

**UNVEILING THE NATURE OF TIME:
ALTERED STATES OF CONSCIOUSNESS AND PENCIL-GENERATED
SPACE-TIMES***

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1. Introduction

One of the most striking and persistent symptoms of the so-called “altered” states of consciousness are undoubtedly *distortions in the perceptions of time and space*. *Time* is frequently reported as flowing faster or slower, *expanded* or *contracted*, and may even be experienced as being severely *discontinuous* (“fragmented”). In extreme cases, it can stop completely or expand unlimitedly. The sense of space is likewise powerfully affected. *Space* can appear *amplified* or *compressed*, *condensed* or *rarefied*, or even *changing its dimensionality*; it can, for example, become just *two-dimensional* (“flat”), acquire *another* dimensions, or be *reduced to a dimensionless point* in consciousness.

As yet, there exists *no* conceptual framework that would provide us with *satisfactory* explanations of these phenomena. Physics itself, although being the most sophisticated scientific discipline in describing the “objective” world, is not even able to account for the ordinary arrow of time, let alone its other, more pronounced “pathologies” mentioned above. Nor does it offer a plausible and convincing interpretation why space has just three dimensions – giving more conceptual challenges than satisfactory answers. And it was, among other things, this failure of current paradigms to accommodate the vast reservoir of phenomena described above that originally motivated our quest for a rigorous and self-consistent scheme, and which ultimately led into what we call the theory of *pencil-generated* space-times.

The aim of this contribution is to demonstrate that this theory represents a cogent starting point for a deeper understanding of the altered states of consciousness in their temporo-spatial aspects. It is shown, in particular, that the three most extreme groups of “pathological” perceptions of time, namely the feeling of *timelessness* (“eternity”), *time standing still*, as well as the experience of the *pure past*, can well be modelled by singular (space-)time configurations represented by a specific pencil of conics. Being speculative, the paper is also offered as a stimulus to our quest for possible links between mathematics and physics on one side and psychology, psychiatry and philosophy on the other.

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2. Examples of Psychopathology of Time and Space

2.1 Near-Death Experiences

A typical near-death experience (NDE) occurs if a person is exposed suddenly to the threat of death but then survives and reports such phenomena as floating out of his/her body, moving rapidly through dark, empty space, having *the life review*, and encountering a brilliant white light. Out of these four consecutive phases it is the third one, the life review, which is of primary focus in the present paper. The following extract is taken from a famous book by R. Moody, 1975, "Life after Life," *Mockingbird Books, Atlanta, pp. 69-70*:

"After all this banging and going through this long, dark place, all of my childhood thoughts, my whole entire life was there at the end of this tunnel, just flashing in front of me. It was not exactly in terms of pictures, more in the form of thoughts, I guess. It was just *all there at once*, I mean, not one thing at a time, blinking on and off, but it was everything, *everything at one time*..."

However, it is *not only the past* but *also the future* that the subject experiencing an NDE can have access to. The first to draw attention to this fact seems to have been K. Ring: K. Ring, 1984, "Heading Towards Omega," *W. Morrow & Comp. Inc, N. York, p. 183*:

"...the material I have collected that bears upon a remarkable and previously scarcely noted precognitive feature of the NDE I have called the personal *flashforward* (PF). If these experiences are what they purport to be, they not only have *extremely profound implications for our understanding of the nature of time* but also possibly for the future of our planet... Personal flashforwards usually occur within the context of an assessment of one's life during an NDE (i.e. during a life review and preview), although occasionally the PF is experienced as a subsequent vision. When it takes place while the individual is undergoing an NDE, it is typically described as an image vision of the future. It is as though the individual sees something of the *whole* trajectory of his life, not just past events... The understanding I have of these PFs is that to the NDEr they represent events of a *conditional future* – i.e., if he chooses to return to life, then these events *will* ensue..."

2.2. Drug-Induced States

One of the most pronounced "distortions" in perception of time and space are encountered in the states induced by the use of drugs. The following extract, taken from a book by Th. Quincey, "Confessions of an English Opium-Eater," pp. 281-282, illustrates that in very detail:

"...This and all other changes in my dreams were accompanied by deep-seated anxiety and funeral melancholy, such as *are wholly incommunicable by words*. I seemed every night to descend – not metaphorically, but literally to descend – into chasms and sunless abysses, depths below depths, from which it seemed hopeless that I could ever re-ascend. Nor did I, by waking, feel that I had re-ascended. Why should I dwell upon this? For indeed the state of gloom which attended these gorgeous spectacles *...cannot be approached by words*.

