This Workshop

—

By Nick Del Grosso

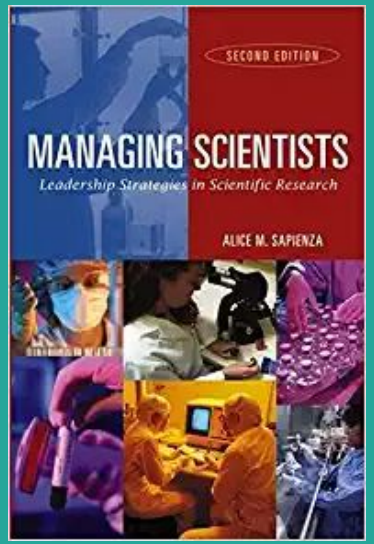
Why Did You Decide to Do a PhD?

“I Decided to do a PhD because I…”

What Gives You Motivation at Work?

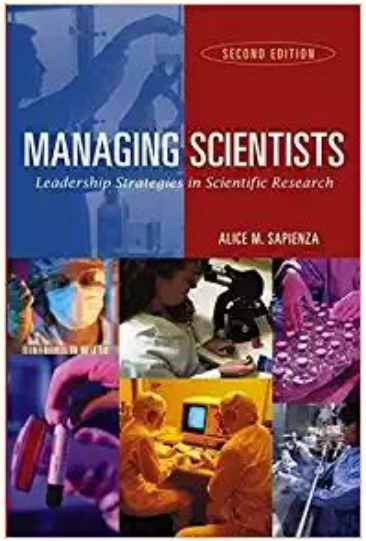
“I am motivated when...:”

“Being Motivated Implies that you love your job, literally.”



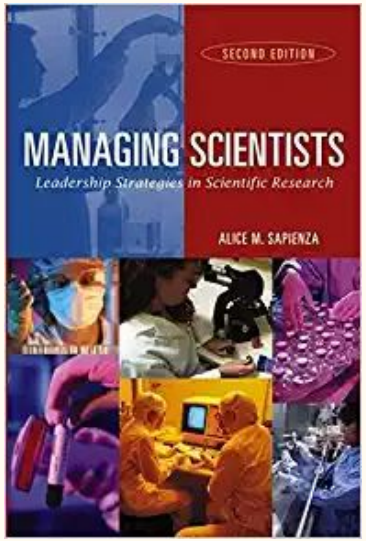
Motivated Groups Have:

- **Reasonable Working Conditions**
  - Ensured laboratory safety
  - Adequate space
  - Available required equipment
- **Competent People Trained Appropriately for their Job**
- **Assurance of the Link Between Effort and Outcomes**
  - Must believe that their effort will lead to desired job performance
  - Must believe this performance wil lead to certain outcomes
  - Mut value those outcomes
- **Equity and Fairness**
  - Treated and Paid Fairly, as compared with similar organizations
- **Appropriate Challenge**
  - Should not be asked to perform the impossible
  - Should be encouraged to go beyond what they initially see as their limits



David McClelland's 3 Work-Related Needs

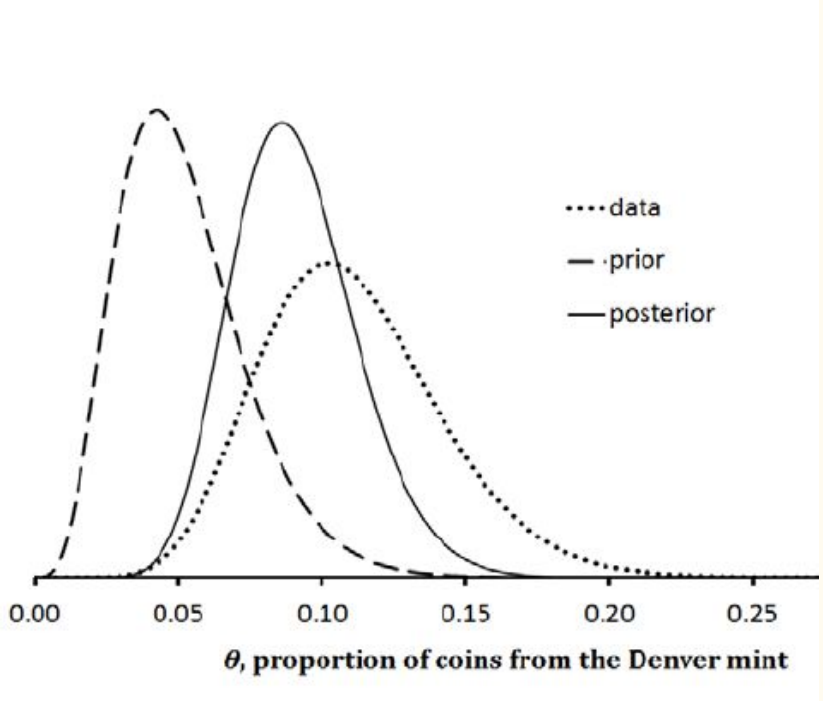
- **Power**: A Desire to Have an Impact on People
  - titles, activity to influence or inspire, concern with organizational action or success, career position and prestige, strategy
- **Achievement**: A Concern for Doing Things Better
  - Numbers, Means-end Statements, winning, doing as well or better than another, concern with how well a task is being performed
- **Affiliation**: A Concern for Establishing Positive Affective Relationships
  - Friends, emotions about relationship, helping, positive response from another



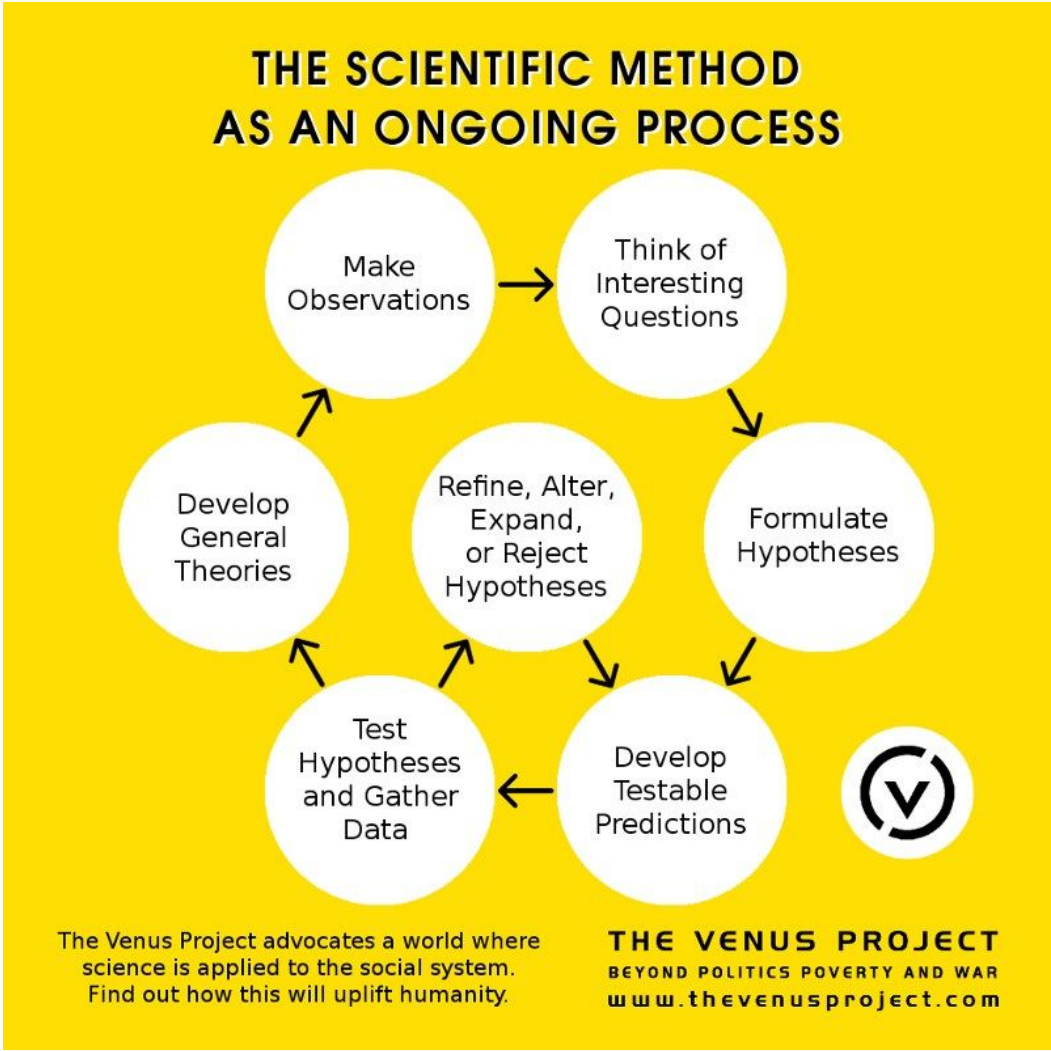
I’d like to discuss Bayes’ Rule today…

$$P(A \mid B) = \frac{P(B \mid A)\ P(A)}{P(B)}$$

Bayes' Rule can be applied iteratively to gain knowledge.

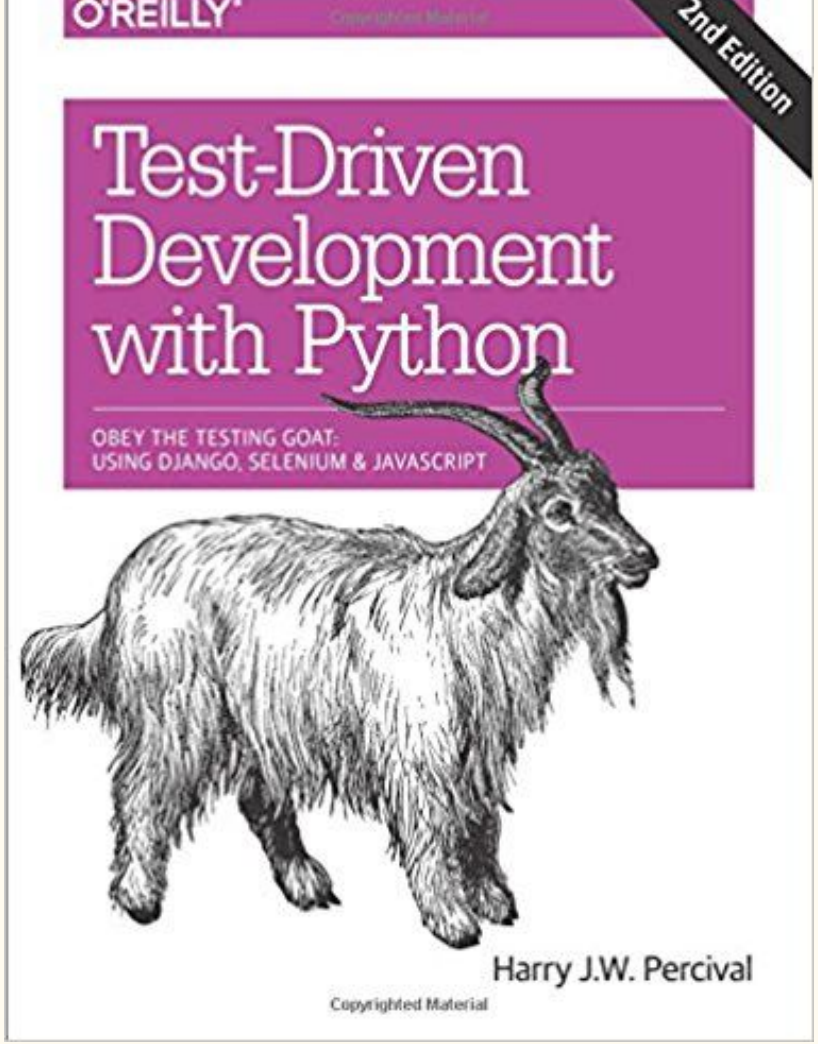


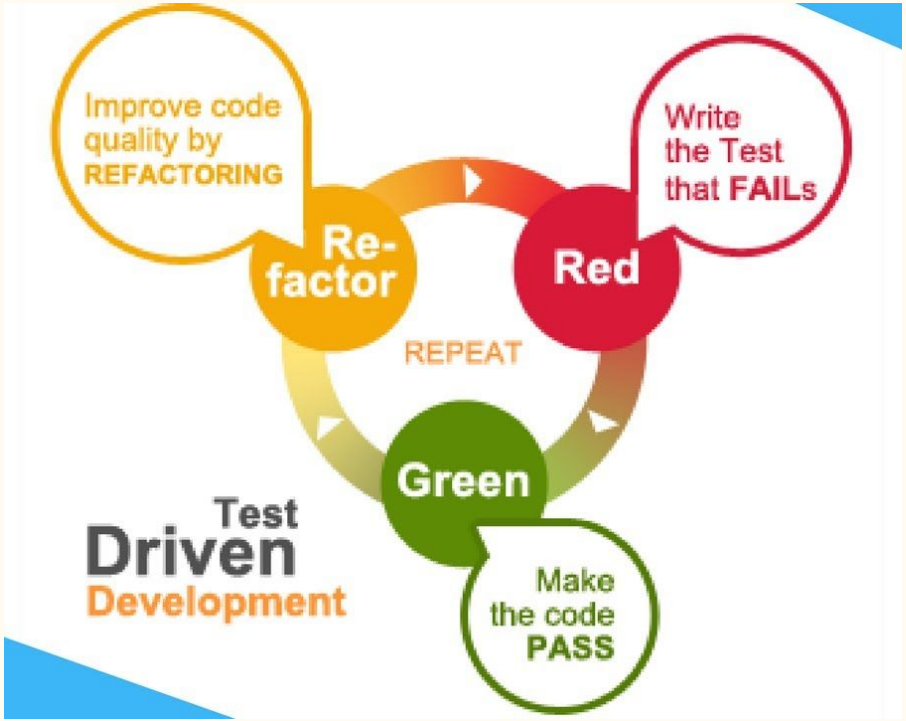
(Mossman et al, 2014)



...But will people use actually Bayes' if I teach it here?
(low impact motivation)

And that reminded me of something I ***do*** use, all the time...





