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“...not only do we measure change by time, but time by change, because they are defined by one another.”

(time is) “a number of change in respect of the before and after”

– Aristotle, Physics, Book IV

“Aristotle’s essay on time is the first detailed Interpretation of this phenomenon [time] which has come down to us. Every subsequent account of time, including Henri Bergson’s, has been essentially determined by it.”

– Martin Heidegger, Being in Time (1927)

“Without a doubt, Aristotle thinks of time on the basis of ousia as parousia, on the basis of the now, the point, etc. And yet an entire reading could be organized that would repeat in Aristotle’s text both this limitation and its opposite.” – Jacques Derrida

De Re: Aristotle could not discuss time as a thing onto itself (*de re*); he could only discuss it in relation to the common experience of observation of change. Similarly, Aristotle could not have described gravity as a thing onto itself, being limited to the observation that everything falls to the ground. We have reached or nearly reached the point where we can discuss gravity as a thing (e.g., gravitational waves), but time is still observed as “a number of change with respect of the before and after.” Gravity, and our perception of it, is still a slave to time. Time-travel fiction, however, implies without explicitly stating usually, that we must be able to discuss time *de re*.

- ✓ “Ironically, as a student, Jacques Derrida submitted a paper on the topic of ‘time’ to his director of studies, Louis Althusser, who passed the essay to his colleague, Michel Foucault, saying, ‘I can’t grade this.’ Foucault’s response was, ‘Well, it’s either an F or an A+’” – Willy Maley, Prof. of Renaissance Studies, University of Glasgow, contributor to, “The worst piece of peer review I’ve ever received,” Times Higher Education, August 6, 2015.
- Metaphysics of Presence: Heidegger and Derrida collectively held that Western philosophy privileges presence, what is, what appears (i.e. phenomenology), over examination of the condition that made the presence possible or impossible:
 - ✓ “Derrida’s enduring references to the metaphysics of presence borrows heavily from the work of Heidegger. Heidegger insists that Western philosophy has consistently privileged that which is, or that which appears, and has forgotten to pay any attention to the condition for that appearance. In other words, presence itself is privileged, rather than that which allows presence to be possible at all – and also impossible, for Derrida. All of these terms of denigration, however, are united under the broad rubric of the term ‘metaphysics.’” – Jack Reynolds (La Trobe University), “Jacques Derrida (1930 – 2004),” The Internet Encyclopedia.

- See full feature quote, bottom of 2 Constructural Elements, p. 200, *infra*.

This examination begins with the fact that our entire concept of time is the now, our language is naturally built on the now. This moment, this thing, this point in time. Because we are mortal, and time flows in one direction. Without special indicators in the sentence structure or without knowledge of the situation, the listener assumes we are talking about the present, present events, instead of something that happened or may happen. Our language *does not* begin with the past or future as the natural tense, and then needs to add modifiers to indicate we are speaking of the present.

- ✓ Verb tenses in English are past, present, future. Happen, happened, happening, will happen, may happen, may have happened.
- ✓ Heidegger and Derrida were not trying to change our language or time sense, and neither is GGDM. We are all mortal and short-lived. They were simply making the point that the privilege given to presence is overwhelming and intellectually crippling. They were pointing to a blind spot in our Public Space.

“Unfortunately, the clock is ticking, the hours are going by. The past increases, the future recedes. Possibilities decreasing, regrets mounting.”

– Haruki Murakami, Dance Dance Dance (1988)

Clock Speed: Most of humanity has undoubtedly assumed that time moves at the same speed for everyone (except for the gods, if we had a reason to think of it in this way). What modern science has added is the possibility that time passes at different rates relative to different observers. But, while special relativity is taught and accepted as nearly unquestionable fact by the current generations, the fact remains that no one has actually tried the famed relativistic experiment of the twins because we cannot.

- ✓ The NASA Twins Study in 2018 (identical twins Scott and Mark Kelly) measured biological changes from a year in space vs. staying on Earth. It was not a relativistic experiment with twins.
- ✓ In 1963, during troubled Mercury-Atlas 9 flight, it was detected that astronaut Gordon Cooper’s watch slowed by 1/20,000th of a second during a day in orbit. Life Magazine, May 24, 1963 trumpeted that he landed 22/1,000,000th of a second younger than if he had stayed on Earth for the day he was in orbit (Albert Rosenfeld, “A 3,000,000-year Trip in Only 55 Years,” pp. 28-34). Most of the article wasn’t about Cooper’s flight, he was just the lead hook; most of it was about explaining space-time theory (with pictures of Albert Einstein, Rudolf Mössbauer, and a young Carl Sagan). Curiously, the internet seems to have forgotten the Cooper flight’s confirmation of relativistic effects; a search on Google for “Gordon Cooper relativity” turns up no relevant hits (October 15, 2019), which shows the limit of the internet as a human knowledge base. None of the articles and secondary sources about him mentions it either (e.g., Wikipedia). I just happen to have a collector’s copy of the Life Magazine issue featuring Gordon Cooper on the cover that a friend bought for me.

