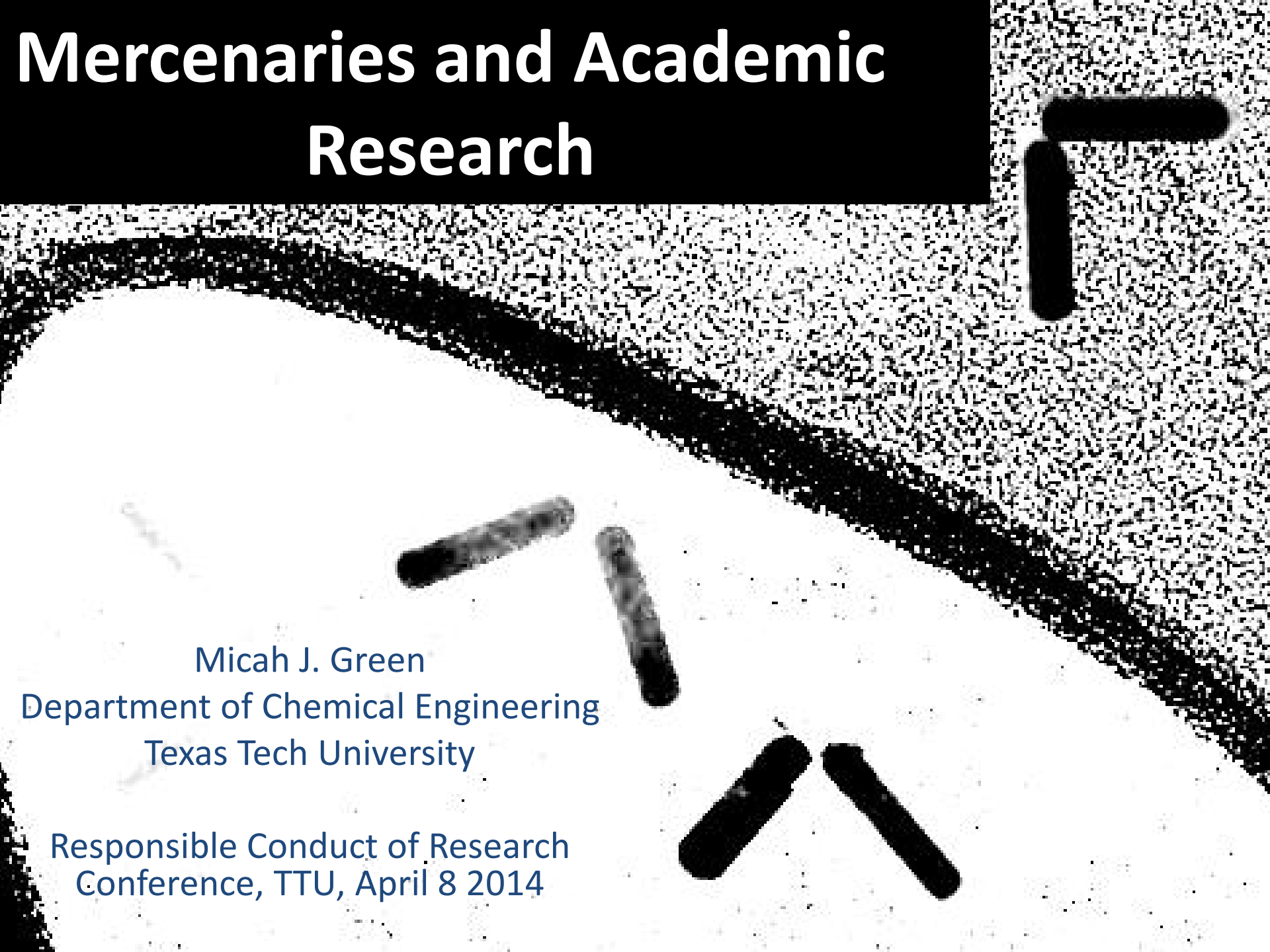
Mercenaries and Academic Research



Micah J. Green
Department of Chemical Engineering
Texas Tech University

Responsible Conduct of Research Conference, TTU, April 8 2014

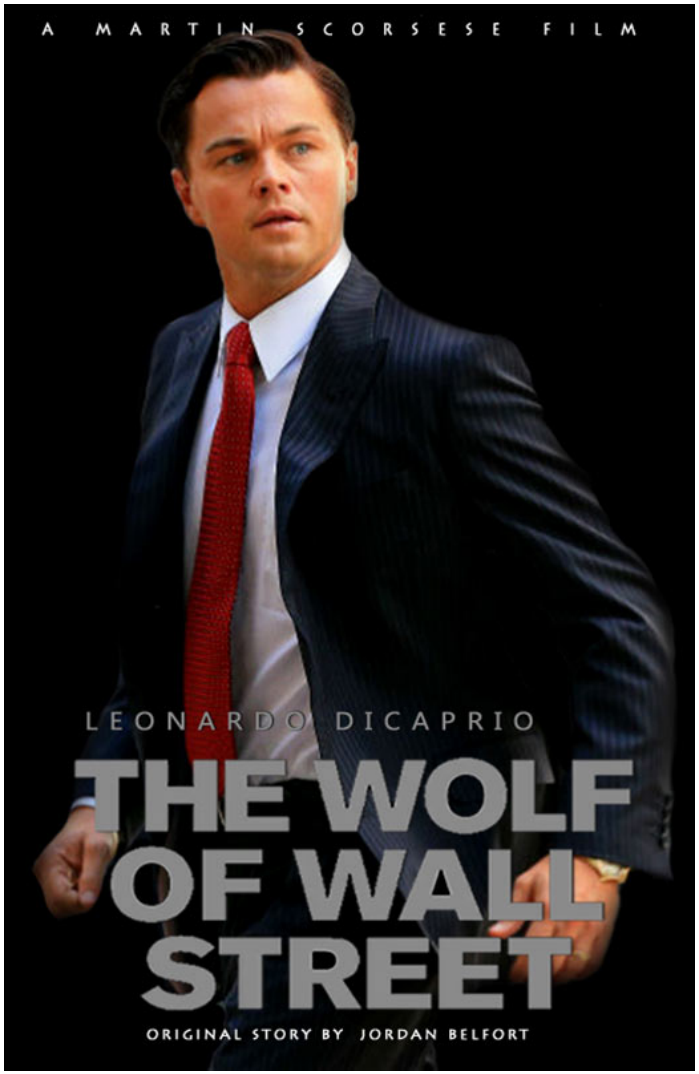
Why did you seek out a career in scientific research?

Imagine you're answering this question to an eager 12-year-old. How do you answer?

- Joy of discovery
- Wonder and awe at the natural world
- Love of learning
- Creativity and invention
- Helping people through science & technology
- It matches my strengths – I can make a difference!

Why did you seek out a career in scientific research?

- Fame!
- Money!
- Self promotion!
- Because the goals are self-centered, the means are up for grabs:
  - **<u>Mercenary</u>**



Ethics and Motivation

- Being motivated by something beyond yourself implies an ethic – There is a **good** (or something fundamentally **right**) to be pursued
- Mercenary – "primarily concerned with making money at the expense of ethics." Ethical obligations never rise above self promotion.
  - Everything becomes a means to the end of self
  - Ex: Marrying someone for their money

	Ethical Researcher	Mercenary
Motivation	Develop new & helpful technology for humanity	Fame! Money!
Circumstances	Should I misrepresent my data to make it more interesting and compelling?	
