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2019

Unit 13

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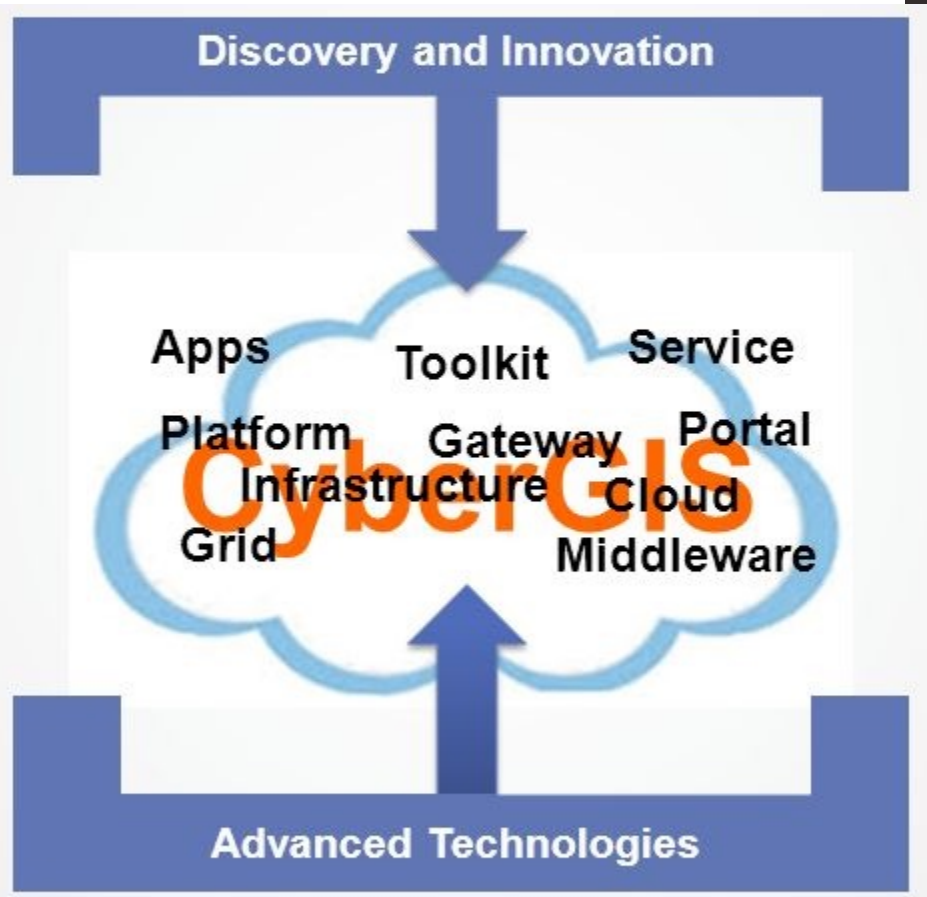
The GIS Frontier

UMassAmherst



Forrest J. Bowlick, Intro GIS

UMass – Amherst, Fall 2018

Overview

- Where we've been
  - Course overview
  - Topics, ideas
- What we're doing
  - Finishing up the semester
- Where you'll go
  - GIS futures

You ~~Will be~~ Are Overwhelmed

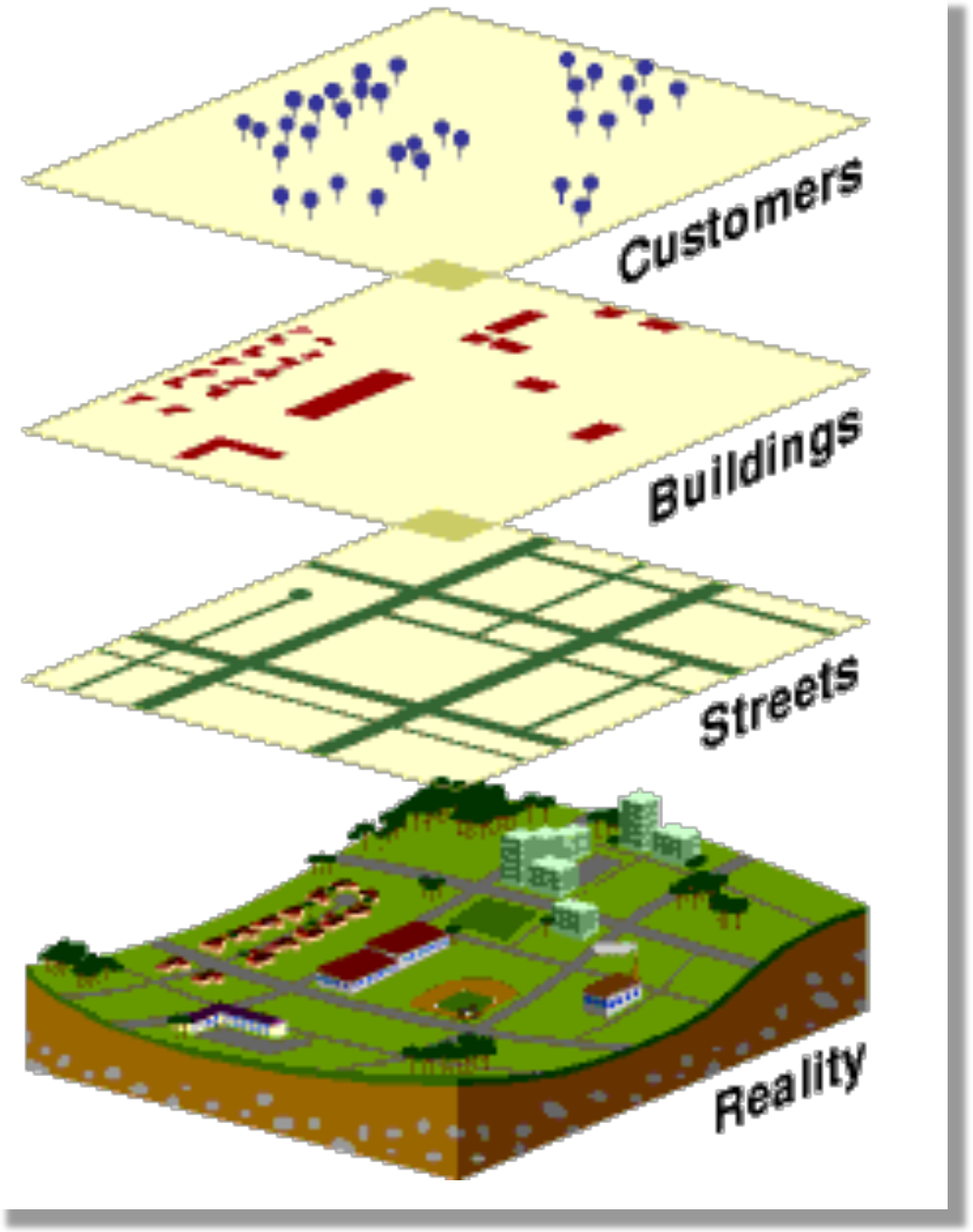
http://www.phdcomics.com/comics/archive/phd020507s.gif

"Piled Higher and Deeper" (PhD) is the comic strip about life (or the lack thereof) in academia by Jorge Cham.

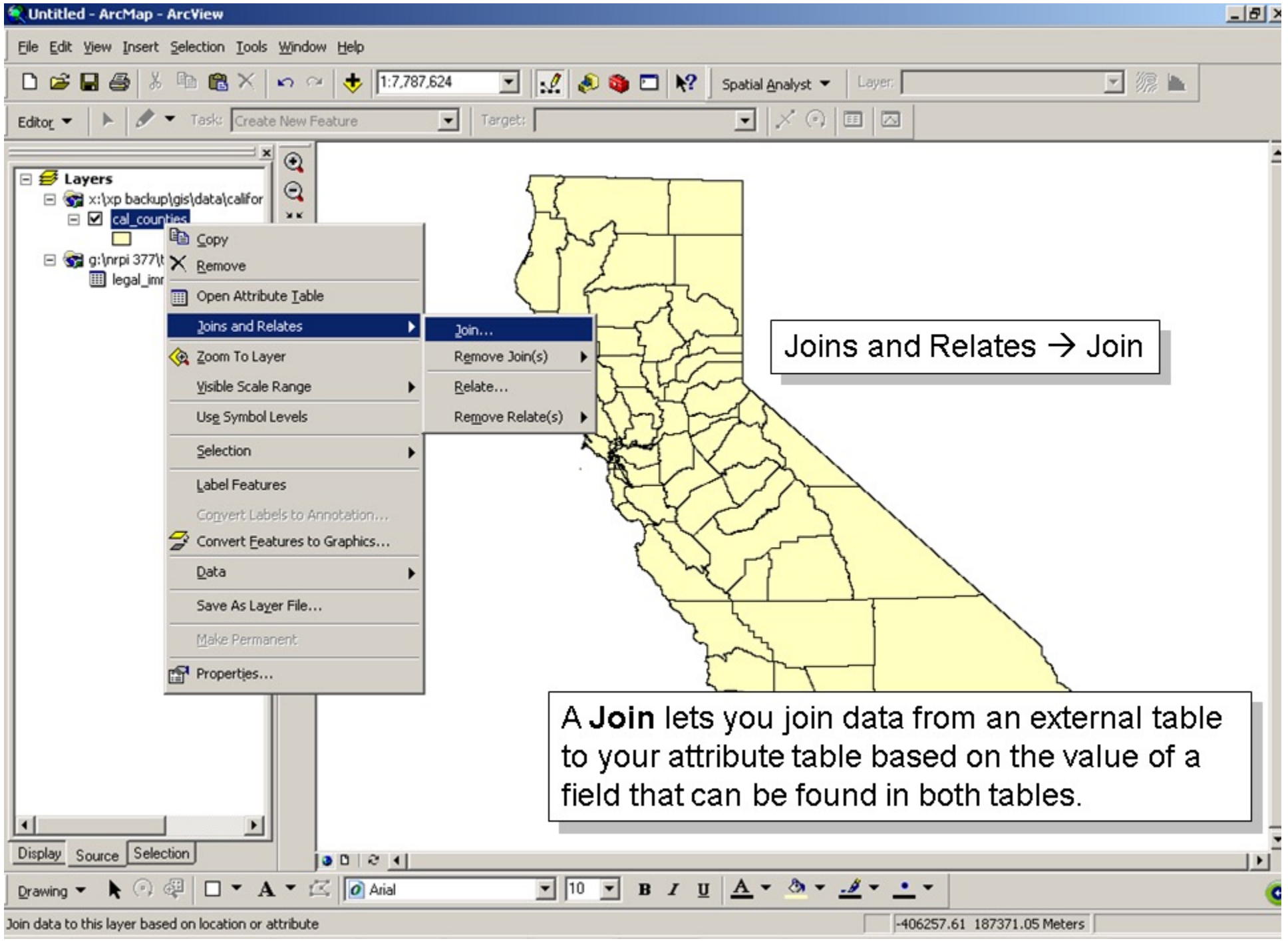
GIS is a way of thinking!

