Message from Prof. Srinivasan

This is the 41st and the final lecture of this series. It has been a long journey, but surprisingly there have been very little feedback. I would love to hear from as many of you as possible, with your views on the lectures, how comprehensible they were, were they interesting, do you feel motivated to pursue astronomy further, etc. Do type in your comments. Better still, send me a detailed email to – **astrowithsrini@gmail.com**.

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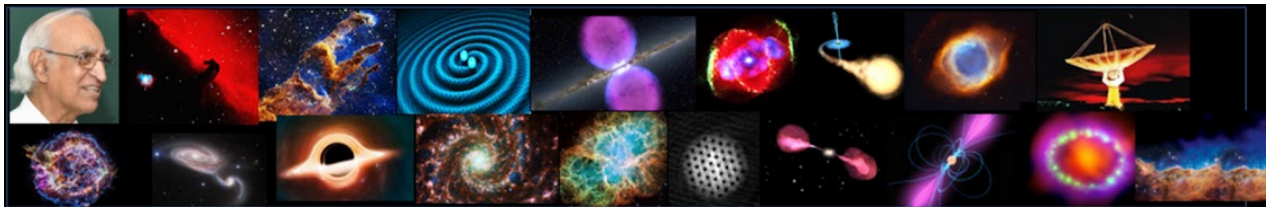
AstroPHYSICS with Srini

https://www.youtube.com/@astrophysicswithsrini1094



The newly launched youtube channel of Prof. Srinivasan. WATCH it, SUBSCRIBE to it, BRING it to the ATTENTION of your friends! And here is why.

The present course of introductory lectures will end with this 41st lecture. There are many topics in basic physics, as well as astrophysics, that you encountered in this course that deserve a 'revisit'. Prof. Srinivasan plans to make new videos on these topics and upload them to this channel. This will start to happen soon. Meanwhile, this channel is up. Currently, the PLAYLIST contains the 40 lectures that he delivered at the International Centre for Theoretical Sciences, a few years ago. All the 41 lectures from this current series would also be available there. And then, many more..

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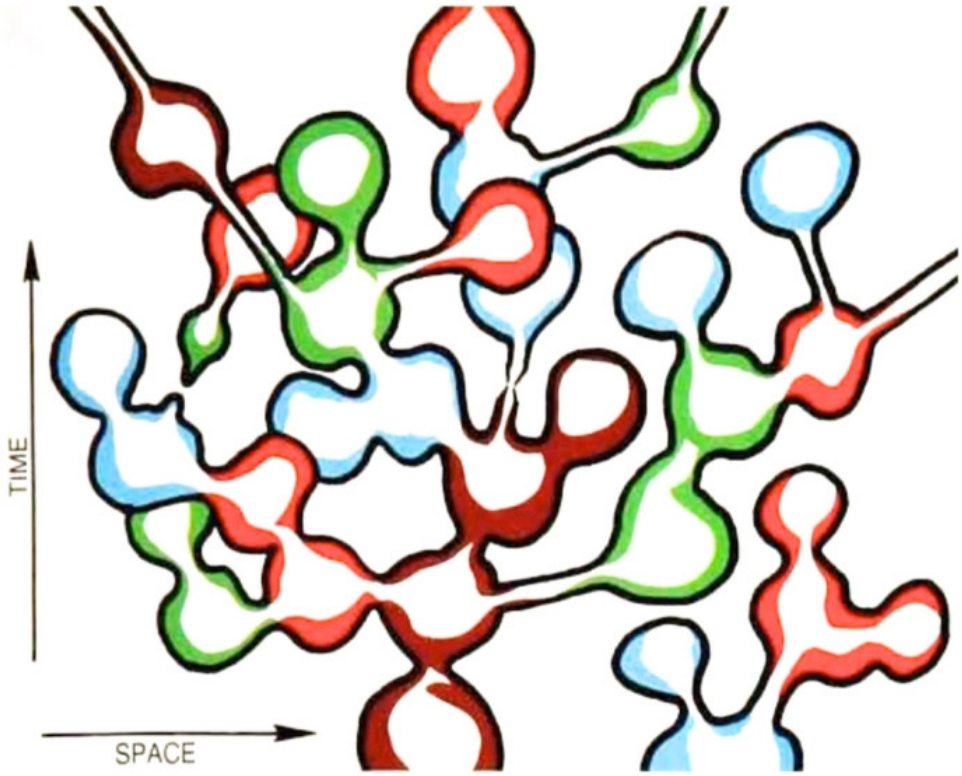
10 February 2023

