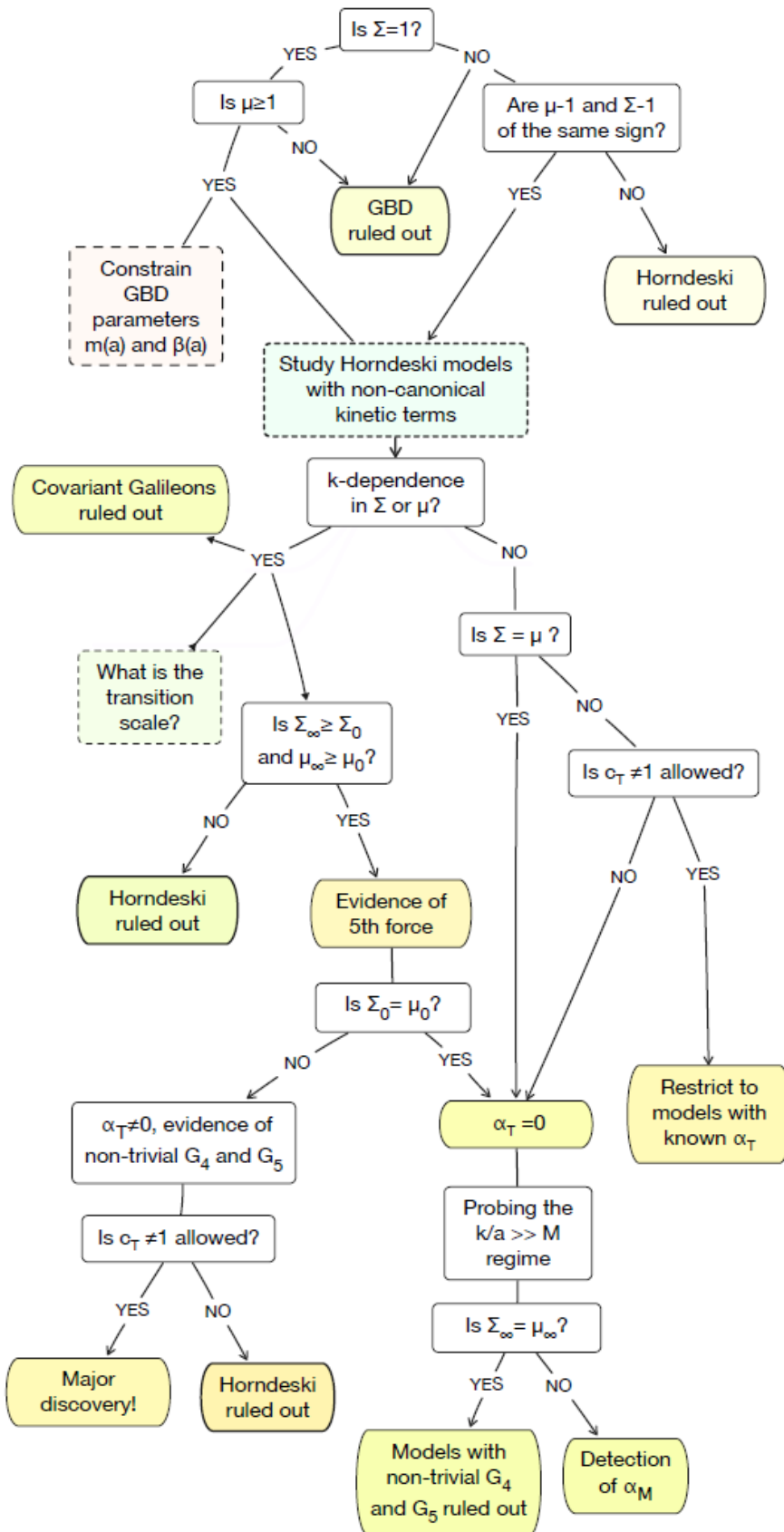


New flowchart to eliminate universe models

November 8 2016, by Erik Arends



In a flowchart, Alessandra Silvestri and Levon Pogosian answer questions with ‘yes’ and ‘no’, leading to the subsequent conclusion. For example, if μ is greater than one and Σ is less, then a large collection of models is ruled out; the so-called Horndeski class. Credit: Leiden Institute of Physics

Cosmologists have many possible models for the universe, of which only one can be true. A new flowchart detailed in *Physical Review D* on November 7 will eliminate some of them when two specific universe features are accurately measured.

Cosmologists try to understand how the entire universe formed and evolves. In short, cosmology is the science of everything above the scale of our pale blue dot floating around in the vastness of space. By aiming their telescopes at distant galaxies and the afterglow of the Big Bang, [cosmologists](#) look back in time and pick up pieces of the puzzle. They used these pieces as parameters in the many possible models they have created for the universe. The more precisely parameters are measured, the more models can be excluded.

Perturbations

Lately, astrophysicists have done many observations to measure two specific parameters. These are called μ and Σ . They represent how fast galaxies formed from the irregularities in the universe just after the Big Bang and how much distant light is bent by gravitational lensing. Recently measured values of μ and Σ generally show a mild tension with the leading cosmological model called Λ CDM. More and better observations will characterize an accurate value of the two parameters. Things would get very interesting if the observed μ and Σ indeed did not

agree with the values expected in the popular Λ CDM model. So then what?

Flowchart

Leiden University physicist Alessandra Silvestri and Levon Pogosian from Simon Fraser University published a paper in *Physical Review D* with an overview of all the models ruled out by each value measured. In a flowchart, they answered questions with 'yes' and 'no,' leading to the subsequent conclusion. For example, if μ is greater than one and Σ is less, then a large collection of models is ruled out; the so-called Horndeski class. With their paper, they add more significance to future cosmological observations, as it lends concrete meaning to the measurement of otherwise abstract values.

More information: Levon Pogosian et al. What can cosmology tell us about gravity? Constraining Horndeski gravity withand, *Physical Review D* (2016). [DOI: 10.1103/PhysRevD.94.104014](https://doi.org/10.1103/PhysRevD.94.104014)

Provided by Leiden Institute of Physics

Citation: New flowchart to eliminate universe models (2016, November 8) retrieved 25 April 2024 from <https://phys.org/news/2016-11-flowchart-universe.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.