

Surviving Life as a Researcher

Jacob Beal

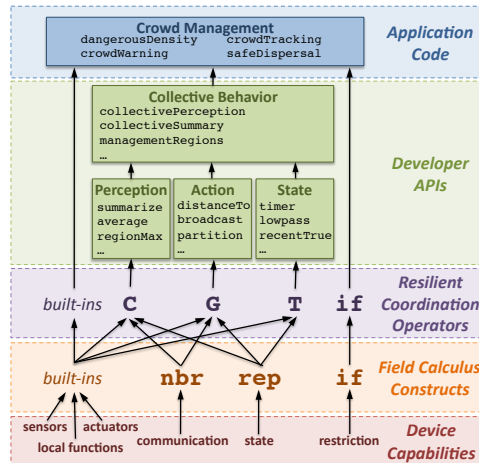
FAS* Doctoral Symposium
Augsburg, Germany
September, 2016

Raytheon
BBN Technologies

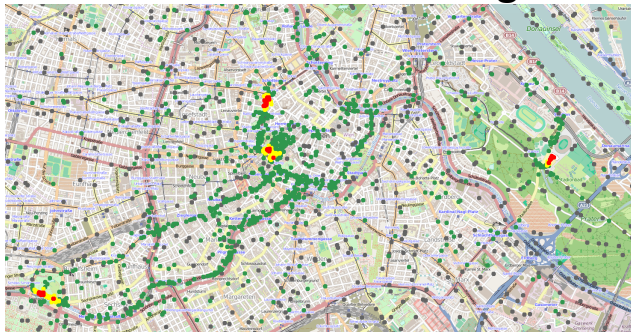
Who am I, and what do I do?

Aggregate Programming

Field Calculus, Spatial Computing



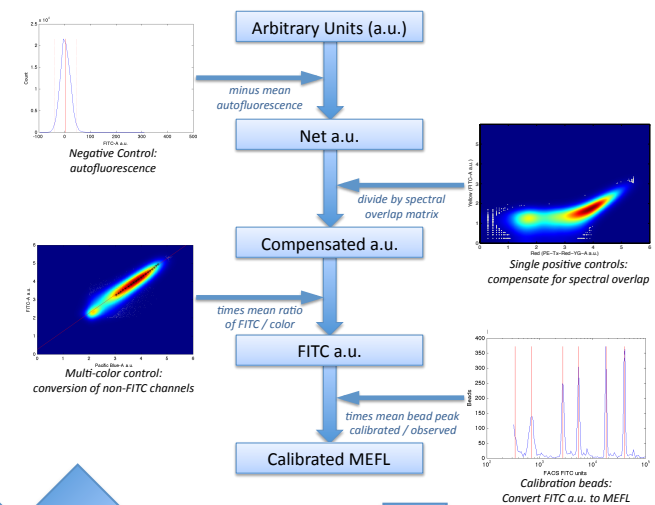
Resilient Networking



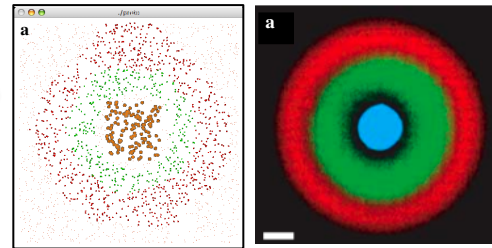
Beal et al., Computer, 2015,
Beal & Bachrach, IEEE Int.Sys. 2006,
Beal & Bachrach, SCW, 2008

Synthetic Biology Analytics & Design

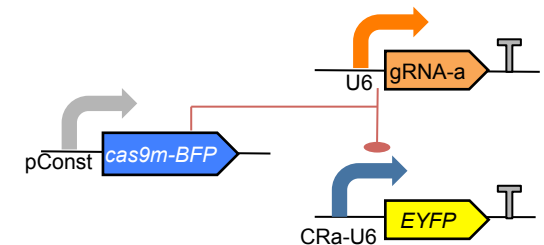
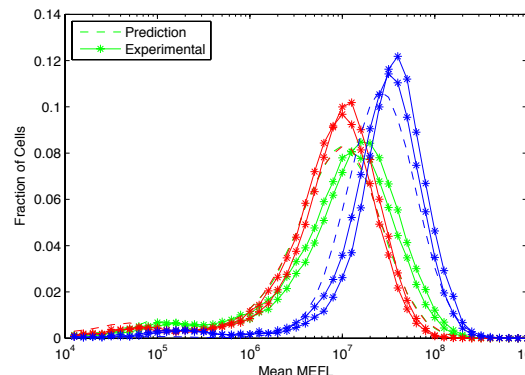
Calibrated Flow Cytometry