- Geographic Information Science for a reason!

- While building technical competency you have also practiced a new way of addressing problems.



GIS is an ‘abstraction’ of Reality


Untitled - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
1:7,787,624
Spatial Analyst
Editor
Task: Create New Feature
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x:\xp backup\gis\data\califor
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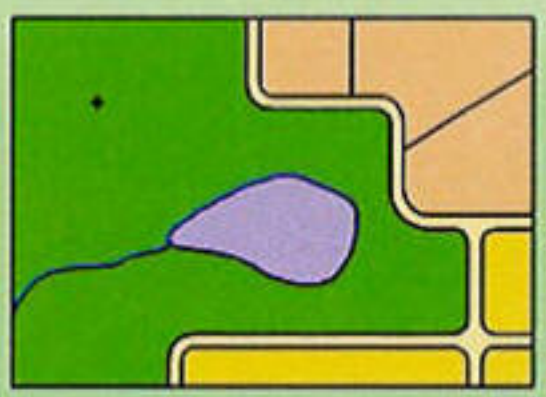
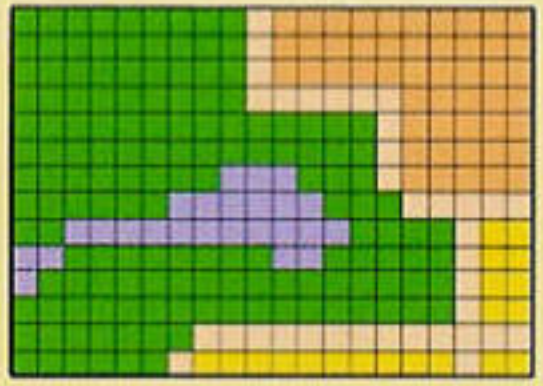
Copy
Remove
Open Attribute Table
Joins and Relates
Zoom To Layer
Visible Scale Range
Use Symbol Levels
Selection
Label Features
Convert Labels to Annotation...
Convert Features to Graphics...
Data
Save As Layer File...
Make Permanent
Properties...
Join...
Remove Join(s)
Relate...
Remove Relate(s)
Joins and Relates → Join
A Join lets you join data from an external table to your attribute table based on the value of a field that can be found in both tables.
Display
Source
Selection
Drawing
Arial
10
Join data to this layer based on location or attribute
-406257.61 187371.05 Meters

	Vector data representation	Raster data representation
		
Focus of model	Vector data is focused on modeling discrete features with precise shapes and boundaries.	Raster data is focused on modeling continuous phenomena and images of the earth.

http://map.sdsu.edu/geog104/lecture/unit-2.htm

Even the Earth's Shape is an Abstraction!

Earth (geoid)

