Superflex

ISBN 978-3-943365-23-8

Re
proto
types,
Tri
ang
ulations and
Road Tests

Simon Starling/Superflex Reprototypes, Triangulations and Road Tests

TBA21

Simon Starling

Re proto types, Tri ang ulations and Road Tests

Thyssen-Bornemisza Art Contemporary

Sternberg Press

The Spectacle of Science: A Visual History of Venus Transit Observation

Birgit Schneider

"The best reason to watch the transit of Venus is history."• This is what NASA tells visitors to its website concerning a transit of the planet Venus across the Sun, which will soon be visible for the last time this century. A number of interlacing story lines, as laid out by the artist Simon Starling on the occasion of this rare event, will be used to trace the following media historiography of observation and visualization of the transits of Venus.

Starling's interest in the media and scientific history underlying this astronomical event is its connection to cinema history: embedded in the narrative of observation is a quite unknown but relevant detail of the history of scientific photography, which provides us with another wellspring of moving images. For the purpose of observing the Venus transit, a rudimentary motion picture camera, the *révolver photographique*, was constructed: an instrument that is "in large part the illegitimate child of those 19th century scientific exertions," as Starling puts it.•• By tracing some aspects of Starling's latest artworks focusing on this forgotten element, I will pursue with a media historian's tenacity the artist's narrative through global history and geography, like a pilot fish clinging to the wake of a sailing ship.

Reflecting the Transit of Venus

Starling's work *Venus Mirrors (05/06/2012, Hawaii & Tahiti (Inverted))* (2012) consists of two 60-centimeter parabolic circular mirrors mounted face to face. A line of six dark circular holes runs across each of the mirrors. The black holes mark the hourly positions of Venus crossing the Sun as it can be observed from two different geographic locations — Hawaii and Tahiti — on June 5, 2012. By changing their positions, viewers can visually superimpose the two mirrors. But although the mirror circles can be overlaid, the dotted tracks of Venus never match exactly. Instead an unclear and shifted impression is created, as if one is seeing double.

The doubling-up effect of the black circles is enhanced because the mirroring effect exceeds the impression of ordinary mirrors. Starling had them processed by a company specializing in the requirements for reflecting telescopes. Such optical mirrors provide a spectacular reflection rate of nearly 100 percent. When looking into the curved mirrors, visitors are confronted with the reflection of a magnified, exceptionally clean and bright virtual image. The black holes drilled into the mirrors therefore have the effect of brutally scarring the unsullied images that they reflect.

• See "James Cook and the Transit of Venus," *NASA Science News*, http://science.nasa.gov/science-news/science-at-nasa/2004/28may_cook/.

•• Artist's statement about his planned film *Black Drop*.

At the same time, Starling's *Venus Mirrors* recall old master paintings that present the Greek goddess Venus looking at herself in a mirror. In Starling's case the desire for perfect beauty has been replaced by the post-Keplerian longing for perfect exactitude, represented by the blank spaces of the black holes.

Venus transits take place when the planet passes directly between the Sun and Earth. At these times Venus becomes visible as a tiny black circle moving across the solar disk. Transits of Venus occur in pairs eight years apart, separated by long intervals of 121.5 or 105.5 years (in other words, the pattern of recurrence is at intervals of 8, 121.5, 8, and 105.5 years); hence they are very rare astronomical events that are not experienced during everyone's lifetime. The German astronomer Johannes Kepler is known in scientific history as being the first to predict the event for 1631, an accomplishment that was made possible only by using the new theory of Earth orbiting the Sun. The transits were observed with scientific instruments in the years 1631 and 1639, in 1761 and 1769, in 1874 and 1882, and in 2004. The transit in 2012 will be the last to take place this century. After this, the next transits will occur in 2117 and 2125, a prospective point in time that is imaginable today only in terms of science fiction. This significantly fictional aspect of Venus transits is also reflected in Starling's work *Venus Mirrors*. Although we know the time and course of the next transits with certainty, we are utterly uncertain about our own and Earth's future in the twenty-second century. What actually becomes evident in the mirrors' polished surfaces is this other blank space: the blank space of knowledge.

It is not only because of the rarity of the event that the transit has played such an important role in the history of science but also because of a weighty astronomical question that could be answered only by observing the event. By precisely measuring the four intersection times of the two outlines of the Sun and Venus from geographically remote locations, it was possible to determine the mean distance of Earth from the Sun (known as the "astronomical unit") and from this the size of the solar system. Once the event became predictable, three distant generations of astronomers set out to find the best possible way of unearthing the elusive data. This was how the Transit of Venus became a major motivation for the development of astronomical observation techniques in general.

