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Oblivious Simultaneity

Events have always been happening at the same time. Billions of things are happening this very second around the globe, in my immediate vicinity, and even within my own body, all without my knowing anything about them. If it is overwhelming to think that about six thousand people die and fifteen thousand more are born every hour, abandon all hope of trying to track the mitosis of cells or the work of chlorophyll! Counting would fail if we tried to quantify all the things that happen without notice, especially once we dive into microscales! (Surely the number of unnoticed things vastly outstrips the number of things known or observed.) Oblivious simultaneity, as we might call it, seems simply part of the order of things. Our bits of awareness are rare and scattered lights on a dark landscape of unknowing. So the poets and philosophers have long told us. Everything flows, said Heraclitus; "Mudam-se os tempos," wrote Camões; "Nobody knows nothing anymore," sings Billy Bragg.

Conscious or controlling simultaneity, however, is quite a different animal. To know, narrate, or act upon another event occurring at the same time but in a different space requires a logistical link of some kind in matter or mind, in transportation or communication.

This essay explores human-based simultaneous action at a distance. It compiles a comparative history of meanwhile structures, which I define as techniques of shuttling between two points in space at the same time that are too far apart for the unaided human senses. From a patchwork of examples, several of them from that library of ancient literature gathered in the Bible, I hope a central point becomes clear: that banking time is a way to span space.

Anderson: Meanwhile Structures in Modernity—and Antiquity?

Benedict Anderson, in his highly influential *Imagined Communities: Reflections on the Origin and Spread of Nationalism* (1983), speculates that "every essential modern conception is based on a conception of 'meanwhile'" (24). He locates this particularly in the modern media ("forms of imagining") of the novel and the newspaper, and in his second edition of the book (1991), in the census, map, and museum as well. The novel "is a device for the presentation of simultaneity in 'homogeneous and empty time,' or a complex gloss upon the word 'meanwhile'" (25). A novel can jump horizontally between scenes—same time, different space—and tell of characters whose lives run in parallel and could cross unwittingly in the street without being aware of their remote links. "In *Imagined Communities,*" he later wrote, "I argued that the historical appearance of the novel-as-popular-commodity and the rise of nation-ness were intimately related. Both nation and novel were spawned by the simultaneity made possible by clock-derived, man-made 'homogeneous empty time,' and thereafter, of Society understood as a bounded intrahistorical entity" (Anderson 1998, 334). (By *intrahistorical*, Anderson means secular or common time, not eternity; see Culler 1999.)

Anderson spins the story elegantly: once upon a time, history and cosmology were inseparable, and time present contained time past and time future. Now we live in a dull and disenchanted

world, where the clock ticks away relentlessly and time flows in a straight line. (Hence the rise of nationalism as an answer to the question of meaning for men and women stripped of ancient religious frameworks.) This tale of a massive shift from sacred to secular, vertical to horizontal, recursive to linear time might be the founding story of modernity. "Our own conception of simultaneity," he states, "has been a long time in the making, and its emergence is certainly connected, in ways that have yet to be well studied, with the development of the secular sciences" (24). Antique narratives were not capable of cross-cutting, as the film-editing technique is called that takes you instantly from one scene to another—near or far—in a parallel time. Petronius's *Satyricon,* the scurrilous Roman novel, in some ways is a forerunner of the modern novel, but "its narrative proceeds single file" (25). There is no "in the meantime" movement from one scene to another.

Anderson places the big shift in the eighteenth century. Evidently borrowing from Marshall McLuhan, Anderson treats the essence of the newspaper as "calendrical coincidence" (33).[1] What all the news stories in a daily edition had in common was that they occurred yesterday. (The more recent 24/7 news cycle changes this circadian rhythm.) Readers of newspapers partake of "the diurnal regularities of the imagining life" (35n63): in both narrative structure (many events, one text) and audience behavior (many readers, one time) newspapers follow a logic of composite juxtaposition. In the middle ages, artists could portray local patrons at the birth of Jesus in Bethlehem without worrying about anachronism; now was then and here was there. Under the regime of modern clock time, in contrast, modern novelists and journalists learned to array events as parallel in space rather than time. At least so goes the argument.

Was Anderson right? Could events happening over great distances be coordinated when messages traveled no faster than foot, horse, pigeon, or ship? Were there no robust meanwhile structures before the eighteenth century? Did the apparently instantaneous transmissions of the telegraph enable new modes?

