Research Misconduct: RM=PF^2

Lab 6

AY 122 – Fall 2010

Lecture by Paul Kalas

November 23, 2010

Misconduct: Rare in astronomy?

(adapted from Broad & Wade 1994)

Hipparcos (~200 BC): Published star catalog taken from Babylonian sources as if it were the result of his own observations (*publication?*)
[Toomer, G.J. 1975, "Dictionary of Scientific Biography" (Charles Scribner's Sons, New York), p. 191]

C. Ptolemy (~200 AD): Claimed to have performed astronomical measurements that he did not.
[Newton, R. R. 1977, "The Crime of Claudius Ptolemy" (JHU Press, Baltimore)]

G. Galilei (~1600 AD): Exaggerated the outcome of experimental results.
[Koyre, A. 1968, "Metaphysics and Measurement: Essays in Scientific Revolution", (Harvard U. Press, Cambridge)]

I. Newton (1687-1713): Introduced fudge factors into his magnum opus so as to increase its apparent power of prediction (*intent?*).
[Westfall, R. S. 1973, "Newton and the fudge factor", *Science*, **179**, 751]

PF^2

- **Plagiarism**: "the appropriation of another person's ideas, processes, results or words without giving appropriate credit, including those obtained through confidential review of others' research proposals and manuscripts" [Federal Register, October 14, 1999]
  - Words and ideas?
  - Unnecessary to cite common knowledge [e.g. "gravity" (Newton)]
  - How should plagiarism be resolved? (apology?, retraction?, sanctions?)
  - Collegial solutions among peers, formal pathways otherwise.
  - Was it sloppy work, or intentional?
  - Why is plagiarism unethical? What are the wider consequences?

PF^2

- **Fabrication**: "making up data or results and recording or reporting them" [Federal Policy on Research Misconduct]

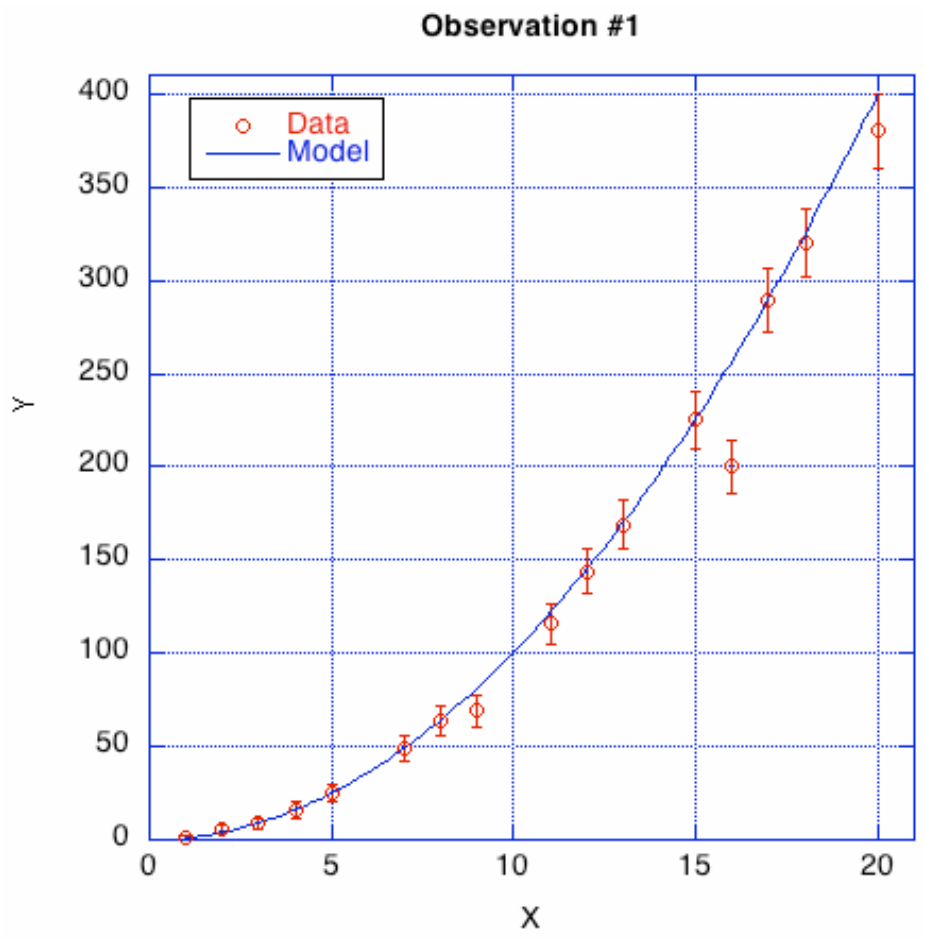
- **Falsification**: "manipulating research materials, equipment, or processes, or changing or omitting data or results such that the research is not accurately represented in the research record" [Federal Policy on Research Misconduct]

