# Careers in Computing and Science

Richard LeDuc
Manager: National Center for Genome Analysis Support

Presented at Clark State on 9/27/2012

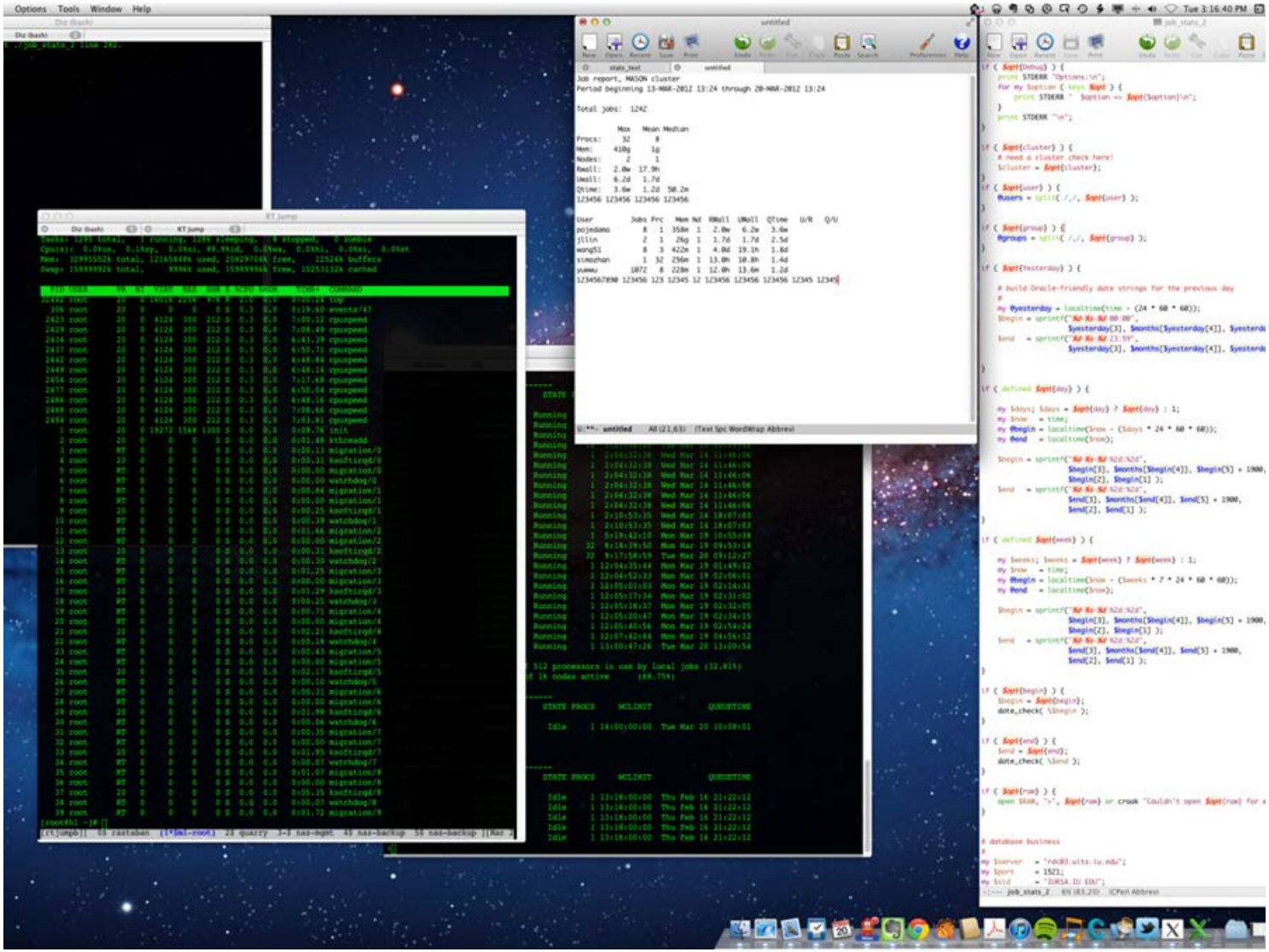
# The Obligatory Introduction Slide

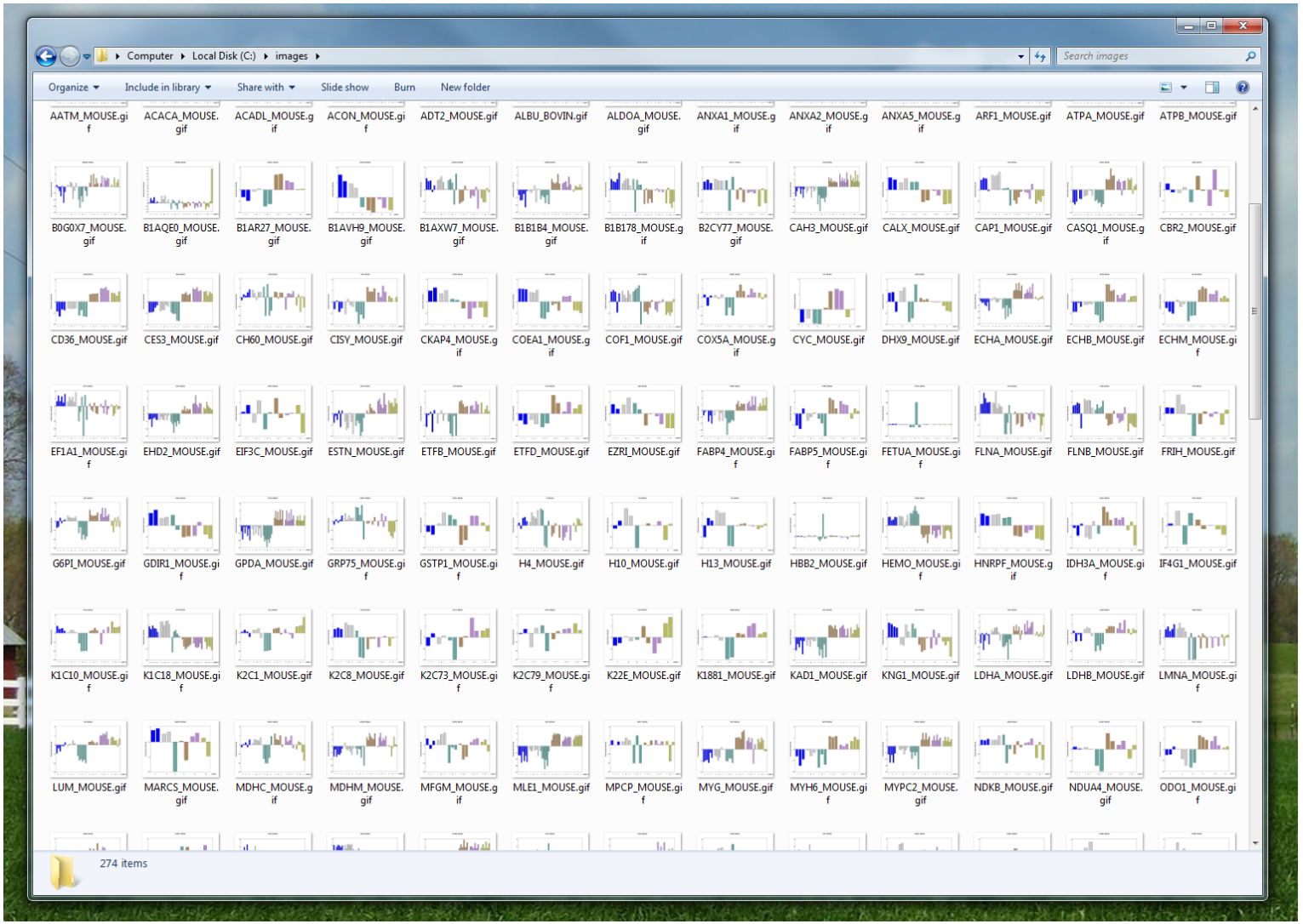
- Overview of Computing in Science – with a focus on biology
- Look at the work environment for computer professionals in the sciences
- High level overview of the different degrees and what their holders do
- End with example employment by specialty

# Computers in Science

A few examples


200 µm
5 µm




Computer ▸ Local Disk (C:) ▸ images ▸
Search images
Organize
Include in library
Share with
Slide show
Burn
New folder
AATM_MOUSE.gif
ACACA_MOUSE.gif
ACADL_MOUSE.gif
ACON_MOUSE.gif
ADT2_MOUSE.gif
ALBU_BOVIN.gif
ALDOA_MOUSE.gif
ANXA1_MOUSE.gif
ANXA2_MOUSE.gif
ANXA5_MOUSE.gif
ARF1_MOUSE.gif
ATPA_MOUSE.gif
ATPB_MOUSE.gif
B0G0X7_MOUSE.gif
B1AQE0_MOUSE.gif
B1AR27_MOUSE.gif
B1AVH9_MOUSE.gif
B1AXW7_MOUSE.gif
B1B1B4_MOUSE.gif
B1B178_MOUSE.gif
B2CY77_MOUSE.gif
CAH3_MOUSE.gif
CALX_MOUSE.gif
