Committee I
The Evolution of Man

Discussion paper

on

Bernulf Kanitscheider's

The Anthropic Principle

by

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It is a great pleasure for me to open the discussion in our committee I on such a comprehensive and very interesting paper.

It may be not impossible that somebody has the intention that I have to present a controversial meaning. But I must confess that a *really* controversial meaning hardly can be defended. Nevertheless, I will try to speak on some aspects of the paper from a somewhat different point of view.

Why are cosmological problems so interesting for mankind from the ancients till today?

To give one of the possible answers to this problem I will use a more metaphorical language. In such a language one can say that cosmology is a mirror which reflects the state of our soul. Cosmology reflects more our thinking about the place of mankind in the universe then about the universe itself.

The earliest ancient thinking about cosmology is named a mythical one today. Of course this is justified. But the problem today is, that nearly nobody is open to see that also in the present scientific cosmology is an underlying stratum with mythical aspects. If I may quote C. F.v. Weizsaecker:

The myth of creation for the century of the hydrogen bomb is the big bang.

It is nearly impossible to falsify cosmological theories by experiments. Therefore a broad range of equally well defined theories is possible. In the paper it is explained in a clear way that the Big Bang cosmology - which seems established for the time following the first three minutes - can be connected with very different conceptions on the time before. Theories of Hawking and Linde for instance show the mathematical possibility to invent theories without an initial Friedman singularity.

All this is good and ingenious physics and it will be further improved. And it seems very hard to refute such theories by physical arguments only.

The later parts of the Big Bang scenario are in good accordance with the astronomical observations and are therefore a ne-

cessary ingredient of any cosmological theory. It is a very interesting fact that they can be connected also with the idea of a "non-beginning" or even of a "perpetual existence" of the cosmos.

I think that it is *our* basic philosophical decision which forces us to favour one or an other type of cosmological theories. Therefore such a theory may perhaps say more about ourselves then about the "real" beginning of the universe (look at page 43 of the paper).

This does mean not at all, that one should not speak about possible inconsistencies in the theoretical concepts. But this should be done more in the physical way of arguing. Therefore I fully agree with Prof. Kanitscheider's intention to look for an *dynamical* explanation of the cosmic coincidences and the other problems not fully understood till now.

One of these problems - and a serious one - is the dimension of space-time. It is an absolutely right description of the history of physics that this was seen very seldom as a real problem. Perhaps it is strongly connected with the difficulties to unite quantum theory with gravitational theory.

For myself I have great difficulties to see that an *ad hoc introduction of 26 space-time dimensions* gives indeed an *explanatory* basis for our 3+1-dimensional world. With respect to this problem I prefer v. Weizsaeckers idea to explain the dimension of space-time as a consequence of abstract quantum theory [1,2].

In the paper the impressive way of modern physics to connect and unite its different parts is described very good .

I fully agree with the statement that cosmology cannot be understand without an understanding of its strong interrelation with particle physics.

But it is not evident in itself that cosmological facts must be explained by means of todays high energy physics theories. These theories are far from being finished and not really understood. They contain too much free parameters as to establish a

fundamental theory and offer many conceptual difficulties.

So it seems not excluded by first principles that there exists a solution the other way round. This would mean that the conditions of the evolving universe create the restrictions for particle physics, e.g. for the masses of the stable elementary particles. This is a conception as good as the idea to "pre"-scribe the early cosmic evolution by the yet unfinished particle theories.

To say it in other words:

The early cosmic evolution can set fundamental conditions for the recent particles and their properties - whereas, on the other hand - there is no visible necessary causal explanation for the evolution of the early universe by the properties of the recent particles.

An other place for a possibility to change the order of arguments is the theory of gravitation.

In physics we are looking for *general laws*. This means we search for laws which hold everywhere and at any time. In case that such a law is expressed by a differential equation, we have an infinity of possible solutions. Every special case of interest can be handled by introducing special initial or boundary conditions. These special conditions characterize the special solution for the given problem.

Such a general procedure is meaningful if we have indeed many special cases all falling under the same general law.

But wether the problems of cosmology belong to this kind of physical situations or not is - at least for me - an open question.

The equations of general relativity describe the connections between the local distributions of matter and energy with the geometric structure of a Riemannian space-time. This is in all known cases a very good description for classical objects *inside* the cosmos.

If we use the concept of a *uni*verse in its original meaning there is no possibility - and also no need - for a multitude of

them. In this case of only one single real existing solution there seems no meaningful speech about a *general* law.

So it may be possible that a large part of the problems in cosmology today - i.e. the "astonishment of improbability" - is produced simply by the way we try cosmology.

Physics as science is a possibility to describe objects which are objects for us. Wether the universe is or is not an object *for us* is a very difficult and undecided question. No wonder that conceptual difficulties may evolve.

But to explain ideas for a possible solution of these problems would need much more time as given in a short discussion speech.

Literature

[1] Görnitz, Th., (1988[1]): Abstract Quantum Theory and Space-Time-Structure, Part I: Ur-Theory, Space Time Continuum and Bekenstein-Hawking-Entropy,
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[2] Görnitz, Th., (1988[2]): On Connections between Abstract Quantum Theory and Space-Time-Structure, Part II: A Model of cosmological evolution,
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