

Dynasty

ECOSUR

**To be, or not to be ... a scientist:
Playing the game
knowing the rules**

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Thank you very much!

- **Dr. Anna Zhadan**
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- **Dr. Galina Buzhinskaja**
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- **Dr. Alexander Tzetlin**
White Sea Biological Station, Moscow State Univ.
- **Dr. Elisaveta Bonch-Osmolovskaya**
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To become a scientist

- On being a scientist
http://www.nap.edu/catalog.php?record_id=12192
- Education and training
College to Ph. D.
- Research
Original + doing/defending dissertation
- Publications

Useful guides


- **Robert Day**
How to write and publish scientific papers
<http://www.uned.ac.uk/possoc/revista/documents/Comoescibirypublicararticuloscientificos.PDF>
- **PLoS Comput. Biol.** Ten Simple Rules
<http://www.ploscollections.org/article/browseissue.action?sessionid=6DE4FF92118F2AEF7FEA03C17711E981.ambra01?issue=info%3Adoi%2F10.1371%2Fissue.pcol.v03.i01>
- **I did a PhD and did NOT got mad**
<http://public.randomnotes.org/richard/PhDtalk.html>
<http://www.phdcomics.com/comics.php?f=1174>

Objectives

- Thesis and associated publications
- Master-apprentice interactions including creativity
- Mechanisms for academic evaluation

Francis Bacon
1561 - 1626


- “Know to forecast, forecast to control”
- “Order, utility and progress”
- “Knowledge is power”
- Proverbs 25,4





Discours de la Methode
René Descartes, 1637

- Reject dogmas
- Divide each problem in parts
- Proceed from simple to complex
- Be as complete as possible
- *"It is our duty, not of God, to release ourselves of illusions and of making mistakes"*



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Ethics

- Ethics vs "widespread tradition"
- Human Resources Training
- Scientific production

Ph. D.

- **Philosophy:** Excluding Theology, Law and Medicine
- **Doctors** in Theology, Law and Medicine since Middle Ages
- **First Ph D Program**
1810s. Liberal Arts, Humboldt University, Berlin (40 nobel prizes, rank 132 en 2011)

* USA: Yale, 1861

Thesis: Extension and duration

Wikipedia Discussion

	Thousands of Words		
	Univ.	M. Sc.	Doct.
• Social sciences	20–30	40–50	80–100
• Other sciences	10–20	20–30	40–50

¿300 words per page?

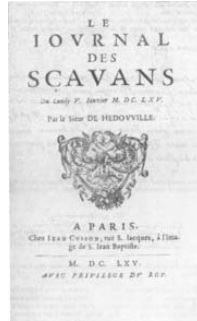
College: 3-7 months
M Sc: 8-10 months
Ph D: 18-30 months

Research question fine-tuning

- 1) Is there the same trend for the research question fine-tuning?
- 2) Quantity = quality?
- 3) What is the role of the mentor?

Scientific Literature: 1665

- Journal des Sçavans, Paris
- Philosophical Transactions of the Royal Society, London



Two comments, 1

- "The requirement that a candidate for a Ph D prepares an extensive document or traditional dissertation must be abandoned ..."
- Such traditional thesis promotes the wrong impression that a written record must be made for every observation or experiment, disregarding if it was successful or not."

Reid, 1978

Two comments, 2

- "A single article in a primary journal, where a large amount of work is presented in a condensed way, would be a better indicator of the candidate capacities than the usual type of thesis."

Cooper, 1968

Social Perception

- Mecenas
Royalty, Expeditions, Gabinetts
- State as promotor of science
National budgets and projects

Social Recognition

- "Poetry simply arrives to you; this is why it is so difficult to receive a prize for something which is beyond your own control"

Leonard Cohen
Nobel Prize, Literature 2011

Social Interactions

- Apprentices and Mentors

Learning how to do science resembles learning in painting or sculpture, because it develops by direct imitation and inspiration.

S L Montgomery, 2003

Inertia vs Creativity

- Mastering subjects/techniques/equipments
- Continue *ad perpetuam*
- Become standard authorities

Creativity: 6 easy steps

1. Lower your level of anxiety
2. Elaborate more and better questions
3. Try new approaches
4. Discover what is more enjoyable
5. Avoid excuses
6. Do something

Peter Medawar, 1979:13

- “Any scientist, disregarding his/her age, wishing to do important discoveries, must **undertake important problems** ... The problem must be one whose answer is relevant, for science in general, or to humankind”

Scientific Revolutions Thomas Kuhn, 1970

- Orthodoxy vs Heterodoxy
- A) Generally accepted backgrounds
- B) Anomalies in results
- C) New findings and change in paradigms
 - C1: Widespread rejection
 - C2: Gradual acceptance
 - C3: Some one else had already proposed the same

Scientific Creativity Dunbar, 1997

- Analogy
- Unexpected Results
- Multi-topic Reasoning

Analogy Wikipedia

- ἀναλογία: *analogia*.- proportion
- Distinctive inference because it limits to particularities, without consideration of general premises/conclusions
- Transfer of information or meaning from one particularity to another particularity

