

# Misconduct in research: who is responsible for what?

Philip Campbell

Editor-in-Chief, *Nature*

*Governance of good research conduct in UK*

Keele University 15 April 2008

# Responsibilities

The cases of Jan Hendrik Schön and Hwang Woo Suk highlight the responsibilities of authors, journal editors, journal referees, researcher employers, funding agencies and the media in relation to fraud.

And the lack of clarity about those responsibilities.

# Jan Hendrik Schön



# Jan Hendrik Schön

- In 2001, Schön published a claim that he had used organic dye molecules to produce an organic transistor.
- Such molecular-scale devices could reduce the scale of electronic devices beyond the limits of Moore's law, and costs too.
- In 2001, he was listed as an author on an average of one research paper every eight days.
- Soon after publication, physicists noticed that data seemed too perfect, and also that experiments at very different temperatures had identical noise. Then, those data were duplicated.
- 25 papers by Schön and 20 co-authors were suspect.

# Jan Hendrik Schön

(from Wikipedia)

- In May, 2002, Bell Labs appointed Professor [Malcolm Beasley](#) of [Stanford University](#) to chair a committee to investigate possible [scientific fraud](#).
- Gave the group full freedom and authority to conduct an objective review of the challenged research, to determine the scope of the inquiry, to interview any Lucent employees, and to review lab records, reports of previous internal investigations and other documents.
- The committee sent questionnaires to all of Schön's coauthors, and interviewed his three principal coauthors (Zhenan Bao, Bertram Batlogg, and Christian Kloc). They examined electronic drafts of the disputed papers, which included processed numeric data.
- They requested copies of raw data but found that Schön had kept no laboratory notebooks. His raw data files had been erased from his computer. According to Schön, the files were erased because his computer had limited hard drive space. In addition, all of his experimental samples had been discarded or damaged beyond repair.

# Jan Hendrik Schön

- 25 September 2002: Bell Labs announced the findings of the Beasley committee.
- In its report, the committee concluded that one member of these teams, Jan Hendrik Schön, had engaged in scientific misconduct by falsifying and fabricating experimental data between 1998 and 2001.
- The committee cleared all the other researchers who had contributed to the experiments, and who were co-authors on several published papers, of any scientific misconduct.
- Committee raised issues for discussion about responsibilities of co-authors of papers.

# Jan Hendrik Schön: co-authors

- From Beasley report:  
<http://publish.aps.org/reports/lucentrep.pdf>
- “No formal statement of co-authors’ responsibilities exists, at least in US official sites.”
- “All collaborators share *some* degree of responsibility for the *entirety* of any paper of which they are co-author”
- “The *relative* responsibility among co-authors will vary. For example, the nature of the expertise, the centrality of individual contributions, and evident leadership roles inevitably and appropriately play a role in determining both the degree of responsibility, and the relative responsibility for different aspects of a paper.”

# Jan Hendrik Schön: co-authors

(Beasley continued)

- Collaborative research requires a high level of trust among the participants.
- However, such trust must be balanced with a responsibility to ensure the veracity of all results.
- Shared credit for the accomplishment must be matched with shared responsibility.

# Jan Hendrik Schön: *Nature* editorial

3 Oct 2002

- The report reaches no conclusions about the role of the journals, including *Nature*, *Science* and *Applied Physics Letters*.
- *Nature*'s editors have looked at their files, including the timing and the state of the concurrent literature, and the scatter of Schön's research across different types of material.
- *Nature*'s peer-review processes have picked up fraud on occasion, and if a referee of Schön's *Nature* submissions had looked at papers on different materials, he or she might have spotted the duplications in data that, in the end, were the smoking gun. But that would have been by luck, rather than by reasonable expectation.

# Brief diversion: editorial responsibilities in peer review

- Truism: editors carry responsibility for the oversight of integrity of selection process
- (We are investigating text-plagiarism checks of manuscripts.)
- Fact: referees can misbehave. In some fields, research is very easily replicated and false credit obtained. We allow authors to suggest competitors to be avoided as referees, and keep close contact with communities.
- Fact: editors can become involved in very detailed negotiations in allegations of author misconduct/error, after publication.
- That may lead to an open exchange, a correction, a retraction, and/or an editorial highlighting unacceptable behaviour.

# Jan Hendrik Schön

- Six papers retracted in *Science*
- Seven papers retracted in *Nature*
- Six papers retracted by American Physical Society journals

# Jan Hendrik Schön: sanctions

- Fired by Lucent
- Banned by DFG in 2004 for eight years from funding and participation in DFG activities.
- PhD withdrawn by University of Konstanz in 2004, now under appeal.

