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Cosmology at the Crossroads of the Natural and Human Sciences: is Demarcation Possible? Part 1: Introduction

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The paper discusses the problem of demarcation between the dimensions of natural and the human sciences in contemporary cosmology. In spite of a common presumption that cosmology is a natural science, the specificity of its alleged subject matter, that is the universe as a whole, makes cosmology fundamentally different from other natural sciences. The reason is that in cosmology the subject of cosmological research and its "object" are in a certain sense inseparable. Any study of the universe involves two opposite perspectives which can be described as "a-cosmic" and "cosmic", egocentric and non-egocentric. Cosmology involves two languages, namely that of physical causality (pertaining to the natural sciences) and that of intentionality (pertaining to the human sciences). On the one hand the universe can be seen as a product of discursive reason, that is as an abstract "physical" entity unfolding in space and time. On the other hand the universe can be experienced through our participation in, or communion with the world understood as the natural context of living beings. This dichotomy between reason and experience, abstract construction and concrete participation, originates in the essence of human persons understood as unities of the corporeal and spiritual. On account of this dichotomy it is hard to set up a strict line of demarcation between the elements of the human and the natural sciences in cosmology. This confirms the intuition that any realistic world view is incomplete without a knowledge of what it means to exist as a human being. Conversely it is likewise impossible to understand human existence without considering its natural setting, that is the universe. We conclude that anthropology is incomplete without cosmology and vice versa.

Keywords: cosmology; philosophy; universe; knowability; humanity; participation; manifestation; phenomenology; beliefs; coherence of explanation

Introduction

Contemporary physical cosmology is a well established and vast enterprise which includes astronomical observations, space programmes, research institutions and funding strategies. Cosmology develops fast. Every day one discovers dozens of new publications on the internet archives. Monographs and popular books telling stories about the universe, about its study and those who study it are in abundance. Cosmological ideas are used and misused in science fiction and fiction in general. Cosmology becomes a sort of a cult reading as if humanity touches upon something ultimately sacred and indispensable for its life. Cosmology gathers numerous conferences, workshops and public lectures resulting in further

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publications of collective volumes. Apart from physical scientists, cosmology attracts historians and philosophers of science, as well as millions of those who adore science and trust its final word on the nature of things. This is a dynamic set of enquiries about the world around us which constitutes an integral part of contemporary intellectual culture. It is exactly the popularity of cosmology in mass-media and among ordinary people which manifests that it affects a collective consciousness of people and has existential and ethical implications. Cosmology is involved in the dialogue with religion: it becomes an arena of theistic inferences and justifications of otherworldly transcendence when the results of its theories are brought into correlation with theological convictions. Contemporary cosmologists are often seen as exercising a certain priestly role in modern society as if cosmological ideas had an immediate existential and social impact that would catch and fascinate public opinion.

In spite of all these facts cosmologists' confidence in cosmology's ability to explain the essence and contingent facticity of the universe is far from being justified. Some cosmologists raise doubts whether cosmology can pretend to be following rigorously what is called scientific method[1], understood so that all knowledge including mathematical theories leads to experimental verification. It is a fact of cosmology's sociology that there are extrapolations and conjectures in cosmology's claims for truth which go beyond scientific justification and this involves the whole field into an interdisciplinary discourse in which the criteria of validity and truth are much more vague that those in the natural sciences. Correspondingly, the objective of this paper is to elucidate the nature of cosmology's claims for the value and truth of its theories in a cross-disciplinary context related to knowability of the universe and its relation to human agency, its history and self-understanding. This will be done in the perspective where cosmology is treated as a mode of human activity contributing to the "infinite tasks" of humanity, its culture and spiritual advance.

Physical cosmology and an input of philosophy

Cosmology, understood as part of theoretical physics, forms a subject matter that by its very nature tests the boundaries and the very possibility of scientific explanation. Indeed, cosmology describes itself as a science which deals with "the universe as a whole", the universe as the all-encompassing, singular and unique "object" of cosmology. However the usage of the word "object" applied to the universe as a whole is problematic simply because the mainstream understanding of objectivity does not allow the concept of the universe to fit in it. Indeed, according to this view the universe consists of independent individual things (objects) which are embedded in space-time. These things as objects are *individuals*, because they have a spatio-temporal location, they are a subject of predication of properties, and they are distinguishable from each other through some properties. The universe as a whole cannot be thought as an object (or as an individual) because it is as a whole not embedded in space-time (it is rather a totality of space and time which transcends their characteristic features such as extension).[2] The universe is unique and cannot be distinguishable from anything through particular properties because, by definition, it comprises everything. The predication of the universe as a whole in terms of properties is problematic because the universe does not attain original givenness in the manner characteristic of particular individual things.[3] The constitution of an individual thing as an object, that is as a thing subjected to thematisation and objectification assumes as a condition the

release from "environmental confinement"[4] or the context in which a thing is looked at. The universe as a whole cannot be released from such a confinement because, in a way, it is itself, by definition, the ultimate environment and context for everything.[5] Thus the standard meaning of the phrase "object of explanation" as if its identity has been defined cannot be applied to the universe with any ontological clarity.[6] But we do indeed understand and use this expression "the universe" and therefore there must be a manner in which the universe is given, a consciousness of the universe that bestows sense on such language. This implies that before any philosophical deliberation or scientific thematisation of the universe, there must be experience of the universe as the recognition that there is the permanent and persistent in the background of change or the variable. There is the sense of identity of the universe as an intentional correlate of subjectivity, but the identity as ideal and unfulfilled. A possible scientifically reductive approach to identity of the universe as an inherent and non-relational aspect of an entity or a logical subject does not clarify the ontological status of this identity. Within these, so to speak, existential delimiters, the universe of cosmology, being thematised, naturally represents the ultimate noematic limit in the process of scientific exploration and explanation. Nothing further is empirically or theoretically accessible to which recourse can be made in order to explain the most general properties of the universe as a whole and the facticity of its own existence.[7] In one way or another, natural scientific explanation stops right there.