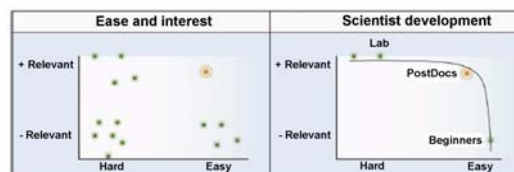
Critical Thinking

Daniel Willingham, 2007

- Critical thinking
 - Selectivity and effectivity
 - Novelty and applicability
 - Autonomy
- * **How to become a critical thinker?**
- *Knowledge* helps detecting deep patterns or structures
- Ordered thinking, or *metacognition*, helps detect patterns and distinguish conditional probabilities

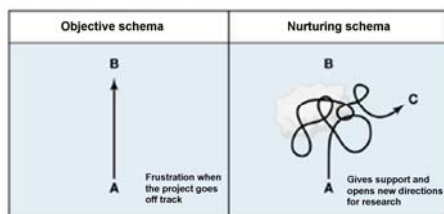
Selection of Research Problem

Alon 2009 Mol. Cell



Feasibility-Interest Diagram for Choosing a Project

Alon 2009-2



Objective and Nurturing Schemas of Research

Doing your best research

PLoS Ten Simple Rules

1. Drop modesty
2. Prepare your mind
3. Age is important
4. You need courage
5. Working conditions
6. Work hard and effectively
7. Believe and doubt your hypothesis
8. Important problems
9. Be committed
10. Open your door

Academic Evaluation

- Scientific production
 - Number of citations
 - Impact Factor
 - Publish or Perish
- <http://www.harzing.com/pop.htm>

Scientific Production

- Meetings reports
- Articles
- Revisions and reviews
- Notes
- Letters
- Reviews of books
- Thesis as Director/Main advisor
- Teaching

Magic Numbers

- Impact Factors
- Number of citations

IF and Citations

- Citations

Citations 2011

$$\bullet \text{ IF} = \frac{\text{Citations 2011}}{\text{Articles 2009-2010}}$$

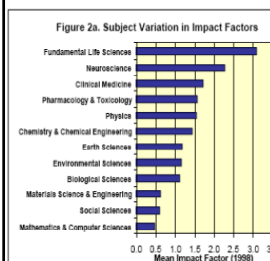
1900-2005: **38 millions** articles

0.5% + 200 citations **50% NEVER**

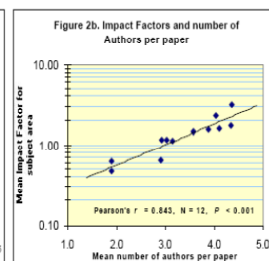
IF use

- Libraries: Subscriptions (Journals)
- ¿Individual scientists, Research groups, Institutions?
- ISI vs <http://scholar.google.com.mx/>

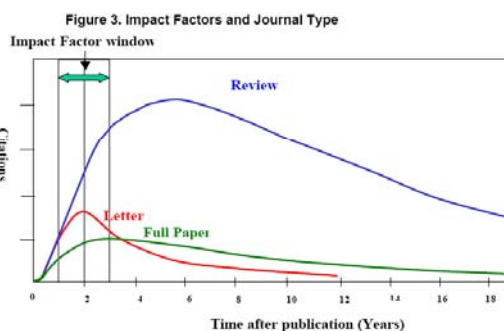
By discipline



Number of authors



Citations per type of publication



Mexico's Academic Evaluation

From pleasure to grief

- * Academic Excellence
- 1980
- S. N. I. 1984
- College or more
- Publications

Unstable Delineation

- Increasing requirements
- M Sc to Ph D
- International Publications (High IF)
- * Number of citations

Is Mexican Science better?

- Last 12 years:
6,000 → **13,000**
 - Mean scientific production
0.7 article/researcher-year
 - France (first or single author)
- Universities: **1** CNRS: **2**

Ethics, again

- **Ethics in academia**
- <http://ethics.iit.edu/codes/coe.html>
- **Ecologists** (ESA Code of Ethics)
- <http://www.esa.org/aboutesa/codeethics.php>

ESA General

- Do not plagiarize.
- Results shall not be fabricated, falsified or suppressed.
- Do not involve in evil actions for personal benefit, or to affect others.

Publications, 1

- **Authorship justified:** Initial idea, data gathering, analysis and interpretation, redaction.
- Unrequested authorities or removal of names.
- Other people results.

Publications, 2

- **Avoid repeated or fragmentary publications.**
- Avoid plagiarism.
- Avoid conflict of interests.

Building/Maintaining Scientific Reputation

PLoS Ten Simple Rules

1. Think before you act
2. Assimilate criticism
3. Do not ignore people
4. Take publishing seriously
5. Declare conflicts of interest
6. Do your share for the community
7. Avoid tasks you cannot complete
8. Be polite and honest with others' work
9. Do not recommend people who do not deserve it
10. Never plagiarize or doctor your data

Power your academic profile

- ¿A large monograph vs several revisions?
- ¿A single species/topic vs several species/topics?
- ¿Annual study vs seasonal studies?
- **Documents as complete as possible**