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### The Eye of God? Nature Research and Satellite Images 2010

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## The Eye of God?

### Nature Research and Satellite Images



Fig. 1: *The Earth from the Apollo Spaceship*

For a long time it remained the privilege of God alone to view the Earth from the heavenly heights. Geographers, cartographers and artists all wondered what this view would look like and thus sought to reproduce it. The view of the Earth from space has since been amply documented, beginning with the first attempts at space travel. The photograph taken from an Apollo spaceship in December 1972 using a Hasselblad camera constitutes one of the first ever visual documents of planet Earth and proved to be a highly effective advertisement for

the Swedish manufacturer. Since these images were produced, this – once spectacular – view has become a more or less commonplace element of everyday culture. Captured by orbiting satellites, we encounter it daily along with less spectacular images of the Earth's surface shown on the weather forecast and in advertisements (Fig. 1).

One consequence of the centuries-long idealization of this view of Earth is the potential for it to become overladen with religious meanings, something that is also evident in secular contexts such as discourses about the 'blue planet'.<sup>1</sup> The image of the blue planet has since become an iconic symbol warning us of the perils of climate change.

Although both the Apollo photograph and the digital satellite image were produced for supposedly documentary reasons, they nonetheless carry within them fixed visual conventions and meanings which, as Denis Cosgrove puts it,

have drawn upon and reconstituted a repertoire of sacred and secular, colonial and imperial meanings, and [...] these representations have played an especially significant role in the self-representation of the post-war United States and its geo-cultural mission.<sup>2</sup>

- 1 Brian J. (Brian John) Skinner: *The Blue Planet: An Introduction to Earth System Science*. New York Chichester, 1999.
- 2 Denis E. Cosgrove: *Contested Global Visions: One-World, Whole-Earth, and the Apollo Space Photographs*. In: *Annals of the Association of American Geographers* 84.2, 1994. p. 270.

The aim in the following is, first, to explore the technical and visual traditions in which satellite images are produced and to show, second, in what ways images are involved in the construction of contemporary concepts of nature and to what extent the convergence of different media enable these constructions to find their way into generally shared communications throughout society.

In terms of the history of technology, satellite images came about as a result of military interests. With the start of the Cold War and the first attempts at space travel, efforts were also undertaken to study the Earth from space, following on from the military tradition of using either moored balloons or aeroplanes to produce photographs of landscapes from a higher vantage point. Naturally, military interests and military financial clout played a prominent role here. This is confirmed in the following comments made by Lyndon B. Johnson, who approved the cessation of regular flights by spy planes in view of the satellite technology being developed in the Soviet Union in the mid-1960s.<sup>3</sup>

I don't want to be quoted on this, but we've spent thirty-five or forty billion dollars on the space program. And if nothing else had come out of it except the knowledge we've gained from space photography, it would be worth ten times what the whole program cost. Because tonight we know how many missiles the enemy has and, it turned out, our guesses were way off. We were doing things we didn't need to do. We were building things we didn't need to build. We were harboring fears we didn't need to harbor.<sup>4</sup>

He was able to approve the ending of flights by spy planes because it was already abundantly clear that a satellite system was to be built. As far back as 1946 the American military authorities had charged the RAND (Research and Development) Corporation with developing a satellite system to discover information about the enemy. On May 2, 1946 RAND brought out a report entitled 'Preliminary Design of an Experimental World-Circling Spaceship', thereby reviving fantasies of conquering space. Explicit mention is made of the possibility of having 'observation aircraft which cannot be brought down by an enemy who has not mastered similar techniques'. RAND estimated the costs of this project at \$ 150 million.<sup>5</sup>

Interestingly, ideas about how to transport data corresponded to communication media technologies available at the time. The satellites worked partly with photographic stills or moving pictures, and the resulting films were hurled back down to Earth in capsules. The more modern technology worked similarly to television. A television camera was used and its images stored on magnetic tape until the satellite had passed by a receiving station and the images could be passed on as electric signals. This kind of technology was used in satellite transmission until the end

3 Georg Erwin Thaller: *Spionagesatelliten: unsere Augen im All*. Baden-Baden 1999, p. 12.

4 Thaller, p. 12.

5 Eric Dyring: *Wie die Erde entblößt wird*. In: Annagreta Dyring (Ed.): *Erdsicht – Global Change*. Stuttgart 1992, pp. 28–29.

of the 1970s. At that point photography was replaced by a new technology, which recorded and stored the light using a sensitive electro-optical technique – just as in the video camera which was to be developed later.<sup>6</sup> Here, too, the analogy between media technology and satellite imaging begins to become apparent.

