

Clocks with Awareness; Enhancing the Quality of Time

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Abstract

In seeking to address a practical concern about the design of clocks, this paper also frames questions about western notions of temporality. In particular, it looks for opportunities to help designers reduce the clock's negative impact on Nature and society. The paper asks why modern clocks still use an internally referenced mechanism for defining time, noting that this inspires single-dimensional, mechanistic beliefs and processes, rather than a more organic mode of temporality. This observation is used to guide a discussion about the role of awareness and synergy, and how they might become helpful parameters for the function of clocks. The paper draws upon arguments from a range of thinkers.

Keywords: Awareness, Synergy, Tacit Knowledge, Teleology, Temporality

1 Introduction

As an eco-designer I would like to find a way to reduce the alienation that curtails social synergies and indirectly damages the biosphere. From a narrow managerial viewpoint consumption is often regarded as a process of linear metabolic change. Here we may remind ourselves that the principle of the clock remains virtually unchanged since its original introduction many thousands of years ago. In this sense – in contrast with organic systems – clocks clearly invoke a mechanical and unidirectional regime of temporality. This condition has been evolving over the last six hundred years or so to bring an all-too-familiar and damaging mode of tyranny to industrialisation. Following this logic, an obvious solution would be to slow down the economic system as a whole. (Wood, 1996) This is a well-established approach that represents economic growth as a linear temporal process. The paper questions the mindset behind this orthodox view and re-frames it by challenging the custom for clocks to be designed as instruments that are radically unaware of their surroundings.

2 THE GENERAL PROBLEM: How can we Reduce Alienation?

This paper seeks a fresh understanding of temporality that calls for 'synergy' and 'consciousness' to be regarded as desirable parameters of clock design. Aristotle encouraged us to believe that time is linear. This is because, in noting the obvious

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spatio-temporal remoteness of the heavens he overlooked their organic and relational nature. Before Galileo introduced the idea of 'velocity' there had been a tacit assumption that space and time were integrated in a quality of flow. Newton's intellectual authority endorsed the idea of time as being autonomous, absolute, and ubiquitous. Today we are so accustomed to technological innovation that recent developments such as 'International Time' now seem natural to us. Indeed, we trust machines more emphatically than our own (human) judgement. (Wood, 1998) This is because the intellectual assumptions behind them have entered our folklore and everyday language.

2.1 The Sources of Alienation

The paper suggests that there were two primary sources of social and environmental alienation. The first was the introduction of alphabetical writing, and the second was the use of clock-time to regulate the industrial workforce. From an environmentalist perspective, the idea of 'speed' has been important to the way economic growth is perceived and managed. Where ecosystems achieve homeostasis by self-regulation at almost every level, industry likes to work with externally imposed plans that work in a linear way, using deadlines and targets. The introduction of printing for example and the global standardisation of 'international time' have both influenced our apprehension of flow, its purpose, and how it works. Although the paper mainly focuses on the issue of clock-time, it also acknowledges the western tendency to consider space-time in an atomistic way – e.g. in a way that conforms to an alphabetical, as opposed to a fluent, pictographic logic. Refinements such as the 'atomised' division of clock time into discrete hours, minutes and seconds played a key role in the accelerating pace of modern industrialised societies. (Mumford, 1934).

2.2 Zones of Heightened Temporal Awareness

Conventionally speaking, a 'well-designed' clock is thermodynamically insulated from its surroundings. In cybernetic terms it is therefore an artificial, closed-order system that entices the 'user' into following a narrow system of temporality. Despite technological refinements such as atomic counters, or radio-frequency transmission, modern clocks still function as closed-order systems in which a local spatio-temporal event-horizon is used to reference the rate of change in many other events that exist in separate and different systems. When many users share the 'same' clock-time, this problem diminishes because they are all implicitly working within a shared timeframe. Nevertheless, the clock remains as the primary referent for action, even though it is far more ignorant than its users. The clock regulates human anticipation in such a way that it alienates us from the very things to which we need to attune ourselves. By enabling relations between clocks and users to become more reciprocal and playful it may be possible to reduce alienation and thereby to enhance the quality of temporal experiences.

