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LIFE AND THE ARROW OF TIME: SOME POINTS OF CONGRUENCE BETWEEN PLOTINUS' AND PRIGOGINE'S THEORIES OF TIME*

Space and time represent the two basic parameters characteristic of our experience of the physical world. Yet, despite the fact that they seem to present to us with a certain phenomenal immediacy, the respective natures of these parameters and their relation to one another is not evident. They have, consequently, been subject to intense study both in the philosophy and physics. Furthermore, the particularly delicate nature of time in particular has encouraged some to attempt to understand time in terms of space or the movements which take place in space. Such attempts made both in Antiquity and in our day have, however, provoked reactions from thinkers who regard such enterprises as a failure to understand the reality of time. The preceding sketch outlines the basic structure of certain controversies which divide and have divided thinkers both in philosophy and in physics. In the following we will attempt to put into relation with one another certain moments of the treatments of the above outlined controversy as it was manifested in what are often studied as discrete disciplines.

In Greek antiquity the distinction between philosopher and physicist was, of course, not practiced as it is in our day. Philosophers were quite preoccupied with questions of cosmology which have since through a long series of developments been assimilated to the domain of physicists. If philosophers tend now to leave cosmology to the physicists, they have certainly not abandoned the pursuit of a better understanding of time. Indeed, some of the philosophical classics of the 20th century thematize time with particular assiduity. Yet, if both philosophers and physicists are preoccupied with attempts to better grasp the nature of time, they are curiously not generally in dialogue with one another. In fact, some thinkers implicated in work on time have lamented the absence of communication between the two disciplinary areas.

Ilya Prigogine (1917–2003) is precisely such a figure. In fact, throughout his career he endeavored to create a physical theory which could do justice to human experience. The Russian born Belgian chemist and physicist wrote, *[t]he dream of my youth was to contribute to the unification of science and philosophy by resolving the enigma of time. Nonequilibrium physics show that*

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*this in entirely possible*¹. His main concern was that theories of time in contemporary physics – from Newtonian physics to quantum mechanics and theories of relativity – treated time as reversible. To do so is to treat time like space in which, of course, movement is reversible. To neglect our experience of the irreversibility of time is, then, to *spatialize* time and fail to properly grasp what time is in itself. Prigogine’s work focused precisely on showing that there is such a thing as an *arrow of time*, i.e. that time is directional.

While, as has been remarked, ancient Greek philosophers worked intensively on questions concerning cosmology, neo-platonic philosophers are not particularly well-known for their interest in physical science. On the contrary, most appreciations of their contribution to philosophy tend to focus on their subtle accounts of subjective experience and their elaborate metaphysics. This might reflect a certain truth of neo-platonic philosophy – for perhaps they are in some sense the most philosophical of the Ancient Greek philosophers. Nevertheless, thinkers such as Plotinus do in fact have much to say about questions of cosmology and about time in particular. Whatever the case may be, Plotinus’ account of time is a rich philosophical one and is motivated by some of the concerns that seem to have motivated Prigogine in his studies. That is, Plotinus is concerned that certain accounts of time put forward by other Ancient Greek philosophers may indeed reduce time to a kind of epiphenomenon of physical motion, which would amount, once again, to a spatialization of time, if we can permit ourselves to use Prigogine’s language when discussing Plotinus’ thought.

In the following I will very briefly outline some of the most relevant elements of both Prigogine’s and Plotinus’ theories of time. I then search for parallels between key elements or concepts in Prigogine’s and Plotinus’ theories. My hope is that while discovering comparable elements – these, of course, usually do not represent exact coincidences – some light might fall upon important structures which might otherwise not be apparent. This method is not easy to exploit and the nature of the significance of the results that it produces are not as obvious as are the results of studies employing certain other methods. Yet such a methodology, I think, will lead us to interesting and important results to which other methods cannot.

