Article

Mediated Futures in Anesthetic Space: Noise, Speculation, and Lowell's Telescope

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Abstract

Media are intimately connected to the future. They are simultaneously posited as encouraging speculation and foreclosing futures. Through an examination of the "canal craze" at the turn of the twentieth century in which the telescopic lens was believed to reveal Earth's future by way of focusing in on its nearby twin, this paper moves beyond notions of open and closed visions by considering the function of noise in mediated futures. That the canals were an effect of dust, as both elemental medium and noise, encourages broader questions concerning how futures pivot on what lies at the blurred edges of media and beyond rather than on what media make clearly visible. This paper argues for an analytic of futures, both potential and prescribed, situated in the anesthetic fields of media ecologies, spaces of speculation, contestation, and the non-dyadic play of visibility-opacity-invisibility.

Keywords

Futures, noise, dust, telescope, speculation, elemental media

In 1877 Italian astronomer Giovanni Schiaparelli peered through his telescope and saw lines on the face of Mars. He mapped out *canali*, proof, he argued, that Mars housed water and vegetation. Percival Lowell, an American businessman and amateur astronomer, obtained those maps in 1892. A year later, he procured a copy of the French astronomer Camille Flammarion's compendium of 200 years of telescopic observation, *The Planet Mars*. With both in hand Lowell took Schiaparelli's apparent discovery and ran with it. Lowell accepted the mistranslation of *canali* as "canals" rather than "channels," suggesting the lines seen though the telescope were constructed by intelligent life rather than formed by geological processes. He used his wealth to build an observatory in Flagstaff, Arizona in 1894 with the intention of producing observational data supporting the idea that Mars was home to a humanoid race using advanced engineering to survive on a dying planet. The "canal craze," as it came to be known, has been the subject of many analyses. What is of interest here is that while much of the public controversy surrounding the canal hypothesis at the time centered on its veracity, for Lowell the stakes were as much about the future as they were the present. He argued that the telescopic "[s]tudy of Mars proves that planet to occupy earthwise in some sort the *post of prophet*" (Lowell, 1908: 111, *emphasis added*).

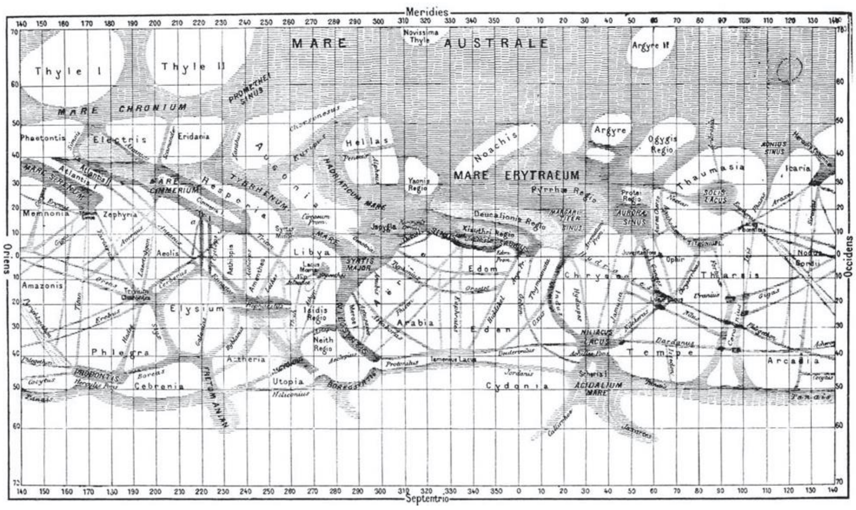

Figure 1: Schiaparelli's Mars (1877)
Credit: Creative Commons

The scene above is neither a straightforward institutionally-sanctioned sociotechnical imaginary (Jasanoff and Kim, 2015), nor is it precisely the "great expectation" of a speculative infrastructure (Reese-Evison, 2021). As such, it is a unique case from which to theorize the relation between media and futures.[1] Media scholars have long recognized the future to be a "powerful political and cultural weapon" (Carey and Quirk, 2009: 133), examining the cultural industries that disseminate futures (Barbrook, 2007; Powers, 2019; Szpunar, 2021) and how media technologies are bestowed with a futural allure (Ernst and Schröter, 2021; Marvin, 1988). Media theorists have investigated how media technologies structure collective relations to time via the (not necessarily linear) organization of future, present, and past, formations which can function to foreclose potential futures (Chun, 2016; Ernst, 2012; Grusin, 2010; Hong, 2023; Hui, 2018; Innis, 1951; Stielger, 2008). Therein, increased attention has been given to media outside of the traditional canon, including the telescope (Peters, 2003; Vogl, 2007).[2] Connectedly, there has been a turn to the elements (e.g., air, water, dust) and how they shape collective experiences and imaginaries (Parikka, 2015; Peters, 2015; Starosielski, 2019).

This paper contributes to theorizations of media temporality and materiality by focusing on an overlooked dimension regarding the futural (or speculative) functioning of media. The canal hypothesis is neither a future that materializes through how a medium neatly changes (or is projected to change) the scale, pace, or pattern of, in this case, vision (McLuhan, 1994), nor one that arises out of what a medium makes incontrovertibly visible, whether as image, map, or data. Rather, it pivots on what the telescope offers for speculation at its blurry limits and beyond. In short, the canal controversy illustrates an instance in which media generate (and sustain) futures through noise as much as signal.