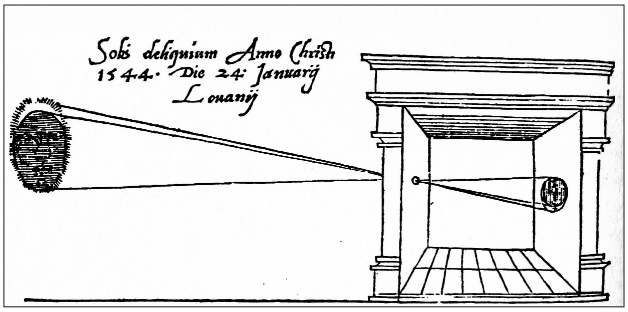
To make use of this event scientifically, in the cause of early data collection, astronomers required a whole slew of instruments. They wanted to obtain figures from the event by using chronometers to measure time; telescopes, mirrors, and filters to block the sunlight; and instruments like quadrants to determine exactly the longitude and altitude of the points of observation. To ensure that the data ascertained from distant observatories would be comparable, a high degree of standardization of the instruments was required. But the challenge of exact measurement was so elusive that the history of the observation of Venus transits can be related not so much as a heroic linear progression of knowledge acquisition but as a fractured story line including errors, obfuscation, and failure.

Early Solar-Disk Cinema

It is impossible to observe the Sun with the naked eye, since to stare at the dazzling solar disk would cause serious damage to the retina. This is one reason why the history of optical media and the history of observing the Sun developed alongside each other. A second reason lies in the fact that vision had long been the primary sense of the astronomer, and thus observation of astronomical bodies requires ways of enhancing the eye.

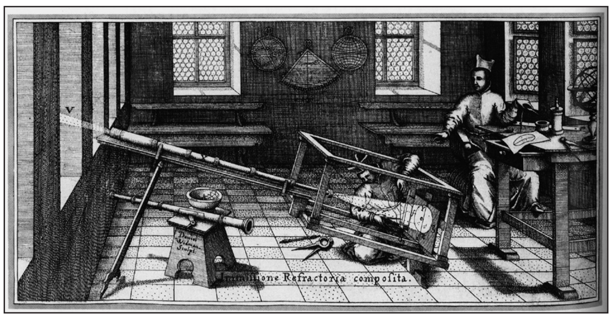
Interestingly enough, the first known representation of a camera obscura, dating from 1544,• already shows the epistemic use of this device for watching a particular event of celestial mechanics [fig. 1]. The light of a solar eclipse passes through a hole in the wall and projects an image, which appears upside down on the opposite wall of a small building. It is the face adorning the Sun's disk, depicted on its head. The figure explains the entire projection process, the solar disk being almost completely obscured by the moon and the optical reproduction of this sight in the chamber. As becomes evident here, in the field of optics, holes are general devices for focusing light and sight; this throws another light on the black holes Starling uses to represent Venus. The holes might even be regarded as blind spots on the optic disk of a retina.

fig. 1



Some decades later, in 1613, the Jesuit Christoph Scheiner built a device called a helioscope, also based on the camera obscura [fig. 2]. What he added to the dark-chamber principle was a telescopic device with which it became possible to watch the Sun's surface in greater detail with reduced brightness. Thus he was able to observe the temporary phenomenon of sunspots more systematically.•• By inserting a piece of paper as a projection screen, he could not only watch the changing shapes of sunspots but also very accurately record their shapes in pencil at the same time. Astronomers do not look at the Sun itself any more; they observe its image on a projection screen.

fig. 2



From today's perspective, the use of sixteenth-century helioscopes might be deemed a cinematographic event in *status nascendi*. The combination of magnifying devices such as mirrors or lenses and dark chambers is reminiscent of a movie projector, in the sense of an optomechanical device for displaying moving pictures by projecting them

• Gemma Frisius, *De radio astronomica et geometrica* (Antwerp, 1544).

•• Horst Bredekamp, *Galilei der Künstler. Die Sonne. Die Hand* (Berlin: Akademie, 2007), 217–27.

on a screen. The helioscope projected images of the Sun *in color and movement*. It was the Sun's original luminosity which was deployed as the brightest primary light source for this projection purpose. Thus the device rendered visible its technical conditions of possibility, like a film projector screening the image of his projection lamp. The spectacle of sunspot phenomena was received as a cinematographic spectacle. At the same time it informed the projection screens in the observatories with a *new* sort of visual knowledge. The projected image became visualized without human involvement. The difference was that the helioscope, like every observer who wants to watch celestial bodies over a period of time, had to be moved to successively capture the Sun moving across the sky.