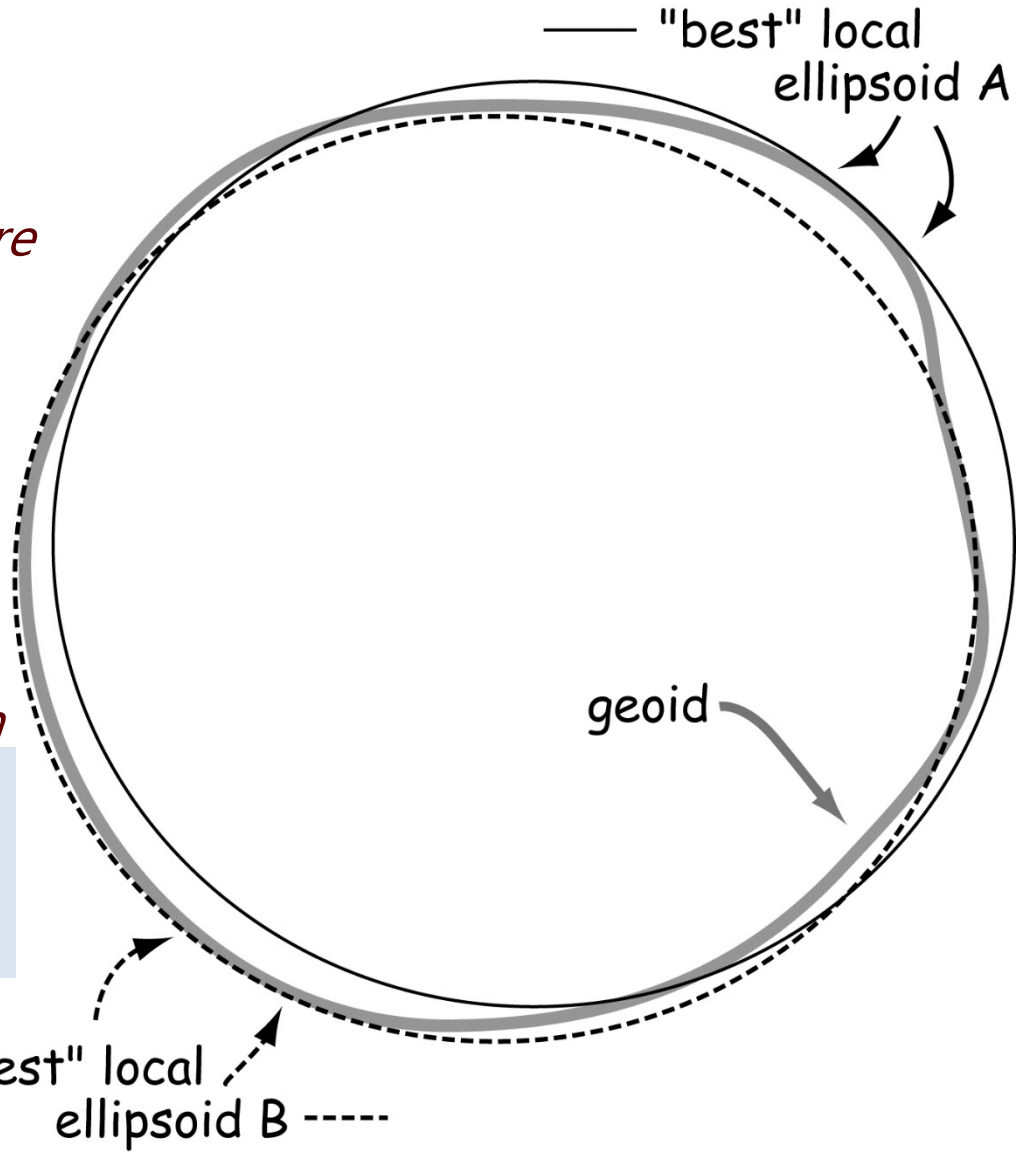
Reference Ellipsoid

Reduction to Perfect Sphere

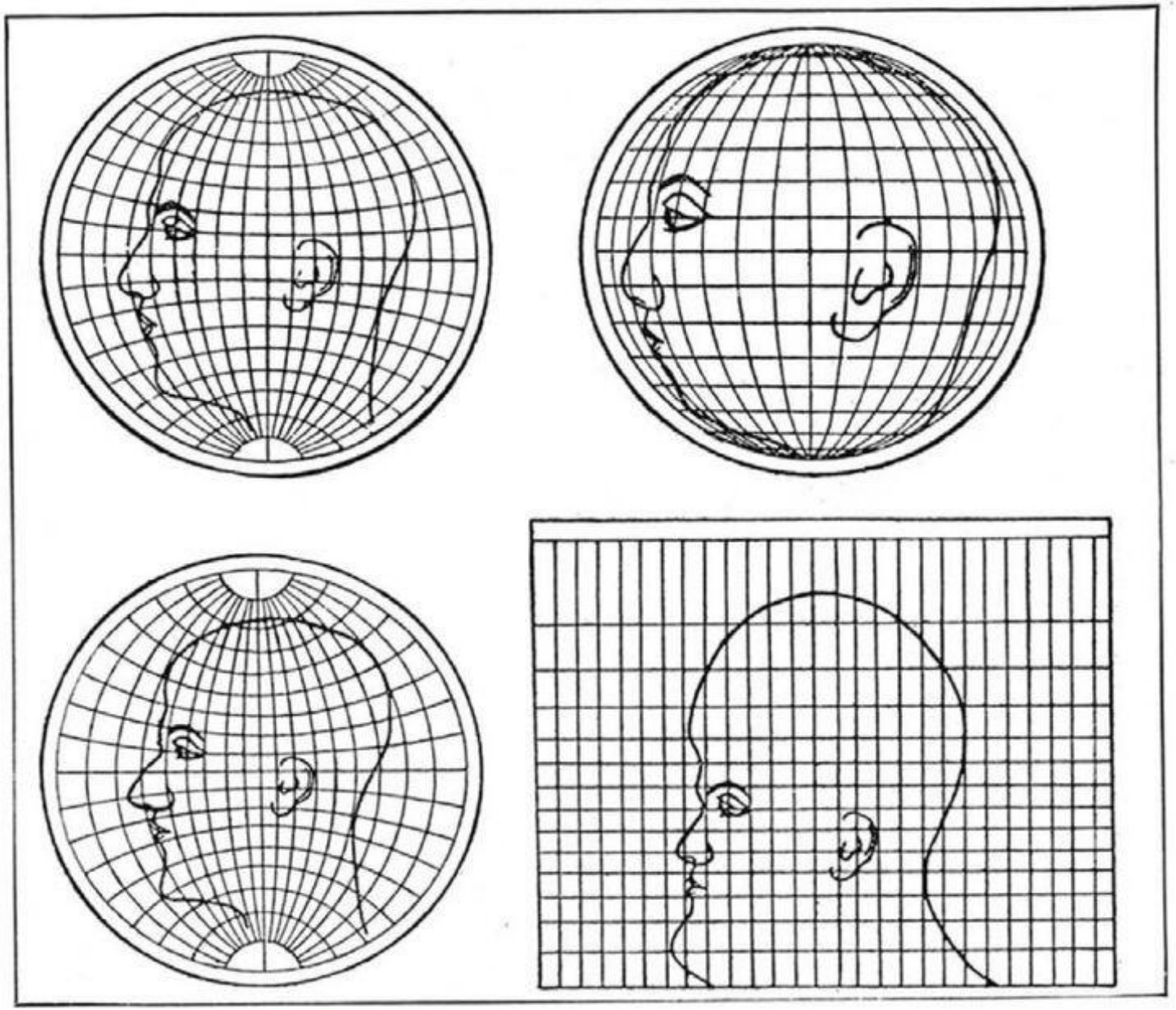
Perfect Sphere

Transformation

Map Projection



Source: Paul Bolstad. 2012. GIS Fundamentals – A first text on Geographic Information Systems. 4th ed.



Upper left: Globular. *Upper right:* Orthographic. *Lower left:* Stereographic. *Lower right:* Mercator

What four commonly used projections do, as shown on a human head

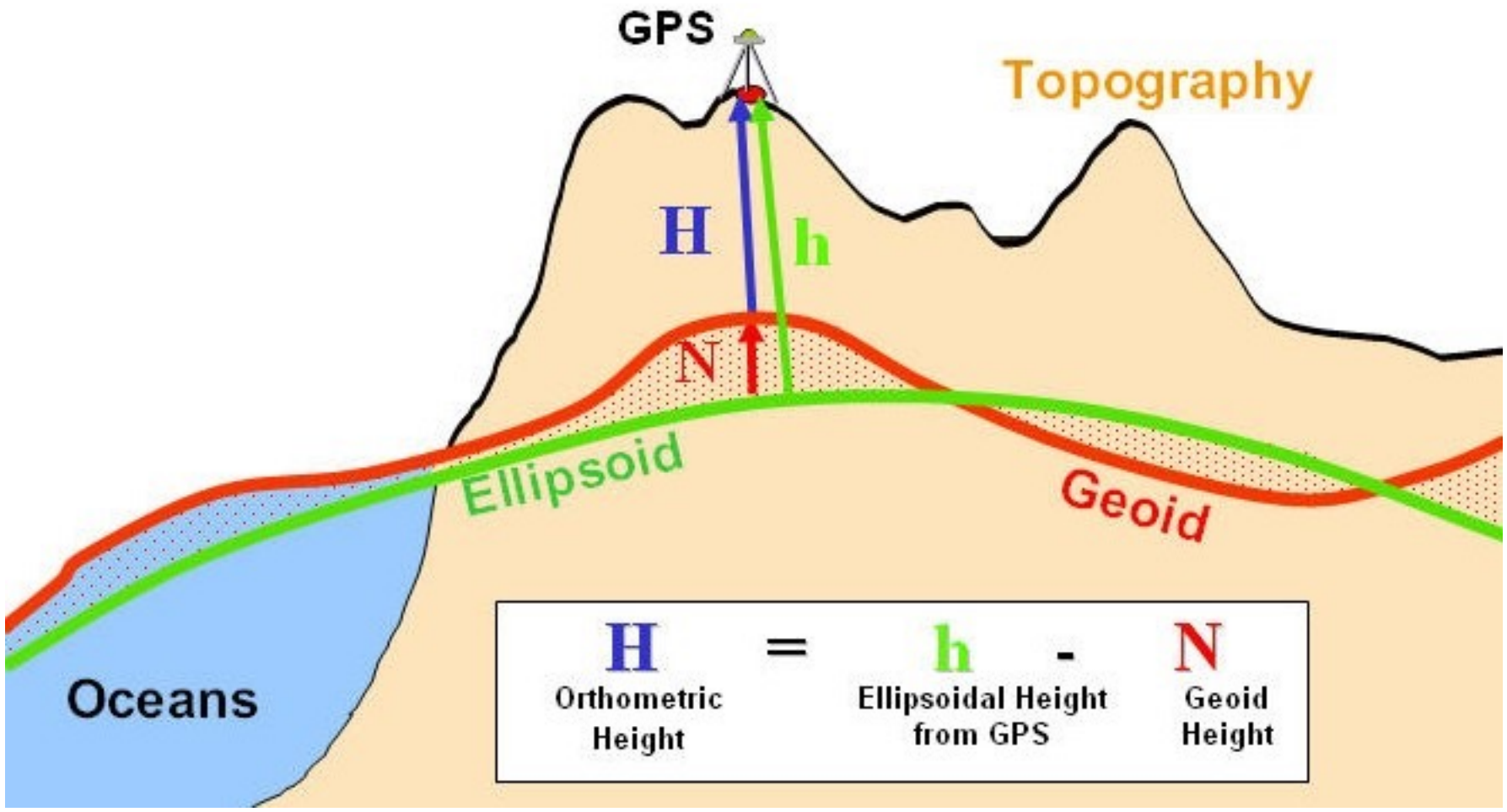
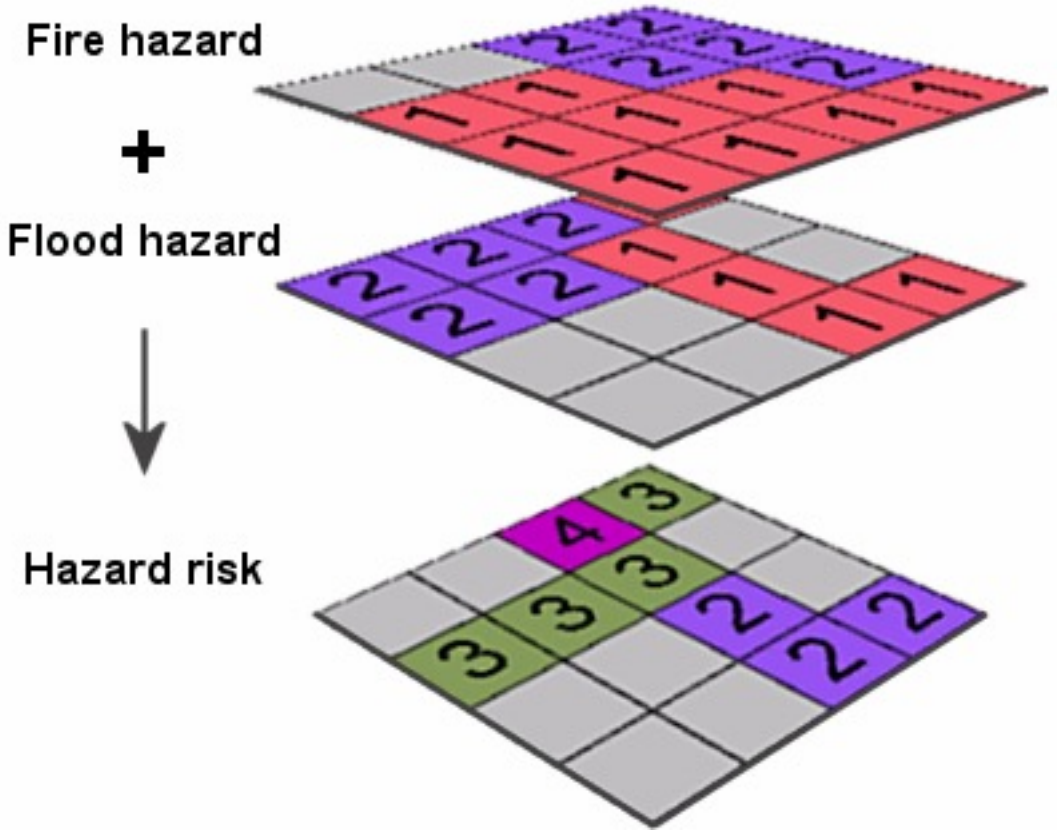


