

## Bird watching: satellites, telescopes and the metaphor of transparency

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Remote sensing is the act of measuring and observing an object from a distance without any physical contact. Interestingly, the term 'remote sensing' was coined by Evelyn Pruitt, a geographer for the Office of Naval Research at the start of the Cold War. This paper argues that remote sensing space satellites represent a contemporary interweaving of vision, knowledge and power and as optical devices have, like the telescope in the 17<sup>th</sup> century, changed how we think and engage with the world.

Space satellites provide a uniquely modern perspective of the earth in that they, as Hanna Arendt wrote in *The Human Condition*<sup>1</sup> were, 'the first step towards escape from men's imprisonment to the earth.' Satellites liberate us by allowing us to see ourselves from space while their instruments provide new insight into our global environment. Space satellites like telescopes extend human sight to make the imperceptible perceivable. Expanding vision beyond the eye's capability allows for greater scrutiny. Even though phenomena observed through a satellite or telescope constitutes a perceived reality, these observations must still be discerned as true. Verifying what is seen is entrenched in a scientific methodology created in part during the 17<sup>th</sup> century. This paper will illuminate how the principles of objectivity in scientific practice and metaphors of transparency have changed in relation to the development of new optical devices and digital imaging methodologies in the 21<sup>st</sup> century. This historical analysis of the telescope in the 17<sup>th</sup> century and the space satellite of the 20<sup>th</sup> century show how knowledge acquired through technologically enhanced vision has shifted both scientific and social paradigms that in turn profoundly influence cultural norms.

Surveillance is commonplace in today's society and the remote sensing satellite is just another tool of observation that functions as a form of deterrence. Surveillance is

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<sup>1</sup> Arendt, Hannah *The Human Condition*. Chicago: The University of Chicago Press, 1998.

a vehicle of power that creates in the end a self-regulating subject. Two artists whose work deals with space satellites, Trevor Paglen and Kathy Marmor, tackle this issue by overturning modern science's professionalism and employing a form of inverse surveillance. Paglen's, *The Other Night Sky* and Marmor's *Bird Watching* are works that act as a tactical response to our society's culture of secrecy and passive consumerism. In fact, Paglen writes '*The Other Night Sky* was primarily inspired by the methods of early astronomers like Kepler and Galileo, who documented previously-unseen moons of Jupiter in the early 17th century. Like contemporary reconnaissance satellites, Jupiter's moons weren't supposed to 'exist,' but were nonetheless there.'<sup>2</sup> I argue that both works employ a contemporary definition of transparency that reframes our thinking.

The first telescopes (c. 1608) were used primarily for naval or military purposes and consisted of a convex and concave glass lens with a low magnifying power set in a long tube. Galileo is usually credited with improving the telescope for the purposes of astronomy, although lenses and writings on optics, e.g. Alhazen's (965-ca:1039) *Book of Optics* and Roger Bacon's (1210 - 1294) *Opus Majus*, predated him. Galileo's refracting telescopes had a magnifying power of approximately 20X and worked by using a plano-convex or biconvex objective lens that concentrated the light and a plano-concave or biconcave ocular lens that made the light rays parallel. Using his telescopes Galileo made a series of remarkable and important observations that included the phases of Venus and Jupiter's four moons. In 1632, Galileo argued in favour of Nicolaus Copernicus' theory that the sun is at the centre of the universe and all the planets revolve around it. Copernicus, *On the Revolutions of the Celestial Spheres*, is considered key to the development of the scientific revolution that occurred from the mid 16<sup>th</sup> century to the end of the 17<sup>th</sup> century. Copernicus' theories presented heliocentricity as an 'elegant, logically coherent, mathematical method'<sup>3</sup> that refuted empirical knowledge. During the 17<sup>th</sup> century, the observations made by philosophers and mathematicians as they looked through the telescope instigated a new world-view that overturned the Aristotelian paradigm, sanctioned by the Church - that placed the earth at the centre of the universe. The telescope itself represented a powerful but imperfect technology that initiated a number of treatises on optics, the eye and lenses by prominent thinkers such as

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<sup>2</sup> Trevor Paglen's website, *The Other Night Sky*, 2007 ([http://www.paglen.com/pages/projects/other\\_night/index.html](http://www.paglen.com/pages/projects/other_night/index.html)).