After the end of the Cold War satellite surveillance gradually began to be used for civilian purposes. The first to recognize the value of panoramic photography were the meteorologists.<sup>7</sup>

Drawing on photographic techniques and combining these with elements from electronics, optics and informatics, remote sensing was developed in which data on emitted radiation are recorded and transformed into images.<sup>8</sup> In terms of media theory, this represents a radical change. No longer are we dealing with technical records of the Earth's surface but with digital imaging which transforms data into visual structures.

The history of observing the Earth from satellites offers clear documentation of military interests in media technologies. Military technologies were apparently able to engage in observation of the Earth away from the gaze of a public whose mass media were based on the same technological structures.

The first war against Iraq in 1990 (Gulf War) was described as a 'media war',<sup>9</sup> not least because the division between military uses and mass media communication could no longer be upheld. Images of swaths of land selected for bombardment functioned simultaneously as material for reporting news. The considerable discrepancy between media functions became apparent here: digital images being used for a specific (military) purpose were attributed documentary character. In this respect, the Gulf War is the first war in which the public mass media collaborated with the military's guidance technology.

However, there is a long standing tradition of collaboration between media technology and military technology. In his publication *War and Cinema*<sup>10</sup> French media philosopher Paul Virilio uses media theory to highlight the parallels between war and cinema, working with a tightly woven technological analogy between the apparatus of war and the film camera:

It was in 1861, whilst travelling on a paddle-steamer and watching its wheel, that the future Colonel Gatling hit upon the idea of a cylindrical, crank-driven machine-gun. In 1874 the Frenchman Jules Janssen took inspiration from the multi-chambered Colt (patented in 1832) to invent an astronomical revolving unit that could take a series of photographs. On the basis of this idea, Etienne-Jules Marey then perfected his chrono-photographic rifle, which allowed its user to aim at and photograph an object moving through space.<sup>11</sup>

6 Dyring, p. 29.

7 Ibid., pp. 34–35.

8 Ibid., p. 35.

9 Paul Virilio: *Krieg und Fernsehen* (War and Television). München, Wien 1993.

10 Paul Virilio: *War and Cinema*. The Logistics of Perception. London 1989.

11 Ibid., p. 19.

In the course of his subsequent comments on this issue, Virilio emphasizes the efforts made by the military to acquire filmic and photographic aerial shots: still or film cameras were tied to hot air balloons or airships to obtain aerial photographs of strategically important swaths of land. Virilio continues:

Soon the army was rigging together the most varied combinations: camera-kites, camera-pigeons and camera-balloons predated the intensive use of chronophotography and cinematography on board small reconnaissance aircraft (several million prints were made during the First World War). By 1967 the US Air Force had the whole of South-East Asia covered.<sup>12</sup>

This theory should not be dismissed off-hand, and indeed it does form part of my argument here. Nonetheless, Paul Virilio's argument fails to address some important aspects of the origins of visual traditions and of the discursive attributions of media apparatuses. In addition to the technical inscriptions of images, formative visual traditions and habitualizations of images exist which function as more than just technical inscriptions. Instead of exploring the formative power of these inscriptions, however, Virilio implicitly takes them as given and is thus able, drawing on historical visual traditions, to formulate his theory of the dominance of technological inscription. In this way, his ideas confirm the persuasive power of images, which has emerged in the course of a long historical process. They are images which, on account of their technical and visual traditions, establish an objective spatial perception.

My assumption—drawing on Cosgrove's comments—is that beyond the technologies there are image-related conventions and structures of communication which perform the task of transforming meanings and enabling them to function in adjacent discourses. According to this, images are nodal points for a multitude of different discourses. I would like to elucidate these ideas by taking a historical look at visualizations of landscapes from a bird's eye view.