Spatial Patterning



Precision Organism Engineering High-Performance Devices



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



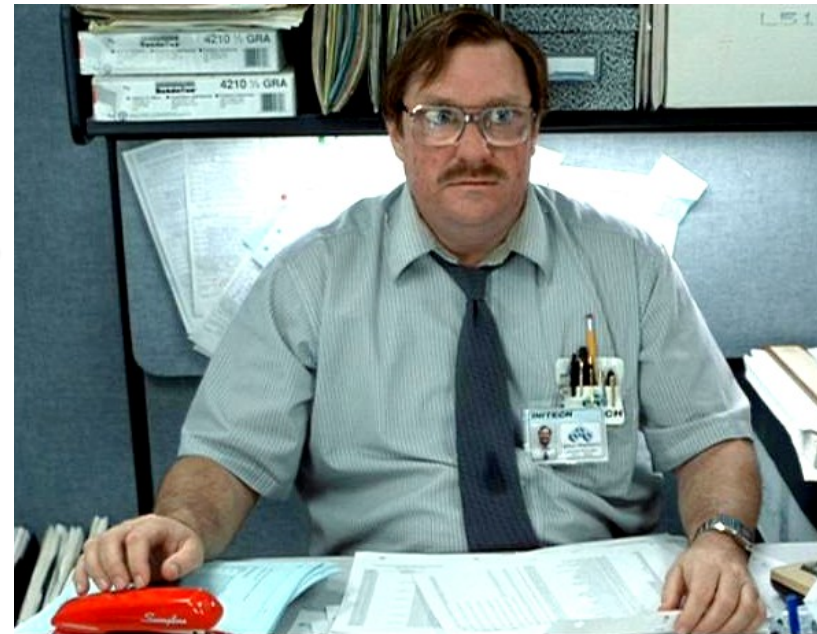
Researchers, artists, entrepreneurs → driven people

What knowledge can help us survive and thrive?