3 SUBSIDIARY PROBLEMS

3.1 Written Characters Cannot Depict Change Reflexively

Alphabetical writing was introduced in ancient Greece in 480 BC, mainly to encourage more international trade. The paper argues that by making writing easier to learn we also reduced its synergistic features. Generally speaking, alphabetical writing differs from pictographic writing in being a system of arbitrary codes. In adopting a Phoenician approach to writing, the Greeks lost the pictographic meaning of writing itself. This was replaced by simplified phonetic codes that could only represent certain aural features of their discourse. Plato eloquently described the anxiety surrounding this historical moment. He reports that the introduction of writing would erode "...the very being and structure, the elements, the connections, the balances, the tensions of the culture." It is interesting to note how this event coincided with the refinement of a more symbolic logic that is neither 'author-reflexive' nor context-situated. Here, by 'symbolic logic' I mean a system of representation using unambiguous but arbitrary alphanumeric codes whose values are not meaningfully re-assigned during a given application.

3.2 Atomism Inspired Formal Idealism

One of the effects of alphabetical writing systems was to elevate idealism in space-time systems. This was probably because of the rise of organisational systems that called for abstract instructions to be carried out by unknown operatives. This form of writing tends to alienate authors and readers from their proximal domains of time-space. As with all static writing systems, it is virtually impossible to represent change effectively in the embodied present tense – i.e. during the change of which it is a part. With a greater emphasis on codified unsituated text, it was possible to develop a system of logic that was more symbolic than indexical. In other words, change came to be represented in a way that detached description from event. As such it was therefore less self-reflexive. Arguably, this in itself is a form of spatio-temporal alienation that has also been attributed to thinkers such as Plato (Wood, 1998).

3.3 Alphanumeric Systems Alienate us from Flow

The alienation inherent in formal idealism did not start with Plato. Several pre-Socratic philosophers such as Heraclitus, Cratylus and Zeno of Elea (490-430 BC) anticipated the problem. It is likely that they noticed it because their culture had experienced at first hand the first effects, after 480 BC, of alphabetical writing. However, although Plato and Aristotle were well aware of this potential problem, they failed to make it clear enough to their successors. It also has a problem for the use of numbers for describing flow. Zeno of Elea's paradoxes of motion can be interpreted as satires of the atomistic (alphanumerical) system of thought. In this mindset, the location of a body must be considered at 'time zero' when considering its velocity. Western successors such as Galileo and Newton chose to ignore this problem. In the 20th century this fundamental problem of symbolic logic was successfully challenged (e.g. Wittgenstein, 1921; Gödel, 1931; Turing, 1937). However, it was only with Chaos Theory (i.e. after 1963) that the

problem was fully accepted as being more than a serious epistemological issue of granular precision. (Gleick, 1988)

3.4 Permanent Anticipatory States led to Temporal Alienation

Another aspect of alienation can be summarised in the western idea of 'teleology'. Phenomenologically speaking, in teleological systems the anticipated outcome of planning and desire can tend to eclipse the process itself. As such they are thereby exalted as its causal purpose. By adopting a teleological perspective, a traveller would tend to focus more upon destination rather than on the journey. As such s/he would probably quantify flow rather than savouring the experience of travel. Clocks contribute to the problem of ecological alienation because they perpetuate the myth of a single temporality (i.e. Newton's 'mathematical time') that is assumed to be monogeneous and one-dimensional. This is a reductionist approach in which time-space is ubiquitous yet lacking in variety. Although we still use clocks that apply the old Newtonian paradigm this is anachronistic.

4 Synergy and Reciprocity

A single clock and its human observer certainly have the potential to meet the most modest definition of synergy. However, it is at a low order of magnitude. Because of its austere mode of asymmetry, the clock typifies what is wrong with most machines. Indeed, the relationship between a clock and its user is highly asymmetrical. Where humans are able to adapt to an environment regulated by clock-time, the inverse is not the case. If we regard a clock and its user as a whole system we are likely to find that it has a lower level of synergy than that which can be attained by a two people collaborating without externally imposed rules. Successful organisms demonstrate a high synergistic awareness that integrates them comprehensively with their whole environment. Synergy is an organisational state in which a high proportion of a given system's constituent parts plays a defining role in initiating and sustaining its total identity. This resembles the notion of 'autopoiesis' as defined by Maturana and Varela in the early 1970s.

4.1 Synergy without Temporal Variety

F. W. Taylor, an advisor to Henry Ford, is famous for (externally) imposing a reduction on the variety of relations in his factory systems (1911). Here, the adoption of a kind of absolute (Newtonian) time created the illusion of a one-dimensional temporality. Although this approach may have increased the net quantities of production output, they nevertheless reduced the synergy of its socio-economic relations. Marx seems to have been the first to identify this problem at the socio-economic level, arguing that the clock was the originary inspiration for industrial capitalism (1863). His argument can be exemplified by mechanistic and reductionist doctrines such as the 'division of labour' and 'economies of scale' within Taylorism. By contrast, synergy is said to exist in situations where the whole exceeds the sum of its individual parts. Following this definition it would be possible to conceive of very simple synergistic orders in which all

relations are primitive and where synergy is simply a (self)unrecognised emergent feature of their combined interactions. Such a system could also be regarded as a rudimentary organic clock.