Decision	Of course not – that would defeat the point of advancing science and technology	Self promotion at all costs.

Our focus today: **Unethical behavior in published scientific research and why it happens**

- Plagiarism
- Data manipulation
- Image manipulation

Case #1: Busted by twitter….

Behnia, "Polarized light boosts valleytronics" Nature Nanotechnology 2012
"Electrons travel through a crystal as waves, which are described by a momentu
index). It i
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waves tha
their mom

See Arr Oh @SeeArrOh 08 Aug

Missed it? Potential Plagiarism in @NatureNano and @NatureMaterials: bit.ly/1ce6iEE #pmtweet #StillNoResponse

Nature Materials
@NatureMaterials

Follow

@SeeArrOh Thank you so much for this. We have taken notice, and we will act as soon as possible. @NatureNano

11:28 PM - 8 Aug 2013

2 RETWEETS 1 FAVORITE

Case #2: Busted by Reddit….

NANO LETTERS

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Nano Lett.

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Addition/Correction

Prev.

Chopstick Nanorods: Tuning the Angle between Pairs with High Yield

Rajasekhar Anumolu *, Benjamin J. Robinson , and Leonard F. Pease , III

Nano Lett., 2013, *13* (9), pp 4580-4580
DOI: 10.1021/nl400959z
Publication Date (Web): June 19, 2013