# Hwang Woo Suk



# Hwang Woo Suk

- Professor of biotechnology at Seoul National University.
- Best known for two articles published in *Science* in 2004 and 2005 where he reported to have succeeded in creating human embryonic stem cells by cloning.
- Both papers editorially retracted after being found to contain a large amount of fabricated data. He has admitted to various lies and frauds.

# Hwang Woo Suk: Nature response

- Mitochondrial DNA from the cloned animal should differ from that of the nuclear donor, providing a straightforward way of ruling out sample mishandling or outright fraud. We think it sensible from now on to ask authors to provide not only nuclear but also mitochondrial DNA fingerprints for all cloning papers submitted to *Nature*.
- It should be noted, however, that there may be confounding factors in interpreting such data. For instance, the mitochondrial contribution of the nuclear donor may vary depending on the species, on whether it is an interspecies hybrid, and on the nuclear-transfer technique used. In the case of papers reporting new embryonic stem-cell lines, nuclear DNA fingerprints of the lines should be presented for comparison with existing lines, to help rule out sample mishandling (intentional or accidental) or contamination with other cell lines.

# Hwang Woo Suk: Nature response

- **in the best interests of science, we encourage researchers embarking on landmark cloning studies to seek independent verification themselves, and to include a report of these findings in their initial submission. And keeping in mind the principle that extraordinary claims require extraordinary proof, *Nature* may in rare cases demand it.**
- we urge scientists embarking on what are likely to be landmark cloning studies to ensure that critical samples are properly stored for later verification. As part of this procedure, an independent scientist not involved in the study should obtain and store cells from the nuclear donor, oocyte donor and the resulting animal or stem-cell line (or oversee their deposition in a repository). This precaution is especially important in the case of human donors, where it may not be possible to go back to the subjects to obtain additional tissues for later verification.
- **Funding agencies should make granting dependent on procedures to ensure later verification of samples, and institutions should demand this for approval by the institutional review board.**

# Hwang Woo Suk: researchers' response

- First, all co-authors should indicate the scope of their involvement and declare their understanding of the data in, for example, an author contribution statement such as that recommended by *Nature* (<http://www.nature.com/nature/authors/gta>). Surprisingly, it seems clear in retrospect that many of the 26 authors on Hwang's report (*Science* 308, 1777–1783; 2005), could not have attested to the veracity of the human nuclear-transfer embryonic stem cells (ntESC) presented. A requirement for personal accountability might have encouraged greater communication between authors and uncovered the deception before publication.
- Second, all journals should, like *Nature* (<http://www.nature.com/nature/authors/policy>), require that all published reagents and cell lines be made available to other laboratories.
- Finally, peer reviewers should be encouraged to demand that authors provide clear and strong evidence that the data presented support the claims made — including the request for mitochondrial DNA fingerprints if appropriate.

# Author contributions statements

- All authors contributed extensively to the work presented in this paper.

- (Much more common)

S.C.W., P.R.J.B., P.v.W. and I.K.T developed the concept and designed experiments. S.C.W. and S.G. performed *P. infestans* transformations and plant inoculations. P.C.B. carried out confocal microscopy and advised on cell biology. S.C.W. performed GUS assays and light microscopy. A.O.A. and J.G.M. quantified gene expression. Antibody detection of tagged transformants was performed by I.H. and S.C. L.M., J.G.M., E.M.G. and M.R.A. carried out experiments with *P. atrosepticum*. L.P. conducted all bioinformatics analyses.

# Hwang Woo Suk: media responses

- Nature's David Cyranoski discovered and reported that lab researchers were donating eggs. There was no code to prohibit this, but Hwang denied it.
- South Korean media supported Hwang and reported accusations of jealousy because Science (our chief competitor) published the work.
- Accusation of fraud was an anonymous e-mail from a researcher to a TV show.
- After following it up and broadcasting, producers received death-threats.
- Anonymous postings alleging fraud appeared on websites.
- South Korean reporters who investigated came up across significant and widespread hostility from editors, politicians, advertisers etc.
- Only after Seoul National University published a report announcing that Hwang's work was fraudulent did the mood change.

# Aspects of cheating

- Scientific cheats get away with it through lack of checking by co-workers and a lack of insistence that transparent records be kept.
- Journals cannot detect most falsifications or fabrications
- Motivations of cheats are rarely revealed.
- Matt Beasley to PC: “we shouldn’t forget that science has its sociopaths too”.
- There is a widespread belief that cheating will be found out through failed replication by other scientists.
- But cheats aren’t necessarily crazy – they often seem to believe they are fabricating the right answer, perhaps in order to get the job done quicker.