The helioscope principle was also used in 1639, when the Venus transit was observed in Europe. The 1631 transit had not been visible there. The English astronomer Jeremiah Horrocks estimated from his observations of the event that the distance of the Sun to Earth was 95 million kilometers, which was a long way off the figure of 150 million kilometers known today. But at that time the rare event stirred the hope in the astronomy world that subsequent Venus transits might reveal better knowledge about the astronomical unit. Horrocks reflected poetically that the remote 1761 transit would be observable only by his descendants, writing, “the splendid sight / Again shall greet our distant children's eyes.”[•] It was James Cook, born in 1728, who, together with his crew, was one of the subsequent generations to observe the small planet crossing the solar disk, observing the transit during their famous expedition on the *Endeavour*.

Chasing the Best Sighting of Venus around the Globe

Starling is also preparing for the 2012 transit of Venus, due to take place on June 5–6. His main artistic enterprise around the event is a film called *Black Drop*, which he will complete in the fall of 2012. For this work, Starling himself will undertake a journey, visiting some of the remote observation sites to which his ancestors voyaged. “Together with a small film crew, a journey will be made to the islands of Hawaii and Tahiti to observe and film…the 2012 transit of Venus and related historical sites. This contemporary footage of the transit and of the various key sites, with the addition of a number of historical photographs, illustrations and paintings, will form a frame within which to understand this rare event and its connections to the birth of the moving image.”[••]

Starling will film the actual transit of Venus from one of the largest observatories in the world, located on the island of Hawaii. After that he visits Point Venus on Tahiti. He plans to also include historical material relating to the previous observations: images of observation sites and instruments,

---

• Horrocks’s observations of 1639 were published by Johannes Hevelius in 1662 under the title *Venus in Sole Vista*.

•• Artist's statement about *Black Drop*.

including those used by the figures discussed in this essay, which he gathered by trawling the archives. By bringing together all this heterogeneous material from different periods, places, and sources, the artist performs a kind of artistic *historical piracy*, the appropriation of science and media history in order to arrange the scattered historiographic elements into a new narrative: one driven by a profound desire for *seeing and knowing*. As he writes his artistic story line into the history of the many Venus observations all over the globe, he becomes more a pirate who adopts and reorganizes the supposedly fixed elements of the story into a narrative about the varying conditions of visual knowledge acquisition in different media eras. In filming the event, he renders the observation sites *film locations*. At the same time, by again reenacting under new conditions the observation "missions" set in motion by Venus, Starling's cinematic journey becomes an object of nostalgic longing for both a history and a future, seemingly distant and unknown, like the planet itself. Methods of artistic research blend with a deconstructed role model of discovery embodied by the artist.

Of course, travel conditions have changed radically since Cook's time. Starling will hop on a plane to reach the remote islands. The network of connecting narratives that in the seventeenth and eighteenth centuries consisted of only a few individual threads has evolved into a web of connections made by ships and planes that have since plotted their trajectories around the globe. It is the network of globalization, whose knots have become increasingly dense and which connects distant cultures, deliberately or not, more and more closely. Starling will witness the consequences of this process when the 2012 Venus transit takes him to observation points such as the one Cook's enterprise was sent to, in order to capture on film his contemporary impression of these sites.

After the failure to record valuable data from the 1761 event, Great Britain, like other European nations, mounted ambitious programs to make progress in the matter of evaluating the astronomical unit. In 1769 British observation teams were sent to Norway, Canada, and the island of Tahiti, which had been visited for the first time by Europeans only recently, in 1767.

One often loses sight of the fact that the primary aim of the great *Endeavour* expedition of 1768–71 was to reach the location offering the best view of the celestial phenomenon that is the Venus transit. This question of astronomical research, which lay at the heart of the whole endeavoring enterprise, actually turns Captain James Cook's global journey into one of *space travel*. The departure into unknown worlds more closely resembles a trip made by Captain James Kirk. It is worth noting that until today great amounts of national funding go into space enterprises. Likewise, when the Royal Society commissioned the scientific voyage to Tahiti in the eighteenth century, national prestige and power were at stake.

