Podstawowe narzędzia warsztatu naukowca
(Wprowadzenie do studiów doktoranckich)

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Overview

- Why this seminar?
- Fundamental skills
- Expected benefits

Why English ☺?

Berlitz advertisement

http://www.youtube.com/watch?v=YsCR9Y4Ymvo

What is the common theme here?

Vladimir Horovitz

http://www.youtube.com/watch?v=Ki5ur78jdUQ

What is the common theme here?

“Eat Drink Man Woman”

http://www.youtube.com/watch?v=zs5WiddD7i0

What is the common theme here?

Japanese martial arts:

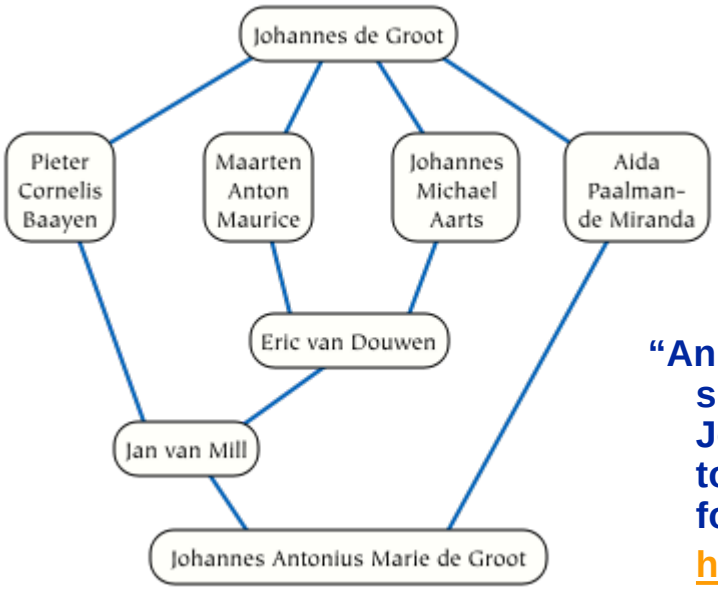
http://www.youtube.com/watch?v=BW3YE-oJJao
http://www.youtube.com/watch?v=KaPxuwPhkDg

The master-apprentice model

- Your success (in science but also elsewhere) depends on your hard work, intelligence, but also on your skills.
- A beginning scientist needs to learn how to do research and how to succeed.
- Most scientists learn this from their advisors (the *master-apprentice* model).
- This model is used in every domain that is hard to master. This was the (intended) common theme of the video clips.

Scientific genealogy

- **All scientists in the history of humankind can be organized into a genealogy graph (often, but not necessarily, a tree)**
- **So call all musicians, chess players, sport players**



"An example of an academic genealogy, the supervisorial relationship between Dutch topologist Johannes De Groot and his namesake, also a Dutch topologist descended from the senior De Groot via four different paths of academic supervision."

http://en.wikipedia.org/wiki/Academic_genealogy

Genealogy in other disciplines

Chadwick (the discoverer of the neutron) was a student of Rutherford (discoverer of the proton) who was the student of Thomson (the discoverer of the electron).

Genealogy in other disciplines

"Horowitz received piano instruction from an early age, initially from his mother, who was herself a pianist. In 1912 he entered the Kiev Conservatory, where he was taught by Vladimir Puchalsky, Sergei Tarnowsky, and Felix Blumenfeld. "

"Horowitz taught six students between 1944 and 1962: Byron Janis (1944-1948), Gary Graffman (1953–1955), Coleman Blumfield (1956–1958), Ronald Turini (1957–1963), Alexander Fiorillo (1960–1962) and Ivan Davis (1961–1962).[18] Janis described his relationship to Horowitz during that period as a surrogate son, and he often traveled with Horowitz and his wife during concert tours. Davis was invited to become one of Horowitz's students after receiving a call from him the day after he won the Franz Liszt Competition.[19] At the time, Davis had a contract with CBS Records and a national tour planned.[19] Horowitz claimed that he had only taught three students during that period. "Many young people say they have been pupils of Horowitz, but there were only three. Janis, Turner, who I brought to the stage and Graffman. If someone else claims it, it's not true. I had some who played for me for four months. Once a week. I stopped work with them, because they did not progress."[20] According to biographer Glenn Plaskin, "The fact that Horowitz disavowed most of his students and blurred the facts regarding their periods of study says something about the erratic nature of his personality during that period".[20] Horowitz returned to coaching in the 1980s, working with Murray Perahia, who already had an established career, and Eduardus Halim."

