Surviving Life as a Researcher

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Who am I, and what do I do?

Aggregate Programming
Field Calculus, Spatial Computing

Synthetic Biology Analytics & Design
Calibrated Flow Cytometry

Spatial Patterning

Resilient Networking

Precision Organism Engineering  High-Performance Devices

Beal et al., Computer, 2015,
Beal & Bachrach, IEEE Int.Sys. 2006,
Beal & Bachrach, SCW, 2008

Kiani et al., Nat. Meth., 2014,
Beal et al., ACS Syn.Bio., 2012,
Beal et al., ACS Syn.Bio., 2014
Why are we here today?

If I were a sensible man, I’d be home with my family.

Researchers, artists, entrepreneurs → driven people

What knowledge can help us survive and thrive?
The research ecosystem is complex

The view from graduate school
The research ecosystem is complex

Reality is much more complicated
The Renaissance Man is Dead

Scientific mythology and ideals are still largely grounded in the era of “gentlemen scientists”

Our world is much faster, more complex, interconnected
There are many niches for researchers:

- Mathematician
- Scholar
- Administrator
- Educator
- Hacker
- Visionary
- Iconoclast
- Integrator
Hamming: “You and Your Research”

Why do some do great work, while others just as smart fail to?

Think great thoughts
Work hard on important problems
Look for generalization
Work with your door open
It’s OK to appear to conform
Learn to communicate

http://www.cs.virginia.edu/~robins/YouAndYourResearch.html
My most important recent project

iGEM interlab study: organized 130 teams around the world to study a fundamental measurement problem in synthetic biology

- Massive community effort
- Critical results on a pressing problem
- Nobody funded it.
- Rejected by high impact → published in PLOS ONE
- Still making a big impact (we think)
Your focus is likely to shift over time

“No matter what, we’ll never be doing the same work 10 years from now. Either we will have succeeded and moved on, or else we will have failed and need to go try something different.”

— Joe Loyall

My own history of technical ambition:
• 1995: Video game programming
• 2002: Human-level AI
• 2009: Spatial computing
• 2016: Synthetic biology, aggregate programming
A Three-Way Pivot

At different times, different aspects dominate
Latour’s Cycle of Credit

Position

Ensuring your work is visible to others

Planning work that may be important

Publications

Explaining your work’s significance

Data

Funding

Doing good work

What grad school usually focuses on
Latour’s Cycle of Credit

Planning work that may be important

Explaining your work’s significance
Heilmeier's Catechism

• 1. What is the problem, why is it hard?
• 2. How is it solved today?
• 3. What is the new technical idea; why can we succeed now?
• 4. What is the impact if successful?
• 5. How will the program be organized?
• 6. How will intermediate results be generated?
• 7. How will you measure progress?
• 8. What will it cost?
Latour’s Cycle of Credit

- Position
- Funding
- Data
- Publications

Ensuring your work is visible to others
Being visible in the community

- Organize events
- Review papers
- Give talks
- Help teach
- Serve on panels
- Write a blog
- Maintain your webpage

I budget 4 hours / week for service & visibility
Latour’s Cycle of Credit

Position

Publications

Survival as a human being

Data

Funding
Imposter Syndrome

Before nearly every conference I go to, before nearly every talk I give, I have a horrible moment of doubt, wondering why I am here.

Remember:

– Everybody shows the face they want the world to see.
– Selection bias greatly distorts your view of the world.
– You and your work’s value is not relative.
– Become comfortable working with areas of ignorance.

Even just knowing about it can help a lot.
Find support for yourself

One of my favorite resources
Keep an eye on your life

• It’s never a good time for life.
• Do it anyway.
• Compromise, triage.
• Drop different balls.
• Keep track of your time:
  – Make time for focused work.
  – Do scut work in broken time.
  – Walk away from burnout.