Biblical Fathers and Sons: Characters Transport Narrative Focus

Let's test Anderson's thesis with two of the Bible's most memorable narratives, both of which concern fathers and brothers separated in different places with very different fates. Neither story has any simultaneous back-and-forth between parallel developments until the brothers actually come back into the same place, bringing their time streams with them. In the book of Genesis, Joseph is sold into Egypt by his jealous brothers, who assume that he vanishes into servile anonymity. When a terrible famine later drives them into Egypt in search of food, they meet an imposing Pharaonic figure whom they don't realize is Joseph, who has—in the meanwhile—risen to the heights of the Egyptian world. The narration follows the physical movement of the brothers; it has no wings to jump from Egypt to Palestine. Likewise in the parable of the father and two sons told in the book of Luke, the younger, "prodigal" son demands his inheritance, moves to a far country, and squanders his wad in what the King James Version memorably calls "riotous living." When he returns in frustrated impoverishment, his father welcomes him home royally, much to the umbrage of the older, faithful brother. We never hear of the two brothers at the same time in different places; the two narrative streams only come together when the brothers do. What is interesting here is not the parallel development of separate stories. That has always happened. What is interesting is the lack of narrative means for saying "meanwhile, back at the ranch." The narrative proceeds, as Anderson says, single file; it does not outpace the physical limits of the characters' movements. There is no magic carpet that carries the reader telegraphically to different places. The moment of recognition is only possible with physical presence.

Prophetic Vision: Live Feed or Memory?

Yet in both the Bible and in Homer, there is such a magic carpet device—but apparently only for the gifted and for gods. The book

of Ezekiel gives us the first. The first verse sets up the drama: the heavens open up to a visionary man located in unusually specific circumstances: by the Kebar river, in Babylon (Iraq), among a group of captives, on the fifth day of the fourth month of the thirtieth year. The Jews are in Babylonian captivity, far away from home. But Ezekiel, with its colorful and weird imagery as well extreme behavior by the narrator, is a psychedelic, literally trippy book, especially with the narrator's frequent flights between Babylon and Jerusalem. The spirit moves him, levitating or teleporting him through the air, where he witnesses people and buildings, especially the temple in Jerusalem, from his location in Iraq. It is not clear whether he is supposed to be accessing events archived in memory or viewing a live feed. When Ezekiel sees, for example, a prince of the people named Pelatiah die in Jerusalem (Ez. 11:13), is this supernaturally privileged access to news he could not have received so quickly in Babylon by normal means or a recounting of an already known event? No one could know without a system of verification that at that time would have to travel on land.

The Homeric Meanwhile?

In Homer, the gods of course are not bound to the sluggish speeds of earth travel. Athena can zoom from the Phaeacians to Olympus and back where she appears to the shipwrecked Odysseus in veiled form (*Odyssey,* book 6); she serves as the puppet master of the several plots in the *Odyssey,* tracking down Telemachus, the long-missed son of Odysseus, in Sparta, for instance, at the opening of book 15 before she jets back to Olympus. Telemachus then approaches Ithaca in his ship while Odysseus feasts and tells identity-cloaking war stories with his friend Eumaeus the swineherd. At line 301 the narrative wings from Telemachus steering his way through the rocky islands around the island to the hut where Odysseus, Eumaeus, and others are hanging out. The transition is marked by a well-known Homeric formula that means something like "but then, on the other hand," but doesn't commit us to understanding it as a "meanwhile," though it is sometimes translated that way.[2]

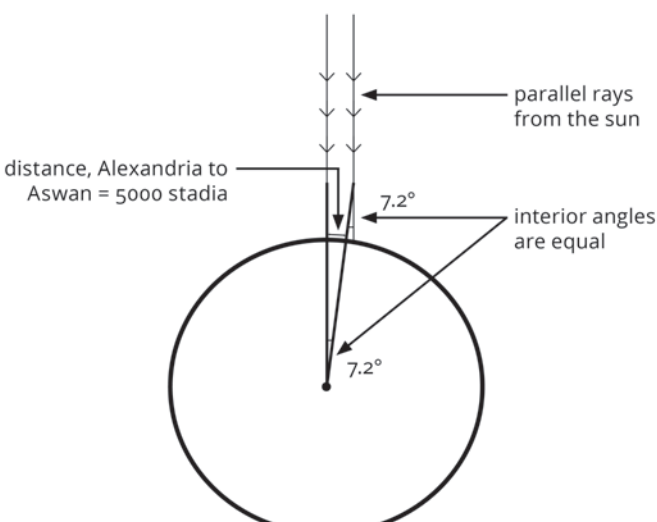
There is no single point of view on the island that I know of where a physical viewer could have stood to take in both the hut and the ship synoptically. In a similar way, book 16 of the *Odyssey* shifts focus between the palace, the hut, and the ship on the shore. The narrative slices through space with the same speed that Athena flies.