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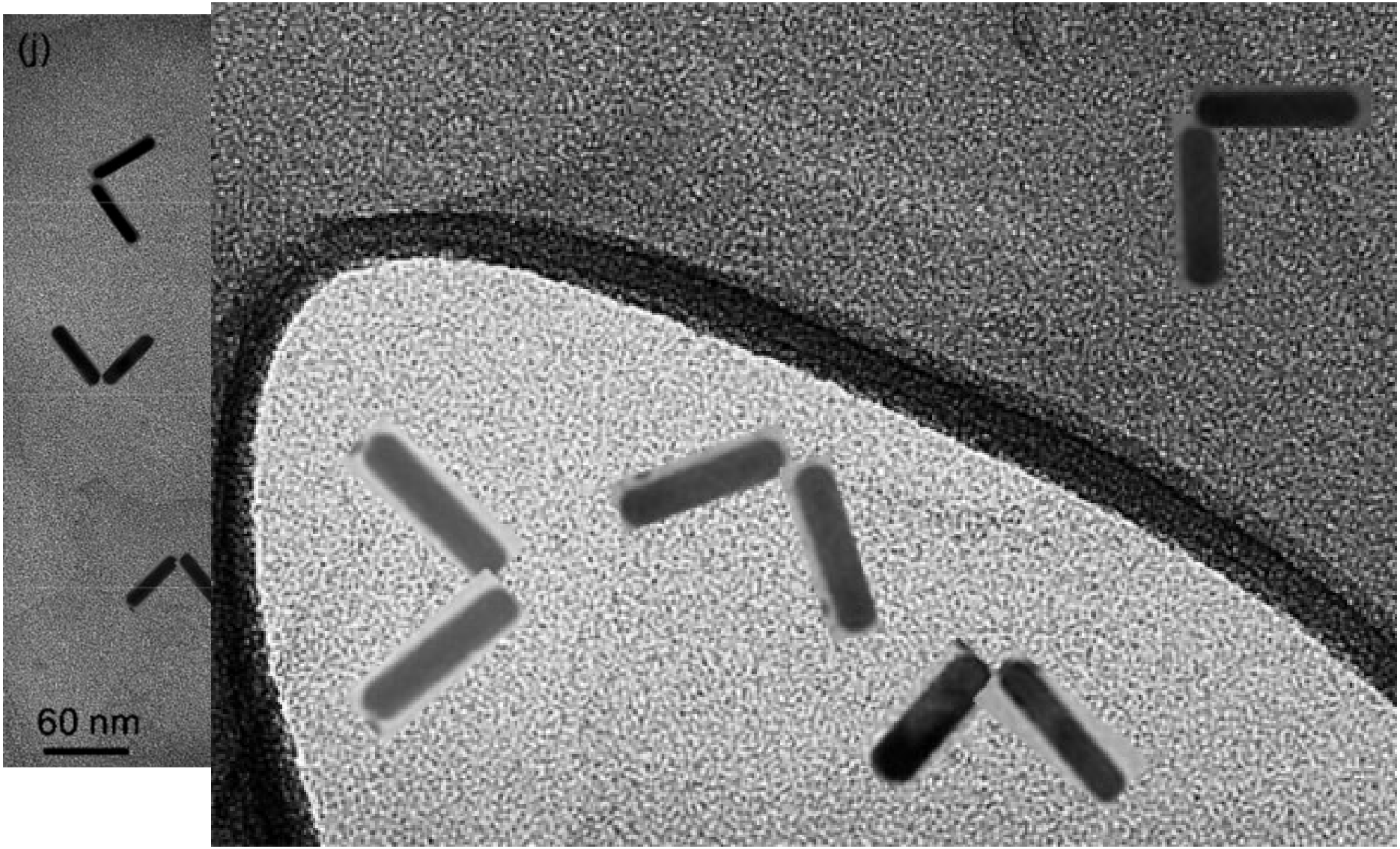
dd to ACS
hemWorx

Leonard Pease lab, University of Utah



reddit CHEMISTRY comments related

119

Alleged Data Manipulation in Nano Letters and ACS Nano from the Pease group (chemistry-blog.com)

submitted 7 months ago by mitchandre in vivo

43 comments share

all 43 comments

sorted by: best

[–] spookyjeff Inorganic 51 points 7 months ago

That is some impressively bad photoshop. Allegedly.

permalink

[–] FubarFreak Analytical 18 points 7 months ago

I'm going to go with MS paint

permalink parent

[–] bawbster Organic 13 points 7 months ago

Man, Chemists and MS Paint have a history. Q.E.D.

permalink parent

[–] [deleted] 7 months ago

[deleted]

[–] stop-chemistry-time Organic 4 points 7 months ago

TOC ROFL basically shows that scientists are having a bit of fun with their graphical abstracts. The id graphical abstract is to grab attention, and many seem to succeed with crazy images.

I also suspect there's a slight undercurrent of resistance against compulsory graphical abstracts, in so don't want to do a graphical abstract, so I'll make a stupid one".

permalink

[–] bawbster Organic 1 point 7 months ago

But can you *calculate* it?

Leonard Pease lab, University of Utah

- Pease also “informed [Chemistry Blog] that legal action might be pursued by the University of Utah if [he] published this story.”
- “Currently the majority of allegations of research misconduct in general are due to manipulated images”
  - Jeffrey Botkins, associate VPR, U of Utah

Case #3: Proofread the Supporting Information

ORGANOMETALLICS

Search

Search text

Organomet

Browse the Journal | Articles ASAP | Current Issue | Multimedia | Submission & Review

Prev.

Emma, please insert NMR data here! where are they? and for this compound, just make up an elemental analysis...

on

Publication Date (Web): July 12, 2013

*R.D.: tel, +61 8 6488 3161; fax, +61 8 6488 7330; e-mail, reto.dorta@uwa.edu.au.

Full Text HTML

Reference QuickView

Add to ACS ChemWorx

	Well-meaning Researcher
Motivation	Develop new & helpful technology for humanity
Circumstances	Get accepted into graduate program! Get papers! Get Ph.D.! Get tenure!
Decision	Cut corners? Fudge data? Manipulate images? Maybe I won’t get caught?