"Tech Primers: What is TDD?" https://i.ytimg.com/vi/T38L7A0xP-c/maxresdefault.jpg

and that reminded me of something...

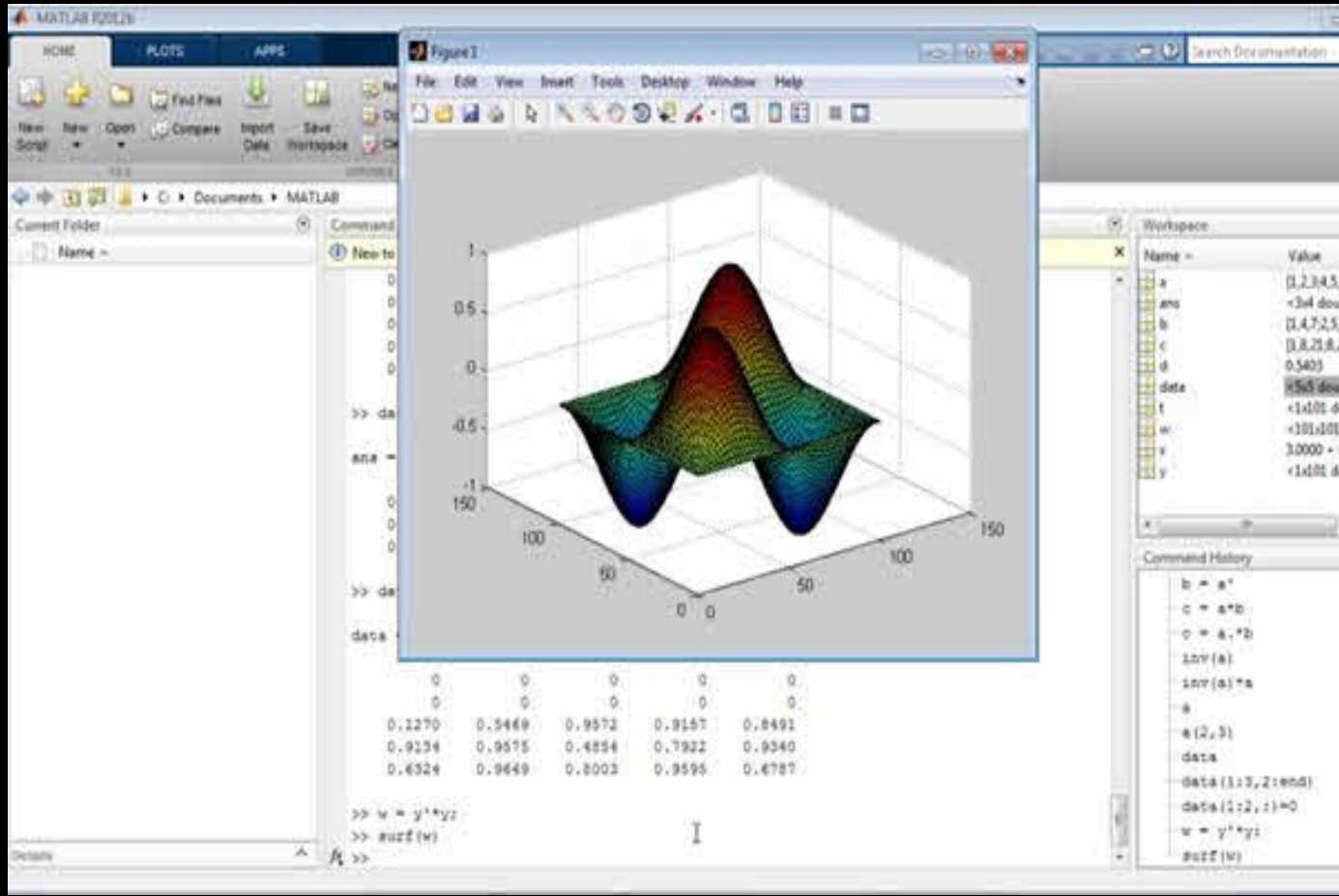
My Sensorimotor Integration Research:

Trying and Trying to Close the Loop.

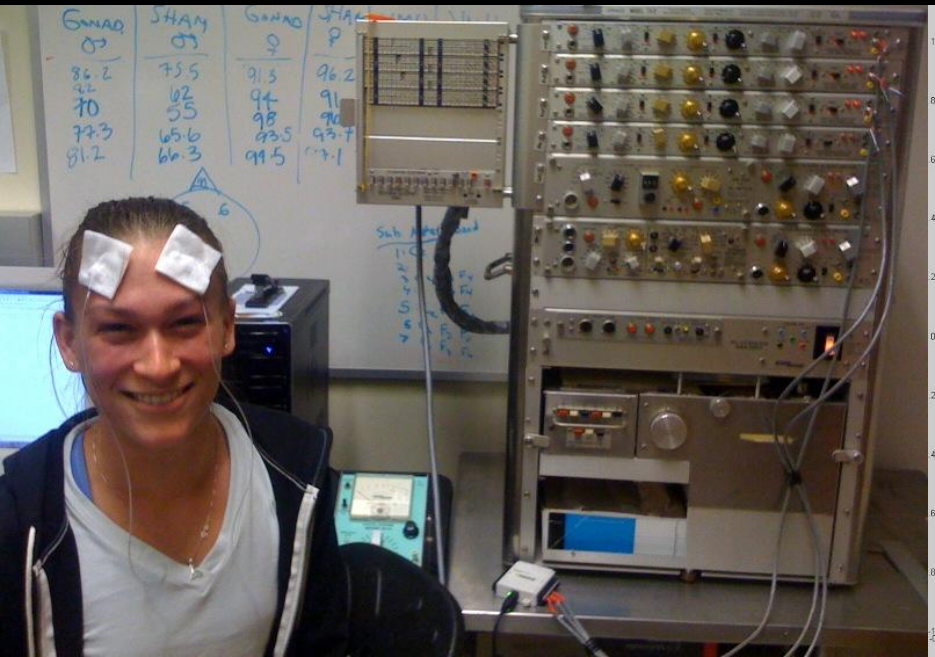
Early Inspirations

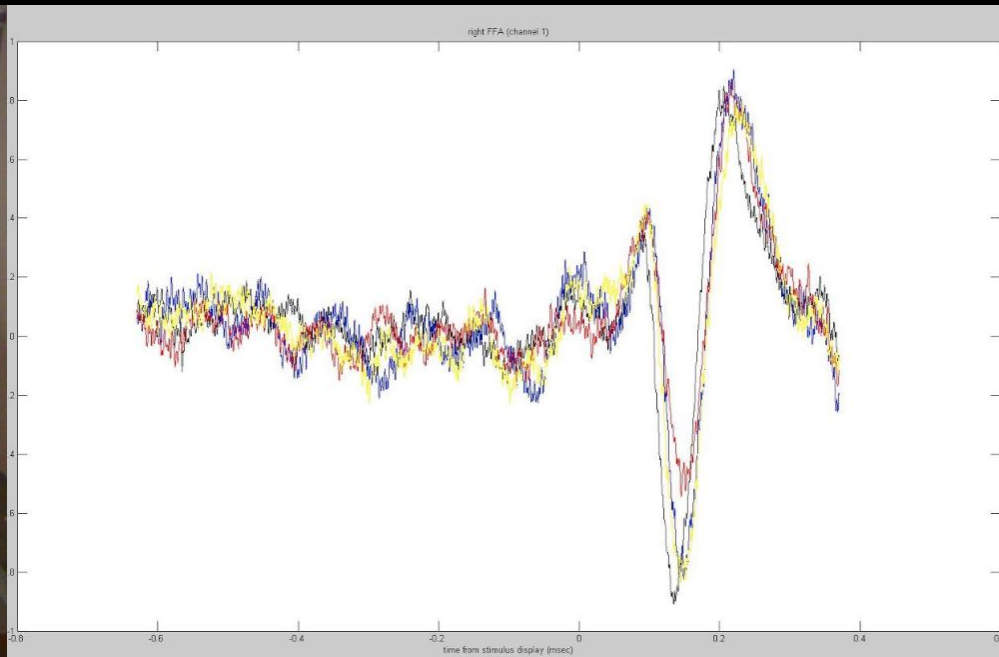
“Teenager moves video icons
just by imagination.”

-Leuthard and Blakely, 2006

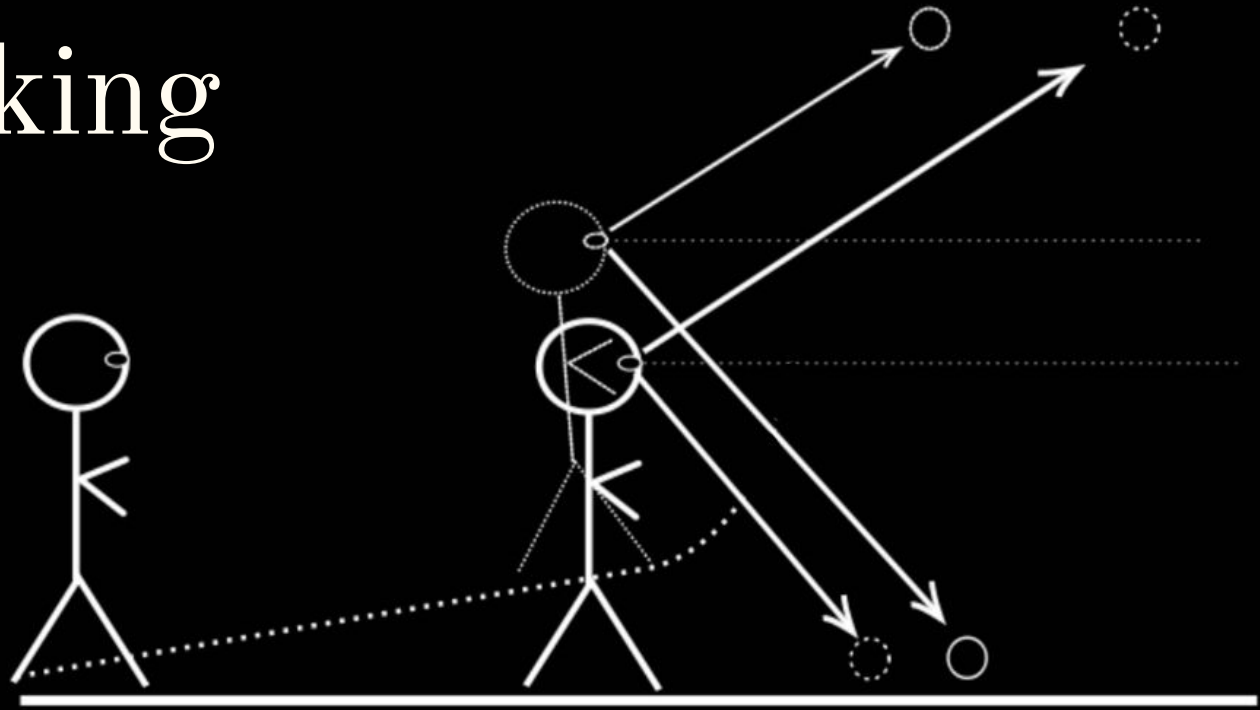

HOME
PLOTS
APPS
Figure 1
File Edit View Insert Tools Desktop Window Help
Documents ▸ MATLAB
Current Folder
Name ~
Workspace
Name ~
Value
Command History
>> w = y'*y;
>> surf(w)
>>
0 0 0 0 0
0 0 0 0 0
0.1270 0.5469 0.9572 0.8157 0.8491
0.9134 0.9575 0.4854 0.7922 0.9340
0.6324 0.9649 0.8003 0.9595 0.6787

My Bachelor Work: “DIY ERPs: Designing inexpensive EEG systems for performing auditory and visual cognitive studies.”

