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## An Interview with Eugenie Samuel Reich

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Eugenie Reich was working as a journalist for *New Scientist* in September 2002 when Bell Laboratories released a remarkable report: Jan Hendrik Schön, a rising *wunderkind* at the laboratory, had apparently been fabricating the striking results he'd been publishing in materials science and nanotechnology. Schön's feats had brought him fame, promotions, prizes and prestige; now he would leave the field in disgrace, guilty of 16 charges of scientific misconduct.

Fascinated both by Schön and by the scale of his apparent deception, Reich left her job and dove into the story, interviewing 126 scientists and journal editors in her efforts to understand the nature of his misdeeds and their implications for the research enterprise. Her findings are published in *Plastic Fantastic: How the Biggest Fraud in Physics Shook the Scientific World* (Palgrave Macmillan, \$26.95).

*American Scientist Online* managing editor Greg Ross interviewed Reich by telephone in June 2009.

### Who is Schön, and what was the nature of the fraud?

At the time he was exposed as a fraudster, Jan Hendrik Schön was a 32-year-old German staff scientist working for Lucent Technologies at Bell Laboratories. The fraud had involved a number of breakthroughs in the area of organic and plastic electronics that involved making electronic devices out of materials related to plastic. Schön had supposedly built a large number of such devices and measured, among other things, transistor characteristics showing that they worked as effective electronic switches. But the report released in September 2002 showed that probably many of these devices had never even existed, and certainly they didn't work anything like he had said.



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### Do we know why he did this? How he expected to get away with it?

Well, Schön himself has not spoken in great detail about what happened, and his statement after the case came to light was basically that there had been a number of mistakes made in his work; the statement was very passive, and Schön didn't take responsibility. He didn't own up to deception on the scale on which it had happened. So this was a topic for my book, to try to discover how it had happened and how he had got involved in it. I believe I did find out why; I paint a picture of him as a basically very polite, amiable, almost well-meaning type of person who wanted very much to fit in with the demands of science. From the very beginning of his time as a scientist, even as a graduate student, he was in the habit of altering his data to fit in with other scientific literature and to conform to the hypotheses both of other scientists in the literature and of his own colleagues. So I think that's how he got into it, as an attempt to conform, which is not something you can do in science, because science is often full of conflict, and often your results won't look the way that they're expected to.

### Given that he hasn't been completely forthcoming about what he did, do we know, even today, the full extent of the deception?

By looking at his data, it's possible to map out how his fabrications became worse over time, because Schön did generate irregular data. He would do things like republish the same data but with changes made to it, so that by going through his papers in enough detail—and this is something that I entertained myself by doing—you can compare different publications with the same data set and see the fabrications or manipulations actually being introduced. And this is the type of forensic work that was started already by the investigation committee, because that's how they detected some of the examples of fabrication. So already they had made a start on establishing the extent of it, but they didn't look at his entire body of work. I did, and I convinced myself that he was already fudging and manipulating data during his time as a student. He probably was outright fabricating data within the first year of starting his postdoc at Bell Laboratories in 1998—so four years before he was exposed he was probably already fabricating data full-scale.

### It seems that one reason he was able to get away with this for so long is that he withheld his original data from his colleagues.

That's true. He shared the outcome of his analyses and he shared some data. In fact, if a colleague asked for data, Schön would produce data, often bewilderingly large amounts of it. The problem was that it wasn't real, and also it would be the product of an analysis or the results of his analysis that he would share, and not the unprocessed raw data in the form that had come off the instruments. And so they had a lot of tolerance for assuming that any processing he had done had been done correctly.