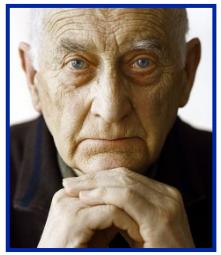
http://en.wikipedia.org/wiki/Vladimir_Horowitz

The master-apprentice model: Pitfalls

- What you will learn depends on the knowledge of your advisor but also on his/her ability to transfer this knowledge.
- But what if you advisor is unable to transfer mastery to you?
- There are otherwise no courses that teach this ☹.

Mentor from hell:
http://www.youtube.com/watch?v=8M_36uhUSFI

Acknowledgments (my “Masters”)



- Gratefully inherited from my Teachers and, whenever I was stupid enough not to ask them or not to listen to them, learned painfully over the years
- Some individuals that I would like to thank to:
  - Włodzimierz Zuberek
  - Willem L. van der Poel
  - Ad van de Goor
  - Max Henrion
  - Herbert A. Simon
  - Granger Morgan
  - Indira Nair
  - Baruch Fischhoff
  - Clark Glymour
  - Adolf Grünbaum
  - …

The goals of this seminar

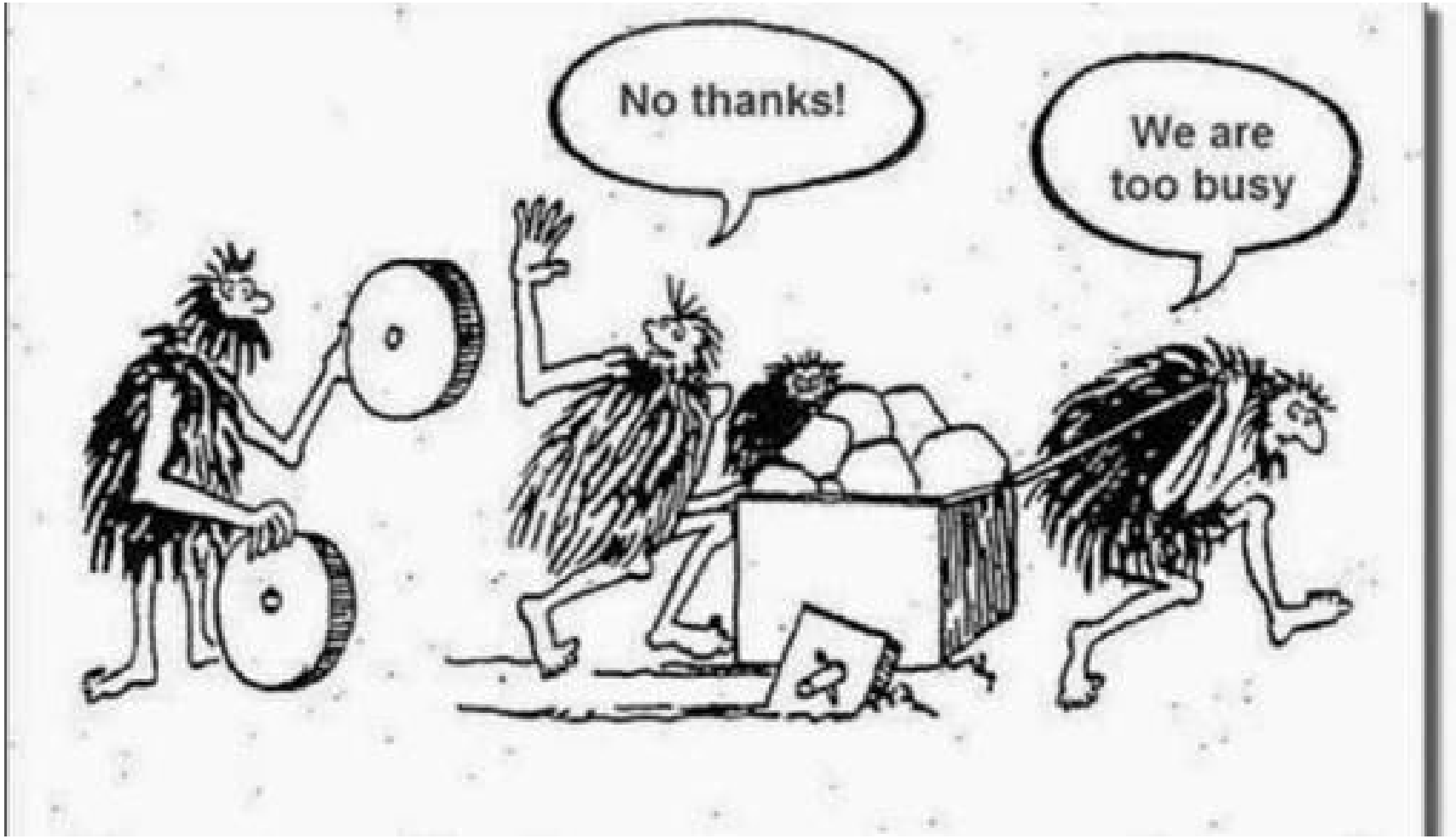
- **Tell a little about the working of science and the duties of an academic.**
- **Review skills that are fundamental to working in a US scientific environment.**