CAP1_MOUSE.gif
CASQ1_MOUSE.gif
CBR2_MOUSE.gif
CD36_MOUSE.gif
CES3_MOUSE.gif
CH60_MOUSE.gif
CISY_MOUSE.gif
CKAP4_MOUSE.gif
COEA1_MOUSE.gif
COF1_MOUSE.gif
COX5A_MOUSE.gif
CYC_MOUSE.gif
DHX9_MOUSE.gif
ECHA_MOUSE.gif
ECHB_MOUSE.gif
ECHM_MOUSE.gif
EF1A1_MOUSE.gif
EHD2_MOUSE.gif
EIF3C_MOUSE.gif
ESTN_MOUSE.gif
ETFB_MOUSE.gif
ETFD_MOUSE.gif
EZRI_MOUSE.gif
FABP4_MOUSE.gif
FABP5_MOUSE.gif
FETUA_MOUSE.gif
FLNA_MOUSE.gif
FLNB_MOUSE.gif
FRIH_MOUSE.gif
G6PI_MOUSE.gif
GDIR1_MOUSE.gif
GPDA_MOUSE.gif
GRP75_MOUSE.gif
GSTP1_MOUSE.gif
H4_MOUSE.gif
H10_MOUSE.gif
H13_MOUSE.gif
HBB2_MOUSE.gif
HEMO_MOUSE.gif
HNRPF_MOUSE.gif
IDH3A_MOUSE.gif
IF4G1_MOUSE.gif
K1C10_MOUSE.gif
K1C18_MOUSE.gif
K2C1_MOUSE.gif
K2C8_MOUSE.gif
K2C73_MOUSE.gif
K2C79_MOUSE.gif
K22E_MOUSE.gif
K1881_MOUSE.gif
KAD1_MOUSE.gif
KNG1_MOUSE.gif
LDHA_MOUSE.gif
LDHB_MOUSE.gif
LMNA_MOUSE.gif
LUM_MOUSE.gif
MARCS_MOUSE.gif
MDHC_MOUSE.gif
MDHM_MOUSE.gif
MFGM_MOUSE.gif
MLE1_MOUSE.gif
MPCP_MOUSE.gif
MYG_MOUSE.gif
MYH6_MOUSE.gif
MYPC2_MOUSE.gif
NDKB_MOUSE.gif
NDUA4_MOUSE.gif
ODO1_MOUSE.gif
274 items