The early scientific seafarer Edmond Halley suggested in 1716 that the future transit of 1769 should be seen as an opportunity to calculate the astronomical unit using the geometric method of solar parallax.[•] Hence the sight of a Venus transit, Halley writes, would be "by far the noblest astronomy affords."[••] The method of parallax makes use of "the difference in direction of a celestial object as seen by an observer from two widely separated points."[•••] The different positions of the two observers and the position of the object form a triangle. If the baseline between the observation sites is known and the direction of the object as seen by each observer has been measured, the parallax can be used to determine distances.

This is why the line of holes drilled into Starling's mirrors does not match but rather seems to deliver a distorted image of dots: the path of Venus crossing the Sun appears different from every position. It is precisely this subtle divergence that is needed to perform the parallax. Visitors who try to match the two mirror patterns actually realize the triangulation of the 2012 transits between Hawaii and Tahiti anachronistically by visually taking in two standpoints at once and experiencing the difference.

It was the desire to witness this noble sight that spurred nations to equip the costly expeditions in 1769. But the view was not easy to obtain. For the transit in 1769, astronomers had calculated that observing conditions would be optimal in the most distant and unknown regions on Earth. To get the best data for the parallax method, they had to travel to a spot in the middle of the Pacific Ocean, which could be reached only by sailing for many months under the most exhausting conditions.[••••]

The organizers strove to make all necessary preparations for the observation on Tahiti by choosing the best instruments, like reflecting telescopes and astronomical clocks; bringing together gifted observers; recruiting a captain who was also a trained astronomer and geographer; and planning ahead for a simple observation site on the island. However, they hadn't spent enough time considering the fact that the choice of Tahiti as observing location would simultaneously lead to the side effect of "cultural exchange" with the inhabitants of that distant location. When reading the very clipped sentences in the journals of James Cook and his companion Joseph Banks, it becomes evident that observing the habits of the natives was often much more spectacular than watching a sober virtual telescope image

---

• Edmund Halley, "A New Method of Determining the Parallax of the Sun," *Philosophical Transactions of the Royal Society* 29 (1716); translated from Latin.

•• Edmund Halley, "De visibili conjunctione inferiorum planetarum cum sole, dissertatio astronomica," *Philosophical Transactions of the Royal Society* 17 (1691); translated from Latin.

••• Encyclopaedia Britannica Online, s.v. "parallax," last accessed May 11, 2012, http://www.britannica.com/EBchecked/topic/442773/parallax.

•••• See Tony Horwitz, *Blue Latitudes: Boldly Going Where Captain Cook Has Gone Before* (New York: Henry Holt, 2002). In his critical biography of James Cook, Horwitz was able to learn about these conditions when he joined the crew of the *Endeavour* replica.

of a little black circle passing across the Sun during long hours of disciplined observation.•

It was Saturday June 3, 1769, when "no Indians was [sic] allow'd to come near us that nothing might disturb the observation."•• Thirteen members of the expedition took up their positions in the observation tents built on "Fort Venus" and two other places on Tahiti. Here they stood behind their telescopes to follow the event while the observers' assistants stood next to astronomical clocks and took care of the time measurements. ••• But although the view was very clear that day, an unforeseen problem occurred while watching. Cook described the difficulty, writing: "We very distinctly saw an Atmosphere or dusky shade round the body of the Planet which very much disturbed the times of the contacts particularly the two internal ones."•••• Cook described here what later was called the *black drop effect*. Because of this phenomenon, it was impossible to know the exact moment at which the trailing edge of Venus's disk entered the Sun's disk, especially during the second contact of the two circles' outlines. When crossing the Sun's edge, the perfect circle of Venus is lengthened optically into a teardrop-like shape. For a long time, the black drop effect was explained as being caused by Venus's thick atmosphere. If the effect was taken as evidence that Venus had an atmosphere, it became feasible that Venus provided similar conditions to those on Earth.••••• How this effect obscured his and his colleagues' data is described by Cook in his journal. "Dr Solander observed as well as Mr Green and my self, and we differ'd from one another in observeing the times of the Contacts much more than could be expected."•••••• His team had observed contact values with a discrepancy of up to thirteen seconds; such inaccuracy rendered the figures more or less useless.

When the *Endeavour* returned to Britain in 1771, astronomers and mathematicians gathered together all the data collected in the different locations of the 1761 and 1769 transits to perform the parallax. The discrepancy between the observations that Cook provided can be compared in an illustration that accompanied his article compiling the

• See James Cook, *The Voyage of the Endeavour, 1768–1771*, Journals of Captain Cook on His Voyages of Discovery, vol. 1, ed. J. C. Beaglehole (Cambridge: Hakluyt Society at the University Press, 1955).