The very existence of the universe turns out to be the precondition for physical science: the latter describes and explains phenomena which take place in the universe as something which is already given. This is the reason why the universe (as the totality of being) is not itself subject to a physical explanation. The phenomena with which physics deals have to be present. Physics simply takes the existence of its objects for granted. The laws of physics are laws that hold *within* this universe; they do not purport to be laws that hold across "universes" (which in this sense would be universal for many universes with different contingent properties), whatever that would mean. Physics is not able to enquire into the underlying facticity of the phenomena within the universe. If this facticity is associated with the contingent appearance of phenomena (as contingent outcomes of physical laws[8]) as if these phenomena manifest the radical coming into being of that which has not been before, physics definitely cannot link the being of these phenomena with that something (non-being) they come from. In other words, physics can deal with the manifestations of being but not with the ground of these manifestations in "non-being". It deals with something that obeys laws which are already in being. In technical philosophical language the same idea can be expressed differently: since physical cosmology is capable of apprehending the interior of the universe, the universe exhibits itself as intelligible; but because of the contingent nature of this intelligibility (it cannot explain itself, otherwise it would not be contingent) the universe embodies a semantic reference beyond itself. Cosmologists cannot themselves deal with this "other-worldly" reference and conduct a proper philosophical work. Some physicists in an attempt to address the foundational questions in cosmology make manifest a "philosophical" mode, not because they adhere to a realm of "philosophy" but because they do not follow the normal ways of theory-assessment in the natural sciences. This was the original motivation, for example, for inflationary cosmologies which aspired to explain away the problem of the special initial conditions of the universe responsible for the contingent display of the astronomical universe. A similar motivation lies in ideas of

multiverse. However, these models, having a developed mathematical basis and being employed for problem-solving, raise philosophical problems and need competence and appraisal through borrowing methods of philosophy and insights of the human sciences.

One can generalise by saying that on the one hand physical cosmology avoids touching upon ultimate questions; on the other hand, because of the special status of its subject matter, that is the universe as a whole, as well as the fundamental inseparability of human subjectivity from the universe, cosmology is imbued with these questions and in order to attend to them one has to invoke a philosophical attitude to cosmology.[9] By conducting a philosophical analysis of cosmology one can on the one hand articulate the *qualities* of cosmological theory which make it scientific, and identify the naturalistic *limits* within cosmological methodology. On the other hand, by transcending these limits through an enquiry in cosmology's facticity, one inevitably brings cosmology beyond the scope of the natural sciences since, de facto, here humanity enquires into the facticity of its own historically contingent subjectivity. Philosophy here manifests itself as a method of enquiry into the sense-forming activities of human subjectivity in the subject area of the universe as a whole.[10] However, since philosophers do not have a supply of knowledge about nature in advance, on which they can draw or to which they should refer, it would be wrong to take the philosophy of cosmology as dealing with issues independently of the research going on in physics and mathematics. But in spite of the obviousness of the fact that the origin of scientifically motivated facts lies within cosmologists' thinking, the sense of cosmological ideas and their significance for the constitution of the noetic pole of the enquiry (that is for human subjectivity), exceeds the scope of the natural sciences and thus requires an appeal to the methods of those sciences which are not restricted in their scope to the causality of nature.

The special status of cosmology as a natural science: from substance to manifestation

The special status of cosmology among natural sciences is determined by the decisive factor that its subject matter is unique and cannot be represented as an outside object, so that there is a fundamental inseparability of the enquiring intellect and the universe as a whole. Said philosophically, the universe enters all forms of human cognition as the ultimate horizon of contexts.[11] Here we are confronted with a question about the status of cosmology as a natural science. In an attempt to study *some particular aspects* of these contexts cosmology exhibits certain features of the human sciences in the sense that the humanly made choice and emphasis of topics of investigation through their naming, methods and goals have a genetic *historical* priority over the post-factum made non-egocentric claims about the reality of the universe as if it is in itself. The same is true with respect to any part of physics. However, the seeming epistemic priority of the human element in cosmology is linked to the fact that the human world (or the "premise-world") associated with the conditions of embodiment has object-noematic priority over all "other worlds", for cosmology, unlike other sciences, has to predicate that reality which is far away in a generic sense from the premise-world. This predication is being made not only as a bottom-up explanation (that is based on ascending series of physical *causation* from the macroscopic empirical phenomena to the additive totality), but also as a top-down *inference* based on the workings of the *intentionality* of human subjectivity.[12] This intentionality includes, for example, the very idea of the universe as the overall totality. From the point of view of empirical physics the invocation

of this idea is optional. Correspondingly the idea of the origin of the universe does not proceed from earthly physics: it enters the discourse through an intentional interrogation into the ground of the universe's facticity, an interrogation which is not part of the enquiry into physically causality, but rather is a philosophical quest for the sense of being. To understand, in an existential sense, intentionality invokes intelligible, invisible entities in order to "explain", or more precisely, to interpret the phenomenal. Cosmology in this respect provides an endless chain of illustrations.

When we accentuate the presence of the language of intentionality in cosmological discourse we effectively involve physical cosmology (which is by its status a science of the abstract, and detached from human reality, universe) in the context of the human affairs, thus exhibiting in a characteristic way that intrinsic ambivalence in cosmology which originates in the paradoxical human condition as "both being a subject of the world and being an object in the world".[13] Being a subject of the world man articulates the whole universe on the grounds of its existential inference of its commensurability with the universe. Being an object, human being realises its insignificance for the whole universe and thus its incommensurability with it. It is the sense of commensurability which is embedded in cosmologist's *intentionality* of believing in and predicating of the universe as a whole. And it is the sense of incommensurability which is implied by cosmologists' physical embodiment that advances their search for the structure of the universe based on physical causality. In spite of its paradoxical standing this twofold perception of the interplay between humanity and the universe reflects an inevitable feature of any disclosure of being by human agency. In this sense the unity of opposites in this paradox is still preserved by the uniqueness of humanity as the centre of disclosure. Correspondingly any pretence of sheer objectivity for the knowledge of the universe as a whole is blatantly incorrect so that a simple relief from this tension would be to conjecture that the *content* of cosmological knowledge (that is, astronomical facts and theories of the universe as a whole including its alleged origins) should be considered not as contraposed and "transcendent" to human subjectivity, but as *transcendentally constituted*. In other words cosmology itself must be seen as part of the transcendental discourse, that is the discourse of the conditions which allow the universe to manifest itself (in particular, through mathematical expressibility). Correspondingly one should make a subtle distinction between the principles which coordinate knowledge of the universe and those connecting principles (expressed mathematically) which state the relation between the properties of objects which are already constituted. It is this transcendental constitution which, being restricted by the outer universe through the stabilisation of patterns of thought, has a fundamental human origin in the very act of its intentional launching, that is an expression of interest and participation in that which gives itself for being constituted.