# Work Environment

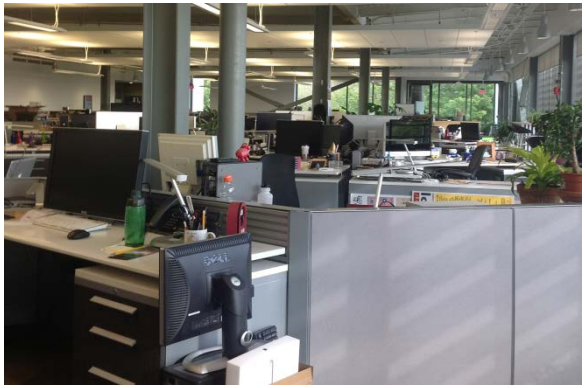
What do you do, day-to-day

# Two Work Environments

- IT shop associated with a science project
  - Work with other IT professionals
  - Focused work within a team
  - Defined career path
- Embedded IT Person
  - Usually works directly with scientists
  - Very independent
  - Broad skill base
  - Poorly defined professional progression

# Research Technologies at Indiana University-Bloomington

- Office work environment
- Chains of command
- Defined tasks and expectations



Indiana University
Research Technologies & PTI – Service & Cyberinfrastructure Centers
March 2012

**Associate Dean and Executive Director, PTI**
Craig A. Stewart

**Systems**
Matthew Link, Director

**Research Storage**
Kurt Seiffert, Manager
Danko Antolovic, Chris Garrison, Kristy Kallback-Rose, Jeff Russ, Haichuan Yang

**High Performance File Systems**
Stephen Simms, Manager
Nathan Heald, Justin Miller, Joshua Walgenbach

**High Performance Systems**
David Hancock, Manager
Matt Allen, Senior Technical Lead
George Turner, Senior Technical Lead
Stephanie Burks, Collin Gayde, Jeff Gronek, BretHammond, Peggy Lindenlaub, Nancy Long, Mike Lowe, Joseph Rinkovsky, Jenett Tillotson

**Core Services**
Richard Knepper, Manager
Erik Cornet, Robert Freeman-Day, Thomas Lee, Matthew Standish, Sarah Williams, *senior systems analyst*

**High Performance Applications**
Robert Henschel, Manager
Donald Berry, Jim Dietz, Arvind Gopu, Huian Li, Scott Michael, Raymond Sheppard, Abhishek Thota

**Visualization and Analytics**
Eric Wernert, Director

**Advanced Visualization Lab**
Michael Boyles, Manager
Ed Dambik, Chris Eller, Chauncey Frend, David Reagan, Jeffrey Rogers, Hui Zhang

**Digital Arts and Advanced Media**

**Statistical and Mathematical Computing**
John Samuel, Manager
Eric Applegate, M. Jefferson Davis, Tak Noguchi, Justin Peters, Anna Radue, Kevin Wilhite

**Science Gateway Group**
Marlon Pierce, Manager
Lahiru Ginnaliya, Yu "Marie" Ma, Suresh Marru, Raminder Singh

Margaret Dolinsky, Research Scientist and Artist

**Visualization and Virtual Reality**
William Sherman

**Digital Library Program (DLP)**

**Digital Library Software Development**
John Albrecht*, David Cliff*, Wallace Hooper*

**Science Community Tools**
William Barnett, Director

**Advanced Biomedical IT Core**
Ganesh Shankar, Manager
Andrew Arenson, Michael Grobe, Abhijeet Malatpure, Jim Mullen, Anurag Shankar, Radha Surya, Michel Tavares

**Open Science Grid**
Robert Quick, Site Lead
Elizabeth Chism, Alain Deximo, Kyle Gross, Soichi Hayashi, Scott Teige

**Software Sustainability Research**
Julie Wernert, Information Manager

**Collaboration and Engagement Support**
Therese Miller, Manager
Malinda Lingwall, METACyt Info. Manager
*Xsede technical expert*
*Kiosk manager*

**National Center for Genome Analysis Support**
William Barnett, Director
Michael Lynch, Co-Principal Investigator***
Matthew Hahn, Co-Principal Investigator***
Geoffrey Fox, Co-Principal Investigator
Richard LeDuc, Manager
Le-Shin Wu

*Indicates UITS staff managed by DLP.