This paper proceeds in three parts. Part I traces the complex ecology—of media (telescope, spectroscope, camera), events (terrestrial droughts and canal projects), objects (planets, atmospheres, dust), and theories (the nebular hypothesis, Social Darwinism)—that allowed Lowell to position Mars as an inscription surface, which, when decoded via the optical telescope, revealed Earth's future. Part II shows how this variety of situated world-making depends on a medium's constitutive noise (Serres, 2007)—in this case, in relation to planetary atmospheres and Mars's ubiquitous dust. Here, a medium's "anesthetic field" (Vogl, 2007) is understood not as a limit point between the visible and invisible but as a zone of opacity that begets speculation. Part III places the canal controversy within cotemporaneous debates regarding objectivity centered on the tension between eye, photograph, and telescope (Daston and Galison, 1992; 2007). This move reveals how Lowell leveraged the noise of one medium (i.e., the camera) to maintain the plausibility of his future in the face of many challenges. Using the questions raised by the case study, the conclusion returns to dust as a medium in order to consider how analyses of contemporary media futures, both prescribed and potential, might usefully shift away from notions of foreclosure and openness and towards the non-dyadic play of visibility-opacity-invisibility within media ecologies.

I. From deity to inscription surface

Hearing about a Dutch invention, itself part of a lineage of optics that traces back to the Islamic world of the first millennium, Galileo built a telescope in 1609. He wrote that through its lens the Moon appears "like the face of the Earth itself" (quoted in Vogl, 2007: 18). Indeed, "Planets looking like the Moon looking like Earth," writes Richard Panek (1998: 13), is an observation impossible, perhaps even inconceivable, without the telescope. However, what Vogl refers to as the telescope's self-referential world-making does not happen in an instant. Nor is it a process reducible to a single medium's technical affordances. Nor does it occur in the same way across celestial bodies. Rather, it emerges out of a historically specific (media) ecology. As such, it is worth retracing this process in relation to Mars, a planet once thought to be a deity whose movements in the night sky portended the future (Koch-Westenholz, 1995).[3]

While Galileo observed Mars in 1610, the Dutch polymath Christiaan Huygens was the first to commit what he saw to paper in the 1650s. A dark blot sketched within a perfect circle. It was, argues Weintraub (2018), in the 150-year period between Huygens's observations and those of the German-British astronomer William Herschel in the 1780s that Mars became a world akin to Earth.[4] By tracking the movement of the dark blot (Syrtis Major) on Mars's surface Huygens determined the length of a Martian day, or what is now referred to as a "sol," to be approximately equal to one on Earth—he was not off by much.[5] Other attributes linking the two planets involved a more interpretive hand. Half a century after Huygens, French-Italian astronomer Giacomo Maraldi speculated that Mars's polar caps were akin in composition to those on Earth (i.e., made of water ice). Herschel later reasoned that the changes observed in those caps indicated that Mars had seasons. This "wave of darkening" would become central to Lowell's vision.

The transformation of the Red Planet continued with the imaginative "terraforming [of] Mars in the 1830s" (Weintraub, 2018: 81; see also Lane, 2010). Wilhelm Beer and Johann Mädler's hand-drawn maps showed a patchwork of dark spots much like

Huygens's drawings. Theirs was the first in a subsequent half century of speculation about the shades and hues seen through the telescope. For the German astronomers, the planet's red appearance was the result of sunlight passing through its atmosphere—much, they reasoned, like Earth's sunsets. For the Italian priest and astronomer, Angelo Secchi, the two distinct colours showed land and sea. English astronomer, William Dawes saw rivers. Schiaparelli, of course, saw *canali*. Lowell, canals.

That fact that Lowell saw canals on Mars was not simply the result of what the telescope offered the eye. Particularly significant in this regard were nascent spectroscopic analyses which he cited regularly (Markley, 2005). The spectroscope, which combines telescope and prism, was not a reliable or overly common instrument of astronomy until the 1960s (Reike, 2009; Sinton, 1986). It registers the absorption and emission of electromagnetic energy by matter, thus decoding the elemental makeup of stars, planets, and atmospheres by way of each element's unique spectral fingerprint. In the 1860s the English and Irish astronomers William and Margaret Huggins were the first to use this technique. Detecting water vapour, they concluded (incorrectly it turned out) that the Martian atmosphere was similar to that of our planet.

Equally influential in shaping Lowell's vision were the catastrophic droughts experienced on Earth in the late-nineteenth century as well as the infrastructural ascendence of canals at the time (Markley, 2005: 13, 109-110; see also Davis, 2001): the successful construction of the Suez Canal (1859-1869), the aborted attempt by France to construct the Panama Canal in 1881, and beyond. Yet, it would be a mistake to construe Mars as a screen onto which fantasies were projected. Instead, Mars was positioned as an inscription surface (Kittler, 1999) whose decoded record revealed Earth's future. But to understand the positioning of a world akin to ours as a harbinger or prophet requires attention to the scientific theories and schemata available at the time, namely the nebular hypothesis and Social Darwinism. Lowell was an avid proponent of both.