Image via University of Oklahoma at http://principles.ou.edu/earth_figure_gravity/geoid/

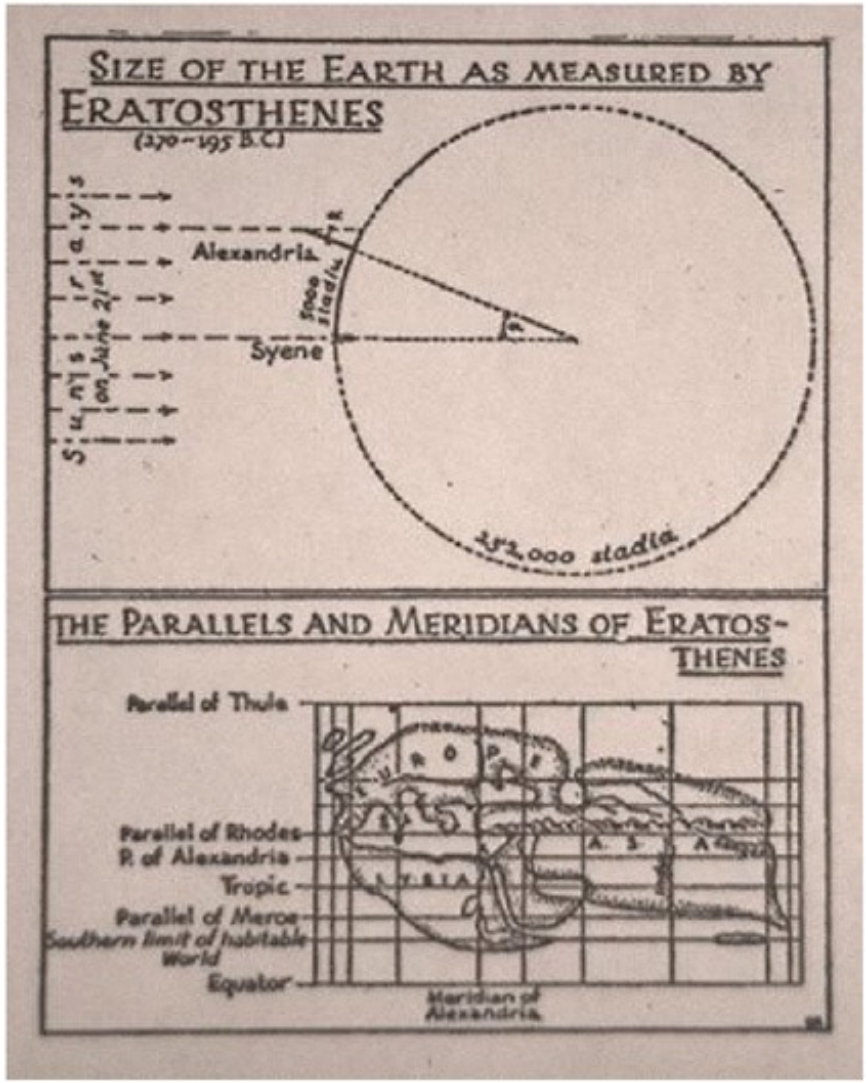


http://www.geography.hunter.cuny.edu/~jochen/GTECH361/lectures/lecture11/concepts/Working%20with%20NoData.htm

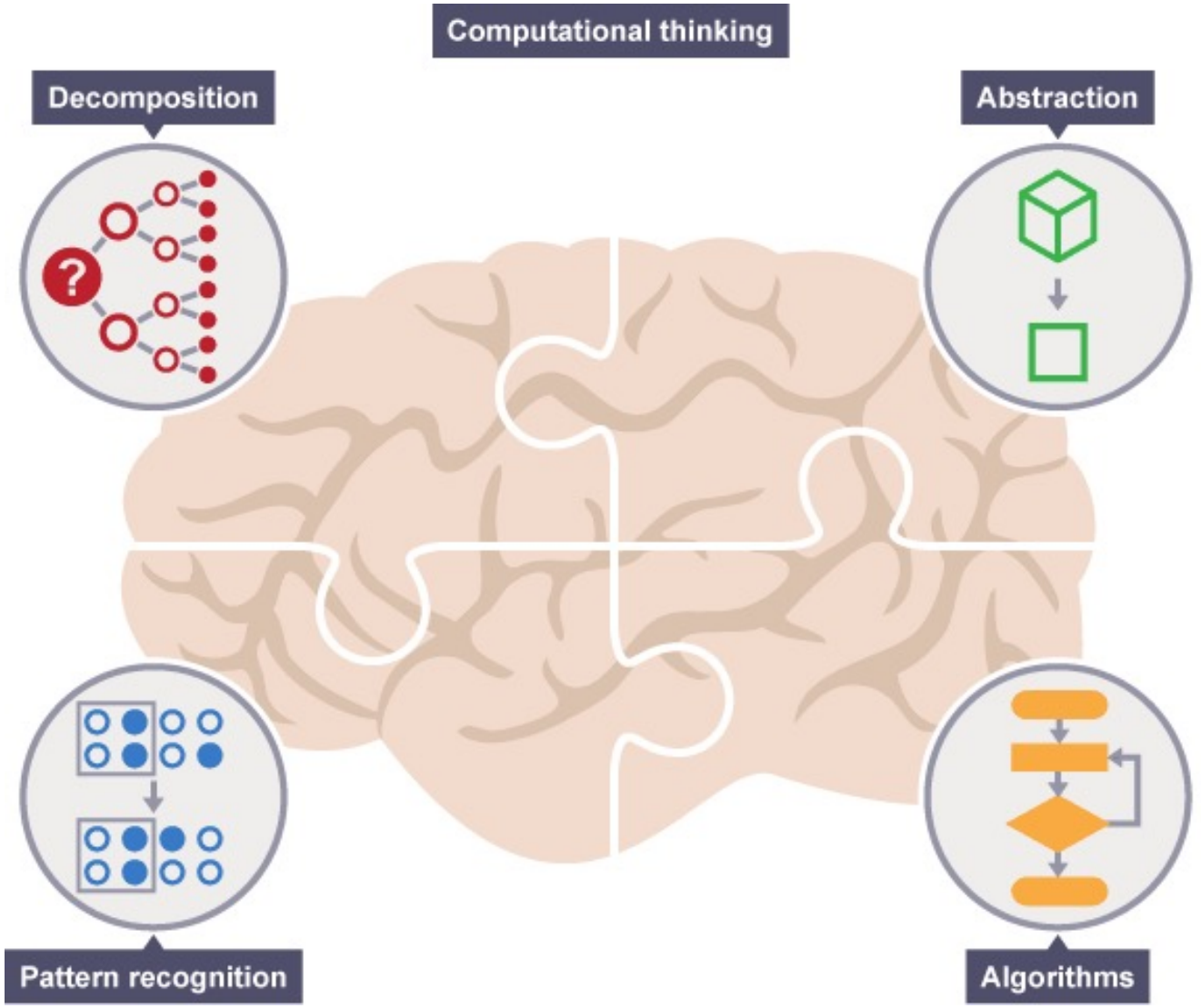
Geographic Inquiry Process

From: http://www.esri.com/Industries/k-12/education/~/media/Files/Pdfs/industries/k-12/pdfs/geoginquiry.pdf

How does it all work together?



https://www.nap.edu/catalog/11019/learning-to-think-spatially-gis-as-a-support-system-in



The Here and Now

- Lab this week: work week!
  - Yes, you probably have stuff to work on!
  - If you don't, congrats!

- TA office hours will run as usual next week (with extra bonus appearances by the UG TAs)
  - As mentioned, I will be at AGU starting Sunday – but available via email and with laptop for troubleshooting.