Prigogine

As I have already remarked, Prigogine was motivated in his work by a desire to reconcile physics and philosophy with relation to the question of time. His work focused on proving that time was not reversible. Furthermore, he was convinced that time was not simply a matter of a human point of view in the universe. And, hence, he had little patience for anthropomorphic interpretations of phenomena of time². Prigogine attempted to demonstrate

¹ I. Prigogine, *The End of Certainty. Time, Chaos, and the New Laws of Nature*, The Free Press, New York 1997, p. 72. In my treatment of Prigogine’s thought in this paper I refer exclusively to this his *The End of Certainty*, since it represents the most up to date and concise account of his work in English accessible to a general readership. The English edition, prepared by Prigogine himself, is based on the original French, I. Prigogine, *La Fin des Certitudes*, Editions Odile Jacob, Paris 1996.

² See I. Prigogine, *The End of Certainty* ... , p. 105.

how certain phenomena already well-known in thermodynamics should be understood as more general properties of the universe. The second law of thermodynamics which states that the entropy of an isolated system increases over time, both implies and requires that time be directional. The Nobel Prize winning chemist and physicist devoted his energies to creating theoretical tools appropriate to understanding the fundamental property of the universe – i.e. time – related to but going beyond the second law of thermodynamics. He asserted that varieties of physical theories which are ultimately concerned with individual trajectories – such as Newtonian physics, quantum mechanics and relativity – fail to get to the truth of certain phenomena which are not manifest at the level of the movement of individual particles. Rather, we should, according to Prigogine, direct our attention to macroscopic structures available only to statistical analysis. He writes:

In short, instability at the level of trajectories leads to stability at the level of statistical descriptions [...] the unexpected feature is that it also allows new solutions that are applicable only to statistical ensembles, and not to individual trajectories. The equivalence between the individual point of view and the statistical description is broken. It is, hence, possible to speak of Laws of Chaos.¹

So then Prigogine focused his research on what he called dissipative structures – *spatiotemporal structures that appear in far-from equilibrium conditions²* – which cannot exist without an arrow of time. His interest in complexity and self-organization suggest that he was motivated by the desire to find a place for *life* in physical theories of time without simply introducing anthropomorphic principles. He speaks, for example, about [t]he choice between solutions appearing at a bifurcation point, determined by probabilistic laws. Far-from-equilibrium self-organization leads to increased complexity.³

Prigogine thought that his discoveries concerning time are immediately relevant to a number of cosmological and philosophical questions, including notably questions concerning 1) fundamental structures of metaphysics, 2) freedom and determinacy, and 3) the origin of the universe.

Plotinus

Plotinus begins his account of time in *Ennead III 7* (45) by distinguishing eternity from time. Indeed, the very first word of this treatise is *eternity* (*ton aiōna*). And chapters 2–6 (out of 13, i.e. precisely half of what follows upon the introductory chapter) of this treatise will be devoted to an investigation of eternity. Thus, it becomes immediately clear that according to Plotinus, time cannot be understood without reference to eternity. Plotinus does admit that it

¹ I. Prigogine, *The End of Certainty* ..., p. 87.

² I. Prigogine, *The End of Certainty* ..., p. 202 and p. 73.

³ I. Prigogine, *The End of Certainty* ..., p. 205.

would be possible to conduct an investigation of time and eternity by beginning with time (in fact, with an image of eternity). Nevertheless, one cannot, in Plotinus' view, conduct an investigation of time without reference to eternity. We might, then, refer to his account of time as *dialectical*.

In chapter 3 Plotinus details how eternity puts everything together in the *now*. He explains that eternity is

[...] *only life, compressing the otherness, in these intelligible realities, and seeing the unceasingness and self-identity of their activity, and that it is never other and is not a thinking or life that goes from one thing to another but is always selfsame without extension, or interval; seeing all this one sees eternity in seeing a life that abides in the same, and always has the all present to it, not now this, and then again that, but all things at once, and not now some things, and then again others, but a partless completion, as if they were all together in a point, and had not yet begun to go out and flow into lines; it is something which abides in the same in itself and does not change at all but is always in the present, because nothing of it has passed away, not again is there anything to come into being, but that which it is, it is.*¹

Plotinus' elaborates on this notion of eternity referring to it as a partless completion (*telos emeres*)². He insists that it does not flow (*ouποτε εἰς ρήσιν προιοντόν*)³. In fact, it is changeless, having neither past nor future, a kind of stretched out *now*⁴. Eternity is characterized, then, by *presence* and *being*. Interestingly, Plotinus takes pain to point out that eternity is not a substrate but that rather it *shines out from the substrate itself in respect of what is called its sameness [...]*⁵. Eternity is ultimately the life of Intellect, where Intellect is the instance which comprehends multiplicity in the most unified possible manner.

