

Title:

**Modern Science and The Bayesian-Frequentist Controversy**

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Abstract:

The 250-year debate between Bayesians and frequentists is unusual among philosophical arguments in actually having important practical consequences. Whenever noisy data is a major concern, scientists depend on statistical inference to pursue nature's mysteries. 19th Century science was broadly Bayesian in its statistical methodology, while frequentism dominated 20th Century scientific practice. This brings up a pointed question: which philosophy will predominate in the 21st Century? One thing is already clear – statistical inference will play an increased role in scientific progress as scientists attack bigger, messier problems in biology, medicine, neuroscience, the environment, and other fields that have resisted traditional deterministic analyses. This talk argues that a combination of frequentist and Bayesian thinking will be needed to deal with the massive data sets scientists are now bringing us. Three examples are given to suggest how such combinations might look in practice. A large portion of the talk is based on my presidential address to the American Statistical Association and a related column in *Amstat News*.