Seen in such a way the intended "subject matter" of cosmology (the universe in its totality) exceeds the scope of the physical sciences for it refers not only to the content of what has already been manifested, but to the conditions of this manifestation which are not part of the physical description *per se*. Seen in this perspective only, the phenomenal universe is a sort of a static image in the ongoing process of manifestation. By its constitution, physical cosmology provides us with a particular, logically and physically accessible pattern in the interpretation of the universe which, however, does not exhaust the whole sense of human presence in the universe as the condition for its manifestation.[14] The transcendental sense of cosmological discourse arrives from the recognition that the universe is not that which is

manifest, but that it is *the manifestation* related to humanity. In this sense the universe is always our universe. By its sense the discourse of the universe as *the manifestation* has to comprise not only the current scope of observations and theories about the universe, but the whole history of formation of views on the cosmos as well as all philosophical and theological issues on the conditions of knowledge of the universe, the *telos* of this knowledge and its value. The universe as manifestation implies a constant participation or communion with it which is tantamount to saying that the universe as manifestation means life.

The conditions of manifestation of the universe which are always implicitly present behind its empirical appearances and theoretical representations yet escape an explicit constitution. They reveal themselves through an excess of intuition over logical simplicity and mathematical thoroughness which delivers the paradoxical sense of *presence* of the universe, the sense which is never disclosed in discursive terms thus leaving one with an immanent awareness of the universe's *absence*. Put differently, the universe *is*, but there is no answer to the questions "What is it?" The incompleteness of any physical description of the universe brings us to that stance in knowledge which is called "apophaticism", that is a mode of experience in which that which is intended to be signified through discursive description is never exhausted through its signifiers.[15] The ambiguity of the presence in absence of the universe deprives a genuine cosmological project of any flavour of *foundationalism* understood as an epistemological correlate of the notion of an ontological ground be it the constituting subjectivity of the self, or the outer universe as underlying substance. Cosmology has to function in the conditions of the classical paradox of human subjectivity in the world which arises in this context and points to the fundamental difficulty in attempting to formulate the ontology of the universe in terms of ground-grounded relationship. The universe as manifestation thus escapes any accomplished definitions and descriptions and, because of this, human subjectivity itself is being constituted through its openness to the universe to the extent it cannot comprehend the universe. One sees thus that cosmological discourse (as a mode of the natural sciences) cannot pretend to be complete without recourse to the essence of the agency disclosing the sense of the universe, that of human beings. [16]

The nature of manifestation and ontological commitment

In some cases cosmology claims the existence of things on the grounds of theoretical consistency and a fit with other plausible constructs, but for which we can have no observational evidence (that is, the principle of direct correspondence with empirical reality is not applicable).[17] Such a situation, for example, happens in the extreme case of the construct of the multiverse[18], where no direct observational or experimental tests of the hypothesis are possible, and the assumed underlying physics is probably untestable in principle. These possibilities do not by themselves prove correct epistemic justification, even less do they point to the truth-content of what theories claim. It is seen that here a sort of philosophical, that is trans-scientific insight is invoked.

In the case where cosmology predicates things beyond their verification through correspondence it appeals first of all to the method of extrapolation (understood in a wide sense) which itself must be evaluated as tacitly committed to a sort of realism grounded in belief of the efficacy of extrapolation. Philosophically and scientifically the problem of extrapolation arises from those limits of scientific explanation which are set by the observational constraints inherent in our earthbound home-place. All that is in principle directly accessible to observations

is positioned on the surface of the past light-cone with its apex on the planet Earth.[19] Outside that cone one has the uncertainties of extrapolation.[20] Thus the extension of a cosmologist's insight into the universe from earth, in the attempt to encompass the universe in a single vision (including its absolute origin), requires an inference from what is already known to what is as yet only conjectured. For a form of knowledge that rests its claim on its empirical, observation-based, access to the world (most of the natural sciences), these limits raise clear difficulties.

One could claim that "extrapolations" (inferences) towards the fundamentally non-observable and untestable are simply physical hypotheses that are assessed along a variety of lines including observational tests as one of them. These hypotheses may rely on appeal to analogy, on consistency with other cosmological contexts, on logical fertility and explanatory force, or a mathematical consistency and elegance. Over time they may be woven into a more and more tightly connected set of beliefs and ideas, each element of which derives support from the set as a whole.[21] One can claim even further that *extrapolations* in cosmology itself (whatever this means, including a shift of "home places"[22] in the cosmological principle, or a free eidetic variation[23] of the parameters of the whole world which happens in theories of multiverse) implies an extended sense of "scientific justification", for example epistemic coherence which does not necessarily refer to tests and observations. This, in turn, entails a different commitment to realism.

For example, in the models of origin of the universe, the major presumption is that one can extend the laws of physics (comprehended by us through mathematical formulae) towards something which can not be physically independent of its mathematical gestalt. In other words, such an extension presumes effectively a set of beliefs that it is possible to catch the sense of reality beyond the sensible (corporeal, in a sense of physical equipment as extension one's bodily function) as its efficacious identity (which could be either on the level of the alleged substance or on the level of ideal forms) through time in spite of the postfactum resistance of reality to this.[24] The validity of these beliefs can only be justified on the grounds of their coherence as well as, to a lesser extent, agreement with that border-line physics which through observation is linked to the empirical validation. The situation when justification is linked to beliefs is dealt with by that part of contemporary epistemology which is called the coherence theory of epistemic justification and which holds that a belief is justified to the extent to which the belief-set of which it is a member is coherent[25]; what is at issue in a coherence theory is a matter of a proposition's relation to other propositions, and not its 'coherence' with reality or with the facts of matter.