When turning to time in Chapter 7 Plotinus immediately undertakes an historical review of the positions of previous philosophers on time. (This turn is introduced rather enigmatically: Plotinus says that, had the Ancient Philosophers said nothing about time, he could go straight from eternity to time. His use of the history of philosophy here is very interesting. That is, he is not looking for a starting point for his discussion of time. Rather, he wishes to find out if any of the accounts which of time which had already been put forward could be compatible with the account of eternity which Plotinus

¹ Plotinus, *Ennead III 7 (45)*, 3, 12–28, transl. A. H. Armstrong, Harvard University Press, Cambridge (MA) 1967. All subsequent citations from the Enneads will be from this translation.

² III 7 (45), 3, 19.

³ III 7 (45), 3, 20.

⁴ III 7 (45), 12, 3 and 3, 28. See also W. Beierwaltes, *Plotin: Über Ewigkeit und Zeit*, Klostermann, Frankfurt 1995, p. 66.

⁵ III 7 (45), 3, 24–25.

himself had already developed in the first half of the treatise.) He divides these accounts into three general groups:

[...] either time is movement, as it is called, or one might say that it is what is moved, or something belonging to movement, for to say that it is rest, or what is at rest, or something belonging to rest, would be quite remote from our interior awareness of time, which is never in any way the same¹.

He further subdivides these groups but we need not go into the details here.

Time will be understood by Plotinus as an imitation of the Eternity which had so carefully investigated in the first part of the treatise. The unity of the *now* of eternity is present but weakened at the level of the soul, since at the level of the soul the *now* is not able to remain the same. He explains this as follows:

*So would it be sense to say that time is the life of soul in a movement of passage from one way of life to another? Yes, for if eternity is life at rest, unchanging and identical and already unbounded, and time must exist as an image of eternity (in the same relation as that in which this All stands to the intelligible All), then we must say that there is, instead of the life There, another life having, in a way of speaking, the same name as this power of the soul, and instead of intelligible motion that there is the motion of a part of Soul; and, instead of sameness and self-identity and abiding, that which does not abide in the same but does one act after another, and, instead of that which is one without distance or separation, an image of unity, that which is one in continuity [to en sunecheia hen]; and instead of a complete unbounded whole, a continuous unbounded succession, and instead of a whole all together a whole which is, and always will be, going to come into being part by part [to kata meros].*²

The vocabulary that Plotinus uses is structured around notions of *part* (*meros*), *interval* (*diastēma*), and, once again, *life* (*zôê*). Although as Plotinus insists elsewhere, the souls is completely unified, having no real parts, its life in contrast involves a partiality.

World-time and Soul-time are to be understood as identical. For the same time is both outside of us and in us (*en hêmin chronos*)³. If Plotinus makes time a psychological reality he does not thereby diminish its cosmological reality. For, according to Plotinus, all soul is one, such that ultimately there is

¹ III 7 (45), 7, 18–22.

² III 7 (45), 11, 43–56.

³ III 7 (45), 13, 66. Cf. W. Beierwaltes, *Plotin: Über Ewigkeit und Zeit ...*, p. 69.

a coincidence of world–soul and individual souls. Yet, in the end for Plotinus time is to be overcome. In Werner Beierwaltes' words, *nicht indem sie dieses verachtet, sondern indem sie es denkend auf seinen intelligiblen Grund zurückführt*¹. And, as Pierre Hadot has pointed out, Ancient Greek and Roman Philosophy, and Plotinus' philosophy in particular, is never a purely theoretical undertaking, but rather is always a matter of practice, and a practice involving rather precise exercises². Plotinus' theory of time is no exception to this principle. There is, then, an important practical aspect belonging to Plotinus' theory of time, for Plotinian philosophers will undertake to detemporalize their thinking³.

