

Wissenschaftliches Arbeiten (WIA)

Vorlesung – Hochschule Mannheim

What is Science?

Prof. Thomas Smits

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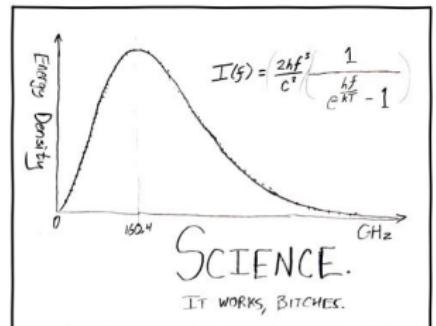


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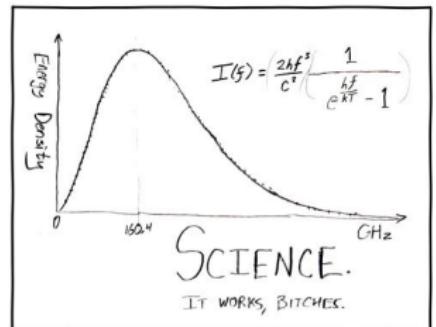
Objectives

Science. It works, Bitches

Science?

Scientific Method

Objectives





Key Questions

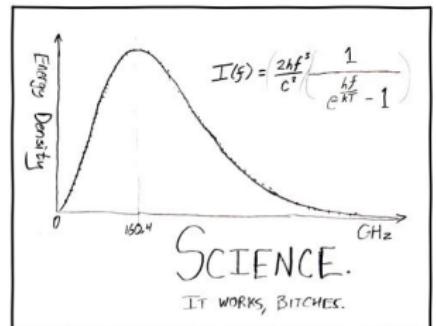
- ▶ Why should I attend this lecture?
- ▶ What is science?
- ▶ What is the scientific method?
- ▶ What is the special role of computer science?

Learning Objectives

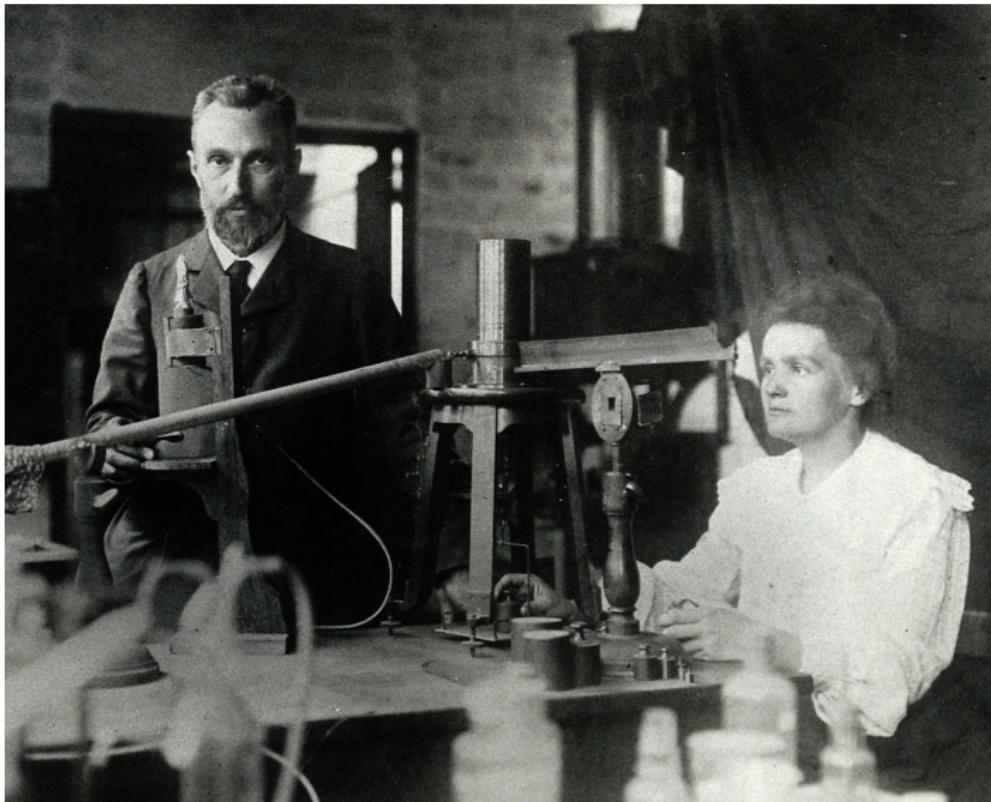


- ▶ Understand why research methods and scientific writing are important for each student
- ▶ Know what Richard Dawkins and Jesse Pinkman have to say about science
- ▶ Describe the different disciplines of science
- ▶ Define the term „scientific methods“
- ▶ Understand why research in computer science has some challenges regarding the „right“ method