- How should F^2 be resolved? (apology?, retraction?, sanctions?)
- Was it sloppy work, or intentional?
- What happens if it is NOT federal research?
- Why is F^2 unethical? What are the wider consequences?

We are in a collaborative team, **3 subteams** complete **3 observations** that need to be included into a grant proposal that is due ***tomorrow***. The PI of the project tells everyone that the grant committee will be looking for any possible reason to ***reject*** a proposal. Without a winning grant proposal most of the team will lose their jobs in a few months.

Team A presents their result below, but cannot explain the discrepant point. The PI notes that the methodology will appear flawed if they indicate an "unknown source of error". Team B suggests that the point is removed.

How would they justify this action, and how would you argue against it?

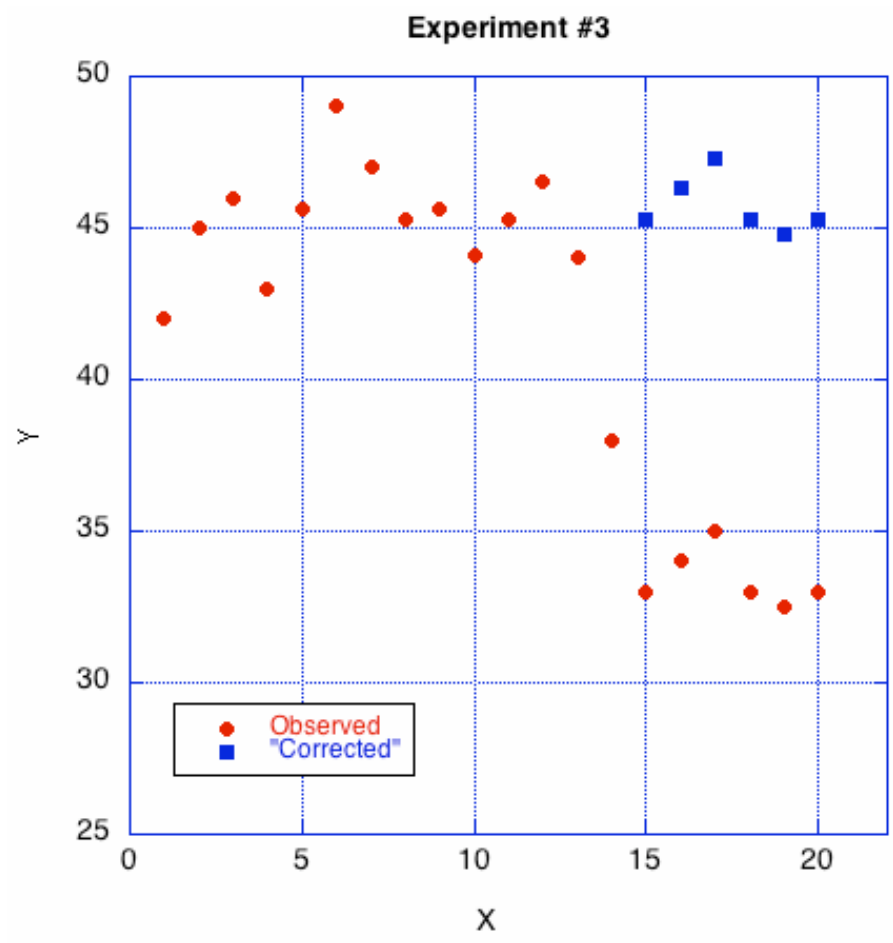


Team B presents the results from an observation performed identically three times over. They suggest that the second trial is so low that it is wrong, and in its place the team could report the average of the first and third trials. Is this falsification of fabrication?