Near the end of the eighteenth-century French scholar Pierre Simon Laplace formulated his nebular hypothesis (preceded by Immanuel Kant) to explain the formation of the solar system. Crudely put, a primordial rotating cloud of dust cools, shrinks, and speeds up out of which form the sun and the planets. For Laplace, not alone in bringing evolutionary ideas to bear on astronomy (Crowe, 2008: 302), the planets, like biological life, follow unchanging laws of evolution.

Within this observational framework, it is not only Mars that changes (from ancient god to celestial twin). Earth is too rendered "one more mere wanderer among the heavens" (Panek, 1998: 13). In other words, an Earth already decentered by the Copernican revolution descends from universal archetype to specimen. Particularly revealing on this point is the debate regarding the Red Planet's colour and vegetation documented by Flammarion. In 1860, French astronomer Emmanuel Liais argued that Mars's perceived colour was not caused by its atmosphere but by vegetation. Flammarion (2015: 105) uses this to critique British astronomer John Herschel's observations of 1830, arguing, "If the surface of the soil is reddish, can it not also mean that it is covered with vegetation of this tint?" Furthermore, in rejecting the idea of Mars as a dust covered desert he asserts, "Why, we may ask, is not the Martian vegetation green? Why should it be?—is the reply. From this point of view, there is no reason to regard the Earth as typical in the universe" (Flammarion, 2015: 440). Just because Mars is subject to the same evolutionary processes as Earth—which for Flammarion signals the inevitability of life for god creates nothing in vain—does not mean that it is a monozygotic or identical twin. In unseating Earth from the position of archetype Flammarion renders the relationship between the two planets dizygotic or fraternal.

As with any set of twins, one is, if only minutely, older than the other. Mars is smaller than Earth and thus cooled down significantly faster. As such, it is further along in its evolution and, therefore, older than Earth.[6] Heavily influenced by the English philosopher, Herbert Spencer (1895; see also Lane, 2010; Strauss, 2001), Lowell's (1908) six-stage planetology stresses this temporal dimension by explicitly bridging the nebular hypothesis and Social Darwinism. Earth is at the fourth, "terraqueous stage". Mars, on the other hand, already in the fifth "terrestrial stage" of evolution, has lost its oceans. In his telling, Mars is different than Earth not only on account of local circumstance, but also as a function of time. Put another way, if in antiquity the red deity's position in the sky, that is, its position in space, was an omen of what was to come, in the modern age of progress its futurity is a function of its position in linear, evolutionary time relative to Earth.

The fraternal twins in question here are not only the planets but their inhabitants as well, who are inseparable from their environs in Lowell's nativist and environmental-determinist politics (Lane, 2010; Markley, 2005). The contention that the very "idea of an inhabited Mars goes back almost to the time of the invention of the telescope" is not entirely correct (Burgess, 1990: 14). Weintraub (2018) traces cosmic pluralism, the belief that other worlds held life, from the Greek philosopher Epicurus in the third century BCE through to Italian friar Giordano Bruno who was burned at the stake in 1600 during the Roman Inquisition (see also Connes, 2020; Crowe, 2008; Dick, 1984). In the age of the telescope, Bernard Le Bovier de Fontenelle's 1686 *Conversations on the Plurality of Worlds* racialized the inhabitants of Mercury and Venus while insisting that life on Mars is limited to birds similar to those on Earth (Fontenelle, 1990). Others, however, readily speculated about intelligent life on Mars, as Huygens (1698) did in his posthumous *Cosmotheoros*. Almost two hundred years later, Camille Flammarion did the same. But because Mars was further along in its evolutionary development, he could stake that it was "inhabited by beings more intelligent than we, and less imperfect" (Flammarion, 1896: 557).[7] It is these elder fraternal twins who were capable of constructing canals visible from another world.

Within the schema in which Lowell sets his narrative of a dying planet not only do terrestrial environments provide for the evolution of groups but their surfaces are, in turn, marked by that evolution. Humankind's agricultural plots and irrigation lines if viewed from above are, argues Lowell, signs of our intelligence. It then follows that the evolutionarily advanced engineering feats of Martians would be visible through the telescope's lens. Earth's future is etched into the Martian surface.

The future Lowell conjures is certainly not uninterested, as much as he attempted to maintain such a position by professing his secularism. Put another way, despite the terrestrial analogs of drought and canal construction, the form his world-building took is not self-evident. For example, while the science fiction of the day largely adhered to the idea of Mars as an inhabited yet dying planet, writers put this notion into the service of various political projects: from critiquing imperialism to promoting socialist utopianism (Markley, 2005: 115-149). What Lowell provided was a future that naturalized environmental degradation and Western racial hierarchies. Both were "the result of inexorable evolutionary laws" (Markley, 2005: 69). As such, the only lesson to be taken from the future revealed by Mars is the need for a promethean effort organized around social, racial, and environmental hierarchies (Markley, 2005: 94, 110). As many scholars have pointed out about futures (e.g., Hong, 2021; Jameson, 2004; Virno, 2015), Lowell's vision simultaneously reflects and works in the service of maintaining his present and its teleological notion of progress.