Unethical behavior is like the World’s Worst Casino!

75% Chance of winning!

The risk outweighs the reward

What kind of unethical behavior are we concerned about?

- Plagiarism
- Doctoring images
- The “1 out of 100” effect in microscopy images – omitting the ones that don’t help your case
  - SI can help!
- Unrealistic precision
- Reporting unrepeatable results

But what about those original motivations?

- Promoting discovery of the natural world through science
- Helping people through science & technology

But what about those original motivations?

- ~~Promoting discovery of the natural world through science~~
- ~~Helping people through science & technology~~

Spreading inaccuracy for the sake of self promotion delays and harms the scientific process.

Does the system bear any responsibility?

- Co-authors failing to check their colleagues
- PI putting pressure on graduate students, postdocs to produce
- Lack of insistence on proper lab notebook keeping; repeatability; transparency in methods
- Poor peer review
- Incentivizing the behavior

nature International weekly journal of science

Editorial

Nature **441**, 785-786 (15 June 2006) | doi:10.1038/441786a; Published online 14 June 2006

Cash-per-publication...

.....is an idea best avoided.

South Korea has become the latest country to offer scientists cash prizes for publications in top-level international journals (see page 792). Other nations, including China and Pakistan, already have such programmes in place. The thousands, or even tens of thousands, of dollars on offer can be a fat prize for researchers in countries with lean science budgets.

Many researchers will turn up their noses at this practice. Scientists, after all, are supposed to be motivated by curiosity, by a devotion to finding the truth, by a desire to solve various philosophical or social problems — not by money. And funds should find their way to self-motivated scientists with a project deemed important. This assessment should be made by taking account of the project's feasibility, originality and scientific significance.

But this is no easy task in any country. In countries with inexperienced or

CRACKED

6 Shocking Studies That Prove Science Is Totally Broken

By Andrew Marinus, Alan Boyle, Jon Pearl | January 16, 2014 | 954,279 views

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"To get tenure, funding, and maintain their prestigious positions, researchers are under constant pressure to publish their results in the best journals. Those journals want only important, interesting findings, which means that researchers have every motivation to find crazy cool things…"

Case #4: The Columbia Case

- Bengu Sezen
- Ph.D. Chemistry, Columbia University, 2005
  - (then Ph.D. Biology, Heidelberg)
- Advisor: Dalibor Sames

Case #4: The Columbia Case

C&EN
CHEMICAL & ENGINEERING NEWS

Reports Detail A Massive Case Of Fraud

Misconduct: Documents reveal Bengü Sezen's winding trail of deception

By William G. Schulz

Department: Science & Technology
Keywords: Research misconduct, scientific fraud, Bengu Sezen

Bizarre new details of the Bengü Sezen/Columbia University chemistry research fraud case are revealed in two lengthy reports obtained by C&EN last week from the Department of Health & Human Services. The documents—an investigative report from Columbia and HHS's subsequent oversight findings—show a massive and sustained effort by Sezen over the course of more than a decade to dope experiments, manipulate and falsify NMR and elemental analysis research data, and create fictitious people and organizations to vouch for the reproducibility of her results.

Sezen was found guilty of 21 counts of research misconduct by the federal Office of Research Integrity (ORI), which is housed at HHS, in late 2010 (C&EN, Dec. 6

"Columbia University has moved to revoke her Ph.D."

Effects on others

- Other students couldn't reproduce her results
- They complained to the advisor
- Sting operation: Her reactions only worked for others *if she knew they were trying to duplicate her work*

Her reaction tries to produce C:

$$A + B \rightarrow C$$

$$D + B \rightarrow C?$$

Effects on others

"Worse, the reports document the toll on other young colleagues of Sezen's: 'Members …expended considerable time attempting to reproduce Respondent's results. The Committee found that the wasted time and effort, and the onus of not being able to reproduce the work, had a severe negative impact on the graduate careers of three (3) of those students, two of whom….were asked to leave the [group] and one of whom decided to leave after her second year.'"

C&EN
CHEMICAL & ENGINEERING NEWS

The Role of the PI

"However, the evidence from the investigations of Bengü Sezen make it clear that [PI] Dalibor Sames had a problem on this front. In particular, at least three other trainees in the Sames lab brought their concerns about Sezen's work (and their inability to reproduce it) to Sames. Rather than take these concerns seriously, however, Sames *dismissed two of these trainees from his research group.*"