Since there are real disadvantages to focusing methodologically on the technical aspects of photographic and filmic imaging, in the following I shall offer a way of looking that relates both cultural and visual traditions and technical dispositifs to one another. This way of proceeding draws on Arjun Appadurai's ideas about strategies of signification that work in different ways, which he calls <scapes>. According to Appadurai, a specific way of looking necessarily emerges from the combination of these different discursive spaces.<sup>13</sup>

Overviews of landscapes are images that are indispensable to warfare and are created using historically varying imaging technologies. Currently, warfare makes use of satellite pictures of the Earth or of specific landscapes. These images are generated technically in a variety of ways: they are not photographs but digital

12 Ibid., p. 19.

13 Arjun Appadurai: *Modernity at Large. Cultural Dimensions of Globalization*. Minneapolis, London 1996, pp. 27–47.



Fig. 2: Abraham Ortelius, *Teatrum Orbis Terrarum* (1570)



Fig. 3: Planet Blue Earth. Nasa photography of the earth

transports within itself its historically attributed guarantee of objectivity. Thus many images whose origin is diffuse, to say the least, continue to live from their attribution to the medium of photography.

Interestingly, implicit assumptions regarding photography and its capacity to offer a supposedly objective reflection of the world have remained a part of discourses about digital images. According to Lorraine Daston and Peter Galison this

constructions pretending to be photographs. Jörg Döring sees in them «ways of world-making» rather than depictions of reality.<sup>14</sup> William Mitchell, a theorist of digital photography, radicalizes assumptions about digital images in that he denies them all mimetic or indexical status. According to Mitchell, digital photography or digital imaging which no longer requires the use of any photographic apparatus has given rise to a form of image production representing an exclusive interpretation of data and their visual presentation.<sup>15</sup>

With regard to digital photography and other digital imaging methods, however, it is possible to identify a considerable discrepancy in terms of attribution. On the one hand, the indexical quality of images – in other words, the reference to an actual object – has diminished, while on the other photography, along with all its successor imaging procedures,

14 Jörg Döring: Raumdeutung. Vorläufiges zu einer «spatialen Hermeneutik» des digitalen Medienumbuchs. In: *Navigationen* 6.1, 2006. p. 57.

15 William J. Mitchell: *The Reconfigured Eye: Visual Truth in the Post-Photographic Era*. Cambridge, Mass. 1992.

attribution of ‹truthful representation› to photography arose in the context of the suppression of subjectivity in scientific discourses of the 19<sup>th</sup> century, at the same time as the shift occurred from drawing to photography. While illustration was still allowed to carry the marks of subjectivity, photography was accorded the role of being both symbol and imager of the new objectivity – suggested not least by its mechanical equipment.

Evidently, those engaged in military research as well as in civil use see the need to maintain the scientific claim (to objectivity) of their own images by seeking to perpetuate traditional photo attributions that have already long become obsolete: in contrast to technological progress, the representations of landscapes provided by limnology as well as the satellite images of the Earth follow fixed visual traditions for which clear evidence can be found. Thus the images serve not only as up-to-date documents they also reveal more far-reaching political and cultural interests.

One of the first landscape overviews arose long before any technical means of recording reality existed. In the year 1570 Abraham Ortelius's representation of the Earth, *Teatrum Orbis Terrarum*, displays astonishing similarities to contemporary representations<sup>16</sup> (Fig. 2 & 3).

Common to both these images is the way the viewer's gaze is guided from a seemingly divine standpoint down to the landscape below: viewers are equipped with the eye of God, giving them total control over the image and what it depicts. A particular viewing direction is established here which later on becomes very important in the military context and guarantees the objective perception of landscapes (Fig. 4).

Provost's painting *SACRED ALLEGORY* (1510) constitutes clearly the linking together of gaze, property and ideological legitimation. Next to the risen Christ stands his mother Mary, elevated to Queen of the World both appear to float among



Fig. 4: Provost, *Sacred Allegory*, 1510–1520

16 Cosgrove: *Contested Global Visions*, p. 271.



Fig. 5: Jacopo di Barbari, *Map of Venice* (ca. 1500)

the clouds while between them, held out by a disembodied hand, is a globe which is exposed to the all-dominating and controlling gaze of God.