Now we see that it becomes a task for philosophy to discuss the various sorts of hypothetical extrapolation that cosmologists make as a regular part of their work and the implied philosophical beliefs which drive them. As a matter of illustration let us refer to the basic assumption underlying the very possibility and foundation of modern cosmology, that is the principle of uniformity of space-time and matter (cosmological principle) which is based in extrapolation (in the certainty of a belief in an indifferent location of humanity in the universe) that the average isotropic picture of the large-scale distribution of matter in the universe as observed from the Earth can be transferred to all possible locations (thus implying spatial homogeneity).[26] This extrapolation makes manifest a certain *philosophical* and, may be, even a *theological commitment* which acts in the cosmologist's mind as a regulative and indemonstrable belief.[27]

The implication of this belief in cosmology is a particular causal structure of the global space-time of the universe; that is, this belief as an act of intentionality cascades down to physical causality.

Another illustration comes from inflationary cosmology: it confesses a belief that there exists a field **Φ** (inflaton)[28], which is described through a corresponding theory and which drives the evolution of the universe during the very early inflationary period. This belief coheres (as justification) with another scientific conjecture (belief) that there was a period of evolution of the universe with an exponential growth in time which, in turn, solves some problems of radiation-dominated cosmology[29] and hence makes the so called standard cosmological model even more coherent. One must stress here that all beliefs surrounding the construction of a quite sophisticated theory of the inflationary universe are driven by the hidden desire to explain away the contingent facticity of the initial conditions of the universe as well as its present display. Contingency as eventuality and historicity is not a part and parcel of physics and thus here we observe a certain "pseudo-theological" commitment to overcome the "latent horror of the unique event."[30] A similar situation occurs with the idea of the multiverse. Since no correspondence with empirical reality is possible, all speculations about the multiverse work in the certainty of belief that there is an extended meta-reality which comprises our universe, so that any justification for a theory of such a multiverse can only be based on the grounds of epistemic coherence, which is related to convention at the level of the community of cosmologists. The fact that the idea of the multiverse is driven by a pseudo-theological commitment to justify this universe through the reference to the transcendent can easily be detected by pointing to the by no means rare discussions on how multiverse competes with the idea of creation of the universe *ex nihilo* by God.[31] In the case of the multiverse, in fact, no realistic reference is even required. We deal here with a situation where the mental states (of cosmologists) affect our sense of reality and even contribute to its theory. [32] The idea of the multiverse can be approached from a different point of view if considered phenomenologically as an eidetic variation of the parameters pertaining to the actual universe. This variation takes place within human subjectivity and aims to articulate some apodictic features of that state of affairs which accounts for this actual universe (as a unique event). In this case the invocation of the idea of the multiverse is a legitimate phenomenological procedure in order to reaffirm with a new force the inevitability of the given contingency of this actual universe. But certainly in this case the causation which is implied by the model of multiverse is of a rather mental kind, so that the analysis of conscious states becomes, in a sophisticated way, the datum of scientific facts and cosmology as such becomes a form of phenomenological explication of the working of human subjectivity.

We see thus that the effectuation of the coherence of epistemic justification in cosmology (which implies a communal or transcendental dimension in cosmology) leads to a different stance on ontological commitment in cosmological discourse. Cosmology is now seen as an enquiry into the condition of appearance of the universe, attaining reality such as it gives itself to be apprehended by human beings and their communities, the very reality of the world in which every sensible entity, astronomical objects, physical bodies including human beings themselves find their place and their meaning. However, this discourse of the appearance does not deal much with a description of what appears at the level of observational astronomy

and constructs of theoretical physics, but in a more profound sense with a characterisation of the very conditions (related to the reality of the human) which govern the possibility of appearance (manifestation) of the universe. In other words, it is not, properly speaking, a discourse of the phenomena as such (related to knowledge of facts about the universe), but a discourse of the process of *phenomenalization* of the universe. In a traditional mode of language a discourse pertaining to the *conditions* in which the phenomenon constitutes itself as phenomenon is called transcendental. By becoming more and more conscious of its constraints and possibilities (as related to the place of humanity and its communities in being), the discourse of philosophy of cosmology becomes more and more a transcendental discourse. Correspondingly this discourse reveals itself not only as the discourse of the universe, but as a discourse of human beings.

By being engaged in the discourse of the universe as a whole human beings themselves are involved into and subjected to the process of their phenomenalization: on the one hand they take it as their task to control this process through advancing (astronomical) praxis dependent upon their theories; on the other hand the universe remains that overall context and horizon of all horizons which escapes constitution by discursive reason so that it is rather human subjectivity that is constituted by the universe to the extent it cannot comprehend the universe. In this sense cosmology represents not so much that which is *manifest*, that is the universe as such, but *the manifestation*, the manifestation which involves the universe and conscious human beings into the endless constitution.[33] Cosmology reveals itself as a contributor to the phenomenological project, as realization of a transcendental discourse.

Phenomenological insight in cosmology as explication of the human

A phenomenological insight into cosmology makes a reversal of its meaning by shifting the centre of its enquiry from the noematic content (that is related to object) to its noetic pole (related to subject), that is the generating human subjectivity. When scientific reason attempts to enquire into the origin of the universe in an absolute sense the strategy of extrapolation acquires some features of *philosophical* transcendence. But here transcendence is not through physical causation (this would be an impossible break beyond the immanent), but through retaining in the background of all physical representations of the universe, in terms of stages of its evolution, an excess of the universe's intuitive donation in the act of life. Transcendence points towards a simple truth that the reality of the human embodied condition in the universe is not exhausted by those physical aspects which position humanity as temporally and spatially insignificant and hence incommensurable with the universe.[34] Correspondingly cosmology, if it is narrowed to the physical and expressed mathematically, cannot account for the ultimate sense of the universe because it cannot account for the ultimate sense of the human.[35] Since no science can give such an account, the question here is about the boundaries of the human in science. The atomic bomb, for example, being a human creation, characteristically points towards the inhuman, that is to the limits of humanity as such. Thus the atomic bomb as a scientific achievement defines in an apophatic (negative) way the sense of the human. Cosmology plays a similar role: it provides some hints and pointers as to where human comprehension and articulation of the universe becomes paradoxically inhuman (the Big Bang, for example). In this sense the cosmology of the Big Bang becomes a characteristic, although

