

Fraud in Research Is a Rising Problem in Science

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The existence of scientific fraud, evident in a number of examples in recent years, is leading some scientists to question openly the integrity of some of their colleagues.

Item: A scientist at the Sloane-Kettering Institute painted dark patches on white mice to make his colleagues believe he had perfected a way to make skin grafts between non-twins.

Item: The Food and Drug Administration charged a major pharmaceutical manufacturer, G. D. Searle & Company, with falsifying the scientific data upon

which claims of the safety of two drugs and an artificial sweetener were based. Searle's research methods, according to an F.D.A. report, were so careless that reliable scientific conclusions could not be derived from them.

Item: A promising student at Harvard University reported experiments showing that something in the blood of one animal can be injected into another, transferring immunity to certain foreign substances. No other research group was able to reproduce the striking results. The line of research was abandoned amid publicly voiced suspicions that the test animals had been tampered with.

Item: A Pennsylvania State University chemist said that he had evidence that the sex scents of insects vary according to what the bugs eat. If true, his "finding" would destroy a major new avenue of research on safe pest controls. His university touted the results loudly. However, the chemist's co-workers examined the same data and repeated the experiments and found no evidence for the claim. The chemist said that he still believed in his theory and would repeat his experiments.

These and a handful of other incidents

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Fraud in Scientific Research Viewed as a Rising Problem

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that have lately become known represent, many scientists believe, only the tip of a broader problem of fraud in scientific research. The problem was highlighted recently by Dr. Alexander M. Schmidt, Commissioner of Foods and Drugs, who said that the Federal agency was conducting a broad investigation of possible fraud by some research laboratories testing drugs on animals.

Scientists who cheat by faking their results or by selecting only those data that support their theories represent a phenomenon that often goes unrecognized by those who see scientists as unswervingly objective in the pursuit of truth.

Some scientific leaders suspect the number of dishonest scientists is growing as a result of the increasingly fierce competition for grant money, which tends to go to researchers who can produce, or assert they can produce, the most impressive new findings in the shortest time.

Other scientific leaders similarly deplore the nature of competition for shrinking grant dollars but say there is no evidence that scientists are engaging in any more deception than usual. The "usual" rate, they emphasize, is very low.

Sloppiness and Carelessness

In addition to deliberate bias, many scientists also see as problems a widening tolerance for sloppy and unrepeatable experiments and careless thought in interpreting results.

How often do scientists cheat? Are lives endangered because fraudulent data or biased interpretations have been accepted in approving a new drug or industrial chemical? Is tax money wasted and scientific talent diverted to try to verify fraudulent findings? Are people misled when they accept a scientist's interpretation of how the natural world works?

One researcher who feels cheating is growing is Dr. Ernest Borek, a microbiologist at the University of Colorado. "Increasing numbers of faked data or, less flagrantly, data with 'body English' put on them, make their way into the scientific journals," he said.

"By fabricating nonexistent phenomena for their advantage, the miscreants are attempting to counterfeit a small part of nature itself," Dr. Borek has written. "It is thus a profanation of the only thing many of us hold sacred, the splendor of nature's ways."

Wasted Efforts Resented

On a purely practical level, a number of scientists have complained about the time and talent that have been wasted in futile efforts to replicate fraudulent or shoddy experiments.

One scientist cited a recent international conference where four scientists from three countries each reported spending months in attempts to repeat a fifth scientist's "experiment." They were forced to conclude either that he had not performed the experiment as he said he had or that he did not get the results he said he got.

"Although the number of revealed fabrications of data is small," Dr. Borek wrote in an editorial in *Chemical and Engineering News*, "the number of shoddy and unrepeatable publications [articles in scientific journals] is increasing at an alarming rate."

Dr. Salvador E. Luria, a biologist at the Massachusetts Institute of Technology who won a Nobel Prize for his research on viruses, asserts that although cheating in science is rare, there must be a number of instances that never come to public attention.

'Manufactured' Findings

"I know of at least two cases in which highly respected scientists had to retract findings reported from their laboratories because they discovered that these findings had been manufactured by one of their collaborators," Dr. Luria said.