This scene, a clear representation of imagined power relations, is dominated by the eye of God, which takes up the central viewing position like the sun in a solar system. Here, the eye of God is the ideal point of escape from which to gaze upon the Earth. Even though this is not represented explicitly in early modern representations of maps or landscapes, the gaze of God – that is, the gaze from above – is etched onto the map as an ideal typical position.

This representation also reveals much about the way the landscape is viewed – in a controlled and controlling way. The eye of God or of some superior authority gazing down from the heights onto the landscape is another highly stable tradition of European imagery. Representations which portrayed the seeing and possessing or appropriating eye of God from the outside were especially popular. This gaze of God is also imitated by the early maps of the Renaissance, which are based on an imagined view from the air (Fig. 5).

There is a mutual correspondence here between the views of the controlling eye and the viewing constellations of the eye itself. The view from outside cements God's claim to power and objectivity (we can assume that photography took over this role in the 19<sup>th</sup> century), and the consequence of the objective gaze of God is the way in which the landscape is represented. Thus we have a tradition of imagery running parallel to the maps and pictures of landscapes, which documents the positioning of the gaze in the form of a media dispositif.<sup>17</sup>

According to Denis Cosgrove, the representation of landscape arose as a mode of seeing the external world in the 15<sup>th</sup> and 16<sup>th</sup> centuries and was closely associated with the visual endeavors of the Renaissance and its concept of humanism

17 Cosgrove: *Contested Global Visions*, pp. 272ff.



and space. As Cosgrove shows, representations produced in different disciplines and areas of society, such as in painting and in landscape gardening, adhere to the same demands of the linear perspective as were also used in cartography and land surveying. The purpose was <the control and domination over space as an absolute, objective entity, its transformation into the property of individual or state.><sup>18</sup>

Spatial processing, modified according to the discipline concerned, was taught in a special manual.<sup>19</sup> This fact explains the varied usage of conceptions of space in different scientific disciplines. In this sense we can say that cartography and taking possession of the landscape occurred in parallel with one another, while the application of geometry often had the purpose of making the acquisition of actual space easier or preparing the way for it.

Implicit in the landscape idea is a visual ideology which was extended from painting to our relationship with the real world whose frame and compass Elizabethans so admired and which Georgian English gentlemen would only approach through the language of landscape painting.<sup>20</sup>

Cartography was happy to subordinate itself to this purpose: this emerges from a comment made by John Dee, the famous Elizabethan mathematician and magician. Dee praises geometry and the art of drawing in the following terms:

... great skill of Geometrie, Arithmetik, Perspective and Anthropographie with many other particular arts hath the Zographer need for his perfection... This mechanical Zographer (commonly called Painter) is marvelous in his skil, and seemeth to have a divine power.<sup>21</sup>

Naturally, military interests, including the need for ballistic calculations requiring reliable information about distances, are relevant to the perspectival use of space. Historically speaking, for example, there is a close link between the mode of representation and economic and military interests. Bruno Latour even goes so far as to describe the central perspective as a new kind of communication medium in prehistory whose function was to link different pieces of information together.<sup>22</sup> If we take Latour's ideas seriously we see that the central perspective is more than an esthetic decision: it links the various scientific disciplines and social domains with one another, thereby facilitating the interchangeability of visual representations. Images could now be used within and exchanged between different contexts, such as economic or esthetic ones, without a hint of disruption.

18 Denis E. Cosgrove: Prospect, Perspective and the Evolution of the Landscape Idea. In: *Trans. Inst. Geogr. N.S.* 10, 1985. p. 46.

19 *Ibid.*, p. 46.

20 *Ibid.*, p. 55.

21 Quoted in Cosgrove: Prospect, Perspective and the Evolution of the Landscape Idea, p. 58.

22 Bruno Latour: Drawing Things Together. In: Steven Woolgar, Michael Lynch (Ed.): *Representation in Scientific Practice*. Cambridge 1990.



Fig. 6: Honore Daumier, *Nadar in a captive balloon* (1858)

As we have shown, by the beginning of the 19<sup>th</sup> century stable visual structures already existed for organizing a great variety of discourses. Two technical innovations in the 19<sup>th</sup> century seem to perfect cartography and its claim to domination: the beginnings of aviation and the introduction of the technical image-making apparatus of photography. From its very beginnings, aviation sought to generate photographic images of the landscape. In 1858 the French painter, author and photographer Felix Tournachon, also known as Nadar, took an aerial photograph from a moored balloon in Paris. This undertaking was recorded by Daumier in a cartoon drawing (Fig. 6).