apophatic, explication of the sense of humanity as that formation in being which is looking for its own origin and its own history.[36] A phenomenological insight into the sense of cosmology as explicating humanity's quest for itself thus compensates for the incompleteness of cosmology and reinstates its human creator to its ontological centeredness in disclosing and manifesting the universe.[37] At the same time the limits of physics and scientific philosophy, tested through cosmology, in fact test the limits of humanity to understand its own sense of existence. The incomprehensible universe invokes in the human scientific mind humility and discernment in order to realise the limits of its pretensions to knowledge of the universe which resists disclosure and exceeds the capacity of understanding.[38]

Since cosmology assessed, phenomenologically, retrieves the "natural" centring of all non-egocentric tendencies of its world-building narrative in human hypostatic subjectivity, this assessment indirectly calls into question the purported neutrality and objectivity of some of its claims with respect to realities which are beyond empirical verification. It could suggest instead that such "neutral" descriptions of the world operate on the basis of existential concerns formulated in a set of *beliefs* (or myths, which may or may not be related to the *faith* of theology).[39] In this sense the phenomenological stance rejects the view that cosmological knowledge describes the world in itself[40]; rather these descriptions are seen as interpretations that are governed by beliefs which can be qualified as controlled to the extent that they are related to a particular *path* of science in human history.[41] For example, if one is to understand and explain the past of the universe as constituted through human history, one must conceive it in terms of past possibilities of this history rather than as a defined and finished product. In this case the cosmologist's own historical consciousness is involved in "archaeology" of the universe and, in analogy with historical science, *cosmological discourse reveals itself as a form of consciousness which humanity (as community) has of itself.*[42] By revealing the *telos* in the historical path of cosmological explanation (as related to the representation of the ultimate origin of the universe)[43], phenomenological analysis discloses the hidden "theological commitment" in cosmological research, meaning that the beginning and the end of the universe in human thought is just a mode of this same thought speaking of its own beginning and its own consummation implying a transcendent reference. Seen from a slightly different angle this "theological commitment" corresponds to an attempt to know and see the universe as "all in all", as that primary existential memory in the human constitution which drives cosmological research.[44]

Regardless of possible scepticism with respect to objectivity and neutrality, scientific cosmology remains an extremely important and useful instrument in demonstrating just how human embodied subjectivity affirms itself through the non-egocentric tendencies of its "natural" attitude. The universe that science depicts as something different from us and devoid of our influence and presence, represents in fact the articulated words and thoughts of humanity. By creating a cosmological narrative we affirm ourselves in a non-trivial sense.[45] Indeed, by creating a physico-mathematical narrative cosmologists loose control over the intentions they are driven by, since the introspection upon their creation is not in the focus of scientific enquiry. To understand the "data" lying behind this narrative one must consider it as manifestation of an expressive act, that is to move from their *given meaning* to their *giving meaning*, from their pure phenomenality to the intentional life which generated them. By predicating the evolving universe and attempting

to phenomenalise the mystery of its contingent origin, human subjectivity employs that intentionality which effectuates the *telos* of human subjectivity's ever-going incarnation as "coming to presence" assigning thus a dynamic character to personhood's manifestation.[46] As expressed by M. Munitz: "The goals of cosmology are goals of human beings". However, the universe as such benefits from these goals: "Through the measure in which they are reached, the universe becomes understood, perhaps for the first time anywhere throughout its vast stretches in space and time" (Munitz, 1951, p. 338). By reflecting the goals of humanity, cosmology exhibits the traditional features of all mythologies, namely that the perceptible aspects of the universe are expressed in terms of human social, behaviorial and existential concerns. In this sense the picturing of the universe as a historical process cannot avoid containing erratic facts associated with the human condition, to be more precise with the intimacy of personal communion with the universe and the extent of not being attuned to it. Any imaginable attempt to disregard these facts and assess cosmology only on the basis of law-like ordered concepts would be incomplete and historically inadequate: in this case cosmology would provide us only with a fringe of the universe's phenomenality. The other "part" of the universe's phenomenality which reflects the erratic fact of not being attuned to the universe is rather reflected in poetic and artistic depictions relying on ecstatic act of personal being in the universe as communion. This only confirms an already formulated view that cosmology cannot dispense with anthropology, not only in a high philosophical sense, but in the mundane sense of human affairs. [47] The so called mythological aspect of any cosmology thus naturally arises from the intention to interpret erratic features of the human universe through a reference to the astronomical order and it is this aspect that brings with a new force a "coherence" dimension in its epistemic justifications which was mentioned before: indeed mythologies never present gaps in their "explanations" and are invoked by the communities of adherents on the ground of coherence of their claims.

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1 A careful analysis of methodological weaknesses in cosmology has been done in a paper of George Ellis (Ellis, 2007).

2 The word "object" cannot be legitimately applied to the universe because the universe as a singular and self-contained whole cannot be detached from human insight and thus positioned as something which is outside and devoid of the human presence. There is a fundamental inseparability between the universe and the knowing subject who is always a part of the universe. Another problem emerges from the universe's uniqueness which cannot be set among other universes. The modern view of the universe as developed from a singular state (Big Bang) which *de facto* encodes the universe in its totality invokes a counter-intuitive sense of the universe as a singular, that is unrepeatable *event* (not an object!) with respect to which the natural sciences experience the sense of fear and desire to explain it away. Edgard Morin expressed the idea that the cosmos reveals itself as the universe and event. On the one hand the physical universe constituted through regular repetitive features, on the other it is a singular event as phenomenon, the phenomenon which evolves for more than ten billion years. The temporal unfolding of the universe which appears to human contemplation lies indissolubly in the advent-event (avènement-événement) of the world (Morin, 1982, p. 120).