5 Synergy and Variety

Where clock-time is used to impose a 'command-line' culture of work, the homogeneity that it encourages may limit the variety of relations. This, in turn would reduce synergy. An implication of Ashby's "Law of Requisite Variety" (1952) is that, if we wish to sustain synergy within a system, only the variety within that system should be allowed to govern any reduction to that variety. This certainly happens in living organisms where their cellular and wave-coupled coherence ensures an enormous variety of interactions between and across many levels. Pascal's idea of 'tacit knowledge' illustrates the idea quite well. According to Polanyi, (1962) all human knowledge can be considered to be tacit knowledge if it rests on our subsidiary awareness of particulars in terms of a comprehensive unity. This also demonstrates the importance of variety. In technological terms a 'synergy of awareness' is an attractive idea because it affords efficiencies that greatly exceed the sum of individual parts of the whole.

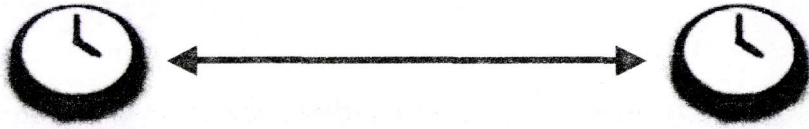
5.1 Voluntary Distributed Time

The above realisation may help us to understand clocks as facilitators of consensus, rather than as instruments of measurement. For the 'slow-food' movement, the act of cooking can be seen as a richly synergistic mode of shared-awareness. (Wood, 1998). In the 19th century, the 'Flaneurs' were strolling voyeurs who walked very slowly as protest against the mechanical pace of the industrial revolution. Perhaps our organic clocks would resemble the pet turtles used as pacesetters for their walking speed. This may remind us of the Tamagotchi toys that were fashionable a few years ago, because they functioned like the 'turtle-clocks' of the Flaneurs'. I have argued that absolute (Newtonian) temporality began to break down in the late nineteen eighties with the advent of mobile phones and other networked communication systems. PDA devices are increasingly likely to encourage users, for example, to re-schedule meetings on a continuous basis, right up to the time at which the relevant parties reach their meeting destination. (Wood, 2002). How could we develop this idea further?

5.2 The 'Lovers' Clock'

An important aspect of clocks is that they demand our attention and therefore tend to synchronise our temporality with their own. Pets have a similar quality. Indeed, some doctors recommend that people with heart problems acquire a cat or dog. However, living pets are very different from the Tamagotchi type of pets because they are therefore more attuned to the primary temporalities in nature, such as diurnal cycles and other organic rhythms. This may help us to define new requirements for the design of machines to help them to integrate and adapt to the prevailing environmental conditions. One possible design approach might be to create a more consensual relationship between active participants. The Lovers' Clock (©Wood, 1982, 1994) was

a conceptual artwork built and exhibited by the author. Functioning as a conventional (digital) clock, it was constructed in two physically separate halves linked by radio.



Assuming that the delay times for each half is reasonably similar, an ideal 'Lovers' Clock' would keep the same time delay in each half, irrespective of their location in respect to each other. Although the time displayed may differ very slightly for each half of the clock, the two halves would always be synchronous to each other.

$$\text{i.e.} \quad R = \frac{2D + M1 + M2}{U}$$

Where:	R	=	clock rate
	U	=	velocity of transmission medium
	D	=	distance between clock halves
	M1	=	delay period of clock half 'A'
	M2	=	delay period of clock half 'B'

5.3 The Building Blocks for Synergistic Clocks

The above system differs from a more organic system in that the key components in the system are mechanistic, rather than organic. By this we might, in essence, be saying that the underlying mechanism still works to a solipsistic principle. Unlike machine clocks, organic clocks may need to be organisationally integrated with their surroundings. There are ecological and biological reasons why this is desirable. One of our most important organic clocks is the pineal gland, located at the front of our brains. This organ orchestrates many other key organs in the body, and sets the basic metabolic rates that also correspond to the time of day or night. Hence it is strongly influenced by (solar) light levels. Industrialised society has learned to apply mechanical time to override our 'natural' pineal/diurnal temporality.

