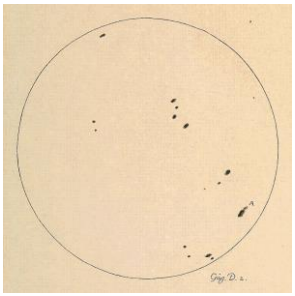
T. Mira y Lopez

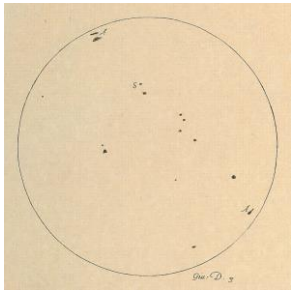
Parallax

June 2nd, 1612:



Drop a measure of bitumen onto a red-hot frying pan. Roof-top tar, printer ink, pitch, the chunk of asphalt you pocket where the road is torn up—let it fall onto a surface set to sear. The petroleum, distilled, black and viscous, thicker than molasses, will begin to syrup and smoke. Clouds will rise and disperse in strange shapes. Take note of these. Try to keep track of their patterns as they stay heavy on the air. What you are looking at are sunspots.

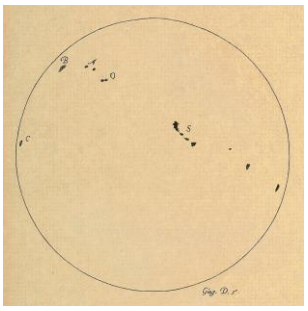
June 3rd, 1612:



You are not really looking at sunspots. You are looking at their imitations. Earthly materials emulous of the celestial. At what Galileo Galilei likened to their clouds or smoke in his *Letters on Sunspots*. Galileo suggested using bitumen to recreate this smoke, in the same paragraph where he will later write, "I do not mean to assert anything positively, I do not wish to mix dubious things with those which are definite and certain."

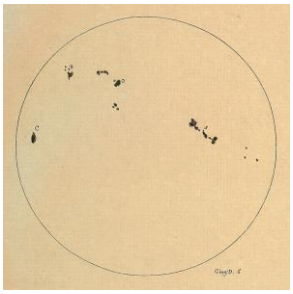
What Galileo believed definite and certain about sunspots was this: they were contiguous to the sun's surface; they generated and decayed like clouds; they were extremely large, not so large as Venus but immense nonetheless. He believed it was vain to determine their true substance, that it was sometimes easier to explain what was further away than what rested close at hand.

June 5th, 1612:



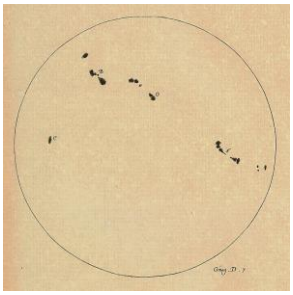
A sunspot also grows on one's skin, a result of overexposure to the sun. My father, born in Brazil with Swiss skin, developed a number of these cancers, basal cell carcinomas to be harvested out. He would come home, a butterfly band-aid on his nose, a small sealed thumbprint on his forehead, and I would know he had been to the dermatologist. Once, he came home with his ear bandaged; its tip had been snipped off, as if he were a Rottweiler caught in a fight. I have my father's and his mother's skin, the skin that one day turns us into lizards. But I see no signs yet of the inherited trait, nothing to be blotted out, just a few white freckles, a loss in pigmentation. I am an animal of different spots. Like the sun's, mine are mere blemishes, harmless if cared for. The most they do is signal that the body they rest upon moves in time and space. That it will one day burn up and disappear.

June 6th, 1612:



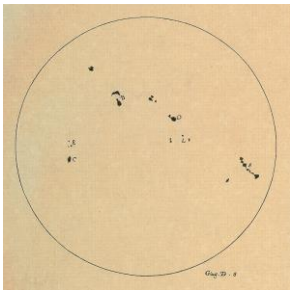
From June 2nd to July 8th in 1612, Galileo recorded sunspots. He drew these to corroborate his arguments in *Letters on Sunspots* and refute those made by Christoph Scheiner, who had observed sunspots in Augsburg the year before. Scheiner, a Jesuit astronmer, wished to retain the heavens' perfection and so hypothesized that the spots were distant from the sun, satellites or small planets passing between it and the earth, momentarily darkened by its brightness. In concluding that the spots existed on the sun's surface, Galileo placed imperfections and blemishes upon what was before thought to be perfect. He could also conclude that the sun itself moved; that it rotated from west to east around its own center; that a full rotation lasted 25 days and that it would take a dozen or so days for a sunspot to pass from view and a dozen more for its return. He believed the spots to reappear, but because they continued to expand and condense when out of sight, he could not be sure that what had once disappeared had now returned.

