Major themes

- Abstraction
  - Leverage existing components without understanding details
  - Create components that can be used as black boxes

- Design tradeoffs
  - Algorithm analysis - scalability and growth
  - Keeping code easy to read for maintainability

- Recursion
  - Reason about problems in terms of self-similarity
  - Write very short code to achieve complex behaviors

- Art – "A programmer who subconsciously views himself as an artist will enjoy what he does and will do it better." (Knuth)

Beyond programming

- Mind-controlled robots
  - http://www.youtube.com/watch?v=TQ7EOpPNQyw

- Muscle-controlled interfaces
  - http://www.youtube.com/watch?v=pktVSTwC8qo

- 3D models from pictures
  - http://www.youtube.com/watch?v=25Yifq70eIY

- Face aging
  - http://www.youtube.com/watch?v=fLQtssJDMMc

- Animation
  - http://www.youtube.com/watch?v=b4kkPlLdMvI

- Security
  - http://www.pbs.org/wgbh/nova/tech/tadayoshi-kohno.html

What project?

- Little text-processing applications
  - identify lines above 100
  - remove line-breaks

- Add a GUI to the random sentence generator

- Automate chemistry, physics, calculus problems, etc

- Find quotes by keyword in books

- What are you currently doing that a computer could do?

What language?

- Expanding your Java knowledge with a project is valuable

- Pick a project, see what language is most appropriate
  - iOS: Swift
  - Android: Java
  - Client-side web: Javascript
  - Beautiful visuals: Processing
  - Quick data processing: Python
  - Embedded systems: C/C++

- Learn a new paradigm
  - Functional languages: Racket, Haskell (now, Java 8, too!)

Leveraging existing code

- Processing language
  - http://nlp.stanford.edu/software/

- Building games
  - http://lwjgl.org/
  - http://jbox2d.org/ (with physics!)

- Processing biological data
  - http://biojava.org/wiki/Main_Page

- Accessing Facebook data
  - http://restfb.com/

- Making music
  - http://www.jfugue.org/

Courses?

- CSE non-majors
  - CSE 154: Web Programming
  - CSE 373: Data Structures and Algorithms
  - CSE 374: Programming Concepts and Tools (C/C++, Linux, ...)
  - CSE 131: Digital Photography
  - CSE 460: Animation Capstone (open to all majors)

