



Time, Experience and Belief

Paul Skokowski^{1,2,3}

¹Saint Edmund Hall, Faculty of Philosophy, University of Oxford, Oxford, OX1 4AR, UK

²Symbolic Systems Program, Stanford University, Stanford, CA 94305-2150, USA

³Center for the Explanation of Consciousness, CSLI, Stanford University, Stanford, CA 94305-4115, USA

E-mail: paul.skokowski@seh.ox.ac.uk

ORCID iD: 0000-0002-9543-5925

Received 29 April 2023; accepted 16 July 2023;
published online 31 July 2023; published in issue 2 April 2024

Abstract

A model is proposed for human-like information-gathering and -utilizing systems. This model uses sensory experience, and subsequent processed belief contents, to provide a notion of psychological time for these agents. This model shows how a narrative can be formed to provide concepts of a ‘now’, a ‘past’, a ‘future’, and perhaps even a ‘flow’ for psychological time. The proposal is that conscious, occurrent access at any moment to registers with different kinds of contents warrants beliefs about relations in time, while recognizing differences between interpretations of psychological time and time as understood in physical theories.

Keywords

time, IGUS, belief, concepts, phenomenology, sensation, experience, psychological time

1. Introduction

The information-gathering and -utilizing system (IGUS) model proposed in Gruber, Block and Montemayor’s (2023) paper accomplishes a great deal in trying to reconcile what they call the veridical and illusory components of various aspects of time. It does so, as they point out, by adding what they call “gadgets” to Hartle’s (2005) IGUS model of an information-gathering system, which are meant to shed light on how humans (and other agents) negotiate their environments and even, for a lucky few IGUSes, reach notions of the nature of time itself. My response to their paper is to offer a simpler solution, based somewhat on the notion of a “narrative” as proposed by Callender (2017). This paper therefore attempts to show

how a human-like IGUS might arrive at robust *beliefs* about the nature of time, including notions of ‘now’, ‘past’, ‘future’ and even ‘flow’, while respecting the differences between time as understood in physical theories and psychological time as supported by the beliefs of the IGUS and its community of other IGUSes. This also addresses the issues raised by Buonomono and Rovelli’s notion of what they call the “commonsense view of temporality” in their target article, and how these views might be reconciled with physics (Buonomono and Rovelli, in press). The idea proposed here is that there is already enough material in the *contents* of the sensory experiences and the concepts of human-like IGUSes to form a narrative about psychological time, without the need for extra gadgets. In effect, we apply Ockham’s razor by sticking to what we already know about the nature of sensory experience and belief, and then applying that to the IGUS model.

2. Background: The Problem of a Common ‘Now’

Modern physical theories describe the world using four dimensional spacetime. The notions of ‘now’, ‘the future’ and ‘the past’ aren’t utilized in these theories and aren’t properties of spacetime. The same holds for the notion of the ‘flow’ of time. This also is not a notion utilized in physical theories.

Further, there cannot strictly be a common ‘now’ between observers of an event. This is because special relativity, which provides our best understanding of spacetime, tells us that the time at which an event occurs depends on an observer’s inertial frame. It also tells us that observers in different inertial frames will judge different events to be simultaneous and that space-like separated observers will not even agree on the temporal order of events. Finally, in special relativity, there is nothing that might serve as a plausible representation of ‘now’. We come to these conclusions from the fact that the speed of light is finite, and that it has the same value in all frames of reference. If the speed of light were infinite, we could more easily have agreement on simultaneity between observers, but the fixed speed of light forbids general agreement on simultaneity.

Einstein appeared to agree that there was no notion of a common ‘now’ between observers of an event. The philosopher and logician Rudolf Carnap recalled an exchange he had with Einstein on the matter:

“Once Einstein said that the problem of the Now worried him seriously. He explained that the experience of the Now means something special for man, something essentially different from the past and future, but that this important difference does not and cannot occur within physics. That this experience cannot be grasped by science seemed to him a matter of painful but inevitable resignation.” (Carnap, 1963, p. 37).