June 7th, 1612:



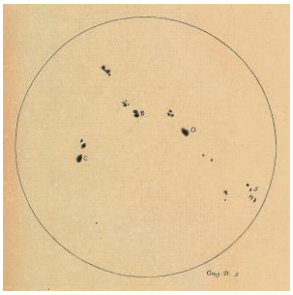
Galileo misjudged size. Sunspots are immense: an average spot swallows up both Venus and the Earth. A monstrosity approximates Jupiter.

June 8th, 1612:



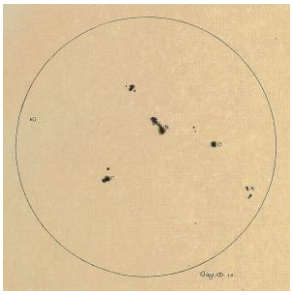
In the house I was born in, my parents built a solar system to hang from my ceiling. They cut planets out of wood, looped thread through their tops and hung them from quarter-inch hooks. The sun in the corner, then the planets in order. They fashioned Saturn's rings out of wire, used cotton balls for Earth's clouds, sprinkled glitter on the wooden circles to indicate the surrounding stars. I stared up at this as an infant, my father and mother on either side of the crib, reciting the names as if trying to orient me on a vast scale. Or rather, disorient me: to make familiar and at home what could not be but unfamiliar. Whichever it was, my mother claims my first word was Jupiter. Jupitah. An unlikely story, yet only she remains with the authority to tell it. We moved out of that first apartment and my parents packed the solar system and hung it from their new bedroom. It hung there for many years, before my mother stripped it down, threw the planets out or left them in a box in storage.

June 9th, 1612:



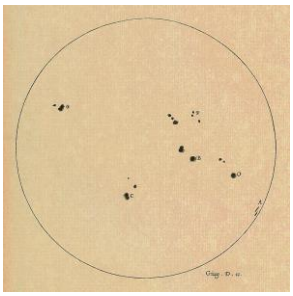
To disprove Scheiner's claim that sunspots were separate planets, Galileo used parallax. That is, the effect created when the position of an object appears to differ based on where it is viewed. Simply put, we see things differently from different places. If the spots were planets moving between the sun and earth, they would appear outside of the solar disk at some point during the earth's orbit. But they did not. Galileo observed that spots fell within the same narrow zone of the sun. Not only that; no matter where on earth people observed the spots, they fell within the same arrangement on the sun. What Galileo telescoped in Florence, Daniello Antonini saw in Brussels, Lodovico Cigoli in Rome. The spots could be drawn from anywhere. They resisted parallax.

June 10th, 1612:



Squint through the eyepiece of a microscope. Adjust the knobs. First coarse, then fine, twist in, now out. Until focused. Choose the right objective; remember that this source of light comes from below. Watch what clarifies, what quivers then sharpens in that jellied dish strapped to the stage. Stand up, blink, rub the red mark the scope's lens has left around your orbital. Let someone else have a look. What you see there—those eukaryotes floating, dividing, uniting—is what you see to your right.

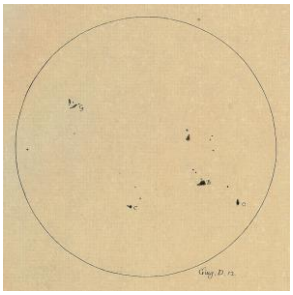
June 11th, 1612:



There are specific types of parallax rooted in our physical limits. Geocentric parallax, when celestial bodies become displaced because we observe them from the earth's surface and not its center. Heliocentric parallax, because we observe them from the earth and not the sun.

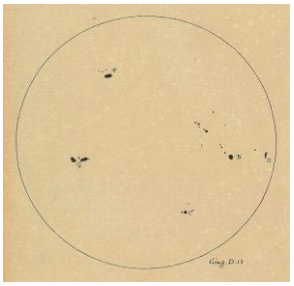
There is another parallax, not a displacement of bodies but disembodiment itself. The parallax that came when my father and I walked across the park to his work and he led me to the microscope at his desk. When something becomes disembodied, we struggle to see it for what it really is. When someone becomes disembodied, we struggle to see him for what he once was. And so we seek out new points of view, trick angles, viewfinders, sources of light that could illuminate what has been removed from our vision.

