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A NEW METAPHYSICS OF TIME

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Summary[1]

The possibility of a new *metaphysics* of time and change presupposes a redefinition of the original idea of metaphysics which can no longer be understood as ontology, but should be interpreted as *chrono-logics*, or *cosmo-logics.*

According to traditional metaphysics, truth is either timeless or eternal. This stance is here challenged by proving it possible to consider contingent truth as being ephemeric, bound to emerge and perish together with the reality it depicts, past contingents being determined for all future, and future contingents being as yet undetermined, hence unknowable. So *time* becomes synonymous with *creation.*

Contingency implies world-wide simultaneity, in spite of special relativity, but in clear agreement with the standard principle of cosmic isotropy which can be regarded as a principle of the general equivalence of observers, a principle of obvious importance to ethics, if decoded by analogy. An ethics of creation allowing for evolution may be based on the principle of trial and error which is pointless without resurgence ultimately based on forbearance, that is: grace.

A. Introduction: What is Metaphysics?

Since a librarian of ancient Alexandria bound the famous phrase *tà metá tà fysiká* up with the *próte filosofía* of Aristotle, metaphysics has been interpreted as the doctrine of being as being, *tó ón hé ón*, for centuries hailed as the most fundamental of sciences. According to Aristotle himself, *reality is thing-like*, all real beings being of the nature of things. The whole universe consists of nothing but things, and the highest thing is called *théos*. God is just a being, or thing, and in this sense God is on a par with other beings, or things. The final step of the philosopher, viz. to identify his God with the very being of all particular beings, hence with universal being, or the universe itself, was then a small one, indeed.

A different kind of metaphysics is to be found in Plato, Aristotle's teacher. In contradistinction to Aristotle, Plato did not write treatises: he wrote dialogues, and the whole gist of his thinking is dialectical which is the opposite of dogmatical. According to Plato, knowledge is related to being in the same way as opinion is related to becoming - but higher than being is goodness, the ultimate cause of being. Plato therefore invented a philosophical monotheism in order to be able to explain the origin of the *panthéon* of gods together with the creation of time and change and thereby the whole world of becoming and deceasing. Goodness, embodied in the Divine Craftsman, was the lofty Paradigm needed to produce *Kósmos* from *Cháos*. *Chrónos*, first of motions, arose together with *Kósmos* and was made measurable by means of the heavenly circuits of sameness (*aequator*) and otherness (*eklíptika*). Kósmos thereby emerged as a perfect synthesis of structure and process, which were the basic ideas of the contrary philosophies of Parmenides and Herakleitos.

A modern philospher, Heidegger, has written extensively about metaphysics. The ambitious goal of his thinking is to combat traditional metaphysics by reverting to Parmenides and rethink his vision which aimed at uncovering the truth of being. According to Heidegger logic has blinded metaphysics and made it forget true being by focussing on the many being things instead of just concentrating on Being Itself. Therefore he conceived a subtle plan, viz. to break the rule of logic in science by confronting it to: Nothing! Face to face with great Nothing, true Being reveals itself as a Presence embracing past and future, and the task of fundamental philosophy, following Heidegger, is to rethink Being as a temporal Unity, thereby avoiding the vulgar image of time as a linear succession of instants.

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To logically minded persons most of this will sound like sheer obscurantism. As I do not share the enthusiasm for so-called "Fundamental Ontology" displayed by the disciples of yon master of linguistic opacity, I shall prefer to clear the table by forsaking the central issues of his discipline in favour of a concern for the basic human experience of time, change, and events. Henceforth I shall devote my efforts to developing a logic of time and change, indeed of creation, which may serve as the *organon* for a new metaphysics very different from ontology. This philosophy will borrow its inspiration partly from Plato and partly from Kierkegaard, both of whom were able dialecticians, eager to unveil nonsense disguised as wisdom.

1. Philosophy, and the Logics of Time.

By tradition, philosophy is the incessant search for *wisdom* whereas science is the relentless quest for *truth*. Is philosophy a science, then, the queen of science, or is it more like the root of the tree of sciences, whereof physics is the trunk? [2] Truth is the whole,[3] Hegel insisted, and philosophy is the universal science of truth. But is it true to say that truth is the sole aim of wisdom?

Following Aquinas, being is the same as being one, being true, being good, and being beautiful; all these predicates unfold various senses of what it is to be. This philosophy may appeal to many as being itself beautiful, good, and true. But if we are not inclined to accept ontology, or the doctrine of being, as our first philosophy, we shall disagree; and there are plenty of reasons for doing so.

Ontology, whether it is taken to reveal ultimate reality or the truth of being, must be expressible by propositions, i.e. assertions having truth-value: true or false. Only propositions, defined as descriptive sentences having a subject, a predicate, and a copula, can have truth-value. But it is a meager truth that can be confined to a single proposition, and language is infinitely richer than the realm of propositions.

To base our notion of language upon that of descriptive sentences, defining meaning in terms of truth-conditions, is unwise: truth depends on meaning, not the other way round. It is also rash to define philosophy as the universal science of truth unless one is willing to accept that there are different senses of truth. The point is that the truth of a proposition, whether universal or particular, differs from the truth of a set of propositions, which again differs from the truth of an entire philosophy. Similarly, truth *in* a logical system differs from the truth *of* a logical system.

The notion of truth is basic to logic which is the instrument of human reason. Provisionally, logic is definable as a formal discipline stating the rules for the valid transport of truth-value (true, false) from the given premisses to their conclusion.

If some unique system of logic could be claimed to be the only valid system, our problems might be less. But, as a matter of fact, even on the basic level there are competitors to the standard system, e.g. the intuitionist logic of Brouwer together with the three-valued system of Lukasiewicz; and when it comes to tempo-modal logics which are not immediately open for a translation into truth-value semantics, these intensional systems turn out to form a tree-like hierarchy.