  (These skills, I believe, are so fundamental to working as a scientist that they are universally useful, no matter where you are on Earth.)
- **They should help you with succeeding in <u>any environment</u>!**

  (Science is global these days and a scientist does the same thing, no matter where he/she is.)

Essentially, review what it is like to be an academic (and why I wouldn't want to do anything else ☺).

The benefits of this seminar



Fundamental skills one needs to master to be successful as an academic

Eighteen fundamental skills of a scientist

1. How does science work?
2. What is research?
3. Identifying good research problems
4. Writing papers
5. Presentation in front of an audience
6. Obtaining funding
7. Reviewing/refereeing the work of others
8. Teaching
9. Guiding students, running a lab, managing projects
10. Scientific creativity
11. Information finding
12. Career planning
13. Interacting with people and networking
14. Marketing your skills: job hunt
15. Balancing your life between work and family
16. Coping with stress
17. Ethics in science
18. Appreciation for quality rather than quantity

Our meetings this semester

1. How does science work?
2. What is research?
3. Identifying good research problems
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What do you need to learn?

1-2. How does science work and what is research?

What are the rules of the game?

We need to learn the rules. Otherwise, how can we do something that we don't understand?

What do you need to learn?

3. Identifying good research problems

- Identifying good problems is critical for success.
- Very often, especially in the beginning, senior colleagues (such as your mentor) will help you to identify and frame a research problem.
- Ultimately, however, it is important that you learn the heuristics that are used in this process, so that you can function independently and be successful.

What do you need to learn?

4. Writing papers

This is the primary method of making the results of one's work known to others.

"Publish or perish," a slogan often heard in academia, says quite clearly that you either learn to write and publish your results or you will practically perish from the scientific community.

Few people are born writers –writing is a skill that can be learned and the most effective way of learning it is by practice, i.e., by writing.

What do you need to learn?

5. Presentation in front of an audience

This is another way of presenting results, often very effective in soliciting people's initial interest.

You should present your work in front of your colleagues, school, or at an outside forum as often as possible.

What do you need to learn?

6. Obtaining funding

If you obtain a job in academia and often also in industry, you will be expected to secure funding for your projects.

You should complete basic training in preparing a successful application for funding.

What do you need to learn?

7. Reviewing/refereeing the work of others

Peer review is one of the basic mechanisms of science (used in: publications, grant applications, patent applications, legislation of standards) and every scientist will be, at some point, asked to judge the work of other scientists working in the same field.

Reviewing each others' is an excellent preparation for future peer-review processes.

In addition, constructive criticism benefits the authors and improves the quality of our work.

What do you need to learn?

8. Teaching

Exposure to teaching is important for future job hunts but it also helps in mastering the material, providing confidence in public speaking and mentoring.

What do you need to learn?

9. Guiding students, running a lab, managing projects

These skills will be necessary once you advance in your career, so it is useful to practice some of these here.

