

# Murder on the New Jersey Express

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Many physicists have been very disturbed by the fabrication of scientific data at Lucent's Bell Laboratories. The fabrication was confirmed by the Beasley panel, commissioned by Lucent<sup>1</sup>. This kind of fraud is the scientific equivalent of murder, and perhaps it should be described within the metaphor of the detective novel. In this case, perhaps the most relevant model is the Agatha Christie story "Murder on the Orient Express".<sup>2</sup> A murder is committed on an isolated, snowbound train containing a dozen or more suspects. The great detective, Hercule Peroit happens to be aboard. The head of the railway asks him to investigate.

The Beasley commission was brought in by Lucent's management after they had been alerted by outsiders. It had been clear for some time that there were difficulties with reproducing some of the lab's organic material studies. These papers reported remarkable, beautiful conclusions related to the applications of organic materials which might be fashioned into important tools for nanotechnology. The commission was called because of evidence of data fabrication. Identical curves appeared in papers describing different experiments. After a careful investigation of the relevant Bell-lab science the commission came to a sharp conclusion: Dr. Jon Hendrik Schön, acting alone, fabricated the data in at least sixteen scientific papers. To support his papers, Dr. Schön could supply no lab books, nor original data, nor samples, nor computer records. Nothing.

Before proceeding further, we might wish to ask about the seriousness of this event. Could this fabrication be viewed as a "victimless" crime with no worse effect than to distort the pattern of scientific spending of a large corporate laboratory. As it turns out, there are additional victims. Schön has been fired. His supervisor and frequent coauthor, Professor Betram Batlogg, has been left in a kind of limbo by the Beasley report: neither

indicted nor exonerated. Both authors might have hoped for a Nobel prize as the outcome of their joint work. This is not to be. Many different laboratories contain disappointed scientists who unsuccessfully worked to reproduce the experiments, to explain them theoretically, and to build upon them. Many person-years of scientific effort have been wasted.

But the effects extend further. The entire system of data deposition and archiving at Bell has been shown to fail. The reputation of the laboratory, scientists and managers, has suffered. People are worried about the possible closure of the entire scientific effort.

The effects will extend beyond Bell. Accounts of scientific outcomes have been discredited in much the same sense as corporate accounting. Despite the misbehavior of corporations, our society needs telephone, energy, and investment companies. However, the society does not in equal measure need research in the physical sciences. This awful event occurred precisely because Bell Labs was in decline as its parent corporation, along with others, decided that research in physical sciences was a luxury. We might expect a large cutback of funding for our kinds of research as a result of this affair. Many more people than Schön will find themselves without jobs.

Beyond that, many of us feel that this violation of our ideals cheapens the entire scientific calling.

Now that we have explored the results of the crime, let us further follow the detective story analogy. Let us ask about motive. Who would benefit from the successful perpetration of this fraud? The authors of the papers might have expected to reap rewards from this important contribution to science and technology. Other scientists and management at Bell would benefit too. A success of this magnitude might help keep the laboratory alive, even in the teeth of a factor of forty reduction of the value of stock in the parent corporation. The rest of us in science? Us too. We have managed to keep our disciplines funded, to employ faculty, postdocs, and graduate students, on the basis of an implicit or explicit promise to deliver important items of technology. If they were real, the Schön “discoveries” would provide all of us with important arguments to support things we hold dear.

That takes care of motive. Imagine that great detective talks to each of us and tries to tease out the truth from the different stories we tell. All

who are seen to lie are suspects. Which of us has not argued for the importance of our own work or the work of our group or profession, and reached just a tiny bit beyond the demonstrably true? In my own area of condensed matter physics, we have cold fusion, sonoluminescence, the theory of high temperature superconductivity, and complexity theory--no one of which has yet fulfilled the high promises made for them. The more recent buzz-words: microfluidics, self-assembly, quantum computing, and nanotechnology, are now being sold as if they were promises rather than just possibilities. Journals, preprints, publicity releases, and public statements all put the promising features of any novelty onto their covers and abstracts. Editors, scientists, and publicity specialists then reserve the words of caution for the last paragraph or for a later publication. Crucial details which might enable people to check or reproduce published work often get left out entirely.