All logic systems have two aspects: a syntactical one and a semantical one. From the point of view of *syntactics*, a full-fledged system consists of rules for well-formed formulae, as well as definitions, assumptions, and principles of inference. Assumptions are also called *axioms*. Some formulae are valid because of their form, no matter how they are interpreted; formulae that are thus provable in the system are called *theorems*. Jointly, axioms and theorems are called *theses* of the system. The question of the truth of formulae which are not valid solely in virtue of form is an empirical one, and thus decidable only if regard is paid to their interpretation. In general, the question of the truth of propositions is not syntactic, but semantic.

From the point of view of *semantics*, the logical system is described in a language which, by its internal structure, models certain very general features of the real world; due to their generality, these features are compatible with a variety of concrete facts, each maximal set constituting a possible world. Now *possible worlds*, which I take to be nothing but *models*, free *constructions* of our intellect, can differ not only as regards *contents*, but also with respect to *structure*; and this will be the case if the models concerned relate to different logical systems. If we stick to some basic system, its models will differ with regard to their contents, not their structure, and the validity of its theses will then be expressible solely in terms of truth-tables. If we consider higher systems, notably intensional ones, truth-tables do not suffice.

Before proceeding further in this direction it deserves mention that there is a tight connexion between syntactical and semantical aspects of a logical system. The crucial condition for claiming a particular system to be sound and complete is that a one-to-one correspondence can be shown to hold between its syntax and its semantics: the system is *sound* iff (if, and only if) all its valid formulae, or theses, are provably true no matter how they are interpreted; and the system is *complete* iff (if, and only if) all provably true formulae can be shown to be theses in the system. In a sound and complete system of logic the theses are nothing but tautologies.

It is customary to separate tautological propositions from empirical ones. The traditional view is that *tautological* propositions are true solely in virtue of *form* whereas *empirical* propositions, if true, are true in virtue of their material *contents*. In what follows I shall identity a fact with a true proposition that is not provably true in virtue of form. True propositions presumably tell us something about *reality*.

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However, I shall insist that the tautological propositions of a logical system tell us more about the *structure* of reality than empirical propositions can ever do. The point is that the semantical model serves as an intermediate between thought and reality which provides us with *a tertium comparationis* enabling us to compare a system of *logics* with a theory of *physics*. We shall later find occasion to compare different interpretations of quantum mechanics to various systems of tempo-modal logic which are translatable into models of branching future possibilities.

It is a commonplace to distinguish *the humanities* which, being primarily historical and idiographic, attempt to *describe* and *interpret* the individual traces or remains of a factual past, from *the social and natural sciences* which, being mainly theoretical and nomothetic, aspire to *explain* and *predict* the general trends of an unknown and presumably fictitious future. Without discussing the adequacy of these various characterisations it seems rather safe to say that *history investigates the past* whereas *theory prepares us for the future*. It is therefore natural to conclude that the distinction of past from future constitutes a kind of *transcendental condition* which is fundamental to all branches of human knowledge. Indeed, the very possibility of experimental science seems to depend crucially on this transcendental condition. Without the condition we cannot even distinguish experience from prediction.

Let us take a closer look at the possible worlds semantics of formal logics. It is pretty clear that *experience* involves a factual knowledge of the past whereas *prediction* implies that notions of possibility and necessity be applied to the future. The cognisance hereof invites us to investigate the systems of tempo-modal logic. In tense logic, which originated with A.N. Prior, it is commonplace to distinguish between *dated* propositions which are determinate and *undated* propositions which are indeterminate. According to Prior, the latter remain full-fledged propositions, although their truth-value may change with the passage of time.

In the philosophy of *Leibniz*, who did not realise the importance of temporal distinctions, *a possible world* is defined as a maximal consistent set of propositions together describing a linear succession of events, hence a world is *a total succession of individual states*. Contrary to later views, Leibniz saw possible worlds as virtually real, and - such worlds constituting *B-series*, not *A-series* - their time does not flow.[4] According to Leibniz, a proposition is possible iff it is true in some possible world and necessary iff it is true in all possible worlds (this will need further elaboration).

It is noticeable that, in order to account for the apparent flow of time and the seeming emergence of possibilities pointing towards the future, he not only depicts worlds as linear orderings of successive world-states; he also imagines the totality of possible worlds - assumed to constitute the eternal contents of the Divine Reason - in the picture of an infinite bundle of world-lines converging towards the past, but

diverging towards the future. His final picture is that of a parallel bundle of world-courses diverging at every instant in the direction of the future, the present ("now") being identified as the actual point of the bundle's diverging into different branches. This explanation, however, leaves the present without a clear indication.

The very same objection can be raised against the system of *Ockham* which may be viewed as a forerunner to that of Leibniz. The main difference between these two systems of logic is that the past according to the system of Leibniz is depicted as a bundle of fibres, whereas the past according to the system of Ockham can be likened to a massive trunk. This means that the entire set of possible world-courses (relative to a given 'now') in *the Ockham-system* is a set of different futures coupled to the same past, whereas a similar set of different futures in *the Leibniz-system* just appears to be connected to the same past. The picture can be summarized as follows: an Ockham-world splits up any second, a Leibniz-world never bifurcates.[5]

The systems are nevertheless on a par as regards the status of truth-value which is given of eternity to any proposition if it refers to some future instant of a given world; this holds even if instants are interpreted as *instant-propositions* in the manner of Prior.[6] Thus a proposition which is dated relative to a given world obeys the basic principles of identity, of the excluded middle, and of non-contradiction, or consistency, without exception. Another way of expressing this fact is to say that the operator representing dated future is transparent to negation, so that an outside and an inside negation together produce an affirmation. The two systems are likewise on a par in the sense that both allow us to distinguish the *simple future* from a merely *possible future* and a strictly *inevitable future*; this fact is itself interesting, since it makes them accomodate closely to ordinary linguistic usage.

