Nothing is unstable?

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A note on the instability of nothing.

Asking about how the universe can be created from nothing [1] is a bit like asking how a stationary fluid can begin moving without any external force being applied. Let $\mathbf{u} = \mathbf{u}(\mathbf{x}, t)$, $p(\mathbf{x}, t)$, and $\mathbf{f}(\mathbf{x}, t)$ be the fluid velocity, fluid pressure, and given external force, each defined for position $\mathbf{x}$ and time t. The fluid is incompressible with viscosity $\nu \geqslant 0$. The Navier–Stokes equations are then given by

$$\frac{\partial \mathbf{u}}{\partial t} + (\mathbf{u} \cdot \nabla)\mathbf{u} = \nu \nabla^2 \mathbf{u} - \nabla p + \mathbf{f}, \tag{1}$$

$$\nabla \cdot \mathbf{u} = 0. \tag{2}$$

Let

$$\mathbf{f} = \mathbf{0} \text{ and } \mathbf{u}|_{t=0} = \mathbf{0}. \tag{3}$$

Then taking the divergence of (1) at $t = 0$ yields

$$\nabla^2 p|_{t=0} = 0. \tag{4}$$

If we do not specify any boundary conditions in particular, any solution of the Laplace equation is a valid solution for $p|_{t=0}$. It then follows that it is possible for

$$\frac{\partial \mathbf{u}}{\partial t}|_{t=0} \neq \mathbf{0} \tag{5}$$

and therefore a stationary fluid can begin to move without any external forcing. It is postulated that any object has atoms that move, so zero velocity of an atom implies that it is a nonexisting atom. An analogous calculation may then prove that the universe can be created from nothing in that a state of nothing is unstable. We know that gravity is the attractive force between two masses. It has long been a question of why does gravity occur? I propose that it occurs as a consequence of the fact that the state of nothing is unstable.

Reference

[1] Hawking, S. W. 1988. *A brief history of time*. Bantam Books.