<sup>3</sup> Smith A. Mark 'Knowing Things Inside Out: The Scientific Revolution from a Medieval Perspective.' *The American Historical Review*, Vol. 95, No. 3. Jun., 1990: 726-744 JSTOR (01/06/2009)

Johannes Kepler and Rene Descartes. Their writings laid the groundwork for a mechanistic approach that profoundly influenced modern science.

Between 1620 and 1630, Kepler wrote a short story called *Somnium*, or Dream, that imagined what it would be like to observe the universe from the moon. In Dream, a man and his mother landed on Levania (the moon) after being hurtled through space; from Levania they can see Volva (the earth). This device allowed Kepler to speculate on how the earth would look as it turns on its axis and orbits around the sun.

Although this is not the author's intention, Kepler's Dream anticipated modern space travel. He repositioned us so we now observe the earth from our lunar satellite; a familiar view in the 21<sup>st</sup> century.

The ability to launch an object into space and have it orbit the earth is indeed built upon some of the theories formulated during the 17<sup>th</sup> century, and later revised or elaborated on (Keplerian Elements, and Newton's law of gravity). Satellites are also the result of a scientific methodology that developed during the 17<sup>th</sup> century and even the satellite's purposes and its instrumentation continue to expand these fundamental scientific approaches.

Satellites are custom built instruments that orbit in space and are in constant communication with the earth. Remote sensing satellites have either, passive sensors that record radiation reflected from the earth's surface, or active sensors that send out a beam of light that will be reflected back. The data acquired by these sensors is transmitted to a ground station where it is interpreted by computers into some form of graphical representation. The remote sensing satellite is essentially an automated vision machine capable of making invisible elements legible to the human eye. Remote sensing data, and the images produced by it, are difficult to evaluate and require explanation from a skilfully trained 'interpreter'. Yet, these images carry the authority of a photograph and because of this the image and the technology collapse into a single representation.

We have little direct interaction with satellites as they are tied to space but we are aware of them because we are consumers of their products. Our knowledge about satellite technology depends on our self-education. There is a distinct imbalance of power, in which we have access to the daily benefits of satellites but absolutely no control over what they do, what they look at, or how their images are distributed. In the end, satellites are abstract: invisible, distant and complex.

Metaphors are useful for understanding abstract concepts; they also have the power to constitute reality.<sup>4</sup> Globalism is a metaphor for what satellite technology does: compress space and provide communication in real time. Transparency, perhaps not as familiar, is another metaphor for what satellites represent: optimism in the form of self-government and public disclosure of information.

Transparency is defined as the quality or state of being transparent.<sup>5</sup> To make something transparent is to make it clear, or easy to see through. Thus, transparency describes a practice of looking that implies there is a truth that lies beneath or beyond the object's surface. For example, the anatomist's scalpel renders the skin transparent or X-ray crystallography exposes the structure of DNA. It is a metaphor that defines a way to see and satellites are perceived as tools that show us truths about land, atmosphere, and universe by exposing their 'substance'. The idea that truth is hidden conserves the phenomenon's naturalness and divorces it from the possibility of being constructed by either the observer or culture. Paradoxically, this metaphor of transparency conceals the fact that satellite images are manufactured.

Transparency in a digital culture, where speed and accessibility is assured, can also refer to an uninterrupted flow of personal and public information with the understanding that privacy is compromised. Satellite imagery and data are part of this steady flow, partly out of economic necessity (satellites are expensive) and political manoeuvring (who owns satellites). Transparency has in fact become synonymous with information and has become a term used in contemporary society to signify accountability. The general public demands transparency from the government, corporations, and its financial institutions. Transparency and democracy seem to go hand in hand. Satellites are included in this rhetoric of transparency: if more countries have access to satellite technology then each country acts as the other's restraint. Ironically transparency may justify a proliferation of satellite surveillance.<sup>6</sup>

The geographer/artist, Trevor Paglen, in his two works, *The Other Night Sky* and *Limit-telephotography*, uses telescopes and large format cameras to document