There is more to this, however, than the entanglement of telescopic data, scientific theories, and political ideologies. As the various takes on the "wave of darkening" above suggest, at the core of this imaginary is the speculation engendered by the telescope rather than the incontrovertible clarity of the data it provides.

II. Speculation at the limit of distinct vision

Vogl (2007: 22) stresses that "every truth that appears through the telescope is bordered by as-yet-undiscovered truths … the birth of a certain idea of science, positioned in the awkward space between sensory experience and abstraction." In rendering the Orion constellation on paper, Galileo draws known and newly seen stars differently while gesturing that there are many others beyond the optical limit of the telescope. Similarly, the discovery of Uranus by William Herschel in 1781 led the president of the Royal Society to ask, "what other nameless and numberless phenomena remain behind"? (Panek, 1998: 98). Indeed, what a medium makes visible indexes the fact of a new "depth of the unclarifiable" (Vogl, 2007: 22). But it is not simply the case that Lowell saw canals and, in asking what remained beyond the resolution of the telescope, utilized Social Darwinism to hypothesize the existence of Martians. The dividing line between visible and invisible is not as clear as the above examples suggest. The reality of observation is messier.

The messiness of observation as a situated practice is part ethico-political (as the pervious section illustrates) and part onto-epistemological (Barad, 2007; Haraway, 1988). Haraway's (1988: 587) question, "What limits to vision?", is approached here neither as a singular political determination nor as a distinct border. Instead, Serres's

(2007: 79) contention that where there are channels "there must be noise" is utilized to more fully appreciate a medium's "anesthetic field," the relation between the visible and the invisible (Vogl, 2007), as a zone of opacity. Indeed, Lowell's future illustrates how both visual noise and what lies beyond the medium's vision—and in their overlap—generate a space that begets theorizing, interpretation, speculation (both open and measured), incremental development, and wild ideas.

Various battles emerged out of the canal controversy. Lowell had many detractors including American astronomer William W. Campbell, British naturalist Alfred Russel Wallace, and French astronomer, Eugène Antoniadi. Campbell, for one, asserted that he could not see canals through his telescope. Others, like Earl C. Slipher, an astronomer at the Lowell Observatory, attempted to offer supporting evidence for the canals. The details of these disputes have been documented elsewhere (Lane, 2010; Markley, 2005; Sheehan, 2016; Strauss, 2001; Weintraub, 2018). The most relevant critique for the issue at hand is found in Joseph Edward Evans and Edward Walter Maunder's 1903 experiments on the limits of vision.

The schoolmaster and astronomer duo sought out to determine whether or not the canals were merely an optical illusion. To do so, they set up a series of experiments that approximated the visual experience of observing Mars via telescope. Students between the ages of twelve and fourteen (all boys) sat in a bright gymnasium with good lighting, "free from glare or shade" (Evans and Maunder, 1903: 489). In the gymnasium hung circular discs (3.1 to 6.3 inches in diameter) which were, depending on the experiment, 15 to 62 feet away from the observers. Given drawing paper with a circular disc already on it, students were instructed to draw the features they saw on the hung discs. The participants were not told to look for anything in particular—"They were told repeatedly to draw all that they could see, but nothing of which they were not certain" (498)—and it was unlikely they had observed Mars through a telescope on their own. From 13 experiments the authors conclude "that markings having all the characteristics of the canals of Mars can be seen by perfectly unbiased and keen-sighted observers upon objects where no marking of such a character actually exists" (497). The authors stress that the canals are in a sense "truly 'seen,' not imagined," and suspect that what had occurred in observations of Mars is that "the eye inevitably sums up the details which it cannot resolve into fine lines essentially 'canal-like' in character" (497-498). Indeed, in their experiments, "the canals were best seen a little outside the *limit of distinct vision*" (499, *emphasis added*). That is, they are not projections beyond what is visible but the result of what is offered at the blurry margins of the apparatus. Here, noise as much as signal (or speculation beyond signal) gives shape to futures imagined.

To adapt a phrase from Serres (2007: 79), quite literally, "No canal without noise." In discussing flows and using "channels" and "canals" interchangeably, Serres is making the point that without noise the medium dissolves into immediacy. But here this wordplay might be reoriented to point to how noise, in this case visual noise, does not simply muddle or distort a message or make the medium itself visible (as much as it does). Instead, it provides the stuff for speculation. The telescope is not used in the Evans and Maunder experiments. Rather its presence is mimicked through a manipulation of scale. While this exclusion perhaps suggests that the telescope is positioned therein as a transparent extension of the eye, what is evident from the experiments is that the optical illusion uncovered is, *in situ*, not possible without the telescope. When the astronomers of antiquity looked up into the night sky, they saw a deity not canals etched into the surface of a planet. Thus, however much a product of cognitive processes, the canals are "not imagined" but have a material basis. Indeed, wonders often come into being by way of a medium and must be simultaneously "rare, mysterious, and real" (Daston and Park, 1988: 17). Not only does the telescope produce "distortions—elongations, blurriness, color fringes" (Panek, 1998: 4) but, as Serres (2007: 66) puts it, "As soon as I start to talk with this new interlocutor, the sounds of the banquet become noise for the new 'us'." Transposed into the visual, the sounds of the banquet in this case consist of the atmospheres of the planets and the Red Planet's ubiquitous dust.