•• Robert Molyneux, a member of the observation team, cited in Wayne Orchiston, "James Cook's 1769 Transit of Venus Expedition to Tahiti," in *Transits of Venus: New Views of the Solar System and Galaxy*, ed. D. W. Kurtz (Cambridge: Cambridge University Press, 2004), 57.

••• Ibid., 54.

•••• Cook, *Voyage of the Endeavour*, 97–98.

••••• Jimena Canales, "Photogenic Venus: The 'Cinematographic Turn' and Its Alternatives in Nineteenth-Century France," *Isis* 93, no. 4 (2002): 595. Canales has investigated the relations of cinema and scientific history most thoroughly. See also Canales, *A Tenth of a Second: A History* (Chicago: University of Chicago Press, 2009).

•••••• Cook, *Voyage of the Endeavour*, 98.

results of the observations for the *Philosophical Transactions* of the Royal Academy [fig. 3].[•] Here, two series of images can be seen, showing the movement of Venus across the edge of the Sun, split up into individual steps. The atmosphere of Venus is painted like a nebulous band circling the planet, and during the contact Venus resembles a leaking drop of ink.

What the graphic thus renders visible is a grand moment of failure. It must have been exceptionally frustrating to stand behind the telescope beneath the clearest possible sky in Tahiti after so many months of sailing and preparing for the event only to be tricked by the perfidious drop effect. The longed-for noble sight of Venus was irrevocably obscured. A popular history of astronomy from 1901 beautifully describes the high expectations that the black drop effect had ruined: "instead of meeting and parting with the desirable clean definiteness, [the limbs of the Sun and the planet are] clinging together as if made of some glutinous material, and prolonging their connection by means of a dark band or dark threads stretched between them."[••]

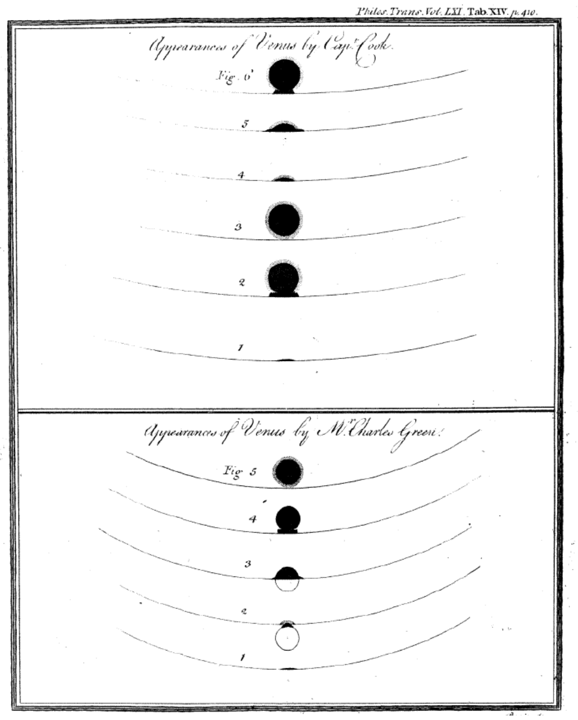


fig. 3

Although Thomas Hornsby, who helped Cook with the parallax analysis of the data back in Britain, came up with a solar parallax value that was remarkably close to the value accepted today,[•••] other analysts — like Jérôme Lalande, Leonhard Euler, and Maximilian Hell — generated very different parallax figures. The discordance between each of these parallax values makes the results seem uncertain and speculative. Astronomers had no choice but to relinquish to future generations of astronomers the task of obtaining better data from the next Venus transits, in 1874 and 1882.

[•] The data was even more uncertain because Charles Green had died on the way home, and he had been the one who took care of the data. Unfortunately Cook was not able to find the times Green had observed clearly indicated in his manuscripts. See Orchiston, "Cook's 1769 Transit of Venus Expedition," 58.

[••] Agnes M. Clerke, *A Popular History of Astronomy During the Nineteenth Century* (London: A. & Ch. Black, 1902).

[•••] See Orchiston, "Cook's 1769 Transit of Venus Expedition," 61.