5.4 The Interplay Between Clocks

Shift-workers, for example, never fully adapt to the non-solar cycles of their work-patterns. Under time-and-motion management regimes this has led to vast increases in industrial throughput. Very often, however, the result for the worker is poor health and an earlier grave. On a broader scale the world faces the environmental results of over-production that threaten the biological diversity and well being of many species. In order to improve the 'Lovers' Clock' we therefore need to ensure that each of its active components are attentive to events and conditions beyond its own internal boundaries. Here, we may introduce a heuristic order in which 'play' and 'interplay' are features of

the way the clock's relations are managed. We may use the idea of 'language games' (Wittgenstein, 1921) to explain how humans habitually frame and reframe their awareness of the current situation in order to maintain continuity and to accommodate new initiatives within a given social group.

5.5 Reducing Delays in Awareness

Following Newton's principle, Pierre Laplace (1819) proposed that the anticipatory realm would become as knowable as the present or the past. Hence he reasoned that, given enough knowledge about the past we could know everything about the present and the future. At face value, Laplace's proposition would have demanded an omniscient and omnipresent apparatus of discovery. This argument is an extrapolation of Newton's claims about the linearity, and therefore the symmetrical fluency of time. However, in seeking to make the idea accessible to (his own/other) human mind/s he backwardly hallucinated it as though seen by an imagined creature living in the future. This trick reveals an additional layer of paraphernalia that was a necessary, but contradictory part of the thought experiment. In Newton's Laws of Motion, for ' $t=0$ ' to hold true in experiential terms we would require to summon 100% of conscious attention upon an infinitesimal region in space-time. This would call for a cognitive intervention at infinite speed. In fact, Galileo and Newton inferred the motional paths by resorting to a kind of post-hoc, hallucinatory observation. However, they nevertheless ignored their own relational flow, as co-creators of the events they described.

5.6 The Spectre of a Solid Time-space

On the one hand, the anticipatory aspects of (teleological) language bring the 'future' forward into the actative present as an empirical reality that is more credible than Zeno's 'frozen present'. By contrast, there are several familiar frames of reference that use the technique of freezing time within a representation of actuality (e.g. Zeno, Parmenides, and Newton). This is where it is vital to face up to what I call the 'Z' paradox, i.e. Zeno and his method of 'Zero-ing' time. If we are to believe that past, present, and future can all be said to equal '0' at the same time we would find ourselves believing (as did some pre-Socratic thinkers such as Melissus and Parmenides) that the world is solid. Here, to understand what is wrong with this argument we need to acknowledge the synergistic relationship between manifold points of co-creation. In order to do so, we would have to relinquish our attachment to single-point time and to explore more organic time-references.

5.7 Feedback and Non-Teleological Awareness

What would an organic clock be like? For one thing, it would probably need to be distributed across approximately the same region of space-time that enfolds its user/s. We may develop this approach using a different example or scenario. For example, we may consider that the balance between a traveller's desired and observed paths subsists as a higher than first order system in which the self-presence of the observer must necessarily be hallucinated reflexively as being in more than one place at the same time. Here, the balance of probabilities may change, according to whether the traveller

focuses upon the (dynamic) relative fluency of 'self-world' or, for instance, upon a (static) destination. In the cybernetics of walking in a public place, one's steering may be understood as a target-oriented negative feedback approach. Seen as a fluent system, this uses what we might call 'passing data' (after Davidson, 1986) that are constrained more by targets that are hallucinated, than they are by static descriptors. In effect, this approach could be seen as an alternative to categorical logic, in that it seems to overlay a number of interdependent phase relations. Because these are subject to chaotic and nested entanglement effects they therefore resist adequate quantification. Desires or intended outcomes are co-created by a combination of location and velocity and are therefore as mobile as the organism that co-created them.

5.8 But we Live Between Divergent Discourses

As we have said, the logic of teleology has tended to condition the habits of our highly technological culture. This is not the only influence. In fact, whereas the development of machines encouraged us to emphasise explicit rules, actions and functions, the discourse of individual consciousness is characterised more by paradox and spontaneity, therefore by adaptive, creative behaviour. Arguably, the two discourses invited different experiences and truths. Over the last few hundred years, where rational thinkers of the Enlightenment sought to classify animals as logical machines, the Romantics inquired into human subjectivity by celebrating sensation and by exploring their own imagination and intuition. Where classical scientists sought to generalise the observer as a peripheral agent of an objective data gathering process, the Romantics invested most of their interest in subjective observation and self-reflection. Human consciousness in the 21st century is a blend of these two very different approaches to self-reflexivity.