You should guide your junior colleagues and manage smaller projects, usually sub-projects of your own work.

Get involved in running the lab of your supervisor.

What do you need to learn?

10. Creativity

Being creative is more important than being smart.

How can we learn to be creative?

How can we enhance our creativity?

What do you need to learn?

11. Information finding

What used to be called “library work” ☺.

What do you need to learn?

12. Career planning

"If you don't know where you are going, how will you know that you got there?"

Career planning consists of formulating long-term goals and strategic planning of how to achieve them.

What do you need to learn?

13. Interacting with people and networking

Science is rarely one man's work.
To be successful, you need to know how to interact with people and how each may benefit from such interactions.
It is important for an emerging scientist to find his or her place in the social structures built by the scientific enterprise, meet other people, talk about mutual interests, and collaborate.

What do you need to learn?

14. Marketing your skills: job hunt

Writing an effective curriculum vita, statement of research interests, and a cover letter, in addition to preparing a job talk, preparing for an interview, etc., are all important skills that can contribute to ultimate success of a scientist.

Each of these can and should be learned.

What do you need to learn?

15. Balancing your life between work and family

Success requires working hard, which has often negative effect on your personal and your family life.
To be truly successful and happy, you need to learn how to balance these two.

What do you need to learn?

16. Coping with stress

To preserve your sanity under pressure to perform, under frequent deadlines, you need to develop effective strategies for dealing with stress.

What do you need to learn?

17. Ethics in science

Science is, like most human activities, not free of problems involving ethics.
A scientist needs to be prepared to face ethical problems in his or her career.

Z http://pl.wikipedia.org/wiki/Doktor_(stopie%C5%84_naukowy):
Formalnie przewód doktorski jest zamykany przysięgą doktorską (w której treści zawarte jest przyrzeczenie poszukiwania prawdy i niesprzeniewierzania się zasadom etyki naukowej).
http://www.katedra.uksw.edu.pl/biblioteka/etyka_zawodowa.pdf
(Artur Andrzejuk, Uwagi na marginesie „Dobrych obyczajów w nauce", W *Zagadnienie etyki zawodowej*, Praca zbiorowa pod redakcją Artura Andrzejuka, Oficyna Wydawnicza NAVO, Warszawa 1998)
"Zródeł etyki pracowników naukowych szukać musimy na średniowiecznych uniwersytetach. Echem wyznawanych wtedy pogladów moralnych jest, kultywowana do dziś przysięga doktorska, w której nowo mianowany doktor obiecuje i przyrzeka, iż będzie wytrwale pracował i rozwijał nauki „nie dla brudnych zysków, ani dla zdobycia czczej sławy, lecz aby bardziej krzewić się mogła prawda i ażeby zabłysło jaśniej światło prawdy, od której zależy szczęście rodzaju ludzkiego".

What do you need to learn?

18. Appreciation for quality rather than quantity

Truly lasting success in academia can be built only on high-quality work and it takes a state of mind to appreciate the value of quality.

What do you need to learn?

1. How does science work?
2. What is research?
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Anything else ☺?

Mel Brooks, “History of the World,” Part I
http://www.youtube.com/watch?v=4TAtRCJIqnk

Concluding Remarks

Class materials

- AV materials (several lectures that I would like to share with you)
- Lectures/lecture notes
- Readings (will give you a list as we go)

What you probably have already ...