3 It is because of the inseparability between the human observer and the universe that the conditions of the universe's observability and mathematical expressibility are constitutive of the very concept of the universe. In this sense the "physical objectivity" of the universe cannot bear an independent reality in a classical sense. Indeed, unlike in classical physics, the basic conditions of the constitution of the universe as a whole have not been permanently available and thus have to be questioned (Cf. Bitbol, et al. 2009, pp. 4, 18.)

4 Terminology of M. Heidegger (Heidegger, 1998, p. 413).

5 Here one sees an original sign that cosmology in a way has some features of the human sciences, because it is known that the release from environmental confinement is not necessary for thematisation and objectification in the human sciences, where a perspective on reality is crucially dependent on the researcher's intentionality originating in the existential and socio-historical condition (and thus cannot be environmentally free). Applied to cosmology this would mean that if one implies that the in-itself of the universe (as its identity) be studied, it must preserve this identity as free from any change through the release from environmental confinement, that is from the inherent subjectivity of a knower of the universe.

6 C.f. Theses A1 and A2 in (Ellis, 2007, p. 1216.)

[7] This was always realised by cosmologists themselves. As an example one can refer to D. Sciama's interview of 1978 where he underlined the existence of a borderline between the ultimate questions about the universe's facticity and the exploration of its properties: "None of us can understand why there is a Universe at all, why anything should exist; that's the ultimate question. But while we cannot answer this question, we can at least make progress with the next simpler one, of what the Universe as a whole is like." (Quoted in (Kragh, 1996, p. xi).

[8] However the very contingent appearance of things in the universe points towards the laws whose outcomes supply these appearances: there must be these laws in order to have these particular things. It is difficult to separate in the universe as a whole between its factual (material) and nomic (law-like) features. In this sense one can talk about facticity of physical laws themselves as linked to the boundary or initial conditions in the universe. See, for example, in this respect (Balashov, 1998, pp. 147; 2009, pp. 269-277).

[9] It is this mentioned inseparability which makes the cosmological idea (that is the idea of totality of the world) fundamentally different among other ideas of reason, such as the idea of soul or the idea of God. Kant wrote that neither psychological nor theological idea entail contradiction and contain antinomies. (Kant, 1933, A673/B701). Practically this means that one can easily deny the existence of a soul (let us say, on materialistic grounds) or deny the existence of God (on atheistic grounds). However it is impossible to deny the existence of the universe for it would deny the empirical world of sense which is part of the universe and which contains the foundation of all knowledge about universe. The antinomian nature of reasoning about the universe originates exactly here: by being in the sensible world one cannot disentangle from the universe, at the same time the universe as totality is never fully materialised in the world of the senses.

[10] The fact that the encounter with the problem of the universe as a whole represents more an epistemological issue than anything which can be associated with the natural sciences, was understood long before by such thinkers as Nicholas of Cusa and Kant. The very concept of "learned ignorance", which amounts in modern terms to the apophaticism of knowledge in general, and which had been drawn from astronomical-cosmological considerations, had most of all an epistemological meaning pointing toward the limits of reason and puzzles which it has to encounter while dealing with such a limiting concept as the universe. (See, for example, (Koyré, 1958, pp. 5-19). A similar sense was attached by Kant to his famous cosmological antinomies, which were indications of the fundamental paradoxical structures of reason rather than any constructive theories of the universe. Here is a characteristic quote from a contemporary treatise on Kant: "Because reason examines itself in order to extract laws from within itself, instead of simply greeting these laws, the cosmological antinomy is the place where the innermost depths of our humanity manifest themselves. In the antinomy, nature speaks to our inquiring minds in the most direct possible way, precisely because, as a complete whole, it is exposed to the danger of being lost in obstinacy or despair."(Kerszberg, 1997, p. 101).

[11] Here, in analogy with Husserl's definition of the "world-horizon" the universe as such is never given in a manner pertaining to ordinary objects. The universe as a horizon of all contexts in the physical and mathematical enquiry in the structure of the world cannot be an object and is distinct from any object given in the background of contexts. The universe is coperceived as the necessary horizon of all individual beings (astronomical or terrestrial) which are immediately experienced. (Husserl,1977, pp. 70-73); see also (Steinbock,1995, p. 104.)

[12] This distinction can be elucidated by a quote from a paper of C. Harvey: "It is common parlance to say that whereas the natural scientists seek to explain, the human scientists seek to understand. This distinction between understanding and explanation, however is itself predicated upon the deeper distinction between *intentionality* and *causality*. If the natural sciences rely upon physicalistic causality as the human sciences rely upon intentionalistic motivation, and the intentionalistic motivation is shown to be prior to causal rationality, then natural science will be shown to be posterior to, because ultimately explainable in terms of, human scientific motifs". (Harvey, 1995, p. 125. Emphasis added).

[13] This paradox is a perennial problem of philosophy and was anticipated by ancient Greek philosophers and Christian thinkers. It was express differently by such philosophers as Kant (see, for example, Kant's conclusion to his *Critique of Practical Reason*.) Among phenomenological philosophers who dealt with this paradox one can mention E. Husserl, M. Scheler, M. Merleau-Ponty, E. Fromm and others. The general discussion of this paradox can be found in (Carr, 1999). The decisive role of this paradox in discussion on science and theology can be found in (Nesteruk, 2008, pp. 173-175). Applied to the study of the universe the paradox of human subjectivity can be formulated as follows: on the one hand human beings in the facticity of their embodied condition form the centre of disclosure and manifestation of the universe as a whole, modelling it as overall-space and time which exceeds the limits of the attuned space related to humanity's comportment on the planet earth (the home place). On the other hand the depicted universe as a vast continuum of space and time positions humanity in an insignificant place in the whole totality making its existence not only contingent (in physical terms) but full of nonsense from the point of view of actually infinite universe. Said bluntly the actual infinity of the universe is attempted to be articulated from an infinitely small part of its formation. One could express this differently: through its insight humanity is co-present in all points of what it observes in the universe, or imagines while physically being restricted to an insignificant part of it. Cosmology as the discourse of the universe as a whole brings one face to face to a general philosophical objective of avoiding any sort of foundationalism in knowledge of the universe which insists on the ground-grounded relation between humanity and the universe leading either to an idealistic reduction (subjectivity as the ground of the world) or to a materialistic, mathematically deterministic diminution of consciousness to illusion. In either mode of reduction the reality of the ground absorbs the grounded and the grounded is reduced to the categories of the ground. To avoid these reductions, the embodiment, as a premise of the person's grasp of the world, must be rather considered as that "over here", where a particular and immediate indwelling of life and the universe comes to *presence*. It is this coming to presence that determines that "place" which constitutes person as a centre of disclosure and manifestation of the universe.