Objectively Revolving Venus

Until the nineteenth century the practice of observing the Venus transit with a telescope required the close collaboration of the senses of hearing and seeing: the seconds of the four internal intersections had to be counted in the mind's eye by listening to the ticking pendulum of a clock while following the moving shape of the planet with the eye. Because the whole astronomical event takes six hours, observers had to battle with the trembling of their hands and the fatigue of their eyes and minds. Hence the largest source of mistakes in astronomical observation was, generally speaking, *personal error*.• These difficulties were magnified by the black drop effect, which made the results of each observer even more discordant. The problem with transit observations before the nineteenth century was that the only opportunity to measure this moment relied on the fallible senses of the observer. Otherwise the chance passed by without the possibility of repetition, since there was no means of recording the observation itself. In the nineteenth century the question of whether the black drop effect had an astronomical or a physiological cause was the subject of heated discussions. An artificial transit machine was even built in advance of the 1874 transit to prove that the effect was nothing more than a "scientific prejudice" like the "fable of an animal in the moon."•• Astronomers could not tell what they were looking at: the deceptive effect caused by their instruments or an actual process taking place on the planet's surface. This tentativeness about the actual source of a perception can also be experienced when looking at Starling's *Venus Mirrors*.

In 1874 a new dispositive media arrived on the scene: astronomers hoped that with the advent of photography they finally had a technical method to hand that could successfully reduce the risk of personal error by replacing the unreliable human sensory apparatus with the objective, unerring mechanics of a camera.••• Moreover, not only could observations through telescopes now be recorded automatically on photographic plates; they could also be reproduced for subsequent interpretation.

Jules Janssen — a member of the French Academy of Science, mathematician, astrophysicist, voyager, and instrument builder — prepared for the forthcoming Venus transit of 1874 by studying how photography could be used not only to record the special moment but also to render visible the progression of time. Janssen's idea of employing a camera was not only about precisely recording the visual impression of the event: he also wanted to use it as a reliable instrument for *time measurement*. To this end, he modified a daguerreotype camera into a device that he

• *Dans le champ des étoiles: Les photographes et le ciel, 1850–2000* (Paris: Editions de la Réunion des musées nationaux, 2000), 16.

•• Charles Wolf, an astronomer at the Paris Observatory, cited in Canales, "Photogenic Venus," 595.

••• Quentin Bajac, "1840–1875: Les faux départs de la photographie astronomique," in *Dans le champ des étoiles*, 16.

called the *révolver photographique* — a name that even his contemporaries thought to be “un peu trop l’art funeste et brutal de la balistique.”[•] The association of “shooting images” and “shooting a gun” in this case originated from a technical similarity: *revolver* was the epithet for any mechanism built to rotate a cylinder. Janssen’s device, which was constructed with the help of an instrument builder, was wound up with a crank handle [fig. 4]. It consisted of a circular photographic plate and a revolving mechanism, which rotated the plate forty-eight times at intervals of 1.5 seconds to capture the next photograph. After 72 seconds the mechanism stopped automatically.

With his adapted camera, Janssen hoped to be able to specify exactly the point in time when each individual shot was made — and hence to deduce the exact moments when Venus came into contact with the Sun. By employing photography, he also hoped to avoid the disturbing black drop effect. Although it was decided that the official equipment of each French expedition team should be an identical “national apparatus” — a regular camera — Janssen equipped his observation team, which participated in one of the French expedition parties to observe the Venus transit of 1874 in Japan, with his revolving apparatus, smuggled onboard unannounced. Besides Janssen’s team, two British expedition parties also took along a revolving camera: soon after they had learned of Janssen’s principle, they had a British instrument builder construct similar devices producing sixty or twenty images per plate. Again, the Venus transit of 1874 was a grand national enterprise. This time a total of ten countries participated, with observation teams sent to more than eighty observations sites all over the globe.[••]

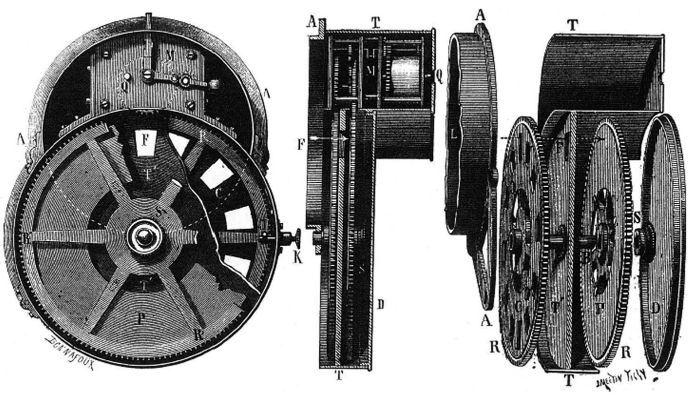


fig. 4

The photographic material brought home from the various sites consisted of several dozen plates. Unfortunately, not one original example has been preserved, except one that was shot for testing in 1876. According to Janssen, the images shot in Japan were “weak, but clearly visible.”[•••] On the preserved test daguerreotype, the continuous movement of a small circle can be seen forging ahead on each picture frame. It shows a series of solar segments, looking