Some Important Links

- SRTI (Course Evaluations)
  - Very important for my knowledge/future course revisions/job.
  - Online only!
  - Due Dec 20th, 11pm: tx.ag/GISEval

- Want more GIS access?
  - Our campus site license offers many trainings, web courses, and so forth free for students!
  - I can make you an account if you sign up here: tx.ag/LearnGIS

The Final

- 'Take home' format (we **do not** sit for the final)
- Will be available starting 5pm, Thursday, Dec. 13th (after presentations)
- Does not require GIS software* (all concept based).
  - As discussed in the past, one of the questions is "How did you archive your data and share it with relevant stakeholders" – so if you haven't done that, you might need GIS…

The Final II

- Due at the end of finals (Thursday, December 20th), 5pm.
- Format will be short response.
- Available/turned in on Moodle

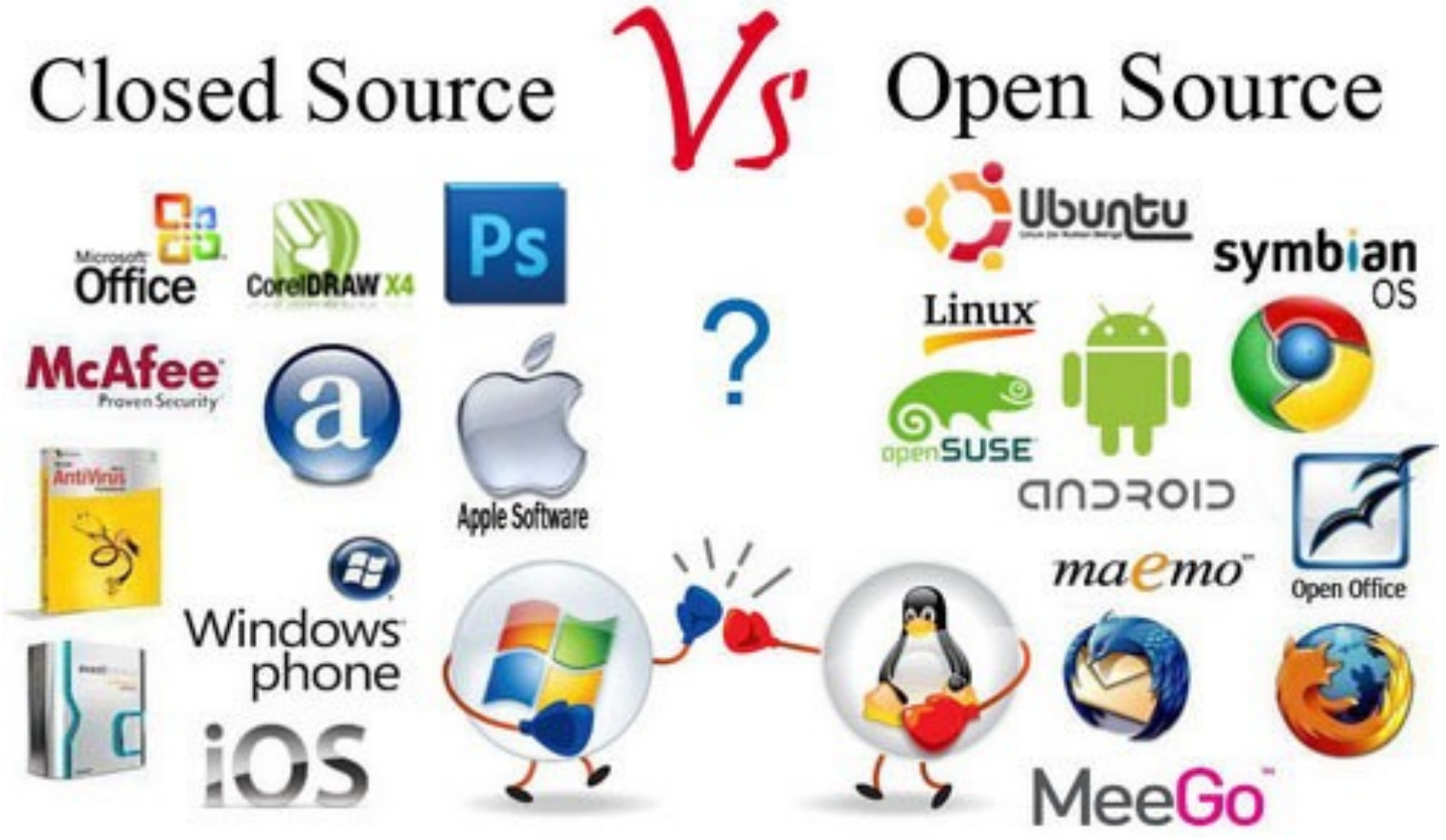
So, what else should you know?

- We did not cover the entirety of the GIS landscape in this course
  - Shocking

- In fact, there is other software out there you might be interested in…

Open Source GIS

- Because it only feels like ESRI controls the world.



Open Source vs. Closed Source

- Open Source:
  - Source code is available;
  - Allows study, change, distribution of software;
  - Encourages collaborative development
- Closed Source:
  - (or, Proprietary)
  - Restrictions on use, analysis, modification, or distribution.
  - Can also refer to file formats, workflows, etc.

The Monolith

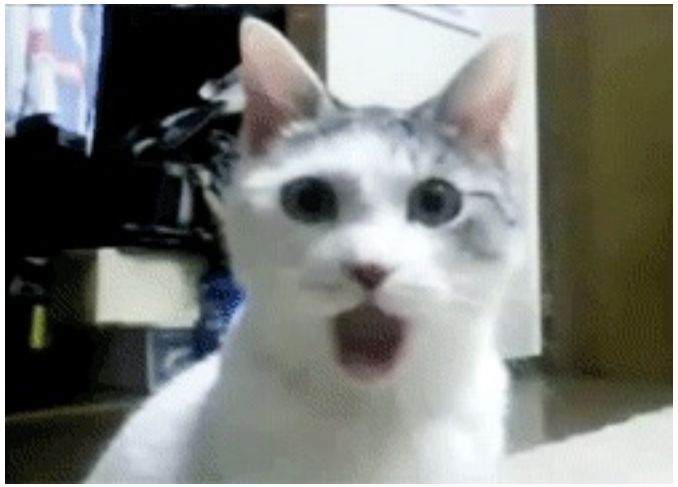
- ESRI products (ArcMap et al.) are often criticized for their proprietary nature.

- The closed source means that:
  - Licenses may restrict what you can do with your program;
  - You might not know what your processes are actually doing.

Sure, ESRI is a Big Deal…

- With ~45% of the GIS market share, ESRI products are everywhere, but:
  - You might not always be able to use ESRI products;
  - You might not always have the budget for ESRI products;
  - You might not WANT to use them!

This Course is not Principles of ArcMap!



Open Source Knowledge for Your GIS Future

- You are more marketable and employable if you can at least demonstrate knowledge of other software packages.

- Your GIS skills will grow if you can abstract your problem solving!

What's Different?

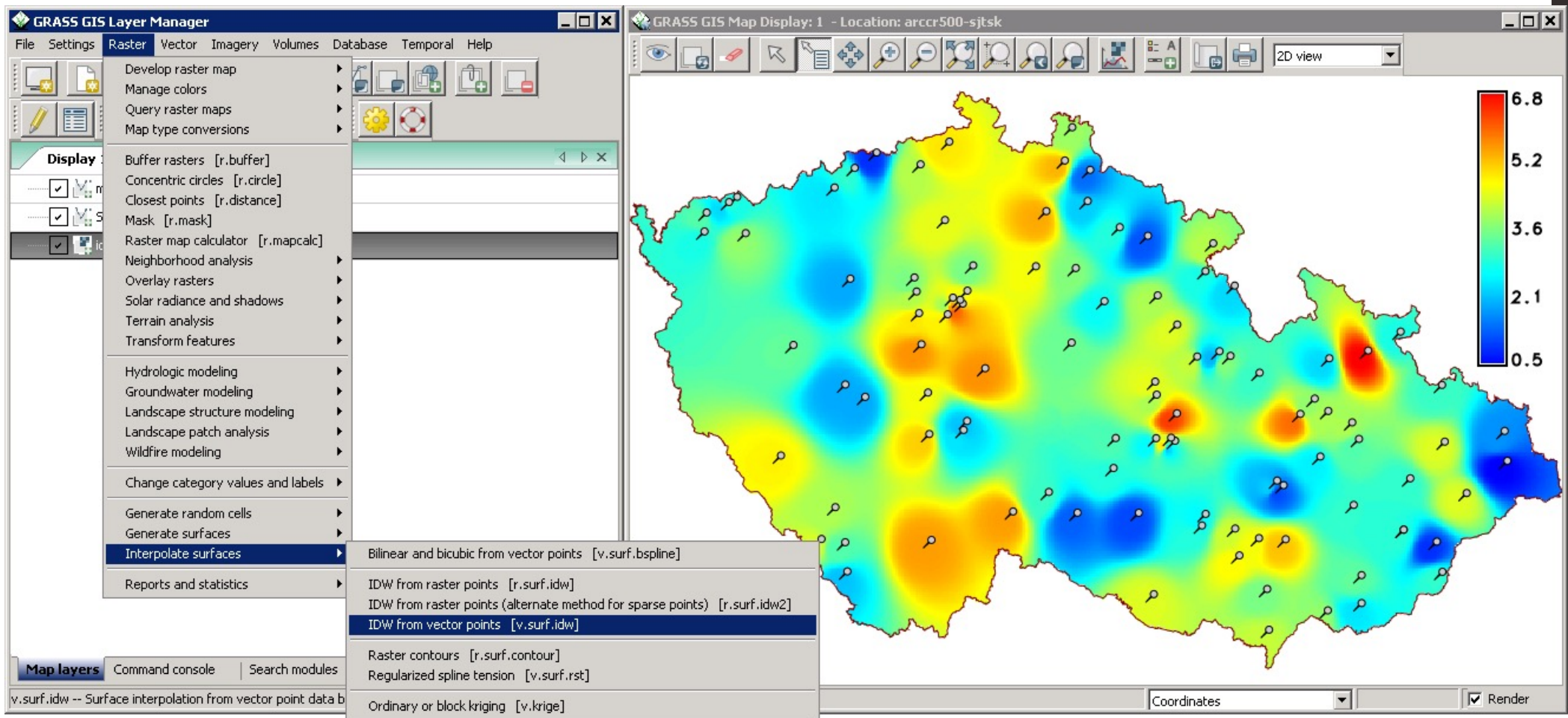
- Interface
- File formats (sometimes)
- Capabilities
- Operating System Support
- How things are Calculated (sometimes)

What's the Same?