Lecture 41 : Eternal Inflation and Multiverse

In 1983, Andrei Linde forcefully argued that inflation (exponential expansion) does not require a cosmological phase transition, or any contrived potential. Rather, it is a 'generic cosmological regime. If one accepts this, then one of the possibilities is that "inflation is eternal" and the universe constantly "reproduces itself". This is the concept of the MULTIVERSE an infinitely large number of universes. This raises many questions such as the following. Will the 'laws of physics be the same in all the universes? Will the fundamental constants of nature have the same values in all the universes? Was there a beginning to the universe? If so, how did this "creation" happen, and what was there before the beginning? In this final lecture of this series, these fascinating but speculative ideas are discussed.



Global structure of a chaotic, self-reproducing inflationary universe. Locally (out to the 10^{10} light-year horizon) the universe looks quite homogeneous, but its global structure is complex. Mini-universes at the Planck energy density are "mutants" that may forget completely the "genetic code" (color) of their parent universe. They may even have a different space-time dimensionality. The typical thickness of a tube connecting two mini-universes after inflation is exponentially large, but if it corresponds to a compactified inflationary universe it can be as thin as the Planck length ($\sim 10^{-33}$ cm). If the tube then evaporates by Hawking radiation, the parent and offspring mini-universes have lost their umbilical space-time connection.

[Source : Linde A., 1987, Physics Today 40, 61 (*Particle Physics and Inflationary Cosmology*)]

10 February 2023

Astronomy & Astrophysics : An Introductory Survey

A lecture series by Prof. G. Srinivasan

A 'Golden Jubilee Celebration' Event of the Astronomical Society of India

Lecture 39 : The Big and Small (Part-I)
The unification of forces and cosmological phase transitions
[Supplementary Material : Dr. Sushan Konar]

Resource Material : ***Text Books, Popular / Technical Articles***

1. S. Weinberg, 1972, ***Gravitation and Cosmology***, Wiley
2. R. M. Wald, 1984, ***General Relativity***, Chicago University Press
3. E. W. Kolb, M. S. Turner, 1990, ***The Early Universe***, Addison-Wesley
4. P. J. E. Peebles, 1993, ***Principles of Physical Cosmology***, Princeton University Press
5. A. H. Guth, 1997, ***The Inflationary Universe: The Quest for a New Theory of Cosmic Origins***, Basic Books
6. M. Rees, 1998, ***Before the Beginning***, Basic Books
7. A. R. Liddle & D. H. Lyth, 2000, ***Cosmological Inflation and Large-Scale Structure***, CUP
8. R. Penrose, 2004, ***The Road to Reality: A Complete Guide to the Laws of the Universe*** Vintage Books
9. V. Mukhanov, 2005, ***Physical Foundations of Cosmology***, Cambridge University Press
10. C. S. Misner, K. W. Thorne & J. A. Wheeler, 2017, ***Gravitation***, Princeton University Press
11. A. H. Guth & S. Tye, 1980, Phys. Rev. Lett., 44 (10), 631
    Phase transitions and magnetic monopole production in the very early universe
12. A. H. Guth, 1981, Phys. Rev. D, 23, 347
    The inflationary universe: a possible solution to the Horizon and Flatness problems
13. K. Sato, 1981, Mon. Not. Roy. Astron. Soc. 195, 467âĂŞ479
    First order phase transition of a vacuum and expansion of the universe
14. A. D. Linde, 1982, Phys. Lett. 108B, 389
    A new inflationary universe scenario: a possible solution of the horizon, flatness, homogeneity, isotropy and primordial monopole problems
15. A. Albrecht, P.J. Steinhardt, 1982, Phys. Rev. Lett. 48, 1220
    Cosmology for grand unified theories with radiatively induced symmetry breaking
16. A. D. Linde, 1982, Phys. Lett. 116B, 335
    Scalar field fluctuations in expanding universe and the new inflationary universe scenario
17. A. D. Linde, 1983, Phys. Lett. 129B, 177
    Chaotic inflation
18. A. D. Linde, 1984, Rept. Prog. Phys. 47, 925
    The inflationary universe
19. A. H. Guth, 2007, Journal of Physics A, 40, 6811
    Eternal inflation and its implications
20. P. J. Steinhardt, 2011, Sci. Am., 304(4), 18
    The inflation debate: Is the theory at the heart of modern cosmology deeply flawed?
21. A. D. Linde, 2015, Rept. Prog. Phys. 80, 022001
    A brief history of the multiverse