Carnap's reply to Einstein was that notions of the experience of time were more properly addressed within the domain of psychology:

"I remarked that all that occurs objectively can be described in science; on the one hand the temporal sequence of events is described in physics; and, on the other hand, the peculiarities of man's experiences with respect to time, including his different attitude towards past, present and future, can be described and (in principle) explained in psychology" (Carnap, 1963, 38).

This response perhaps seems reasonable, but it's worth recalling that Carnap's view of psychology was nothing like we have today. Carnap was himself a Logical Positivist/Empiricist, and one of the founders of the Positivist movement going all the way back to its formation in the Vienna Circle (Ayer, 1966; Janik & Toulmin, 1973). Under the Logical Positivist view, claims about the 'now' can only be verified through 'The Given' — that is, through sense data. But *time*, including the 'now', cannot be sensed. The Given includes sensory data like patches of colors, sounds, tastes, pains, etc., but the 'now' isn't a datum delivered through any sensory channels.

One doesn't have to be a logical positivist to make this claim, of course. As Craig Callender puts it "... presentness is not a phenomenological feature of the world." (Callender, 2017, p. 230) Similarly Dean Buonomono states "our sensory organs do not directly detect the passage of time", (Buonomono, 2017, p. 6) and he adds:

"Our "sense" of time is not a true sense such as vision or hearing. There is no organ of time, there are no time receptors in our eyes, ears, nose, tongue, or skin. Nor could there be, as time is not a physical property akin to light or the changing pressure of air molecules" (*ibid.*, p. 77).

Logical Positivism takes things a step further, for any claim to experience 'now' or time itself would amount to metaphysical nonsense. Indeed, any purported conscious experience to underwrite such a claim would be considered an "occult property" (Carnap, 1932). The reason is that Carnap's solution for explaining Einstein's 'now' would be through Behaviorism. And that means that any psychological explanation of the notion of 'now' or time would have to be based entirely on observations of human external behaviors. Thus the 'experience of now' would just amount to certain types of human behavior.

But surely our concepts of time amount to more than just our external behaviors. We certainly seem to have robust *beliefs* about time. We are apt to attribute to ourselves, and to others, 'being in the moment', 'anticipating his throw', 'recalling a past experience', 'noticing time flowing by', and so on. Craig Callender also recognizes this problem. The behaviorist ignores the underlying cognitive states

causing behaviors — our experiences and additionally our beliefs, desires, and memories. Callender appeals to evolution and cognitive science to account for these mental states — states that ultimately help explain why we claim to share the same ‘nows’ (Callendar, 2017, Ch. 10).

Doesn’t relativity theory, however, forbid a common ‘now’? The straightforward answer is yes, but as Hartle urges, the psychological explanation is more nuanced. Hartle points out that most human interactions are proximal and at low relative velocities compared to the speed of light, c . This means that for practical purposes, agents can “construct a common present ... that is local, inherently approximate, and contingent upon their relation to each other and their environment” (Hartle, 2005, p. 6). Callender (2017) and Butterfield (1984) have extended the notion of a common now to groups. The idea is that each of our ‘nows’ overlap with those of our neighbors, yielding an approximate ‘common now’ for larger groups in a reasonably small area of space (Butterfield, 1984; Callender, 2017).

3. Forming a Narrative

The agents in a common now are based on Hartle’s IGUS – an “information gathering and utilizing system”, as illustrated in Fig. 1 below (Hartle, 2005). But this brings up a crucial point. If we humans don’t experience a ‘now’ or flow of time, then how do we obtain these notions in the first place? Callender develops the notion of a *narrative*. The ‘now’ and flow of time are concepts we get from this narrative. As Callender explains:

“What crawls up the worldline is not a substantial metaphysical entity, but rather the character in a kind of story. A narrative is being built up the worldline. At each moment, the main character in this story is being created from the resources available at that time. You are always the leading edge of the story. What is “crawling” up your worldline is a story that unfolds “up” the worldline, the story of me (and for you, you). With this understanding, we obtain a reason for our deep conviction that something is moving through time” (Callender, 2017, p. 251).