As these examples suggest, narrative structure with regard to space and time in Homer is highly varied and complex. There is a more than century-old debate in Homer studies about Zielinski's law, which decrees that simultaneous events in Homer are always narrated as sequential. Early on, the debate was inspired by the Anderson-like and perhaps condescending thought that ancient authors could not imagine simultaneous events, but the obvious point that Homer is a poet of enormous narrative prowess who handles time and space in a variety of ways, not always consistent, has been made by many scholars since. (For an excellent overview see Scodel 2008). But for us the relevant point is that brilliant scholars have not been able to settle the question for good whether there are meanwhile structures in Homer. That the question is open is itself a sign that his narrative world was different than that of the modern newspaper or novel, where there could be no such question. Anderson both offers too stark a historical narrative of before-and-after *and* sees something important about modern narrative organization.

Eratosthenes: A Priori Synchronization

Eratosthenes, the third-century BCE Greek mathematician, astronomer, and chief librarian of Alexandria, was the first that we know of to arrive at an accurate estimate of the earth's size. He did so via a thought-experiment that put two distant places into one time. There are learned debates about his methods—did he take shadows from wells, towers, or sundials? What are the modern equivalents of his measurements? Did he round his calculations for arithmetic convenience? But here is one account of what he

did: He knew that on the summer solstice that the sundial in Alexandria, in northern Egypt, showed a shadow of 7.2 degrees. He also knew that at Aswan, 5000 stadia to the south on the same meridian, there was no shadow at noon on the same date: the sunlight went straight down to the bottom of a well. He assumed a round earth, and perfectly parallel rays of sunlight. He didn't need a telegraph relay from Aswan to tell him that the sun was casting no shadow at noon; he knew that already and took it as given. The regularity of planetary rotation obviated the need for fresh data. Astronomical constants do not require empirical confirmation and remain invariant compared to noisier and more mutable kinds of data, such as weather data. Using basic *geometry*—quite literally, the science of earth measurement—he inferred that the angle of the shadow at Alexandria would be the same as the angle from the center of the earth to the two cities (see Figure 1). This angle was 7.2 degrees, or one fiftieth of a circle (7.2/360 = 1/50), so Eratosthenes figured that the distance from Aswan to Alexandria, known to



[Figure 2.1]. Inspired by Ryan (2016: 372).

be 5000 stades, was one fiftieth of the circumference of the earth. 5000 x 50 = 250,000 stades. If, as one historian concludes, a stade was about 157.7 meters, then Eratosthenes's estimate was 39,425 kilometers, which is remarkably close to the earth's equatorial circumference of 40,075 km (Engels 1985). (The earth, like many of us, bulges at the middle, and its meridional or north–south circumference is 40,008 km.)

The Hare and the Hedgehog

Eratosthenes engaged in what we can call space-axis manipulation, a term I owe to Paul Frosh. This is an odd and interesting kind of action at a distance. In such a priori synchronization, a single person combines two observations in the nonlinear time of memory to fly across one fiftieth of the earth's surface. But let us be more precise. Eratosthenes did not have to fly across the two spaces. He was already in both, or at least had instantaneous knowledge of conditions of both spots at once. He operated in the symbolic realm free of the grind of real time. His memory was a random-access database. This is timeless simultaneity, as explicated by Hartmut Winkler in a brilliant essay (Winkler 2009 and 2015, 233–54). Building on the Grimm Brothers tale of a race between a hare and a hedgehog in which the hedgehog, obviously a much slower runner, always wins, Winkler contrasts two modes of operating in space and time. The hare always uses up time in running the race, however little. The hedgehog, however, requires no time to traverse point A and point B because he—or she—is already there. That is, the hedgehog cheats by stationing at the endpoint of the track his wife, whom the hare mistakes for the original hedgehog. Whichever direction the hare runs, he finds the hedgehog already there, victorious. The hare can never win against an opponent who spans space instantaneously. The hare must always pay a toll to time. Because the hedgehog has taken advantage of earlier time to pre-distribute over space, travel is free. Or rather, no travel is necessary. In memory, like any archival system that gathers many moments into an instantaneous array, the past and the present are

contemporaneous. (This is the mode of apprehending time that Anderson thought uniquely medieval or sacred; it is in fact one of the fundamental modes of—nonlinear—temporal organization.) The hare mode is typical of media operations that transmit, such as telegraphy and telephony; the hedgehog mode is typical of media operations that spread all at once in advance, such as publishing. (We ignore the many further subtleties here.) Most narratives inch along in hare mode. A play like *Hamlet* jumps between different characters and scenes, but the implication is that we are in a weird kind of diachrony. Eratosthenes, rather than rapid movement, had a real simultaneity. So, with help of earth, sun, and memory, meanwhile structures were possible, at least rarely, in the ancient world.