The research ecosystem is complex

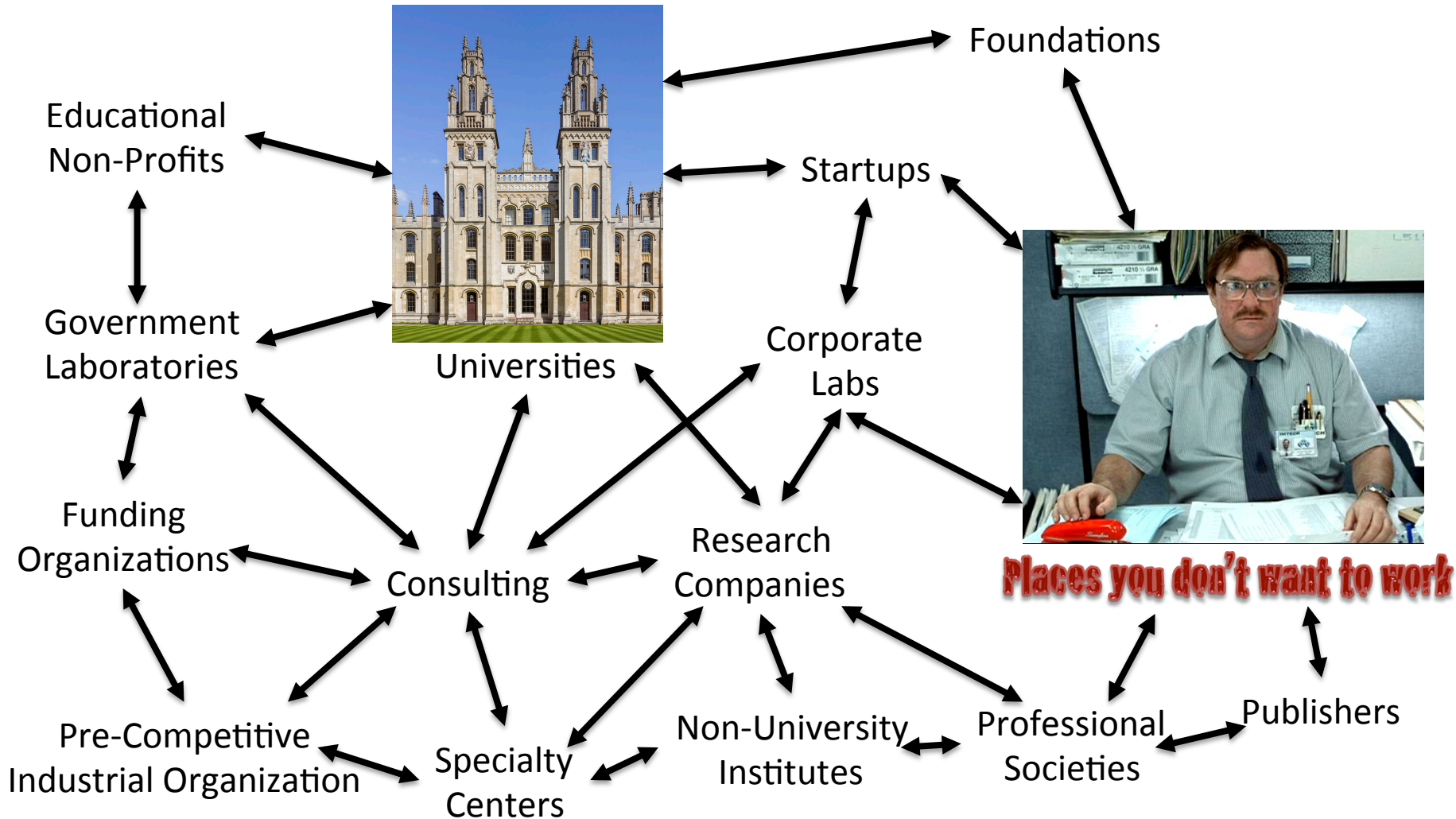


Industry



The view from graduate school

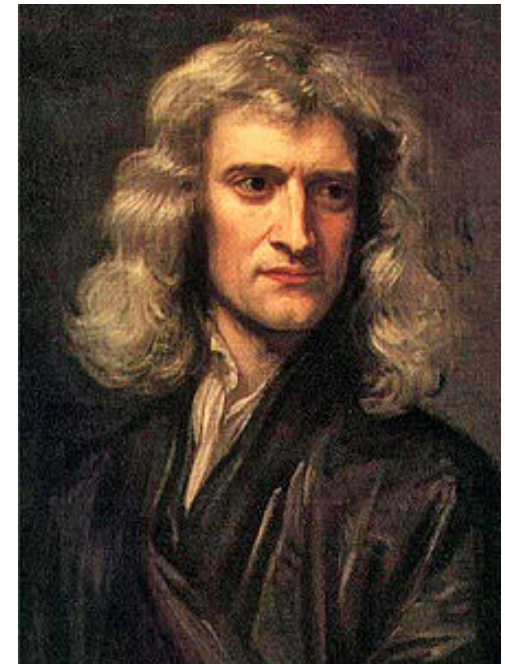
The research ecosystem is complex



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



Administrator



Scholar



Educator



Hacker



Visionary



Iconoclast



Integrator

Hamming: “You and Your Research”

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

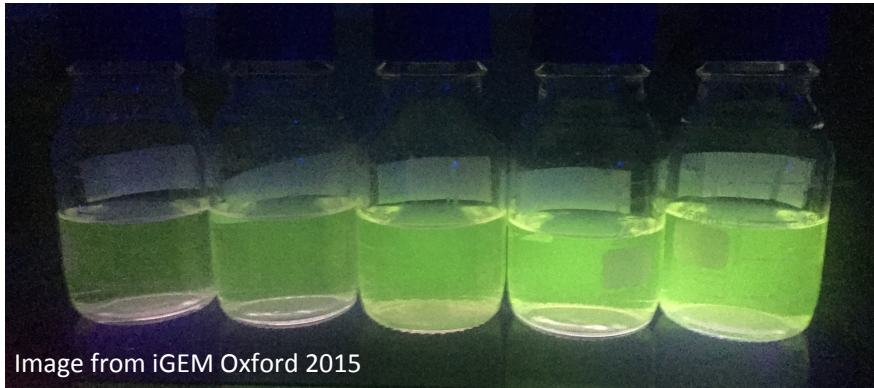


Think great thoughts
Work hard on important problems
Look for generalization
Work with your door open
It's OK to appear to conform
Learn to communicate

<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



The diagram illustrates a 'Three-Way Pivot' model. It consists of three purple, horizontally-oriented ovals arranged in a triangle. The top oval is labeled 'Vision'. The bottom-left oval is labeled 'Skills'. The bottom-right oval is labeled 'Application'. The ovals are connected by thin lines, forming a triangular structure.