Trial	Data	Suggested Value
#1	75.89	75.89
#2	23.33	74.33
#3	72.77	72.77

Team C presents their observations. The drop towards the final third of the experiment is consistent with a change in bias in the electronics of the detector. Since bias correction is, in general, a valid data reduction step, they suggest offsetting the curve upward by the median value of the previous points.

Is this “cooking” the data? Should they discuss this extra step in the proposal?



The PI instructs team A to send the plot with the discrepant point removed, team B to take the average value for trial #2, and team C to provide a plot with the "corrected" data.

After the meeting, student Arthur says to postdoc Lisa: "Dude, I can't believe we're just gonna make up some of this data." Lisa says, "Oh, the PI has good reasons. Think of it this way:

1. Fairness: Everybody else is doing it, fair for us to do it.
2. Benefit to science outweighs the cost, ends justify the means.
3. Fill in the blank....

Does this kind of stuff really happen?

The Economist

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Scientific misconduct

Monkey business?

Allegations of scientific misconduct at Harvard have academics up in arms

Aug 26th 2010 | from PRINT EDITION

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RARELY does it get much more ironic. Marc Hauser, a professor of psychology at Harvard who made his name probing the evolutionary origins of morality, is suspected of having committed the closest thing academia has to a deadly sin: cheating. It is not the first time the scientific world has been rocked by scandal. But the present furore, involving as it does a prestigious university and one of its star professors, will echo through common rooms and quadrangles far and wide.

Bubble Fusion Scandal

- Bubble fusion confirmed?

Evidence for Nuclear Emissions During Acoustic Cavitation

R. P. Taleyarkhan,[1]* C. D. West,[1]† J. S. Cho,[2] R. T. Lahey Jr.,[3] R. I. Nigmatulin,[4] R. C. Block[3]†

In cavitation experiments with deuterated acetone, tritium decay activity above background levels was detected. In addition, evidence for neutron emission near 2.5 million electron volts was also observed, as would be expected for deuterium-deuterium fusion. Control experiments with normal acetone did not result in tritium activity or neutron emissions. Hydrodynamic shock code simulations supported the observed data and indicated highly compressed, hot (10^6 to 10^7 kelvin) bubble implosion conditions, as required for nuclear fusion reactions.

2002, Science, 295, 1868

Nuclear Engineering and Design 235 (2005) 1317–1324

www.elsevier.com/l

Confirmatory experiments for nuclear emissions during acoustic cavitation

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Can it happen in astronomy?

The Lick-Carnegie Exoplanet Survey: A 3.1 $M_\oplus$ Planet in the Habitable Zone of the Nearby M3V Star Gliese 581

Steven S. Vogt[1], R. Paul Butler[2], E. J. Rivera[1], N. Haghighipour[3], Gregory W. Henry[4], and Michael H. Williamson[4]

Received _____; accepted _____

Can it happen in astronomy?

Planet discovery not confirmed by Swiss Group...

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THELAYSCIENTIST
MARTIN ROBBINS
HOSTED BY THE GUARDIAN

The Mystery of the Disappearing Planet

As humans peer into the galaxy in search of interstellar friends, media narratives fail to give a realistic picture of scientific progress.

Can it happen in astronomy?

Aliases of the first eccentric harmonic : Is GJ 581g a genuine planet candidate?

Guillem Anglada-Escudé[1]