June 12th, 1612:



My mother removed this solar system because she developed what she calls cosmophobia. It is exactly what it sounds like: a fear of the universe, specifically the night sky, its stars and its moon. At first, I believed this a joke. She would proclaim to people she had just met, "I have cosmophobia." "What's that?" they would ask, "I've never heard of it." "I hate the sky!" she would respond. She does not tell them she has invented this term, but she has held true to it. When she takes the poodle out for his nightly walk at her house in the country, she keeps her eyes down on the road. If the moon hangs low and she catches sight of it, she will shudder. If I am out with her, I will point to the constellations I see and remark how beautiful they look. "Stop it, stop it!" she will scream at me and then she will tell the dog, "Don't listen to him" and she will scoop him up and take him inside. I am joking and she is joking, but we are also not.

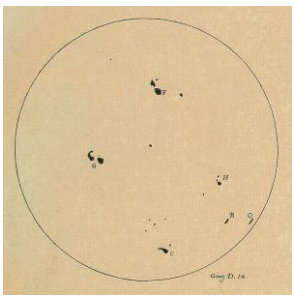
June 13th, 1612:



Letters on Sunspots did not overhaul the geocentric organization of the heavens, but it did point to a system that would. At the end of his last letter, Galileo endorsed Copernicus, foreseeing his system's "universal revelation" with "little fear of clouds or crosswinds." Though this was not the exact case (and though he would later refute this), Galileo took a step he could not take back. And he dragged Scheiner with him, in thrall to his orbit like one of Jupiter's moons.

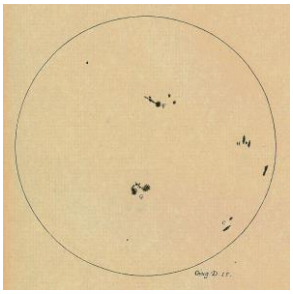
One cannot help but feel sorry for Scheiner. At least I do. What do we do when the position we have staked out reveals itself as false? Or rather, overthrown. I imagine a trauma to this: the news that shatters our hypotheses, the revelation which forces us to rebuild a world. Or the realization that the world has always been built this way, but that only now—because you've swung around on the globe, drifted in latitude—it appears as such. A surprise parallax. I imagine Scheiner must have felt the way we do when a loved one betrays us, has been betraying us all along. Or the way we do when a loved one dies, which is its own sort of betrayal, because that is not supposed to happen to us. At least not so soon. How do I know this? Well, he felt the way I feel.

June 14th, 1612:



In her enamel class at the YMCA, my mother makes clocks from copper. For a long time, even after my father's death, she made universe clocks, in which the second and hour hands would move over a glazed indigo background (the night sky) and small technicolor glass baubles (the stars and planets). She made many of these, handing them out as Christmas and birthday presents (my inevitable birthday clock came the year after my father's death). It's a funny idea—keeping time out of what seems beyond it. But cosmophobia hit and now she makes clocks with sheep in the background. The universe became a former friend, one that offered to take care of something or someone for her and then betrayed her. It swallowed that something up without even the sense to apologize or admit mistake, and now she has cut off conversation, avoids eye contact when they run into each other on the street. She loves the sheep on her clocks because they are like the ones that graze on the hillside opposite her window in the country. But these clocks conceal no secrets: in the end, she's counting sheep.

June 15th, 1612:

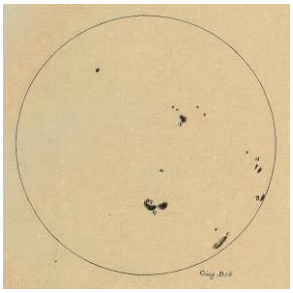


It is the year 807 A.D. in France and you are alive. Charlemagne rules as Holy Roman Emperor, people dress in sack-like tunics, and a black smudge passes over the face of the sun for eight days. Clouds obscure the dark spot's entrance and exit, but it looks for all the world like the passage of Mercury. You believe this.

Yet it is not Mercury. It could not have been, Galileo will realize, because that planet can not reside within the sun's sphere for seven hours, much less eight days. Mercury travels quicker than this. The smudge must have been a sunspot.