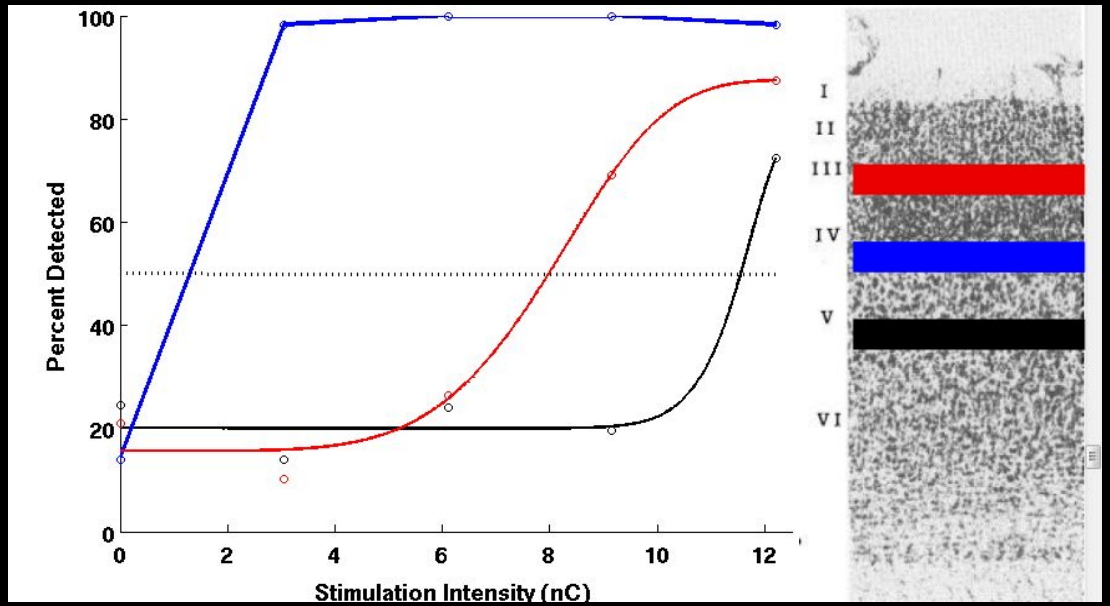




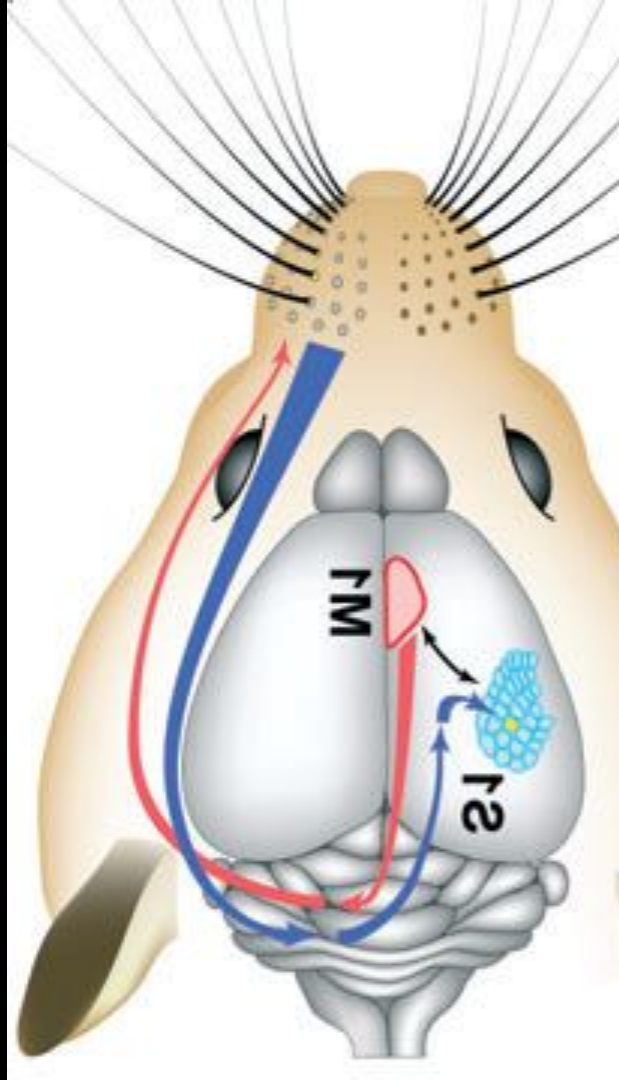
Blind Walking



My Lab Rotation: "Layer-Dependent Sensitivity to Electrical Stimulation in Barrel Cortex"

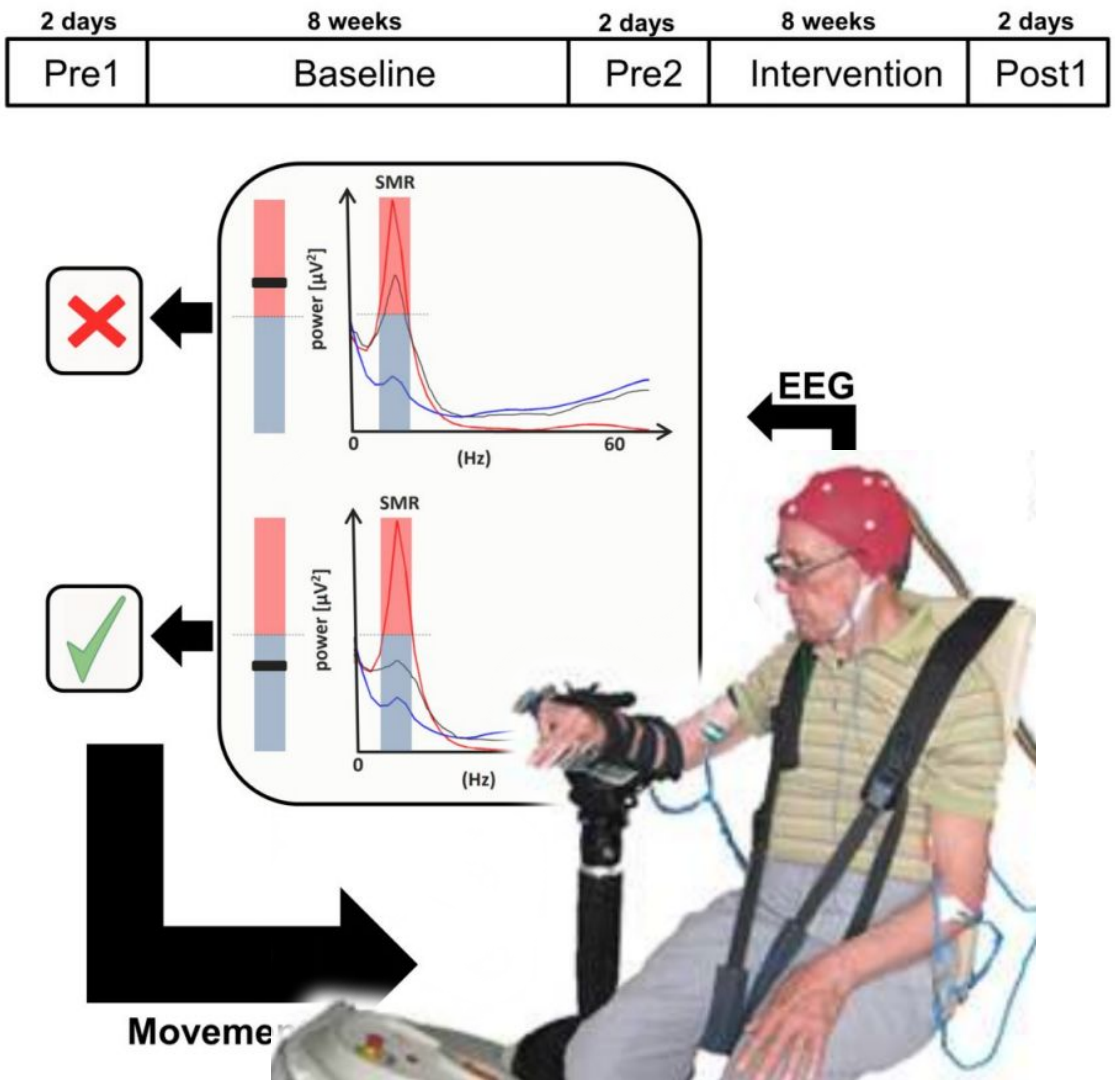


(Aronoff et al, 2010)

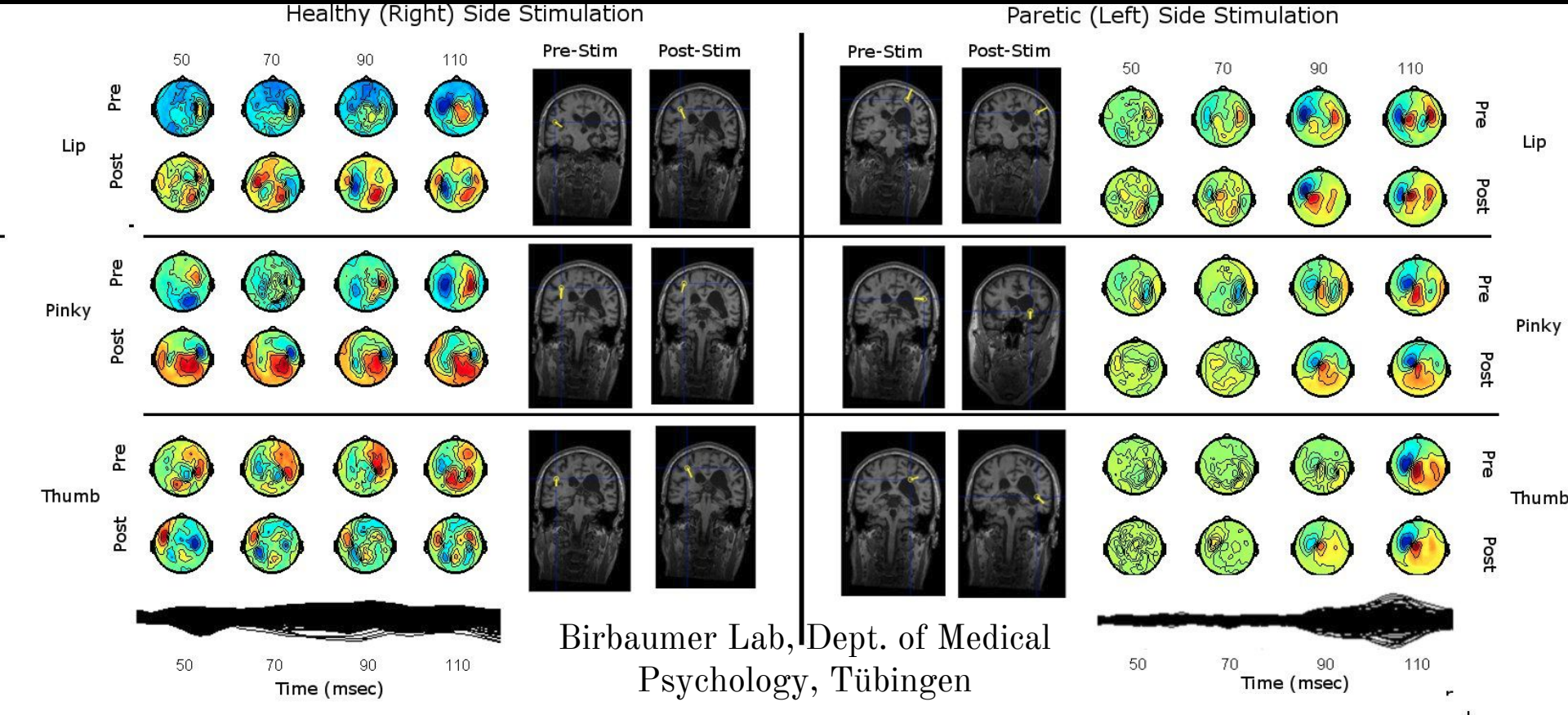


EEG-Robot BCI

(Ramos et al, 2014)

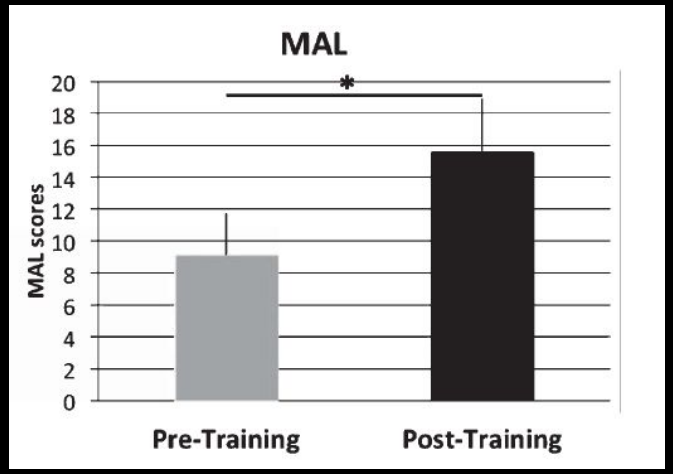


My Master's Thesis: "Neuroplasticity in the Recovering Hemiparetic Stroke Patient"



Birbaumer Lab, Dept. of Medical Psychology, Tübingen

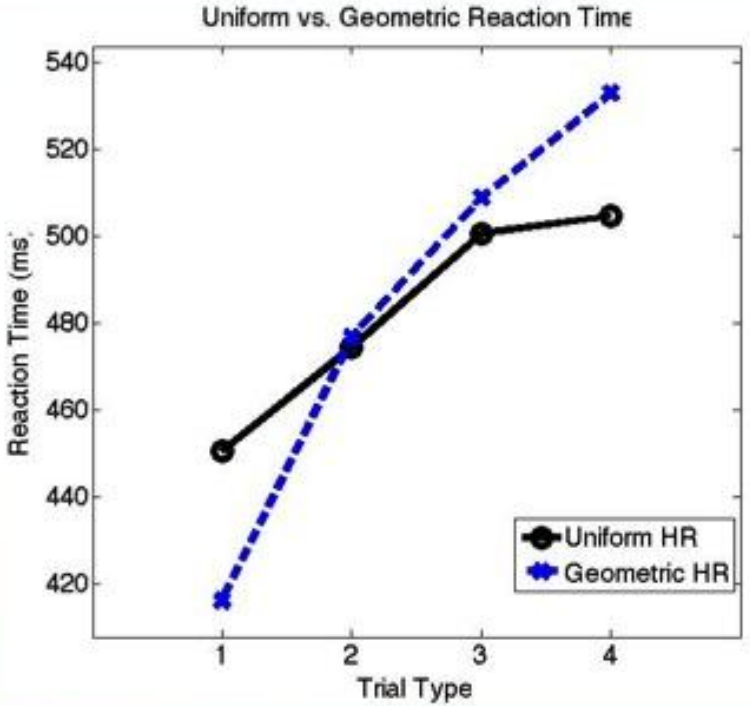
Physiotherapy Enhancement through Rich Experiences

