

The God Particle and the Cosmic Fireball: Inflation from the Higgs boson

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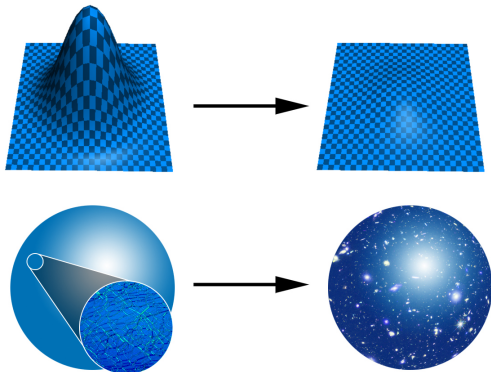
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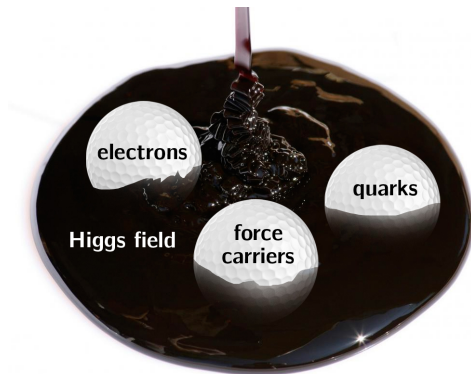
Inflation

- Inflation is **burst of rapid cosmic growth** after Big Bang.
- Explains **flatness**, **uniformity** at large scales—**no big lumps**.
- Explains **small lumps** like stars, galaxies, etc.



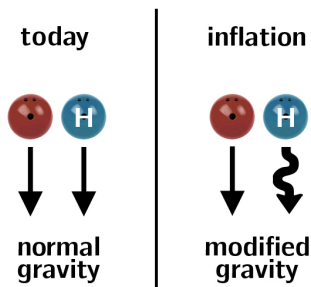
Higgs boson

- Cause of inflation unknown. **Higgs boson** natural candidate.
- Higgs **gives other particles mass** by slowing them down.
- **Too light** to cause inflation, assuming it **falls normally**.



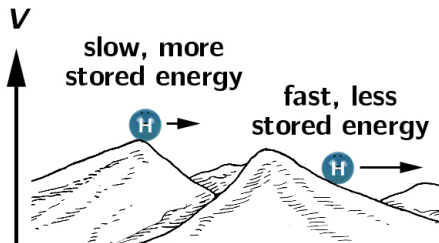
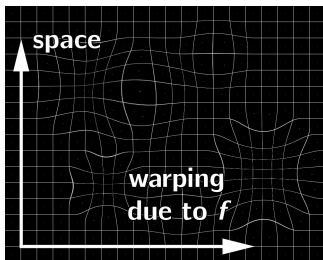
Modified gravity

- **Modified gravity**: special trajectories for Higgs during inflation.
- **Equivalence principle**: everything falls the same way. Built into Einstein's theory of gravity. **No special trajectories!**
- Break rules **during inflation** when no one is watching.



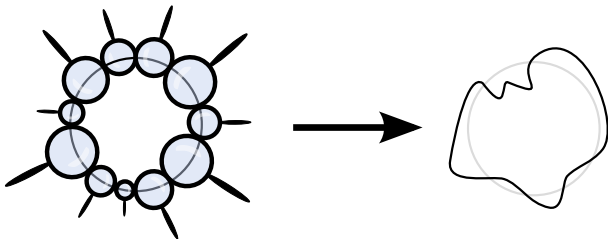
Controlling the trajectory

- Control trajectory with **interaction f** and **potential energy V** :
 - f controls **strength of gravity** by warping space.
 - V is ability to **convert kinetic into stored energy**.
- **Higgs potential V is fixed**. Want to **find f** to get inflation.
- Mathematically hard since we have **gravity + warping**.



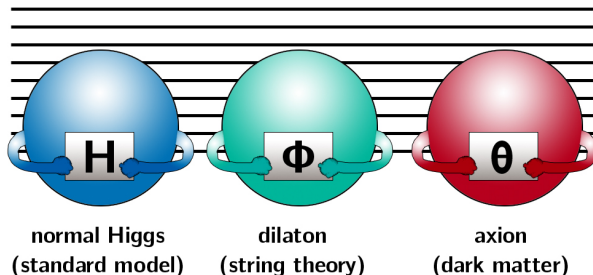
Rescaling

- To simplify, look through **moving magnifying glass**!
- Do it just right and modified **gravity looks normal**.
- **Easy to find f** that works with Higgs potential $V...$
- ...but **take away magnifying glass** and theory looks weird.



Inflation without a magnifying glass

- I'm looking at **general f and V** without magnifying glass!
 - Different V probes **fancy relatives** of Higgs.
 - Different f probes different **high energy physics**.
- Also looking for **generic predictions** to test modified gravity.





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