



Symmetry and Dance: A Case of Scientific Fraud

Brown, W.M., Cronk, L., Grochow, K., Jacobson, A., Liu, C.K., Popovic, Z. and Trivers, R. (2005). *Dance reveals symmetry especially in young men*. *Nature*, 438, 1148-1150. doi: 10.1038/nature04344

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Brown and colleagues (2005) appeared to show a strong link between bodily symmetry (small fluctuating asymmetry or FA) and dance ability, with sex differences fitting predictions exactly. This work seemed to be an important contribution to the literature on human sexual selection and fluctuating asymmetry, and it has now been cited at least 156 times according to Google Scholar. All the results presented by Brown et al. were subject to careful reanalysis that failed to support any of the major findings of the paper (Trivers et al. 2009). The reanalysis suggested that the correlation between symmetry and dancing ability was positive but very weak and lacked any of the reported sex differences.

This case is complex, involving multiple modes of scientific misconduct by Dr. Brown, including, in the order in which we uncovered them: 1) selecting subjects in a biased manner, based on prior knowledge of dance ability, 2) altering values in the dataset to decrease within-group variability in dance evaluations, thus creating significant effects where none existed, 3) most surprising of all, altering 65 out of 80 values for relative fluctuating asymmetry (rel FA) of the selected dancers in the dataset so as to construct entirely false values for the critical variable in ~80% of all cases. Brown then made the fraudster's classic error—he created a data set that was internally inconsistent—he forgot to change the adjacent columns giving simple FAs, so it was impossible to derive his false values of rel FA from the true values of raw FA. Additionally, with just one exception, he only changed values for those selected as subjects. Although complex, the case for scientific misconduct here is actually more obvious than for other statistical detections of fraud, which are typically based on probability theory (e.g. Pitt and Hill 2013 and references therein). Because we had access to Brown's dataset and the original dataset, we were able to demonstrate directly that many of his numbers and reported results were not externally valid, nor internally consistent.

A formal investigation by Rutgers University confirmed the reanalysis by Trivers et al. and uncovered additional evidence for scientific misconduct (Rutgers Research Advisory Board 2012). After a very long delay, *Nature* eventually agreed to retract the original paper (Brown et al. 2013). Surprisingly, *Nature's* news division published a story on the case (Reich 2013) titled "Symmetry study deemed a fraud" nearly seven months before a retraction was published. The retraction notice is incredibly weak, consisting of just two sentences that provide none of the reasons the paper was retracted, thus creating more questions than answers. The reason for this is that Dr. Brown, and his chief supporter Dr. Cronk,

insisted on language unacceptable to the other scientists, because it would have shifted responsibility for the failings away from Dr. Brown and onto the Jamaican Symmetry Project itself. *Nature's* proposed language referred to problems in "data handling and treatment", but Brown and Cronk wanted to give the impression that the problems were with "data management". The history of Dr. Trivers' efforts to retract the paper are briefly reviewed by Oransky (2013).

The interested reader can see detailed statistical analysis of this case in Trivers et al. (2009). In this short book we also briefly review the problem of fraud in science and discuss missteps that increased the opportunity for fraud in the Brown et al. study. The *Nature* news story (Reich 2013) and Dr. Trivers' webpage (http://www.roberttrivers.com/Robert_Trivers/A_Case_of_Fraud_at_Rutgers.html) also describe the mistreatment that Dr. Trivers received at Rutgers as a result of coming forward as a whistle-blower.

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