It was the combination of aviation and photography in particular that excited the cartographic imagination of the time. Contemporary texts provide evidence of the varied and exaggerated expectations made of photographic procedures, as indicated by a speech given by *Geheimrat* (Privy Councillor) Prof. Finsterwalder in 1923 about the merits of photogrammetry:

The necessities of war have – more quickly than one might have expected – removed the optical and photographic difficulties that stood in the way of taking aerial photographs from an aeroplane.<sup>23</sup>

Finsterwalder reflects further on the astonishing burst of innovation in photogrammetry, which he attributes to the First World War:

...and soon enough a thousand busy hands set to analysing the content of pictures from war maps, initially using laborious drawing methods, later with the help of photographic procedures.<sup>24</sup>

23 Geheimer Rat Finsterwalder, Prof. Dr. S.: Bedeutung der Photogrammetrie für Technik und Wirtschaft. Hg.v. Oberregierungsrat von Langendorff, Vortrag gehalten bei der 2. Hauptversammlung der internationalen Gesellschaft für Photogrammetrie. Berlin 1927. p. 11.

24 Ibid., p. 11.



Fig. 7: Erich Wasmund, *Aircraft on limnological excursion*

The advantage of the aerial photograph when compared with traditional photographs is the temporal proximity within which the images can be taken, as Finsterwalder notes:

The maps of the high mountains sketched previously in the interests of warfare are generally fifty, or indeed a hundred, years old and give only an imperfect picture of the mountainous formations and their current ice cover.<sup>25</sup>

It is interesting to note how, in the course of his talk, Finsterwalder shifts between the civil and military uses of aerial photographs, which can be used for both purposes. In this way, just like the perspectival pictures of early modernity, they meet the demands of a society which itself is constantly shifting between civil and military interests.

Whereas the visual strategies of perspectival representations have been adopted in barely modified form, the discursive contexts of the images have changed. This becomes especially clear when looking at the example of limnology (lake research) which works principally with cartographic material in conjunction with aerial photographs.

In his capacity as a limnologist, geologist Erich Wasmund mapped a range of landscapes in the 1920s, which seem to be located in the Romantic visual tradition

25 Finsterwalder, p. 11.

of the 18<sup>th</sup> and 19<sup>th</sup> centuries<sup>26</sup>, as shown by his images of lake landscapes which, in line with this tradition, depict reflections on the water's surface and sloping rays of sunlight falling on it.

His aerial photographs also fit with the traditions of landscape representation highlighted by Denis Cosgrove. If we look at the aerial images of Lake Constance, we can identify correspondences with the conventions of Renaissance cartography down to every last detail. Although the medium has very clearly moved away from drawing with the advent of photography and far more varied ways of looking at landscape have emerged since the advent of aviation, the aerial view of Lake Constance does display remarkable similarities in its iconography to the imaginary aerial images of Venice. Both images follow a central perspective which structures the aerial view of the landscape and conveys the illusion of a landscape that presents itself freely to the observer's gaze and apparently subordinates itself to its claim to dominance. The categories of water and land stand out through the use of especially sharply drawn lines: it almost seems as if the island of Lindau is sitting atop the water. In certain respects the photograph creates a separation between water and land, the water remaining an indefinable mass and the land appearing as an object awaiting appropriation.

At the start of the 1930s Erich Wasmund turned to cartography, apparently filled with the spirit of National Socialism, as demonstrated by his publications which appeal for geologists to be deployed in the regime's labor service (1934) and establish the use of military geology for the nation (1937).<sup>27</sup> Scholars of literature are familiar with the close interconnections between the homeland movement (*Heimatbewegung*), nature conservation and fascist ideology. What seems astonishing in the context of Wasmund's limnology and study of landscapes is how straightforwardly the proximity between landscape images and military geology can be created.

Wasmund's images alternate between an esthetic representations of landscape and obviously cartographic depictions that barely conceal their military usefulness. In this sense, many images of ecological research, too, are designed to be able to serve multiple functions in various discourses and can thus be deployed at random, regardless of discourse.

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