

## **Cognitive Bias, the Elephant in the Living Room of Science and Professionalism**

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### **Abstract**

Cognitive bias, in its many manifestations, is the major cause of geotechnical overestimation and faulty probability forecasts in petroleum geoscience. The five most prevalent cognitive biases in petroleum E&P are: Confirmation Bias; Overconfidence; False Analogs; Anchoring; and Motivational Bias. They are caused by premature selection of theory, personal hubris, lack of perspective, lack of imagination, laziness, and excessive self-interest. Important influences include the existing organizational reward system, economic pressure for objective geotechnical results, and the anticipated consequences of project reviews and evaluations. In fact, the field of E&P Risk Analysis emerged during the 1980s to help identify and reduce bias in assessing the value of new plays and prospects. Companies that routinely utilize disciplined methods of Risk Analysis tend to deliver on their E&P promises.

Pioneering work by Nobel laureate Daniel Kahneman, his late colleague Amos Tversky, and others since the 1970s has made scientists much more aware of the dangers that Cognitive Bias pose for the practice of objective, reliable science. Even so, increasing awareness of obvious agenda-serving scientific publications, slanted peer review (“pal-review”), withholding of codes and formulae, unreproducible experimental results, and scientific fraud indicate that procedures to identify and limit Cognitive Bias are not being appropriately utilized throughout the scientific community. This is probably because many of the organizational and economic pressures routinely experienced by E&P geoscientists are not as intensely or widely operative within academic and governmental organizations.

The late physicist and Nobel laureate Richard Feynman recognized (1974) the danger of Cognitive Bias: “the first principle is that you must not fool yourself – and you are the easiest person to fool.” Feynman knew that dedicated practice of the Scientific Method is the key to elimination of Cognitive Bias, recommending “a kind of scientific integrity, a principle of scientific thought that corresponds to a kind of utter honesty – a kind of leaning over backwards.” A practical research approach familiar to many geoscientists is T. C. Chamberlain’s “Method of Multiple Working Hypotheses”, introduced in 1890. Also important is the separation of E&P activity into two essential and complementary components – 1) play and prospect generation; and 2) play and prospect risk assessment. Professionalism constitutes the conscious honoring of such principles.

Sound and objective science is essential to the continued progress of Society. Is it possible that methods widely applied by Petroleum Geoscience to identify and counter Cognitive Bias might also be useful to other branches of Science?