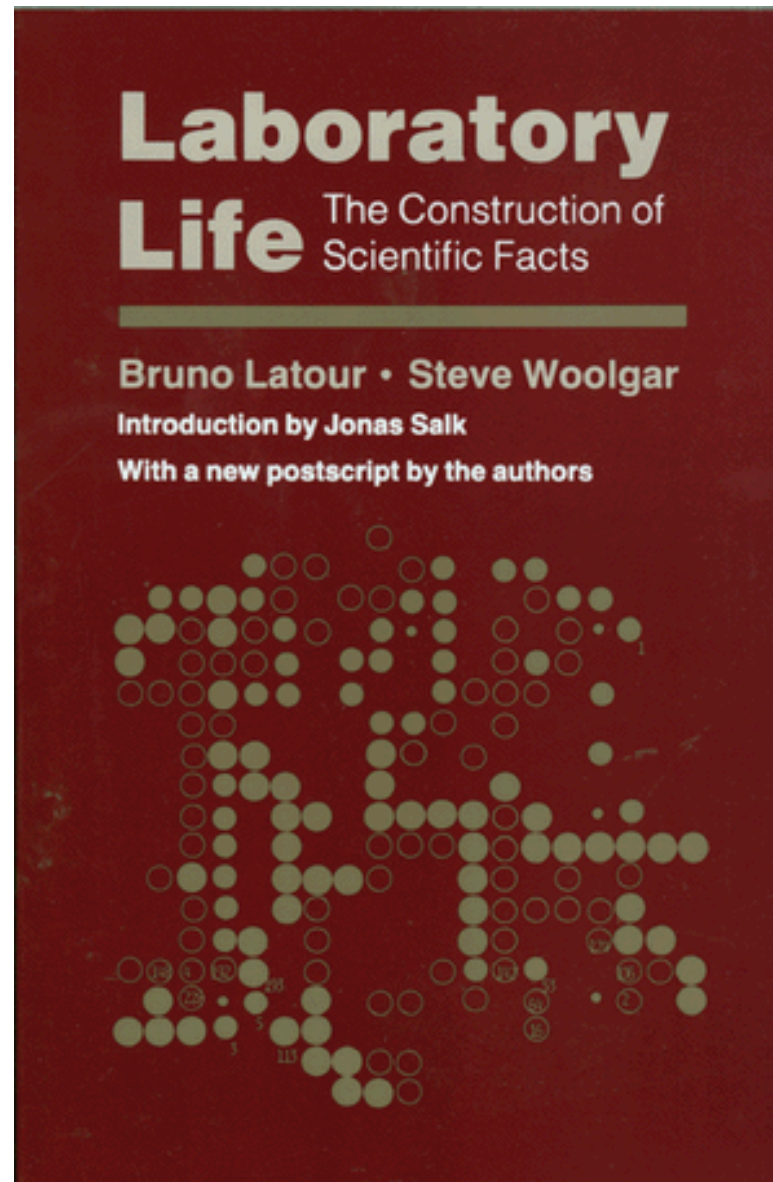
Vision

Skills

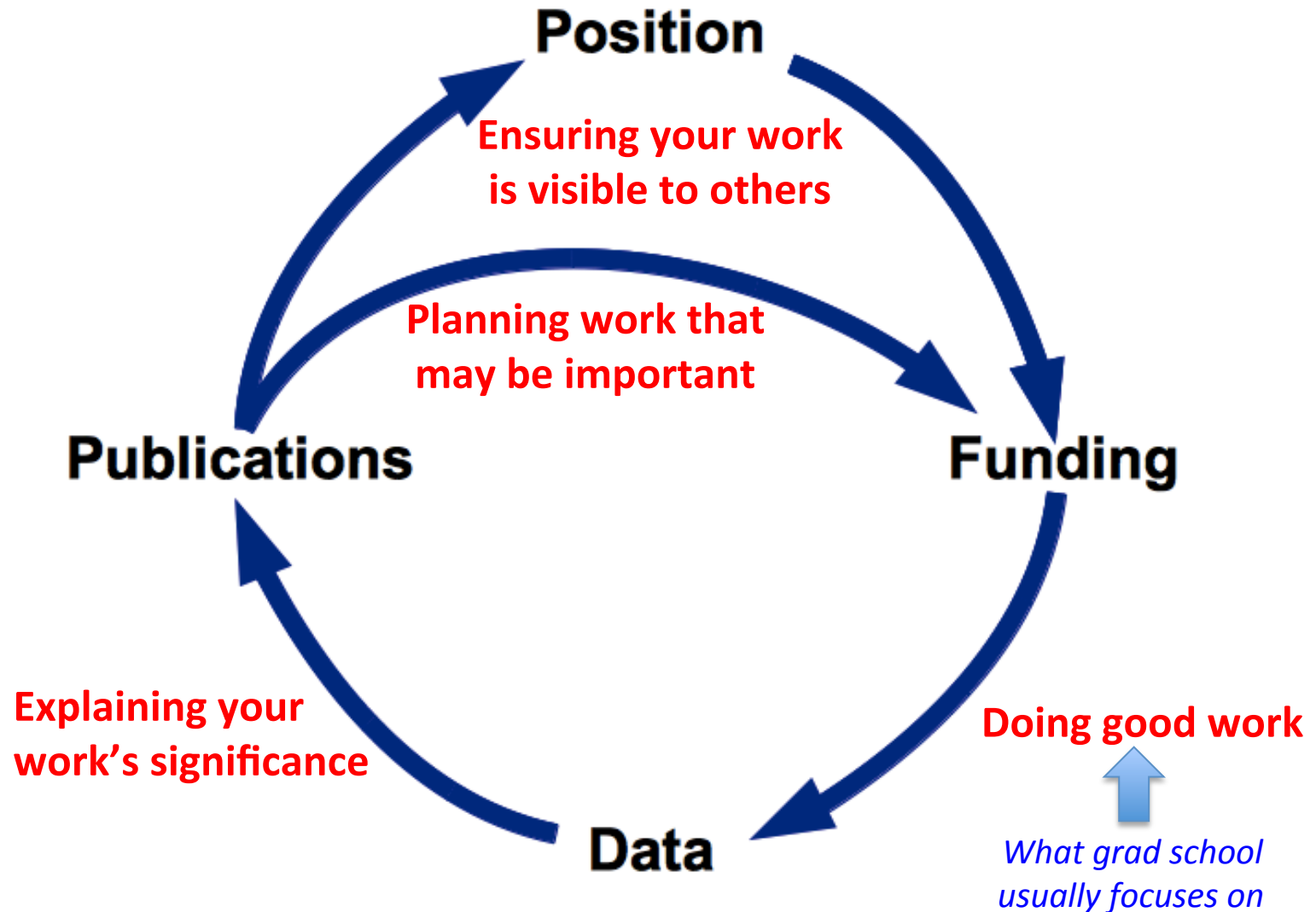
Application

At different times, different aspects dominate