The *sense of space*, and in the end *the sense of time*, were both *powerfully affected*. Buildings, landscapes, etc., were exhibited in proportions so vast as the bodily eye is not fitted to receive. *Space* swelled, and was *amplified to an extent of unutterable and self-repeating infinity*. This disturbed me much less than *the vast expansion of time*. Sometimes I seemed to have lived for seventy or a hundred years in one night; nay, sometimes had feelings representative of a *duration far beyond the limits of any human experience*..."

Here one should notice that the “amplification” of space goes hand in hand with “expansion” of time, the combination that is reported by quite a few experiencers. Even more dramatic departure from the “reality” is found in *Stanislaw Grof, 1976, “Realms of the Human Unconscious. Observations from LSD Research,” E. P. Dutton & Co., Inc., N. York, p. 187:*

“... I found myself in a rather unusual state of mind; I felt a mixture of serenity and bliss... It was a world where miracles were possible, acceptable and understandable. I was *preoccupied with the problems of time and space and the insoluble paradoxes of infinity and eternity* that baffle our reason in the usual state of consciousness. I could not understand how I could have let myself be “brain-washed” into accepting the simple-minded concept of one-dimensional time and three-dimensional space as being mandatory and existing in objective reality. It appeared to me rather obvious that there are no limits in the realm of spirit and *that time and space are arbitrary constructs of the mind*. Any number of *spaces with different orders of infinities* could be deliberately created and experienced. *A single second and eternity seemed to be freely interchangeable*. I thought about higher mathematics and saw *deep parallels between various mathematical concepts and altered states of consciousness...*”

This description clearly demonstrates that the mind of each of us is not confined to the limits of conventional space and time and what we perceive in our “normal” state is only a tiny fraction of the world we all have potential access to.

2.3 Mental Psychoses

This is the domain where there is still much unsettled and uncertain and which thus offers us an invaluable source for our scientific imagination, as we strive to decipher the laws of Nature. In the examples given below we shall see three distinct types of time pathologies reported by mentally ill patients. The first type is for what most psychotics use the phrase *time standing still*. Its most spectacular examples we were able to find in literature available are those in the paper by *H. Tellenbach, 1956, “Die Raumlichkeit der Melancholischen. I. Mitteilung,” Nervenarzt, vol. 27, p. 13:*

“I sure do notice the passing of time but couldn't experience it. I know that tomorrow will be another day again but don't feel it approaching. I can estimate the past in terms of years but I don't have any connection to it anymore. The *time standstill* is infinite, I live in a constant *eternity*. I see the clocks turn but *for me time does not flow...* Everything lies in one line, there are *no differences of depth* anymore... Everything is like a firm *plane*.”

ibid, p. 14:

“Everything is very different in my case, time is passing very slowly. Nights last so long, one hour is as long as usually a whole day ...” Sometimes *time* had totally *stood still*, it would have been horrifying. Even space had changed: “Everything is so empty and dark, everything is so far away from me... *I don't see space as usual*, I see everything as if it were just a background. It all seems to me *like a wall*, everything is *flat*. Everything presses down, everything looks away from me and laughs...”

It is worth noticing that when time comes to stillstand the perceived space loses its one dimension and becomes only two-dimensional. We shall see later that this feature finds a very nice explanation in our model.