A Comparison: Seven points of Congruence

1) Space and Time

The kind of movement which Plotinus thinks that we should not understand to be the basis of time corresponds roughly to the kinds of movement that Prigogine understands to be at the basis of the analyses of the kinds of physics that tend to *spatialize* time, that is, all physical theories whose principle object of calculation is individual trajectories. In fact, we might even be justified in speaking of a kind of *trajectory ontology* at the heart of contemporary physics, that is, a conception of being which asserts that the basic units of reality are trajectories.

Plotinus puts forward a conception of time according to which unity and the manner in which it is manifested at the level of soul is the key to understanding the nature of time. That is, according to Plotinus, what is essential to time is not any particularly spatial movement or kind of spacial movement but the activity of the soul which manifests unity by the cohesion of succession (it is as we have seen *to en sunēcheia hen*⁴): *This movement of soul was the first to enter time, and generated time, and possesses it along with its own activity.*⁵ Time is indeed related to movement but not to one that is a priori a physical movement. Moreover, the movement in question is itself an expression of the nature of soul just as in time⁶.

2) Macroscopic view and Unity

Prigogine's attempt to understand time by devoting attention to ensembles

¹ W. Beierwaltes, *Plotin: Über Ewigkeit und Zeit ...*, p. 77.

² P. Hadot, *La philosophie antique: une éthique ou une pratique?* in: P. Hadot *Etudes de Philosophie Ancienne*, Les Belles Lettres, Paris 1998, pp. 207–229.

³ See W. Beierwaltes, *Plotin: Über Ewigkeit und Zeit ...*, pp. 75–88 who explains in detail how the notion, although the term *detemporalize* is not employed by Plotinus. Such a notion is pertinent in understanding of a decisive moment of the Plotinian *epistrophe*.

⁴ III 7 (45), 11, 35.

⁵ III 7 (45), 13, 45 sq.

⁶ See the notion of the *psyche* as *autokinéton* in Plato's *Phaedrus* 245 c 5. Note, however, that there is reason to suspect that Prigogine might in fact, simply to suggesting that theories of time replace one type of movement with another. It is possible that Prigogine's theory of time may be in some sense similar to a certain Stoic theories characterized by distinctions concerning ordered and non-ordered movement at the end of III 7 (45), 7, 24–26.

rather than simply individuals resonates with Plotinus' view of *logos* as a kind of structuring principle which is situated, we might say, at the level of soul, a dynamic version of the *eidos* or form which is inherent in the intellect. In Ennead IV 4 (28) and *passim* in Plotinus' works it seems that the *logoi* are particularly manifest at the level of the universal *taxis* or order.

3) Anthropomorphism

As we have noted, Prigogine vigorously disapproves of anthropomorphic interpretations of the physical phenomena (various anthropomorphic theories have been put forward both to explain phenomena in quantum mechanics and in cosmology). Yet he, nevertheless, wishes to do justice to human experience. He is prepared neither to give up human experience (or to say that human experience is false), nor to reject the existence of a physical order governed by *objective* laws. In a sense, he is trying to bridge the gap that seems to open between human and cosmos.

Plotinus, for his part, does not employ the concept of *anthropomorphism*, a concept which, even if composed of Greek roots, is quite foreign to ancient Greek thought. Plotinus in particular seems to avoid making distinctions between realms which modern philosophers would refer to as subjective and objective. His conception of soul as an ultimately unified substance is elaborated in such a way that it should be impossible to distinguish between *subject* and *object*. No doubt, he would never admit that his understanding of the universe is somehow the projection of subjective or merely human concepts on the objective or natural world. Human thought in its noetic activity is, according to Plotinus, capable of reaching that reality which exceeds human reality and which is that cause of human experience.