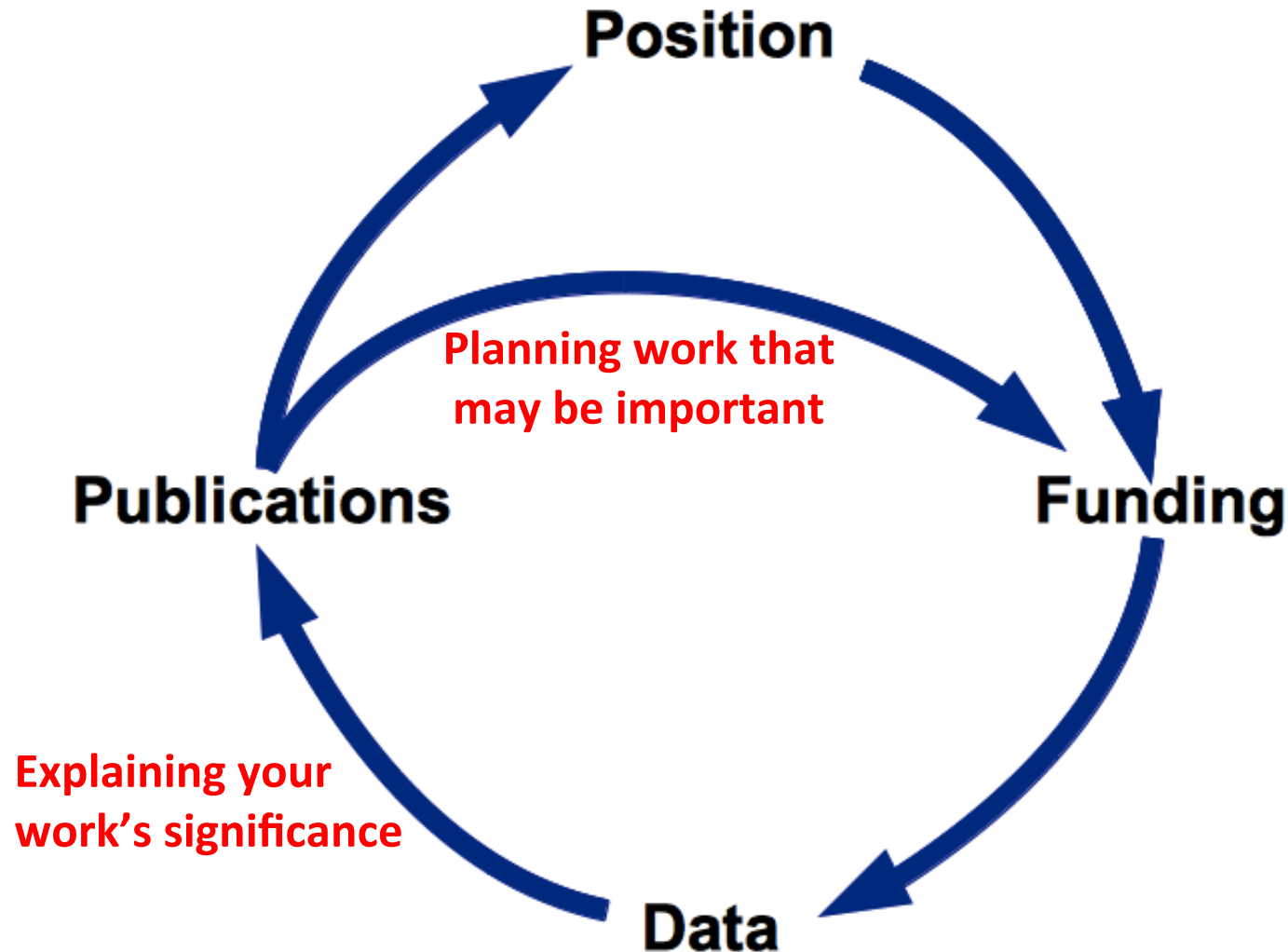
Bruno Latour: Anthropology of Science



Latour's Cycle of Credit