Much of cutting edge science remains without direct empirical basis and is arguably closer to philosophy. Many will object to this characterization and dismiss me to the kid’s table.

Our concept of time has not changed. This is the origin of the analog clock, on which time is measured by the steady movement of hands across the numbers and marks on the face (i.e. change in distance). Any sentient being can perceive change, therefore any sentient being can perceive time. How they perceive time is often asked about cats and dogs.

Sentience Quotient (SQ) seems to be really a measure of the rate at which a creature experiences the passage of time (change); and if so, then the hypothetical SQ+50 creature must live in near relativistic time dilation. You can imagine this like the old computer commercial with the glass falling in slow motion off a table; the computer can do millions of calculations before the glass hits the floor. For a computer, a minute is an eternity.

- **There is a Season:** The problem with this entire poorly designed universe is that everything takes time. *Non sequitur:* GGDM is a turn-based strategy game that is designed to run continuously. Each position submits Actions which are regularly batch processed in the order they were received, as long as the Actions were submitted in the time period allocated to each position for submitting their Actions. The Actions must, of course, be submitted by a representative of the position (i.e. a known team member).
 - ✓ “[Professor Dame Linda] Partridge admits there’s definitely a limit to how long humans can live. ‘It’s not biologically feasible to live to 3,000 years. There’s constraints on how fast we run, speeds at which we can see. So without any further interventions, bodies can only last a certain amount of time,’ she says.” – Bianca Britton, “Humans Have Reached Their Lifespan Limit, Researchers Say,” The CNN Wire, October 6, 2016.
 - “Old ladies die all the time. It’s practically their job description.” – Dr. Who, “Mummy on the Orient Express” (2014).

“The local situation quickly escalated before commanders on either side, still several weeks away from the front, could control the situation.... Because of the distance to the Capital, Emperor Strephon could do little else than simply accept the Armistice. Through clever public relations, Strephon was able to turn the affair to his advantage, creating the image of himself as an effective war leader. The years following the war marked a transition of Strephon’s rule, from quiet management to a more proactive leadership role.”

– Traveller RPG Wiki, “Fourth Frontier War,” captured July 27, 2018

Communications Breakdown: There are two underlying assumptions that must be understood with regard to issuing orders to far-flung fleets and colony worlds separated by interstellar distances, lightyears from each other or from command and control centers. The first underlying assumption must be that each fleet and world contains command elements (officers and staff) who have the intelligence, initiative and authority to operate independently within a commonly understood framework of missions, ideals, and operating procedures, when out of communication range of headquarters. Even in the modern age of instant communications, it is not necessary for military or corporate leaders to issue orders to each individual in the organization; organizations have a certain inbuilt intelligence, local initiative and momentum of purpose.¹

- ✓ See also Transatlantic Cable, 1 Movement, p. 837 and EN 2, p. 843, *infra*.

- FTL Communications: The second underlying assumption is that, if ships can travel faster than light, why wouldn't an interstellar society be able to communicate at faster than light as well? This may seem to be a specious leap of logic, except that modern physics already has determined that information apparently does travel faster than light.
 - ✓ For example, the famous polarized screen experiment with two photons traveling in opposite directions at the speed of light from a single light source; one photon seems to 'know' what happens to the other, but any information exchange between them would have to occur at least faster than light. This is called quantum entanglement.

Whether justified by current science or not,² instantaneous interstellar communications is a common assumption of modern television and movie science-fiction.

- ✓ For example, in 2017 the first successful 'hack proof' communications were sent from a quantum ~~*~~ to the Earth using the concept of quantum entanglement. Scientist and serious intellectuals of past decades have always assumed that technologically advanced alien civilizations would not communicate using radio waves; quantum communications gives us the first peek at how they may actually communicate.³ That doesn't mean that there might not be mysterious radio waves out there from early technological civilizations; for example, the fifteen high frequency radio repeater bursts from a galaxy 3 billion lightyears away in 2017 may, but probably don't, represent an early technological civilization – that existed three billion years ago.

