A Hierarchy of Spacetime Symmetries: Holes to Heraclitus

JB Manchak*

Abstract

We present the hierarchy of symmetry conditions within the context of general relativity. The weakest condition captures a sense in which spacetime is free of symmetry "holes" of a certain type. All standard models of general relativity satisfy the condition but we show that violations can occur if the Hausdorff assumption is dropped. On the other extreme, the strongest condition of the hierarchy is satisfied whenever a model is completely devoid of symmetries. In these "Heraclitus spacetimes" no pair of distinct points can be mapped (even locally) into one another. The condition is incredibly strong but we show that Heraclitus spacetimes do, in fact, exist. We close with a brief comment on the prospect of using the symmetries of a spacetime as a guide to how much "structure" it possesses.

---

*joint work with Thomas Barrett