The second type of psychotic time “pathology” is what we may call the *pure past*. The couple of examples below give a detailed account of it. The first narrative makes it explicit that the temporal is devoid of the notions of both the future and the present (F. Fischer, 1929, “*Zeitstruktur und Schizophrenie*,” *Zeitschr. Ges. Neurol. Psychiat.*, vol. 121, p. 563):

“I stop still, I am being thrown *back into the past* by words that are being said in the hall. But this all is self evident, it must be that way! There is *no present* anymore, there is *only* this stated *being related to the past*, which is *more than a feeling*, it goes through and through. There are all sorts of plans against me in the air of this hall. But I don't listen to them, I let my mind rest so that it doesn't corrode... Is there any future at all? Before, the future existed for me but now it is shrinking more and more. The past is so very obtrusive, it throws itself over me; it pulls me back... By this I want to say that there is *no future* and I am thrown back... Strange thoughts enter my mind and drive me off into the past...”

ibid., p. 561:

“It pulls me back, well, where to? To where it comes from, there, where it was before. *It enters the past*. It is that kind of a feeling as if you had to fall back. This is the disappearing, the vanishing of things. *Time slips into the past*, the walls are fallen apart. Everything was so solid before. It is as if it were so close to be grabbed, as if you had to pull it back again: *Is that time?* Shifted way back!”

The third characteristic type of distorted temporal dimension a psychotic often experiences is what can be termed as the *extended present*, and here is what it looks like (L. Ciompi, 1961, “*Ueber abnormes Zeiterleben bei einer Schizophrenen*,” *Psychiat. Neurol. Basel*, vol. 142, pp. 104-107):

“The patient elevates herself above normal boundaries of time without totally surmounting them. The distinction of the present and the future is not cancelled out as the patient still speaks about both dimensions, yet *the line between the actual present and the only maybe-possible and unreal future becomes swaying and possible to cross*. Both dimensions incapsulate and overlap each other without a steady transition. *The future fuses with the present* and vice versa and experiencing acquires a flickering twilight character which is radically distinguished from how a healthy person anticipates the future in day-dreams and the like... *The edge between the present and the past is swaying as well*. At the same time and in a totally different way, *the past is included in and fuses with the events of the present* as well as usually the present is part of the past. There is a kind of *condensation of time*; the present is not distinguished amidst the continuous, steady flow of the past any more, but at the same time the present is not filled with something past as it usually is with normal people; in this case it overlaps...”

The three temporal levels of past, present and future therefore *seemed to overlap* in the psychotic experience of the patient *in an extremelly peculiar simultaneousness* without really invalidating the distinction of past, present and future.”

2.4 Mystical States

In the last example the present loses its point-like nature and starts expanding into both the future and past. If this expansion is not limited, the experiencer will eventually attain the state of the *pure present*, when he/she is able to see all the events simultaneously, as in the following narrative taken from G. Huber, 1955, “*Akasa, der mystische Raum*,” *Origo-Verlag, Zuerich*, pp. 45-46:

“I woke up in a whole different world in which the puzzle of the world was solved extremely easily in a form of *a different space*. I was amazed at the wonder of this different space and this amazement concealed my judgement, *this space is totally distinct from the one we all know*. It had *different dimensions, everything contained everything else*. I was this space and this space was me. The outer space was part of this space, I was in the outer space and the outer space was in me...

Anyway, I didn't experience time, time of the outer space and aeons until the second phase of this dream. In the cosmic flow of time you saw worlds coming into existence, blooming like flowers, actually existing and then disappearing. It was an endless game. *If you looked back into the past, you saw aeons, if you looked forward into the future there were aeons stretching into the eternity, and this eternity was contained in the point of the present*. One was situated in a state of being in which the “will-be” and the “vanishing” were already included, and this “being” was my consciousness. It contained it all. This “being-contained” was presented very vividly in a geometric way in form of *circles of different size which again were all part of a unity since all of the circles formed exactly one circle. The biggest circle was part of the smallest one and vice versa*. As far as the differences of size are concerned, I could not give any accurate information later on...”

Note a striking similarity between this experience and the experience of Grof's subject (Sec.2.2); in particular, both the subjects speak about an equivalence between the eternity and the moment of the present. This seems to be a very important property of a mystical state for it is also mentioned by such famous mystics as St. Thomas and Meister Eckhard, and even by the great Dante Alighieri, as pointed out by A. K. Coomaraswamy, 1947, “*Time and Eternity*,” *Atribus Asiae Publishers, Ascona (Switzerland)*:

St. Thomas (p. 110): “Eternity is called “whole” not because it has parts, but because it is wanting in nothing... the expression “simultaneously whole” is used to remove the idea of time, and the word “perfect” to exclude the now of time... *The now that stands still is said to make eternity...*”

Meister Eckhart (p. 117): “God is creating the whole world now, this instant (“nu alzemale”)... He makes the world and all things in this *present Now* (“gegenwuertig nu”)...”