***Faculty 100% Department of Biology.

Chart includes appointed staff only. See http://uits.iu.edu/scripts/ose.cgi?ltxt.help.

# Precision Proteomics at Northwestern University

# And Laboratories Everywhere

- More relaxed
- Collaborative/team projects
- Goals are “fluid”
- Skills are more open: learn how to do it, then do it…

# Degrees and Certificates

What degrees are out there,
and how do I get them?

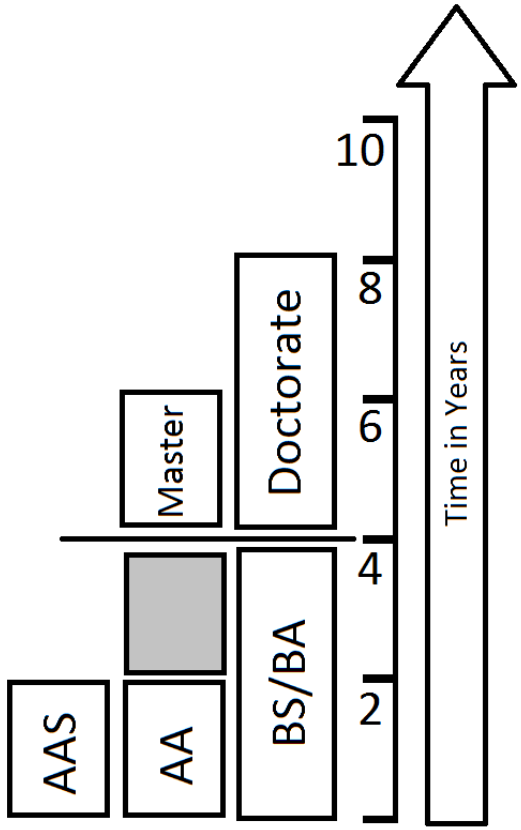
# Being a Scientist requires education

- BS required for academic professional
- MS required for many technician-level jobs, as well as administrative and Community College positions
- PhD to manage science projects
- Post docs (and beyond) to run your own lab

You can work in the sciences without being a scientist.

# Know your degrees

- Bachelors aka Baccalaureate is a common milestone
- Frequently an AA plus two years at a four year school can get you a Bachelors.
- Graduate degree programs care very little about the path you take to your bachelors (In my experience).
- Only in special cases does an AAS give you transferable credit hours for a BS.

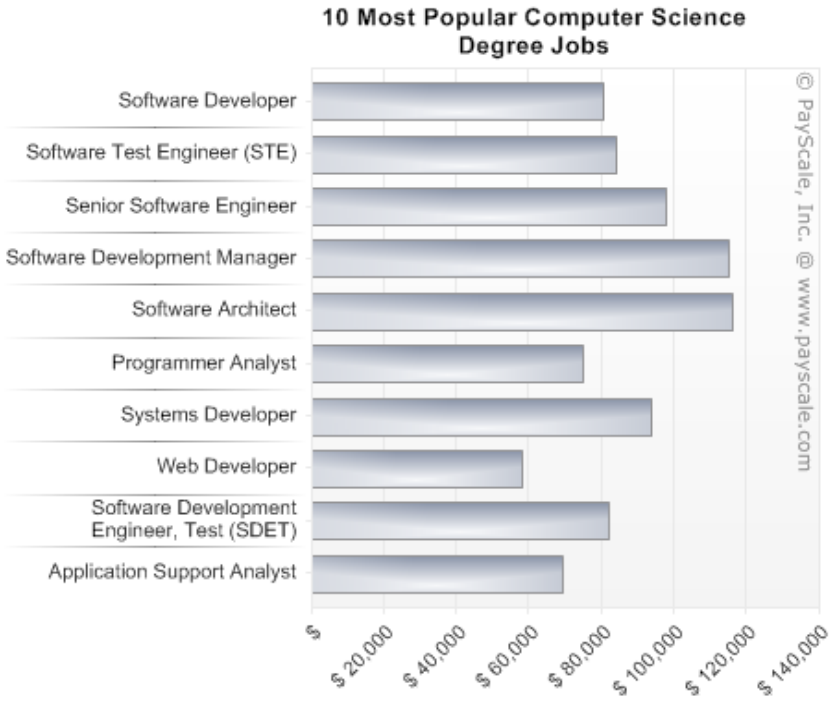


# Why get a Bachelors in IT

## Intangibles

- Job security
- Opportunities
  - Relocation
  - Promotion
- Salary and benefits

## Money



# Associate of Arts is a “way point”

- “Once you get a degree it is yours to keep”
- Generally transferable across the country

- Good value:
  http://www.clarkstate.edu/net_price_calculator
  http://www.ohio.edu/admissions/fees.cfm
- Save $22,308 by going two years at Clark before going to Ohio University

