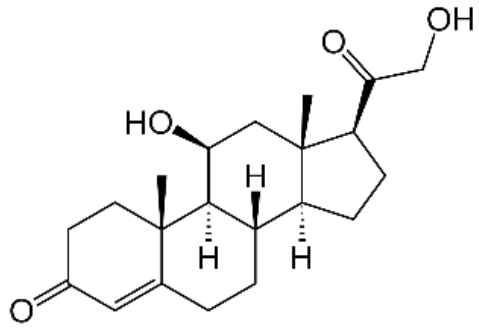


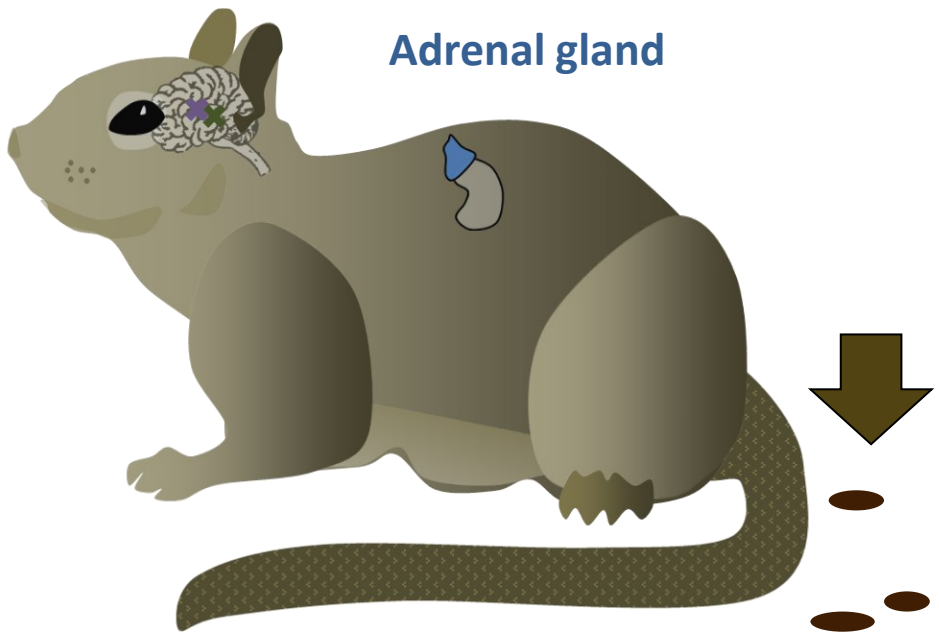
Fecal sample

Mark individuals & release

How do we measure “stress” from feces?

Hypo-thalamus → Pituitary gland → Adrenal glands → Glucocorticoids in: blood → feces





Fecal sample

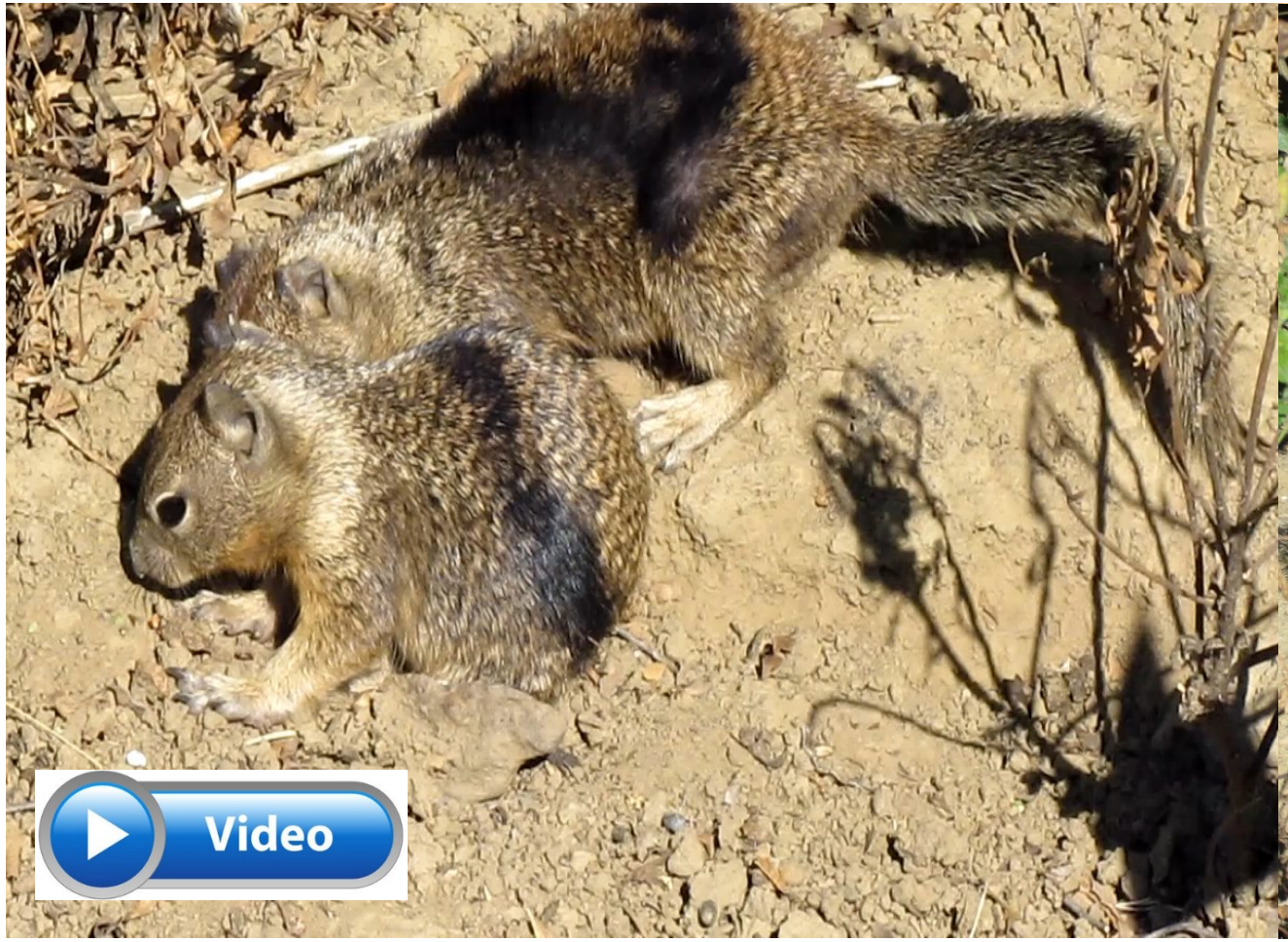
Fecal glucocorticoid metabolites (FGMs) assayed for “CORT” in lab