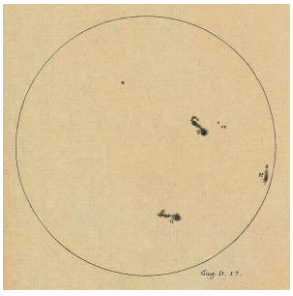
It is not your fault; you and the others watched from a disadvantage. You could not predict the future. There was no way to build your own telescope, as Galileo did in 1609, because the Dutch had not yet invented it. And you are not alone. We have been interpreting and misinterpreting sunspots for centuries, choosing to see them as we please. In doing so, we have cured and salted their mystery. We have preserved them against their own heat and taken from their smoke the signals we need to survive.

June 16th, 1612:



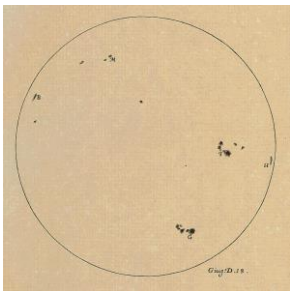
My mother and I are not joking those nights in the country because I want her to accept what she refuses and she wants me to accept her refusal. It is ridiculous, this game of chicken, this incessant pointing at the moon. Perhaps just as ridiculous as being asked to continue a life where what gave that life meaning has been removed. Where what ordered that system has been hauled out and proven false. If my father is absent, then she believes she can will that other system, the universe that confirms his absence, to disappear as well.

June 17th, 1612:



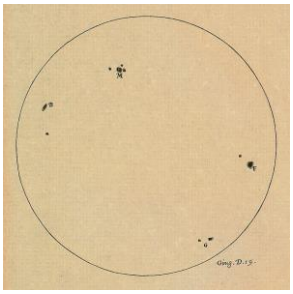
Sunspots are not blemishes or smokes, but areas of intense magnetism that form on the sun's surface. Areas with a lower surface temperature that appear dark compared to the surrounding photosphere. A century ago, Vilhem Bjerknes, a Norwegian meteorologist, theorized that the sun's gases looped and coiled around its sphere like a rubber hose. When forced to the surface, these loops broke into two segments—why sunspots often appear in pairs.

June 18th, 1612:



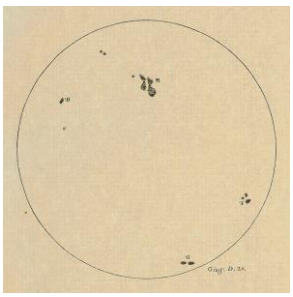
In Bjerknes' theory, the segments have magnetically opposed charges. A confluence of events we do not fully understand—a sunstorm, a looping magnetic field—produces a phenomena in which a pair of opposites are held in close, sustained contact. They must drift or cycle across the face of the sun in this position, bound to an inextricable rotation, until they disappear. And for this duration, these two bodies, this surviving dipolar pair must coexist yet also realize they will never unite.

June 19th, 1612:



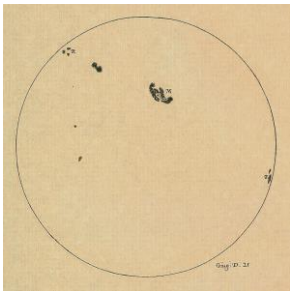
In her cosmophobia, my mother has moved closer to the sun. The sun whose light obscures the rest of the universe. "I love the sun," she tells me over the phone. "It's ours. He makes things grow. It's responsible for life." "Did you call it a he?" I ask. "I call it an it. S-u-n, not s-o-n," she says. "Do you like the earth?" "I like the earth. I love the grass. Trees, birds. The sheep." She goes on, but then another voice obscures hers—the phone lines have become mixed up and I must wait through this snippet of conversation until her voice returns. When it does, she is asking me where I am. "I'm here," I say and I ask again. "Does it bother you that the sun is going to blow up?" "I don't give a flying fuck. What am I supposed to do? Worry?" "Do you ever think the sun is one of those stars that has already died and we just don't know it yet?" "Tom," she pauses, "We would know it. It takes 9 seconds for its light to reach us. It's only 93 million miles away." "What about sunspots?" "Oh, I love sunspots" she says, "They fuck up all our technology." Then she sighs. "Why are you sighing?" I ask. "Contemplating the universe?" "No, Tom, I told you. I don't contemplate the universe."