Two other systems of tempo-modal logic are interesting for the reason that, by contrast, they do not allow us to identify the simple future as being distinct from the possible future and the necessary future. These systems, named after *C.S. Peirce* and *S. Kripke*, resp., differ from the two just mentioned by making a difference between outside and inside negation of the operator for dated future, thereby making it opaque to double negation. In *the Kripke-system* the future is not determined, so it softens the principle of non-contradiction by *accepting all future contingents including their inner negations*.[7] In *the Peirce-system* the future is determined, thus it slackens the principle of the excluded middle by *rejecting all future contingents including their outer negations*.[8] Both systems are similar to that of Ockham with respect to the past which is backwards linear, but in the Kripke system time is branching into different futures which are all "real", while in the Peirce system only future possibles branch, such possibles being imaginary. I will now briefly consider the interesting, but not very clear, logic of the Danish philosopher *Kierkegaard*.

In his *Philosophical Fragments*, and in the *Concept of Dread*, we find ideas which can be combined in a way that at least resembles a plausible system of tempo-modal logic. In one place he identifies the future with the possible and the possible with the future, in another he claims that time is perfectly linear: these elements, when combined, lead to determinism.[9] Kierkegaard, however, was no determinist, but a resolute defender of human freedom. Nor was he a chump, so we should rather interpret his views in a reasonable manner. So let us assume that, when assimilating the possible to the future, he was speaking of the indeterminate, or undated, future. Let us further suppose that, when claiming time to be linear, he was referring to determinate time - i.e. time understood as a succession of abstract instants, or dates. Future possibles are branching. The calendar, an abstract ordering of dates, is linear.

Kierkegaard said that *possibility is temporal* whereas *necessity is atemporal*. This debars the usual definitions of 'necessary' as 'not-possible-not' or, alternatively, of 'possible' as 'not-necessarily-not'. Using possibility and necessity as our primitives this suggests that we define the inevitable as that which is not possible not the case and the conceivable as that which is not necessary not the case. Instead of having only one pair of contraries, we thus end up by having two pairs: 1) a *temporal* one: possible *versus* inevitable; 2) an *atemporal* one: necessary *versus* conceivable.

I will now sketch a logic which is akin to Kierkegaard's in certain respects.[10] We start by adopting the *branching structure* of the systems of Peirce and Kripke which combine the linearity of the real past with the branching of future possibles. What I mean by possible, here, is what is yet preventable, hence not inevitably false, just as what I mean by necessary is what cannot be denied on pain of contradiction, that is, what is not conceivably false. For this reason our primitives can be shifted.

We now introduce instants by means of *clock-propositions*, i.e., propositions true only once, but neither earlier, nor later, covering all the branching possibilities. By this means we construe a *calendar* as a completely ordered set of world-instants, each instant being indexed with reference to some particular possible world-course, a possible world-course being definable as a maximal consistent set of propositions.

Following Peirce we define the true future as that what is now inevitable, or determinate, whereas we define the possible future as that which might still be prevented, i.e. as that which is so far indeterminate. So true future is a dated future, and dates must, properly understood, impute a total ordering on events.

What is necessary was always inevitable. What is future is inevitable now. But this very future might have been preventable, or even unstatable, a moment ago. This lends a kind of inevitability to the future without making it strictly necessary.

Such logic, I contend, yields a promising base for our new metaphysics.

2. Cosmology, and the Physics of Worlds.

Passing on to cosmology we must ask: What sort of entity is this world? Referring to the one and only real world, not one of those imaginary constructions we call possible worlds, it is unique. Plato, in his late dialogue *Timaios*, declared:[11]

"Thus, in order that this cosmos might be eminently like (its paradigm which is) the most perfect of living beings, the Divine Craftsman produced neither two worlds, nor an infinity, but our world is the only one to have been created, and will ever be."

Having been asked how he could be so sure of that, his answer might have been: This is what we mean by 'the universe', so it is just a matter of correct definition. Essentially, the universe is the totality of everything that can be said to exist.

This unique totality is outside the scope of anyone's experience except God's. We conclude that the term 'universe' denotes a limiting concept in the sense of Kant: it is intelligible and, like an angel in scholastic theology, it is the only one of its kind. The idea of the universe as the sum of existing reality - a totality that, transcending experience and intelligence, is unobservable and unknowable - is both paradoxical and indispensable if we are to understand the perceptual contents of our experience. What we perceive is a swarm of sense-impressions: they impinge upon us and, by perceiving them, we are aware of events, past and present, and imagine future ones. Hence I shall insist that *Time*, as discerned by its modes of past, present, and future, is a necessary concomitant of all possible worlds, including the actual one.

The material contents of possible worlds are temporal happenings or events. A universe in which nothing happens makes no sense, such a world cannot be real. So the static universe of Parmenides, devoid of Heraclitean flow, is against reason. We shall here take the further step to identify a world with a temporal world-course: the real world is nothing but the actual world-course of events observable to us together with those events which must be presupposed as their necessary conditions. This, in fact, brings us very close to the view of André Mercier who has proposed to identify the universe with a relativistic *super-time* of at least four dimensions.[12] I sympathize with Mercier's metaphysics which claims that *temporal flux* is real in the sense of being the bearer of reality, or existence. Its central idea is very original, stating that *being, or reality, is what is given to us as time flows* from future to past. But I am convinced that, to vindicate this idea, a final step must be taken.

This step will no doubt seem radical to all who, like Mercier, have been inspired by Einstein's relativity theory: It implies a revival of absolute simultaneity! Furthermore, the idea of time-flow is closely connected to modern tense logic, and such logic does not make sense unless temporal modes can be considered absolute, making the cut between facts, past or present, and fictions of the future, sharp. Likewise, our concept of existence, signifying the endurance in time of something that did once arise and may once expire, is bound up with the concept of interval. However, Special Relativity, by discarding absolute simultaneity, also relativizes the concept of interval: granted that the existence of something (a lump of radioactive matter, say) is limited to a definite temporal interval, it may be the case for three observers in fast relative motion that, by meeting in mutual coincidence, the first reports that the lump perished long ago, the second that it is still there, and the third that he has not yet observed anything of the kind in that place.