TODAY: Is "stress" explained by human & dog presence?

Low disturbance

Moderate disturbance

TODAY: Is "stress" explained by age, sex, & condition?
(mass divided by foot length)



TODAY: Are an individual's "stress" levels repeatable?

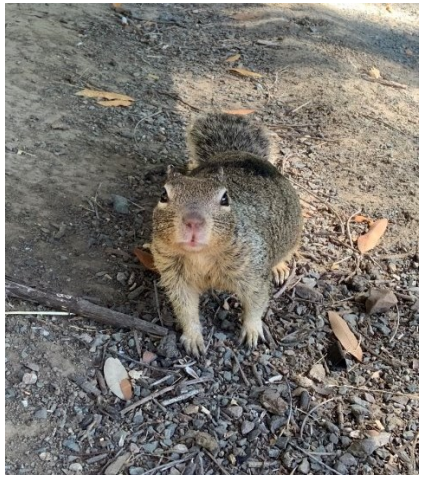
TODAY: Does trapping area repeatably predict "stress"?

How do we test hypotheses?

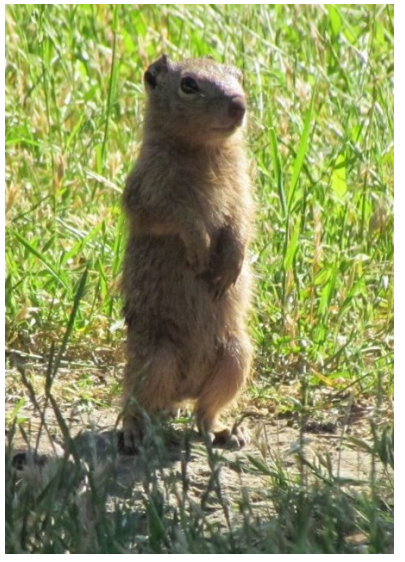
We have a LOT of data!!!

> 4,300 measures of “stress” from >1100 squirrels over 11 years captured at ~150 locations from 2 sites