- (Of course, you know you would rather go to IU ☺ )

# Transfer Credits

As an aside, I use to be a university registrar…

- AAS does not carry the same wait when transferring as an AA degree.
- Clark State has some great articulation agreements with other Ohio universities.
- 7 year clock on credits.
- AA+AAS = Good

# Value of Graduate Technical Degrees

Another aside

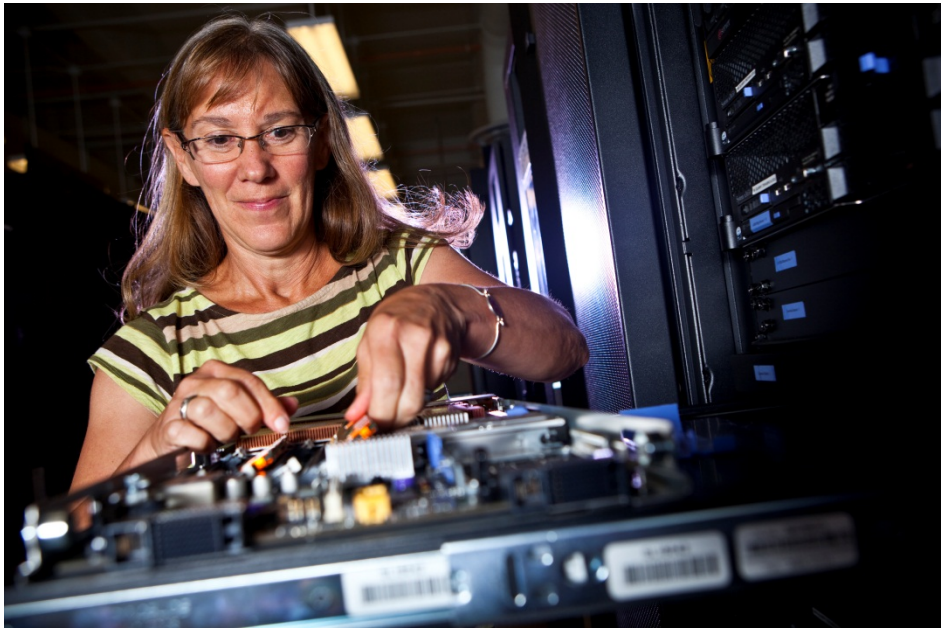
- Beyond BS, more education does not equal more money.
- Greater flexibility and employment options.
- Better employment stability.

# Who's Who

Jobs in science by education required

# Technical Support

- In the sciences this is often provided ad hoc.
- Institutions or departments may have “level 1” help desk support.
- Very heterogeneous computational environments



# Networking

- Certification plus AAS
- You don’t need to worry about what runs over the wires…
- In the sciences, between the laboratories and the world, networking is handled by the institution; within the lab, by an “embedded” IT person.