### He was publishing these results at the time, wasn't he? Why didn't the journal review process catch some of this?

Well, I did see the reviews for some of Schön's papers, and what I found was that they tended to be extremely positive, and very often Schön's results would fit well to the expected results for the field. In one case in particular he had mimicked results that were very well known in organic electronics by a pioneer in the field and translated it into the context you would expect for his devices. He had actually been quite clever in the way he had done this, so that it was a recognizably impressive result to people in the field of organic electronics, which these reviewers were, or in some cases in the field of superconductivity. They would recognize the form of the data as something you would definitely expect, and often it would be very beautiful data, because he had less noise to deal with than other scientists taking real data, because he was fabricating it to look very compelling. So I think the reviewers were seduced by the appearance of the data. Although they did ask a number of difficult questions, they didn't oppose publication.

### How then did the fraud finally come to light?

Schön actually slipped up in the end. He had always been republishing the same data sets in different papers. He had a quite impressive output—he sent 17

papers to *Nature* and *Science* over a four-year period. Those are the leading journals that most people would be happy to get one paper in in a year, and he was doing so much more than that. It came to light that he had duplicated data between different research papers when the context for the data would be different. So he was representing different experiments using exactly the same data sets. Some of the noise that he had introduced to make them look a little more realistic was identical, which was not something you would expect to happen in nature and was really a sign of human artifice. So when people noticed that for the first time in April 2002, it was really curtains for what he was doing. It was the end of the show, because there was no way that that could have happened by chance.

**It sounds like he was tripped up by his own carelessness. Do you have the impression that a really careful fraudster could get away with this?**

I definitely think a careful fraudster would go much further. Schön was really exposed because of some of his own carelessness. It was also a product of the way he was doing it, which was that he was always trying to show the textbook result. He just showed the textbook result too many times. So if he'd been a bit more meticulous, he'd have had to introduce more noise and maybe more outliers into his data to make them more realistic, and that would have slowed down his output and made his fraud possibly less damaging. I think that a more meticulous fraudster would have got a lot further, and I don't think they would have been exposed in the dramatic way that Schön was. Certainly there would have been problems with the reproducibility of his data, because that's not something that a fraudster would be able to second-guess, even someone who was very meticulous. But the reproducibility problems that did exist in Schön's data were not sufficient for him to be outed as a fraud; they simply led people to think that he must have a very clever method that he wasn't sharing with others. So I think things would have stalled in that situation for many months, and possibly years, longer than they did.

**Ostensibly science is designed to detect exactly this sort of thing. Has looking at Schön's story shaken your confidence in the scientific enterprise?**

It definitely shakes your confidence, because you worry that there are undetected frauds that could be using some of the same tricks, perhaps combined with other tricks that we don't know about, to get away with this. Although it came to light in the end, it only did so because a number of people took personal risks that we should hope scientists would not have to take in order for science to make progress. People really need to stick their necks out in order to make the self-correction process of science happen. It doesn't happen by itself.

**Where is he now? What's he doing today?**

The only time I spoke to Schön was in 2006, very briefly by phone, and he was working at an engineering company in southwest Germany, and I don't know what's happened to him since that time. He did get another job, not in science but in industry, after this. I was told that he got it through a colleague who had known him as a Ph.D. student.

**Do you think there's any chance that he might someday return to science?**

Well, he's been banned from working in science for eight years by the German research foundation. He would not be able to raise money or to be funded to work in science. After that, it's very hard to say. He would need somebody to give him another chance, and that person would be taking a risk for their own lab and their own institution if they did so.

**What was your overall impression, having spent so many years reporting this? Did you come away with a different impression than you expected?**

I started out very fascinated by Schön, almost sympathetic toward him in that I really wanted to know his side of the story. And the one thing I became convinced of is that he had deliberately done this, and it had been a protracted campaign of misleading other people, basically fabricating data that exceeded their expectations and then passing it off as real on a repeated basis, without any kind of compunction about doing so, as far as I could tell. I was fascinated by what he had done, but I was really disenchanted; the idea that he might somehow have made mistakes, or been misled himself or confused himself into doing this, which I had started out with, was completely lost. I came to the conclusion that he had known exactly what he was doing.