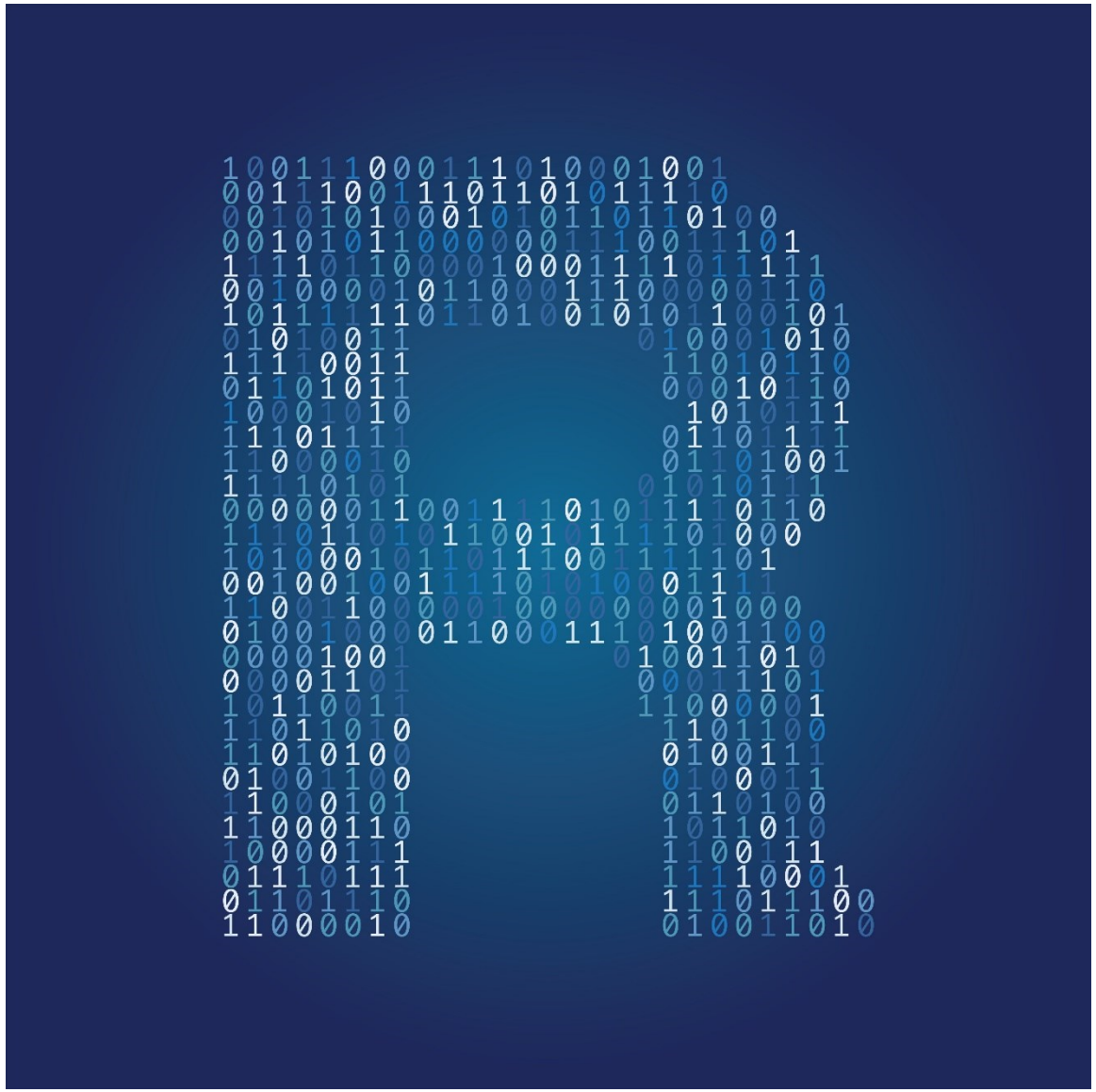


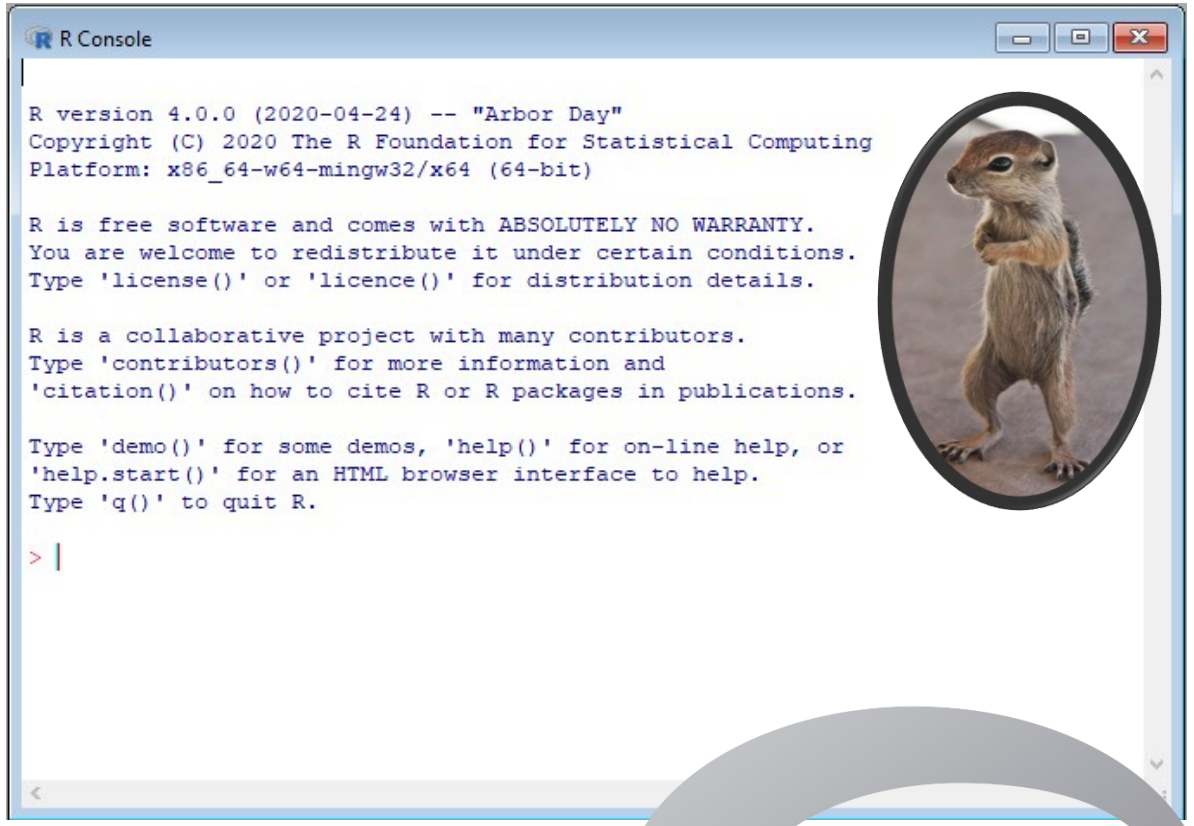




What does it mean? -> Statistical computing & data visualization



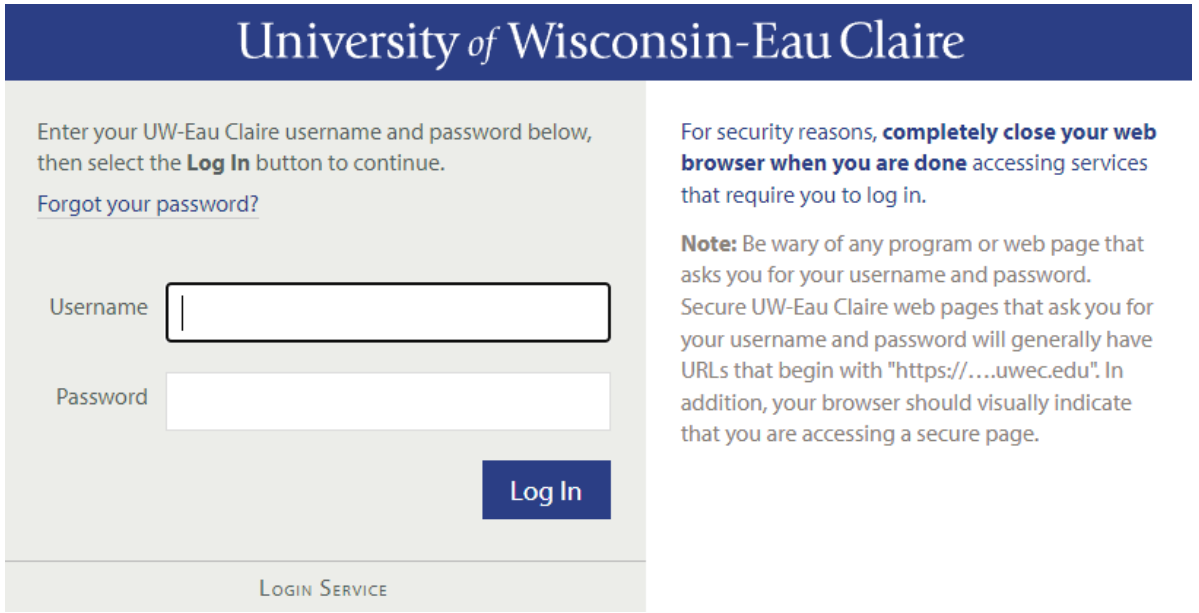


R software is open-source and free software – very popular in Biology!

Run 3 “R scripts” in Jupyter

1. Model & graph long-term data: *what explains “CORT” levels?*
2. Calculate repeatability: *how consistent is “CORT”?*
3. Cross-sectional data: *does human & dog activity predict “CORT”?*