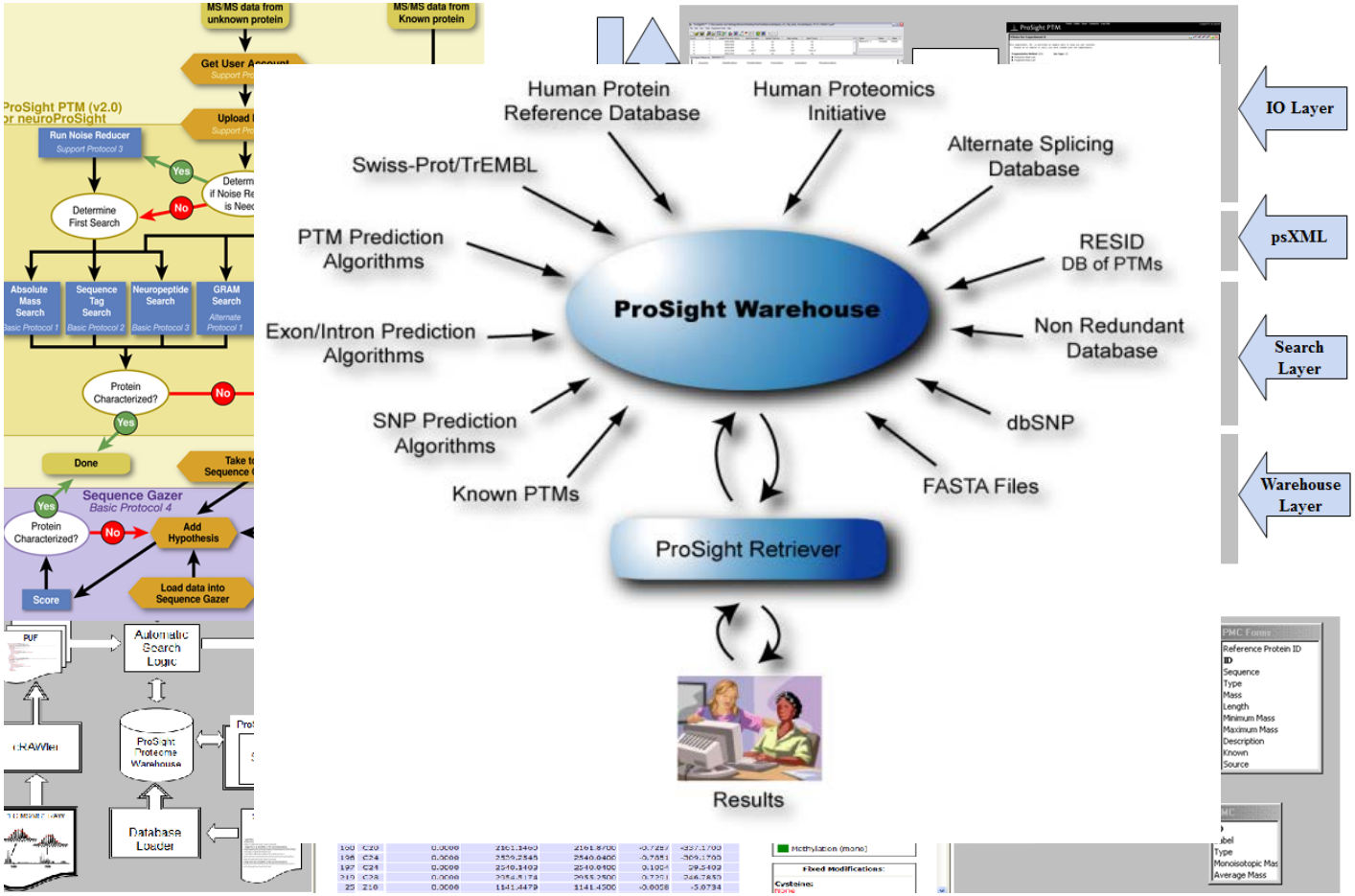
# Systems Administration

- They are the glue that holds academic science together.
- Usually requires a bachelors degree (in an academic lab).
- Broadly skilled and social

# Database Administrators

- Lots of databases in the sciences – but not that many DBAs.
- Again usually Bachelors degree plus certification.
- Frequently paired with programming.
- Well-paid by academic standards, low by industry standards.