• Camille Flammarion, “Le passage de Vénus,” *La Nature*, May 1875, 356.

•• Françoise Launay, *The Astronomer Jules Janssen: A Globetrotter of Celestial Physics*, trans. Storm Dunlop (New York: Springer, 2011), 73–75.

••• Cited ibid., 82.

a little like the points of a crown [fig. 5]. Disappointingly, when all measurements were analyzed, the results obtained by photography proved to be no better than those obtained using other methods.• Again the expeditions had been a failure.

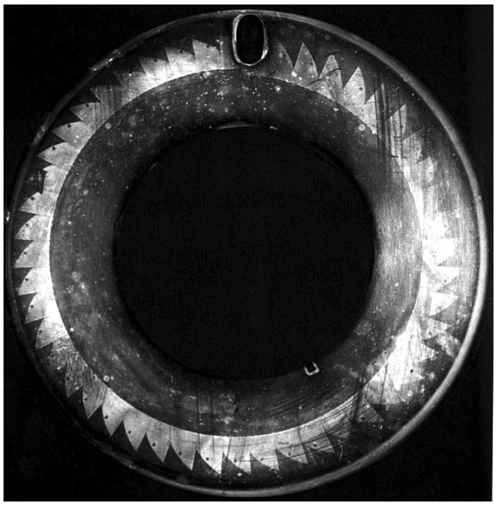


fig. 5

Janssen's enterprise was concerned with the serial recording of a moving object in successive phases of motion, this being the definition of chronophotography. Like Eadweard Muybridge's photographic studies of the flying legs of a trotting horse (1872) and Étienne-Jules Marey's visualization of the waving wings of a flying pelican (1882), Janssen's circular portraits of Venus flying across the solar disk were developed to reveal an "optical unconscious"—a term coined by Walter Benjamin—with the help of a photographic plate.•• The fusion of photography and movement was realized because of the desire to produce a new sort of scientific knowledge. This new sort of knowledge was revealed optically by photographic visualization. Visualizations surrogated the epistemic object of the Venus transit and became a second level of epistemic objects to be questioned. At the same time, photographic technology was thought to meet the scientific ideal of "mechanical objectivity" in the nineteenth century, which sought to replace human perception with media technology that could record automatically.••• In his later talks on celestial photography, Janssen enthusiastically commented on the epistemic potential of photography for science in general: "the photographic plate will soon be the actual retina of the scientist."••••

Today it is known that the black drop effect is caused neither by the Sun nor by Venus: it is a smudging of the image of Venus by turbulence originating in Earth's own atmosphere and imperfections in the viewing apparatus.

• Canales, "Photogenic Venus," 602–3.

•• Walter Benjamin, "The Work of Art in the Age of Its Technological Reproducibility (Third Version)," in *Walter Benjamin: Selected Writings*, vol. 4, *1938–1940*, ed. Howard Eiland and Michael W. Jennings, trans. Edmund Jephcott et al. (Cambridge, MA: Belknap Press of Harvard University Press, 2006), 266.

••• Lorraine Daston and Peter Galison, *Objectivity* (New York: Zone Books, 2007).

•••• Launay, *The Astronomer Jules Janssen*, 109.

Shot/Countershot: Janssen, Marey, Lumière

The question arises as to how a historiography of the moving image could be written differently, as Janssen's apparatus is normally excluded from it. What does it change about cinematic history when a new initial starting point is taken into account, this being the scientific observation of an event of celestial mechanics?

In fact, the quality of the visual content of Janssen's daguerreotype disks showing the Venus transit is rather poor or even diagrammatic, the issue of intersecting circles being a purely geometric one. We see a small circle changing position on a larger circle segment. On an aesthetic level, it is not nearly as spectacular as the study of humans and animals in motion that became popular so quickly in the 1880s and that Janssen had already suggested in 1876 as a potential use for the revolver.• The playful and spectacular aspect of cinema is entirely missing from the early events of chronophotography capturing the cosmos. Instead, Venus as an object of a cinematographic event appears as the result of the desire of disciplined and well-trained researchers to replace their own sensory apparatus with automatic registration devices. Obviously they were not at all interested in the fascination of cinema machinery.