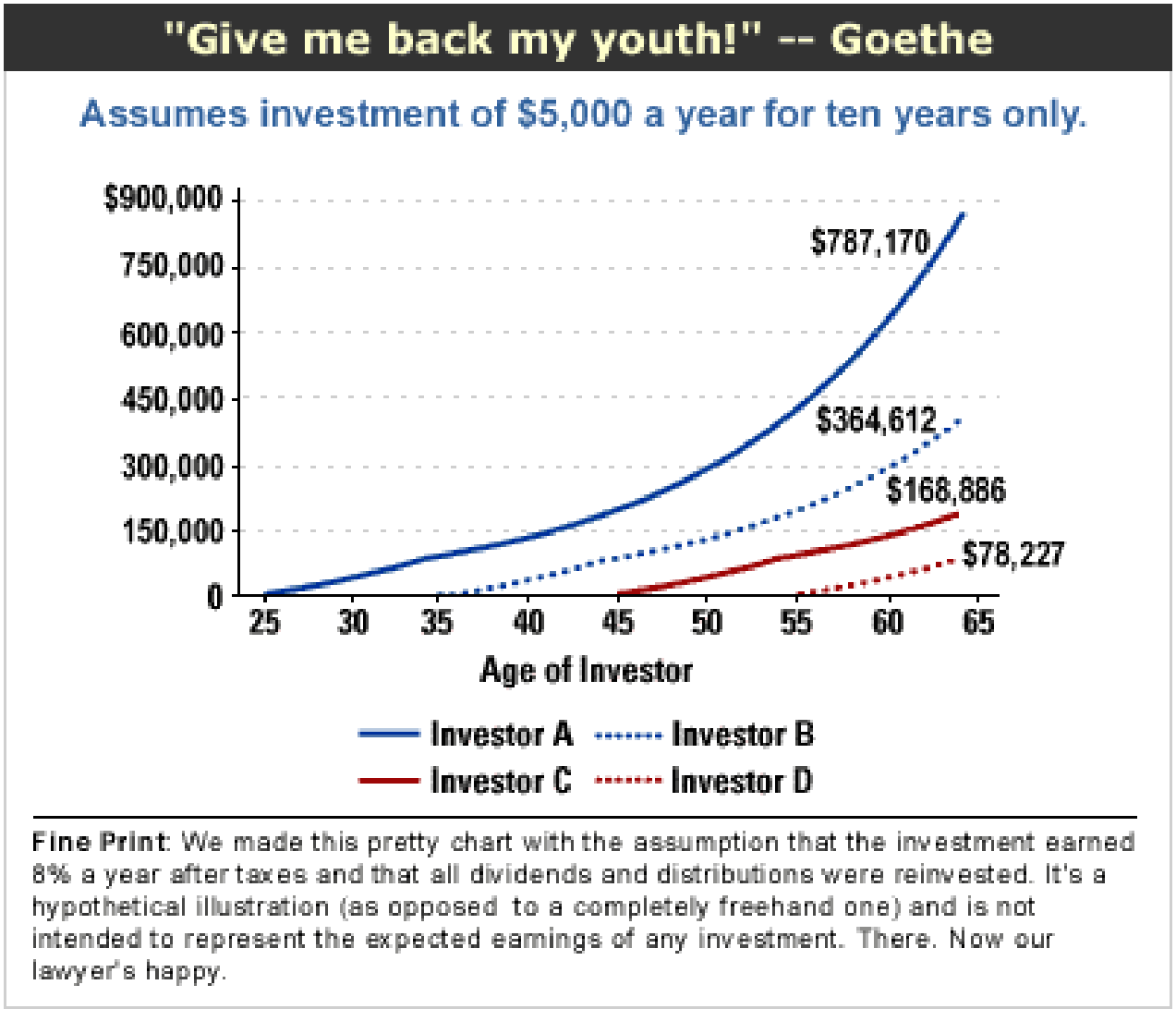
- You are smart.
- You are hard working.
- You have developed your own, quite likely successful, ways of dealing with the complexities of being a scientist.

What will you get out of this?

- Generally, as much as you put into it
- The true value of this seminar is in getting you to think seriously about your career.
- You will organize your knowledge of the most important, fundamental skills of a scientist.
- You may feel bored now and then, but ...
- If, during each of our meetings, you get one good idea that you will assimilate and use throughout your career, you will have made a great investment.
- Experience with teaching these skills shows consistently that they are priceless.

The value of investing early

- **Invest into your skills as soon as you can (and not later than now ☺).**
- **You will reap the fruits for the rest of your career!**



https://adventuresinmissingthepoint.wordpress.com/2009/01/11/investment-fractals-and-breaking-even/

What I will give you

- All that I know and that I believe to be worth passing to you (and anything else that you may be interested in).
- I will be the last to leave this auditorium.
- I will be glad to meet with you outside of the class.

What I expect from you

- Come to our meetings.
- Be active (ask, add, disagree).
- Help me to improve this seminar for the sake of your younger colleagues.
- Pass these skills to your younger colleagues.
- Relate the contents of this class to your professional career.
- Succeed and make our university famous!