Ones Gravitatòries, Inflació, ...
... i tot això

Emili Elizalde

ICE/CSIC & IEEC, UAB

AASCV, 15 Des 2017
The Nobel Prize in Physics 2017 was divided, one half awarded to Rainer Weiss, the other half jointly to Barry C. Barish and Kip S. Thorne *"for decisive contributions to the LIGO detector and the observation of gravitational waves"*
Inflació
Miracle de la Física No. 1

[Alan Guth, MIT]

“La gravetat pot ser repulsiva”
2\textsuperscript{ona} Equació de Friedmann

\[
\frac{\ddot{a}}{a} = - \frac{4\pi G}{3} \left( \rho + \frac{3p}{c^2} \right) + \frac{\Lambda c^2}{3}
\]

\[p = w \rho\]
“Les energies no són sempre positives: el camp gravitatori té energia negativa”
3rd International Winter School-Seminar on Gravity, Astrophysics and Cosmology «Petrov School»
November, 27 – December, 2 2017

30th NOVEMBER, THURSDAY / 30 НОЯБРЯ, ЧЕТВЕРГ
LECTURE SESSION / ЛЕКЦИОННОЕ ЗАСЕДАНИЕ

Chairman / Председатель Francisco Lobo
8.45-9.45 Alexei A. Starobinsky
“New results on inflation and its origin from curvature singularity. Part II.”
9.45-10.45 Salvatore Capozziello
“Addressing the missing matter problem in galaxies through a new fundamental gravitational radius”
10.45-11.00 Coffee-break / Кофе-брейк
11.00-12.00 Emilio Elizalde
“On the origins of modern cosmology and a renormalization group improved scenario”
12.00-13.00 Mohammad Sami
“Quintessential inflation”
I tot això ...
Cosmic Inflation Theory Faces Challenges

The latest astrophysical measurements, combined with theoretical problems, cast doubt on the long-cherished inflationary theory of the early cosmos and suggest we need new ideas

By Anna Ijjas, Paul J. Steinhardt, Abraham Loeb

On March 21, 2013, the European Space Agency held an international press conference to announce new results from a satellite called Planck. The spacecraft had mapped the cosmic microwave background (CMB) radiation, light emitted more than 13 billion years ago just after the big bang, in better detail than ever before. The new map, scientists told the audience of journalists, confirms a theory that cosmologists have held dear for 35 years: that the universe began with a bang followed by a brief period of hyperaccelerated expansion known as inflation. This expansion smoothed the universe to such an extent that, billions of years later, it remains nearly uniform all over space and in every direction and “flat,” as opposed to curved like a sphere, except for tiny variations in the concentration of matter that account for the finely detailed hierarchy of stars, galaxies and galaxy clusters around us...
A Cosmic Controversy

A *Scientific American* article about the theory of inflation prompted a reply from a group of 33 physicists, along with a response from the article’s authors.

*Credito: Scientific American, February 2017*

The origins of space and time are among the most mysterious and contentious topics in science. Our February 2017 article “Pop Goes the Universe” argues against the dominant idea that the early cosmos underwent an extremely rapid expansion called inflation. Its authors instead advocate for another scenario—that our universe began not with a bang but with a bounce from a previously contracting cosmos. In the letter below, a group of 33 physicists who study inflationary cosmology respond to that article. It is followed by a reply from the authors (an extended version of their reply can be found here).
In “Pop Goes the Universe,” by Anna Ijjas, Paul J. Steinhardt and Abraham Loeb, the authors make the case for a bouncing cosmology, as was proposed by Steinhardt and others in 2001. They close by making the extraordinary claim that inflationary cosmology “cannot be evaluated using the scientific method” and go on to assert that some scientists who accept inflation have proposed “discarding one of [science’s] defining properties: empirical testability,” thereby “promoting the idea of some kind of nonempirical science.” We have no idea what scientists they are referring to. We disagree with a number of statements in their article, but in this letter, we will focus on our categorical disagreement with these statements about the testability of inflation...


We have great respect for the scientists who signed the rebuttal to our article, but we are disappointed by their response, which misses our key point: the differences between the inflationary theory once thought to be possible and the theory as understood today. The claim that inflation has been confirmed refers to the outdated theory before we understood its fundamental problems. We firmly believe that in a healthy scientific community, respectful disagreement is possible and hence reject the suggestion that by pointing out problems, we are discarding the work of all of those who developed the theory of inflation and enabled precise measurements of the universe.

Historically, the thinking about inflation was based on a series of misunderstandings. It was not understood that the outcome of inflation is highly sensitive to initial conditions. And it was not understood that inflation generically leads to eternal inflation and, consequently, a multiverse—an infinite diversity of outcomes. Papers claiming that inflation predicts this or that ignore these problems …
... i una mica d’IA
Kurzweil’s Predictions

“2029 consistent date for when an AI will pass a valid Turing test and therefore achieve human levels of intelligence. Date 2045 for the ‘Singularity’, when we will multiply our effective intelligence a billion fold by merging with the intelligence we have created”

"By 2029, computers will have human-level intelligence"

• The singularity is that day when all the advances in artificial intelligence (AI) will lead to machines smarter than human beings

• Consistent with other predictions, as Softbank CEO Masayoshi Son: dawn of super-intelligent machines will happen by 2047

• For Kurzweil, the process towards this singularity has already begun
To Fear or Not to Fear...

Should humanity fear the singularity?

- **Wrong:** When machines become smarter than humans, they take over the world — Stephen Hawking, Elon Musk, Bill Gates —

- **Kurzweil:** The singularity is an **opportunity** for humankind to improve
  By the 2030s, we will connect our neocortex to the cloud
  
  - TESLA Elon Musk’s “neural lace”
  - XPRIZE Foundation Peter Diamandis’ “meta-intelligence”

- **Kurzweil** predicts that during the 2030s some **technology will be invented to go inside your brain and help your memory**

- A future of unparalleled **human-machine synthesis**
Moltes gràcies