# Reasons to be cheerful

- Authors are increasingly declaring their contributions
- Many institutions have implemented frameworks for discouraging misconduct.
- Despite worryingly widespread questionable behaviour, most has small scientific impact.
- Small minority of research results need retraction.
- The literature is stable over time, and major errors and frauds discovered quickly.
- Most people have pride and/or a conscience.
- Institutions are introducing archived e-notebooks – slowly!

# Reasons to be less than cheerful

- Image manipulation has never been more easy. (We spot-check for it.)
- Universities sometimes bury cases of misconduct.
- Journals can resist retractions, or can lack resources to investigate publication retrospectively.
- Authors' claims of 'carelessness' seem to be on the rise.
- Co-authors have a hard time living up to co-responsibilities. Should they identify authors who take particular responsibility for integrity?

# Responsibilities for misconduct in international collaborations

- Commentary, Christine Boesz & Nigel Lloyd, *Nature* **452**, 686-687 (10 April 2008)
- Chairs, OECD Co-ordinating Committee for Facilitating International Research Misconduct Investigations. Proposals:
- Central database for international policies
- **Memoranda of understanding for collaborations at outset (PC recommends this includes authorship rules or guidelines)**
- need to define misconduct, state who is in charge of investigations (and the procedures they will follow), detail how information will be shared during investigations, and specify how confidentiality will be assured.
- Subgroups will report their preliminary results at the next expert-group meeting in Paris on 21–22 April 2008. Hope to reach agreement on the major issues and plan out the remaining work. By the end of 2008, the committee aims to publish a practical manual on how to approach misconduct cases in international research collaborations, and a directory of who to call in each country.

**Who is accountable? How the responsibilities of co-authors for a scientific paper's integrity could be made more explicit.**

Editorial, *Nature* 450, 1 (1 November 2007)

- It is too glib to state that every co-author of a paper shares full responsibility for its content. A researcher who specializes in the radioactive dating of rock strata cannot necessarily be expected to vouch for a palaeontologist's analysis of fossils within them — especially if the work has been carried out in labs on different continents.

# Who is accountable? How the responsibilities of co-authors for a scientific paper's integrity could be made more explicit.

Editorial, *Nature* 450, 1 (1 November 2007)

- We suggest that journals should require that every manuscript has at least one author per collaborating research group who will go on record in a way that collectively vouches for the paper's standards. Each would sign a statement with reference to *Nature's* publication policies (see [http://www.nature.com/authors/editorial\\_policies/index.html](http://www.nature.com/authors/editorial_policies/index.html)) as follows:
- "I have ensured that every author in my research group has seen and approved this manuscript. The data that are presented in the figures and tables were reviewed in raw form, the analysis and statistics applied are appropriate and the figures are accurate representations of the data. Any manipulations of images conform to *Nature's* guidelines. All journal policies on materials and data sharing, ethical treatment of research subjects, conflicts of interest, biosecurity etc. have been adhered to. I have confidence that all of the conclusions presented are based on accurate extrapolations from the data collected for this study and that my colleagues listed as co-authors have contributed and deserve the designation 'author'."
- Principal investigators traditionally bask in the glory of a well-received paper. We are proposing now that they willingly open themselves to sanctions that could be brought to bear should the paper turn out to have major problems.

# Responses to editorial

- Amongst the 18 responses, 6 came out against, 2 for the proposal.
- Against: 'pointless box-ticking that would make no difference and reduce, not raise, public trust'.
- Worthy suggestions about education and training.
- Concerns about honorary authorship, eg in situations where head of lab is required to be involved formally but has no knowledge of the work.

# Responses to editorial

- Positive suggestion: researchers should share lab data through open e-notebooks  
[Question: who owns lab notes?!]
- Positive suggestion: editors must ensure that all co-authors are copied in at all stages of the process.  
Rationale: co-authors may not be aware of paper submission and transactions in their name.  
Practical consideration: average number of co-authors 6, max number >100
- We now communicate accept letter to all authors

# Nature-journal actions to come

- No box-ticking
- Guide to Authors to include enhanced wording about co-author responsibilities, and that submission implies signing up to those principles
- Prompt to read the guidance from manuscript submission system.
- Authors contribution statements to be mandatory

**Comments and  
suggestions  
welcome!**

**[p.campbell@nature.com](mailto:p.campbell@nature.com)**