Note that if we do depend on a narrative, then crucially, language is required. In a sense, the narrative is a kind of Kuhnian worldview of time, or perhaps relatedly, a Wittgensteinian language game, the latter of which amounts to a folk theory of time (Kuhn, 1962; Wittgenstein, 1953). A narrative needn’t be true. The time flow we are referring to can very easily be, and probably is, based on false beliefs. As Callender puts it: “Like a theoretical construct such as ‘center of gravity’ this fiction can play an important explanatory role in science” (Callender, 2017). And of course, this is the nature of belief — beliefs can be *false* (Brentano, 1874; Dretske, 1988; Skokowski, 2022).

Further, if we allow Callender’s claim that ordinary human narratives about time can be false, then this allows physics to keep the picture of objective, physical

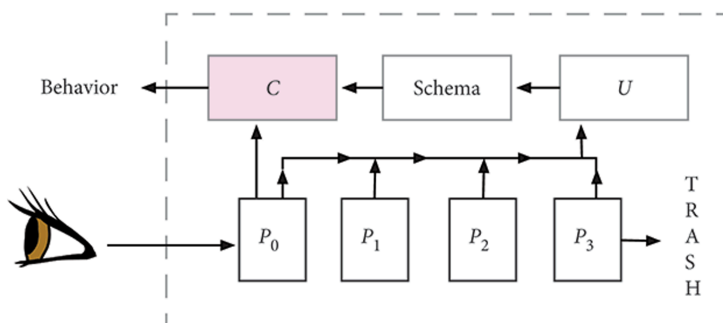


Figure 1. An IGUS, showing the memory registers P_0 , P_1 , P_2 and P_3 .

time as the only true time. Despite ordinary human beliefs about time, physical time doesn't itself need to be flowing. Humans only *believe* it to be flowing because of their narratives.

I think there's something to this. The philosophers Donald Davidson and Fred Dretske claimed that reasons are causes. These reasons are beliefs, desires, memories and other mental states. The vehicles for these states are states in the brain that cause further beliefs and also cause our behaviors (Dretske, 1988; Skokowski, 2022). Thus our mental states are reasons that are causes. Given this picture, the reasons we humans give in our narratives are themselves comprised by our beliefs. And beliefs, of course, are mental states that can be false.

So, we humans can have a narrative about time which gives reasons for our concepts of 'now', 'flow', 'past', and 'future', and which, though convincing to ourselves and others, may be false.

4. An IGUS That Is More Like Us

I now want to give an alternative view. Though I am a fan of the narrative explanation, I would like to suggest a different possible underpinning for our temporal concepts. Like Gruber, Block, Montemayor and Callender, I will use Hartle's IGUS as a starting point, as depicted in Fig. 1.

It seems to me that the generic interpretation of an IGUS treats the memory registers P_0 , P_1 , ... P_n as equivalent in type, and amount of content. As Hartle explains: "These [registers] contain a time series of images of its external environment [...]. The most recent image is in P_0 ; the oldest is in P_n " (Hartle, 2005). So, at intervals τ_* these images are moved from one location to another with no loss in quality, as shown schematically in Fig. 2.

But I don't think we're built like that. Fred Dretske famously argued that the senses deliver content in 'analog' form — these contents are the stuff of our sensory experiences. In order for agents to act on it, this content must be 'digitalized'.

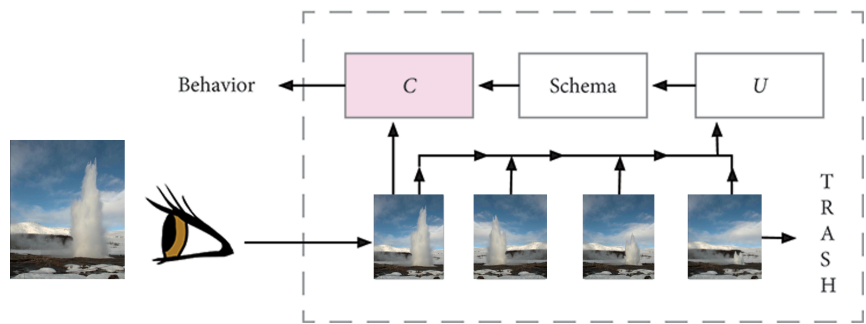


Figure 2. An IGUS where the contents are moved at time intervals τ_* to different registers with no loss in quality.