Much the same view came from David Hindenlang, a graduate student in chemistry who formerly worked with the scientist at Pennsylvania State University who contended that insect sex scents were determined by what they ate. Referring to the Sloan-Kettering incident in which Dr. William Summerlin admitted painting mice but never conceded his theory was wrong, Mr. Hindenlang said:

"The Summerlin episode was a major evil, but I'm sure lesser evils are being perpetrated every day in science. Unfortunately, given the pressures of the research environment, when your work is challenged, you cover yourself at first rather than admit your error."

Dr. Richard W. Roberts, director of the National Bureau of Standards, estimates that half or more of the numerical data published by scientists in their journal articles are unusable because there is no evidence that the researcher accurately measured what he thought he was measuring or no evidence that possible sources of error were eliminated or accounted for.

Source of Errors Elusive

Whether such deficiencies in the report reflect defects in the experimental design, inadvertent omissions in the writing or an effort to deceive cannot be determined.

The extent of intentional bias in science, judging by the few published reports, appears to be totally unknown. Inasmuch as one of the main duties of scientists is to identify and exclude sources of error, this omission strikes some researchers as curious.

"Double blind procedures and control groups are part of the substantial array of techniques science has for coping with unintentional bias," Dr. Ian St. James-Roberts of the University of London wrote in the British magazine *New Scientist*. "Yet science seems to ignore another source of error, intentional bias."

Dr. St. James-Roberts, in an article entitled "Are Researchers Trustworthy?" argues that because science takes such little formal notice of cheating, it has developed few real safeguards against it.

A 'Completely Untested' Assumption

"Although scientists in general are very critical of untested assumptions," he wrote, "the assumption of scientific impartiality is almost completely untested."

One of the few areas of research where studies have been made is psychology, where it is well known that the scientist's opinions and expectations can be conveyed to his human research subjects in subliminal ways, affecting the subjects' behavior in the experiment.

This phenomenon, known as experimenter effect, has been the subject of books and articles in psychology. Less well studied, however, is outright fabrication of published results. One indirect suggestion of the problem came from an

exercise reported by Dr. Leroy Wolins, a psychologist at Iowa State University.

Dr. Wolins said a student of his wrote to 37 authors of recent scientific reports in psychology journals and asked for the raw data upon which they had based their conclusions. Of the 32 scientists who replied, 21 said their data had either been lost or accidentally destroyed. Nine researchers sent him copies of their data.

Dr. Wolins, an expert in statistics, was able to analyze seven sets of data. Of these seven, three had errors significant enough to invalidate what had been published as scientific fact.

Exposed British Psychologist

Dr. Leon Kamin, a Princeton University psychologist, believes some areas of psychology are particularly vulnerable to fakery, especially if the conclusions support popularly held views. Dr. Kamin played a major role in exposing the invalidity of claims by Cyril Burt, the late British psychologist, that most of the variation in human intelligence is due to heredity.

In social or educational psychology, where experiments and observations are often inherently unrepeatable, Dr. Kamin said, "it's relatively easy to fake it and get away with it, particularly if it matches everybody's preconceptions." He went on, "If an engineer fakes, the bridge falls down and everybody knows about it."

Dr. Kamin said that Dr. Burt's purported findings went largely unchallenged for decades because the data could be taken as scientific evidence that blacks are inherently intellectually inferior to whites, a popular view among some whites.

"Most of the stuff that gets published in psychology is trivial," Dr. Kamin said. "It will sink like a stone in a year. If there are errors or frauds in it, nobody cares enough to find out before it's forgotten anyway."

Cheating Isn't New

While many researchers blame the shrinkage of Federal support and tighter competition for scientific cheating and exaggeration of findings, the phenomena are hardly new.

Perhaps the most famous old case was that of the Piltdown Man, the purported remains of a prehistoric human that an amateur British anthropologist, Charles Dawson, said he found in 1908. The "fossils" confounded science until 1953 when they were proved to be a hoax consisting of a modern human skull and a modern ape jaw, both modified to seem old.