SCIENTIFIC AMERICAN™

Bioengineering

Asst.Prof.Dr. Bengü SEZEN

Department of Bioengineering

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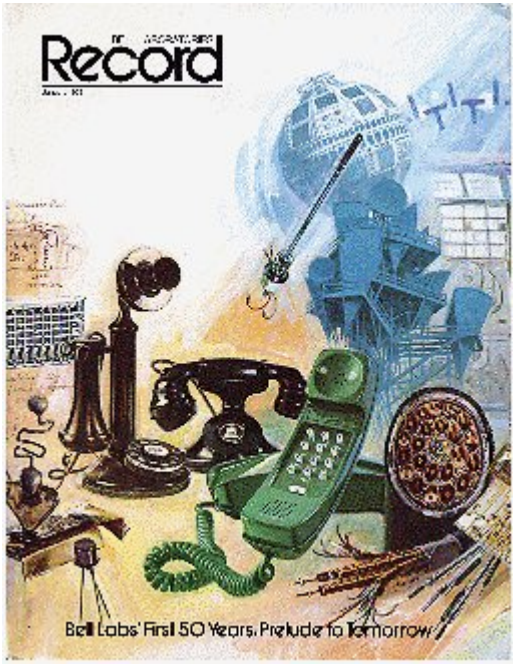
Case #5: Plastic Fantastic

- Jan Hendrik Schön
- Born 1970
- Ph.D. Physics, Konstanz, Germany, 1997
- Postdoc Bell Labs

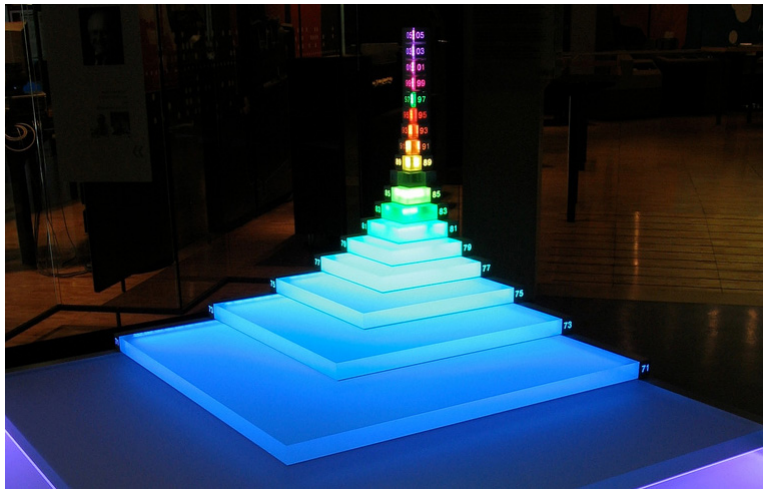
Bell Labs



- Fax
- Transistor
- Laser
- Photovoltaic solar cells
- UNIX
- C and C++ programming languages
- Wireless LAN
- 7 Nobel prizes

Jan Hendrik Schön's work

- Focus: Crystalline organic materials
  - Field Effect Transistor behavior
  - Key issue: Aluminum oxide coating
    - Done at Konstanz, not Bell Labs
  - First organic electrical laser
  - First-ever light-emitting transistor
  - Implications for beating Moore's Law