Game Actions represent some combination of orders from higher up, and individual initiative and actions 'on the ground' within the framework of mission, operational procedures, training, intelligence, and command hierarchy; i.e. a Scout Ship fired at by alien warships does not need to be ordered to retreat by HQ although the position must inform the Concierge of the intent to retreat. If players like, the game could be tailored to assume no FTL communications, relying entirely upon the initiatives of the people present, but when the game is based on either or both assumptions being true, it would not make that much difference.⁴

- Really?: There seems to be some dispute and some doubt in the professional science world about whether quantum entanglement means that FTL communication is possible. The consensus seems to reject the idea. But for game purposes, we must assume that the problem may have been solved already by a civilization capable of faster than light travel.
 - ✓ "One suggested FTL communicator is outrageously simple. It consists of a perfectly rigid rod, as many light years long as required. Since the rod is rigid, its whole length will move when we push the near end. ...

Another suggestion: take two of these lightyears long rods, hanging side by side in space. Near Earth, the rods touch; they are at a very small angle to each other so that their far ends are centimeters apart. If one rod is moved sideways it will slide over the other until, after a short time, the Earth ends of the rods are a few centimeters apart while the far ends are touching. In that short time, without any mass or energy being sent faster than light, *something* has traveled light years along the rods: the point at which they touch has moved all the way from the Earth to the far end. Could this be used to transmit information? In fact, the answer is 'no.'...

The flaw is that the entire length of the sideways-moving rod must already be moving before the rods' point of contact can travel faster than light; those at the far end would

already know the ‘signal’ was coming and receive absolutely no more information from it. Physicist call this a ‘non-meaningful superlight signal.’ We can aim a laser at the Moon and swivel it so that the bright spot moves across the Moon’s surface with FTL speed – but the spot carries no information from one part of the moon to another.” – Peter Nichols, The Science in Science Fiction (1982), p. 74.

[Interview in French translated by English subtitles]

“Villeneuve’s campaign started well. He linked up with the Spanish at Cadiz and reached Fort du France. Nelson was completely fooled. He wasted precious time in the Mediterranean and passed Gibraltar a month behind Villeneuve. But the rest of the plan didn’t run so smoothly. Missiessy was not contacted in time and he returned to Europe. Ganteaume was blockaded in port and could not emerge without a battle. So the plan had to be modified. Napoleon, in Italy, issued new orders. ...

But how could Napoleon’s orders reach Villeneuve? Remember, Napoleon wasn’t in Paris. He was constantly moving between Lyon and Milan. His orders first had to reach Paris – that took ten days – and then get to a port, in this case Rochefort. Then went out on several frigates, in case one was captured because the French navy weren’t masters of the sea. So two or three ships were sent to contact Villeneuve’s fleet somewhere in the Caribbean, they had no idea where. They had to find them first. There were so many variables. Communications were unreliable and very slow.”

– Contre-amiral Rémi Monaque, *Trafalgar: The Greatest Battle in Naval History* (documentary, 2007) ⁵

Creaky Communications: The creaky, feudalistic Third Imperium setting for the Traveller RPG is an example of a large, complex interstellar civilization that does not possess direct or instantaneous FTL communications. News, orders and information from the Capital required two months to reach the frontiers; communication travelled outward at the fastest available FTL jump ship speed (about 15 to 18 lightyears per week, jumping only from starport to starport). Supplies, trade and reinforcements took even longer. As a result, important decisions were made locally by military commanders, bureaucrats, and nobility. Most building, education and recruiting was also localized. This was an important element in the Imperium Civil War.⁶

- ✓ Conversely, the BattleTech universe featured a form of near instantaneous FTL communication to a range of 50 lightyears, which was monopolized by the semi-mystical ComStar Corporation. ComStar, with its own military assets and a proto-religion to augment the monopoly on FTL communications, was able to exert some control over the Great Houses. When the system collapsed after 500 years, the Houses resorted to messenger ships *à la* Traveller RPG.
- ✓ In the Stargate Universe series (2009-2011) the characters used Ancient “communications stones,” which allow communication over any distance by taking over another person’s body at the target location. *Yeah, you read that right.* Characters on the Destiny often swapped bodies both ways with personnel at SGC, it was a bit confusing at times during the series because sometimes they showed the actual person who was there, and sometimes they showed the body of the person who was there (*got that?*). Of course it created drama opportunities, and comedy moments, and the writers love that stuff to fill screen time.