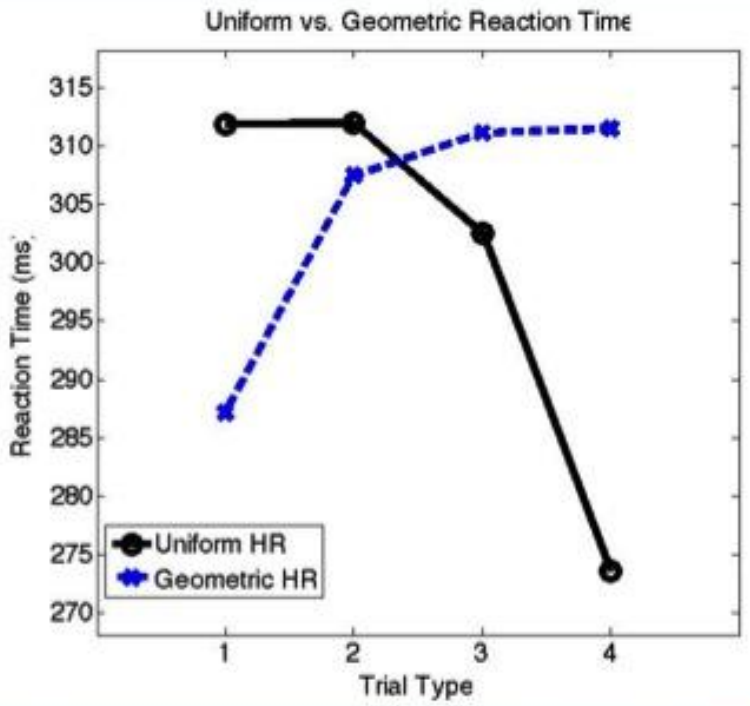


(Broetz et al, 2014)

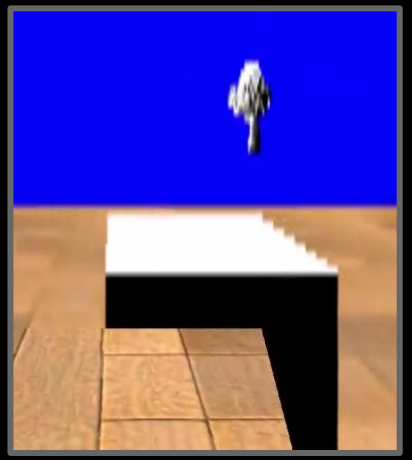
Attention and Hazard Rate

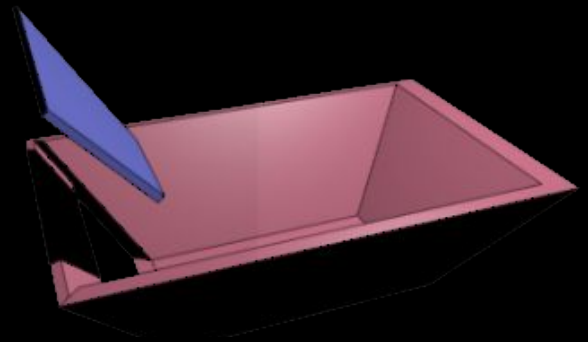
Uniform Vs Geometric Distribution



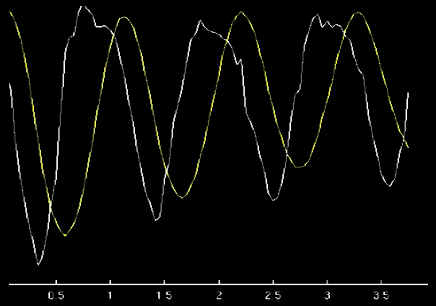


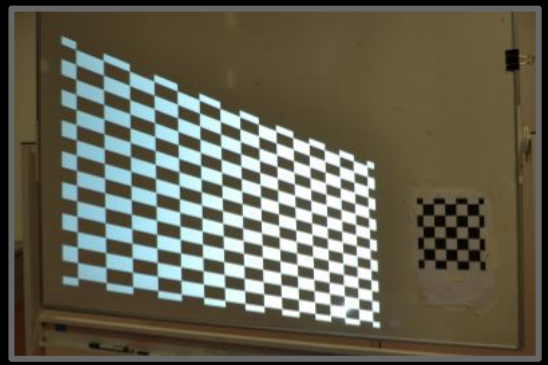
2013-2014: HippoVR

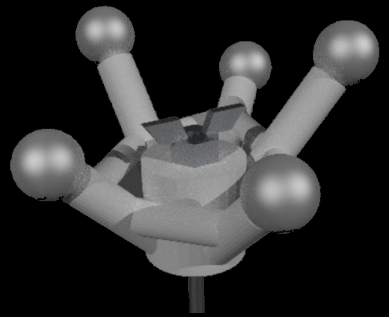


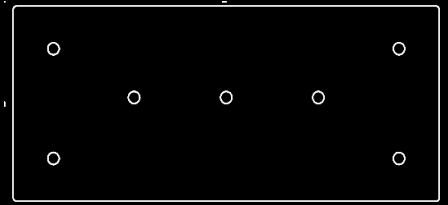


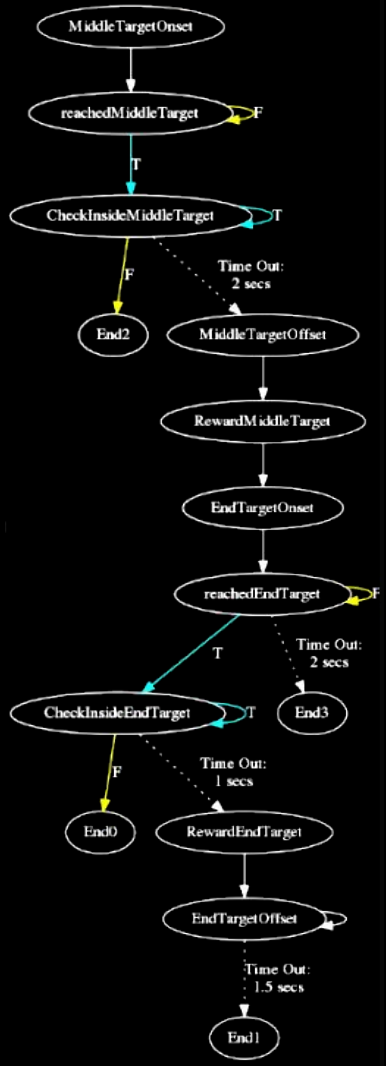
Input Lag: 120 msecs

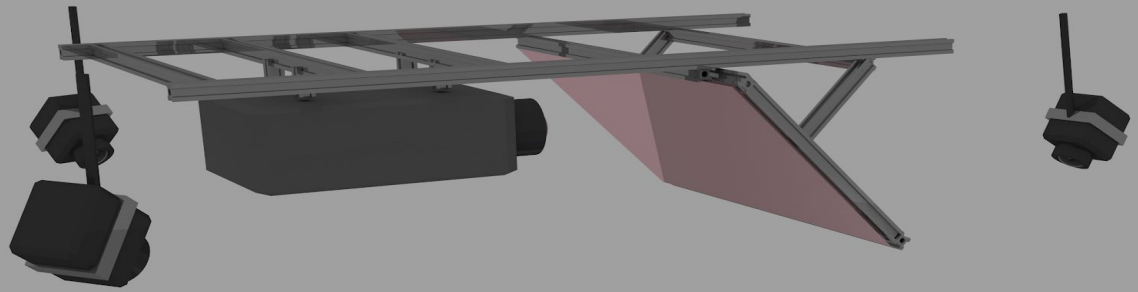


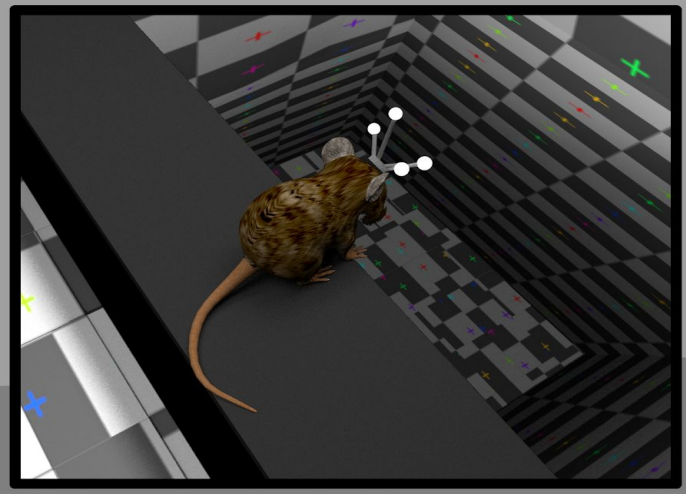




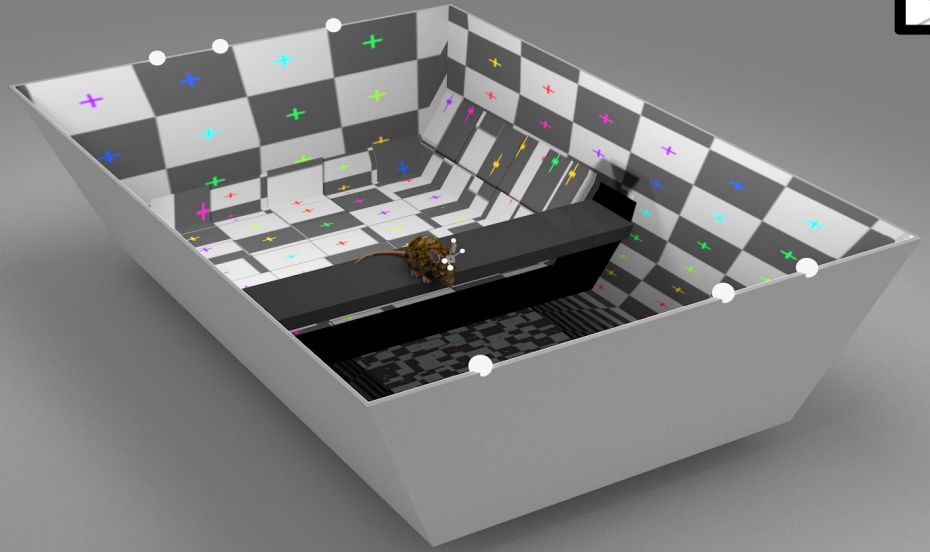








2016: The ratCAVE VR Setup



2018:Preventing VR Sickness

In Summary:

I am very interested in the importance of closed loops in sensorimotor research.

I have also not published much.

Publish or perish

From Wikipedia, the free encyclopedia

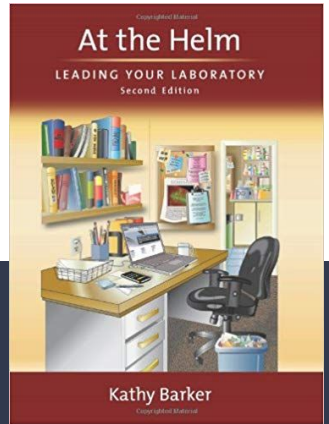
This article is about the concept in literature. For the Columbo episode, see Columbo (season 3) § Episodes.