The New Moon: Synchronization Plus Buffering

Contingent and variable data cannot be handled hedgehog style. Such data perish in time, and so transit speed affects their value. The moon's phases are an example. The ancient Jewish calendar pivoted on the new moon, which marked the beginning of the month and of many holidays.[3] The new moon must be sighted but varies slightly by point of view on earth. A new moon occurs when the moon is between the earth and the sun; it is therefore invisible by the naked eye for a variable period of around twenty-four hours. The paradoxical challenge is to spot something that you can't see, so you settle for the first sliver of the crescent as proof of the new moon. Determining when it is at its smallest (= newest) is always a judgment call with potential for a slight geographic bias. Another complexity was that the Jerusalem Sanhedrin held a monopoly on determining the new moon until the fourth century, when Hillel II introduced a regular calendar. To send the signal to a people scattered across the ancient Middle East faced many perils. Its drag left ambiguity about its accuracy: the speed of transmission always affects time-sensitive information. The solution reached was to grant double holidays to the diaspora: assuming that remote intelligence

might be unreliable, you build in a fudge-factor to account for message latency. (Even with instant signal transmission today, most of the diaspora observes double holidays; some pleasant things live on even after the reason for their origin has passed.) Delay was not the only problem: so were faulty or corrupt witnesses, tampering with the fire signals, clouds or fog that obscured sighting of the moon or the fire signal, slow messengers or ones who refused to travel on a holy day, etc. (If the announcement of the holiday causes its messengers to violate its sanctity by traveling on it, this is an odd contradiction. The fact of the holiday would be news that that fact makes unshareable!)[4] The strategy here is synchronization plus buffering to allow for lag times to pool and catch up or run ahead.

Information Is Never Free

It is dangerous to be a messenger. For a messenger bringing unwelcome news to a volatile tyrant, never was McLuhan's equation of medium and message more fraught. In the first chapter of 2 Samuel, an Amalekite soldier brings news to David of the death of his sometime opponent and father-in-law King Saul. David asks how he knows that Saul is genuinely dead. The messenger tells of coming upon Saul after his unsuccessful attempt to fall on his sword. The Amalekite finds Saul badly wounded but agonizingly still alive; Saul asks him to kill him, and he complies. In telling David this, the messenger thought he was currying favor; instead he was confessing to a crime. The admission cost him his life, as David orders his henchmen to murder him. This story leans toward a crucial quantum discovery: that information is never free. Information is ontologically part of the system: you cannot observe a system without engaging it. Maxwell's demon is the fantasy of costless information—a fantasy that went down, literally, in smoke. The universe will run down; information is intervention. These two truths have much to do with each other. The nature of the cosmos and the limits of our knowledge are one. And the nature of the cosmos is that time runs in only one direction: anything we know comes at the expense of time (Kittler 2003).

A lot can happen while a message is buffering. The book of 1 Samuel tells the episode of the city of Jabesh threatened by the Ammonites. The elders of the city ask for seven days to send messengers throughout Israel to see if anyone of their compatriots will come to their aid. Officially they are asking for time to transmit a message, but they are also gaining time to mobilize. The transmission of the data is also the readying of an army. In such situations signal and ontology most closely approach each other. Much mischief can occur between point A and point B in hare mode. Aristotle, in the *Politics,* smirks that Babylon was more a nation than a city: "Babylon, they say, had been taken for three days before some part of the inhabitants became aware of that fact."[5] Aristotle thought it absurd that a polis would not be in instantaneous communication with itself. It was supposed to be a single body, "always already in synchrony" as Helge Jordheim remarks.[6]

But even bodies are not self-transparent. Herrmann von Helmholtz discovered the finite speed of nervous propagation in the 1840s, forever ending the fantasy of complete self-unity. "I think, therefore I am" was now "I think, therefore I am belated." Imagine the split second in which I have died but my brain hasn't gotten the news yet. Of course, the fact that I am alive enough not to know I am dead suggests I might not yet be dead. The body, like the ancient Jewish diaspora or a metropolis like Babylon, could never be on one precise same time grid. Where the ancient world could only imagine the terror of organic mismatch for the Leviathan of a state like Babylon, after Helmholtz it was a fact written into all nervous systems. That held especially for the Leviathans of *Moby-Dick,* whales whose long nerves suggested potentially significant syncing mismatches. Did their two, entirely independent, non-binocular eyes cause them to live in a synthetically integrated immersive now-time, or did they require a completely different mode of being in time (see *Moby-Dick,* chapter 74)? The problem of communication within the polis moved to the physical body.