June 20th, 1612:



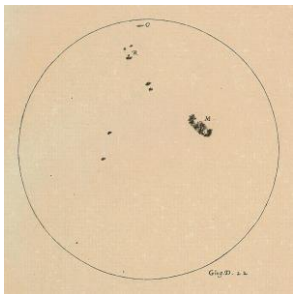
Sunspots' magnetism leads to another definition: as a notional cause of an odd error. Why did the television screen suddenly go blank? Sunspots, I guess. What caused this unforeseen and disastrous event, this irrevocable loss? Sunspots. The definition exists since we do not fully understand sunspots and so attribute unknown causes to them. They have been blamed for the Great Depression and climate change. Their frequency affects the rate of tree growth, but also changes the amount of ions in the air, which we say alters our moods and psychological states. Their magnetic storms disrupt radio communications and interfere with electronics. The voice that crackles through the telephone wire while I speak with my mother, momentarily obscuring hers. Is it a ghost? Is it my father? No, sunspots.

June 21st, 1612:



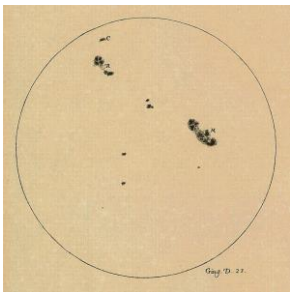
It is solstice, endless eventide, endless end of day. The sun stands still, its spots bask. They have become continents on an earthly or alien sphere, continents before they have drifted apart. Pangea, Panhelios in the late Paleozoic. A past when there was no difference between Brazil and New York, when Swiss skin would have burnt anywhere, given such a thing as Swiss skin, when there was no manmade park between our home and my father's microscope. This is the shape of things before they drifted away, the atmosphere full and thick like a father's head of hair, the continents no more than tiny islands, Pacific islands we will never see, but able to be grasped and slung about as if from star to star. Clustered, reunited, made whole again.

June 22nd, 1612:



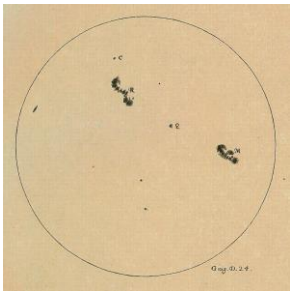
My mother did once contemplate the universe. Scorpius RA 17h57m 40s D -37° 33' is a star in the Milky Way. After my father died, my mother contacted the International Star Registry and paid to rename this star *Rafael, Judy, and Tommy*. The dedication was retroactive to the day of his death, as if that were when the three of us packed up the wooden planets and relocated once more, shooting forth from earth into star. The International Star Registry has no official authority with which to redesignate celestial bodies (they are really something of a swindle), but that is all well and good because my mother now prefers to forget there is a ball of gas somewhere with our names tethered to it. The dedicatory plaque hangs in a corner of my room. I ask her how she can love the sun and hate the stars when the sun too is a star, when stars, if seen from a different perspective, could also be suns. "But it's *our* sun. Those other motherfuckers are far away and probably dead. All they do is twinkle and shit. I don't give a shit about twinkling."

June 23rd, 1612:



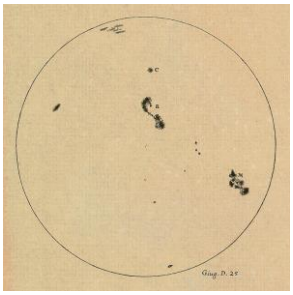
The star my mother chose fell in the Scorpius constellation because that is my astrological sign. This made sense in terms of the celestial narrative she had constructed, if she or I were to see a son as the continuation of a father's story. If we believed that the spot the sun's rotation carries away from us will return—altered, transformed, and perhaps unidentifiable, but still in some sense the same. Most of us, I think, would like to assign stories to the stars that partake in our lives. Galileo cast astrological charts for his patrons and pupils to earn some money on the side; he even cast them for his daughters.