"**Publish or perish**" is a phrase coined to describe the pressure in academia to rapidly and continually publish academic work to sustain or further one's career.[1][2][3]

Frequent publication is one of the few methods at scholars' disposal to demonstrate academic talent. Successful publications bring attention to scholars and their sponsoring institutions, which can facilitate continued funding and an individual's progress through a chosen field. In popular academic perception, scholars who publish infrequently, or who focus on activities that do not result in publications, such as instructing undergraduates, may lose ground in competition for available tenure-track positions. The pressure to publish has been cited as a cause of poor work being submitted to academic journals.[4] The value of published work is often determined by the prestige of the academic journal it is published in. Journals can be measured by their impact factor (IF), which is the average number of citations to articles published in a particular journal.[5]

See also [edit]

- Academic careerism
- Forced ranking
- Impact factor
- Least publishable unit, reduction to which is often disparagingly labeled "salami slicing"
- Slow science



Figures

211
GSN^{LMU}/ENB Students
157 PhD
41 Fast-track PhD
13 MSc

Over 20
International & National Collaborations

104
MCN^{LMU} Members

133
GSN^{LMU} Faculty Members

56%
Internationals

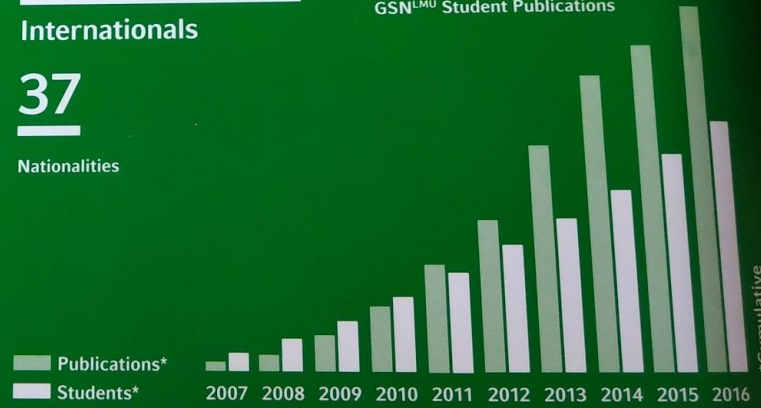
37
Nationalities

7
Teaching Sections

Male Students
130
Female Students

134
Graduates
77 PhD
11 Fast-track PhD
46 MSc

Over 500
GSN^{LMU} Student Publications



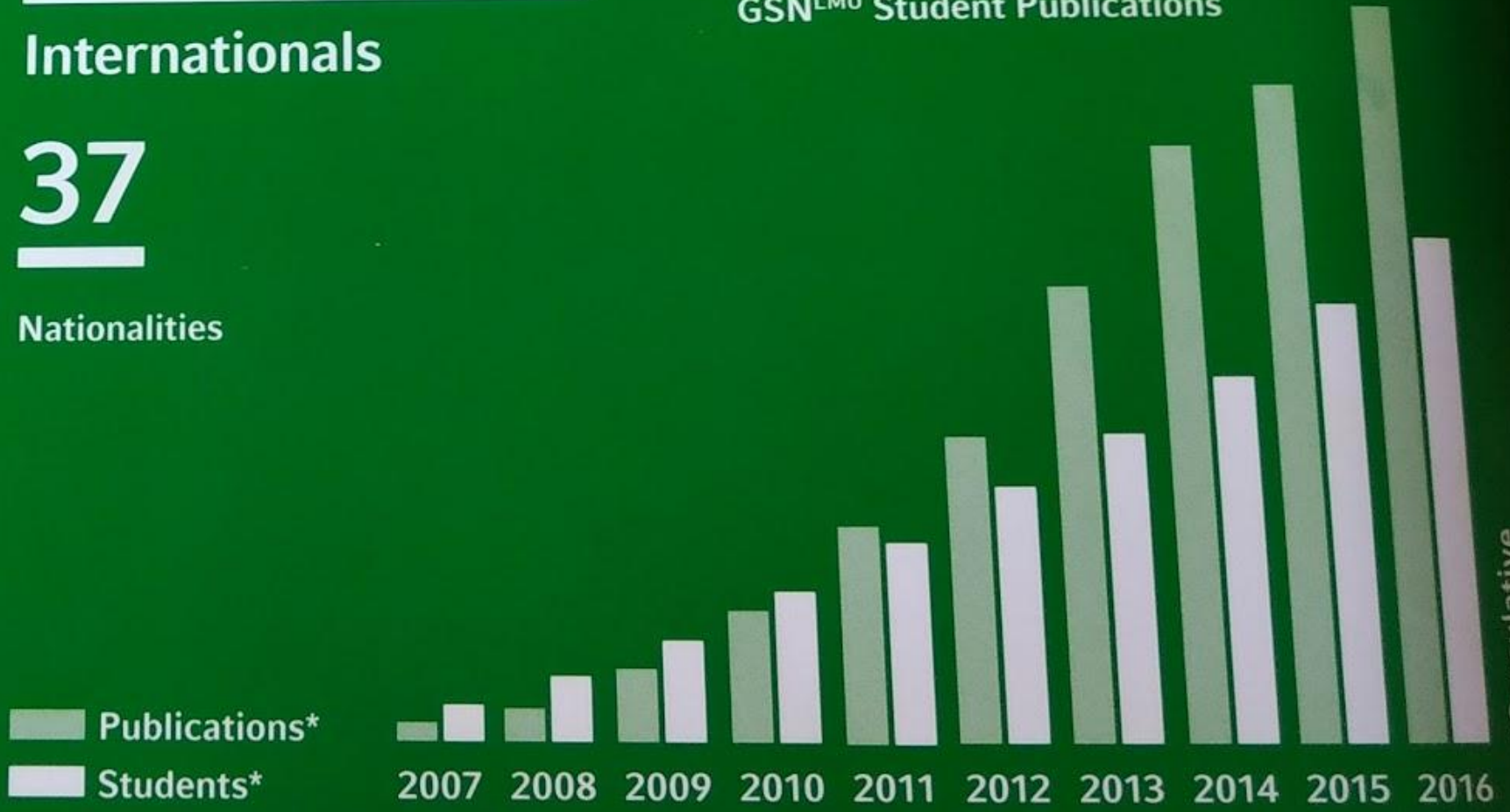
Munich C
Ludwig-Max
Grosshadern
82152 Planeg
+49 89 2180
mcn.office@b

Internationals

37

Nationalities

GSN[LMU] Student Publications



Power failure: why small sample size undermines the reliability of neuroscience

Katherine S. Button[1,2], John P. A. Ioannidis[3], Claire Mokrysz[1], Brian A. Nosek[4],

False-Positive Psychology: Undisclosed Flexibility in Data Collection and Analysis Allows Presenting Anything as Significant

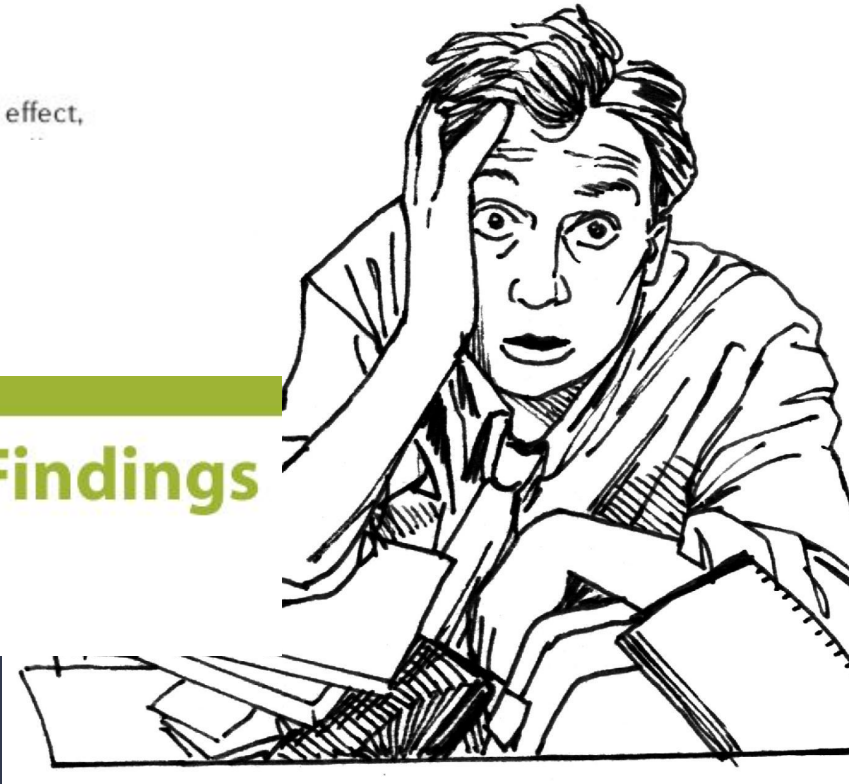
rue effect,

Joseph P. Simmons[1], Leif D. Nelson[2], and Uri Simonsohn[1]
[1]The Wharton School, University of Pennsylvania, and [2]Haas School of Business, University of California, Berkeley

Essay

Why Most Published Research Findings Are False

John P. A. Ioannidis



I Think This Isn’t News to Most of Us

Burnout:

What happens when your work-related needs aren't met for a long time.

"Burnout is a psychological syndrome of

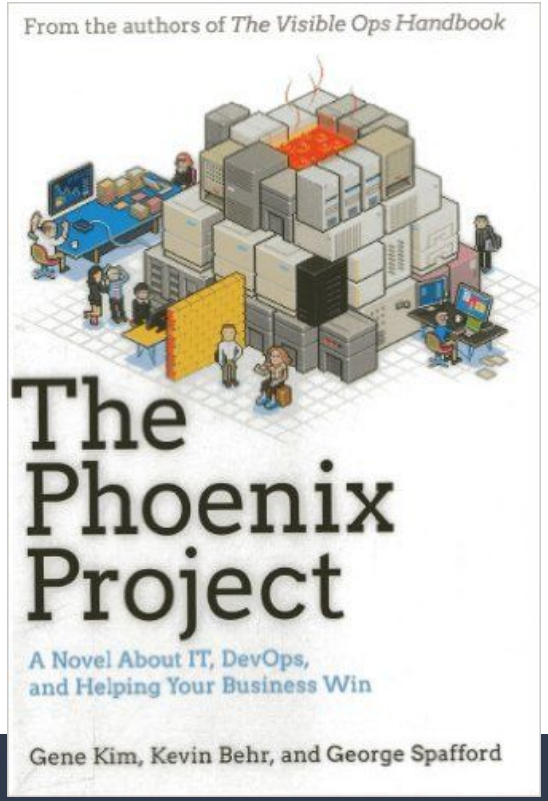
- **emotional exhaustion**
- **reduced personal accomplishment**
  - may feel unhappy with oneself
  - feel dissatisfied with accomplishments on the job
- **depersonalization**
  - negative, cynical attitudes and feelings
  - dehumanized perception of others

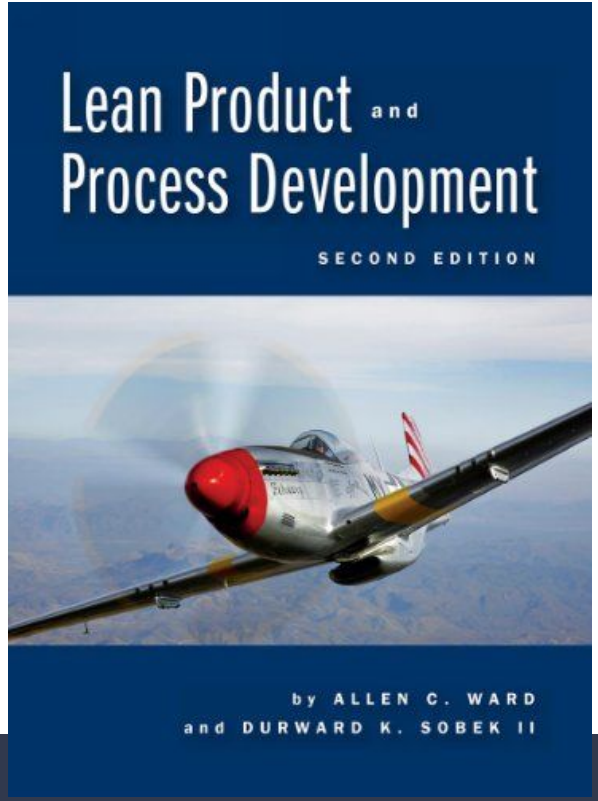
(Maslach et al, 1996)

Discussion

1. What proportion of time in a representative week do you spend doing things that match your listed work motivations?
2. Do you feel effective, competent, creative, and valued?
3. How likely is it that someone in your group will experience burnout during their PhD?
4. What percent of people in your department do you think are *currently* burned out?
5. Is this having an impact on your research?


YOU WERE SO PREOCCUPIED WITH WHETHER OR NOT YOU COULD
YOU DIDN'T STOP TO THINK IF YOU SHOULD


From the authors of *The Visible Ops Handbook*
The Phoenix Project
A Novel About IT, DevOps, and Helping Your Business Win
Gene Kim, Kevin Behr, and George Spafford


Lean Product and Process Development
SECOND EDITION
by ALLEN C. WARD
and DURWARD K. SOBEK II