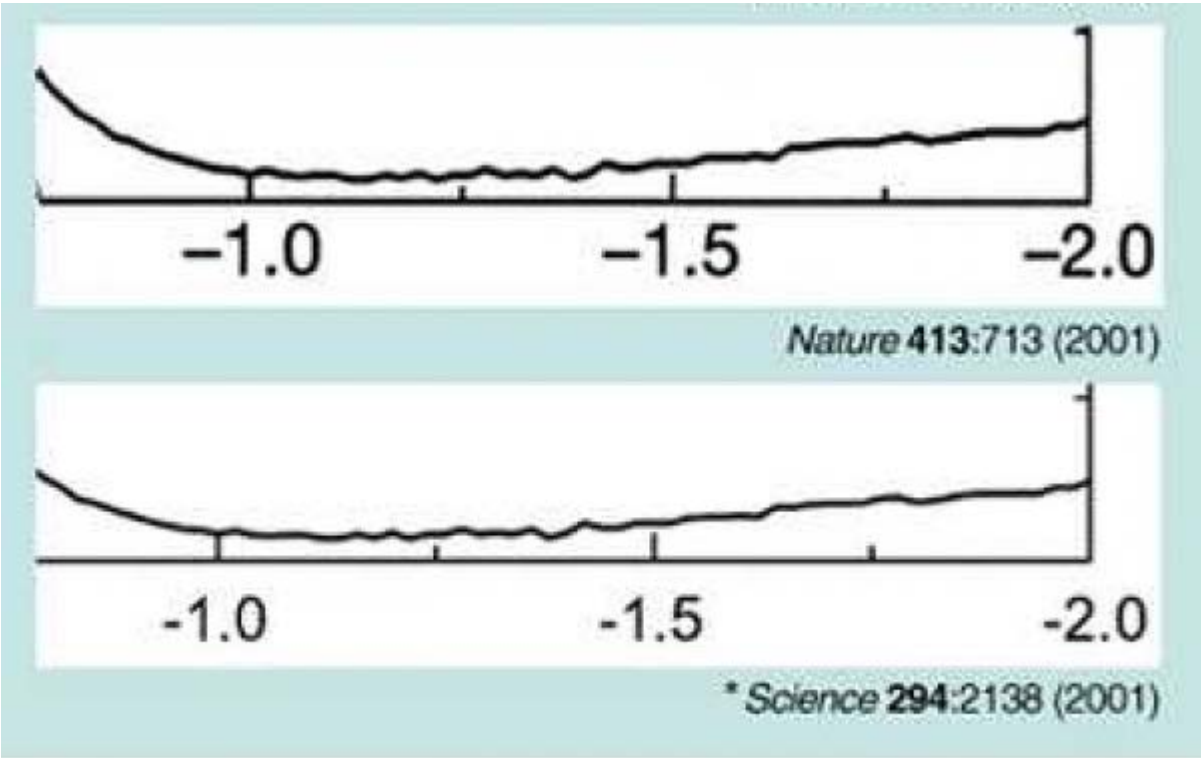


Jan Hendrik Schön's productivity

- 16 papers in *Science* and *Nature* in 2000-2001
- For 2001, he was listed as a co-author on a new publication **every 8 days** on average

Jan Hendrik Schön's problems

- Tons of honors, tons of citations but ….Data couldn't be experimentally duplicated
- Seemed he was trying to prove one thing but instead proved another; data kept defying theory
- Symmetric bell curve?! ("Messy data keeping!")



http://news.sciencemag.org/2002/05/pioneering-physics-studies-under-suspicion

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Willett

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Schön

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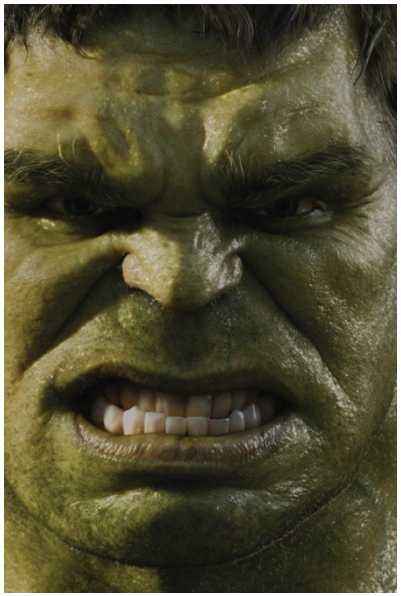
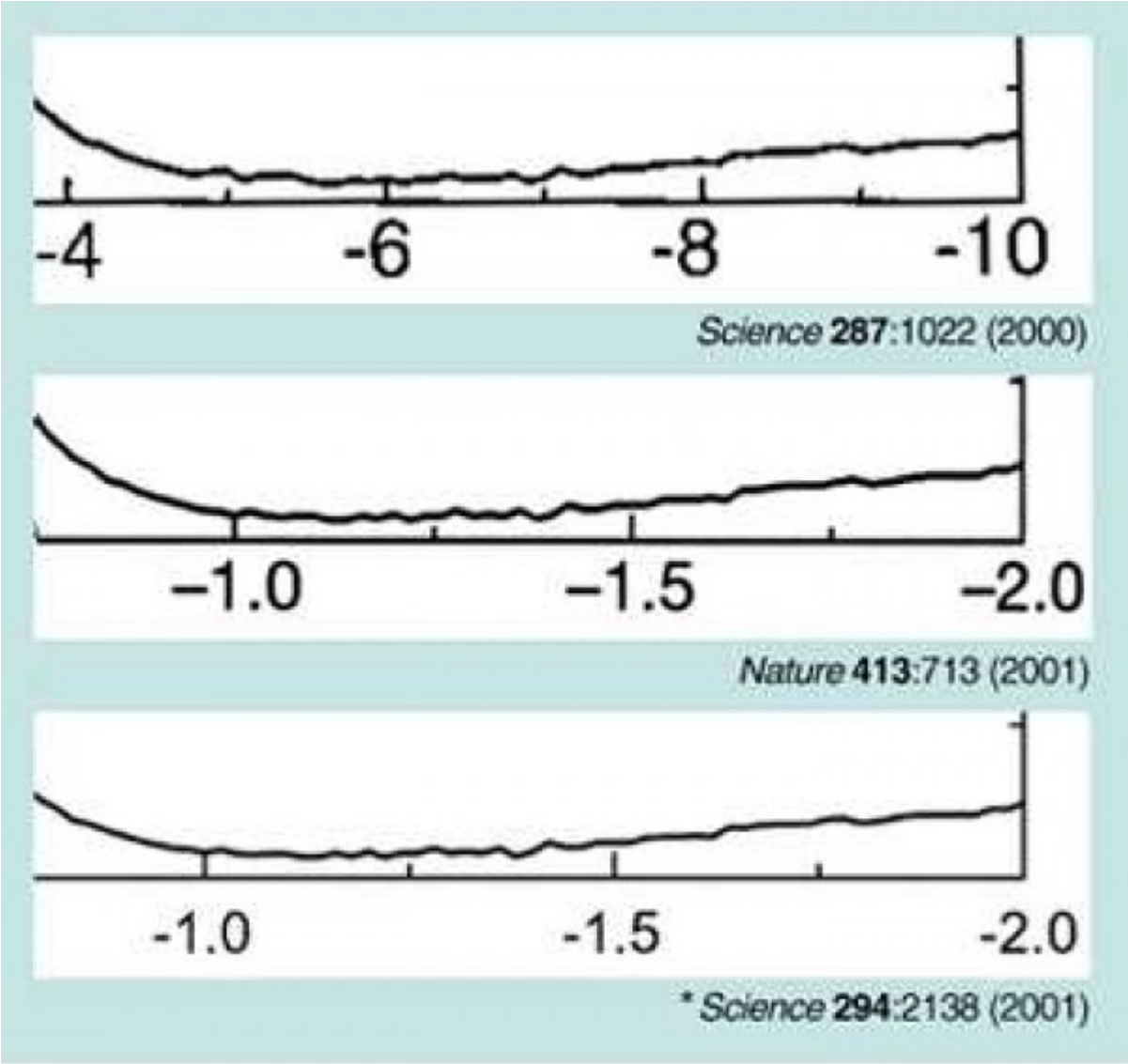