- Fundamentals of GIS
- Geographic Questioning
- Cartographic Technique (but not capability)
- Spatial-ness

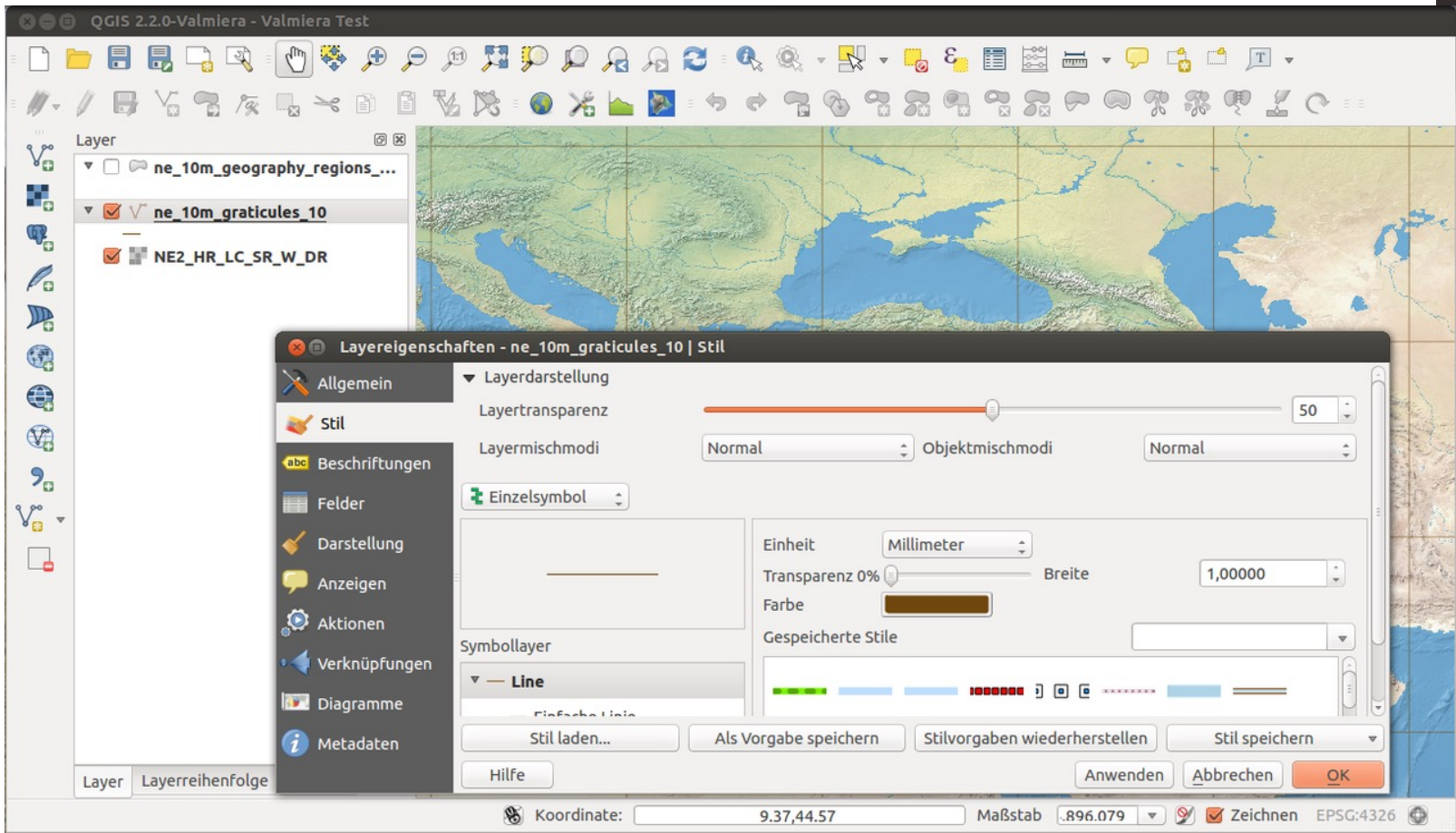
Example: GRASS GIS

Developed by the Army Corps of Engineers



Example: QGIS

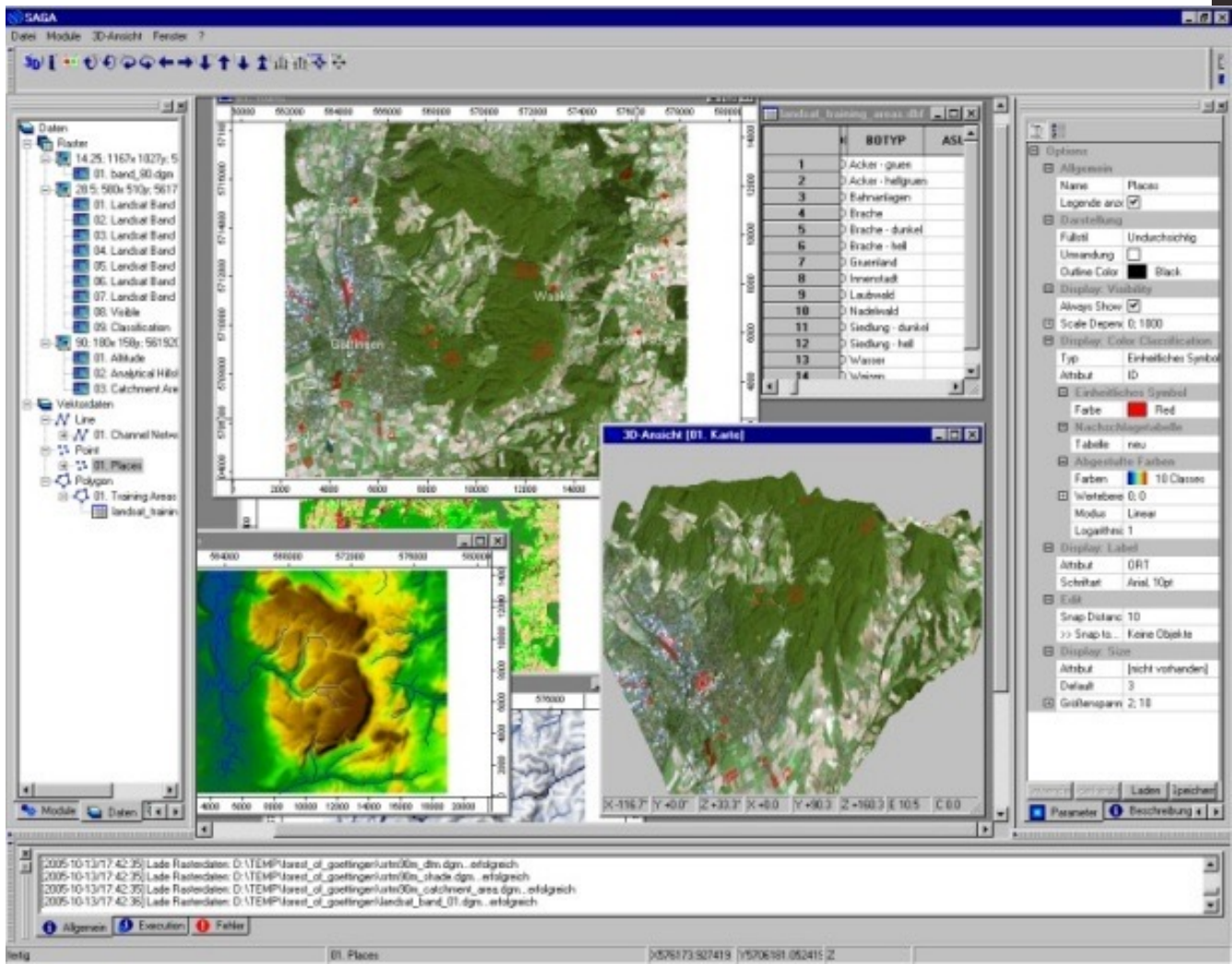
Previously Quantum GIS, a product of the Open Source Geospatial Foundation



Example: SAGA

Developed at the University of Göttengin.

Only needs 10mb!



What other skills might you need?

