# Chapter 7: PERSPECTIVAL LOSSES

Hyperimages are assembled from many computed and corrected photographs. Because of this, they lack any one specific point of view (POV) as well as angle of view (AOV) or field of view (FOV). In other words, the such images do not allow for the possibility of a subjective view. Rather, they are computed based on the differential parallax between stereoscopic pairs, or the apparent displacement of the position of an object, such as the Earth’s surface, in respect to a reference point or system, when viewed from various positions of observation.

Figure 26: Clement Valla, Postcard from Google Earth - 40°50'41.94"N,73°54'42.33"W (courtesy of the artist)

The combining of geographical and geological images, maps, and photographs is today mostly done automatically. Yet, problems arise from such computational techniques. Using artificial intelligence, many different and diverse images can be computed and combined into a total image. fuse can calculate and fuse many images to produce a map-alike imaging. Such AI-based software includes, for example, the NASA Ames Stereo Pipeline (ASP), which merges a large amount of satellite images;Skycatch, a drone image processing platform; and Altizure, a community for realistic 3D modelling; to name but a few.[[1]](#footnote-1) Google Earth Engine also assembles together aerial photography, geological information system data, and satellite photography. Yet, problems arise from such computational techniques.

Machine vision, like human vision, has its own specific errors. What computer scientists call ‘glitches’ are often the result of some failure of a machine to execute the commands which we instruct it with, as machines have completely different way of operating than humans do. But artificial intelligence, because it is synthetic, does not automatically check for its own errors. Rather, AI can only detect errors in the imaging process through glitches in the image structure.[[2]](#footnote-2) Clement Valla, an artist who catalogues errors in the computations of Google programs which combine different images, has demonstrated in his serial *Postcard from Google Earth*, how many such glitches may have certain visual features in common.[[3]](#footnote-3) Valla’s series of artworks embody what Keller Easterling once observed: that disruptions, dissensus, and discrepancy are all contradictions in the structure of space.[[4]](#footnote-4) In Valla’s art, Google’s software is shown to have failed to recognize the pattern of a road or railway, building or bridge, having morphed such forms in accordance with the landscape.Therefore, Lawrence Bird concludes that:

[I]t is not a coincidence that these images, which record elaborations and disruptions in the infrastructure of a city, also evince ruptures in its image. These images are sewn together by the machinery of Google Earth from multiple satellite images taken at different times.[[5]](#footnote-5)

This total image is an image which is fractioned, segmented, sewn, and even partially invented. It does not form any unitary visual system. Or, as Angela Krewani writes, ‘Google Earth disjoins the experience of a planet earth into fractured smithereens of planetary knowledge’.[[6]](#footnote-6) Yet, it is not only that Google Earth which produces spatial deviations, but the employing photography without its original, linear perspective system. Computational photography, rather than serving as a tool for the analysis of space, actually produces a new category of space. This total image space exists independently of any given subject or subjective perception. And neither is it singular nor objective.

## Medieval Perspective

Given of the complex, assemblage effect in some images, authors such as Clemena Antonova and Martin Kemp, among others, look to the perspectival systems of the Medieval Period in their analysis of perspective, and these are of crucial importance in the post-digital age. [[7]](#footnote-7) Rudolf Arnheim terms such a perspective ‘inverse perspective’,[[8]](#footnote-8) Clemena Antonova ‘reverse perspective’,[[9]](#footnote-9) and John White ‘divergent perspective’.[[10]](#footnote-10) This perspectival system, in contrast to those which are more ‘analytic’ or ‘synthetic’, if the view is from above, has more in common with the ‘complex’ and ‘oblique’ view.[[11]](#footnote-11) As most of these authors consider this type of perspective to have already existed since Greek scenography in Antiquity, but to have reached its peak in Byzantine and Medieval icons, it is often referred to as – Medieval perspective.

During the Medieval Period, namely, Christian thinkers commonly thought of God as the guarantor of the existence of space, including those spaces which are not immediately perceivable, such as spaces in the past or at a distance. Therefore, for visual representations, various spatial views had to be conjoined in order to produce a space as would be viewed both by God and humans, which in turn introduced into images both past and distant spaces through the logic of assemblage. This perspective system, also known as ‘orthodox isometric’, shows the parallels of an object as diverging into the distance, thus allowing the viewer to see both sides of an objects. In orthodox isometric perspective, the artist or image-maker depicts objects which are farther away as larger in size and closer objects as smaller. In many instances, the so-called ‘rule of the bottom’ is applied as well, whereby objects which stand on the ground are depicted as either larger in the foreground or smaller in the background of the image. Finally, the scene is often viewed from an elevated or even eye-in-the-sky position, and it is this in particular which connects Medieval Perspective to the aerial photography of today.