That is, it must be reduced or distilled to a form that can guide action. Important information is extracted from sensory experience, and the distillation yields the beliefs that guide behavior (Dretske, 1981).

This analog/digital distinction corresponds to the distinction between *non-conceptual* and *conceptual* content (Dretske, 1995; Evans, 1982). Sensory content is non-conceptual. This is raw, high-fidelity content which is unprocessed at the cognitive level. Cognitive content, on the other hand, is conceptual. These are the contents of our beliefs, which guide our behavior, and are available for reasoning and evidential assessment (Dretske, 1988; Skokowski, 2004).

These are distinctions between what I have elsewhere called technicolor phenomenology (Skokowski, 2022), as delivered by the senses, as depicted in register P_0 in Fig. 2, and concepts digitalized or learned from these sensations. The latter would be contents like ‘Alice is to the left of Bob’ (aLb), ‘Fred is taller than George’ ($f > g$), or ‘predator over there’ (predator at $loc(x,y,z)$), for example, as depicted in Fig. 4 below.

But unlike what is claimed for the IGUS, non-conceptual content is transitory; the fidelity delivered by our senses at time t begins to degrade immediately at time $t + dt$, or $t + \tau$. For example, look at a redwood forest while out on a hike in Northern California. What you see is full of technicolor phenomenology and incredible detail. Now close your eyes. How much of that content remains? Very little in comparison with the full-on sensory experience.

Again, these are distinctions between technicolor phenomenology as delivered by the senses (Fig. 3), versus degraded phenomenological states such as autobiographical memory or dreams, as represented in register P_1 in Fig. 3, and versus conceptual concepts digitalized or learned from current sensations, as are represented in registers P_2 and P_3 in the figure. Both the immediate experiential contents and the recent digitized/conceptual contents are available at the conscious level. That is, we can compare current sensory contents with recently processed contents. This capacity is represented in Fig. 4, where the red arrows show how

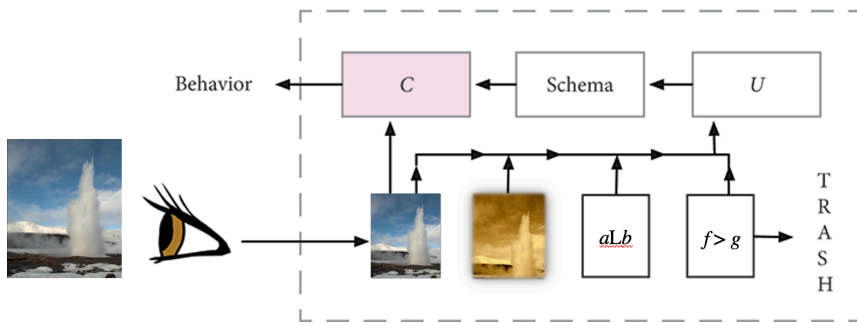


Figure 3. An IGUS showing technicolor content in the initial register P_0 , degraded content in register P_1 , and digitalized/conceptualized contents in registers P_2 and P_3 .

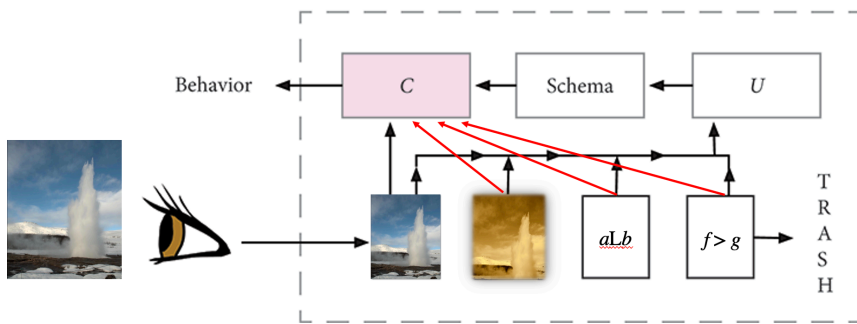


Figure 4. The red arrows in this figure indicate that the processed contents in registers P_1 , P_2 and P_3 are available for conscious assessment, judgement and action by the IGUS.

the various processed contents in registers P_1 , P_2 and P_3 are available for conscious assessment.