[14] This concerns first of all the dimension of personal (hypostatic) embodiment. Indeed the discursive or linguistic expression of experience of the universe does not rule out the immediate corporeal presence of the universe on the level of sheer consubstantiality between human beings and the universe. Correspondingly if this dimension is overlooked then the per-

ceived inability of cosmology to make results personally meaningful can be alienating and frustrating for non-specialists: for example, the sheer insignificance of humanity on the cosmic scale can create a sense of anxiety and despair related to the meaning of human life. However cosmic physics does not exhaust the sense of the human experience of space, or astronomical objects. Our experience of the universe as that mysterious environment with beautiful night skies and warming presence of the life-giving sun exceeds and is much richer than just knowledge of astronomy or solar physics. The problem is that the formalised and mathematised science sometimes has the effect of de-legitimising and de-appreciating other ways of communion with the wonders of space. (Nieman, 2005, pp. 383-388).

[15] One can mention that the "apophatic" conviction applied to some limiting situations in cognition is well known in history of philosophical and theological thought. Generalising this conviction towards knowledge in general, C. Yannaras describes "as "apophatic" that linguistic semantics and attitude to cognition which refuses to exhaust the content of knowledge in its formulation, which refuses to exhaust the reality of things signified in the logic of signifiers (Yannaras, 2004, p. 84). In philosophy, for example, it originates from an epistemological argument pertaining to a sort of linguistic reformulation of the Kantian transcendentalism (which is typical for post-structuralism) that language conditions the accessibility and intelligibility of reality. In this approach the very phrase "there is" points to a referent which the very language cannot capture because the referent is not constituted by language and by definition is not the same as it linguistic effect. According to this view there is no access to the referent outside the linguistic effect, but the linguistic effect is not the same as that referent it attempts but fails to capture. This situation entails, in analogy with theology, a variety of ways of making such a reference, where none of which can claim it exclusiveness and true accessibility to what the reference is made. A phenomenological philosopher J. Ladrière, without using the notion of apophaticism, points towards the same feature of any knowledge, more precisely to the apophaticism of that fashion in which the human existent approaches the encounter with the world. An object is never a pure reference to itself, but is also a revelation of the fashion of its comprehension. (Ladrière, 1970, pp. 448, 450). The range of cognitive situations which fall under the scope of apophaticism can be found in works of J.-L. Marion under the name of "saturated phenomenon". See (Marion, 2002).

[16] C.f. "A philosophy of nature and a philosophy of man are mutually complementary;… neither can be completed unless it shows itself as the counterpart of the other", (De Laguna, 1966, pp. 81-82).

[17] This, for example, can be related to the cosmological principle which postulates uniformity of the universe beyond observational limits. Another example is a famous "inflaton" field which drives the exponential expansion of the early universe.

[18] Multiverse proposals in cosmology refer effectively to the old idea of the plurality of worlds understood either in a physical sense as an ensemble of worlds with all possible physical conditions, or a variety of mathematical structures which have or do not have their incarnation in the physical. In this case the existence of our universe in its contingent facticity is explained away through a reference that it simply belongs (in a generic sense) to an ensemble of universes which through its totality contains whatever is possible. (The literature on the multiverse is vast, as an example see a paper (Tegmark, 2003) or a book (Carr, 2007) with a variety of papers on different aspects of the multiverse debate.) In all multiverse proposals the question of existence, that is of the contingent facticity of this universe, is thus quite illegitimately transferred to the question of selection, whereas the issue of the existence of the multiverse itself cannot not addressed at all for obvious philosophical reasons.

[19] There is a tiny piece of the human observer's world line which relates to the immediate cosmic environment like the earth, planets in the solar system, stars in our galaxy which, in terms of cosmic times and thus space, are "close" to us so that their separation from us is in a way "commensurable" with the humankind's life span. We assert the existence of such objects in terms similar to those of the earthly objects.

[20] Thesis B1 in (Ellis, 2007, p. 1220).

[21] See, for example, (McMullin, 1994, pp. 119-120).

[22] This is the terminology of E. Husserl (Husserl, 1981).

[23] On eidetic variation in phenomenology see e.g. (Sokolowski, 2000, pp. 177-84).

[24] This is a longstanding point made in (Meyerson, 1964).

[25] See, for example, (Dancy,1989, p. 116).

[26] There are discussions at present that the universe may not be uniform at large and that the observed uniformity is the result that we are centred in a sort of void.

[27] Discussing the cosmological principle in close connection with the so called Copernican principle, E. McMullin points out that the Copernican principle has to be understood in terms of what it rejects, namely older teleological beliefs about the uniqueness of the human and the likelihood that humanity has a selected position in space, for example being a cosmic center.(McMullin, 1993, p. 373). However the desire to abandon the teleological explanation is itself based in intentionality, rather than any scientifically demonstrable conviction. The indifference postulated by the cosmological principle is indemonstrable because it itself lies in the foundation of the very possibility of scientific demonstration applied to cosmology. Thus it is based in the belief in knowability of the universe which has a different motivation in comparison with that one of teleology (but related to the latter).

[28] In spite of the fact that the hypothesis of this field, its very existence, is very efficient in a qualitative and quantitative modelling of observable phenomena, the physical nature of this field, that is its relation to a certain class of observed particles, remains obscure. This is one of the major points of scepticism with respect to inflationary theories, which has been raised, for example, in the abovementioned paper of Ellis (Ellis, 2007, p. 1210). (See a similar point made in (Penrose, 2005, p. 751) and in (Weinberg, 2008, pp. 202, 217)).

