Comment on Darren Bradley's "Defence of Fine-Tuning Arguments"

Formal Epistemology Workshop 2005

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1 Basic Model

1.1 Definitions

The model refers to two universes, Universe 1 and Universe 2.

x is a variable ranging over the two universes.

The model allows for possible worlds of four types:

1. No universes exist.
2. Universe 1 and only Universe 1 exists.
3. Universe 2 and only Universe 2 exists.
4. Both universes exist.

The model employs these predicates:

Ex Universe x exists.

Lx Universe x contains life.

Yx You exist in Universe x.

R is a proposition intended to capture the fact that life is rare (non-guaranteed) in universes that exist. In practice, this means that $\sim R \supset \forall x(Ex \supset Lx)$.

In total, this model entertains seven propositions: $E1, E2, L1, L2, Y1, Y2, R$.

1.2 Further Stipulations and Definitions

We stipulate that $\forall x(Lx \supset Ex)$ and $\forall x(Yx \supset Lx)$.

We define these variables for use throughout:

a Prior probability that exactly one universe exists.

b Prior probability that both universes exist.

c Probability that Universe 1 exists conditional on both universes' existence.

d Prior probability of R (life being rare in existing universes).

e Probability that Universe x contains life conditional on R and Universe x's existence.

f Probability of your existing in Universe 1 conditional on Universe 1's containing life and Universe 2's not.

g Probability of your existing in Universe 2 conditional on Universe 2's containing life and Universe 1's not.

h Probability of your existing in Universe 1 and only Universe 1 conditional on both universes' containing life.

i Probability of your existing in Universe 2 and only Universe 2 conditional on both universes' containing life.

j Probability of your existing in both universes conditional on both universes' containing life.

Further stipulations:

- In defining all these variables but d and e, we assume that the relevant probabilities are independent of R.

- In defining e, we assume that each universe has the same probability of containing life if it exists, and this probability is independent of whether the other universe exists and whether it contains life.

- Variables $a, b, d,$ and e are assumed to have non-extreme values.

1.3 The Model

The basic probability model $\mathcal{M}$ (states with probability 0 have been omitted):

$E1$	$E2$	R	$L1$	$L2$	$Y1$	$Y2$	$Pr_{\mathcal{M}}$
T	T	T	T	T	T	T	$bde^2 j$
T	T	T	T	T	T	F	$bde^2 h$
T	T	T	T	T	F	T	$bde^2 i$
T	T	T	T	T	F	F	$bde^2(1-h-i-j)$
T	T	T	T	F	T	F	$bdef(1-e)$
T	T	T	T	F	F	F	$bde(1-e)(1-f)$
T	T	T	F	T	F	T	$bdeg(1-e)$
T	T	T	F	T	F	F	$bde(1-e)(1-g)$
T	T	T	F	F	F	F	$bd(1-e)^2$
T	T	F	T	T	T	T	$bj(1-d)$
T	T	F	T	T	T	F	$bh(1-d)$
T	T	F	T	T	F	T	$bi(1-d)$
T	T	F	T	T	F	F	$b(1-d)(1-h-i-j)$
T	F	T	T	F	T	F	$acdef$
T	F	T	T	F	F	F	$acde(1-f)$
T	F	T	F	F	F	F	$acd(1-e)$
T	F	F	T	F	T	F	$acf(1-d)$
T	F	F	T	F	F	F	$ac(1-d)(1-f)$
F	T	T	F	T	F	T	$adeg(1-c)$
F	T	T	F	T	F	F	$ade(1-c)(1-g)$
F	T	T	F	F	F	F	$ad(1-c)(1-e)$
F	T	F	F	T	F	T	$ag(1-c)(1-d)$
F	T	F	F	T	F	F	$a(1-c)(1-d)(1-g)$
F	F	T	F	F	F	F	$d(1-a-b)$
F	F	F	F	F	F	F	$(1-a-b)(1-d)$

2 The Argument from Dice-Rolling

Starting from the basic model, the "dice-rolling" scenario makes these further stipulations:

- If at least one universe contains life, you exist.

- You cannot exist in two universes at once.

- If both universes contain life, it is equally likely that you will exist in Universe 1 or Universe 2.

- If exactly one universe exists, it is equally likely to be Universe 1 or Universe 2.

Together, these stipulations give us: $c = 1/2, j = 0, f = g = 1, h = i = 1/2$.

The argument has:

Background Knowledge (K): Life support is rare and some universe exists. $(R \,\&\, (E1 \lor E2))$

Evidence (E): You exist in Universe 1. $(Y1)$

Hypotheses (H): Multiverse, Single Universe. $(E1 \,\&\, E2, (E1 \lor E2) \,\&\, {\sim}(E1 \,\&\, E2))$

In this scenario, the Multiverse Hypothesis is confirmed by the evidence. (According to *any* relevance measure of confirmation.)

Multiverse support remains even if:

- The scenario allows you to exist in both universes.

- The evidence is that you exist in *some* universe.

- The scenario prohibits you from existing in Universe 2.

- The scenario gives you a constant chance of existing in any universe that contains life, independent of what's going on with the other universe (thereby allowing you to exist in either universe, neither, or both).

Multiverse support disappears or depends on priors if:

- Universe 1 has the same chance of existing whether there are exactly 1 or 2 universes.

- The scenario allows you not to exist even if a universe supports life (but doesn't allow you to exist in both universes).

(*Caveat*: So far I've examined the results of all the alterations above severally but not jointly.)

If the scenario is altered to allow zero universes to exist, the result depends on choice of confirmation measure.
Using $r = Pr(H|E \,\&\, K)/Pr(H|K)$, Multiverse confirmation remains.
Using $l = Pr(E|H \,\&\, K)/Pr(E|{\sim}H \,\&\, K)$, Multiverse confirmation depends on priors.

3   Scarcity of Life as Evidence

Starting from the basic model, this scenario makes these further stipulations:

- If at least one universe contains life, you exist.

- You cannot exist in two universes at once.

- If both universes contain life, it is equally likely that you will exist in Universe 1 or Universe 2.

- If exactly one universe exists, it is equally likely to be Universe 1 or Universe 2.

Together, these stipulations give us: $c = 1/2, j = 0, f = g = 1, h = i = 1/2$.

The argument has:

Background Knowledge (K): You exist in Universe 1. $(Y1)$

Evidence (E): Life support is rare. (R)

Hypotheses (H): Multiverse, Single Universe. $(E1 \,\&\, E2, (E1 \vee E2) \,\&\, \sim(E1 \,\&\, E2))$
Note that the background evidence in this case necessitates the existence of at least one universe.

In this scenario, the Multiverse Hypothesis is confirmed by the evidence.
(According to *any* relevance measure of confirmation.)

Multiverse support remains even if:

- The scenario allows you to exist in both universes.

- The background is that you exist in *some* universe.

- Universe 1 has the same chance of existing whether there are exactly 1 or 2 universes.

Multiverse support disappears or depends on priors if:

- The scenario prohibits you from existing in Universe 2.

- The scenario allows you not to exist even if a universe supports life.

- The scenario gives you a constant chance of existing in any universe that contains life, independent of what's going on with the other universe (thereby allowing you to exist in either universe, neither, or both).

(*Caveat*: Again, I've examined these results severally but not jointly.)