Here it is useful to return to the nascent spectroscopic observations conducted by the Hugginses in which they detected water vapour. Their method of determining the makeup of the Martian atmosphere consisted of comparing spectra from the Moon to that of Mars. The former has no significant atmosphere and thus was intended to calibrate against the effect of Earth's atmosphere on measurement. Almost a century later, American astronomer Bill Sinton (1957) observed absorption patterns on Mars thought characteristic of leafy vegetation found on Earth.[8] In each case it turned out—30 and 10 years after their initial observations, respectively—that what was detected was nothing more than elements of the Earth's own atmosphere. That the Hugginses' method did not work is indicative of its difficulty (Weintraub, 2018: 236; see also Campbell, 1884a; 1884b). Here, in relation to the spectroscope the atmosphere that sustains life on Earth becomes the noise that sustains the fantasy of life on Mars.

By the 1930s the canal craze had largely subsided. Indeed, the debate had been as much about delineating the boundary between science and pseudoscience (Markley, 2005) as well as demarcating who is permitted to speculate therein. Lowell's wealth was certainly a significant factor for gaining access into this exclusive club. Nevertheless, Lowell, who died in 1916, and his adherents failed to provide convincing evidence, and the pillars of his planetology gradually fell into disfavour. While theories of non-humanoid life persisted—most notably Dutch astronomer, Gerard Kuiper (1955), asserted that flora on Mars were extant, however limited to lichen—these too would flounder. On 15 July 1965 Mariner 4 beamed back its first image of Mars (*Figure 2*):

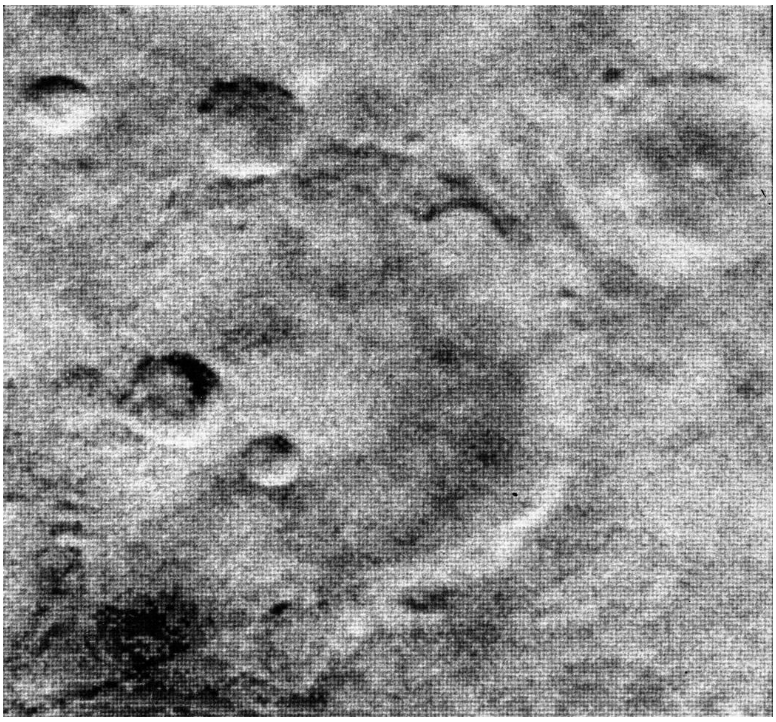

Figure 2: First Fly-By Image of Mars
Credit: NASA/JPL

As the renowned scholar of Mars, Nadine Barlow (2008: 5), put it, only after cameras had been rocketed into outer space were astronomers "able to say definitively that canals do not exist on Mars and that the 'wave of darkening' simply results from the movement of dust and sand across the planet by seasonal winds."

While astronomers had observed yellow clouds on Mars since 1892 (McKim, 1996) and Antoniadi hypothesized they were composed of dust, those whose observations formed the foundation of Lowell's vision—namely, Flammarion and Schiaparelli—actively contested the idea that Mars was an arid, desert-like planet (Flammarion, 2015: 436). Kuiper (1955: 280), for his part, argued that dust was yellow, not the black or dark gray of the patches observed on the surface. The wave of darkening that these observers believed to be an indicator of life—as vegetation, rivers, or canals—turned out to be an effect of Martian dust. Here, dust as noise reveals as much as it obscures from sight. Through his telescope Lowell unwittingly performed a sort of abacomancy, divination by dust, by way of reading (into) the dust strewn about the Martian landscape by aeolian forces. Lowell's future, it turned out, was not one inscribed on the surface of Mars, but a fantasy adrift in the dust of another planet. (I return to dust as medium in the conclusion.)

