

Research Methodology
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Lecture - 71
Ethical Conduct in Science: Cases of Scientific Misconduct Part 01

Today I will take you through a few cases of scientific misconduct by eminent scientists. I am doing that in order to make you aware that such cases of scientific misconduct has happened, do happen, and therefore, a scientist has to be aware of conscientiously avoiding such conduct.

Now, in telling you the history of some such cases, I will deliberately avoid taking names of those people who are still alive. Those who are dead, I can take their names. But for those who are alive, I will avoid taking their names. Let us first start with the case that happened in 1998. Most of the cases that are cited are not very old. Some will be older.

A paper was published in the famous biology journal Lancet, in which it was shown that the babies who received a specific vaccine called MMR vaccine (it is against measles, mumps and rubella), that MMR vaccine – it apparently showed that those who took that MMR vaccine have a higher propensity of developing a cognitive disorder called autism. Now that caused a quite a bit of hue and cry because mothers refused to get their babies vaccinated because of the fear of developing autism.

When other scientists examined the information, the data, on the basis of which these scientists came to that conclusion, they found that it was basically a sample collection from the babies who were vaccinated with MMR vaccine, and the babies that ultimately developed autism. Now what should have been done was to do a random sampling from the babies who received this MMR vaccine, but what these scientists did, because they had a hypothesis and they wanted to prove that hypothesis, therefore, they selectively chose those samples who had autism. The number of samples was also quite small, only 12. So, the number of babies who received this particular vaccination, out of that they chose only the babies who ultimately developed autism and presented that as the data in support of the claim that MMR vaccination leads to autism. So, that was a clear case of scientific malpractice caused by a scientist's desire to validate his or her own personal belief.

The second case I will come to, relates to an even that happened in Korea. There was a scientist in South Korea, who specialized in cloning animals like mice, like pigs, like cows. He would clone animals and he made a name for himself as a cloning specialist. But it was a time when people had not succeeded in cloning humans or human cells and the challenge was to create human stem cells. Now, in 2004 and 2005 this scientist claimed that he had succeeded in cloning human stem cells and that created a lot of interest because nobody else had been able to do that.

This man who specialized in cloning animals, was so famous in Korea, that he was considered to be the 'Pride of Korea'. But when this claim appeared in 2004 and 2005 that he had succeeded in cloning human stem cells, other people became a bit suspicious. Some inquiries were done. And then it was revealed that most of the data that he presented were fabricated.

Not only that. His characteristic style was, before he presented any verifiable information before the scientific community as research papers, he would give a press conference in which he would make a pompous announcement of some scientific success. Since common people are not aware of the process of science, the verification process, the validation process in science, so they would hail him as a pride of Korea.

But when this particular case happened, there was an inquiry and it was revealed that even the earlier work for which he became famous, were fabricated. In late 2005 it was revealed, and it led to his downfall.

The third case that I will cite, actually is from India, from the field of geology, Earth Science. More accurately speaking, from the field of paleontology. Paleontologists regularly go to different places in search of fossils and when they find fossils, they bring, and analyze.

This man used to go every year to the Himalayas, and he would find fossils, he would bring them, publish papers on that. The finds were a bit surprising for many seasoned paleontologists, because he was finding organisms in places where it was earlier known that those organisms are unlikely to be found. But still since these are found, people accepted that and on the basis of that, the evolutionary history was formulated assuming that his fossils were really found there. Not only that. Other scientists based their theories

on the assumptions that these were really found in the Himalayas, and even these kind of theories went into textbooks.

Then some scientists got suspicious. They started an inquiry, and it was then revealed that he did not really find these fossils in the Himalayas. Rather, he sourced these from different places. In different countries there are shops that sell fossils. He would go to different places, sometimes to Egypt, sometimes to Japan, sometimes to the United States, and he would collect fossils from there. Then he would plant these in different places in the Himalayas and next year he go with his students and would find these.

This revelation was actually a damning revelation because, not only the current body of knowledge has to be revised, even the textbooks had to be revised. It was a painstaking process to flush out the wrong knowledge that had crept in over a period of more than 20 years. So, a scientific malpractice can cause such harm to a field for a long time. The whole evolutionary history had been conceived assuming that these organisms lived in the sea from which the Himalayas arose at some point of time.