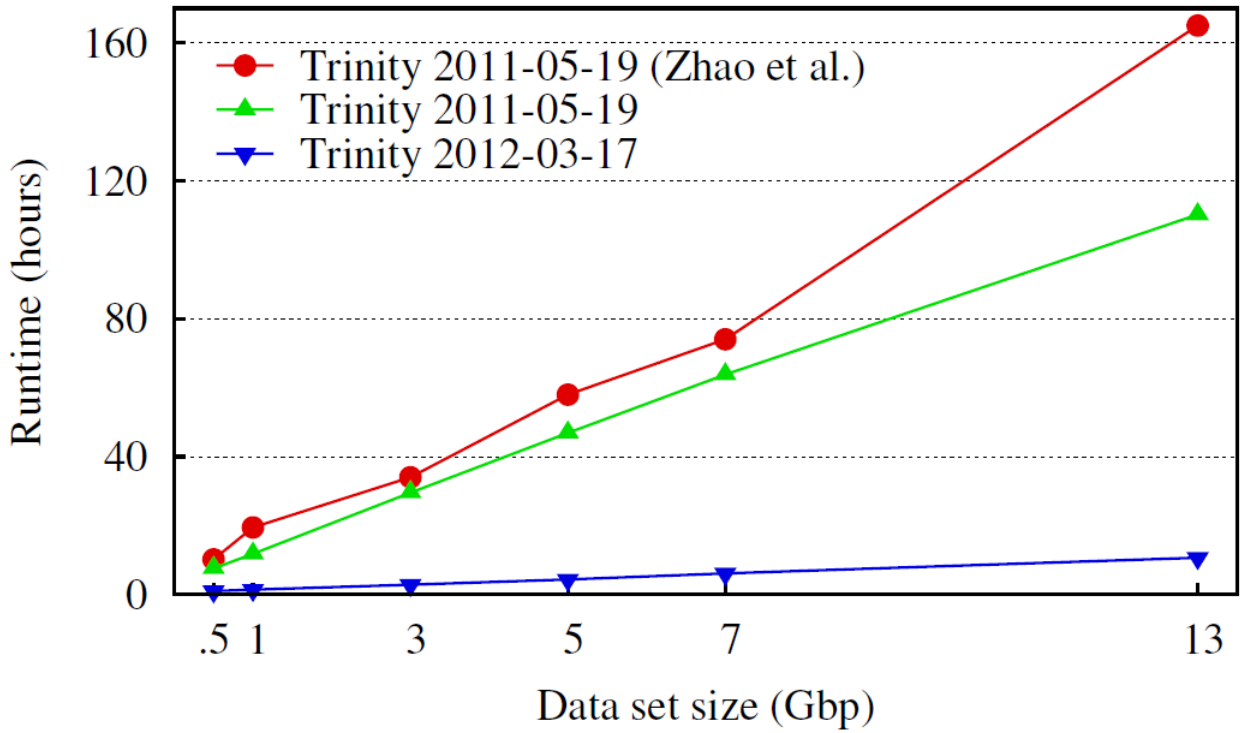
# Computer Programming



# Programmers and Analysts

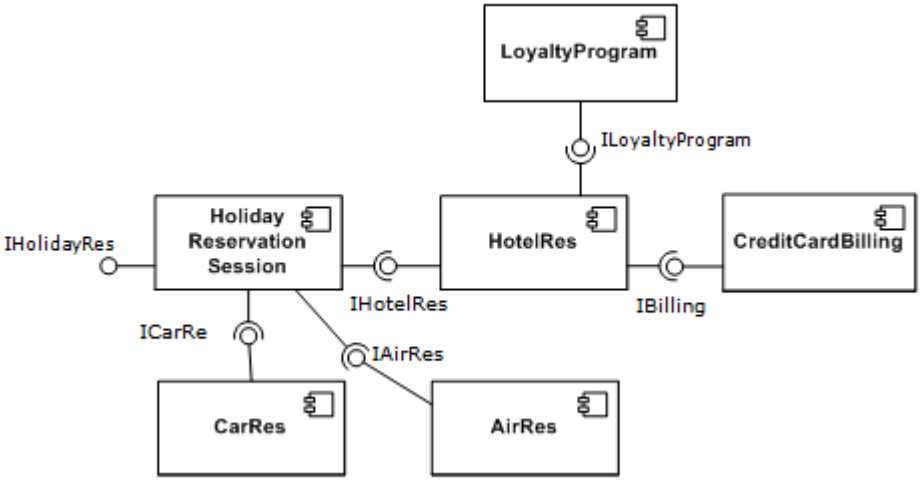
- Working on scientific computer programs almost always requires a Bachelors degree.
- A lot of scientific applications are written by non-professional programmers who hold advanced degrees in the applications domain.
- Salary is frequently not competitive with industry, but the perks can be good.

# Not all programming is equal



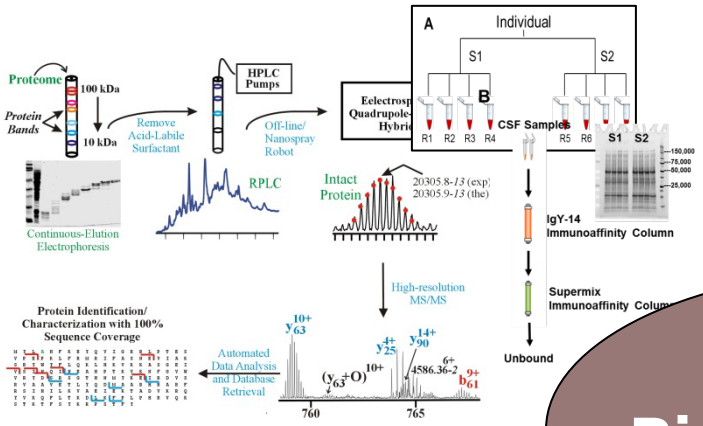
# Software Engineers

- Typically hold Bachelor of Science or Master of Science degrees specialized in "best practice" programming.
- Highly respected…
- Even the best software engineers need domain knowledge.