Dante Alighieri (pp. 120-1): “Dante, when he is speaking of Eternity, makes many references to this “essential point” or “moment.” *All times are present to it* (“il punto a cui tutti li tempi son presenti”, *Paradiso* 17.17); *there every where and every when are focused* (“dove s'appunta ogni ubi ed ogni quando,” *Paradiso* 29.12)... In it alone is every part there where it ever was, for it is not in space, nor hath it poles (“in quella sola è ogni parte là ove sempr'era, perché non è in loco, e non s'impola”)...whereby it thus doth steal from thy sight (22.64).”

3. An Outline of the Geometrical Model

In what follows we shall introduce the basic features of a simple model capable of mimicking remarkably well the pathologies of time and space we spoke about in the previous section. The model is based on a specific *pencil* (i.e. a single parametric aggregate) of *conics*, whose structure is illustrated in Figure 1-left. We see that all the conics touch each other in two different points, B_1 and B_2 , and the corresponding two common tangent lines meet in the point S . This pencil of conics will represent the *time* dimension, each conic representing a single event. The pencil, as it stands, is homogeneous in the sense that every conic has the same footing in it. From our everyday experience we, however, know that there are three different kinds of event, namely the past, present and the future ones. So, we must “dehomogenize” our pencil

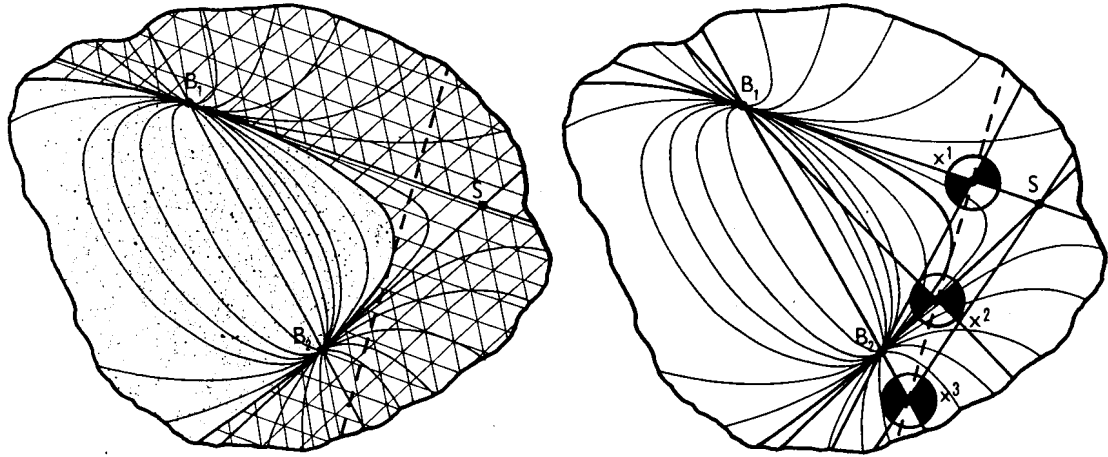


Figure 1.

in order to exhibit the required structure. This can be done very easily if we select in the plane one line that does not pass via any of the points B_1 , B_2 , and S – the broken line in Figure 1. As far as the intersection properties are concerned, the conics are seen to form two distinct domains with respect to this line: namely, the domain comprising the conics that have no intersection with it (dotted area – we shall call these conics “non-cutters”), and that featuring the conics cut by the line in two distinct points (shaded area – we shall call them “cutters”). These two domains are separated from each other by a *unique* conic, drawn bold in Figure 1, which has the broken line for its tangent (this conic will be referred to as the “toucher”). And this is really a very remarkable pattern for it reproduces strikingly well, at least at a qualitative level, the observed “arrow” of time after we postulate that the cutters represent the past events, the non-cutters the moments of the future, with the unique toucher standing for the present, the now.