The above paradox may be viewed as a universal conundrum of existence. According to the special theory of relativity, the concept of existence is individual and relative to the reference frame of a particular observer. In temporal logic this idea just does not work.[13] The relativisation of simultaneity is the most fatal blow ever given to scientific realism. The only question is: when will reality hit back, in order to eliminate this image of the world?[14] To the observer, an existent always emerges as a series of causally connected events; this is a cue that our concept of a thing may be composed from our notion of an event, but whether such a definition will do in logic or in physics is not my point here. My point is that, howsoever we conceive of existence, whether we define it, or use it as as a primitive: a concept of existence which is not transitive simply makes no sense at all because, if the concept is intransitive, it is particular or private which is next to illusion.

Similarly, it is of no avail to postulate the existence of four, five, ten, or even three hundred and sixty, dimensions of space-time since existence, then, must mean something altogether different. If existence means appearance in space-time, then space-time itself does not exist; and if space-time itself exists, then everything in it has timeless "being", whatever that is. Some philosophers have gone so far astray as to defend physics by proposing a metaphysics that reduces events to be nothing but the timeless properties of coordinates. According to this view, absolute super-space is the sole reality, all details being merely the modes of a super-being which would have gratified Parmenides as well as Spinoza. Both Strawson [15] and Quine [16] appear to be the potential proponents of such a world-picture which constitutes the final implementation of the scientific program of Einstein, the subtle purpose of which it is to reduce everything in natural science to space-like concepts.

However, what is empirical in physical geometry is of a topological, not a metrical, nature; on this issue I prefer to side with Poincaré rather than Einstein: Coordinates are conventions, like the metrics incorporating them, and should not be hypostatised to abstract properties characterising an absolute nature. Neither is it well founded to concoct a temporal metaphysics based on those absolute entities called instants, or dates, whether they be of universal or of merely local validity. Dates, when arranged in linear series, form calendars, but calendars do not inhere in the universe. Of course, we may still devise calendars based on scientific reasons.[17] But philosophy should not be reduced to the interpretation of science. Philosophy is not the maiden of theology, but neither is it the maiden of physics. So it should not degrade itself by accepting a restriction to "mopping-up work" (a phrase of Locke's) its real obligation being to combine profound analysis and inspired synthesis.

However, philosophising is not the prerogative of academic philosophers. Scientists are also free to think, and Eddington, astronomer and cosmologist, in a philosophical vein once pointed out that *the physical world* is, in fact, very different from *the world of the physicist* (or, as we should rather say, for there are many: the worlds of the physicists). What he meant was that the real world, our actual physical universe, is one of a kind, is unique. Since the only kind of similarity our intellect can grasp is similarity of *structure*, the only way for us to come to know anything about the real world is to construct *models*, the structure of which can then be compared to that of the real world. The world as a 'thing in itself', independent of observation, is unfathomable. What is left to know is the world as a "thing for us", but this world is plural. How do we manage to know the real world? By devising models of the world and testing them by means of observation and experiment.[18]

Cosmology has not yet succeeded in producing a viable grand unified theory, although some attempts in that direction have been made. As yet we possess only partial theories, fragments of world-models. The unification of relativity theory with quantum mechanics is still in jeopardy, due to the vexatious emergence of infinities, and the standard renormalisation procedure made use of for their removal is *ad hoc*. As pointed out already by Heisenberg, the great obstacle is the relativistic denial of classical absolute simultaneity.[19] More recently John Bell has also admitted that the cheapest solution to the problems confronting physics with the experiment of Aspect might be to go back to relativity as it was before Einstein, when people like Lorentz and Poincaré thought that there is a preferred frame of reference, an aether.[20]

Personally I would prefer a solution which would make a new radical kind of relativity compatible with a refined form of absolute, or invariant, simultaneity. [21] However, the prevailing tendency at the biennial conferences on relativity which I have attended in later years shows a preference for some kind of substratum theory.

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Indeed, such a theory would solve the problem by invoking a preferred reference frame defined by the socalled 3K cosmic background radiation, in accordance with Weyl's principle. This reference frame, of course, would no longer be stationary but expanding, hence it is natural to assume that it would possess dynamic properties that would make it possible to explain gravity in terms of spontaneous accelerations, due to local deviations from universal symmetry and homogeneity.

Such explanations have been proposed by Milne and by Landsberg who both invented their cosmologies in conformity with the Hubble law of cosmic expansion. Hence they are characterised by their consent to a cosmological principle implying certain minimal requirements as regards isotropy and homogeneity. Indeed, Milne was first to make that principle an effective instrument of cosmology.[22] It has long been proven by Robertson, and independently by Walker, that any world-model in which the average distribution of matter-in-motion conforms to the cosmological principle is describable in terms of an expansion-factor where a statistically defined time parameter serves as the argument, a parameter which is universally invariant. Thus a Cosmicv Time is definable for all standard Robertson-Walker models.

This fact, as I see it, is exceedingly important. If it is possible to estimate the size of the fluctuations in the average density and distribution of matter in the world, we must be able to specify: Deviations from what? From the universal mean, of course! Now atomic clock rates are retarded by dynamic forces, hence we must be able to specify: Retardations relative to what? To the Universal Time, of course!

So I shall follow Whitrow by claiming that the internal oscillations of atoms must ultimately be determined by a *cosmic rhythm* which is invariant with regard to an ideal class of equivalent fundamental observers conforming to the principle of perfect cosmic isotropy. But I shall insist, against Whitrow, that this rhythm is not merely statistical, as it reveals the conformity of phenomena to basic ideas of reason.

This metaphysical conjecture also opens the possibility of revolutionising our understanding of the phenomenon of gravitation so that instead of explaining the retardation of clocks by the influence of gravitation we might instead try to explain gravitation in terms of the retardation of atomic clock-rates.[23]

So there is no reason at all to discard the notion of absolute simultaneity. On the contrary we have every reason to retain it in order to vindicate a tempo-modal logic that lends formal support to the idea of a never ceasing temporal flow: a flow which, according to Mercier, is passing from the future towards the past.