And of course they glossed over the massive implications – personal, metaphysical, social – and legal. The program showed the ‘visitors’ to SGC being driven around in government vehicles while occupying someone else’s body, to visit family, etc. (‘hi honey, it’s me, ignore what you see’). Can you see where this is going? Imagine the lawsuit and witness testimony if something happened to the body while occupied by another’s consciousness – a car accident, a shooting, a rape, or if crimes were committed by the occupier of someone else’s body. I chuckle imagining reading that complaint, what legal theories would apply? The fact section – if declassified – would be head spinning hilarity like the complaint in *United States ex rel. Gerald Mayo v. Satan and His Staff*, 54 F.R.D. 282 (W.D. Pa. 1971) (no kidding, *Google it*).

- The blasé treatment of the Ancients communications stoness technology in SGU is emblematic of the major problem with the entire Stargate franchise (as well as much of television science-fiction): It is the attitude that if the ancient technologically advanced races figured it out, it’s safe, easy and totally ok for humans to use without regard to any possible dangers.⁷ Only once in the entire franchise do I recall a point being made about the dangers of assuming alien technologies; that was the episode where the U.S. Air Force was trying to fly Goa’uld Death Gliders (fighters) they had captured. Alien technology in GGDM should never receive blasé treatment, it should be edgy, dangerous, unknown with potential.

“According to the [Continuity Hypothesis], babbling is a direct forerunner to language. At first, infants produce universal sounds that exist in all areas of the world and in all languages. Reduplicated canonical babbling produces a number of sounds but only some of them (‘ma ma’ and ‘da da,’ turning into ‘mommy’ and ‘daddy,’ respectively) are recognized as meaningful and thus reinforced by caregivers and parents, while the others are abandoned as meaningless.... This hypothesis agrees with the claim that the anatomical changes of the vocal tract are very important, but suggests that the social environment in which an infant is raised has a greater influence on the development of language. Infants pay close attention to their caregivers’ reactions and use their feedback as approval for the sounds that they are making. This reinforcement through feedback helps infants to focus their attention on specific features of sound. Social feedback facilitates faster learning and earlier production of a variety of advanced words.

There is evidence that babbling varies depending on the linguistic environment in which a baby is raised. Current babbling research supports The Continuity Hypothesis. For example, it has been noted that infants raised in French-speaking environments display greater amounts of rising intonation in comparison to infants raised in English-speaking environments. This is likely due to the differences between French and English intonations while speaking. The ordering of consonants and vowels in the babbling of English, French, Swedish and Japanese infants also appears to resemble that of their native language. These findings support another hypothesis, the ‘babbling drift hypothesis’ in which infant babbling resembles the phonetic characteristics of a child’s native language through exposure to speech.... The babbling drift hypothesis provides further support for The Continuity Hypothesis.”

– from Wikipedia article, “Babbling,” captured November 2, 2019

Drifting in Babble: How infants learn to speak borders on the sublime. Language is a habitual repetition; this is why political correctness is objectionable to some – it interferes with habitual use of words and concepts.

From my recollection of a lecture on language learning (apparently on the ‘language drift hypothesis,’ *ut supra*), various recordings were made of babies from across the world, across many different language groups, at an age before they begin learning language. A baby will make every sound used in every language before they are six months old. You cannot tell a Chinese baby from a French baby from the sounds they make at less than a few months old.

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The International Phonetic Alphabet (IPA) represents every sound used in every spoken language in the world today. Using the IPA one could transcribe into symbols any conversation without needing to understand the language.⁸ They would simply record what they hear, meaning and content are not necessary. Every language uses a range of possible sounds, but not all; every language has a natural repetition of sounds that is pleasing to the native speakers of that language.

After about six months old, babies begin repeating the sounds they hear from adults speaking around them. As time goes on, repetition of the sounds they hear spoken becomes stronger, regular, and they begin less and less to make the sounds not used in their native language. Thus our brains are conditioned from infancy to certain language sounds and patterns, onto which are added concepts, ideals, meanings, and abstractions through our childhood into adulthood.

This is why learning a foreign language is difficult, especially one that is in a different language group and/or uses a non-Romantic alphabet. The origin of the Romani was traced both genetically and linguistically to a certain tribal group near northern India who migrated about 500 A.D. This also has a profound effect on children in multilingual families or environments, such as the border regions in Europe, where they grow up speaking several languages – I also recall a headline somewhere that multilingual speakers were found less susceptible to dementia in old age, but I don’t know on what studies or data that was based.

- ✓ Folk etymology might suggest that ‘babble’ comes from ‘Babel’ and looking at the definitions in Merriam-Webster, one could see some similarity in meaning. But according to Merriam-Webster online dictionary, ‘babble’ was in use a century before ‘Babel’ entered the English language (the 13th and 14th centuries, respectively) and thus ‘babble’ could not have come from ‘Babel’ by simple math. And Babel is, of course, connected to the Biblical origin myth of ‘folly.’ Merriam-Webster offers no connection between them, instead stating that ‘babble’ is probably imitative; the Wikipedia article has a 15-second video of a baby in a crib repeatedly uttering ‘ba-ba.’