In the pre-linear perspective systems of the Medieval Period, distortions or glitches are most visible when there are straight lines in the composition, such as with the building architecture of an urban scene. This perspective, according to Lev Zhegin, produces distortions in the view like that those which occur when looking through a telescope or barrel.[[12]](#footnote-12) Also known as ‘Byzantine perspective’, in this inverse or inverted perspective system, straight lines curve into concave ones, while convex lines become straight lines, according Fernando C. Casas. [[13]](#footnote-13)

This so-called curvilinear perspective is when straight lines do not meet but foreshortening exists in all directions.According to White, Leonardo da Vinci defined this perspective in his now-lost manuscript*Discorso*, at least as the story was told by Benvenuto Cellini.[[14]](#footnote-14) Although James Elkins argues that Leonardo’s descriptions could also have matched three-point linear perspective.[[15]](#footnote-15) With this perspective system, the image is perfectly projected onto the sphere of the eye, given that the shape of the inner eye is concave too, leading Erwin Panofsky to conclude our vision is spheroid or tunneling. [[16]](#footnote-16) Images, namely fall on the retina that is concave, producing a subjective, perspectival view which is then convex (And this is also what happens in representations of the planet by the Flat Earthers.compose such a shape, a convex shape is transitioned into a flat shape.)

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## Linear Perspective

Medieval perspective is usually contrasted with linear perspective, which creates an illusion of depth on a flat surface through a system of parallel lines or orthogonals which converge in a single vanishing point on the composition’s horizon line. Inverse perspective, because it is not truly systematic, is commonly described in contrast to linear perspective, which Arnheim also calls the ‘illusionist doctrine’.[[17]](#footnote-17) But were the perspective systems of the Medieval Period really perspective systems at all? Some art historians suggest that the perspective of the Medieval Period is but a ‘twisted’ or ‘warped’ representation of the way vision works. And some further deny the category of systems which might be called perspectival to the East. Such authors find that the reasons for the visible distortion of space in the Medieval Period rest upon the logics of iconographic symbolism and hierarchies of visual rhetoric, rather than an organized way of presenting. Whereas, as John Berger notes, the historical moment when linear perspective was introduced, given its basis in mathematics rather than in symbolism, also introduced a profane view into art, image making, and our representations of the world.[[18]](#footnote-18)

According to Pavel Florensky, linear perspective is based on six conditions which are presumed to define reality.[[19]](#footnote-19) First, the world itself is not organized as a Euclidian space and any space made through geometry is going to be different from the space which is actually seen. Second, there is no absolute point of view or center for perspective. Third, the way of seeing which is provided to the viewer in reality is binocular. Fourth, the viewer, or eye of the beholder, in reality is fluxing not fixed like it is in an image. Moreover, fifth, while an image is static, the world itself is not. And finally, all psycho-physiological processes are excluded from linear perspective, as he writes;

The eye looks motionlessly and dispassionately, the equivalent of an optical lens. […] Moreover, this looking is accompanied by neither memories, nor spiritual exertions, nor recognition. It is an external-mechanical process, at the most a physio-chemical one, but in no way is it that which is called vision. The whole psychic element of vision, and even the physiological one, are decisively absent.[[20]](#footnote-20)

During the Renaissance, an artist could apply linear perspective in an image in order to describe both the scene as well as the position of the narrator. When viewed from the vantage point of the narrator, the scene is then seen all at once, perceived by the audience as being fixed and having existed prior to the action itself of viewing the artwork. Linear perspective, since its development in the Renaissance, has consisted of the geometric projection of three dimensions onto a two-dimensional plane. This, in turn, has supported the mathematization and, consequently, the rationalization of observed space. Such a view has been further revolutionized by the invention of new techniques and tools. For example, as Friedrich Kittler describes, in the mid-18th century the ruler invented by Alsatian Johann Heinrich Lambert, today known as ‘Lambert’s ruler’, assisted in the calculations of perspective for scenes of the open landscape.[[21]](#footnote-21)

## Technical Perspective

Already in Antiquity, optical research was initiated to orient to measure reality, reaching its peak with the discovery of Renaissance perspective, and at least being mechanical realized with the invention of photography. Although it was not the camera obscura itself, which was the direct precursor of the photographic camera, but rather camera lucida and lanterna magica, used as perspectival tools, which first offered a geometrically correct translation of reality.[[22]](#footnote-22) The photographic camera itself would be more accurate than any previous tool as aperspectival device. Soon after the invention of the technology and the medium, photography was accepted as a more perfect way of seeing than even human vision which itself suffers from parallax confusion, overlapping images received through two eyes as sources, producing a third one. Monocular vision of the camera presented the *finnisage* of development of visual representational media. Because of its monocularity, photography had a high capacity for representing a three-dimensional reality without additionally coding it, as it would by producing yet another set of symbols.