http://news.sciencemag.org/2002/05/pioneering-physics-studies-under-suspicion

Alcatel·Lucent

Bell Labs

nature

Science

The New York Times

Investigation and Fallout

- Bell Lab committee: Schön showed **"a reckless disregard for the sanctity of data in the value system of science."**
- Withdrawn – 9 papers from Science, 6 from Physical Review journals, 4 from Applied Physics Letters, 2 from Advanced Materials, 7 from Nature
- Concerns about 8 more.
- Where is he now?
- Despite the retractions, his papers are still cited even today.
- **Millions of dollars wasted unsuccessfully trying to duplicate his methods and results**
  - **Ruined others' postdocs and graduate careers**

PLASTIC FANTASTIC

HOW THE BIGGEST FRAUD

IN PHYSICS SHOOK THE SCIENTIFIC WORLD

EUGENIE SAMUEL REICH

So what do we make of Schön?

	Psychopath
Motivation	?????
Circumstances	Opportunity to make a splash
Decision	Unethical decisions everywhere, with no regard for the future or for others

	Schön
Motivation	Wants authority figures to think well of him
Circumstances	Hears authority figures express interest in certain theories and phenomena
Decision	Makes up data that matches/confirms what the authority figures want to hear

Why did you seek out a career in scientific research?

- To satisfy expectations of authority figures
- So that other people will think that I am smart
- I want to be good at something
- To have a foundation for my sense of worth and identity
- Applause

	You
Motivation	~~Develop new & helpful technology for humanity~~ Gain respect, applause from others
Circumstances	Should I misrepresent my data to make it more interesting and compelling?
Decision	Whatever it takes to make others (especially authority figures) think well of me

Points to take home

- Every one of us struggles with the mercenary mindset.
  - Mentally identify it and call it out!
  - Recognize how this mindset betrays science
- Don’t confuse symptoms of success for actual success
  - Mercenary mindset pursues only the symptoms, trying to “play the game” well

Points to take home

- Don’t use scholarly achievement primarily as a means to gain the approval of other people
  - Others can tell; it will undermine the contributions of your work and push toward unethical behavior

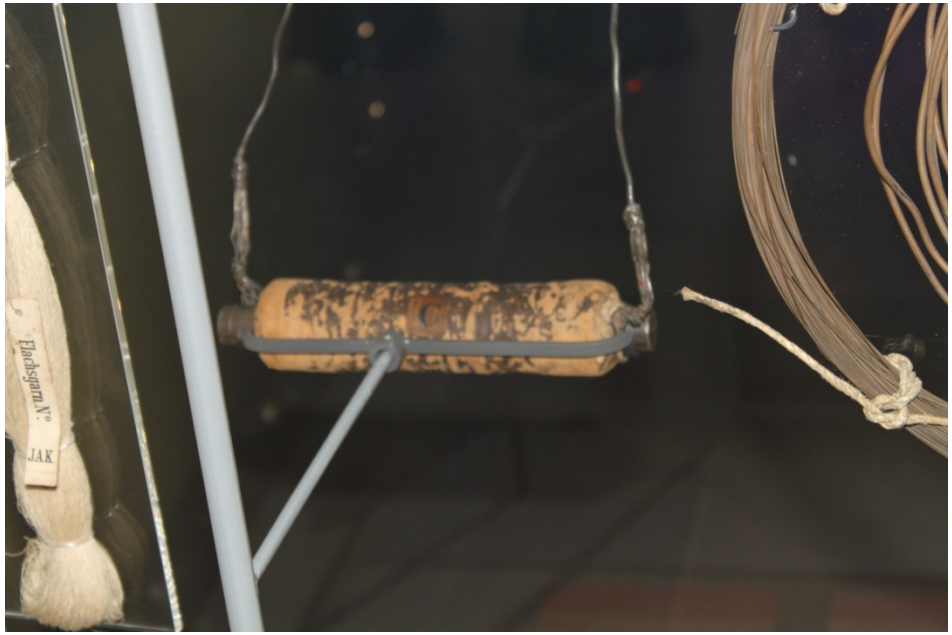
- Identify hollow rationalizations for unethical behavior