4) Being and Becoming

Prigogine suggests that his physical theory is related to a metaphysics which sees becoming as more fundamental than being¹. Unfortunately, Prigogine is not very explicit about what he means by this. However, he does in this context allude to Bergson's philosophy and perhaps even more importantly to the process metaphysics of Whitehead. What we have in Whitehead is a kind of platonic thought which occasionally slips into the kind of anti-Platonism (a simplified version of which is apparent in certain currents of contemporary philosophy), which contends that in elaborating his *theory of forms* Plato failed to adequately account for becoming in his metaphysics. If indeed Whitehead makes critical remarks about Plato, he is also in some sense a *neo-platonist*. Prigogine's reference to Whitehead reveals the plausibility that he too is not outlining an entirely anti-platonic program when he gives priority to Becoming.

Now, if – as is arguably the case – the kind of Platonism that anti-platonism oppose cannot really be attributed to Plato himself, then it is possible to refer even to Plotinus as an anti-platonist in a very restricted sense. For what

¹ I. Prigogine, *The End of Certainty* ..., pp. 9–17.

we have in Plotinus is an attempt to give a satisfactory account of time and becoming while safe-guarding a place of privilege for Being. As we have seen, the relationship between time and eternity runs parallel the relationship between becoming and being. Significantly the platonic notion of *mimesis* is at the root of the Plotinian understanding of this relationship. That is – to simplify the platonic metaphysics here – time participates in the being of eternity but involves a certain element of privation. Unlike Parmenides, Plato and Plotinus would seem to have positive accounts of Becoming.

Prigogine might be formulating something of a false dilemma when he suggests that thinkers must choose between Being and Becoming. Yet it is difficult to see how Prigogine might be able to adapt elements of the platonic relationship between Being and Becoming structured, as it is, by way of a very particular understanding of *mimesis*.

5) Freedom and Determinism

Related to his remarks about Being and Becoming are Prigogine's speculations concerning freedom and determinism. According to Prigogine possibility may be more important than reality¹. His theory permits that from the initial conditions of an ensemble a variety of possible evolutions of the system be possible. Although he is not able on this basis to mount a thorough proof that reality is not fully determined by a chain of causality, he nevertheless thinks that his theory provides the foundation for further work that shall be able to provide such a proof.

Plotinus' theory of freedom is outlined in Ennead IV 8 (39). Freedom, even as manifested in the soul, is founded in the intelligible and the super-intelligible². For it is the One which is ultimately the paradigm of true freedom. Once again, we have what we could call a dialectical understanding of freedom. Plotinus' theory of freedom has much in common with his theory of time. On the other hand, whereas Plotinus explains very clearly how eternity at the level of the intellect is the paradigm of time at the level of soul, in his discussion of freedom in IV 8 (39) true freedom is at the level of the One which is beyond the intelligible and consequently cannot directly serve as the paradigmatic cause of phenomena at the level of the soul. As has often been remarked, in IV 8 (39) Plotinus permits himself to characterize the One in such positive terms as we do not find elsewhere in his œuvre, where in general he tends to approach the One in *kataphatic* terms. This adds to the complexity of Plotinus' understanding of freedom. Suffice it to note that a metaphysical super-entity such as the Plotinus' One would probably go beyond the bounds of the questions ordinarily addressed by contemporary physicists, even those who often do find themselves obliged to address certain questions of metaphysics in their work. This is once again a point at which Plotinus' thought diverges significantly from that of Prigogine.

¹ Note that we discern here a Heideggerian note in Prigogine's thought. Indeed, although he does not treat the German phenomenologist's thought in any detail, Prigogine does in certain passages mention Heidegger, see for example, I. Prigogine, *The End of Certainty* ..., pp. 10–14.

² VI 8 (39), 5.

6) Creation

Prigogine takes a very controversial position concerning the origin of the universe. He calls into question the so-called standard model which asserts that the beginning of the universe emerged from a singularity by way of an event which is normally called the *big-bang*. Prigogine argues that

[...] irreversible processes associated with dynamical processes have probably played a decisive role in the birth of our universe. From our perspective, time is eternal. We have an age, but time itself has neither a beginning nor an end. This brings closer two of the traditional views of cosmology: the steady-state theory introduced by Hermann Bondi, Thomas Gold and Fred Hoyle, which may apply more precisely to the unstable medium that generates our universe (the meta- or pre-universe), and the standard big bang approach.

