Remark on 'The future of mathematical Cosmology" and "100 years of mathematical cosmology: Models, theories and problems, Part B" by S. Cotsakis and A.P. Yefremov

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Abstract

In this review article, allow us to offer a few remark on "the future of mathematical cosmology" "100 years of mathematical cosmology: Models, theories and problems, Part B" by Cotsakis and Yefremov, which seems to us very interesting piece of review on progress on the last 3 or 4 decades in theoretical cosmology development. In particular, we would emphasize on testability of cosmology models, which seem to us this criterion can only be achieved via correspondence between condensed matter/superfluidity/low temperature physics and cosmology (cf. for instance, Kibble & Pickett, 2008).

Keywords: cosmological theories; low temperature physics; correspondence between condensed matter/superfluidity low temperature physics and cosmology

1. Introduction

This year is quite remarkable, especially for cosmology field, because there is 100 year anniversary of mathematical cosmology studies. And there are 2 volumes published by Philosophical Transactions A, 2022. In particular there are 3 articles by Cotsakis & Yefremov in those volumes. In this review article, allow us to offer a few remark on "*100 years of mathematical cosmology: Models, theories and problems, Part B*" by Cotsakis and Yefremov, which seems to us very interesting piece of review on progress on the last 3 or 4 decades in theoretical cosmology development. In particular, we would emphasize on testability of cosmology models, which seem to us this criterion can only be achieved via correspondence between condensed matter/superfluidity low temperature physics and cosmology (cf. Kibble & Pickett, 2008).

2. A few remark on implications of correspondence between low temperature physics and cosmology modeling

While these writers appreciate and agree with Cotsakis and Yefremov, on their remark: "The subject of mathematical cosmology plays a fundamental role in theoretical physics today and has deep applications in contemporary astronomy and astrophysics [1]," nevertheless there are few remark that we can offer here. For instance, to begin with, experts know that there are problems of inflationary theories [3], why there is such a rapid inflation in the very first instance in the beginning of the universe (if we accept the scenario of big bang). Similarly, for quantum cosmology such as Wheeler-De Witt equation, it is interesting to remark that John Wheeler himself has retracted from using term such as

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geometrodynamics, and even he did not mention his own equation WDW, see his biography a few years before he deceased (Geons …, 2006). Nonetheless, there is a hope if we try to find correspondence between cosmology models and experiment in labs, and researchers began with COSLAB etc, and article by Kibble and Pickett, seem to be very interesting, because it suggests that the future may be found in *quantum (liquid) and its correspondence with cosmology theories.*
Therefore, in particular, we would emphasize on testability of cosmology models, which seem to us this criterion can only be achieved via correspondence between condensed matter/superfluidity low temperature physics and cosmology, cf. Kibble & Pickett [4]. According to Kibble & Pickett, at first sight, low-temperature condensed-matter physics and early Universe cosmology seem worlds apart. Yet, in the last few years a remarkable synergy has developed between the two.