III. Good viewing

Visions of tomorrow do not sit comfortably in anesthetic space. It is a field of contestation. Telescopic observers of Mars were well aware of the distortive potential of the Earth's atmosphere. Observational reports of the time, as thoroughly documented by Flammarion, almost always include the conditions of viewing. Lowell's supporters and detractors equally articulated in detail the atmospheric and thermal conditions necessary for "good viewing": high altitude, clear sky, dry air. As much as they touted the technical specifications of their instruments, each would stress why the environment in which they made their observations—either at their own observatories or those to which they travelled—was the most suitable. Thus, in regard to what the telescope offers, observers engaged in debate about the medium itself, how best to see what it offered to the eye, and which auxiliary technologies might be useful in this regard. (Again, visions arise out of complex media ecologies.) The aforementioned spectroscope was used only marginally at the time. Thus, the focus here is on the more prominent use of photography and the attendant debates regarding mechanical objectivity (Daston and Galison, 1992; 2007; Galison, 1998) to highlight how Lowell leveraged the noise of one medium against his critics in order to keep his vision alive.[9]

The invention of the telescope began the process by which unaided vision was stripped of "its status as natural evidence" (Vogl, 2007: 18). Even Mars's characteristic hue that had tied it to coming violence and malady throughout antiquity was not what it seemed: its "colouration is not as red as is generally believed," wrote Flammarion (2015: 440). Lowell, moreover, was operating at a time when photography had already long upset the eye's evidentiary authority. Photography was paired with the telescope from the former's inception. The first confirmed successful astrophotograph (that combines telescope and camera) is American chemist John William Draper's 1840 image of the moon (Brasch, 2017a).[10] At the turn of the century Lowell set out to photograph the Red Planet in order to silence claims of illusion. Taken and developed by Carl Otto Lampland of the Lowell Observatory, in 1906 Lowell published the "First Photographs of the Canals of Mars" as a report to *The Proceedings of the Royal Society*. Squarely in line with notions of mechanical objectivity at the time, which sought to "let nature speak for itself" and extricate human intervention (Daston and Galison, 1992), Lowell asserted that photography would "make the canals of Mars write their own record" (Lowell, 1906a: 132).

Various newspapers touted the success of the photographs, which some have attributed in part to Lowell's aptitude for storytelling (Markley, 2005: 87-92; Nall, 2019). Conversely, Lane (2010: 55) notes the images did not have the widespread effect on public sentiment Lowell sought because their low resolution made them impossible to reproduce for mass publication. Even so, Lowell resisted the urge to retouch the images (Daston and Galison, 2007: 179). Peter Galison (1998: 329) also notes that Lowell's commitment to nonintervention is evident in his 1905 drawings based on mere 15-minute exposures of the eye to what the telescope offered. But as Daston and Galison (1992: 98) argue, "while photography played a central role in the continuing development of mechanical objectivity, it neither created not terminated the debate over how to depict." Indeed, Lowell's position in this debate is more complex than a mechanical adherence to (a new) objectivity. Rather, it is indictive of the non-linearity of the development of regimes of visuality within and around science (Dhaliwal, 2023).

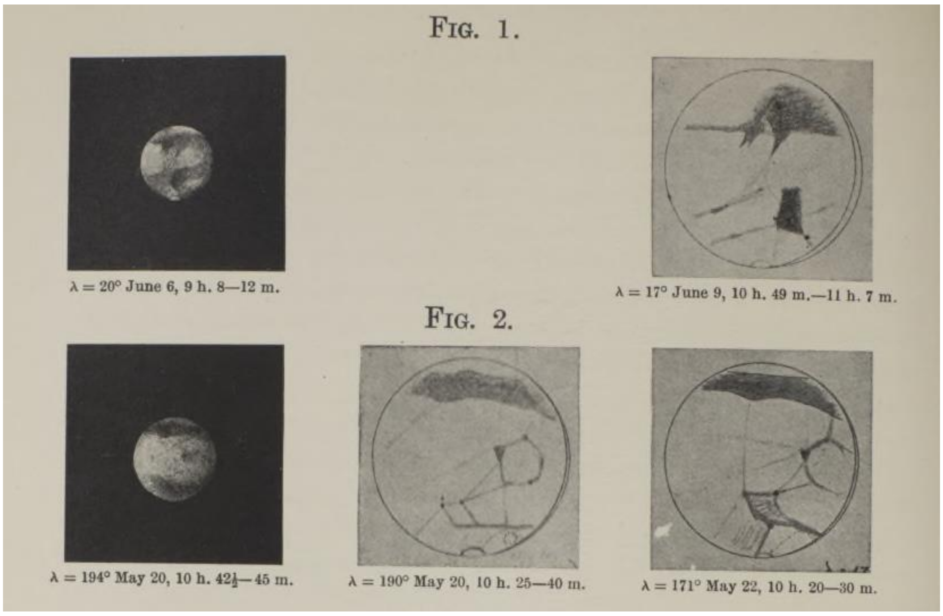

Figure 3: The First Photographs of the Canals on Mars with accompanying sketches
Source: Lowell, 1906a, plate 1 between pages 134 and 135

Galison (1998) examines both Lowell's photographs and drawings but does not consider the fact that, in his original report to the Royal Society, Lowell (1906a) tellingly juxtaposes these himself (*Figure 3*). That each photographic plate is accompanied by one or two of Lowell's hand drawings may be taken as an admission that the canals could not speak for themselves through photography. But Lowell stresses that the drawings were "made absolutely independently of the photographs and selected for the regions and the times at which the photographs were made" (Lowell, 1906a: 135). As such, rather than a capitulation, this move is indicative of the ways in which he leveraged notions of "good viewing" in the context of mechanical objectivity to keep his vision alive. For Lowell, juxtaposing the images puts into relief issues of noise vis-à-vis the camera, supporting his argument regarding the superiority of the trained eye.