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<sup>4</sup> Kornprobst Markus and Vincent Pouliot, Nisha Shah and Ruben Zaiotti. *Metaphors of Globalization Mirrors Magicians, Mutinies*. New York: Palgrave Macmillan, 2008

<sup>5</sup> <http://www.merriam-webster.com/>

<sup>6</sup> For a more complete examination of the politics of transparency see Marmor, Kathy. "Bird Watching: An Introduction to Amateur Satellite Spotting." *Leonardo* Vol. 41 No. 4. 2008: 317-323.

classified satellites and secret military bases and installations.<sup>7</sup> His photographs act as evidence of a secret government that acts outside of the public's reach. The conceptual basis of his work pushes past the notion of counter surveillance and into the metaphor of transparency itself. His images present what we all know but do not want to acknowledge. It is this uneasiness that reframes transparency by forcing us to recognize our own collusion. As Karen Beckman writes, 'the pictures shift our attention to photography's complex framing of the relationship between knowledge and vision'.<sup>8</sup> His pictures are the artefacts of the telescope and exist in a liminal space between belief and disbelief and as Paglen states; ' At the end of the day you have to trust that I am some kind of reliable witness.'<sup>9</sup>

In my interactive installation, *Bird Watching, 2007*,<sup>10</sup> I ask the viewer or participant to witness. Like Trevor's pieces, my work also seeks to address the metaphor of transparency. However, I do so by putting the viewer in direct contact with home made remote sensing satellites. My cardboard structures resemble boxes in flight and are embedded with proximity sensors and audio speakers. The simple material and form make my 'birds' appear innocuous, like the first reconnaissance satellites, their capabilities are hidden in plain sight.

I created *Bird Watching* to draw attention to space satellites as actual physical objects. My satellite's low-tech look is a humorous draw that beckons people to interact with them and when you look into the boxes or walk up to one they respond by making chirping or twittering sounds which becomes comprehensible as you move away from the box. The installation also includes a projected map consisting of six colourful concentric circles that represented my satellites in the installation space and when a sensor on a box is tripped the map tracks your movement from box to box. I want the participant to become aware of the invisible satellite, and become conscious of it as a machine that watches us, just as we wait and watch for it.

The use of an instrument to extend human sight provides a new way of seeing. The depicted images must be given a meaning and the means by which they were obtained must be explained. As Paglen says of *The Other Night Sky* '... the

<sup>7</sup> To see Trevor Paglen's work <http://www.paglen.com/>

<sup>8</sup> Beckman, Karen. *Telescopes, Transparency, and Torture: Trevor Paglen and the Politics of Exposure*. Art Journal, Fall 2007: 62 -67

<sup>9</sup> Vanderbilt, Tom. *Trevor Paglen Talks About The Other Night Sky, 2007*. Art Forum March 2009, XLVII, No. 7 224-228

<sup>10</sup> To see Kathy Marmor's work [http://kathymarmor.com/portfolio/bird\\_watching.shtml](http://kathymarmor.com/portfolio/bird_watching.shtml)

production of the symbolic order goes hand in hand with the exertion of control... if we can only control things by first naming or imaging them – then developing a lexicon of the other night sky might be a step toward reclaiming the violence flowing through it.' <sup>11</sup> The 17<sup>th</sup> Century provided a methodology that scientists use today but seeing is more than the just the physiology of the eye, Descartes qualifies this by creating a split between 'knower and knowledge' - by distinguishing the object from the image, and the image from the idea.

The telescope in the 17<sup>th</sup> century was a vital tool in the hands of many amateur astronomers and initiated important research on optics, vision and lenses. It corroborated theories that could not have been proved by the senses alone and ushered in a new paradigm based on mathematical reasoning. Like the invention of the telescope, remote sensing satellites have significantly altered our culture and in response we have created new metaphors to articulate what they do. Transparency is related to power and Paglen's work and my installation *Bird Watching* are attempts to highlight this relationship.

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<sup>11</sup> Vanderbilt, Tom. *Trevor Paglen Talks About The Other Night Sky*, 2007

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