In one preserved image, Jules Janssen appears in person as a ghostly fantasy figure on a photographic disk split up into twenty sequences [fig. 6]. It was his colleague Marey who shot the sequence in the 1880s with his adaptation of the photographic gun. On the disk we see Janssen, the academy member, wearing a bizarre white turban, his hand aloft, smoking a cigarette.

This strange photographic portrait introduces a more playful element into the cinematographic historiography of Venus. It reminds one of magic disks, also called phenakistoscopes. Such toys became very popular after the 1830s. Here the sober scientific history of the moving image connects with another cinematic story line, which is a narrative of fascinating toys and effects of illusion. On magic disks, we see simple movements of daily routines like cyclists, dancers, escaping mice, and grimacing faces. Circular picture disks had also been constructed for epistemic reasons, although at issue here were the conditions of visual perception itself. The magic disks were also called "philosophical toys" since they were able to make obvious the human phenomena of vision, like stroboscopic effects and afterimages.

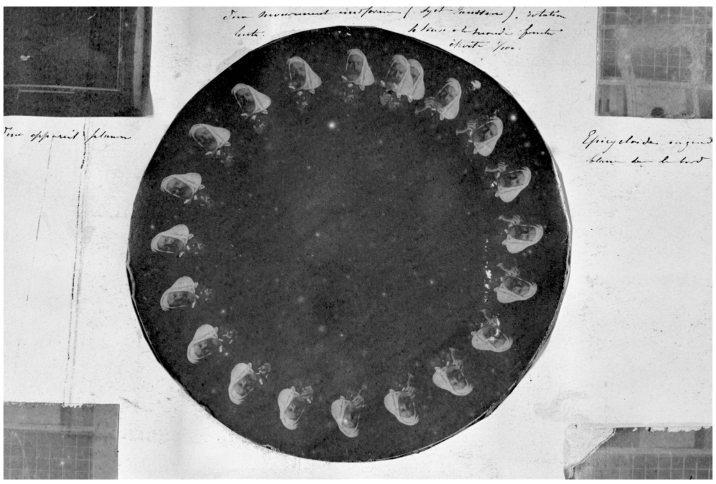


fig. 6

• See Martha Braun, *Picturing Time: The Work of Etienne-Jules Marey (1830–1904)* (Chicago: University of Chicago Press, 1992), 55. For an interlaced history of cinema and science, see also Canales, *A Tenth of a Second*.

Later Janssen not only went on to capture the Sun in countless photographs but also became an active member of the French Photographic Society, of which he was elected president for three years. Originating here, a third trace of Janssen's presence in movie history can be followed. During a meeting of the National Union in Lyon in 1895, Louis Lumière made Janssen's arrival the subject of one of his very first amateur films. This short movie is similar to "Leaving the Factory" and "Arrival at the Train Station" (both also 1895), in which a fixed camera films people walking through the doors of a factory or a train. Here one can see the landing of the participants in the congress. Janssen is stepping off the boat carrying a camera, which he seems to point back at the cameraman Lumière, who at this very moment is shooting some of the first minutes of moving images on celluloid film. The "Landing of the Participants" together with a movie called "Discussion among Mr. Janssen and Lagrange" and other early Lumière movies were screened together with "Leaving the Factory" in 1895 at many institutions.

Shots, countershots, rotating revolvers, locomotives, and locomotion are central to the revolution in visual history, such events of looking making up the visual history of the Venus transit. Starling will shoot his film *Black Drop* employing the antiquated nineteenth-century technology of celluloid film. At the end of the film the artist will capture himself editing the movie. Thus the film can be seen within the film, "giving it a Russian doll–like structure as the editor/astronomer finds himself editing himself editing,"• or resembling an onion, which, when the skins are finally removed, is revealed to be empty. Starling's method of artistic research acts here like a second-order cybernetics. Observers can never see how a system works because they are always engaged with the system being observed. A media historiography of looking comes to a similar end. Circuits are closed like endless feedback loops of lookers looking at the process of looking to critically reflect on the role of media in producing the conditions under which knowledge is "successfully" generated.

• Artist's statement about *Black Drop*, 2012.