Latour's Cycle of Credit

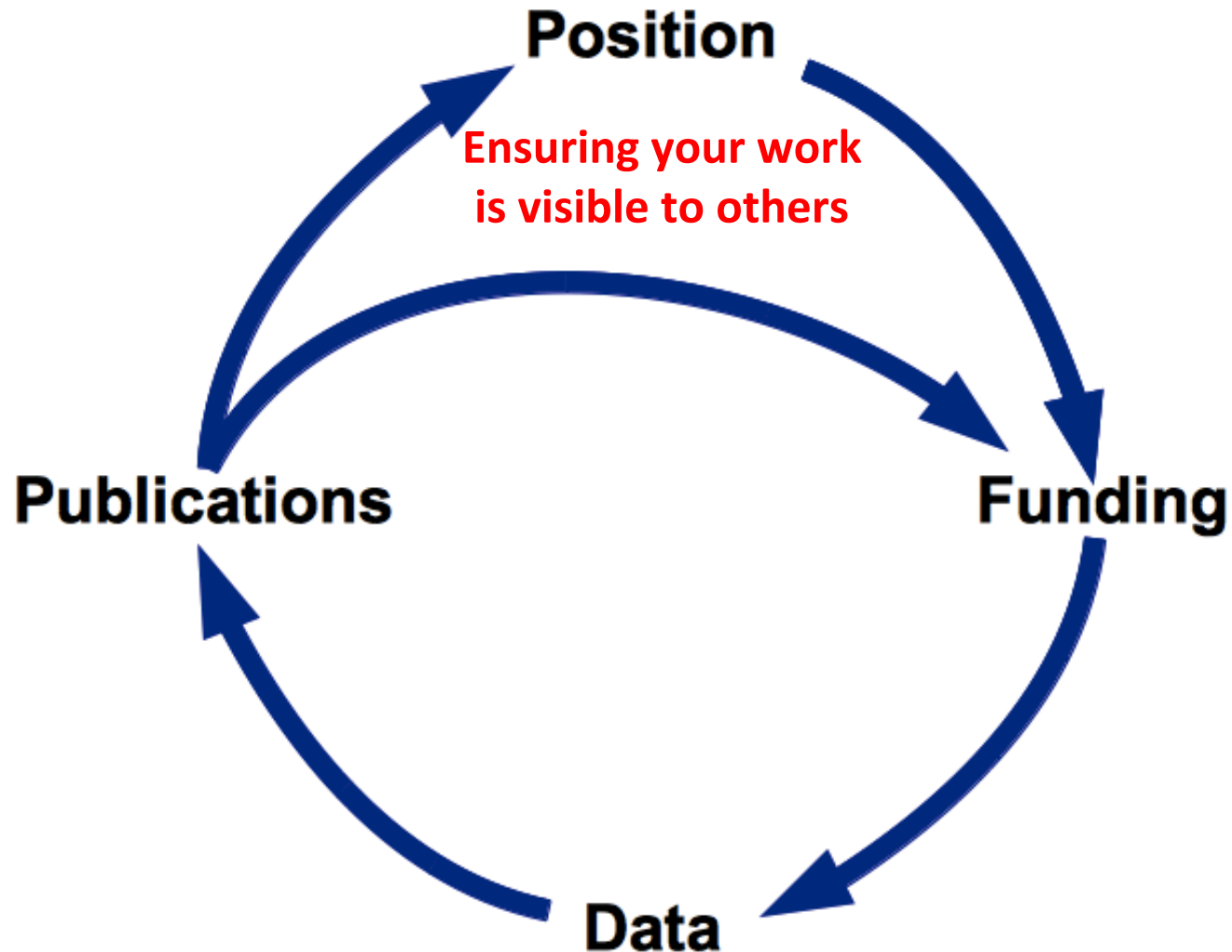


Heilmeier's Catechism

- 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?