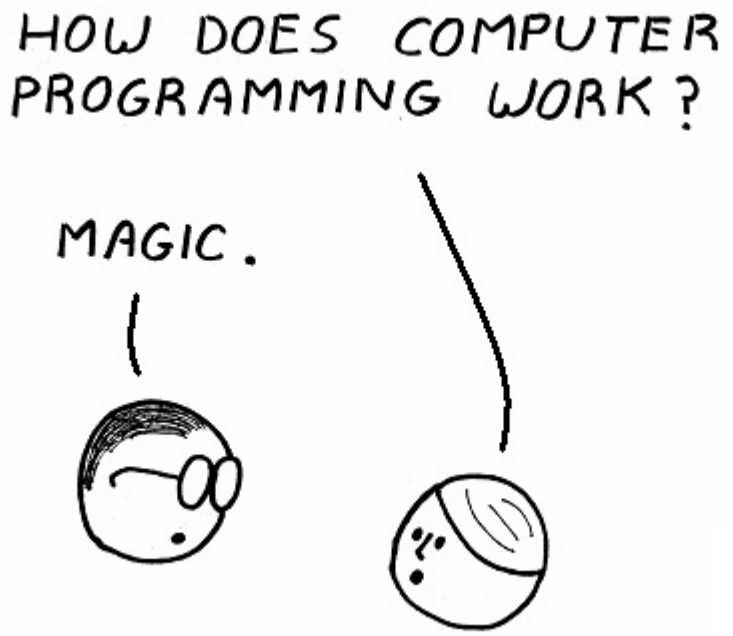
python
powered

```
print("Hello, world!")
```

http://www.pixelstech.net/article/images/Python.png

Programming is not ‘Beyond’ You

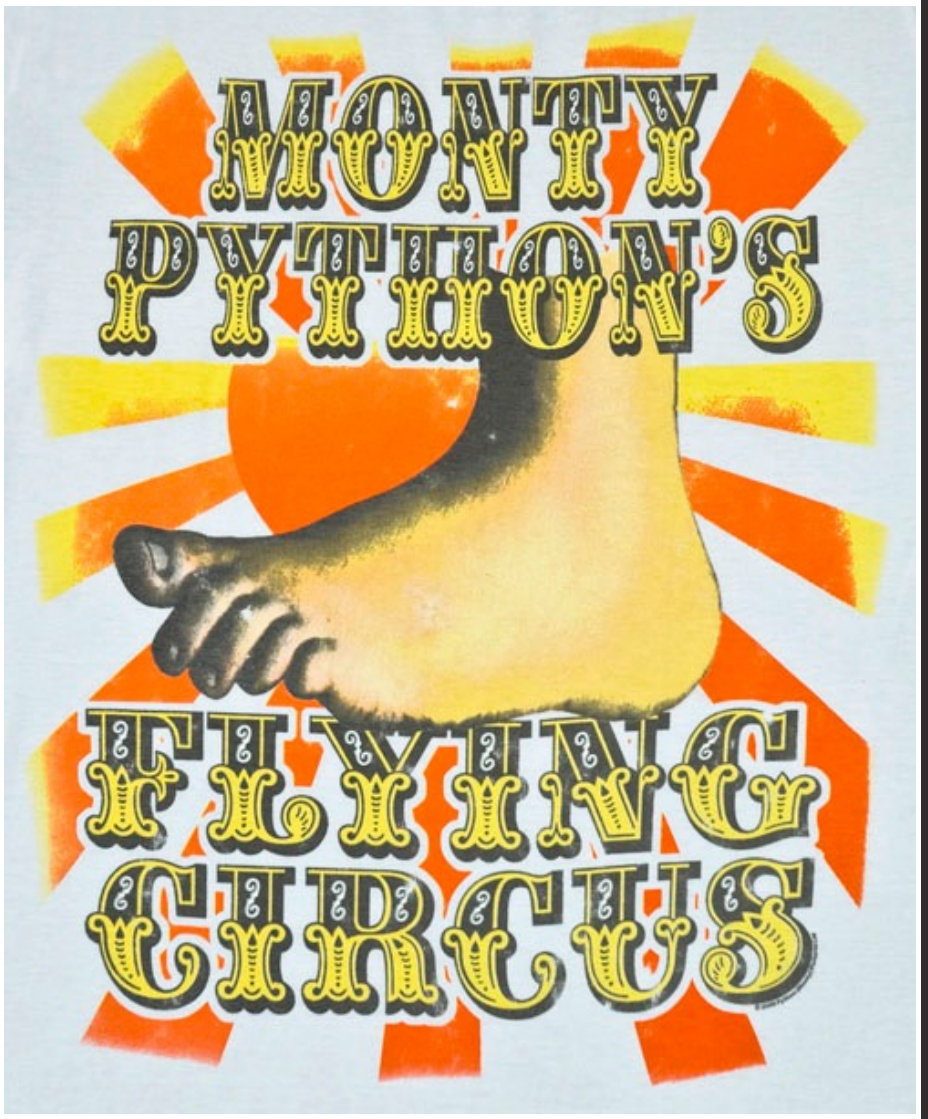
Not Like This

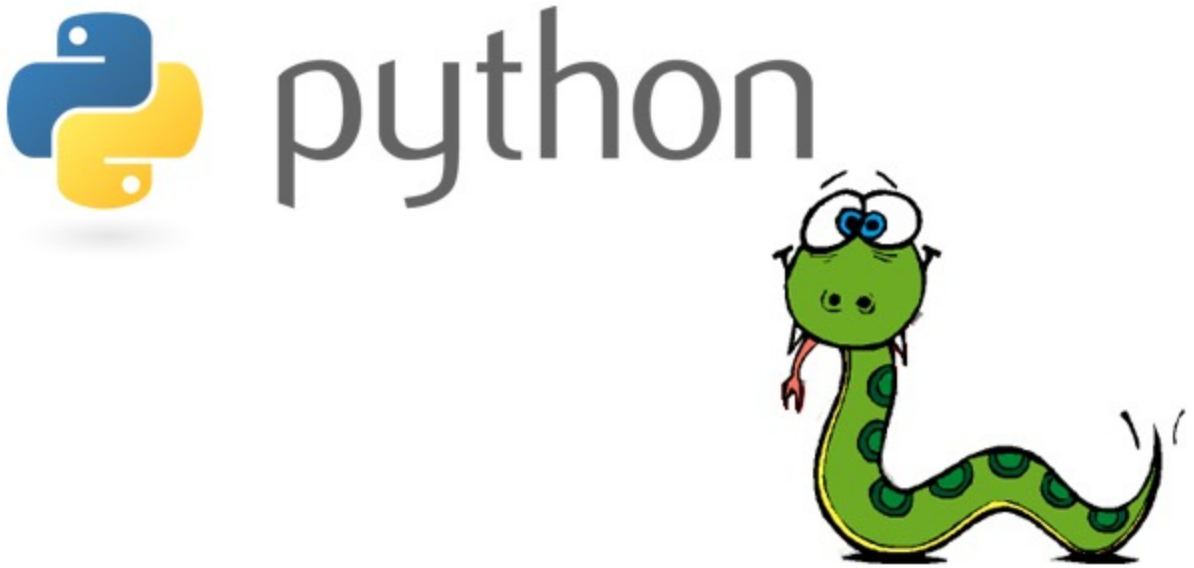


https://raw.github.com/tcyrus/python/master/en/assets/intro.png

So About This Python, Anyway

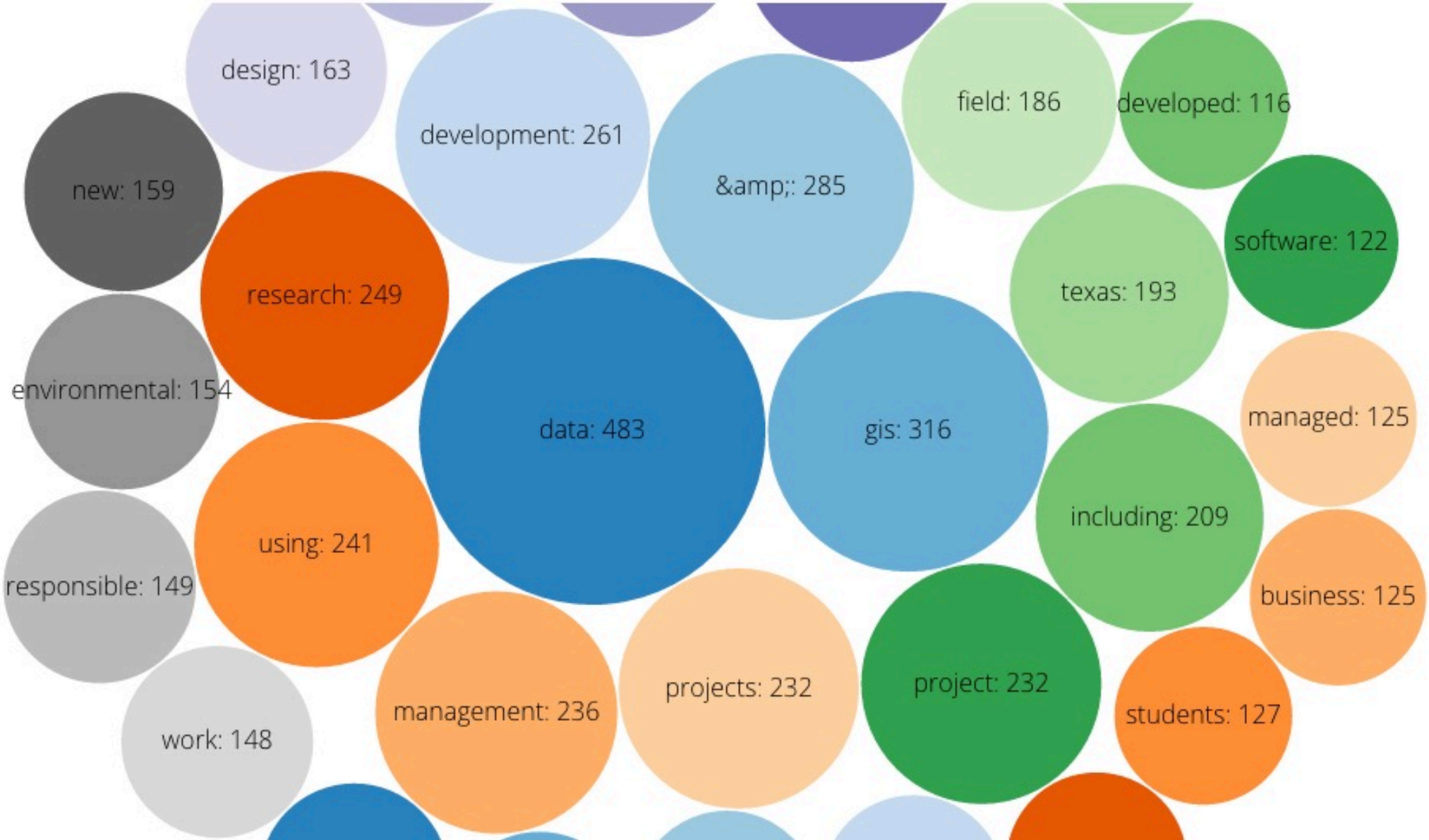
- Python is a:
  - High-level
  - General-purpose
  - Interpreted
  - Dynamic
- Programming Language




python

http://www.learnpython.org/en/Welcome

What might you do?