The most obvious issue for Lowell's use of photography was the problem of mechanical reproduction and resolution. In addition to his well-documented travels to show various parties his original photographs, he also argued that with the camera, as with the telescope, "good viewing" requires a particular configuration. For the "true effect" of the photograph to materialize it must not be magnified "for the grain of the plate will soon destroy the true character of the detail" (Lowell, 1906a: 135). In effect, the material limitations of the photograph might obscure or even erase the lines inscribed on the surface of Mars. Noise here becomes not only the source of a fantasy but also the means by which to maintain its plausibility. This is all the more evident in Lowell's discussion of the photograph's sensitivities.

The same year he published the first photographs, he wrote in *Mars and its Canals*:

> Its [the camera's] rival, of course, is the eye…. Now, thus viewed, its superiority in one respect is unquestionable; it simply states facts. But though it cannot misinform, *it can color its facts by giving undue prominence to the effect of some rays and suppressing the evidence of others*, so that its testimony is not, it must be remembered, always in accord with that of human vision (Lowell, 1906b: 272, *emphasis added*).

The photographic plate has sensitivities along the electromagnetic spectrum. And these sensitivities were experimented with. Astronomers tinkered not only with telescopes or their location but, for those who employed photography, the chemical composition of plates and the use of filters (Brasch, 2017a; 2017b; Hentschel, 2002). Lowell simultaneously highlights various forms of intervention within a supposedly self-abnegating process but attempts to turn what was celebrated as an evidentiary feat—that with photography light was no longer merely observed, it was collected—on its head. From his attempts to photograph the surface of Mars he concluded, the "eye is a very much more powerful instrument than the camera because the camera must register the bad moments with the good, and details perfectly distinct to the eye must not be expected in the prints in consequence" (Lowell, 1906a: 135). As with today's Martian rovers (Vertesi, 2015), one had to be taught how to properly view the procured photographs, a point Lowell articulated in his correspondence with Lampland (Markley, 2005: 91-92). Only the trained eye can filter the "bad moments," distinguish signal from noise.

Lowell's arguments are perhaps a precursor to a regime of objectivity based on judgement and the expert interpretation of images that would not take firm hold until the mid-twentieth century (Galison, 1998). But for the subject at hand—mediated futures—what Lowell's entry into this debate highlights is the complex, non-dyadic, play of making and unmaking, of visibility–opacity–invisibility within which the status of Mars as prophet sits uncomfortably. When the photograph does not, on its own, corroborate the story of the telescopically-enhanced eye—and in Lowell's argument it is the presence of the camera that naturalizes and erases the presence of the telescope—Lowell leverages the noise to which the camera is subject against his detractors. In what is perhaps a contradictory position, the noise of the photograph is equally important to maintaining Lowell's vision as is its evidentiary value vis-à-vis the telescope. Because the camera does not simply observe light, but collects it, and because of its sensitivities and limited resolution, he can argue that it is in fact the trained (telescopic) eye that is better suited for good viewing. Lowell's prophet arose from the unstable noise of the telescope and maintained its stature through the leverage provided by the noise of the camera.

IV. Mediated futures in the dust of another planet

This paper has shown how media can spark visions of tomorrow through what they offer at their eco-technological edges. The canal craze, as a future inscribed on the Martian surface, is the product of noise as much as, if not more than, signal. Certainly, it is historically and ecologically particular. Yet it raises important questions for how the relationship between media and futures might be conceptualized. Elemental media are infrastructural (Peters, 2015) and noise is what reveals infrastructure (Nunes, 2011). Above, dust is simultaneously an elemental medium and the constitutive visual noise of the telescope; it is both infrastructural and that which reveals infrastructure. Here the poetics of infrastructure and the poetics of noise converge (Larkin, 2007; Nunes, 2011; see also Hainge, 2013; Malaspina, 2018). This is perhaps nowhere more evident than on the Red Planet today which remains a site of futural investment, largely by way of the designs of Silicon Valley billionaires whose efforts, nevertheless, borrow from and overlap with scientific space exploration (Messeri, 2016; Tutton, 2021; Vertesi, 2015).

The dust of the planet, and the regolith from which it derives, remains at the core of Mars's futural allure. Freed from the Earth's atmosphere, advances in spectroscopy have allowed scientists to, when corrected for roaming and settled dust of course, partially decode Mars's four-billion-year-history which, as it turns out, is indeed etched into its surface. (Unlike Earth's record it has not been overwritten by tectonic forces.) Simultaneously, the surface is transformed into an archive of elements that serves as a reference for the production of regolith simulants, which are then used to prototype the 3D-printed human colony of the future. The most recent, Mars Dune Alpha, was printed inside a hangar at NASA's Johnson Space Center in Houston, Texas in 2023. In this vastly different ecology, abacomancy shifts from the telescope to parametric design software and 3D printers.