The next case I will cite is from Denmark. A Danish scientist published a large number of more than a 100 peer reviewed research papers, that established a specific mechanism of brain repair. If there is a damage in the brain, the brain repairs it. But the mechanism was unknown and this person tried to figure that out. The role played by a metal binding protein was her focus, and she established that there was a role played by this particular substance in the repair mechanism.

Now nobody had suspected any wrongdoing in the whole affair. But two of her students noticed something. The experiments were conducted by the students. Therefore, they had the primary data with them. They noticed that the data they obtained from the experiments were not exactly the same as the ones they that were ultimately published in the paper.

So, when they saw their papers in which they are also coauthors, they found that these actually differ from the primary data they had obtained. They raised a flag to the university authorities. There was a inquiry conducted by the Danish Committee on Scientific Dishonesty.

This committee examined not only this particular paper. They examined all her earlier work, even her own PhD thesis. And they found huge number of cases of data fabrication. The data that were actually not obtained, but simply put in the dataset. As a result, she was sacked from the university.

The next case that I will cite was a bit older. You know, Darwin wrote the book 'The Descent of Man', not the first book 'The Origin of Species', the latter one, where he specifically dealt with how man originated. He proposed the theory that man had originated from some ancestral primate species. The primate species would, under certain circumstances, be evolved and through a series of evolution, ultimately the modern man emerged.

But at that time, some of the intermediate stages were not known. These were called the 'missing links', and following the publication of that book, there was a huge hunt by scientists all over the world, in trying to find the missing links.

The Dutch scientist Eugene Dubois went to Java, another person went to China and other places. So, everywhere they tried to find and that is how the Java man was found and understood to be a missing link. In a cave close to today's Beijing, at that time it was called Peking, few bones were found. This was the time of the Sino-Japanese war. The person who found it put the bones in a crate and shipped it to the United States.

But since it was the war time, the ship sank, and with that all the bones sank. But fortunately this person also had made plaster casts of those bones and after examining those plaster casts it was realized that these were really one of the species in the missing link.

So, the Peking man, Java man and many other intermediate species were found. And at that time somebody in England, in a place called Piltdown, his name was Dawson, he claimed that there was a gravel pit being dug in that place called Piltdown, and in that digging process a few fragments of a skull were found. So, he collected these and then later he further continued the excavation and found a few more pieces of jawbone, teeth and things like that. He then presented that to the Royal Society.

The Royal Society assembled all these fragmented pieces and made the appearance of the skull, the whole skull. People were intrigued because the appearance of the cranial

part of the skull and the jaw bones and the teeth were a bit peculiar. But still, since it was found, people accepted that and accordingly wrote the evolutionary history of man. What appeared peculiar to them was that the cranial part was more advanced than the jawbone and the teeth. As a result, it was then assumed that in the evolutionary history, the cranial part, the frontal lobe, developed earlier than the development of the jaw and the teeth. The human like jaws and the teeth developed later, but the human like skull developed earlier.

In 1953, people got really suspicious, and some scientists requested the place where it is kept, I suppose it was the Museum of Natural History in London. They extracted that particular skull and examined it very thoroughly, and then they found that these are not belonging to the same organism at all.

The skull part, the head part was dug up from a grave of a man from the medieval times, not very old, some 500 years back. The jawbone was from a Orangutan and the tooth was from a Chimpanzee. And on minute microscopic observation they even found that this man Dawson had filed a part of the jawbone, the tooth, to make it look more like human tooth.

So, it was a clear case of fraud, scientific fraud. But by then Dawson was dead, and before he died, he was famous, he received all the honors and accolades. But ultimately it is now known that it was basically a scientific fraud. He just wanted to be famous.

The next case that I want to highlight concerns stem cells. You know, normally the first cells in any organism are the stem cells, and then they specialize into becoming various cells of various body parts. Some become liver cells, some become skin cells, some becomes cells of the eye, some become cells of the brain and so and so forth. They become specialized.

Once they become specialized, normally they cannot be converted back to stem cells. Stem cells are not specialized cells, they can be developed into anything. While a specialized cell is a specialized cell, as the cell of a skin cannot be converted into a cell of a liver, for example.

Now, a Japanese scientist published a paper in Nature, claiming that she has found a way of converting specialized cells into stem cells. Well, it was not that nobody has done that

before. There was another earlier instance where a very complicated process was done by another Japanese scientist who got a Nobel Prize for that. He had succeeded, at least partially, to convert a specialized cell and to remove the elements of specialization, so that it more or less behaved like a stem cell.