As for a *spatial* dimension, this will be modelled by a specific *pencil of lines*, i.e. by all the lines that pass through a *specific* point. Here the specific point means any point which our broken line shares with each of the lines B_1 - B_2 , B_1 - S , and B_2 - S , defined by the pencil of conics. From Figure 1-right it is obvious that for a “general” position of the broken line there are just *three* specific pencils of lines (denoted in Figure 1 as three

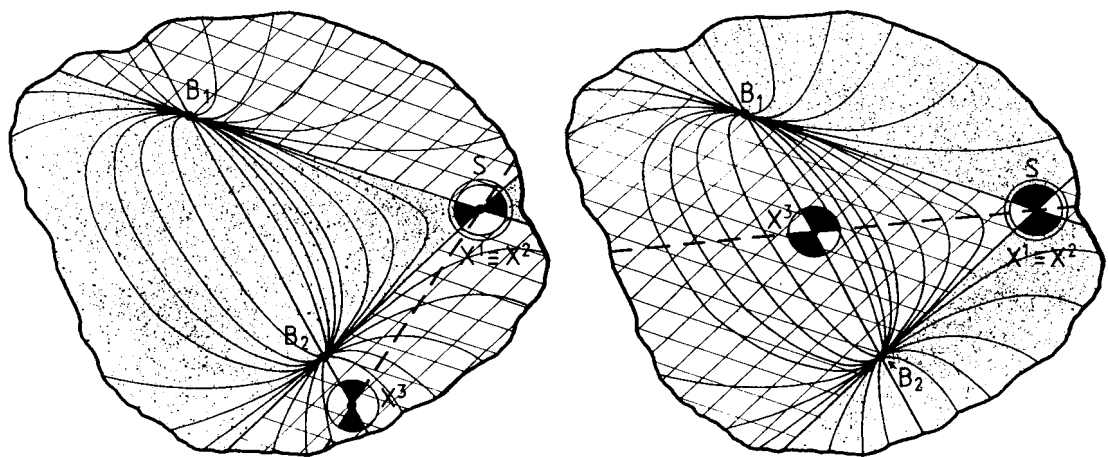


Figure 2.

“half-shaded” circles) and, so, there are just *three* spatial dimensions (x^1 , x^2 and x^3) we can perceive in our “normal” state of consciousness! The model just outlined is thus characterized, as the attentive reader may have already noticed, by *an intricate connection between the existence of the “arrow” of time and the number/multiplicity of spatial dimensions.*

In order to make this link visible to the eye, let us start moving the broken line from its original, “non-singular” position of Figure 1 towards the point S in such a way that it eventually passes via the latter – as shown in Figure 2. As it can easily be discerned from this figure, in this limiting case the toucher disappears and we find only cutters (shaded area) and non-cutters (dotted area). In other words, our time dimension now *lacks the moment of the present*, being only endowed with the past and future events. As it is intuitively obvious that out of the three temporal levels, i.e. the past, present and future, it is the present that seems to be fully “responsible” for what we experience as the “flow” of time, its absence in the above-mentioned arrow implies that, when experienced, such time does not flow, *stands still*. From Figure 2 it can further be discerned that this “break-down” of the arrow of time is accompanied by a $3 \rightarrow 2$ reduction in the dimensionality of space, because its two coordinates (x^1 and x^2 in Figure 1) merge with each other and form a single coordinate. But this is exactly the space-time construct that a couple of Tellenbach’s patients (see Sec. 2.3) were trying to describe!