The Moon: Romantic Simultaneity

Separated lovers have at least the moon in common. Probably every generation has rediscovered that the moon can serve as a transponder for bouncing heartthrobs to other parts of the earth. The moon as an instantaneous relay was expressed by the Tang poet Zhang Jiuling (678–740 CE) in "Looking at the Moon and Thinking of One Far Away" (望月怀远). In one translation (Bynner 1982, 66):

> The moon, grown full now over the sea,
> Brightening the whole of heaven,
> Brings to separated hearts
> The long thoughtfulness of night.
> It is no darker though I blow out my candle.
> It is no warmer though I put on my coat.
> So I leave my message with the moon
> And turn to my bed, hoping for dreams.

According to Su Hua, one of the lines may be translated more directly as "the sea gives birth to the moon (and) even the ends of the earth share the moment." She also points to the closing line of a famous poem by Su Shi (1037–1101 CE), the many-sided poet-statesman of the Song dynasty, called "Water Melody": "Though three hundred miles apart, we are still able to share the beauty of the moon together." That poem's "I" says he wishes to ride the wind but fears the cold of the high altitudes and settles instead on a reverie with the moon beams. In a different mode, Li Bai, perhaps China's most famous poet and, like Zhang from the Tang dynasty, tells of drinking alone to the moonlight, the moon and its shadow providing company for him and making three total. Here, of course, is no synchronization, only the moon as a companion for the lonely—as it was a go-between for the separated lovers in the other poets.[7] René Girard's point, made in a series of books starting in the early 1960s (see Girard, 1961) that romantic love always involves a third party, was never more true.

Retrospective Simultaneity

The Christian Gospels recount many episodes of Jesus healing people. Sometimes he touches them, or they touch him, and sometimes he concocts medicaments on the spot of mud and spittle. Yet he also often cures the sick at a distance, and in many instances touch is superfluous. For a comparative history of simultaneity, the most interesting episode (John 4:46–54) occurs when a royal official hears that Jesus has entered into Cana, a town in Galilee, and approaches him, asking him to come down to Capernaum, presumably a day's journey, in order to heal his son. Jesus says that he doesn't need to come and sends the man home, telling him that his son will be fine. The official trusts him and returns, and on the way is met by servants who tell him that his son has recovered. He asks them when it happened. The fever, they report, broke yesterday at the seventh hour (about one in the afternoon). Cross-checking the timestamp, the man realizes that was exactly when Jesus talked to him; he and his household become firm believers when they realize that the healing must have been caused by Jesus. The Gospel of John uses this retrospectively established simultaneity to make a point about the nature of faith, but it is a simultaneity discovered only after the fact by comparing two separate chronologies—standard for a world without any system of synchronizing time across distance.

The Genitive Absolute; Or, Event-Splices

If biblical narrative proceeds normally single file, there nevertheless are many examples of two things happening almost exactly at the same time. The four messengers to Job, announcing the four rapid disasters that destroy all his family and possessions, come in quick succession, each one overlapping slightly with the previous—following "hard upon," as *Hamlet* has it. There are two dramatic event splices, for instance, in Luke's story of the Passion. Luke 22:47 says that "while Jesus was yet speaking" the mob led by Judas came to arrest him. Peter then follows Jesus at a distance, warming

himself at a fire and sputtering denials against curious onlookers who think they have seen him with Jesus. After the third denial, again "while he was yet speaking," the cock crows, Jesus turns and looks at him across the crowd, Peter remembers his promise never to deny and Jesus's warning that he would do so three times before the rooster sounded, and goes outside to weep bitterly. You can almost imagine the camerawork.