OPEN OnDemand



Open Ondemand: https://ondemand.hpc.uwec.edu

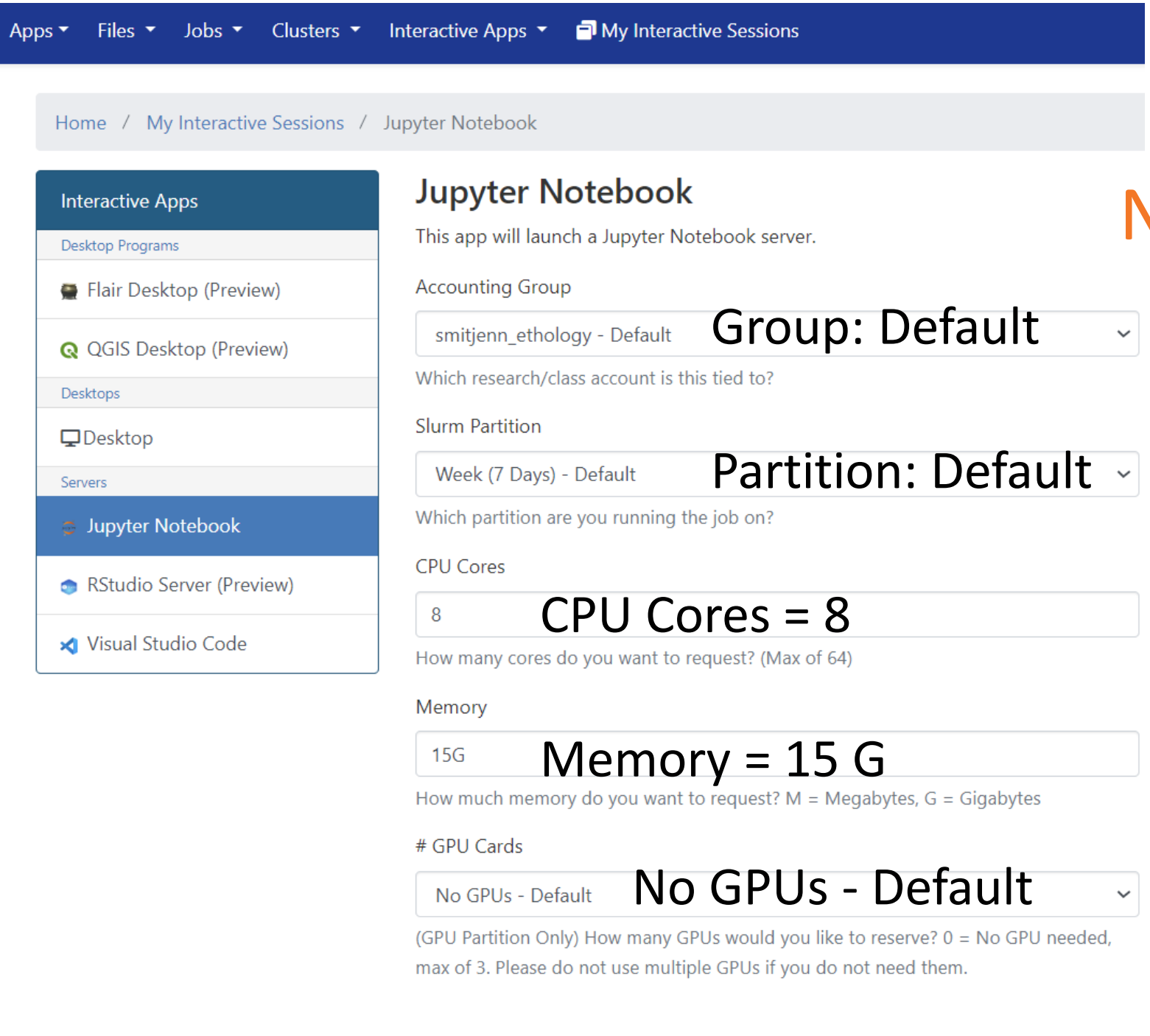
jupyter

OPEN OnDemand

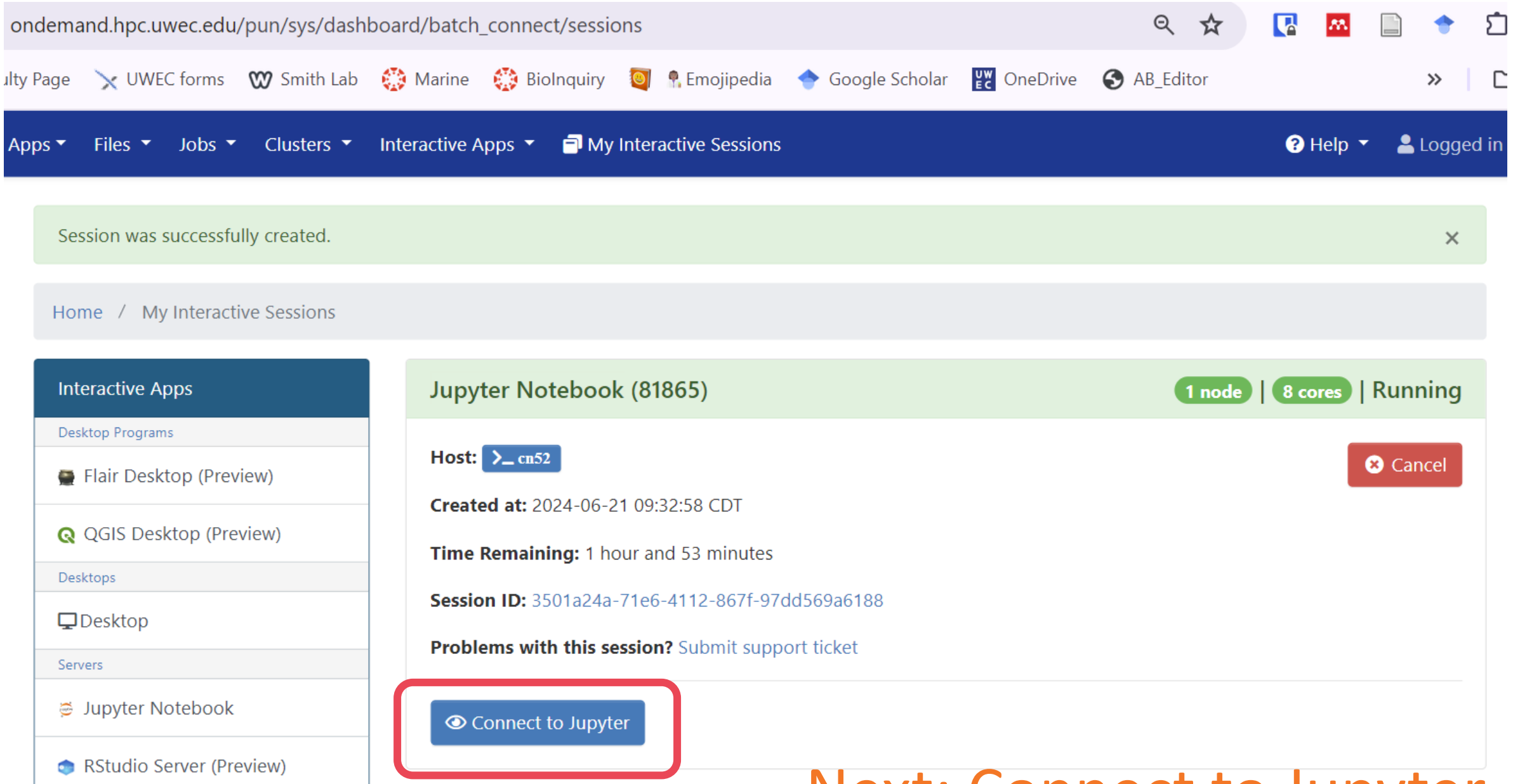
OnDemand provides an integrated, single access point for all of your HPC resources.