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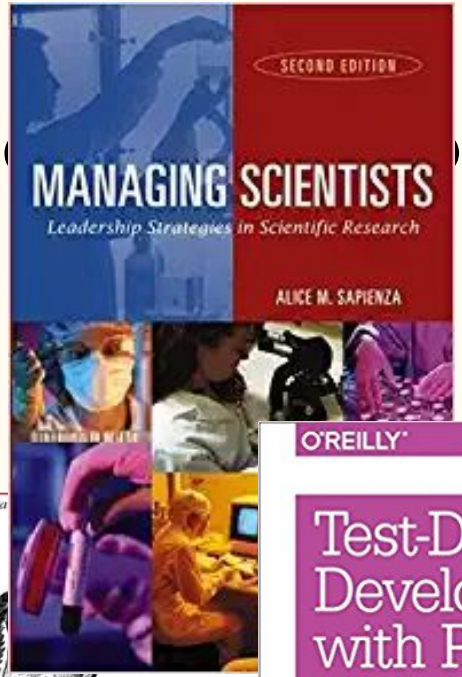
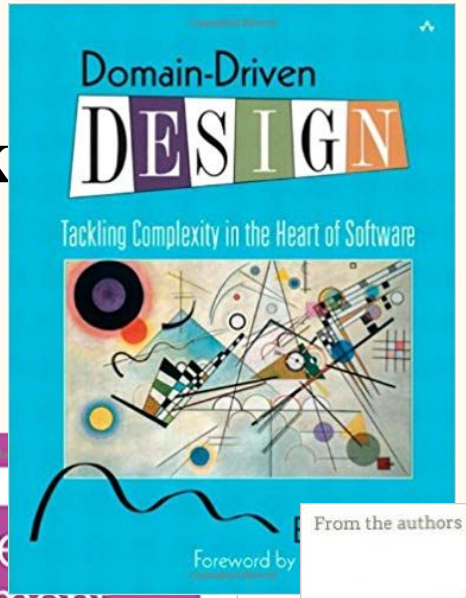
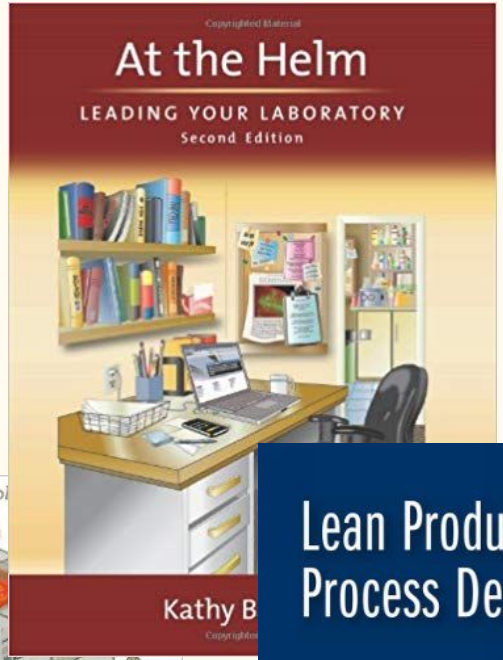
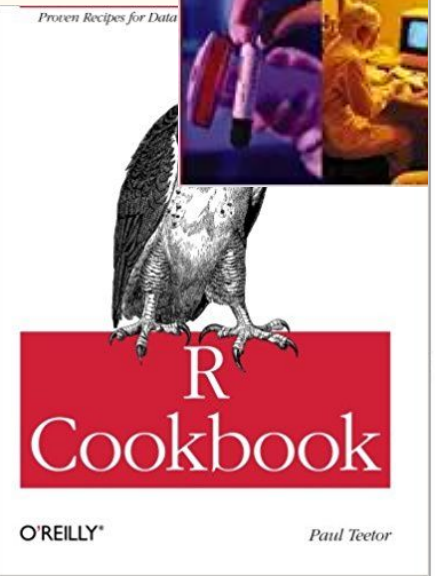
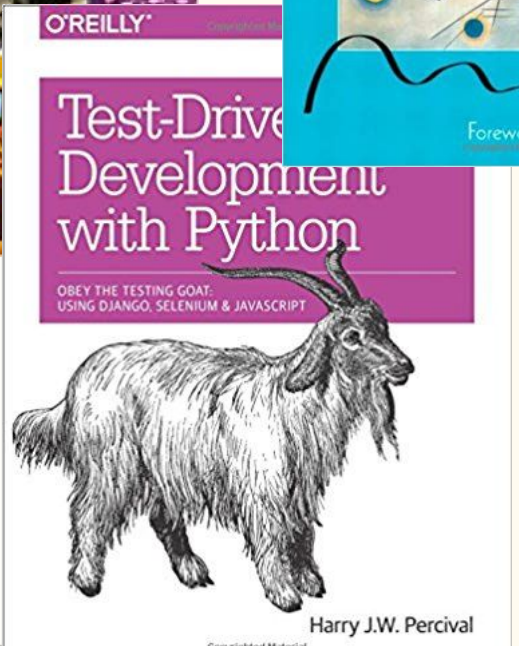
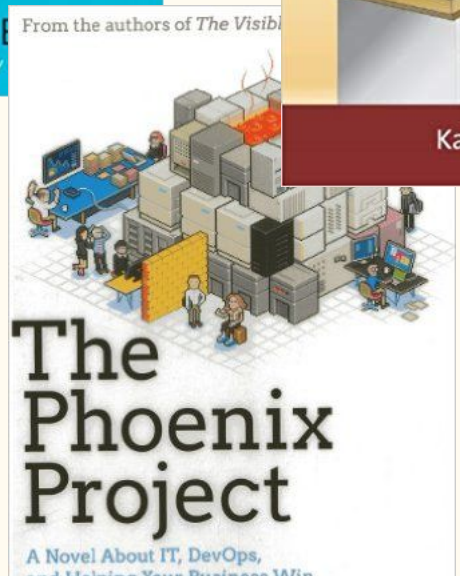

SECOND EDITION
MANAGING SCIENTISTS
Leadership Strategies in Scientific Research
ALICE M. SAPIENZA

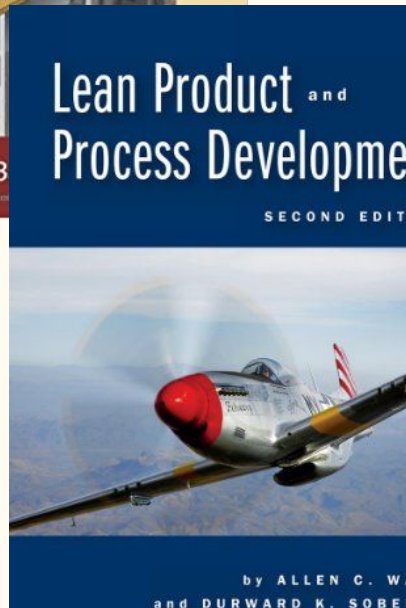

Domain-Driven
DESIGN
Tackling Complexity in the Heart of Software
Foreword by


At the Helm
LEADING YOUR LABORATORY
Second Edition
Kathy B


Proven Recipes for Data
R
Cookbook
O'REILLY
Paul Teetor


O'REILLY
Test-Drive
Development
with Python
OBEY THE TESTING GOAT:
USING DJANGO, SELENIUM & JAVASCRIPT
Harry J.W. Percival


From the authors of The Visibl
The
Phoenix
Project
A Novel About IT, DevOps,


Lean Product and
Process Developme
SECOND EDIT
by ALLEN C. W
and DURWARD K. SOBE

…and that’s how I came up with this workshop:

Productivity in Science

—

Probability Theory, Test-Driven Development, and Lean Management Principles, presented by Nick Del Grosso

Proposal: Let's Embrace "Publish or Perish"

The Chronicle of higher Education: Schaberg, 2016

Research Outputs

- **Knowledge**
  - Theoretical Models
  - Important Insights
  - Experimental Methods
  - Intellectual Property (e.g. Patents)
- **Data**
  - Experimental Data
  - Simulation Data
- **...and combinations of Both.**

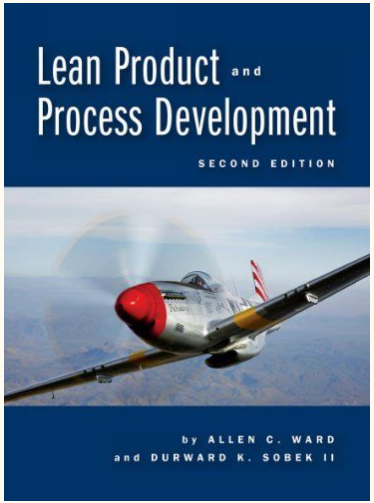
Motivation:
To be accomplished researchers doing impactful research in an engaging, innovative, and positive research community.

Goal: To Regularly Publish High-Impact, High-Quality Research

“Lean Research” = Lean Development + Lean Operations

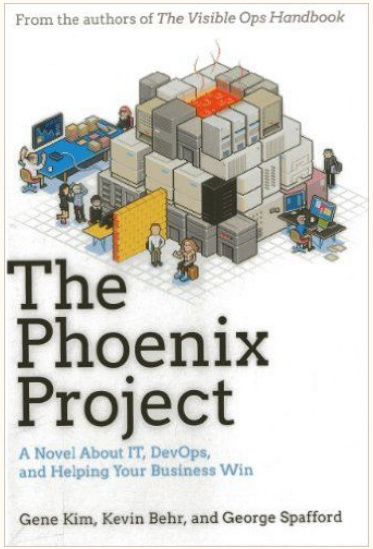
Lean Product Development

- Produces Knowledge
- Produces Operational Value Streams



Lean Manufacturing Operations

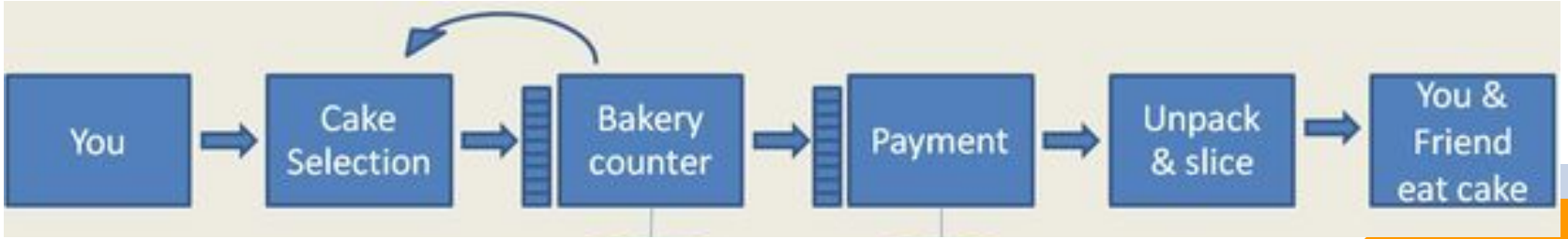
- Produces Products



Lean Methodologies
focus on Increasing Productivity
by Minimizing Waste

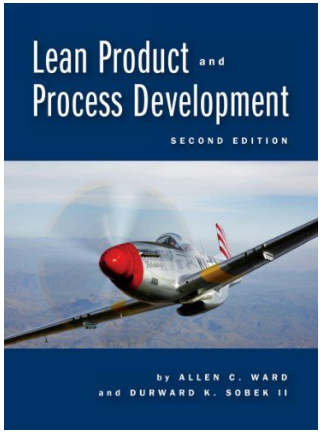
p(Success): What is your Project Risk?

- Independent Probabilities can be multiplied.
  - p(My Animals Surviving Surgery) = 0.9
  - p(My Animals Learning the Task) = 0.8
  - p(Both) = 0.9 * 0.8 = 0.72
- Task: estimate the total risk of each of your projects.



http://www.johngoodpasture.com/2015/11/value-stream-mapping.html

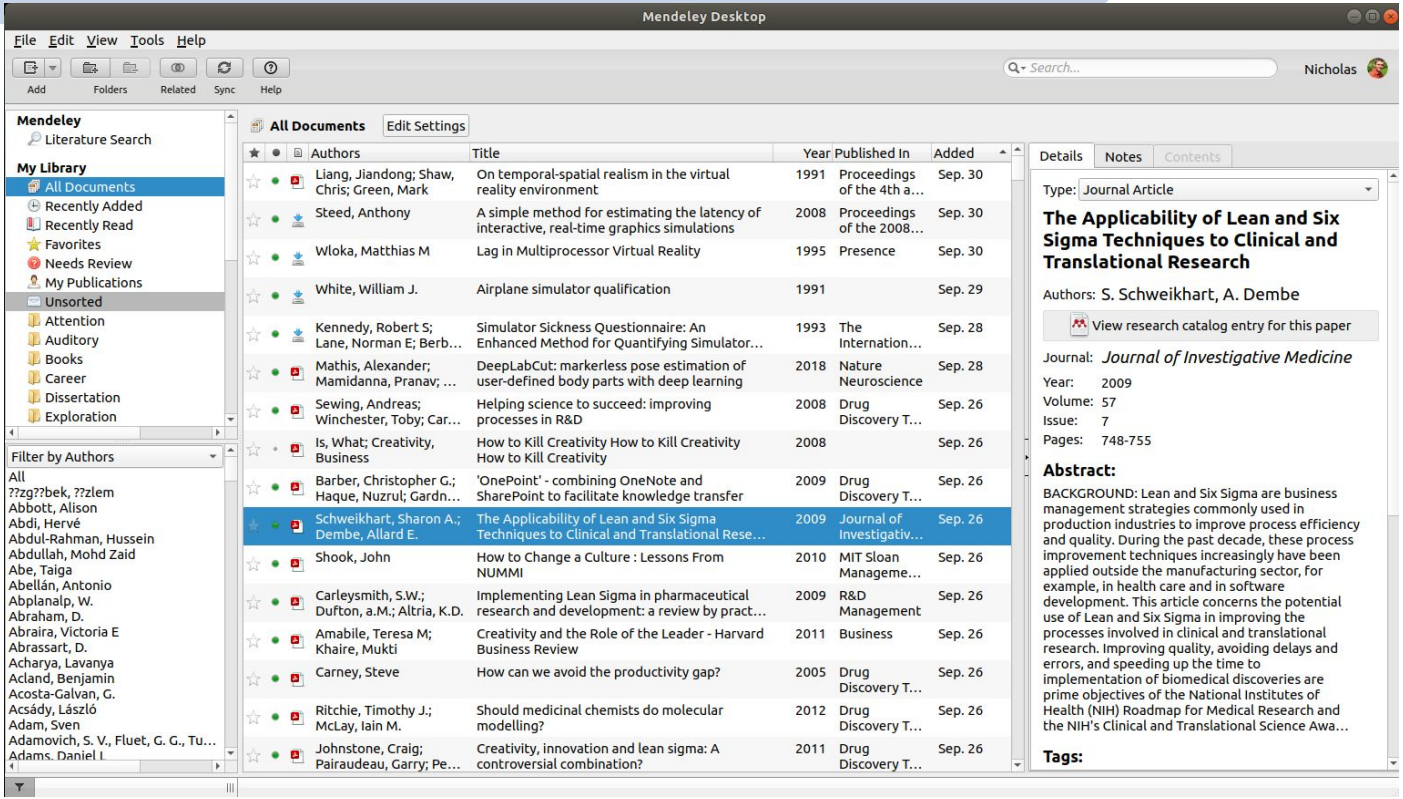
Lead Time: Can You tolerate this risk?