Erich Auerbach has wonderfully analyzed this episode already (see Auerbach 1946, chapter 2). I want to reflect more specifically on the ways the text treats time. This is not a modern meanwhile structure, because the figures remain within sensory range of each other; for me, a genuine meanwhile structure must involve cross-cutting between remote scenes. But the grammatical structure in Greek of the genitive absolute allows for the juxtaposition of two happenings, one suspended in the absolute, and the other with a finite verb. This kind of event-splice happens biblically when two happenings are within range of each other, not at a distance. The grammatical structure occurs hundreds of times in the New Testament, and more rarely in Homer, Thucidydes, and Plato (Fuller 2008). It links two happenings—causally, concessively, consecutively—by floating one in absolute form, and the other finite. Greek grammar enables meanwhile structures of a sort. But only if one is suspended in a tenseless (timeless) state.

Magic Carpet Rides

Almost as in Ezekiel, fast travel across great gulfs of space occurs in *The Book of a Thousand Nights and One Night*. In Richard Burton's translation: "Prince Husayn . . . spread his carpet upon the court-ground behind the Khan wherein he lodged, and sitting thereon, together with his suite and the steeds and all he had brought with him, mentally wished that he might be transported to the cara-vanserai where the three brothers had agreed to meet. No sooner had he formed the thought than straightway, in the twinkling of an eye, the carpet rose high in air and sped through space and carried

them to the appointed stead where, still garbed as a merchant he remained in expectation of his brothers' coming."[8] The carpet is a hare, not a hedgehog, since it takes some time, even if only the twinkling of an eye, but the preestablished meeting point with his brothers suggests hedgehog-like preprocessing, the use of past time in order to set up a later cost-free simultaneity. You need to use expensive time to buy free time, or loose time to prepare for tight time. (Chess players know that bad moves lose tempo. A strong position is the same as having spare moves.)

Sympathetic Simultaneity

Francis Bacon explores eight forms of action at a distance: communicable diseases, light and sound, electricity and magnetism, gravity, interpersonal influences of affection and imagination, the influences of celestial bodies, sympathy, and "emission(s) of immateriate virtues" (Bacon 1844, 2:124). As is typical with Bacon, the list combines elements easily recognizable to us with ones that look weirdly medieval. Bacon clearly is a bit skeptical about the last one but feels called to investigate the idea "that in things, or the parts of things that have been once contiguous or entire, there should remain a transmission of virtue from the one to the other: as between the weapon and the wound" (126). He is referring to the practice of *unguentem teli,* or anointing at a distance, in which a salve applied to the sword that caused a wound will heal the wound, however far away its victim happens to be. It is a kind of hedgehog argument: an entire system retains its integral virtue, even when sundered. Bacon might have been interested to know of quantum entanglement, which is surely just as weird!

Longitude: Chronometer as Telegraph

Bernhard Siegert places the deep history of the modern quest for simultaneity at sea: in the problem of how to determine longitude (Siegert 2015). The rise of simultaneity to the forefront of early twentieth-century physics is not simply the culmination of a long

history of scientific experimentation but also part of the history of an imperial struggle for power, for control over the seas, that goes back to the sixteenth century. Ptolemy, the late Greek astronomer and geographer, already designed a grid system of latitudes and longitudes, but it took on new life as a technology of power under the Portuguese and Spanish seaborne empires. Longitudes, of course, draw imaginary north–south lines from pole to pole. Because of the remarkably stable rotation of the earth's axis, north and south are essentially invariant within historical epochs, and latitude is relatively easy to calculate: a clear view of the horizon and a sighting of the North Star allows you find the angle between the two. That angle is your latitude. On the equator, the North Star is on the horizon, and your latitude is zero; at the North Pole, the North Star is directly overhead and your latitude is 90 degrees. (South of the equator you can use the Southern Cross instead of the North Star.) Finding your point on the east–west axis is, however, another matter. The earth is always spinning; there are no fixed celestial points to designate an invariant east or west. There could be no such thing as an East Star!

In 1530 the Belgian mathematician Gemma Frisius had the brilliant thought to use another point on earth as the standard for longitude. The earth rotates twenty-four hours a day, on annual average, and so a reliable clock on a sea voyage set to the local time of a distant place could indirectly indicate eastward or westward displacement from that longitude. Fifteen degrees of longitude equals one hour of the earth's rotation. The problem was that no clock could keep accurate enough time at sea to be functional, thanks to many factors including the rocking motion that threw off its spring balances and exposure to temperature, humidity, and water itself. For more than two centuries a reliable sea chronometer was a major agenda item for European science and technology, a problem in mechanics, metallurgy, and waterproofing, until the British clockmaker John Harrison decisively solved it in 1762. (The problem of longitude drove Christiaan Huyghens's invention of the second hand in 1657, among other innovations.) The notion of pre-

cision, which had long pertained only to the sky, was brought down to earth, or rather to sea. The exact measurements of celestial position that astronomers had been making since antiquity went horizontal. My eyes, my finger, that star; here at sea, clock, there at that time. If you know, for instance, that the sun rises at Greenwich at 4:42 a.m. on June 21, and you have a clock that gives you the exact time at Greenwich, and the sun rises for you when that clock says 8:42 a.m., and you are on the same latitude as Greenwich then you know that you are four hours later, i.e. 60 degrees west of Greenwich. (If you aren't on the same latitude, tables can help you make necessary adjustments.)