Before elaborating any further on this new metaphysics of time and change, I will briefly hint at the structural similarities between various semantical models of tense logic and certain interpretations of classical and quantum mechanics.

First, it appears that the Leibnizian idea of the world as a linear series of world-states, the past giving rise to the future and the future preserving the past, resembles the determinism of Laplace. Given the description of a single world-state, all other world-states, past or future, are then computable to the tiniest detail.

Second, it seems that the Ockhamist idea of possible worlds as a tree, linear towards the past but branching towards the future, with a privileged world depicted as a line discerned by marks hidden to any observer, resembles the image given by Bohm of the classical world as causally imbedded in the sub-quantum world.

Third, the many-worlds interpretation of quantum mechanics by Everett and de Witt appears to resemble a possible world in the sense of Kripke, having no privileged sequence of world-states but only a brushwood of branches budding from bifurcations and framing a diffused infinity of virtually real futures.[24]

To these three systems of logic which are more or less deterministic in their way of construction I shall oppose a system that, in my opinion, is the only one to embody in a satisfactory way a development which is radically indeterministic in the sense that all causal determination is depending on ***creation*** defined as ***time-flow***.

This does not imply that causality is absent, or impotent, but it means that it is contingent: that it depends on a steady flow of time, from the future to the past. This is further correlated to the fact that all our experience stems from becoming. The logic alluded to is that of Peirce, refined by Prior, akin to that of Kierkegaard.

The system, sketched by myself in a joint work with Peter Øhrstrøm,[25] conveys the impression of structural process, a picture similar to that produced by the covering theory of classical and quantum mechanics devised by Tom Phipps.[26] His is the only one among current physical theories to give a formal justification of time's arrow, in contrast to the factual justification offered by thermodynamics; it further frees us from fiddling with quantum logics and non-Boolean algebras. It is a source of persistent surprise to me that these brilliant ideas of Phipps has attracted much less attention from contemporary scientists than the rather dubious quantum time operator invented by Prigogine.[27]

This type of logic, being the logic for a time-bound truth emerging together with the reality depicted, is uniquely well suited to reveal the feature of contingency, so crucial to our understanding of the idea of creation.[28]

3. Mythology, and the Ethics of Creation.

The antique philosophy is marked by its transition from *mythos* to *lógos*, and it has since been a matter of major concern to many thinkers, ancient and modern - except, maybe, the greater ones - to liberate philosophy of "the gods".

By contrast, the unity of *lógos* and *mythos* is central to Christian doctrine. The majestic *prologue* of the gospel according to St. John (*KATA IΩANNHN*) begins by proclaiming the myth of the Divine Logos: *'Εν ἀρχῆ ἦν ὁ λόγος ...*

"*In the beginning was the Word, and the Word was with God, and God was the Word. The same was in the beginning with God. All things were made by him, and without him [became not one which has become]. In him was life; and the life was the light of men. And the light shineth in darkness; and the darkness did not comprehend it ... And the Word was made flesh, and dwelt among us (and we beheld his glory, the glory as of an only-begotten of a Father), full of grace and truth.*"[29]

In *Concise Oxford English Dictionary*, 1934, we find a myth is described as: "A purely fictitious narrative usually involving supernatural persons, etcetera, and embodying popular ideas on natural phenomena." The tenor is rather positivistic: *fictitious* contrasts with *factual* in the same manner as *popular* and *supernatural* contrast with *scientific* and *natural.* But *COED* is a token of educated opinion.

As our point of departure we thus have to face the fact that the central idea of Christianity - which is that Christ, God's Anointed, became incarnate in the man Jesus who was recognised in the gospel as the only-begotten Son of the Father - according to the general academic consensus peculiar to the era of modernism is nothing but (oh, that "nothing-but-tery" of our enlightened age) the fantastic core of a fairy tale traded down to us by generations of illiterate people.

If we now turn to the most famous Christian thinker of the modern age, Søren Kierkegaard, there is no help to be found, and we shall be no better off. According to Kierkegaard, the Incarnation - interpreted as the unification of God and man, the temporal manifestation of eternity - constitutes the Absolute Paradox, a veritable absurdity to non-believers, unfathomable to anything but revelation.[30] In the same vein, proofs of the existence of God are just ridiculous, for if He exists, they are superfluous, and if He does not, they must be inconsistent.

However, as I have argued elsewhere, this way of reasoning is superficial.[31] God having created the Universe, which is the totality of everything that can be said to exist, it makes no sense to ask whether the Creator himself exists, since the only significant question is whether God did once exist - viz. as a human being. Secondly, as conceded by Kierkegaard, proofs of God might after all be reasonable, and even useful, if they were expressly designed to elucidate the Idea of God; but this was precisely the motive behind the dialectical proof of St. Anselm.

As I have shown elsewhere, this proof is valid when reconstructed in terms of modern symbolic logic, its premisses being implicitly granted by the atheist.[32] So the claim of the atheist, that there is no God, can be silenced by formal logic: either the atheist does not understand what he is talking about when rejecting the *quod-nihil-maius-cogitari-potest* as an illusion, or he is just contradicting himself - both horns of this dilemma severely threaten his intellectual integrity.

If, by *mythology*, we do not understand merely a narrative body of myths, but also the formal study of myths, it is of the utmost importance that their sensitive interpretation is not hampered by the erection of artificial barriers between illusion and reality, fiction and fact. To the fulfilment of this purpose St Anselm's proof, by succesfully defending the Christian Idea of God against the attack of so-called "enlightened" atheism, represents a major step forward.

The next step in paving the way for a deeper understanding of the Christian *Lógos-Myth* would be to repudiate the insinuation that the Christian Idea of God, when it is interpreted as a unitary idea, is beset with contradictions, or incoherent.[33]

This claim, if based on the apparent conflict between *Divine Providence* and *Human Freedom*, was already countered in the Middle Ages.[34] Nevertheless, the medieval solution, although being consistent, does not seem very plausible, and so other solutions may be needed in order to overcome the doubt lingering.

