



RESEARCH METHODOLOGY

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SCIENTIFIC FRAUD

- ❏ Scientific misconduct, as bad as plagiarism
- ❏ Usually big news, because claims are big
 - ❏ Fake data may be present in less important papers also, but few people notice
- ❏ More common in experimental fields than in theory
- ❏ Often caught by people trying to replicate results
- ❏ Sometimes by investigative teams
- ❏ Usual punishments: Retraction, loss of face, or worse

SUPERHEAVY ELEMENTS

- ☞ Elements 116 and 118 at LBL (1999)
- ☞ Published in Physical Review Letters 83, 1104 (1999)
- ☞ Creation by banging lead nuclei and krypton nuclei
- ☞ Other teams failed to replicate
- ☞ Reanalysis of original data could not find crucial evidence
- ☞ Conclusion: data fabricated

SUPERHEAVY ELEMENTS

- ❏ First author lost job; others retracted the paper
- ❏ Earlier works under suspicion but confirmed later
- ❏ None of his coauthors had a clue that their paper was fraudulent
- ❏ Led to formulation of stricter guidelines for coauthors
- ❏ Coauthors now have to take responsibility for published work
- ❏ APS called for expanded ethical training and oversight

MOLECULAR TRANSISTORS

- ☞ Jan Hendrik Schön, brilliant physicist, extraordinary student
- ☞ Joined Bell Labs after PhD, worked under Brian Batlogg
- ☞ Wrote an average of 1 paper every eight days in 2001
- ☞ Eight papers in Nature and Science in 2001
- ☞ Electrical properties of organic materials (incl. superconductivity)
- ☞ Discovery of a molecule size transistor (Nature, 2001)
- ☞ Thin layer of organic dye molecules used to create a transistor

MOLECULAR TRANSISTORS

- ☞ Received three major prizes in 2001-2
- ☞ His Al_2O_3 thin films were better than anyone else could make
- ☞ No one could replicate his experiments or transistor
- ☞ His data was too “clean” – the noise was not as expected
- ☞ Two experiments at different temperatures had identical noise
- ☞ A third experiment in another paper found to have the same noise
- ☞ Bell Labs set up a committee to investigate

MOLECULAR TRANSISTORS

- ❏ Committee wanted the raw data but was told it was not there
- ❏ Schön had kept no lab notebook
- ❏ Raw data files had been erased from the computer
- ❏ Samples had been thrown away or damaged beyond repair
- ❏ Committee's report listed several counts of scientific misconduct
- ❏ Even many graphs had been manufactured without data
- ❏ All responsibility was found to have been Schön's alone

NCBS RETRACTION (JULY, 2021)

- ❏ High impact journal (Nature Chemical Biology)
- ❏ Pictures had been duplicated to claim a big discovery
- ❏ PI showed original data, but that turned out to be photoshopped as well
- ❏ Evidence posted to pubpeer.com
- ❏ PI retracted paper claiming irreproducibility
- ❏ First author (student) dismissed (not true)
- ❏ Investigative committee blamed everything on that one student

The scientific community [...] bears a responsibility to expose fraudulent science. Unfortunately, debunking is time consuming and it adds little to your scientific resume. [...]

The success and integrity of science therefore rests on its culture of openness, by means of which errors are eventually exposed and corrected. Until they have been independently verified, results are regarded as tentative at best. Moreover, nothing is sacred; every claim is open to challenge. In such a culture fraud is difficult to sustain.

Robert L. Park
Fraud in Science
Social Research 74 (2008) 1135