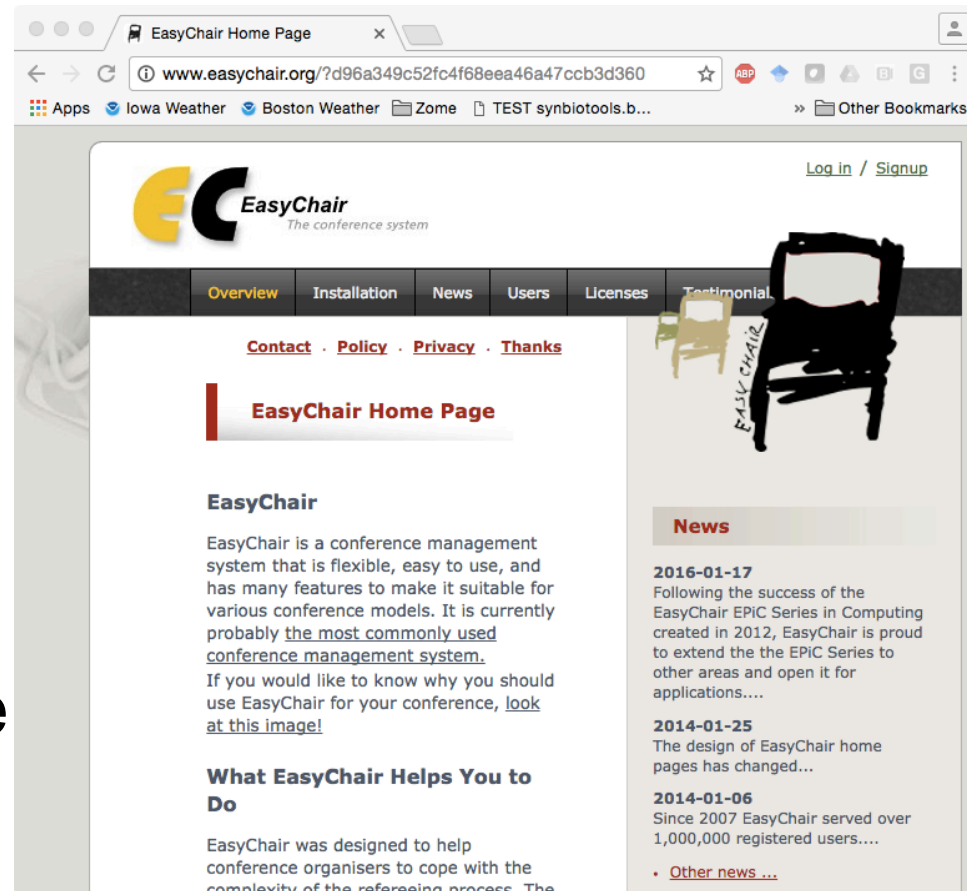
Latour's Cycle of Credit



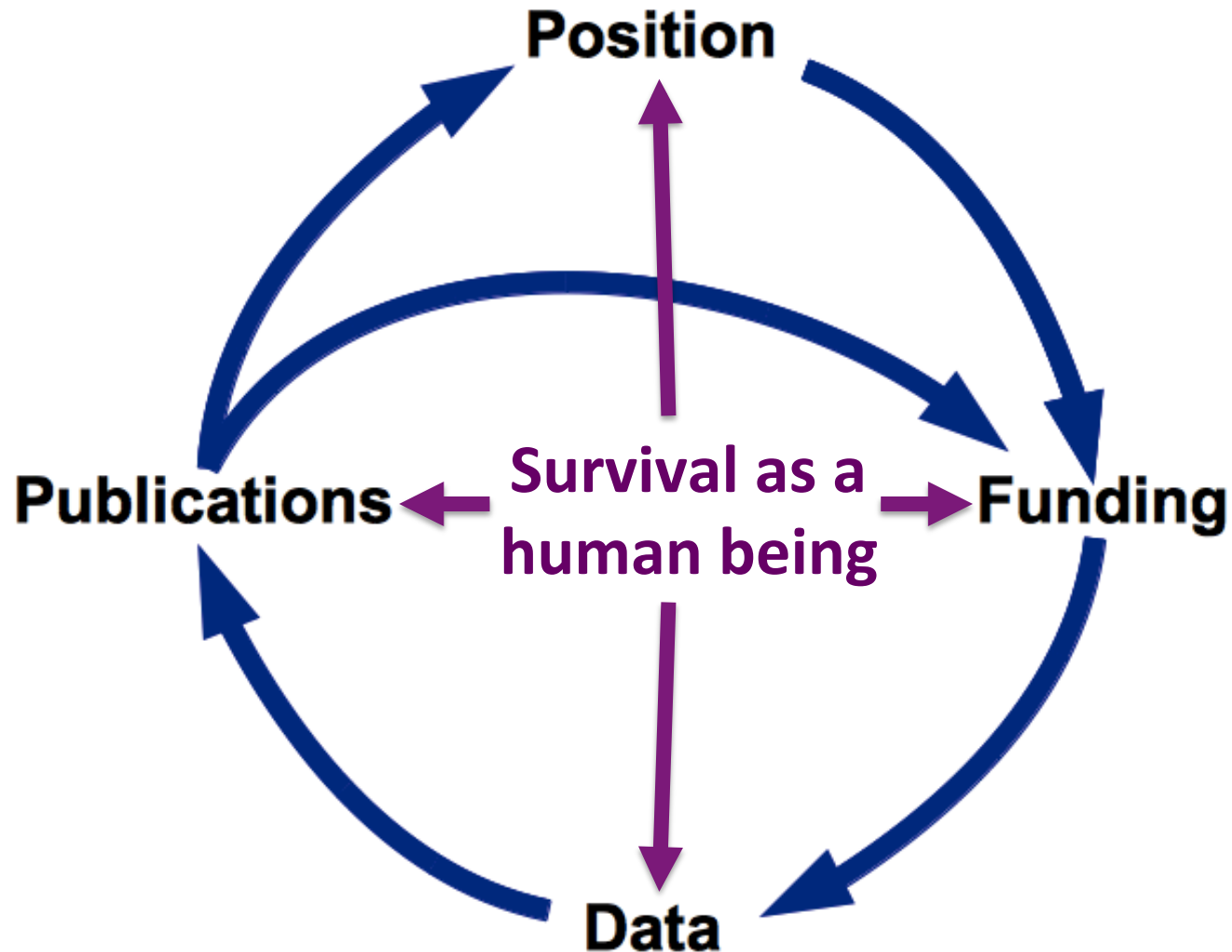
Being visible in the community

- 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



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

The screenshot shows the Academia Stack Exchange website. At the top, the browser address bar displays 'academia.stackexchange.com'. Below the browser, a navigation bar includes links for 'StackExchange', 'sign up', 'log in', 'tour', and 'help', along with a 'Search Q&A' box. The main header features the 'ACADEMIA' logo, a row of navigation links ('QUESTIONS', 'TAGS', 'USERS', 'BADGES', 'UNANSWERED', 'ASK QUESTION'), and a colorful illustration of various academic buildings. The central content area is divided into two main sections. On the left, a text block describes the site as a question and answer platform for academics, with a 'Sign up' button. On the right, a section titled 'Here's how it works:' illustrates the process with three icons: a question mark in a speech bubble, a speech bubble with an 'A' (answer), and a speech bubble with an 'A' and a checkmark. Below this, a 'Explore Our Questions' section shows filters for 'active', 'hot', 'week', and 'month', and a list of tags including 'publications', 'phd', 'graduate-admissions', 'research', 'graduate-school', 'citations', 'thesis', 'masters', 'journals', and 'mathematics'. A specific question is visible: 'Is it possible to publish research paper independently?'. On the far right, a box titled 'Retraction Watch' features a magnifying glass icon and the text 'Tracking retractions as a window'.

academia.stackexchange.com

StackExchange sign up log in tour help Search Q&A

ACADEMIA QUESTIONS TAGS USERS BADGES UNANSWERED ASK QUESTION

Academia Stack Exchange is a question and answer site for academics and those enrolled in higher education. Join them; it only takes a minute:

Sign up

Here's how it works:

Anybody can ask a question

Anybody can answer

The best answers are voted up and rise to the top

Explore Our Questions active hot week month

publications phd graduate-admissions research graduate-school citations thesis masters journals mathematics more tags

0 0 9 Is it possible to publish research paper independently?

Retraction Watch Tracking retractions as a window

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.