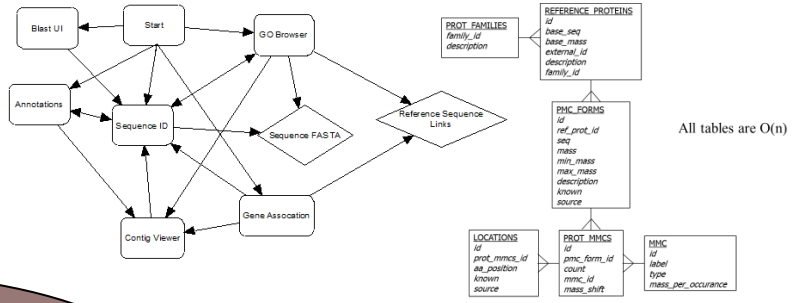


# Bioinformaticians

## Experimental Biology

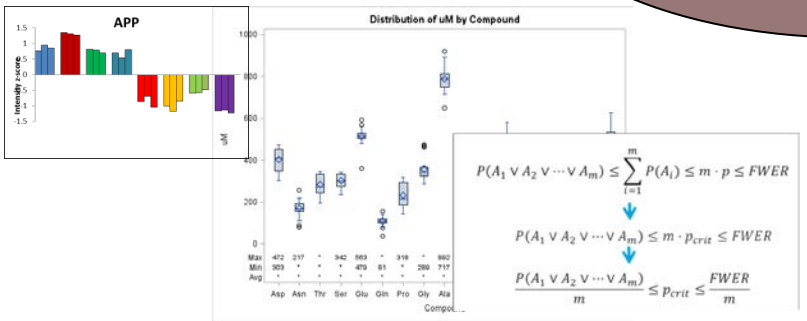



## Information Technology

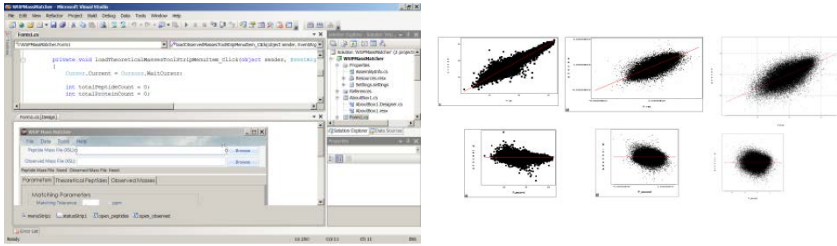



# Bioinformatics

## Statistics




## Computer Science



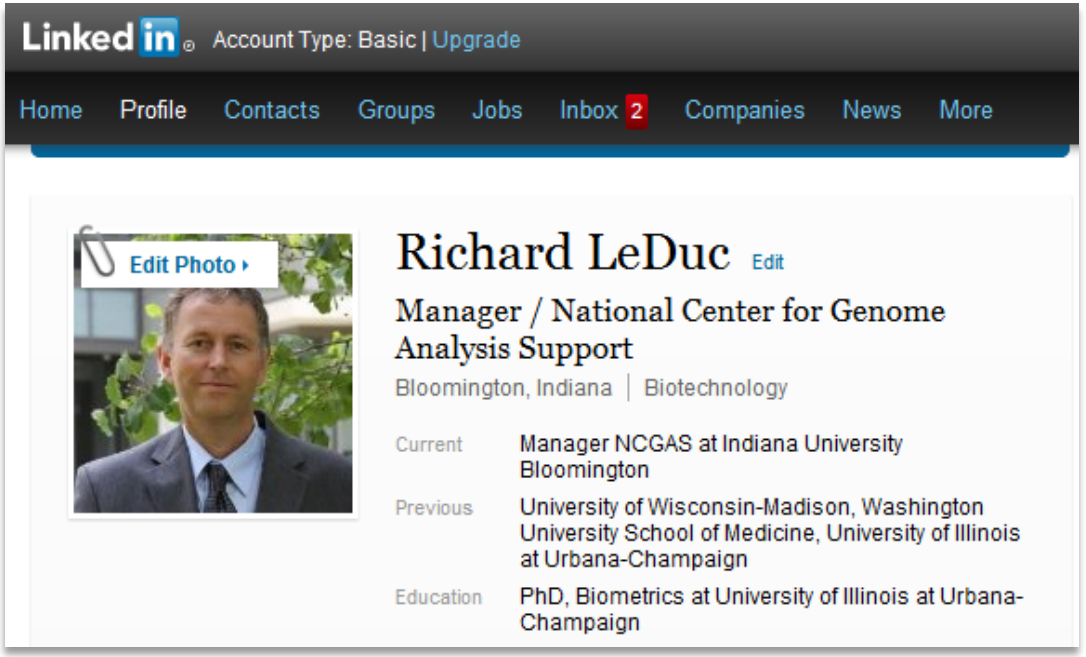
# Bioinformatics

- Typically done by PhDs or Master's level analysts.
- Starting to see more Bachelor-level analysts (CS-Biology double major is a winning combination)
- A lot of IT support is required *for* the bioinformatics people.

(This only made the list because it is my field)

# Use Linkedin for professional growth

- It's free
- Join relevant groups
- But don't embarrass yourself



# What I want you to remember

1. Finish your degrees.
   (two half degrees do not equal
   one whole degree)
2. Once you finish your associates – start thinking about your Bachelors degree. (Beyond that maybe, maybe not)
3. There is a lot of flexibility in careers and education – particularly in the sciences.

# Thank You

Questions?

Bill Barnett (barnettw@iu.edu)

Rich LeDuc (rleduc@iu.edu)

Le-Shin Wu (lewu@iu.edu)

NATIONAL CENTER FOR GENOME ANALYSIS SUPPORT

INDIANA UNIVERSITY

# Questions

```
% phd.m
%
% author: Cecilia
% date: 09/08/05

load THESIS_TOPIC

while (funding==true)
    data = run_experiment(THESIS_TOPIC);
    GOOD_ENOUGH = query(advisor);
    if (data > GOOD_ENOUGH)
        graduate();
        break
    else
        THESIS_TOPIC = new();
        years_in_gradschool += 1;
    end
end
```

# Acknowledgements & disclaimer


- This material is based upon work supported by the National Science Foundation under Grants No. ABI-1062432
- This work was supported in part by the Lilly Endowment, Inc. and the Indiana University Pervasive Technology Institute
- Any opinions presented here are those of the presenter(s) and do not necessarily represent the opinions of the National Science Foundation or any other funding agencies

# License terms

- Please cite as: LeDuc, R.D., Clark State Community College, 9/27/2012. Available from: [URL]
- Items indicated with a © are under copyright and used here with permission. Such items may not be reused without permission from the holder of copyright except where license terms noted on a slide permit reuse.
- Except where otherwise noted, contents of this presentation are copyright 2011 by the Trustees of Indiana University.
- This document is released under the Creative Commons Attribution 3.0 Unported license (http://creativecommons.org/licenses/by/3.0/). This license includes the following terms: You are free to share – to copy, distribute and transmit the work and to remix – to adapt the work under the following conditions: attribution – you must attribute the work in the manner specified by the author or licensor (but not in any way that suggests that they endorse you or your use of the work). For any reuse or distribution, you must make clear to others the license terms of this work.