Pinned Apps A featured subset of all available apps

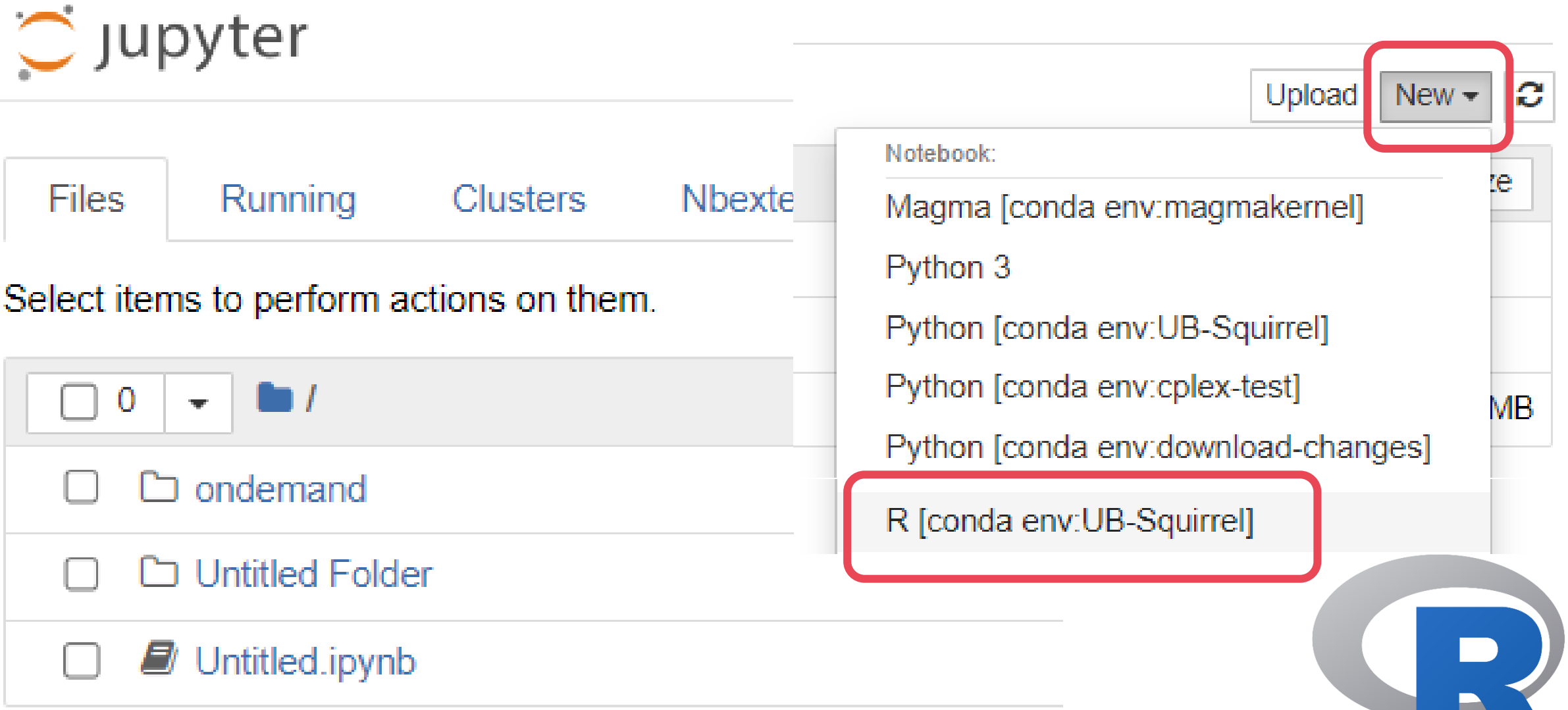
Jupyter Notebook System Installed App	BOSE Cluster Shell Access System Installed App	Home Directory System Installed App
Active Jobs System Installed App	Desktop System Installed App	Visual Studio Code (Preview) System Installed App