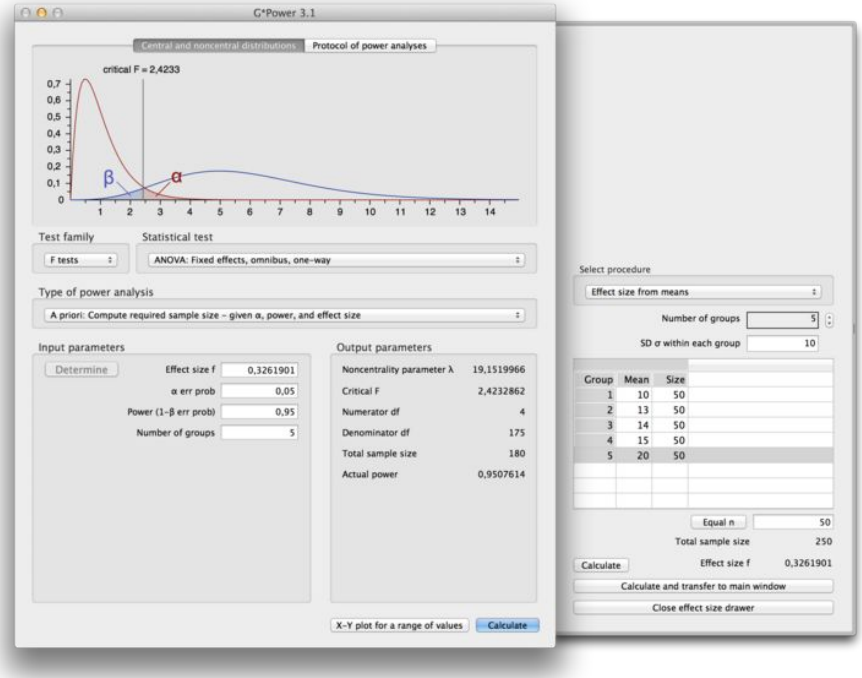
Lead time is the sum of four periods:

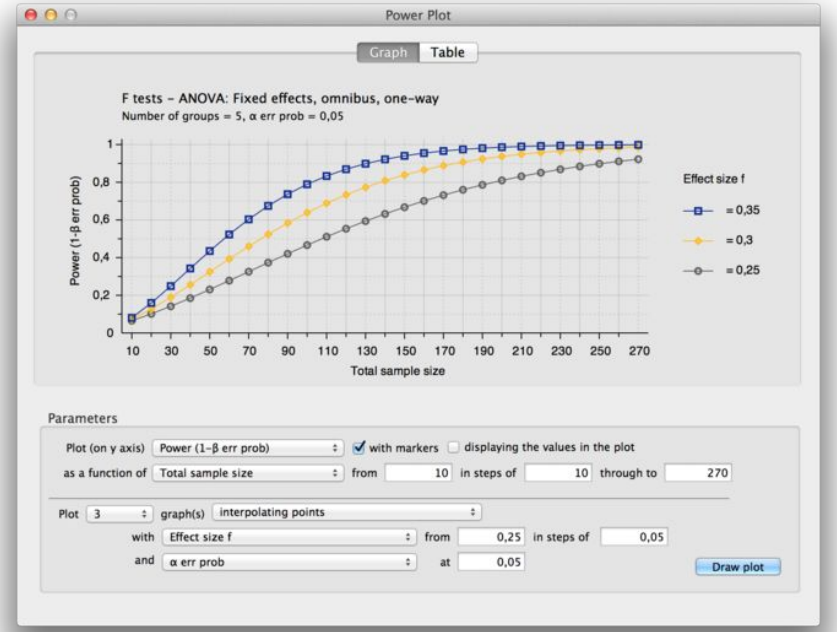
1. **Reaction time,** between the opportunity appearing and the company deciding to invest.
2. **Exploration time,** during which the team explores multiple alternative implementations (and knowledge-value is efficiently added).
3. **Lock-in time,** during which only a single solution is detailed.
4. **Fix-up time,** during which the company tries to deal with the problems of the solution.

Literature Reviews Make a Big Difference



Estimate Needed Sample Size with Power Analyses



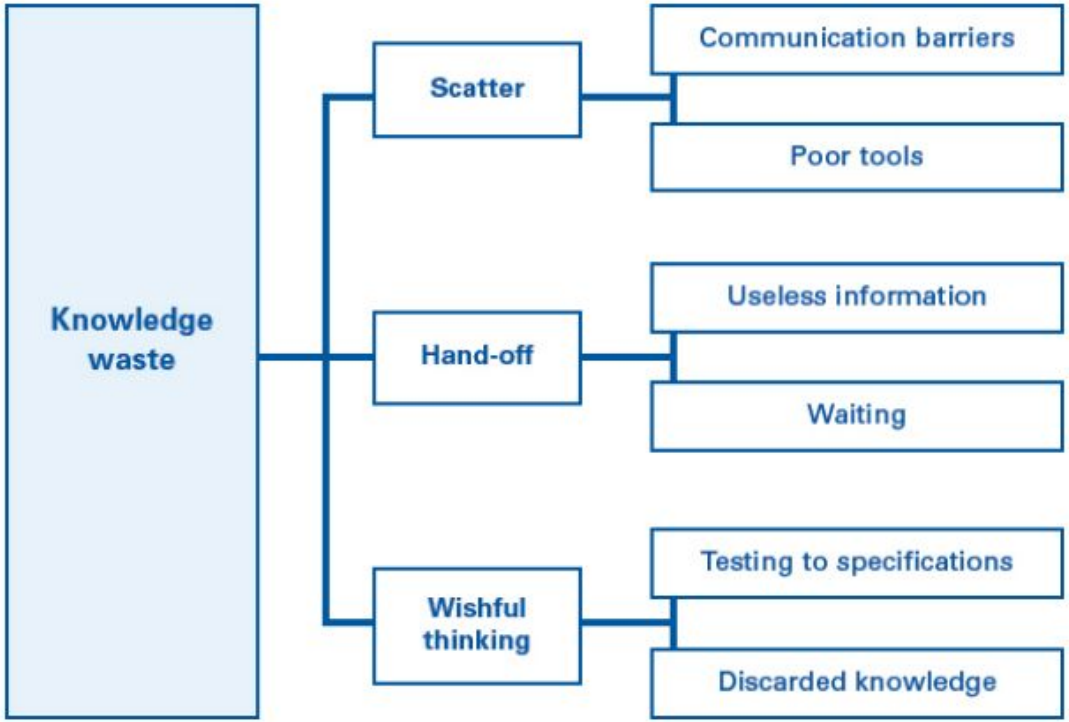


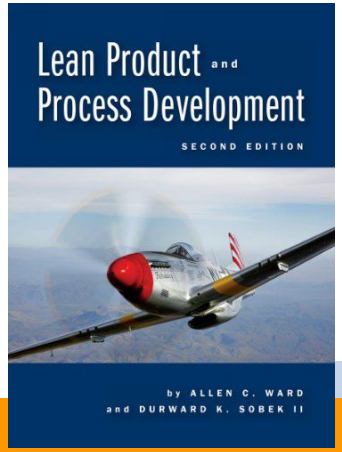
Present Your Plans Early and Aggressively Search for Failure Points

Insights from Learning-Centered Teaching: Knowledge Distribution Must be Goal-Focused

- **Journal Clubs:**
  - Training of Critical Thinking and Reading Skills
- **Progress Reports:**
  - Identification of failure points and deviation estimation from target product
- **Conferences / Talks:**
  - Impact scientists by changing their behavior (use your methods, cite your work, work in your field, hire you for positions, give you resources)

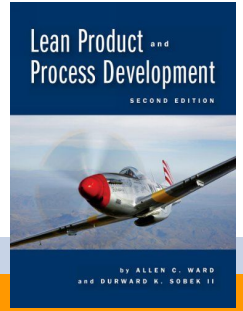
But Stay Efficient: Beware of Knowledge Waste





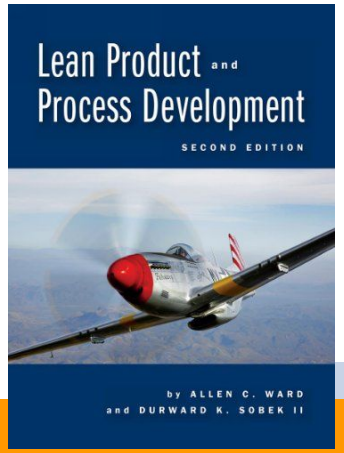
Lean Management is Sometimes Unintuitive, Often Unconventional

	Situation	Conventional response	Scatter effect	Lean response
1	Things are going badly	Reorganize	Obsoletes interaction knowledge	Find and fix root cause
2	The project is falling behind	Add more developers to the team	Disrupts communication	Supervisors pitch in
3	The purchasing agents are slow finding suppliers	Call them more often	Distracts purchasing	Find and fix root cause
4	We keep having product failures	Add more tasks and checks to the development process	Distracts developers	Find and fix root cause
5	The customer wants something new	Add a rush development project	Overloads resources, produces new failures	Steady drumbeat of innovation
6	We're having problems with the manufacturing system	Keep the manufacturing engineers on the project until the system is running properly	Manufacturing engineers not available for next project; problem repeats	Set-based concurrent engineering, rotation of people from plant on to the team.



Solutions for Minimizing Scatter (quoted from book)

- Stop Reorganizing
- Reduce demands for information on short notice from subordinates.
- Respond to “fires” with the least disruptive but effective response. If it is someone’s job to put out the fire, let them do it.
- Stop sending out or replying to excessive email or voice mail.
- Think twice about adding more projects.
- Stop adding formatl structure (tasks, checks, reports) to your development process.



Eventually, you'll come to a consensus...

Bayes Demo Time!

Upon Consensus, Produce!

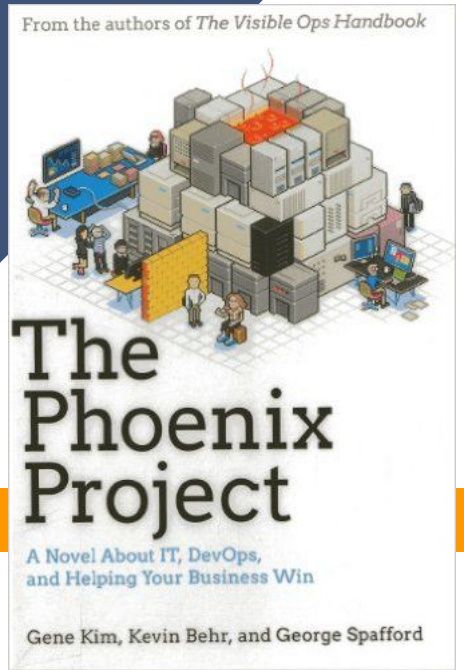
Produce either Knowledge or a Product

End of Part 1.

Break!

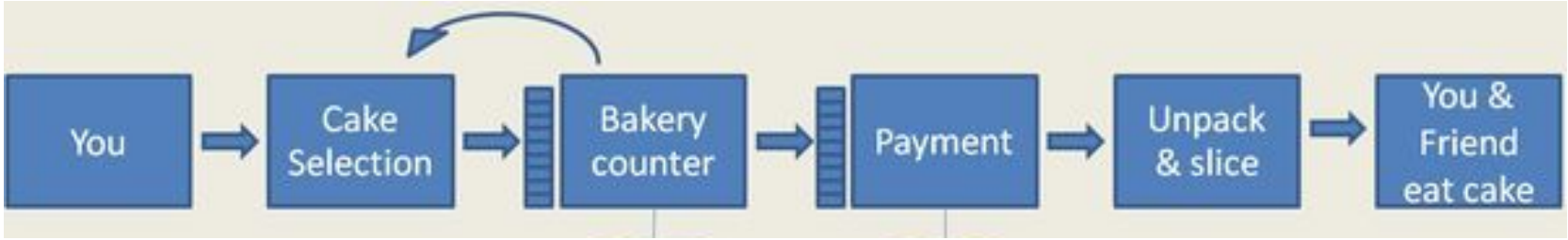
Beginning of Part 2.
Unbreak!

Lean Experiments:
Lessons from Toyota and DevOps



Value-Stream Mapping: Visualizing Lead Time

- **Exercise**: Make an experiment value stream map, using an example from your laboratory or department.



http://www.johngoodpasture.com/2015/11/value-stream-mapping.html

Lean Operations Minimize Waste

Brainstorming Exercise: Identify as many sources of wasted time in this value stream map as possible.

Feel free to adjust the value stream map if you see places to add more detail.

