Remarks on Probability and "Intelligent Design"

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- There are various *non*-contrastive questions that one can ask about a single hypothesis H and a body of evidence E:
  - What is the *probability* of H, given E [$\Pr(H \mid E)$]?
  - **What is the *likelihood* of H on E [$\Pr(E \mid H)$]**?
  - Does E *support/counter-support* H?
  - **Should we *accept/reject* H in light of E**?
- There are also *contrastive* questions concerning pairs of alternative hypotheses H_1 *vs* H_2 and a body of evidence E:
  - Is H_1 *more probable than* H_2, given E?
  - **Is the *likelihood* of H_1 *greater than* that of H_2 on E**?
  - Does E *favor* H_1 *over* H_2 (or *vice versa*)?
- Bayesians focus on probability and support questions.
- Likelihoodists focus on likelihood and favoring questions.
- Both come in contrastive and non-contrastive flavors. And, both include some who worry about acceptance/rejection.
- "Intelligent Design" theorists (*e.g.*, Dembski) have adopted a rather naive non-contrastive Likelihoodist stance, which aims to connect the boldface non-contrastive questions.

- Fisher was one of the leading statisticians of the early-mid 20th century. He was the father of Likelihoodism. See [5].
- Fisherians (and other Likelihoodists) think that likelihoods are objective in a way that probabilities (esp. *priors*) are not.
- Error characteristics of diagnostic tests are typically cited as canonical examples of objective likelihoods (see, *e.g.*, [12]).
- The idea is that $\Pr(E \mid H)$ [sometimes $\Pr(E \mid \sim H)$] is reflected in causal-statistical frequencies, whereas $\Pr(H \mid E)$ is (in general) only reflected in the degrees of belief of scientists.
- Fisher went through various stages in his career. Early on, he endorsed a naive sort of non-contrastive Likelihoodism.
- Later in his career, he became more sensitive to contrastive (and in some ways even Bayesian) considerations. See [9].
- The anti-Bayesian Fisherian ideas had a strong influence.
- For instance, Fisher [7, p. 39] infamously said (roughly!) that

(*) **If $\Pr(E \mid H)$ is sufficiently low and E obtains, then either a highly improbable event (E) has occurred or H is false.**

- The (*) reading of Fisher's statement caused some to adopt a non-contrastive Likelihoodist methodology which sanctions *rejection* of H if $\Pr(E \mid H)$ is sufficiently low and E obtains.
- Unfortunately, this reading of the statement is fallacious.
- What we have in these cases is a statistical model $\mathcal{M}$ which entails that $\Pr(E \mid H) \approx 0$. Two unsound arguments for (*):

(a)
$\mathcal{M}$ is an accurate statistical model.
(*i*) If $\mathcal{M}$ is accurate, then $H \supset \Pr(E) \approx 0$.
$\therefore$ Either H is false or E is highly improbable.

(b)
$\mathcal{M}$ is an accurate statistical model.
(*ii*) If $\mathcal{M}$ is accurate, then $\Pr(E \mid H) \approx 0$.
$\therefore$ Either H is false or E is highly improbable.

- Argument (a) is valid, but its second premise (*i*) is false.
- In (b), premise (*ii*) is true, but the argument is invalid.
- Fallacy: (*ii*) does not entail (*i*). That is, '$\Pr(E \mid H) \approx 0$' does not entail '$H \supset \Pr(E) \approx 0$'. Counterexample: $E = \sim H$.
  [Note: (*i*) $\not\Rightarrow$ (*ii*). That direction involves 2^{nd}–order probabilities!]

- Dembski [4] aims to provide a (partly) statistical method for determining when some observed pattern (or trait) is the result of "intelligent design". See [8] for a long critical essay.
- Today, I'm just focusing on the *statistical part* of Demsbki's "design detection methodology", which adopts principle (*).
- Dembski cites Fisher's quote with approval. And, he seems to think that (*ceteris paribus*) the (*) reading of Fisher is right (both as a reading of Fisher and as a rule of inference).
- I'm not entirely convinced that Fisher [7, p. 39] really intended to imply (*). But, I'm not doing Fisher exegesis.
- The point is that (*) has no sound justification.
- Moreover, in the biological case (*e.g.*, E = that the vertebrate eye has the precise structure it has, and H = evolutionary theory), it is not clear (to me anyway) whether $\Pr(E \mid H)$ *is* very low (or what statistical model $\mathcal{M}$ is suitable here).
- Both Dembski and Dawkins [2] seem to accept both (*) and $\Pr(E \mid H) \approx 0$. Fisher [6] tries to argue *against* $\Pr(E \mid H) \approx 0$.

- Dawkins takes the "a highly improbable event (E) has happened" horn of the (*) dilemma. Dembski rejects H.
- All of these guys are obsessed with low likelihood.
- Last Point: it's important to note the *contrastive* nature of hypothesis testing (esp. paradigm shifts) in science.
- Typically, before scientists definitively reject a hypothesis, they identify *alternatives* whose likelihoods can be assessed.
- Modern likelihoodists [12, 13] often stress the importance of *contrastive* testing, which requires an *alternative* H' to H.
- It is notable that most IDers (Dembski, Plantinga [11], Behe [1], *et al.*) refuse to even *articulate* an alternative hypothesis (H') for explaining what they see as "anomalies" in biology.
- And, there is certainly no attempt to assess the *likelihood* of any alternative H' (under a common statistical model $\mathcal{M}$).
- Interestingly, even Paley [10] was more sophisticated than this [14]. Paley recognized the importance of *comparing* $\Pr(E \mid H)$ and $\Pr(E \mid H')$. In this sense, ID is regressive.

For centuries the most powerful argument for God's existence … was the argument from design: Living things … could only have been made by an intelligent designer. But Darwin provided a ***simpler*** *explanation. His way is a gradual, incremental* ***improvement*** *starting from very simple beginnings and working up step by tiny incremental step to more complexity, more elegance,* ***more adaptive perfection****. Each step is not too improbable for us to countenance, but when you add them up cumulatively over millions of years, you get these* ***monsters of improbability****. [3]*

[1] M.J. Behe (1998): *Darwin's Black Box*. The Free Press.
[2] R. Dawkins (1996): *Climbing Mount Improbable*. W.W. Norton & Company.
[3] R. Dawkins (2006): Time Magazine Interview, 11/13/06.
[4] W. Dembski (1998): *The Design Inference*. Cambridge University Press.
[5] A.W.F. Edwards (1992): *Likelihood*, 2nd edition. Johns Hopkins University Press.
[6] R.A. Fisher (1954): "Retrospect of the Criticisms of Natural Selection", in *Evolution as a Process*, J. Huxley et al. (*eds*). Allen & Unwin.
[7] R.A. Fisher (1956): *Statistical Methods and Statistical Inference*. Oliver & Boyd.
[8] Fitelson, B., Sober, E., and Stephens, C. (1999): Review of [4], *Phil. of Science*.
[9] D. Howie (2002): *Interpreting Probability*. Cambridge University Press.
[10] W. Paley (1802): *Natural Theology*. Rivington.
[11] A. Plantinga (1993): *Warrant and Proper Function*. Oxford University Press.
[12] R.M. Royall (1997): *Statistical Evidence: A Likelihood Paradigm*. Chapman & Hall.
[13] E. Sober (1994): "Contrastive Empricism" in *From a Biological Point of View*. CUP.
[14] E. Sober (2004): "The Design Argument", in W. E. Mann (*ed.*), *Blackwell Guide to the Philosophy of Religion*, Oxford: Blackwell Publishers, pp. 117–147.