

ROYAL METEOROLOGICAL SOCIETY: AUSTRALIAN BRANCH MEETING

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Facts, Fallacies and Fraud: Science as a Fallible Human Activity

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Dr Pittock gave a fascinating talk on the fallibility of human scientific endeavour. His intention was to stress that since eminent scientists have suffered from self-delusion, it is a potential danger for all scientists.

The talk started with four examples of 'good' science in which sound theories have been presented but were accepted only slowly by the scientific community because they conflicted with established ideas. Of these three, Darwin's theory of evolution, Shapley's theory of the location of the solar system well out in a spiral arm of the galaxy, and the theory of continental drift, are well known. The fourth example was Bretz's (1923) theory of Channelled Scabland in Washington. Bretz argued that the cause of the formation was a prehistoric catastrophic flood. This was contrary to the useful geological uniformitarian tradition that upheld that those geological processes currently occurring have always done so.

Turning to examples where individual researchers were at fault through unconscious self-delusion, the nuclear physics experiments by Davis and Barnes and the 'discovery' of 'N-rays' by Professor Blondlot, head of physics at the University of Nancy in 1903, were given. A common factor in these two lines of research was that subjective observations were taken under threshold conditions. The researchers, influenced by autosuggestion, imagined results to support their hypothesis.

Nobel prize winner, Irving Langmuir, who helped in the exposure of Davis and Barnes' experiment, was himself a victim of unconscious self-delusion in his cloud seeding experiments. He claimed an observed seven-day cycle in various meteorological parameters over much of North America was a response to his weekly cloud seeding experiments in New Mexico, in which about 2 lb of silver iodide was released from a single ground generator. His conviction was so strong that he refused to heed arguments from meteorologists that showed that seven-day cycles were not particularly rare and gave instances of them occurring before his seeding experiments began.

An even stranger influence of a prior conviction appeared in the case of Samuel George Morton, a president of the Philadelphia Academy of Natural Sciences in the nineteenth century. Morton ranked brain size (believed equivalent to intelligence at that time) with race and supported the popular local belief that Caucasians had the largest brains and black races the smallest. A subsequent reanalysis of his data by Gould (1978) revealed

that Morton had made several statistical and mathematical errors all of which exaggerated Morton's claimed result. When Morton's mistakes were corrected his conclusion could not be substantiated.

Two brief meteorological examples in which the author's claims could not be substantiated by their published data were then given. The first was an astonishing explanation of ball lightning by W.I. Arabadji published in the **Journal of Geophysical Research** in 1965. The second example concerned the influence on the Indian southwest monsoon of the sunspot cycle by P. Jagannathan and H.N. Bahlme published in the **Monthly Weather Review** in 1973.

Dr Pittock's last examples consisted of cases of admitted or probable fraud. Prior to 1974 the only published results indicating a strong correlation (0.88) between thunderstorm frequency and the sunspot cycle were those of Evald Septer, Director of the Geophysical Observatory, Irkutsk, USSR (1926). Nowhere else had a correlation exceeding 0.4 been reported. Subsequent analysis of the Russian data by Kleimenova (1967) revealed that Septer's data had either been fabricated or had disappeared without any evidence of it ever existing.

The most spectacular example of scientific fraud yet to be unearthed was in the achievements of Sir Cyril Burt, the noted British psychologist. Burt's work was largely devoted to proving that intelligence is inherited. He used statistical analyses of the I.Q. of children and their fathers and of identical twins as research subjects. After his death research on his notes and diary for his biography indicated that Burt had been guilty of a gross fiction. He had invented data, co-authors and authors in an attempt to substantiate his views.

In his conclusion Dr Pittock restated some of the symptoms of what Irving Langmuir described as 'pathological science'. These were:

- . the alleged effect is often close to the observational threshold;
- . it is largely insensitive to variations in the intensity of the cause;
- . many measurements are required because of the low statistical significance of the results;
- . there are often claims of great accuracy;
- . the proposed theories are often contrary to experience; and
- . support within the scientific community for the theory often reaches 50 per cent but is not sustained.

Dr Pittock said that it was considered by those who had studied pathological science that self-delusion is a common influence throughout the field of scientific endeavour. This possibility should be realised by all scientists. Scientists should be more free to publish criticism of erroneous work and should publish sufficient information to enable others to verify their claims. The importance of truly critical refereeing was emphasised in the ensuing discussion.

A list of references covering many fascinating examples of facts, fallacies and frauds in scientific research is available from Dr Pittock.