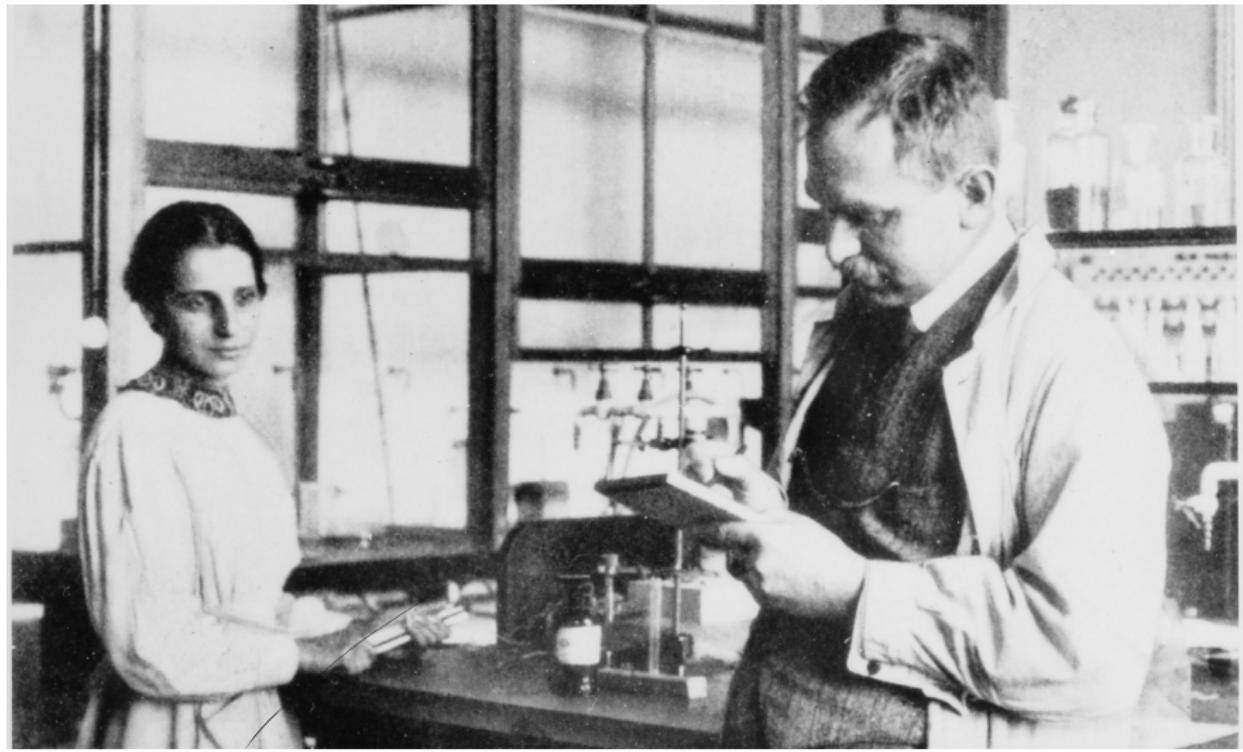
Science. It works, Bitches



Pierre and Marie Curie



Otto Hahn and Lise Meitner



Barbara Liskov



Walter White



Source: ACM, <http://www.amc.com/shows/breaking-bad>

You!



Source: Wikimedia Commons

Science?



Science?



Science?



DEBENT
IVS LAFIDIS IGNARI RES FERRE
VNICA CARI CERTA VILIS ET POST
RES SED SED DENIQ3 VBIQ3 OPERARI
CERTA VILIS SED RARI REPERTA
QUATVOR NVLLA INSERTA NATVRIS
RES EST TALIS MINERALIS QVALIS IN
REPERTIVR VBIQ3 NVBE PRINCIPALIS
LOCALIS.

Science?





rhinoBeam forte

"beamt" die Nase frei!
"beam" your nose clear!

**Biophotons
magnetic field
therapy**

**Energie für die Zellen
energy for the cells**

on

rhinoBeam forte

CE RB-01

The advertisement features a woman smiling while holding a rhinoBeam device near her nose. The device is white with a circular button labeled "on". A small inset image shows a close-up of a nose with a red beam of light emanating from it. The text "Energie für die Zellen" and "energy for the cells" is displayed at the bottom left.