This comparison — at a time t , and continually updated — gives us evidence to form a judgment of a ‘now’. That is, at a time t or during an interval τ_* as indicated by Hartle – we can simultaneously compare the contents of registers P_0, P_1, \dots, P_n . We are conscious of the difference between: (1) the quality of the contents of the registers (technicolor vs degraded vs conceptual contents), and contents arrived at through learning, and (2) the relative timing of the registers: ‘now’ accords with technicolor phenomenology, ‘past’ with degraded phenomenology and conceptual contents, and ‘future’ with predicted conceptual contents, often associated with actions (jump!; turn left!; eat that!) That is, conscious access to current registers allows us to judge what *has* happened, versus what *is* happening, versus what *will* happen. My hunch is we get this ability through learning. Finally, our (learned) language allows us to state the relations, and form a (tensed) narrative.

Because we make these judgments at a time, and because registers for experience, memory, and other conceptual contents are continually updated, we have evidence for a ‘now’, a ‘past’, a ‘future’, and perhaps even a ‘flow’ for time. The basic idea is that conscious, occurrent access at any moment to registers with different kinds of contents warrants our beliefs about relations in time. This result uses the psychological tools already at hand to explain how we can form beliefs and narratives about time.

References

- Ayer, A. J. (1966). *Logical Positivism*. New York, NY, USA: Free Press.
- Brentano, F. (1874). *Psychologie vom Empirischen Standpunkt*. Leipzig, Germany: Duncker & Humblot.
- Buonomano, D. (2017). *Your brain is a time machine*. London, United Kingdom: W.W. Norton.
- Buonomano, D. and Rovelli, C. (in press). Bridging the neuroscience and physics of time. In *Time and Science*, R. Lestienne & Harris, P. (eds). New Jersey, NJ, USA: World Scientific.
- Butterfield, J. (1984). Seeing the present. *Mind*, 93, 161–176.
- Callender, C. (2017). *What Makes Time Special?* Oxford, United Kingdom: Oxford University Press. <https://doi.org/10.1093/oso/9780198797302.001.0001>.
- Carnap, R. (1932). Psychology in physical language. *Erkenntnis*, 3:107–142.
- Carnap, R. (1963). Intellectual autobiography. In: P. H. Schilpp (Ed.), *The Philosophy of Rudolph Carnap* (pp. 3–43). La Salle, IL, USA: Open Court Publishing.
- Dretske, F. I. (1981). *Knowledge and the Flow of Information*. Cambridge, MA: MIT Press.
- Dretske, F. (1988). *Explaining Behavior*. Cambridge, MA, USA: MIT Press.
- Dretske, F. (1995). *Naturalizing the Mind*. Cambridge, MA, USA: MIT Press.
- Evans, G. (1982). *The Varieties of Reference*. Oxford, United Kingdom: Oxford University Press.
- Gruber, R. P., Block, R. A., & Montemayor, C. (2023). Physical time within human time. *Front. Psychol.*, 13, 718505. <https://doi.org/10.3389/fpsyg.2022.718505>.
- Hartle, J. B. (2005). The physics of now. *Am. J. Phys.* 73, 101–109. <https://doi.org/10.1119/1.1783900>.
- Janik, A., & Toulmin, S. (1973). *Wittgenstein's Vienna*. New York, NY, USA: Simon and Schuster.
- Kuhn, T. J. (1962). *The Structure of Scientific Revolutions*. Chicago, IL, USA: University of Chicago Press.
- Skokowski, P. (2004). Structural content: A naturalistic approach to implicit belief. *Philos. Sci.*, 71, 362–379. <https://doi.org/10.1086/421538>.
- Skokowski, P. (2022) Sensing qualia. *Front. Syst. Neurosci.*, 16, 795405. <https://doi.org/10.3389/fnsys.2022.795405>.
- Wittgenstein, L. (1953) *Philosophical Investigations*. Oxford, United Kingdom: Blackwell.