In media theory dust (and its granular kin, sand) is seemingly all things material and temporal. It is death (Connor, 2009; Parikka, 2015) and the stuff of creation (Negarestani, 2008). It is a "ledger for past existence" (Marder, 2016), the "underside of progress" (Gabrys, 2011), and the condition of new timelines (Zee, 2022). While running the risk of trapping theorizing in an endless loop—all things ashes to ashes, dust to dust—as elemental medium it challenges long held notions that posit futures as open or closed.

Diagnoses of the contemporary foreclosure of the future and the role of media in this operation abound, though scholars differ significantly on the causes, tenor, and details (Berardi, 2011; Carey and Quirk, 1988; Huyssen, 2006; Jameson, 2004; Pogačar, 2017; Stiegler, 2008). A key symptom of this foreclosure is the recycling of tomorrows in a way that maintains the present in a variety of respects (Hong, 2021; Virno, 2015). But a singular focus on packaging, on what is visible, perhaps overly suggests that "opening" the future is a matter of muddying the waters or blurring the gloss of tomorrow. Indeed, this is important. The basis of interplanetary futures may have changed—from an inhabited yet dying planet to a techno-habitable frontier—but they continue to service and launder extractivist, eugenicist, and colonial ideologies. Yet, for indeterminacy or openness to remain an uncritical endpoint of theorizing mediated futures risks positioning noise as singularly oppositional or obfuscatory vis-à-vis systems of control and the futures they (threaten) to bring into being. While a source of potentiality, *pace* Serres (2007), noise need not necessarily lead to reorganization (Hayles, 1990). Although Lowell's vision may have challenged scientific orthodoxy in some ways (but see Markley, 2005), it firmly reinforced the social order of the day. In more recent history, precisely because of its recalcitrance to exact reproduction, sand was a key part of Cold War speculative infrastructures whose function was not the prediction of a single future but the generation of multiple possibilities (Kirschenbaum, 2023). There is certainly a risk in positioning dust (and sand) as the stuff of both closed and open futures. But what dust's role in interplanetary visions over a century ago, today, and in the shift between these visions highlights is that the futurological function of media pivots on a complex non-dyadic play of visibility-opacity-invisibility within a historically-specific ecology. Beyond opened and closed, it is not enough to highlight that efforts to foreclose the future are more effect than fact; if media are enlisted in this foreclosure and noise is constitutive of media, this much is evident. The interpretations and wagers on mediated futures, prescribed and potential, require a more nuanced analytic. This is because they are not so much inscribed in the present (Berardi, 2017) as they are situated uncomfortably within anesthetic space.

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Notes

[1] The future is a topic of increasing interest across fields including science and technology studies (Jasanoff and Kim, 2015), memory studies (Szpunar and Szpunar, 2016), sociology (Beckert and Suckert, 2021), anthropology (Valentine and Hassoun, 2019), and psychology (Topçu and Hirst, 2022).

[2] This is particularly relevant given that what the telescope cannot furnish is an eye into the present; see Rovelli (2017).

[3] The planet-god's position in the night sky usually portended imminent troubles: as it approaches Venus, military defeat; in conjunction with Jupiter, a king's death (but also a prosperous crop); nearby to Saturn, a coming scarcity (Koch-Westenholz, 1995). Thought to be a malefic god by the Babylonians, other cultures conceived of Mars as a warrior and protector (Chamberlain, 2019; Hamacher and Banks, 2019; Orthmann, 2013).

[4] Of course, the rise of monotheism first stripped Mars of its status as deity.

[5] Today the accepted measure is 24 hours, 39 minutes, and 35 seconds.

[6] While the notion of "deep time" goes back to James Hutton in the eighteenth century, at the time of the canal craze Lord Kelvin had estimated the Earth to be approximately 100 million years old.

[7] It is an idea that would persist well into the first quarter of the twentieth-century. Over a 36-hour period between 21 and 23 August 1924, the US government asked for radio silence throughout the country for the first five minutes of every hour so that Army and Navy receivers could listen for signals from Martians ("Asks air silence," 1924; "Mars sails by," 1924). At the time, William Coblentz (1925: 400), a key figure in the development of infrared spectroscopy, mused in a report of his spectroscopic observation of Mars, "whether or not Martians attempted to signal to us with bicycle lamps or other means, during the past summer, we do not know." On contemporary searches for microbial life or its remains on Mars, see Barlow (2008) and Walter (1999).

[8] There were certainly spectroscopic measurements made in the interim with varying results, see: Campbell (1184a; 1184b); Colbentz and Lampland (1925); Kuiper (1955).

[9] In this context "good viewing" highlights the imbrication of environmental conditions and notions of objectivity. Beyond the scope of this paper is how, in the case astrophotography, letting celestial nature speak for itself required not only the abnegation of the observer but also that of the world, its atmosphere.

[10] Louis Daguerre is said to have taken the first photograph of the moon, but it is lost to history.

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