Source: <http://brandigg.de>

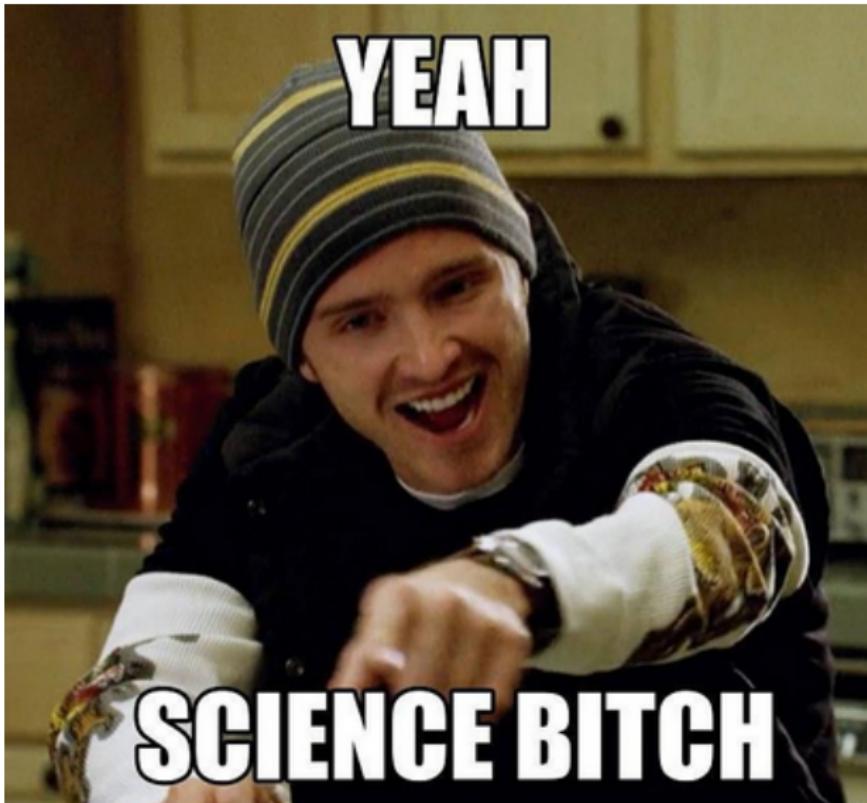


Electricity Saving Box

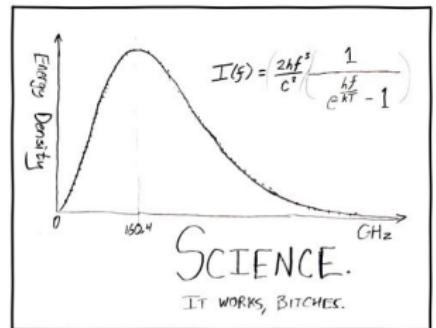


Source: <http://citykey.net>

Jesse Pinkman



Science?



Richard Dawkins



If you base medicine on science, you cure people. If you base the design of planes on science, they fly. If you base the design of rockets on science, they reach the moon. It works, bitches.

Richard Dawkins, born 26.3.1941, evolutionary biologist

What is Science?



What is your understanding of science?

What experiences do you have with science and the scientific method?

Can you give examples of scientific theories?

What is Science?



*Science (from Latin *scientia*, meaning „knowledge“) is a **systematic enterprise** that builds and organizes knowledge in the form of testable explanations and predictions about the universe. Contemporary science is typically subdivided into the **natural sciences**, which study the material universe; the **social sciences**, which study people and societies; and the **formal sciences**, which study logic and mathematics. The formal sciences are often excluded as they do not depend on empirical observations. Disciplines which use science, like engineering and medicine, may also be considered to be **applied sciences**.*

Wikipedia, „Science“



What is Science?

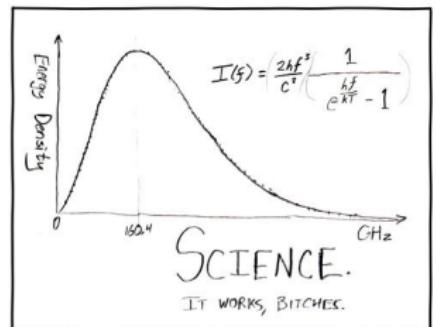
Science

- ▶ systematic enterprise
- ▶ testable explanations and predictions
- ▶ about the universe (aka everything)

Disciplines

- ▶ natural sciences (Physics, Chemistry, Biology, ...)
- ▶ social sciences (Psychology, Sociology, ...)
- ▶ formal sciences (Mathematics, ...)
- ▶ applied sciences (Engineering, Medicine, ...)

Scientific Method



Scientific Method



The scientific method is a body of techniques for investigating phenomena, acquiring new knowledge, or correcting and integrating previous knowledge. To be termed scientific, a method of inquiry is commonly based on empirical or measurable evidence subject to specific principles of reasoning.

Wikipedia, Scientific Method

We want to gain knowledge (not only beliefs) with a method that ensures our knowledge is as correct as possible

Scientific Methods



- ▶ A *method* is a type of approach using specific instruments to reach a certain goal
- ▶ A *scientific method* consists of
 - ▶ a system of rules
 - ▶ used by the acting persons
 - ▶ with an explicit description of the rules and terms
 - ▶ that allows to check whether or not the subjects applied and obeyed the rules
- ▶ Different Methods can have a hierarchical relationship



Why Should I care?

As a graduate

- ▶ you have to analyze problems and
- ▶ gather knowledge
- ▶ either as a researcher
- ▶ or as an employee

Working with the scientific method ensures that your results are sound and correct

What about Computer Science?



Computer science (CS) is a special case, because it studies an object

- ▶ it **created itself** (→ law)
- ▶ which is **purely men-made** (→ economics, law)

Computer science has ties to all the other sciences

- ▶ theoretical computer science and algorithms ⇒ formal science
 - ▶ technical computer science ⇒ applied science (electronics)
 - ▶ software engineering ⇒ social sciences
- ⇒ there is **not a single approach** to gain scientific knowledge in CS

Different Methods for Different Disciplines