June 24th, 1612:



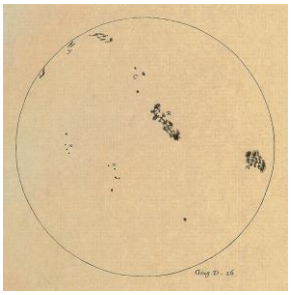
Sunspots can cause solar flares and coronal mass ejections. Or rather, these are associated with sunspots. Solar flares occur at the dividing line between oppositely charged ends. Flares heat up and release an energy equivalent to a billion megatons of TNT, potentially causing geomagnetic storms on earth. Sunspot maximums increase the brightness of the Northern and Southern lights, disrupt power grids, and reverse the polarity in satellites. This is, in my mother's words, what fucks up technology: the energy and havoc wrung from two opposed areas.

June 25th, 1612:



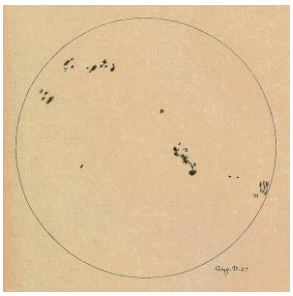
To see sunspots and still be able to see, look at the setting sun. Atmospheric interference increases at twilight and objects appear larger than usual. Beware of parallax. Find any promontory or plateau, the panorama end of any graveled drive, where bitumen sediments into stone, and look west. Hopefully, your horizon is flat—the prairie, the desert, the sea. But if it is 1612 and you find yourself in a pinch, the rolled Tuscan hills will do. Find a clear line of sight through the cypresses. Spot the sun. Wait for the tiresome pink clouds to pass. Now look. If it is the right day, if it is just around the summer solstice, you will be able to see other clouds, dark storms gathered on the sun. Visible to the naked eye. Hurricanes, planets, magnetic fields. Tiny islands, moles, cigarette burns. Whatever they look like to you.

June 26th, 1612:



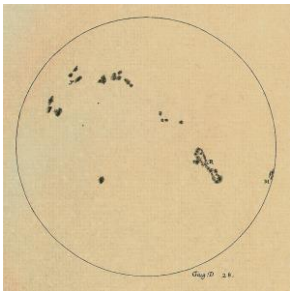
The sun actually rotates every 25.38 days. Or rather, the sun rotates at different speeds: it takes up to 38 days to rotate near the poles, 24.47 days at the equator, and 25.38 days at a latitude of 26 degrees, the line where most sunspots occur and from where astronomers measure. Galileo was not far off: it takes twelve or thirteen days for sunspots to round the face of the sun, to disappear and then return camouflaged, amidst new spots.

June 27th, 1612:



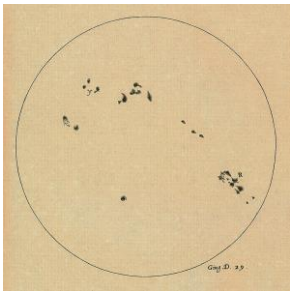
According to Galileo, he and Scheiner shared at least one point in common: both believed sunspots were not “lakes or caverns in the body of the sun”. Here is another: they were both wrong. “As a matter of fact that is precisely what sunspots are,” Stillman Drake, Galileo’s translator, writes in a footnote. Observers liken sunspots to magnificent hurricanes on the sun’s surface. As if caught in a vortex, hydrogen sweeps into the center of a sunspot. This central, darkened whirlpool is the umbra; the outer region, the penumbra. In photos, these two, umbra and penumbra, resemble a sunflower or a pupil and iris when seen in black and white. In 1769, Alexander Wilson, a Scottish astronomer, noted that the width of penumbrae foreshortened when they reached the sun’s visual edge. In a trick of perspective, another sort of parallax, he concluded that this was because sunspots were actually saucer-shaped depressions in the photosphere.

June 28th, 1612:



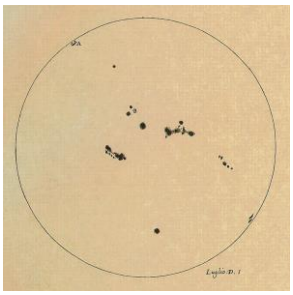
When he did not watch the setting sun, Galileo recorded sunspots through a method devised by his pupil, Benedetto Castelli. Galileo claimed this method rendered the spots “absolutely exact both as to their shape and their variation of position” and drew them “without a hairsbreadth of error in a very elegant manner.” The method was the following: Direct the telescope towards the sun. Focus and steady it, but do not look through it. Place a sheet of white paper about a foot from its concave lens. This will reflect the sun’s disk as well as its spots “with exactly the same symmetry as in the sun.” Move the paper further away. The disk enlarges and the spots show with more clarity, so much so that ones not normally visible through the telescope will appear.