- CSE majors
  - CSE 311: (Mathematical) Foundations of Computing
  - CSE 332: Data Abstractions (Data Structures and Algorithms)
  - CSE 331: Software Design and Implementation
  - CSE 341: Programming Languages
  - CSE 344: Intro to Data Management (and databases)
  - CSE 351: Hardware/Software Interface
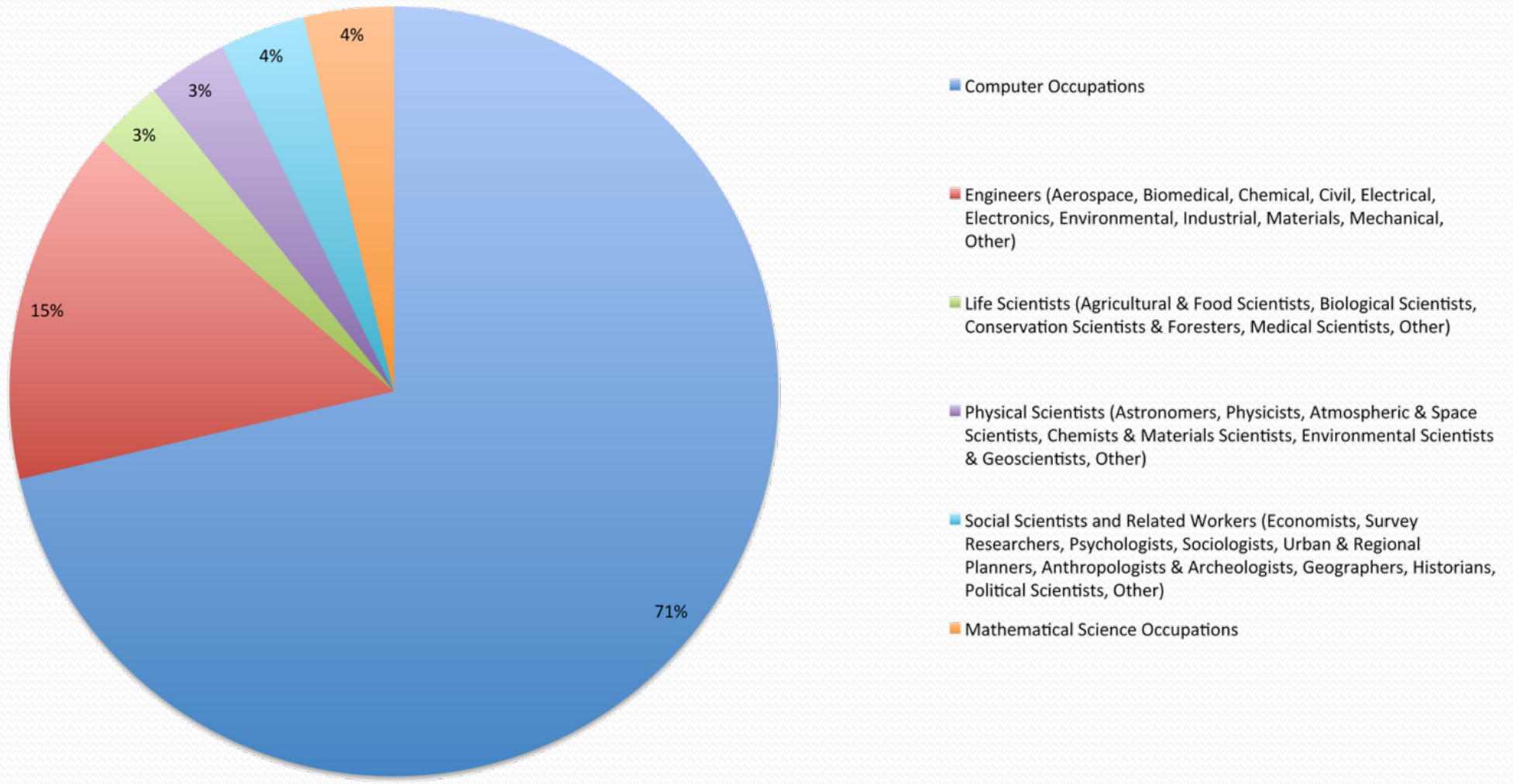
- INFO, AMATH, DXARTS, ...

Weekly meetings

- Change – technologies for low-income regions
  - http://change.washington.edu/

- Dub – human-computer interaction and design
  - http://dub.washington.edu/

Job Growth, 2012-22 - U.S. Bureau of Labor Statistics
Computer Occupations = 71% of all STEM

Pie chart segments:
- 71% — Computer Occupations
- 15% — Engineers
- 3% — Life Scientists
- 3% — Physical Scientists
- 4% — Social Scientists
- 4% — Mathematical Science Occupations

Legend:
- Computer Occupations
- Engineers (Aerospace, Biomedical, Chemical, Civil, Electrical, Electronics, Environmental, Industrial, Materials, Mechanical, Other)
- Life Scientists (Agricultural & Food Scientists, Biological Scientists, Conservation Scientists & Foresters, Medical Scientists, Other)
- Physical Scientists (Astronomers, Physicists, Atmospheric & Space Scientists, Chemists & Materials Scientists, Environmental Scientists & Geoscientists, Other)
- Social Scientists and Related Workers (Economists, Survey Researchers, Psychologists, Sociologists, Urban & Regional Planners, Anthropologists & Archeologists, Geographers, Historians, Political Scientists, Other)
- Mathematical Science Occupations

Roles in Industry

- Software Developer/Software Engineer
  - Builds and designs software
  - Includes designing and engineering architecture of a software system as well as programming

- Product Manager (PM)
  - Designs and makes decisions regarding the overall product
  - May write specifications for software developers
  - Works with people across disciplines at the company
  - May or may not program
  - Role can be different at different companies

- Test/QA
  - Write and design tests of the product

Internships

- Various career fairs around campus.

- Start looking early!

- For those just starting out
  - Microsoft Explorer Program - https://careers.microsoft.com/students/explore

  - Google Engineering Practicum - https://www.google.com/about/careers/search#!t=jo&jid=120165001&

What Do I Do?

- When I'm not teaching, I work at Sift Science, a startup in San Francisco, as a Software Developer

- Sift Science uses large scale machine learning to help online businesses detect fraud

- Small company (~50). Work closely with people in different disciplines across the company

- Full-stack, primarily focusing on front-end development
  - Frontend uses React, Facebook's javascript framework
  - Backend uses Java!