But this person, in 2014, presented a very simple mechanism of this conversion, much much simpler than the earlier mechanism proposed by that other Japanese scientist. As a specialized body cell she used mouse blood cell and claimed to have converted that into stem cells by the simple process of soaking it in a weak bath of citric acid. Now such a simple procedure to accomplish such complicated task: people had doubts about it. That resulted in some scientists complaining to the journal and to the university authorities, and then an investigation started.

It was then revealed that the genetic markers of the process, called STAP (Stimulus Triggered Acquisition of Pluripotency), that is what she was claiming, actually was completely fabricated. It did not really happen. What she actually did was simply to take some embryonic stem cells of a mouse from the freezer and put it there and claim that cell has been converted to this.

So, it was a clear case of scientific cheating and naturally she lost her job. In most of these cases, when these cases are found, one simply loses the career. There are also instances where a scientist had to face jail sentence.

One of the pursuits in physics in the 20th century was the discovery of transuranic elements. As you know, elements up to the atomic number of 92 are found in nature. Beyond that, these are not naturally found, and these can form only through nuclear processes. These are normally short lived; they decay into other substances. Finding elements of such transuranic atomic numbers became a pursuit for many laboratories.

Normally these would decay within a fraction of a second and the way to detect an element's existence was to analyze the decay products. Through that, one would come to the conclusion about what was formed, which resulted in these decay products. That is how the discoveries actually happened.

The first few transuranic elements were discovered in the Lawrence Berkeley Laboratory in the United States. In fact, elements with atomic numbers 93 to 103 were discovered in the Lawrence Berkeley Laboratory in the United States.

After that, the two elements 104 and 105 – these were discovered in a Soviet laboratory called Flerov Laboratory of Nuclear Reactions. So, for some time the Soviets and the Americans were competing with each other at the time of the Cold War, competing with each other in a scientific discovery.

The next one, the element 106, was discovered by both these laboratories at the same time. So, nobody could claim that we did it first. But after that, a German laboratory in Darmstadt, they surged ahead and discovered the next 6 elements.

So, the American laboratory was under enormous pressure because the Soviets and as well as the Germans were doing better in discovering new substances, new elements and then in 1999 the announcement came that the American laboratory, the Lawrence Berkeley Laboratory, has discovered element 118. The other laboratories had been trying to do that, but were unsuccessful. But this laboratory announced that we have succeeded in doing that.

What was the process? Let me briefly discuss the process. They used a cyclotron of about 88 inch diameter, and they accelerated krypton nuclei and bombarded uranium with it. Through that process something formed. As I said, that would decay into various substances and there was an array of detectors that would detect what were formed. These are an enormous number of particles that would be detected and so you cannot really do things by hand.

There was a program, a computer program, an algorithm. It was called Goosy, which analyzed that raw data to infer what was actually formed. The use of the program Goosy was universally accepted because it was a fool proof program. If you feed the program with the right data, it would give the right answer.

The program reported that the element 118 was formed and then it had decayed into element 116 and then on to element 114, thus releasing certain other particles which were detected. So that is how it was established that it was element 118.

When this announcement was made, the German laboratory as well as the Soviet laboratory tried to replicate that experiment. Doing exactly the same procedure, they failed. They could not do that. They did not get what was reported by the American laboratory.

So, they lodged a complaint. They suspected foul play, and so there was an inquiry instituted. That inquiry team systematically tried to eliminate all possible sources of error and they could not find any error apparently.

And then one member of that inquiry committee noticed something bizarre. He found a log file of the raw data that was fed to the program Goosy. The raw data comes from the detectors. It is a system where things are automatically fed to a file and that file is fed to the computer program to ultimately analyze it.

Somebody had entered that particular file and tweaked with the raw data, changed the raw data here and there, in such a way that the program would infer that element 118 was produced. So, this was a clear case of fabrication or distortion of data. It happened because the person who was involved, who did it, wanted to become famous. It also happened because of the enormous pressure that the American laboratory was facing from the higher ups, because apparently they were lagging behind the German laboratory and the Russian laboratory.

So, pressure on the scientific community can also be so detrimental. Because that might induce people to take unfair means in claiming discoveries. Naturally the Lawrence Berkeley Laboratory retracted the paper from Physical Review Letters, and naturally the scientist in question, who did that malpractice, lost his job.