Moreover, I have long felt a growing suspicion that the idea of timeless truth is an import of Greek origin foreign to Christian tradition, and that the idea of God's providence as implying a knowledge of future contingents is an unhappy construct. Maybe 'providence' simply means: God's active care to fulfil his promise.

With this attempt to re-interpret the central ideas of the Christian tradition in light of the (Jewish-Christian) Bible, I have taken my inspiration from J.L. Lucas.[35] His view is supported by a remark due to the Danish national bard, Grundtvig: *The creation is a divine experiment.* A natural interpretation of this passage is that even God does not know the outcome of his own experiment in advance because, if he did, it wouldn't be a genuine experiment! What the Gospel says is that God is on our side in fighting against evil and that he has promised us the final victory.

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One may ask: What if creation is planned, all truth being known of eternity? And this, of course, is the engrained view of tradition: Why should it be wrong? Because, if God knew everything in advance, his act of creation would be pointless! What reason could convince God that it was good to duplicate his original vision? Much more important than any reasoning, however, is the indisputable fact that the idea of a God living and acting in time, and caring for his beloved creature, is much closer to the Bible than the traditional idea of an eternal, immutable, and dispassionate deity transcending time as well as the sufferings of man.

If the creation of the universe, together with the life it contains, is in fact a divine experiment, then not only its outcome, but also the laws determining that outcome, may after all be unknown. Perhaps the laws of nature are just its "habits", as suggested by C.S. Peirce? Maybe the laws of nature are not given of eternity but stems from evolution? If that were the case, if laws were customs, then *lex* would be akin to *mos* and *nómos* to *éthos*, and the difference between laws of nature and laws of society, or morals, would be a matter of degree rather than a matter of kind.

Nevertheless it can be argued that creation must be performed in agreement with certain trancendental conditions if a universe is to emerge at all.[36]

Formal models of the universe are devised by scientists who have a double rôle in the great play of life, being at the same time both participants and observers. A first condition of *objective knowledge* is that scientist are able to communicate in order to ensure that they use the same definitions for their exchange of data. To this purpose they will have to agree on the use of *transformation formulae* which are *invariant* to the communication of laws between different observers.

We may therefore conclude that a primary condition for a rational universe is that it allows the definition of a universal class of fundamental observers which are equivalent in the sense of possessing congruent clocks. The *cosmological principle*, generalising the principle of relativity by claiming the existence of *a universal class of equivalent observers*, is *necessary* if the universe is to be transparent to science. This fact is of great significance not only to science, but also to morals.

The point is that the cosmological principle can be interpreted as normative rather than descriptive: "In the absence of evidence to the contrary, provisionally treat all observers as if they were equivalent!" Although the fundamental status of observers may thus be regarded as a matter of approximation or degree, it is utterly important that the principle provides us with *a cosmic norm or ideal*.

For this reason the principle assumes a status which makes it comparable to that of the *principle of universality* in morals; we shall return to this principle later. Perhaps also other elements of cosmological or physical theory are derivable from purely epistemological considerations, as suggested by Eddington.[37]

However, when it comes to the laws of higher order in nature, such as those of biology, it seems evident that these are the outcome of incessant trial-and-error in energetic systems that are subject to the fundamental principles of thermodynamics. Many attempts have been made to deduce the laws of thermodynamics from those of classical physics, but in vain, one of the latest being due to Prigogine.[38] In fact, his main conclusion is right: considerations of entropy do not suffice to distinguish between the positive and the negative directions of time, hence physics needs a principle of selection in order to know which is the right one. However, he didn't clearly realise that physics of itself is unable to provide us with such a principle. Fortunately it turns out that a proper logic of the temporal modes can do the job.

One of the greatest attempts in history to frame a moral philosophy is that of Kant. His metaphysics of moral conduct is appealing and appalling at the same time, at once a natural object of admiration as well as abomination. The main problem with the ethics of Kant is that it is impotent: it blocks our motivation in advance by presenting duty as foreign to all human emotions. Kant's fault was to invent a chasm separating law and duty from life and love; for this reason his concept of morality appears in the disguise of inhumanity. How would it have to be changed?

First of all we would have to alter his priorities relating causality to freedom. Instead of trying to invent a loophole for freedom in the context of natural causality we would have to search for a natural place for causality in the context of freedom. Therefore we should begin by constructing an indeterminist logic of time; and then we should proceed by investigating the implications of that new logic to physics and biology, making it clear that the existence of our universe is conditioned by a principle of equivalence, whereas life evolves by creating higher laws of its own. That is: we should, in fact, have taken precisely the course we have followed.

The way is now open for us to further inquiry into the relations between time and creation, order and purpose, science and morality.

We shall follow Kant by conceding that nothing but the will can be good. A good will, motivated by respect for the moral law, is the well of human dignity; when good it is good by itself, not by its end or purpose, its value being intrinsic. But the spontaneity of divine love, when moved entirely by itself, transcends duty which is the need for action motivated by reverence for life and human dignity. The dignity of man as an imperfect image of God derives from the fact that man is a rational animal, subject to morality, and empowered to act according to duty. The frailty of this image is evidenced by the fact that man is selfish, unable to love his fellow by heart without being driven by his fear of God. Some love is natural: that between man and wife, parents and children, etc., just as friendship is natural. The gospels testify that there is a love transcending nature, viz. that of God.

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Among the moral imperatives, some are hypothetical and others categorical; while compliance to *a hypothetical imperative* is inspired by *desire* for what appears under the aspect of good, obedience to *a categorical imperative*, on the contrary, is inspired by *respect* for what appears under the aspect of duty. The only principle giving rise to a categorical imperative is *the principle of universality* which says: "Thou shalt act so that the rule of thy action could be generalised to a universal law of human conduct without impairing life or human dignity!" That this tacitly implies the *universal equivalence* of human agents is obvious; its meaning is this: "Do unto thy neighbour as you would he should do unto you!"

Acting according to this principle, the human will assumes a legislatory rôle; choosing its own rule of action it determines a law of social behaviour. Autonomy, the power of will instructed by reason to create and obey its own laws out of esteem for life and human dignity, is the core of freedom.