“The examiner nodded. ‘When you see much of this, you have a tendency to speculate. Now, we regularly add to our stock of fighting men and ships, and our ability to control the effects of time enables us to operate, from the observers’ viewpoint, either very slowly, or very fast. How is not in my department, and this knowledge is not handed out to satisfy curiosity. But – it’s natural to speculate. The only way we know to slow time, from the observer’s viewpoint, is to accelerate, and increase velocity to near the speed of light. A great ancient named Einstein said there is no way, without outside references, to distinguish the force of gravity from acceleration. So, I think some wizardry with gravitors is behind this.’

He looked thoughtfully at Lance Phillips. ‘The main thing is, you see what you have to know to be one of our apprentice strategists. We accumulate strength slowly, take the toughest, most generally uncivilizable of each generation, provided they have certain redeeming qualities. These are our fighting men. We take a few standard types of ships, improve them as time goes on, and when we are attacked, we accelerate our response, to strike with such speed that the enemy cannot react. We obliterate him. He, mortified, blames the defeat on something else. His fleet was caught in a nova, the gravitors got in resonating synchrony, something happened, but it didn’t have anything to do with us. Nevertheless, he leaves us alone.’

‘After we get out – then what happens?’

‘It depends on circumstances. However, fighting men are in demand. If, say, a properly keyed signal cut power to the engines, and after some days of drifting, the warrior were offered the opportunity to enlist in some outfit that meets our standards...’

– From “The Claw and the Clock,” by Christopher Anvil (1971)

Endnotes.

¹ **Commentary:** Communications delay to the Mars rover is 4 to 24 minutes; it self-drives across the Martian terrain.

² **Commentary:** See Quantum Computing, for example. In September 2017, articles appeared discussing a quantum computing toolkit (a proto-programming language for as yet non-existent quantum computers) built from MS VS; one article included code samples. Engineers have worked the last few years on harnessing quantum teleportation for use in computers and communications. But we still don’t know the data transfer speed of quantum entanglement; any such computers would be slowed by our electronics.

³ **Commentary:** Note that the movie Magellan, also released in 2017 specifically depended on the idea that quantum entanglement could be used to communicate instantly and simultaneously across galactic distances and the obviously very old and advanced intelligences were communicating in DNA sequences.

⁴ **Commentary:** The Concierge should consider that communications may not allow far-flung colonies to be aware of the current situation at any moment. I watched a sci-fi series episode where the remaining handful of humans were imprisoned in a work camp with high walls guarded by alien robots. As the story began, there had not been an alien supply ship for over two centuries and the alien android guards were failing due to lack of replacement... The aliens had never begun exploiting or colonizing the planet after conquest, but had moved on, leaving the Earth with centuries to recover to be inherited by the human prisoners when they finally broke out.

⁵ **Citation & Commentary:** This beautiful French-produced English language (except where French speakers are interviewed) CGI/live-action documentary provides an alternative and refreshing French point-of-view on the Trafalgar campaign through the letters of Admiral Pierre-Charles Villeneuve, the commander of the Franco-Spanish fleet at Trafalgar. Notable threads in the documentary include Napoleon’s dislike of naval officers, the lack of local initiative by the French naval commanders, and confusion of orders and counter-orders and poor logistics. Conversely, Admiral Nelson disobeyed the orders of the Lords Admiralty to chase down Villeneuve after being initially fooled and displayed great tactical independence in battle.

⁶ **Commentary:** Star-spanning civilizations without FTL communications may suffer an interstellar version of the *Two Generals Problem and/or a Byzantine Fault*. Participants and the Concierge should understand what these are.

⁷ **Commentary:** The relationship that developed between the Ancients and the Humans of Earth in the Stargate universe was a parental or mentoring one. The Ancients passed their technology to humanity when they were facing extinction and could not ascend – the changes they made to themselves to achieve near immortality in this universe meant that they could not ascend. Still, we have all heard stories of pre-teen children trying to drive cars or, worse, playing with guns, paint cans, or other dangerous adult-world items. Imagine your dog trying to use the electric can opener to get his food? This especially is an apt analogy when minor races are involved.

⁸ **Commentary:** When I was first introduced to the IPA, I immediately noted the similarities to the Speed Writing shorthand system I had learned in junior business college.