5.9 The Self can be Visualised from Inside or Outside

As we have hinted, whilst our belief systems - and therefore our actions - are conditioned by quasi-scientific understanding. We also live out a Byronesque sense of personal freedom. Human beings are complex and arational organisms. On the one hand, today's citizens are increasingly inclined to describe their behaviour and feelings in a detached way, using bits of professional jargon borrowed from medicine or biochemistry. At the same time they also celebrate their freedom to make 'free' choices and to experience things in an idiosyncratic way. On both levels, a kind of post-hoc and interpretative mode of self-observation is used to regulate personal actions at the level of instinct and bodily reflexes. Unfortunately, despite its original concerns with the epistemology of 'being' and 'becoming', Romanticism tended to produce art rather than science. However, in embracing ephemeral phenomena rather than universal realities, it failed to undermine science's faith in a repeatable and objective truth.

5.10 Towards a Non-Teleological Governance

When a human observer adjusts the controls in a simple (i.e. first-order) negative feedback system we introduce a second-order of regulation in which manual intervention overrides the automatic regulation. This collaborative process may inform the design of 'smarter' thermostat mechanisms that anticipate the slow mechanical action of switching 'on' and 'off'. When the human decision is sufficiently anticipatory,

the system's hysteresis may diminish or disappear. This approach raises the question as to whether the human being is more focused upon his/her current sense of well being (including being warm) or upon an imagined future condition that cannot (yet) be apprehended by the mechanical system. However, even in this description, our system already contains traces of a phenomenological entanglement with the human mind. (Wood, 2000:2) This cannot be isolated from the whole system that must, therefore include the human imagination. Because it is an open system, any theory by observer/s will increase the probability of intervention. However low this may be, it is an integral factor in the whole system. This is why a 'watched kettle' takes longer to boil. When we include a mechanical clock into the system, it is only the 'ignorance of detachment' that persuades us otherwise.

5.11 The Ethics of Uncanny Collision

Consider the case of a second traveller who walks beside the first one. By using peripheral awareness of her companion to inform her own path, the first walker may help to avoid collision between the two. In this example, the system may seem similar to the case of thermostatic control, however it invokes a higher order of cybernetic regulation within a less temporal mode of homeostasis. Indeed, in enriching the organic relationships between the walkers we may find that the system's aggregate 'purpose' can be re-framed as being autopoietic, rather than teleological. Indeed, the situation can become extraordinarily complex when we attempt to map everything that contributes, on each level, to the real-time situation. For example, 'courteous' walkers must always be able to visualise both their own, and their companion's walking trajectories within the same conceptual space. Indeed, this mapping would also need to include a spatio-temporal 'shadow' of probable intended paths.

5.12 A Holonomic Cybernetics of Flow

In the Aristotelian (ethical) logic of categories the question of a moving body's location is more relevant than its (organic) quality of flow. This is a dubious idea if we consider a collision between bodies that can detect one another. Where a travelling organism is able to choose where to go whilst en route it can identify exterior conditions either (to polarise) by conscious focus on one (or a set of) points, or by a peripheral acknowledgement of phase-differences in the surrounding area. This could be viewed, for example, as a set of parallax values that are changing in relation to each other, and in relation to the travelling observer. This calls for second, third, or higher orders of cybernetic self-regulation. In human experience, we may find it easier to comprehend as a simultaneous set of dynamic and abductive inferences that are hallucinated in a reflexive 'self-other' way. In other words, we may consider them as nested 'movies' that summarise contingent, provisional, and retrospective scenarios in (experiential) real-time.

6 Conclusion

The richness of co-dependent interconnections implied by the standard definitions of 'synergy' make it difficult to define in a satisfactory mathematical form. If we are to define 'synergy' in terms of an organism's 'awareness' this may exacerbate the problem. Indeed, it is likely that such a range of possible configurations would be more helpfully researched using empirical methods. Some models may therefore be found in biological or ecological systems. A workable system would integrate several methods described previously in this paper, as :

- 1) 'Lovers' Clock' (one reciprocally regulated clock in two places)
- 2) 'Voluntary Distributed Time' (network of temporal conditions)
- 3) 'Zones of Heightened Temporal Awareness' (discourse-centred monitors that reflect meaningful interactions rather than individual participants)

It would be possible to conceive of a wireless ICT system using portable devices that would link together across a network of optimum size. Each device would act as a portable 'awareness clock' that registers local and global interactions as temporal events. Whilst some interactions would be designed to facilitate better awareness of ecological events (i.e. externally), others might connect users with their own project teams and/or tasks (i.e. internally). It would be designed to encourage a positive and high quality of relations amongst its users, rather than a fast pace of actions. As such, it would encourage the emergence of creative and synergistic awareness across the whole.

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