June 29th, 1612:



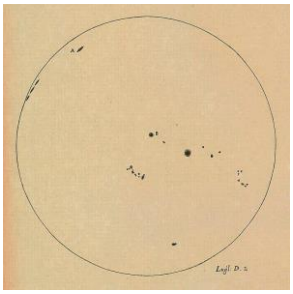
If our fundamental system is upended, if our father and husband suddenly dies and we realize that the cosmos do not remember but forget us, then we either reject the new system offered or we force our own interpretation. We complete our own circle no matter what’s inscribed within. Sunspots become not magnetic storms in the photosphere, but magical planets that circle the sun, invisible then darkly illuminated. They return and we once again feel the pleasant hum, the throb of a completed cycle. My mother rejects, but I tint my telescope with rose-hued lens, like Scheiner used to do, so that the reality I should by now be familiar with appears novel and different and reasonable. I seek out parallax.

July 1st, 1612:



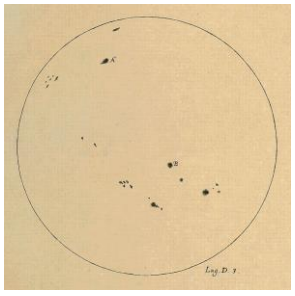
Although Galileo's letters were in response to Scheiner's, Galileo did not address them to him. In fact, Galileo did not know whose arguments he was responding to: Scheiner wished to remain anonymous and so signed his letters with a pseudonym. He called himself *Apelles latens post tabulam*—Apelles behind the curtain—honoring the apocryphal story of the Greek painter who hid behind one of his paintings to hear what criticisms people offered. What's more, Apelles and Galileo did not exchange letters directly, but sent them through an intermediary named Marc Welser. Welser came from one of the wealthiest families in Germany and, like Galileo, he was a member of the Lyncean Academy. Apelles wrote in Latin, but Galileo wrote in Italian, a language his counterpart did not speak. Apelles would have to wait for Welser to translate the letter before he could respond. Galileo only knew that Apelles was a Jesuit, did not speak Italian, and believed the sun to be a perfect entity. Both men, however, were similar in one respect: they could not address the you they were really talking to.

July 2nd, 1612:



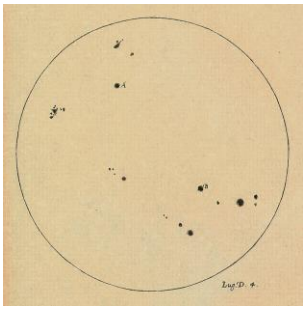
Welser wrote Galileo that he received his letters "like manna from heaven," a funny, if stock turn of phrase to apply to one who would find himself contradicting the Church. Yet what caused Galileo such trouble was not the content of what he said as much as the position from which he presented it. It was another case of parallax. The Church insisted that Galileo label his work *"istoria"* instead of *"dismostrazione"*. The words are cognates: in order to continue writing, he would have to transform the scientific into the storied, demonstrable proof into fancy.

July 3rd, 1612:



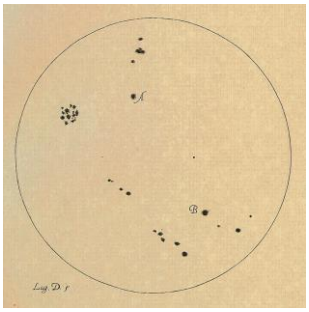
In my old room, my father hung the sun from my ceiling and my mother the orbiting planets. His death rendered the sun much as it would appear at its zenith: too bright to be gazed at directly. To do so without harm, we would need to cap those rose-tinted lens on to the end of our telescope. But if we cannot look at the sun, we look towards its effects. My mother waits for her grass to grow and the sheep on the hillside to eat it. I project my father outward. I imagine that one day a sunspot will form and release a solar flare, within which, bound up with all those megatons of TNT, will be some part of my father. The eruption will hurl him outward, like slingshot or cannonblast, and he will become matter in space, waiting for me to reach him before he grows cold. I must fling myself out there as well. And I feel sometimes, briefly and wonderfully, that I could. That is, I could if it were not for something like parallax. Like heliocentric parallax: the idea that although we can see something—the sky, the stars, the dark—we see it displaced, we see it not for what it really is because we are on earth and should be next to the sun, because we exist in a position irreconcilable with the vision of its true, celestial angle.