[29] These are famous horizon, monopole and flatness problems. See e.g. (Weinberg, 2008, pp. 201-208). See also (Penrose, 2005, pp. 753-57), in what concerns a certain critique of the inflationary hypothesis.

[30] C. f. (Torrance, 1996, pp. 166-7).

[31] See, for example, discussion of this issue in (Leslie, 1989), (Temple, 1994), (Stoeger, 2007), (Collins, 2007).

[32] This thought was anticipated by Henry Margenau who believed that modern physics could provide an evidence that the nature of its reality is determined not only through causation in empirical reality, but also through intentional acts of thought. In his approach to the nature of physical reality he posed a question: "Is sensed nature the only field of departure or arrival in the process of scientific verification, or will inspection of the eidetic structures of consciousness function in a similar way as dator of scientific fact?" (Margenau, 1944, p. 278).

[33] C.f. (Ladrière, 1972, pp. 169, 173, 176).

[34] In the context of the so called anthropic inference this was pointed out by (Bitbol, 1993). In a wider philosophical and theological context this excess of humanity beyond nature was discussed in (Nesteruk, 2001).

[35] The cosmic environment provides the necessary conditions for human corporeal existence (and this is exactly detected in anthropic arguments) whereas the sufficient conditions do not belong to the sphere of physics and point towards human morality, ethics and some eschatological commitments. See discussion in (Nesteruk, 2003, pp. 200-214).

[36] One can point to similarities between the phenomenology of birth and the aspirations of cosmologists to disclose the sense of birth (origin) of the universe. See (Nesteruk, 2008, pp. 247-66). "Is there not, when we read it sufficiently profoundly, an analogy between the deep structure of nature and the structure of human existence as openness, creativity, possibility of accord with the event? The problematic of nature can thus be linked with the problematic of human existence." (J. Ladrière, 1972, p. 186).

[37] The idea that a research into the underlying sense of science leads to enlightenment of the ways and *telos* of the human spirit was clearly formulated by many phenomenological philosophers starting from Husserl. Here is a quote from J. Ladrière: "The detail of the life of science must […] be investigated in order to know something of the nature of reason and of its becoming…The destiny of reason is outlined […] in the incessant comings and goings that define the life of science. It is in the patient advance of its history that its finality reveals itself" (Ladrière, 1970, p. 455).

[38] The phenomenological construct of "presence in absence" can be easily applied to cosmology. For example: we see the universe back in time along the so called past light cone, so that the inference about the universe outside this cone can be considered as an attempt to deal with the universe as a whole which is present in its empirical absence. A similar thing can be said if one remembers that according to present-day model the visible matter represents only 4% of the whole material content of the universe. The other 96% (dark energy and dark matter) is postulated in order to balance the model with observations. In other words the universe is present to us through 4% of what is visibly manifested but in empirical absence of the 96%.

[39] A basic and unavoidable structure of any cosmological myth, including its contemporary scientific arrangement is the duality between the factual and empirical on the one hand, and the intelligible (as allegedly stable and underlying) on the other hand. See e.g. (Ladrière, 1972, p. 153).

[40] As it was eloquently expressed by A. Gurwitsch, "the goal of phenomenology is not an exhaustive description of an infinite variety of immanent data, but the investigation of those contexts of consciousness owing to which there is a perceptible world, the universe of physical constructs, etc." (Gurwitsch, 1992, pp. 43-44).

[41] It is the presence of this concrete path of science which confirms our previous stance on cosmology as the working of constitution, that is a re-enactment of the production of the world. To clarify this point one can quote another paper of J. Ladrière: "The theoretical apparatus is thus not a description in the ordinary sense, as presentation of an entity, supposedly given, and of its properties, it is the characterisation of something which is not a thing, but a *structural path along which a thing comes, from the ultimate horizon of every givenness, to the actual presence in which it is effectively given to apprehension*." (Ladrière, 1989, p. 138). (Emphasis added.)

[42] C.f. (Aron, 1938, p. 80).

[43] See (Nesteruk, 2008, pp. 250-254; 2009, pp. 78-81).

[44] Physical cosmology makes it clear that the world line of the human observer starts at the Big Bang, so that whatever we have on our physical content is directly related to that undifferentiated something lying in the foundation of all possible form of mater in the universe.

[45] See, e.g., (Swimme, 2005, p. 7), (Mathews, 1991, p. 5), (Kline, 1977, p. 423).

[46] C.f., (Heelan, 1972). See also in this context (Compton, 1967, p. 82).

[47] As was provocatively conjectured by an author from the camp of the human sciences and arts, we need "a sort of "mytho-scientific, neo-anthropomorphic" theory, one that would stay operational by combining the findings of mainstream science with conjectures based on mythological thought. This type of theory would map features of the universe through images taken from the domain of human social behaviour….Although anthropomorphic theories might not be operational, they can lead to a better understanding of the universe." (Friedman,1993, p. 361).

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Космология на перекрестке естественных и гуманитарных наук: возможна ли демаркация? Часть 1. Введение

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В статье обсуждается проблема демаркации элементов естественных и гуманитарных наук в космологии, понимаемой как дисциплина, занимающаяся изучением вселенной как целого. Акцент сделан на феноменологическом анализе предпосылок космологии, подчеркивающих ее исторически случайный характер, связанный с положением человека в космосе. Одним из тезисов является предложение понимать космологию как отчасти гуманитарную дисциплину, изучающую человека. Точнее то, что познавательные структуры физической вселенной в естественно-научной дисциплине космологии неявно эксплицируют структуры человеческого субъекта, озабоченного пониманием своего положения в мире. В этом смысле исторически-случайный характер естественно-научной космологии дополняется абсолютным и универсальным содержанием, относящимся к проблеме человеческого.

Ключевые слова: космология, философия, вселенная, познаваемость, человек, соучастие, манифестация, феноменология, верования, когерентность объяснения.