Few comments
A few brief comments from us, considering the close relationship between condensed matter/superfluidity and cosmology (cf. Kibble & Pickett, Zurek *et al*) as well as new findings about nonscale physics such as topology defects. So it is better to propose 2 more realistic approaches to cosmology in the following principles:
(i) the principle of correspondence between the cosmos and the lab scale experiments, meaning that as far as possible the effects debated in cosmology can be tested in the lab, for example if you want to develop or prove there are deviations from Newton's third law, you probably must test them with the Magnus force in superfluidity. Or other lab experiments. There has been a recent study of Apophis trajectory as part of NEO (near earth objects), however it seems to us such a study needs to be extended to possibility of deviation of trajectory of Apophis due to Magnus or Iordanskii effect corresponding to superfluid physics. Just for reference purpose, there are several studies on trajectory of Apophis and even prediction of its coming to Earth around 2029 (see for instance, our colleague Ershkovs's article, and others [6][7][8]). Nonetheless, very few have been done to discuss possible deviation of its course due to Magnus force, although an article can be found studying Magnus effect on a satellite trajectory. In their article, Ramjatan *et al*. wrote: "A spinning body in a flow field generates an aerodynamic lift or Magnus effect that displaces the body in a direction normal to the freestream flow. Earth orbiting satellites with substantial body rotation in appreciable atmospheric densities may generate a Magnus force to perturb orbital dynamics."[9] Meanwhile, Orlov argues that vortex gravity theory supersedes Newton's theory, and we agree with him, with additional comments that we don't agree with his support of old Earth age around 1 billion years or more [10][11], because elsewhere we already show that a computational simulation of Ermakov equation corresponding to cosmology in correspondence with BEC can give a model of nonlinear behavior of the Universe where instantaneous increase of radii of the Universe is possible [12]. And this can be shown without even any other hypothesis such as Guth's inflationary theory. To us, such an approach based on condensed matter correspondence with cosmology may be able to model or replicate in lab somedays in the future.
(ii) the principle that because so far humans can only send probes as far as the edge of the solar system (e.g. Voyager). Then the solar system may be considered as "*our nearest large-scale lab*" to be able to test ideas about the cosmos.

The following diagram may be useful for practical researchers doing cosmology model tests on lab, which seem to us they can be categorized as follows:

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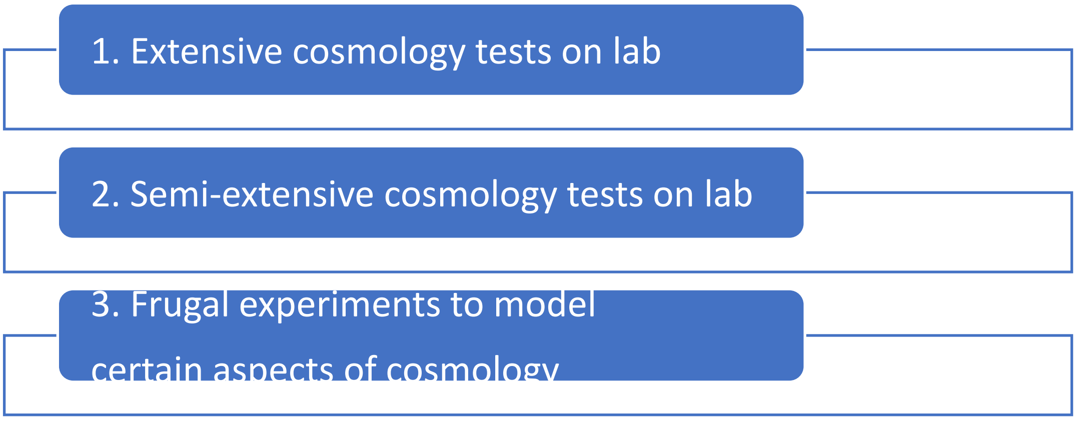

Diagram 1. Category of cosmology model tests on lab

In order to give a more practical insights and also to support the idea of such a correspondence, this writer conducted a number of frugal/small experiments with small intensity laser pen (to irradiate) and a glass of potable water. And then also experiments to irradiate potable water with low intensity laser pen in combination with Solfeggio scale frequencies. We report those experiments in 2 articles in this issue.

3. Concluding remark

In a series of articles this year, Cotsakis & Yefremov have discussed interesting developments of mathematical cosmology. Nonetheless, allow us to emphasize in particular on possible testability criteria of cosmology models, which seem to us this criterion can only be achieved via correspondence between condensed matter/superfluidity low temperature physics and cosmology, cf. Kibble & Pickett [4]. According to Kibble & Pickett, at first sight, low-temperature condensed-matter physics and early Universe cosmology seem worlds apart. Yet, in the last few years a remarkable synergy has developed between the two.
We also suggest 2 more realistic approaches to cosmology in the following principles: the principle of correspondence between the cosmos and the lab scale experiments, (ii) the principle that because so far humans can only send probes as far as the edge of the solar system (e.g. Voyager). Then the solar system may be considered as "our nearest large-scale lab" to be able to test ideas about the cosmos.

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