Soft Skills vs. Hard Skills

- Hard working
- Good communication
- Team player
- “Ability to comprehend, analyze, and interpret documents.”

- Ability to analyze data in R
- Cartographic capabilities in ArcMap
- SQL database management experience

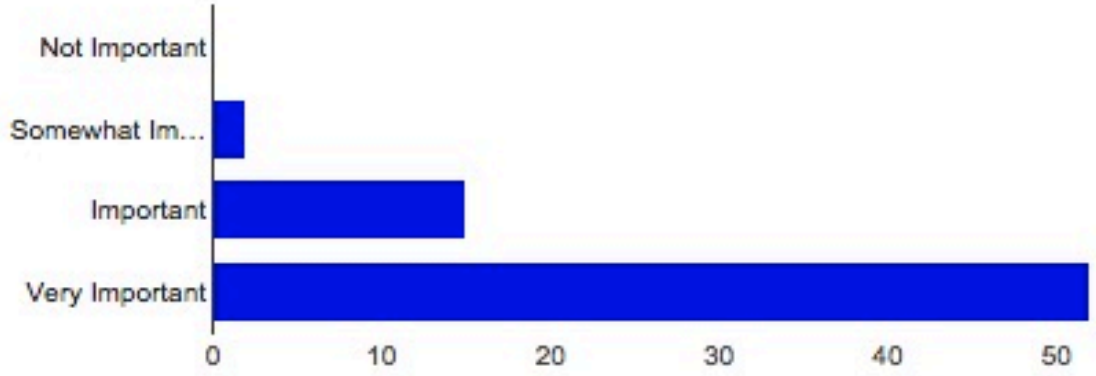
Degree Requirements

- “Bachelor's degree from an accredited college or university with major work in physical or natural science, geography, engineering, planning, computer science or a related field.”

- AKA ‘Have skills will hire’

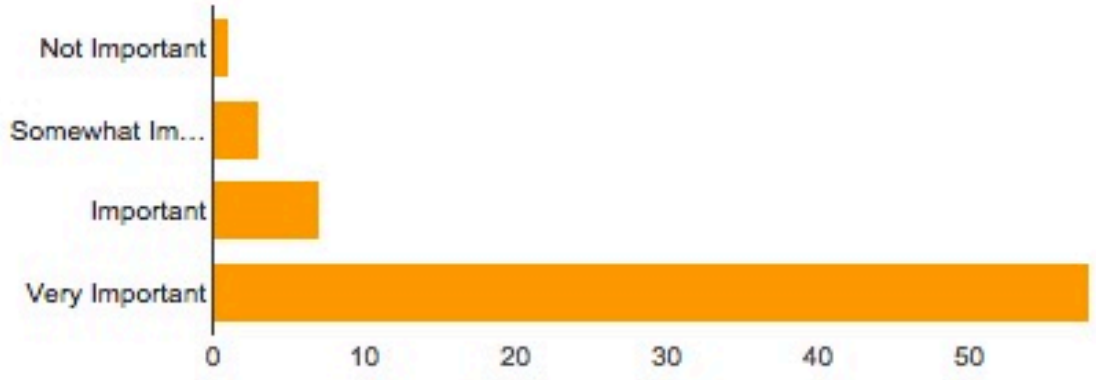
Thoughts from the Energy Domain I

GIS Data Creation & Editing [Rank the importance of the following GIS skills for a new GIS professional in your group/division]



Not Important	**0**	0%
Somewhat Important	**2**	2.9%
Important	**15**	21.7%
Very Important	**52**	75.4%

GIS Data Management [Rank the importance of the following GIS skills for a new GIS professional in your group/division]



Not Important	**1**	1.4%
Somewhat Important	**3**	4.3%
Important	**7**	10.1%
Very Important	**58**	84.1%

Thoughts from Natural Resources I

- “Most, if not all, wildlife projects benefit from the use of GIS-based tools. Many depend on GIS-based analysis. If you want a wildlife job you need to understand GIS.”

- 25 years experience in Wildlife Biology

Thoughts from the Energy Domain II

- Q: What would you consider the biggest deficiency when students join your group/division as new hires?

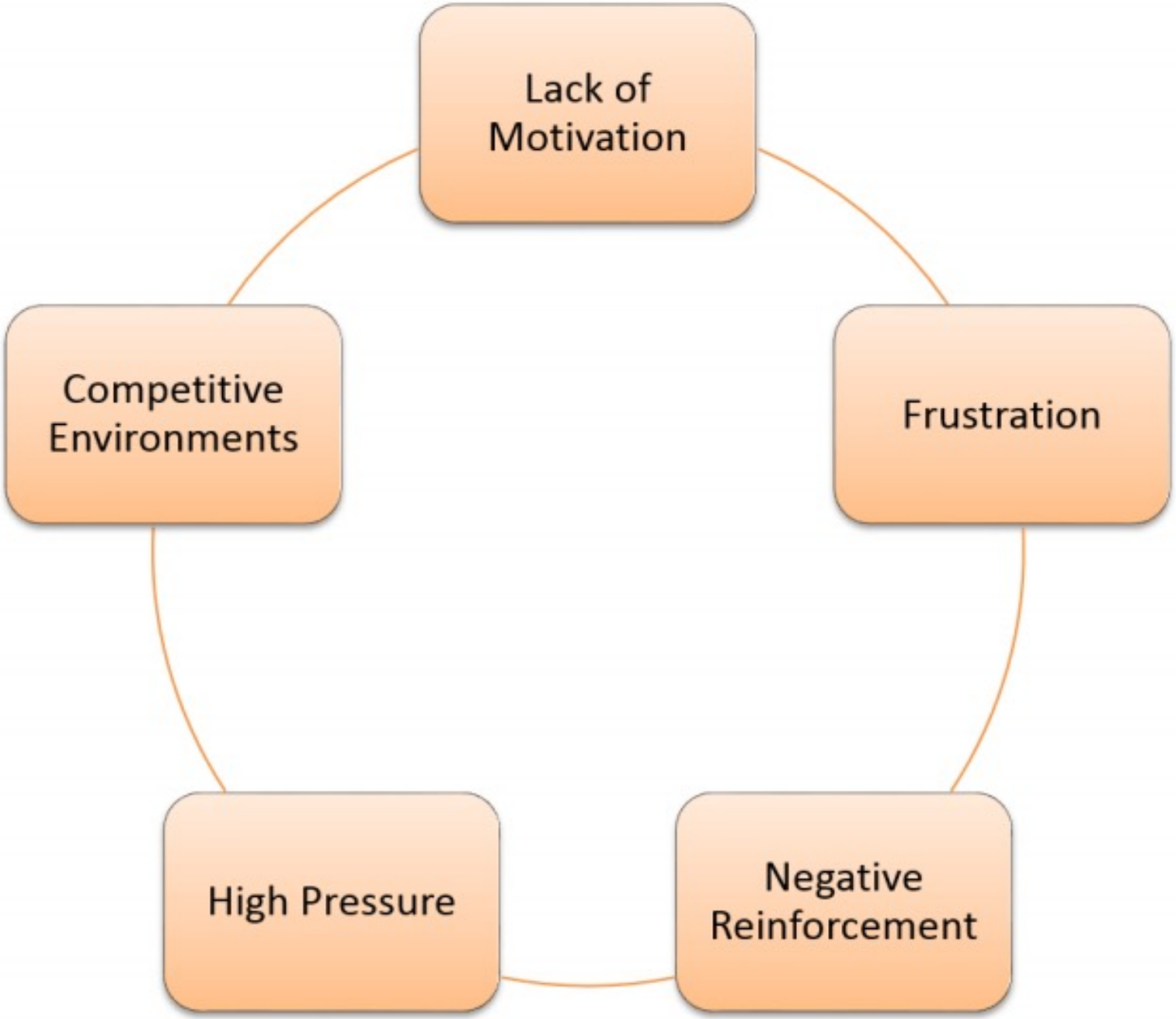
- “Lack of critical thinking skills. Asking "How do I do this" rather than finding the answers themselves from help files or the web.”

Thoughts from Natural Resources II

- “Learn how to code and learn how databases are structured + how to work with them. Knowledge of Python, Javascript, C++ is now a base-level job requirement for many GIS and related jobs, and, to be honest, makes many GIS tasks much easier.”

- 18 years experience in Geology

Our Problems Now (Still?)



Fin

- See you in lab!
- Have a wonderful poster conference!