Unlike physicists such as Hawking who think that time emerged with the *big-bang* Prigogine asserts that *[e]ven before our universe was created, there was an arrow of time, and this arrow will go on forever*². He does admit that the concept of a *big-bang* will not be obsolete. However, he thinks that it will be meaningful only in the context of a cosmology which can speak of a *meta-universe* or *pre-universe* which exists before the universe proper.

Insofar as he asserts that time is the life of the soul, Plotinus considers time as coextensive with the universe. He writes:

This is why it is said that time came into existence simultaneously with this universe, because soul generated it along with this universe. For it is in activity of this kind that this universe had come into being; and the activity is time and the universe is in time.

Of course Plotinus does not think that the universe has a beginning or an end in time. In this respect his thought is similar to and different from Prigogine's. For he would reject any explanation resembling that of a *big-bang* theory. We can still speak of creation in Plotinus even if it does not represent an even in time. Insofar as the eternity of Intellect is prior to the time of Soul in which the universe exists, the universe is posterior and an effect of *creation*. Furthermore, the creation or *demiurgia* of Plotinian cosmology is perhaps in some sense akin to the continuous creation for which Prigogine is

¹ I. Prigogine, *The End of Certainty* ... , 1997, p. 166. See n. 13 to p. 173: *This model is based on the perfect cosmological principle: Not only is there no privileged place in the universe, but here is also no privileged time. According to this principle, every observer, in the past and in the future, is able to attribute to the universe the same values of parameters such as temperature and matter density. The steady-state universe is characterized by an exponential expansion compensated by permanent creation of matter.*

² I. Prigogine, *The End of Certainty* ... , p. 182.

³ III 7 (45) 11, 22–25.

advocating. On the other hand, there can be little doubt that Plotinus would not approve of the notion of a continuously expanding universe.

7) Stability and Nonequilibrium

Instead of a singularity Prigogine suggests that there was some kind of instability at the beginning of our universe. Indeed, as I have noted above, a central concept (perhaps *the* central concept) in Prigogine's physics is that of non-equilibrium. He claims that instability provides the theoretical means by which we can replace the notion of singularity in accounting for the origin of the universe¹.

In Plotinus *stasis*, which we might be justified to translate as *stability*, is associated with the Intellect. If there is something that we could call instability in Plotinus, it is to be discovered at the level of soul. In fact, it seems that Plotinus' account of time is precisely an account of instability. That is, he explains how the *now* of temporality, in contrast to the eternal *now* of intellect, is ever changing precisely because it is not complete in any given moment. This allows us, I think, to apply the Prigoginian notion of instability to Plotinus. In other words, the realm of Soul represents a *non-equilibrium system*.

Ultimately, however, Plotinus' non-equilibrium system is, we might say, poised to return to an equilibrium system. Once again, it is at this point that the thought of Prigogine and Plotinus diverge significantly. For in Prigogine's view there seems not to be a level of stability, at least not one of any real metaphysical import, which should contrast with the realm of *nonequilibrium*. Enticingly, towards the end of his book *The End of Certainty* Prigogine makes reference to the dialectical relationship of the *Iliad* and the *Odyssey*². And he explicitly pleads for a more dialectical view of nature³.

This remarks begs several questions. What shall the pole opposite to nonequilibrium in the dialectic that Prigogine is proposing be? Is his work only one pole of a dialectical structure? In other words, does his theory only make sense in relation to the theories of physicists working on the *standard model*? Or is Prigogine himself able to provide the opposite pole in the dialectic that he seeks? If he is, would it look anything at all like the Plotinian Intellect? Or, if we turn this question around, might we understand the Plotinian intellect to be at all similar to a unified physical theory?

Conclusion: Physics and Philosophy

We shall have to be hesitant in drawing conclusions. In any case, it is

¹ I. Prigogine, *The End of Certainty* ..., p. 179 writes: [t]he birth of our universe is no longer associated with a singularity, but rather with an instability that is analogous to a phase transition or bifurcation.