July 4th, 1612:



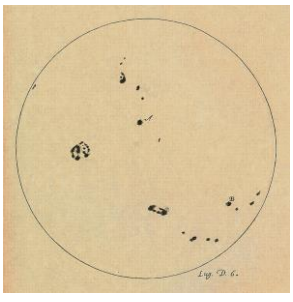
Like Galileo and Apelles, I too must speak through an intermediary. I too cannot reach the you I truly want to speak to. I do not know how to address this you—what pseudonym you now go by, what form you hide behind—just as I do not know if you would recognize my attempt. I do not even know if we still speak the same language, if I need another you to translate this. Another you: a starry messenger to crackle through the line and relay my message. So that I need this second you, the you that is not you. Because you becomes him and he does not respond; because there is no way to really know what Scorpius RA 17h57m 40s D -37° 33' is made of or which painting Apelles hides behind; because I do not know where you are.

July 5th, 1612:



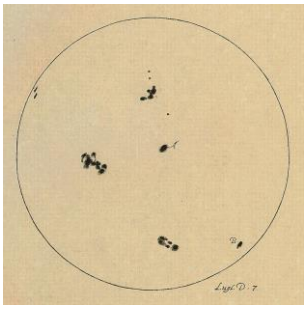
I go to a planetarium to see sunspots. It is noon and bright. "We project them onto a flat, white surface," the girl at the desk tells me. I walk in and find the flat surface. It is a round table, the size and height of my kitchen table. Ten feet above it, a circle of sunlight hovers on the brick wall. A mirror juts out at an angle here, like a door left half-open. A semicircle of light hits the mirror and travels upward to a second, larger mirror. The second mirror, angled downward, refracts a crescent of sunlight onto the white kitchen table. Within the table's circle, a square of light is inscribed—the mirror's reflection—and at the square's edge, a sliver of brighter light, no bigger than my lunula. It is the sunlight. I look down at it, ready to trace.

July 6th, 1612:



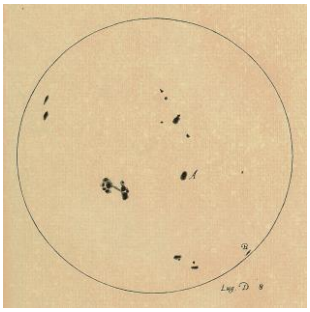
But there are no little black spots. It is empty, jellied, lifeless like the slide of a microscope before the petri dish is slipped underneath. The light quivers, as if afraid to draw breath. It is disappointing; it is just light on a table. I gaze back up at the circle on the wall and then I look around the sealed room, its artificial lights, its security cameras that look briefly like telescopes. I realize there is still mystery here, still illusion and parallax based on what position I stand in. I look back at the brick wall. There are no sunspots, but there is something else—there is sunlight itself and I have no idea where it comes from.

July 7th, 1612:



Now it is time to pack up. Now it is time for Galileo to disassemble his telescope and for Apelles to uncap his rose-tinted lens and step out from behind the painting. The sun has set, the night sky is coming on, the bitumen vapors have dispersed. Now it is time to wipe your brow and shoulder your telescope and trundle home, before the hills become too dark and you lose your way—home where there is hearth and wine and peasant bread and that squab your son caught outside Siena. But maybe just one more look at those circles—sneak it out of your pocket, light a torch—one more glance and see what shapes, what smokes or spirits or monsters, you have captured, conjured.

July 8th, 1612:



The light comes from a skylight across the planetarium. The skylight is slit into the ceiling, difficult to spot unless one is directly below. I walk underneath it, next to a plastic asteroid within which a boy and his father watch a video. The boy looks up at me, puzzled that I am standing so close to him yet looking up. The light hits a mirror that hangs from the skylight, the mirror refracts the light to another, mounted on the wall and resembling a large magnifying glass. This is the mirror that projects the light thirty feet across the room onto the brick wall. I walk back over to the table. The sliver of light hovers and shakes and is growing smaller, vanishing before my eyes. It is like watching the sunset, when you can actually see the sun move and it looks like it sets inch by inch, when really it does not, when that is just a result of your angle on earth, when really there is much more to the sun than that, but all the same it looks small, and a few seconds later when it disappears, it looks dead, it looks gone.