Lean Operations Minimize Waste

1. **Waste of Overproduction:** creating things that don't add value
2. Waste of Time on Hand / Waiting
3. Waste of Transportation
4. Waste of Processing Itself
5. Waste of Stock at Hand
6. Waste of Movement
7. Waste of Making Defective Products
8. Waste of Underutilized Workers

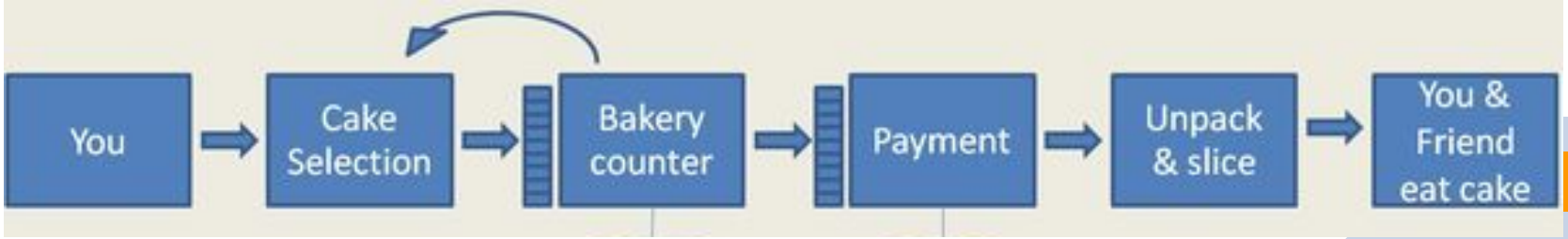
Lean Operations Minimize Waste

Brainstorming Exercise: Identify as many sources of wasted time in this value stream map as possible.

Feel free to adjust the value stream map if you see places to add more detail.

“The First Way”
Create a Constant Feed-Forward Flow

- Waste is Often Spent Waiting.
  - High “Work in Progress”
  - Ignoring this aspect creates a Push System
  - Wastes Effort, Decreases Responsiveness of System

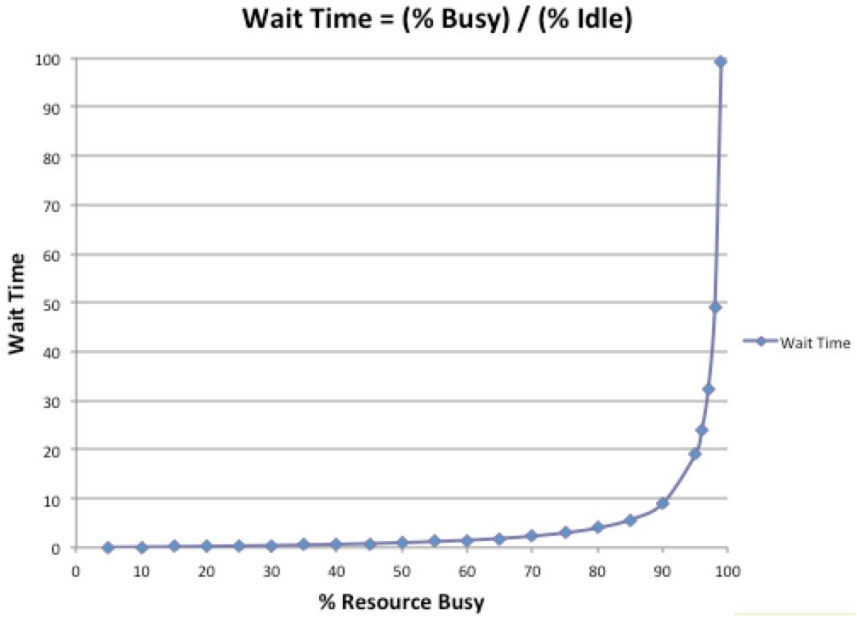


“The First Way”
Create a Constant Feed-Forward Flow

- **Exercise:** Pushing and Pulling Paper Airplanes

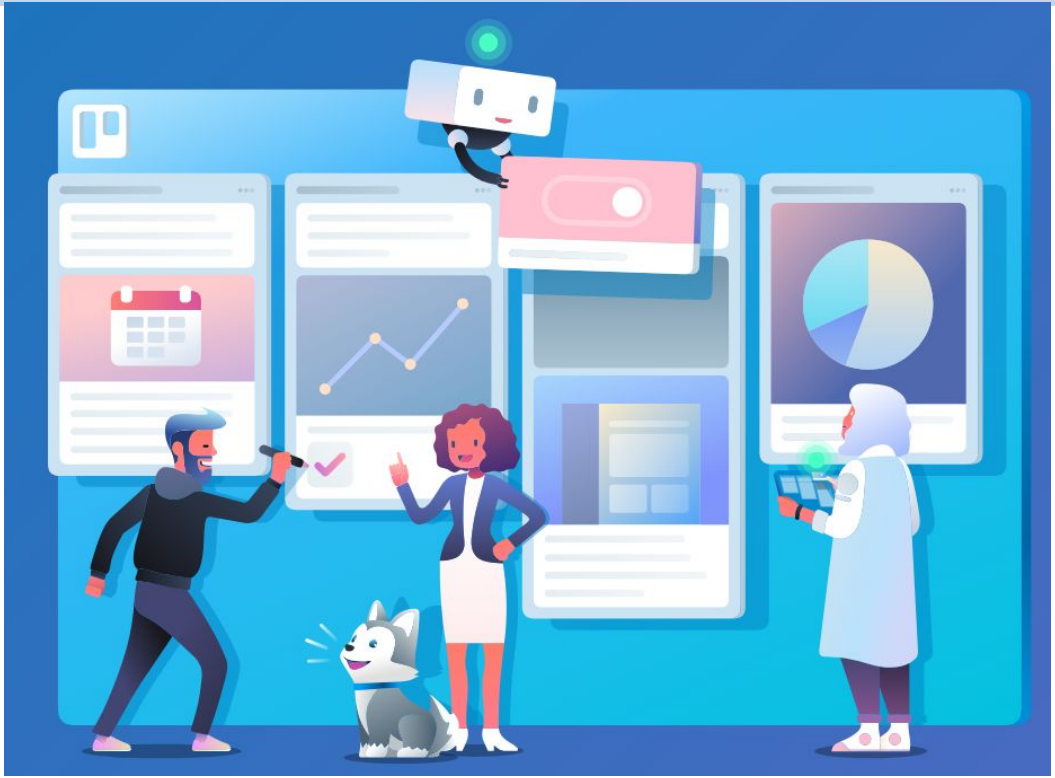
“The First Way”
Create a Constant Feed-Forward Flow

- Toyota’s Solutions
  - “Andel Cords/Buttons”
  - “Swarming” Problems
  - Slack Time
  - Decrease Batch Size
  - Kanban Boards

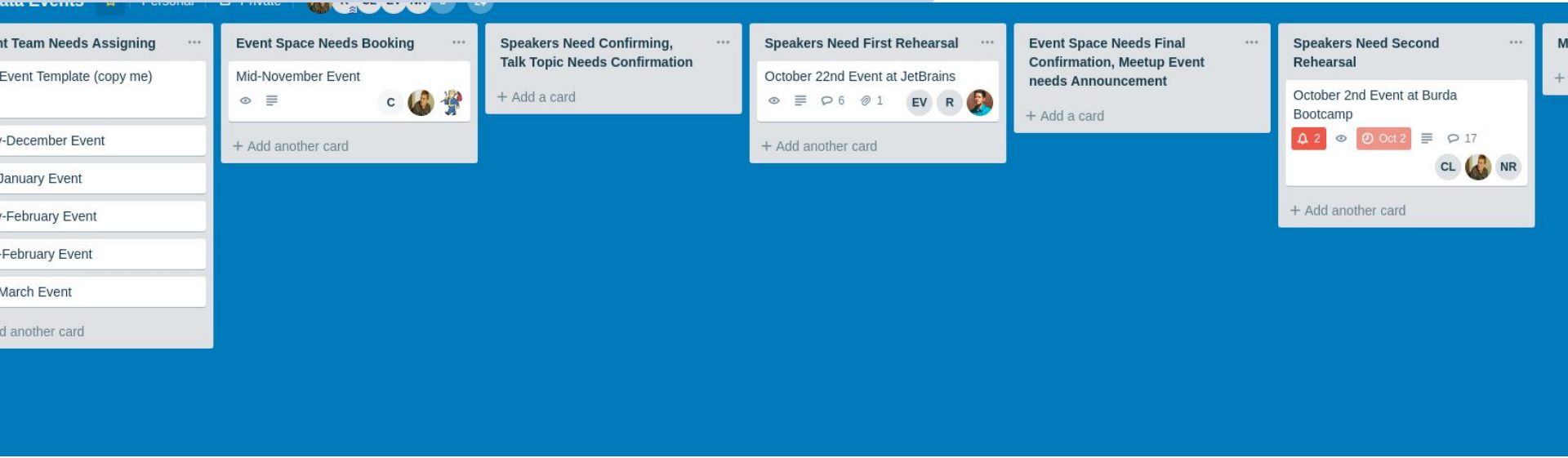


- **Discussion:** How can we apply this to our research?

KanBans: Keeping Your Value Stream Visible



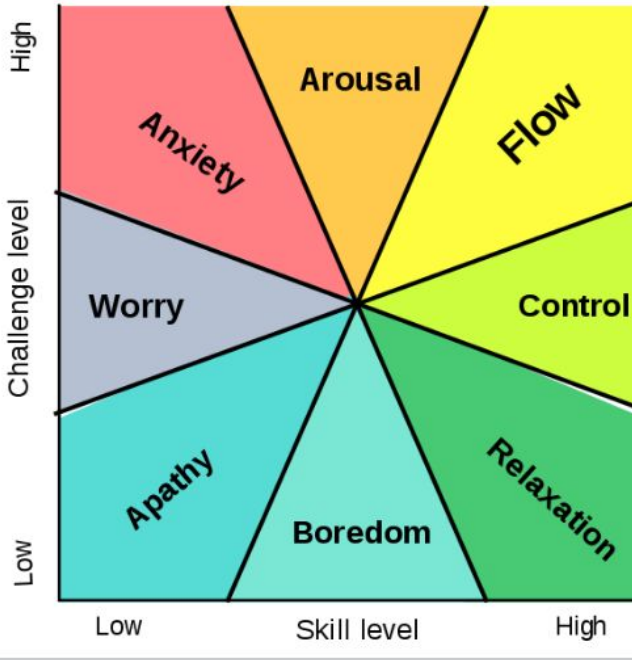
Trello.com Example: PyData Munich Org Team



Note: Flow in Psychology seems somehow related to me

Flow theory (psychology) postulates three conditions that have to be met to achieve a flow state:

1. One must be involved in an activity with a clear set of goals and progress. This adds direction and structure to the task.[14]
2. The task at hand must have clear and immediate feedback. This helps the person negotiate any changing demands and allows them to adjust their performance to maintain the flow state.[14]
3. One must have a good balance between the *perceived* challenges of the task at hand and their own *perceived* skills. One must have confidence in one's ability to complete the task at hand.[14]

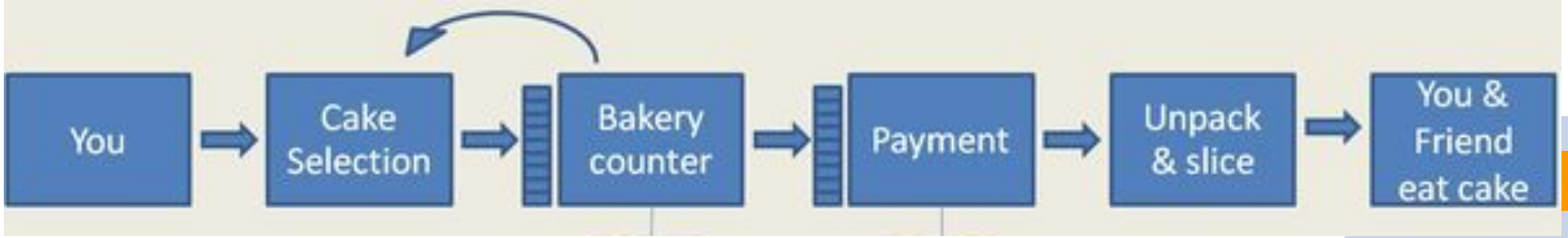


Mental state in terms of challenge level and skill level, according to Csikszentmihalyi's **flow** model.[9][*page needed*] (Click on a fragment of the

(wikipedia entry on Flow)

“The Second Way”
Maximize Flow with Feedback Systems

- Work that moves backwards:
  - Creates Unplanned Work.
  - Indicates unknown root problems
  - Increases Bottlenecks



“The Second Way”
Maximize Flow with Feedback Systems

- Toyota’s Solutions:
  - Visual Indicators of Quality at all Work Stations
  - Single-Piece Flow
- Devops Solution:
  - Test-Driven Development
  - Version Control Systems
  - Minimally-Viable Product
  - Continuous Deployment
- **Discussion:** How can we apply this to our research?

Demo: Test-Driven Development

“The Third Way: Cultivate a Culture of Experimentation and Innovation.

Conclusions

- We are motivated to be good researchers.
- Productive research creates research products.
- Finding innovative approaches requires thinking like a product developer.
- Committing to an experiment requires thinking like a manufacturer.
- Reducing waste is essential to being lean.
- Slack time is essential for productivity.
- Pull-feedback systems create smoother flow and higher quality.

Evaluation and Feedback:

1. Your Position (e.g. Master, PhD, Postdoc, PI)
2. How Much Did you Enjoy this Workshop? (1-10)
3. How Valuable is this Topic for You? (1-10)
4. How Engaged Were You? (1-10)
5. What things did you like about the workshop? (3-5 items)
6. What would you like to see Improved in a future workshop on this topic? (3-5 items)

Thank you for your attention!