² I. Prigogine, *The End of Certainty* ..., p. 186.

³ I. Prigogine, *The End of Certainty* ..., p. 182: *We need a more dialectical a view of nature.* The context is very interesting in the context of our comparative study with Plotinus, but goes beyond the boundaries of the present study: *Of course, thus far we have only a simplified model. Einstein's dream of a unified theory that would include all interactions remains alive today. Nonetheless, such a theory would have to take into account the time-oriented character of the universe as associated with its birth and subsequent evolution. This can be achieved only if certain fields (such as gravitation) play different roles from other (such as matter). In other words, unification is not enough. We need a more dialectical view of nature.*

clear that even if it is possible to make Prigogine's and Plotinus' respective theories approach one another, certain very fundamental differences persist. For example, although Prigogine claims that he wishes *to contribute to the unification of science and philosophy by resolving the enigma of time*, it is not clear that the enigma that he is seeking to resolve is really at the root of the division between accounts of time in physics and philosophy. In other words, Prigogine's work concludes that time is real and directional as it is in human experience, but he does not explain how the time of experience, or, we might say, psychological time is really the same or coincides with the time of the physicists. Furthermore, if Prigogine endeavors to reconcile philosophy and natural science, it is not entirely clear what kind of philosophy he has in mind. For example, would Prigogine admit that philosophy or even theory in general is to be understood as essentially rooted in practical concerns? I imagine that he might have been open to such a suggestion, however, I am not aware that he addressed this question.

The platonic notion of *mimesis* playing such a large role in Plotinus' theory of time might be very difficult to reconcile in any way at all with the Prigoginian account of time. For it seems that Prigogine would, like most contemporary physicists, refuse to recognize any kind of non-physical paradigm for a physical phenomenon. On the other hand, some of the parallels which I have highlighted might be made to bear fruit by offering a richer conceptuality by which to understand both of the thinkers addressed in this study. For example, as we have seen, it might be fruitful to think of the level of soul as a *nonequilibrium* system where possibility has a different meaning than at the level of intellect, perhaps even a meaning which Prigogine might have recognized. Finally, Plotinian philosophy might offer to Prigoginian physicists the possibility of discerning more than one *level* of reality. Moreover, the Plotinian insight that life is to be understood as essential to time might prove fruitful for the study of time in physics. For Prigogine seems still to see time as a condition for life, whereas Plotinus sees life and soul as coextensive.

A Note on CPT Symmetry Violation

A further objection that can be raised with regard to the Prigoginian theory of the directionality of time points out that Prigogine focuses exclusively on what corresponds to the laws of thermodynamics when attempting to establish some kind of proof for the physical reality of the directionality of time. Admittedly, he expands and adjusts the import of these laws. However, there are phenomena in particle physics that may somehow serve as a physical foundation for directionality of time, in particular the violation of CPT symmetry. CPT symmetry asserts that at the level of the weak interaction, charge (C), parity (P i.e. directionality – three dimensional but to be understood on the model of left and right-handedness) and time (T) taken together should remain symmetrical. Such a symmetry implies that time is reversible. However, recent evidence suggests that in certain circumstances this symmetry is violated and certain subatomic processes are not fully

reversible¹. If indeed it turns out that the arrow of time has some foundation at a subatomic level, then the phenomena which Prigogine studies at the level of more complex structures could not be seen as the only explanation for time directionality. In such a case, Prigogine's suggestions concerning the various corollaries of his theory would have to be examined from a very different perspective.

¹ For a popular summary and account of relatively recent experiments which seek to observe CPT symmetry violation see N. Mavromatos, *Experiment sees the arrow of time – at last!* in physicsworld.com, Dec 1, 1998 (<http://physicsworld.com/cws/article/print/1327>, retrieved Aug. 24, 2010). The Berkeley Lab web site provides a short summary of the history of CPT symmetry violation research (<http://www.lbl.gov/abc/wallchart/chapters/05/2.html> Retrieved Aug. 24, 2010). More recent developments are mentioned at http://en.wikipedia.org/wiki/CPT_symmetry#CPTViolation (retrieved Aug. 24, 2010).