

In-Sight Publishing
Ask A Genius 166 – Spontaneous Symmetry Breaking (Part 1)
Scott Douglas Jacobsen & Rick Rosner
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[Beginning of recorded material]

Scott Douglas Jacobsen: I had a new thought.

Rick Rosner: Okay.

SDJ: What is spontaneous symmetry breaking to you, or in a standard Big Bang universe?

RR: The analogy that everybody uses—there are two analogies that everybody uses. One is a marble on top of a sombrero, but they don't say it that way. They say a marble on a peak, but imagine a marble on a sombrero! It may stay there for half of a second, but it is stable or semi-stable. It is very—stability, when you're talking about the orientation of something in a gravitational field against a surface, is that object when it is in its lowest state, when it has its lowest possible gravitational energy.

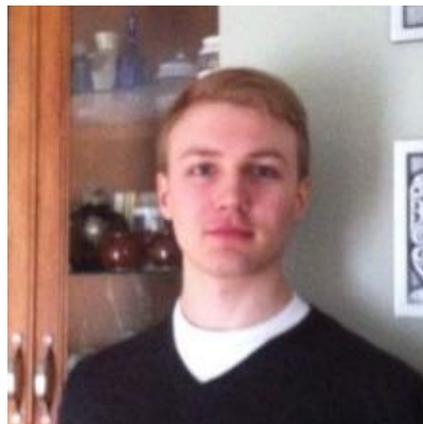
It's like a domino when it is face down on the table. Then there is meta-stability. An object is locally stable, but has potential gravitational energy that can be released. So a domino, there's 3 ways to orient a domino: flat, lying along its long side on edge, lying along its short side on edge as you'd stand it up where a 1,000 dominoes have a chain effect when you push them over. Any time you have a domino on edge it is metastable.

Where it takes a little energy to push it over, but more energy gets produced pushing it over than when you put into it. It is metastable. There's energy waiting to be released. So a marble on top of a sombrero is metastable. There's potential energy waiting to be released. This is supposed to be the situation with regard to the Big Bang at the moment it is about to happen, which isn't really a moment because there's no time yet.

[End of recorded material]

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