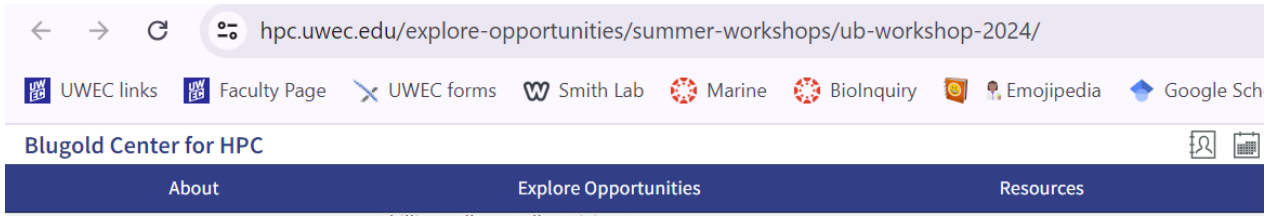
Next: Launch Notebook


ondemand.hpc.uwec.edu/pun/sys/dashboard/batch_connect/sessions
ulty Page
UWEC forms
Smith Lab
Marine
BioInquiry
Emojipedia
Google Scholar
OneDrive
AB_Editor
Apps
Files
Jobs
Clusters
Interactive Apps
My Interactive Sessions
Help
Logged in
Session was successfully created.
Home / My Interactive Sessions
Interactive Apps
Desktop Programs
Flair Desktop (Preview)
QGIS Desktop (Preview)
Desktops
Desktop
Servers
Jupyter Notebook
RStudio Server (Preview)
Jupyter Notebook (81865)
1 node | 8 cores | Running
Host: cn52
Cancel
Created at: 2024-06-21 09:32:58 CDT
Time Remaining: 1 hour and 53 minutes
Session ID: 3501a24a-71e6-4112-867f-97dd569a6188
Problems with this session? Submit support ticket
Connect to Jupyter
Next: Connect to Jupyter

Next: Open “New” Notebook – R [conda env:UB-Squirrel]



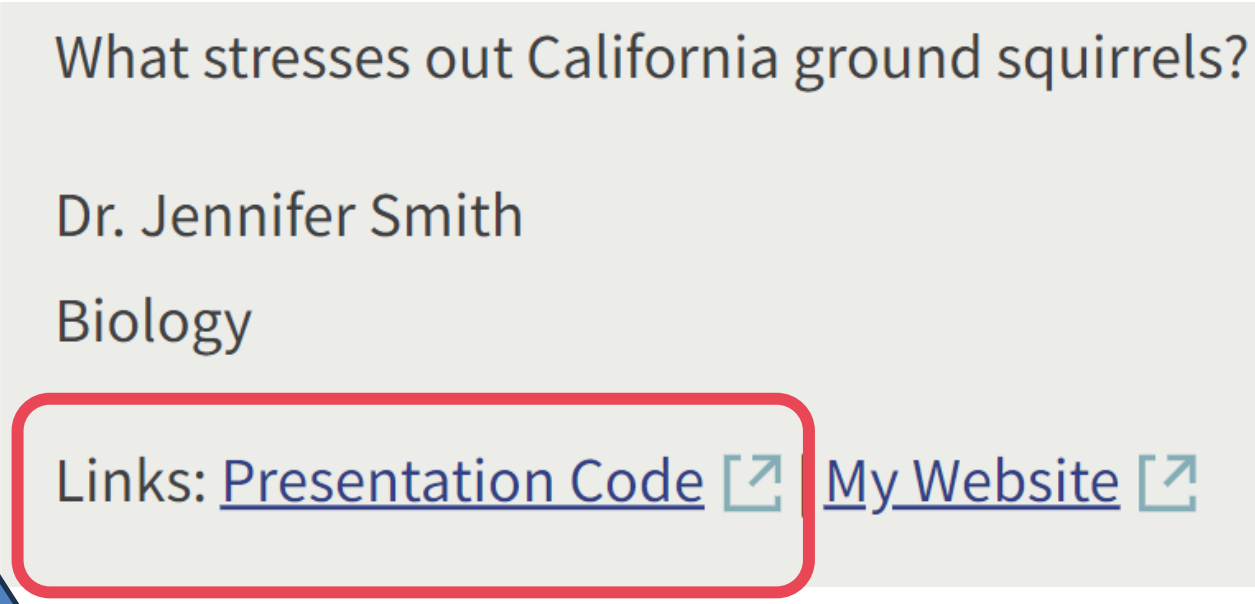
1. Locate “Presentation Code” on workshop’s page