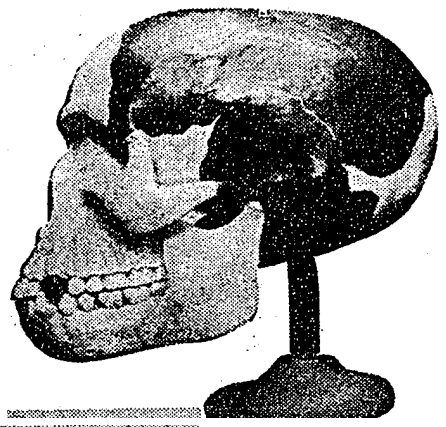
Another famous scientific fraud occurred early in this century when Paul Kammerer, the Austrian geneticist, painted the foot of a toad to fool people into believing it had inherited the coloration from a similarly painted parent. He wanted to prove the now-disproved Lamarckian theory of evolution that says acquired traits are passed on to offspring. When the tampering, the subject of Arthur Koestler's book "The Case of the Midwife Toad," was discovered, Kammerer shot himself.

There is even evidence that an earlier Austrian scientist, Gregor Mendel, the father of the gene theory of heredity, may have doctored the results of his pea-breeding experiments to make them appear more perfectly to conform to his theory of heredity. Mendel's conclusions, of course, were correct, but a statistical analysis of his published data indicates the odds are 10,000 to 1 against their having been obtained in a real experiment.

What makes scientists cheat? In the view of Dr. Borek, the Colorado microbiologist: "Since one must publish to get



Paul Kammerer, left, Austrian geneticist, painted a toad's foot.



Skull of Piltdown Man, above, was a modern-day fabrication. Even Gregor Mendel, left, may have doctored data on pea-breeding.



grants, and promotion in many institutions hinges on the size of grants, publication and grants rather than discovery become the goals in the laboratory. When rewards are almost within reach, temptation, to some, becomes overwhelming to cut corners or to doctor data or even to manufacture some."

Especially vulnerable to these temptations, Dr. Borek contends, are ambitious young scientists in large institutions where little direct supervision is given.

Dr. Luria, the M.I.T. virologist, believes scientists who publish falsified data suffer from a personality defect shared by compulsive gamblers. Dr. Luria contends that the controls against fraud are still good enough in science that only those with "a distorted sense of reality" can believe they might get away with it.

According to Dr. Luria, scientists who cheat often begin by believing in their theories before they are proved and then conclude that it is justified to take risks to establish that truth in the minds of others.

When the 'Gambler' Loses

When the scientific gambler loses, the resultant damage extends beyond his reputation and that of his institution. The financial backer of the scientist has also lost his investment. For the vast majority of research done, the financial backer is the taxpayer.

In some instances lives and health may also be damaged. Although fraud and error in medical research are often weeded out by the standard scientific practice of trying to replicate an experiment in an independent laboratory before accepting the findings, a number of people may still be hurt in the attempts to repeat the experiment.

One of the most obvious areas of science where the incentives toward intentional bias are great and where fraud may injure people is the testing of drugs by manufacturers with a financial stake in having the drug approved, prescribed and bought.

Last year the Food and Drug Admin-

istration announced that its investigators had found serious deficiencies in the way G. D. Searle & Company conducted some of its research on Flagyl, an antibiotic; Aldactone, a diuretic, and Aspartame, an artificial sweetener. The investigators found flaws ranging from mixups between treated and untreated animals to questionable research procedures that would automatically cover up evidence of a drug's harmful effects.

No Autopsies on Dead Animals

For example, it was found that animals that died during an experiment had not had autopsies immediately but instead had been put in bottles of preservative for future analysis. When it came time for analysis, however, the preservative proved to be inadequate and many of the dead animals had disintegrated. Those animals would have been the ones most likely to show toxic effects, but the drug company's report simply omitted them.

Last week, the drug agency recommended to the United States Attorney in the northern district of Illinois, where Searle is situated, that a grand jury be convened to investigate the drug maker.

Searle officials have strongly objected to the agency's allegations. Daniel C. Searle, the company's chief executive officer, acknowledged at a corporate annual meeting last April that "numerous human errors did occur" but described them as minor. Searle's executive vice president, James A. Buzard, in a letter to the agency, called the report on his company "incomplete, biased and distorted."

During a Senate hearing on the Searle case last year, Senator Edward M. Kennedy, Democrat of Massachusetts, chairman of the hearing, said:

"Inaccurate science, sloppy science, fraudulent science—these are the greatest threats to the health and safety of the American people. Whether the science is wrong because of clerical error, or because of poor technique, or because of incompetence or because of criminal negligence, is less important than the fact that it is wrong."