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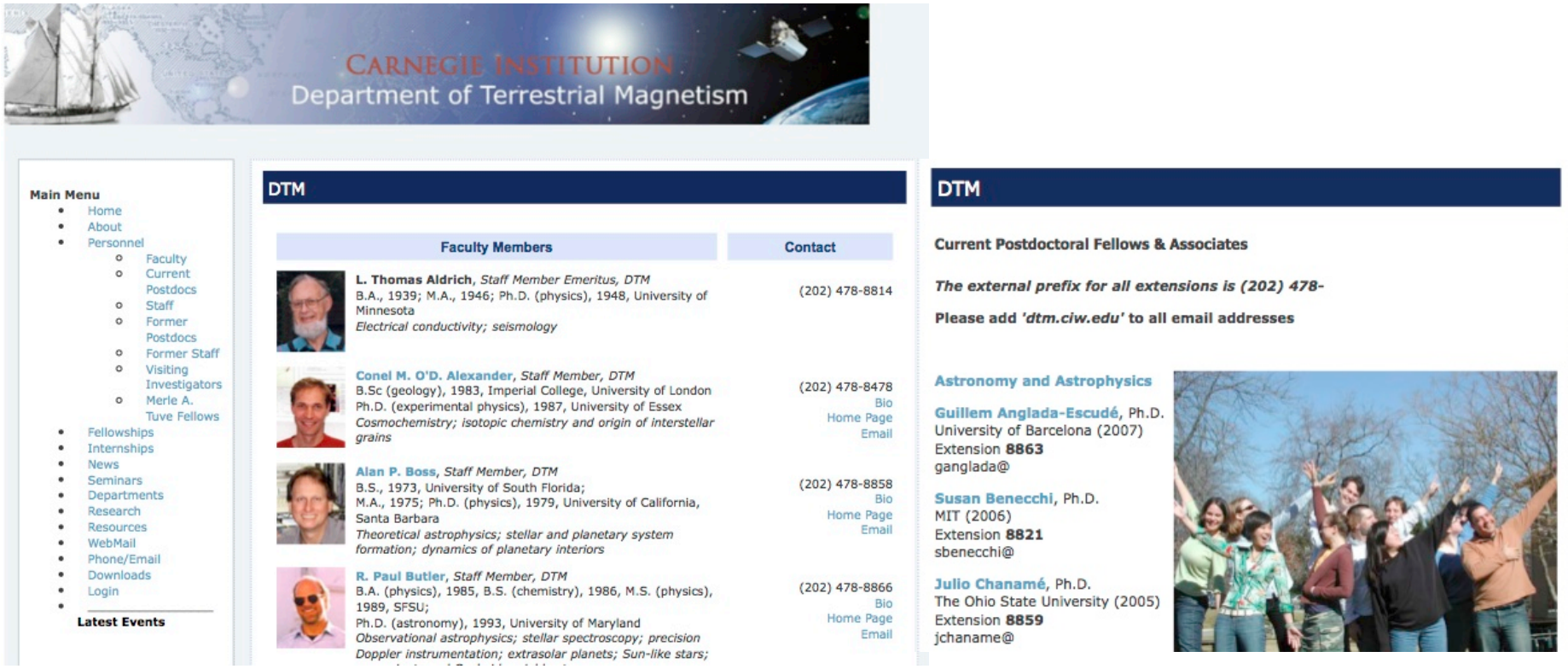
ABSTRACT

The radial velocity (RV) method to detect extrasolar planets has been the most successful to the date. The RV signal imprinted by a few Earth-mass planet around a cool star is at the limit of the typical single measurement uncertainty on state-of-the-art spectrographs. As a consequence, one has to rely on statistics to unearth signals buried below the noise. Observationally related issues such as unquantified systematic errors or artifacts introduced by the observing cadence can produce spurious signals. Also, they can mask genuine signals that should be easily detected otherwise. This is the case for the planetary system around the low mass star GJ 581 for which there has been recently announced a 3.1 Earth mass planet in its habitable zone. Even though it is a very stable star, the combination of the observing cadence and the presence of multiple planets has already caused a number of period misinterpretations in the past. We discuss here a particularly devious statistical degeneracy that derives from the aliasing of the first eccentric harmonic of an already detected planet with the characteristic one year sampling frequency. Such a degeneracy can prevent the detection of the true signal and correlate the eccentricities of known planets with the mass determinations of additional low amplitude companions. By performing a number of statistical tests, we conclude that even though the statistical degeneracy is clearly present, the existence of GJ 581g remains well suported by the available data.

Can it happen in astronomy?



What should be done?

Homework, due Dec. 7

- Read / skim the four articles on the Lab 6 web page concerning ethical conduct in research.

- Answer the following questions separately from your lab report (2 pages max):
  1. In the J.R. Minkel article (SciAm) there is an error concerning gravitational lensing in the 5th paragraph (beginnning with the word "If"). What is the error? Explain.

  2. Read Section V of Dyson et al. 1920. What is the stellar displacement measured with the 4-inch lens at Sobral? Look at the "probable error", and then write down your opinion on how well the observation matches the prediction of Einstein.

  3. In Section V of Dyson et al. 1920 you will find a figure. Explain in words what it shows (explain the axes, the points, the lines) and what is missing.