- Phillips Hall 265 - All Participants

Friday, June 21st

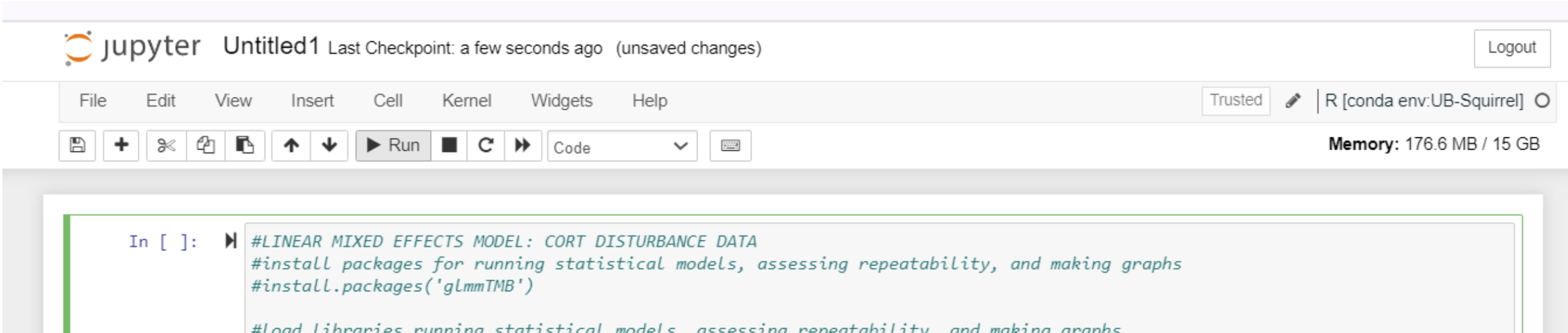
Time	Session
9:00 - 10:15	Pushing science to its limits with "High Performance Computing" Blugold Center for HPC Staff Links: OnDemand | Linux Quick Guide
10:30 - 11:45	Building “trees” of South African shrubs Dr. Nora Mitchell Biology Links: My Website
11:45 - 12:45	Lunch Break
12:45 - 2:00	What stresses out California ground squirrels? Dr. Jennifer Smith Biology Links: Presentation Code | My Website



https://hpc.uwec.edu/explore-opportunities/summer-workshops/ub-workshop-2024/

2. Copy/Paste: Code Block 1 text into Jypter notebook

3. “Run” Script from “Block 1” in Jypter notebook



Run 3 “R scripts”

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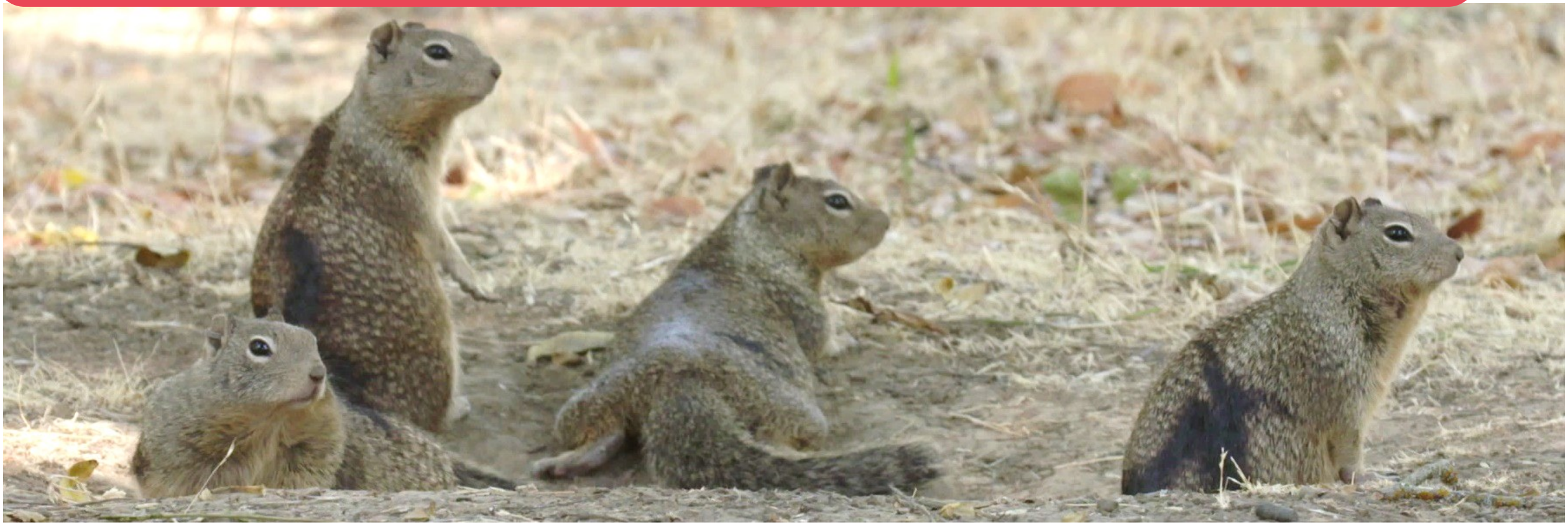

Does human presence reduce fear of natural predators?

Wrap-up & Discussion

Data are complex & computers help to inform conservation – *what else might be important?*