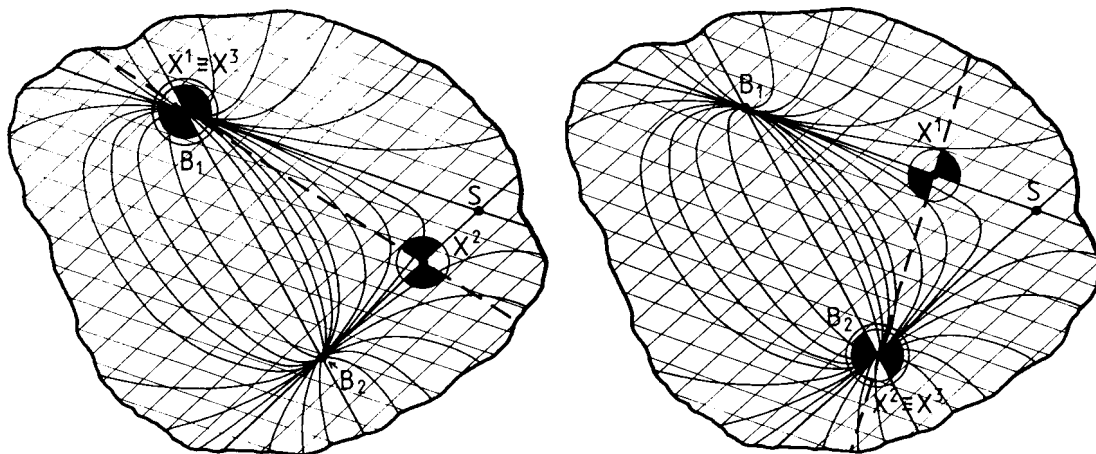


Figure 3.

Another kind of “deformed” time arrow occurs when the broken line hits one of the points B_1 , B_2 , but does not incorporate the point S – the mode depicted in Figure 3. It is obvious that the line selected in this way is a secant to *every* conic of the pencil, which means that the corresponding time dimension will feature *only* the region of *the past* – that is, it is identical with the temporal of F. Fischer’s schizophrenic patients (Sec. 2.3). Note that there is again the $3 \rightarrow 2$ drop in the number of space dimensions.

The third, and last fundamental mode is characterized by the broken-line coinciding with one of the common tangent lines, B_1 -S or B_2 -S – as shown in Figure 4. As in this case any point of the broken-line is the meet of pencil of lines representing a spatial

coordinate, space becomes *infinitely* dimensional (which is illustrated in Figure 4 by two lines running parallel to the line B_1 - S resp. B_2 - S). On the other hand, the broken-line is now tangent to every conics of the pencil, i.e. *all* the conics are its *touchers*; the time dimension thus consists solely of the events of the present, and represents nothing but what in the previous section was referred to as the “eternity”. We see that this (kind of) space-time manifold possesses all the basic attributes of the space-time of mystics – see Huber’s narrative in Sec. 2.4.

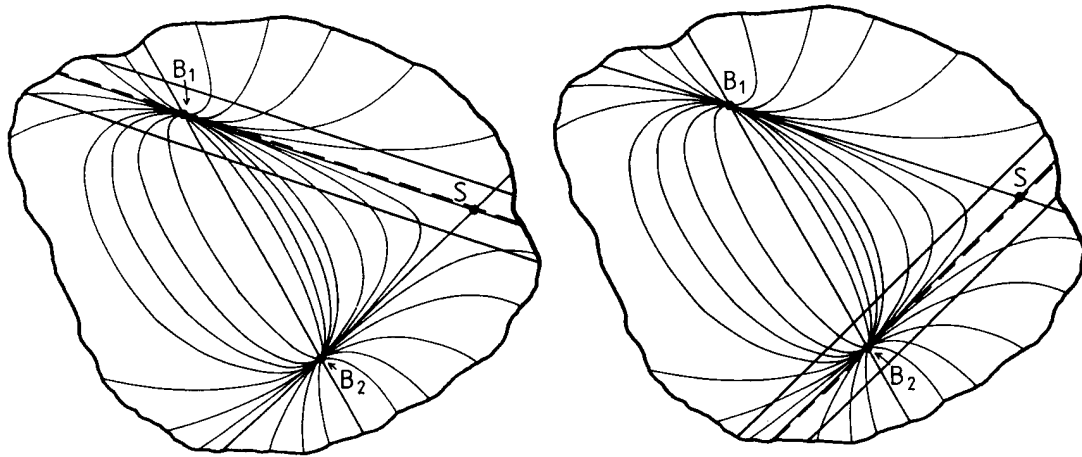


Figure 4.

4. Concluding Remarks

The ideas and findings in the previous two sections provide us with strong evidence that there are forms of human consciousness entirely different from our waking state and experiences of them may represent important phenomenological resources whose contents may, when properly mathematically classified and analyzed, provide valuable insights into the nature of the human mind. Although the interpretation of unusual (or anomalous) mental states, of which those mentioned in Sec. 2 represent only a tiny fraction, has up to now been the domain of psychologists, psychiatrists, philosophers and/or theologians, the time is ripe now for a more general assault, demanding physical and mathematical scrutiny as well.

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