Natural causality imposes heteronomy. Spiritual exigency furthers autonomy. The idea of *freedom* is a latent logical potentiality in each single human individual. As an heir to that idea, each human individual is a *person* entitled to be the member of a spiritual realm of moral purposes which refers directly to its divine creator. In order to be truly free it does not suffice to act under the aspect of freedom, the great difficulty being to vindicate freedom in the practice of moral action.

Freedom of the will is not a human property, but the ultimate goal of life. The possession of perfect freedom and innocent life is a divine prerogative, but the principle of perfection converges towards the principle of happiness, the perfection of freedom in spontaneous love being the ultimate well of joy.

The universe, which displays the goodness of its Creator, is its own purpose. Spontaneous manifestations of life and human dignity are their own purpose.

Man as a moral agent is his own purpose, and his freedom should never be subdued by oppression or abused as a means to promote ignoble aims.

Ω. Conclusion: Time=Creation=Grace.

By seeing consciousness - which is a complex of reason, will and emotion - as the final result of a universal urge towards the spontaneous emergence of laws, or habits, of ever higher order and complexity, we do not want to preclude the possibility of infinite mental evolution.

If the present stage of the development of consciousness on this globe were a summit that could never be surpassed, we would be truly wretched creatures! But the driving force of evolution is trial-and-error, combined with survival of the fittest, and this is hardly a fact of biology only.

A condition of the success of trial-and-error is, of course, that the errors are not lethal in the sense that the continuation of trials is blocked by the lack of time. Therefore, when considering phylogenetic evolution, it is a necessary presupposition for development to take place that time is granted. But this is even clearer if we consider the unfolding of ontogenetic potential.

That the flowering of mental capabilities is conditioned by trial-and-error in the sense of training is a psychological fact too trivial than needs to be emphasized. What can be said of the "survival of the fittest" in the context of human psychology? In order to elucidate that question, we shall consider culture and art.

It is commonplace that art represents the expressions of our creative abilities. What is not commonplace is the surmise that these expressions are the more sublime the better they succeed in manifesting the universal in the particular, and that they are the more impressive and fascinating the stronger and more comprehensive the laws embodied in the individual work of art concerned are.

This kind of strength is spiritual and should not be confused with brute force. My point is that the power of life depends on the scope of the laws it unfolds, and that its vitality is evidenced by its ability to invent and obey its own laws. In order to substantiate this view, we shall turn to human history:

It is a well-known fact that the supreme fruits of culture - the great works of art, literature, music, and philosophy - have all survived due to their "fitness", their suitability to express human feelings, aspirations, and hopes. This also applies to Christianity if, ignoring its uniqueness, it is compared to other great world-religions: even the power of Christianity is to be found in the laws embodied by its founder and brought to completion and perfection through him.

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However, the Christian belief is a great paradox, indeed an absolute paradox. Therefore its strength is found in weakness, its pride and honour in humility, just as its power to overcome corruption is tightly bound up with the secret of suffering. This may sound much like the Baconian motto: *to conquer nature by obeying her* - except that to set up power, vitality, and conquest, as aims in themselves would be to replace morality with egotism, repeating the error of Nietzsche.

Traditionally, Protestantism has put a great emphasis on the gift of grace. Therefore it is strange to compare the Protestant origin of the Kantian ethics with its insistence on the necessity of God as an instance whose function it is to sanction morality by giving eternal penalty or reward to the will of man. Apparently Kant did not realise that, by assigning this purely moral function to God, he not only alienated man from his creator, he also scorned grace by taking it possible for man to deserve divine reward. Neither did he see that external sanction, whether reward or penalty, is foreign to his own idea of the moral imperative as categorical, not hypothetical.

The crucial point is that to follow a good will up in act is a reward in itself, just as to follow a base will up in act is a penalty in itself - but the truth hereof is first unveiled *sub specie aeternitatis*, as demonstrated by Dante in his *Commedia*. Therefore *Paradise*, which is a symbol of the fulfilment of our deepest yearnings, is open only to the will that has attained freedom by acting in accordance with the goodness of God. To this purpose - the perfection of the will by love - grace is indispensable. What good we can do is from God, but our evil deeds are all our own. So, without grace, the goodness of will is just an empty posture.

From the Protestant view, morality is only a vain substitute for spontaneity. But the Lutheran word: *simul justus and peccator*,[39] is a contradiction in terms, and to wait for miracles to happen is to scorn the exhortation "Wilt thou be made whole? Well then: rise, take up thy bed, and walk!"[40] Contrary to this, the Thomist saying: *gratia naturam non tollit sed perfecit*,[41] assumes grace to be effective regarding the piecemeal improvement of human nature. Of course, grace can never be deserved for, if it could, it wouldn't be grace - but if only theologians were willing to admit the fact that *grace may work*, the immense potential of religious energy latent in our modern society could be set free to improve our dreadful world just a little bit.

The present condition of mankind is indeed miserable. But, as Leibniz saw, the actual world, being the one and only, may still be the best of all possible worlds. Not only is it ruled by the best laws, producing the richest and most complex effects from the simplest and most sparing means, but it also furthers, better than any other, a steady progress towards the realisation of our most lofty hopes.

What we need is not pessimism, but a new optimistic belief, supported by a trustworthy metaphysics, that *Time is Creation, the true gift of Grace*.

