Anthropic reasoning in multiverse cosmology and string theory

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Abstract

Anthropic arguments in multiverse cosmology and string theory rely on the weak anthropic principle (WAP). We show that the principle, though ultimately a tautology, is nevertheless ambiguous. It can be reformulated in one of two unambiguous ways, which we refer to as WAP_1 and WAP_2. We show that WAP_2, the version most commonly used in anthropic reasoning, makes no physical predictions unless supplemented by a further assumption of "typicality", and we argue that this assumption is both misguided and unjustified. WAP_1, however, requires no such supplementation; it directly implies that any theory that assigns a non-zero probability to our universe predicts that we will observe our universe with probability one. We argue, therefore, that WAP_1 is preferable, and note that it has the benefit of avoiding the inductive overreach characteristic of much anthropic reasoning.

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