Points to take home

- Be careful of what you praise
  - What do you daydream about? The science itself? The discoveries? Or the accolades that accompany them.
- If you find you love the accolades more than the science, then rediscover those original motivations…

FARADAY MUSEUM, LONDON

1831



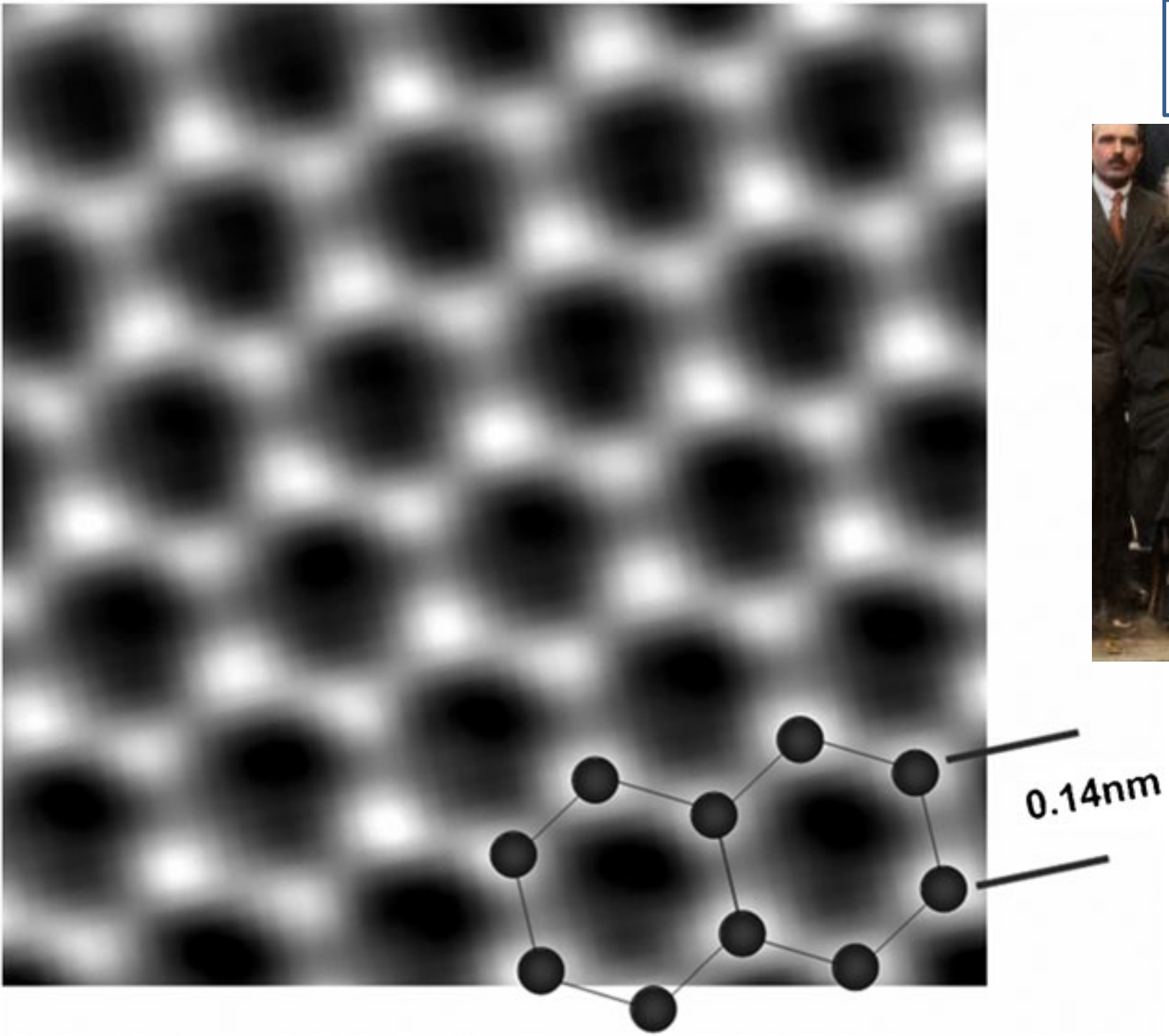
1814

Understanding our place in scientific history

- We are technologically advanced only because of the men and women who came before us.
- We are not smarter than them; we have opportunities to delve deeper because of the foundation they left for us.
- Our mercenary motivations (and rationalization) for unethical conduct seem small and foolish in light of the history of science

Parting thoughts

- We all struggle with a combination of excellent motivations and mercenary motivations.
- Mercenary motivations
  - no basis for ethical decisions
  - produce poor researchers
  - give no ultimate satisfaction
- Humility is the foundation for ethical researchers
  - You are a little player in the grand scheme of science that has found so much truth and done so much good for humanity
  - It is a privilege that you get to be a researcher in 2014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