NOTES

[1] This paper is exceedingly dense, so I found it necessary to provide a summary.
[2] Cf. Descartes on *mathesis universalis*: philosophy is like a tree of which the root is metaphysics, the trunk physics, and the branches all the other sciences.
[3] *Die Wahrheit ist das Ganze!*
[4] The distinction between the A-series: *past*, *present*, and *future*, which is absolute, and the B-series: *earlier*, *simultaneous*, and *later*, which is relative, derives from the Scottish philosopher McTaggart who argued against the reality of temporal becoming, insisting that the passage of time is an illusion.
[5] Cf. the Ockham-system as formalized by McArthur and the Leibniz-system as formalized by Nishimura - see Øhrstrøm & Hasle: *Temporal Logic*.., Kluwer 1995.
[6] Cf. A.N. Prior: *Past, Present & Future*, 1967, *Papers on Time & Tense*, 1968, and the posthumous *Worlds, Times & Selves*,1977 (ed. Kit Fine).
[7] In the Kripke system, $F_n p$ is compatible with $F_n \neg p$ (different branches).
[8] In the Peirce system, $\neg F_n p$ does not exclude $\neg F_n \neg p$ (indeterminate future).
[9] Cf. *master-argument* of *Diodoros Kronos*, discussed by Lars Gundersen (this volume).
[10] Cf. my joint paper with Øhrstrøm: *A New Tempo-modal Logic for Emerging Truth*, in: J. Faye & al., eds.: *Perspectives on Time*, Kluwer 1996.
[11] *Timaios* 30A, compare also 32C.
[12] Cf. Prof. Mercier's paper (this volume).
[13] Cf. the paper *SFTT* ('Some Free Thinking about Time') by A.N. Prior (this volume).
[14] But the relativity-specialist P.G. Bergmann already in 1970 spoke of "the breakdown of the principle of relativity" (*Foundations of Physics 1*); and in *The Natural Philosophy of Time*, Oxf.1980[2], p.302, G.J. Whitrow, co-founder of the *International Society for the Study of Time*, wrote: *The concept of the relativity of simultaneity on which, in 1905, Einstein based his Special Theory of Relativity, at first appeared to eliminate from physics any idea of an objective world-wide lapse of time according to which physical reality could be regarded as a linear succession of temporal states ... Nevertheless, a quarter of a century later, theoretical cosmologists who made use of the physical ideas and mathemati-cal techniques as-sociated with relativity theory were led to re-introduce the very concept which Einstein began by rejecting.* -
Cf. my paper on on: 'God, Time & Creation', *PIRT-Proceedings*, BSPS, Ld. 1994 (Conf. Proc.s "Physical Interpretations of Relativity Theory", spons. by Brit. Soc. Phil. Sc.)
[15] Cf. P.E. Strawson: *Individuals*, Methuen 1959.
[16] Cf. W.v.O. Quine: *Word & Object*, MIT 1960.
[17] Thus, when Whitrow in his otherwise fine book: *What is Time*? London 1972, claims that in an evolving universe, *there is a single universal scale of cosmic time in terms of which, depending on the choice made of time zero and unit of time, every event has, in principle, its own intrinsic date*, I disagree, insisting that *dates are something we construct* - they are *not* "given out there"!
[18] Cf. my paper: 'Ideas of Cosmology. A Philosopher's Synthesis', *PIRT-Proc.*, BSPS, Ld. 1996, in: Duffy & Wegener, eds.: *Recent Advances in Relativity Theory Vol.1, selected papers from the PIRT Conf.s 1988-96, Vol.1*, Hadronic Pr., Inst.f. Basic Research, Florida 1999.
[19] Cf. W. Heisenberg: *Physics and Philosophy*, NY 196?.

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[20] Cf. J. Bell in: *The Ghost in the Atom*, Davies & Brown eds., Cambr. 1986.
[21] It is interesting to see that such strange combination is possible; cf. my papers 'Relativity with Absolute Simultaneity', *PIRT-Proceedings*, BSPS, Ld. 1996[3], as well as those published in *Physics Essays 8*, 1994. For my view today, cf. the reference of note 18.
[22] Cf. J.D. North: *The Measure of the Universe*, Oxf.1965.
[23] Cf. A. Mercier, 'Gravitation **is** time', quoted from *Gen.Rel.Grav. 6*, 1975.
[24] Cf. e.g. A. Rae: *Quantum Physics: Illusion or Reality*, Cambr. 1994.
[25] Cf. my joint paper with Øhrstrøm: *A New Tempo-modal Logic for Emerging Truth*, in: *Perspectives on Time* (Faye & al., eds.), Kluwer 1996.
[26] Cf. my joint paper with Øhrstrøm: *A New Tempo-modal Logic for Emerging Truth*, in: *Perspectives on Time* (Faye & al., eds.), Kluwer 1996.
[27] Cf. I. Prigogine: *From Being to Becoming*, Freeman 1983.
[28] Cf. my paper on: 'God, Time & Creation', *PIRT-Proceedings*, BSPS, Lond. 1994.
[29] Cf. Nestle & Marshall: *Interlinear Greek-English New Testament*, 1960;
the bracket might be rendered: .. *became nothing of what has become* ..;
in the parenthesis I have retained the indefinite article.
[30] Cf. his *Philosophical Fragments* & *Concluding Unscientific Postscript.*
[31] Cf. my paper on: 'God, Time & Creation', *PIRT-Proceedings*, BSPS, Lond. 1994.
[32] Cf. my paper on: 'St Anselm's Proof of God' (reprographed), presented at:
ECAP 2 (*2nd European Congress of Analytic Philosophy*), Leeds 1996.
[33] Cf. e.g. A.O. Lovejoy in: *The Great Chain of Being*, NY 1936 & later.
[34] Cf. the discussion in Øhrstrøm & Hasle: *Temporal Logic* .., Kluwer 1995.
[35] Cf. J.L. Lucas: *A Treatise of Time & Space*, 1973, and: *The Future*, 1989.
[36] Cf. my paper: 'A-priorism in Poincaré, Eddington and Milne', 1996,
in: *Philosophia Scientiae 1*, cahier spécial 1, Entretiens de la session 1994
de l'Academie Internationale de Philosophie des Sciences.
[37] See A.S. Eddington: *The Philosophy of Physical Science*, Cambr. 1939.
Compare Bastin & Kilmister: *Combinatorial Physics*, World Sc. Publ. 1995.
[38] Cf. I. Prigogine: *From Being to Becoming*, Freeman 1983.
[39] At the same time righteous, yet sinful.
[40] The Gospel according to St. John, 5.6-8.
[41] Grace does not suspend nature, but makes it perfect.

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