Another kind of lie is told by authors who fail to fulfill their responsibilities. People accept the title of "author" without being fully aware of all aspects of the work they have signed. This outcome is understandable when a junior author adds a specialized expertise to a larger work. This author could meet his or her responsibilities by asking that the introduction describe the different inputs of the various author. A senior author should lead the way in doing this, particularly since--without further comment--the scientific world should assume that the senior person takes responsibility for the entire work. He or she can then be expected to have done all the reasonable checks which will ensure that the paper has a proper chance of being right. Overenthusiastic people often seek to "improve" or "select" or "smooth" their data. Competitors are often not given due credit. Senior authors should see that all these kinds of lies do not occur. If the presence of any author only represents a vague connection with the work, perhaps indicating only administrative or fundraising responsibility, this author is taking the reading public for a ride. He or she then runs the grave risk of being in turn taken on a ride into scientific disgrace.

The last two paragraphs describe the lies which tempt us all: editors, authors, scientists, technical managers, grant administrators. If we succumb to the temptation to lie, we will not only excite the suspicion of the detective. We will be setting an example in which lies are the norm rather than an exception. We will help convince people that an adjustment

of the audit of our scientific work to make the bottom line look better is the expected behavior. Most of us are only given to little lies. But, even our little lies each contribute, just a little, to increase the probability of crimes like the one committed on the New Jersey express.

The great detective might notice that, despite these lapses, our community does maintain a deep and essential respect for truth, especially in the content rather than the form of science. Our methods do, after a while, strain out both fraud and scientific errors. The community outside of Bell has rejected the work of Schön in a timely fashion. Earlier the community also rejected the reports of cold fusion and the wilder interpretations of sonoluminescence. We can be mostly pleased with the action of our filters. After filtering, the remaining scientific material is a solid core of observation and theory which is, in the main, *true*. Since the art of the fictional detective is built upon the scientific sifting of evidence, Peroit might well feel respect for these essential goals and achievements of our profession.

In the book, Hercule Poirot carefully investigates the murder on the Orient Express, and “solves” it by offering two quite different explanations. In one, by far the most plausible, almost all of the possible suspects acted together to avenge an earlier crime and rid the world of an evil person. The other solution was that an outsider, acting alone, had appeared on the scene, done the murder, and disappeared into a snowdrift, leaving no tracks. Despite the glaring inconsistency in the latter story, the detective and his employer pick it as the one which they will present to the police and the world at large. So Poirot is not so committed to truth after all.

Now back to science. We live in the real world. We should not expect Peroit’s easy solutions. We cannot believe that this fraud results from a conspiracy of many equally guilty actors. Nor can a full explanation base itself upon the isolated action of a single wicked individual, coming from outside the system. But anyhow, solutions are for detective stories, not life. We cannot know what really happened. Instead of fruitlessly asking whodoneit, we should ask how our profession might get better outcomes in the future.

Certainly we need to define more precisely the norms of our profession. The little homily about authorship given above is a small essay in that direction. But no set of written words can replace the working of a healthy

society.

We can make our laboratories healthier and more supportive of truth by making them more open and having our scientific work be more of a cooperative endeavor. Each of us should encourage our colleagues to see us at work, and to share in and criticize that work. We should each share in our colleagues' activities. An atmosphere of constructive cooperation and constructive criticism should pervade our in-house seminars and all of our scientific contacts.

The output of our work is important too. Every scientific output should be, in the end, fully documented and reproducible. A lab with more open doors, open results, and shared goals will be at less risk from fraud and will produce outcomes closer to our idealized picture of science. Probably, as Robert Laughlin has suggested<sup>3</sup>, an open mode will not maximize the production of intellectual property. But this mode will be likely to produce something even more valuable: a correct description of the natural wor

1. See the Lucent web site:

[http://www.lucent.com/news\\_events/researchreview.html](http://www.lucent.com/news_events/researchreview.html).

2. William Collins Sons & Co., London 1934.

3. Robert Laughlin, December Physics Today, in press.