Here is something remarkable indeed: the complete fulfillment of the hedgehog principle. The ship and Greenwich are already in touch. Like Eratosthenes, there is no need to transmit any data. Both can count on the regularity of the earth and its rotation as a given. Such instantaneous communication might seem magical and silly in Bacon, but Greenwich and the ship do communicate in some odd way out of time. The clock serves as a wireless telegraph *avant la lettre,* a benign and portable doppelgänger of Greenwich. It receives intelligence from afar regardless of weather, pirates, interference, or glitches. Here is a time-and-space coordination system with little vulnerable infrastructure. A watch, said Norbert Wiener, is "a pocket orrery," or miniature model of the heavens. Heavenly patterns locate ships moving about the globe for economics and empire. Time here is a proxy for space.

Synkairization through Networks

What if we thought of syn-kair-ization as well as syn-chron-ization, if you will forgive the ugly term? That is exactly the crazy undertaking of meteorology, the gathering of many *kairoi* into one synoptic forecast. (*Kairos* means *weather* in modern Greek.) Meteorology is a privileged site for seeing changing conceptions of time, and modern weather data is perhaps the clearest of all domains for seeing space-time compression.

Local weather description existed from time immemorial, but in the 1780s came the first efforts to track large-scale weather events with real data. Natural philosophers had long sensed that local weather was dependent on remote conditions but because the speed of weather's change was greater than the speed of data's transit, same-day, large-scale weather events could only be studied and mapped after the fact. If it was hard to send data about the new moon in antiquity, it was even harder to send sufficient data about the fickle atmosphere. (Meteorology has always been a big-data science.) The very idea of a weather map was a major innovation—a map of quickly fluctuating things such as rainfall, temperature, or pressure instead of rivers, shorelines, and mountain ranges. In history maps were generally of constants, not variables. Indeed, until the late nineteenth century, climate science was a branch of geography until it was claimed by the physicists.[9]

German physicist F. W. Brandes may be the first to have made a weather map (1816). His plea for Europe-wide help on his project to reconstruct the weather in Europe of 1783 reveals the toil and trouble facing any ambitious weather knower before high-speed data transfer (Brandes 1819). His grand ambition was to map the temperature in Europe "*gleichzeitig*" or simultaneously. He complained how "utterly exhausting" it was to sort out a "host" (*Heer*) or "ocean" (*Meer*) of "a hundred thousand data-points" when only a few hundred belonged to each day (625). The glimpse of larger patterns gave some relief (*Aufmunterung*) from the toil. He was on the brink of discovering low-pressure cells, which far outspan the observable range of an individual tethered to the earth. (Only with space flight and satellites did global weather come into phenomenological range.) His textbook, *Beiträge zur Witterungskunde* (1820), also starts with weariness amid heaps of data. He had to sort through 180,000 discrete bits of data, 70,000 of which he gathered himself. The research process took him to the verge of total despair about "die so oft erfolglose Versuche etwas Regelmässiges in diesem Gewirre zu entdecken," the so often unsuccessful attempts to discover anything regular in this snarl; his

efforts were interrupted by the recurrent crushing (*niederschlagend*) feeling of having accomplished nothing (iv). The subtitle announces his more specific aim: "gleichzeitige Witterungs-Ereignisse in weit von einander entfernten Weltgegenden." In 1820, the only way to analyze "simultaneous weather-events in mutually remote regions of the world" was retrospectively—and via networks. Weather data had to be composite. A pressure system could be seen only by many eyes and ears. For him, it took several decades to gather enough data to map a single day's weather.

Timelines into Timepoints

William Charles Redfield (1798–1857), one of the first American meteorologists, "didn't need an observer network, at least not at first," says Mark Monmonier in his useful history of weather maps (Monmonier 1999, 31). Traveling from western Massachusetts to his home in Connecticut in 1821, Redfield noticed that trees flattened in an earlier storm "were uniformly prostrated *towards the south-east*" (21, original emphasis), while the trees that fell in central Connecticut were all facing the northwest. Aha! He thought: "*This storm was exhibited in the form of a great whirlwind*" (21, original)! A single person, endowed with a purse full of post-hoc flexible time, could compile observations of a single event whose radius was *unübersichtlich* in real time. Rather like Eratosthenes, Redfield was his own network: he could cross-cut in memory. After gathering more data, including discussions with sailors, he reconstructed the storm ten years later in an 1831 journal article (Redfield 1831). His doctrine was the circular motion of storms; hurricanes were like big tornadoes. The piece ends with an appeal that anyone possessing additional facts should "leave a memorandum" with hydrographers Edmund and George Blunt in New York City, sellers of nautical books and charts (51). Redfield shows the centrality of the postal system to eighteenth and nineteenth century meanwhile structures, a critical nationalist medium of imagining untouched by Anderson, but Redfield also shows that one observer can produce their own meanwhile—rather like a novelist or a journalist.

One critic thought Redfield's inability to prove tight synchronization was his Achilles' heel: the trees could have been flattened by a different or later storm two or three days later (Mitchell 1831, 362). Such is the eternal threat to retrospectively inferred simultaneity: the risk that indeterminate time lags confound the data. Only as the electrical telegraph provided weather data in more or less real time were same-day weather reports possible. This was a boutique genre in the 1850s and a fledging journalistic genre in the 1860s, in the United States and United Kingdom at least. The telegraph enabled the separation of communication and transportation for the first time in history, says James Carey (1989). That may be, but the telegraph also did something else: it separated weather from climate for the first time! Climate lasts weeks, months, seasons, or years: weather is daily. Brandes reconstructed the weather of 1783 in 1816; Redfield of 1821 in 1831; James Pollard Espy analyzed a June 20, 1836, storm in an 1837 report. The amount of time that it took to cover space was shrinking.

The Demons of Microtime

Just as the telegraph made instantaneous communication possible, thoughtful souls discovered its bondage to the Hare principle. Electricity travels at the speed of light—and the speed of light is finite. Even the fastest transmissions cannot exceed 300,000 km/sec. On a cosmic scale, this is not fast enough to create a central grid of time coordination. The telegraph enabled superfast transmissions and also disclosed the older regime of a universe of asynchrony. This is the discovery of Einstein (Galison 2003).

The between-time is a time for mischief of all kinds, as well as of monopolies of knowledge. The novelist can track between characters. Mathematicians and evangelists can dramatically join separate events. Young meteorologists can read storm patterns they could not have witnessed for themselves. The stock market now operates in microseconds and even nanoseconds, thanks to high-frequency trading. Paul Baran's supposedly innocent plan for

a network based on the microtimes of packet switching has created a system in which every node could potentially access the whole network, in which every split second was the strait gate through which the spies and hackers could enter (Sprenger 2015). Blindness to the arts of buffering time has cost us all dearly. Oblivious simultaneity is written into our condition, but critical analysis helps us see that synchronization always takes time, affects space, and consumes energy or power.

Notes

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1 Anderson mentions *The Gutenberg Galaxy* with a brisk brush-off (34n58), but see McLuhan (1952). "The new book of the people, the newspaper, created a one-day world utterly indifferent to the past, but embracing the whole planet. The newspaper is not a time-binder but a space-binder. Juxtaposed simultaneously in its columns are events from the next block with events from China and Peru." A newspaper "surrealistically" collects its items under the rigid "convention of a single date-line."

2 Thanks to Mary J. Depew for guidance on Homer.

3 This custom is based in the Hebrew Bible and is developed in the Mishnah's section on festivals (Moed).

4 A helpful collection of sources and more recent discussions of the doubling of the "yom tov" (holiday) is http://www.michaelbrochstein.com/misc/SecondDayYomTov.htm.

5 Aristotle, *Politics,* book 3, part 3, trans. Jowett, http://classics.mit.edu/Aristotle/politics.3.three.html.

6 Personal communication, June 22, 2019.

7 See https ://en.wikipedia.org/wiki/Shuidiao_Getou 千里共婵娟. Personal communication, Su Hua, June 15, 2019.

8 Richard Francis Burton, trans., *The Book of a Thousand Nights and a Night* (1887), vol. 13 https://en.wikisource.org/wiki/The_Book_of_the_Thousand_Nights_and_a_Night/Volume_13.

9 The work of my colleague Deborah Coen is essential; see Coen (2018).

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