However, there are also significant differences between the pictorial perspective of a painting painterly and mechanical perspective of the photo camera. A painted image can lose perspective for various reasons, Rudolf Arnhem analyses, such as if the painter lacks skills, has chosen not to adopt the canon of fundamental principles and general rules, has a perceptive error, paints only what they think they see, or has an unusual angle of view. [[23]](#footnote-23) But such distortions to the perspective do not so easily happen with the creation of a mechanical image. Unless the photographer intentionally creates some distortion or other, images taken with a camera will all record relatively the same reality. Yet, what is recorded may still not impact the beliefs of the photographer, so if the photographer thinks that they have recorded UFOs, there may be no way to employ the image to contest this belief.

Photographic metrology, or the science of measurement in photography, is defined by at least three elements: the depth of the field, the ordering of planes, and the metric or proportion of the composition. Beyond any the interpretation of the angle of view, together these elements can convey to the viewer the relationship between objects in the image, as well as the relative distance to the subject or photographer from their position in space. And all three elements, distance, plane, and measurement, can be modified or even distorted through the use of various lenses. Still, there are many differences between this perspective which is recorded by a camera and that which is produced by the eye. One key difference, as Vasco Ronchi elaborates, lies in the fact that the photographic camera is set in front of the eyes but not necessarily having neutral lenses (although 50 mm lenses are often taken to be a model of neutral sight).[[24]](#footnote-24)

## View from Above

The aerial view has changed our perspective on the world. Since the beginning of perspective systems in Western culture during the Renaissance, as Antoine Bousquet remarks, two different perspective systems have been developed: a linear and a military perspective, with a military perspective supporting the aerial view.[[25]](#footnote-25) Linear perspective was based on the representation of architectural structures within a geometrically-designed space, like with Renaissance paintings in which all lines meet at the vanishing point. In contrast, military perspective was based on the second perspective depicted space the way two parallel lines stay parallel and thus they never meet, like with a surveying map. This was the perspective system of the aerial view, Bousquet claims.[[26]](#footnote-26) It contained neither infinite points nor straight lines and has only a single plane.[[27]](#footnote-27) From down on the ground, space was seen like a pyramid, with the biggest plane that of the Earth’s surface, and the smallest plane that of the Earth’s sky or atmosphere. Whereas from up in the sky, perspective was reversed, with the biggest plane the sky, and the smallest the surface. Further, in the absence of architecture, which frames the space, this view could not include the measurement of distance. Thus, from the aerial view, the observable world had no depth of the field, order of planes, proportional rules, or a view angle. In other words, the Earth become approximate and unmeasurable.

There are further elements which distinguish the aerial view from linear perspective. Linear perspective is defined by both a horizon and pictorial vanishing point. While horizon exists in reality, the vanishing point, which does not exist in the real world, but it is tied to the image space where serving the simulation of the third dimension on the flat surface. Without a horizon, it is difficult to determine vanishing point as well as the relative distance between the subject and the horizon. But in aerial photography, the vanishing point is independent from the horizon, or the horizon is completely missing. Often, the viewer’s eye is even located below the horizon line, which distorts the perspective.[[28]](#footnote-28)

|  | MAPS | LAND PHOTO | ORTHOPHOTO |
| --- | --- | --- | --- |
| SPACE DESCRIPTION | Space | Place | Larger space |
| VIEWER POSITIONING | Distributed | Fixed | Distributed |
| CONSTRUCTION | Discreet | Compact | Compact |
| VISUAL CHARACTERISTIC | Abstraction | Realism | Realism |
| VISUAL STUDIES | Visualization | Vision | Vision |

Table 6: Comparison of qualities which characterize maps, land photographs, and aerial photographs

## Photographic Polyperspectivalism

While photographic technology in and of itself is a perspectival machine, the medium also enabled artists to experiment with perspective. In the 19th century, the first polyperspectival experiments were conducted by the Pictorialists, who montaged several photographs together in order to produce complex stories such as simulating the existence of ghosts. The most famous mechanics or ‘monteurs’ in photographic technology, however, remain Eadweard Muybridge, Etienne-Jules Marey and, around the same time or just a bit later, Harold Edgerton with his stroboscopic photography. Both Muybridge and Marey used photography to analyze time. Although, each did so in their own distinct way. Muybridge, for example, used a set of twelve cameras to analyze the movements of an animal or human in sequence, by shooting with multiple cameras, which he distributed in space. Whereas, Marey used multiple exposures to produce an effect of simultaneity. These experiments directly led to the development of photogrammetry (through the construction of the multiplexing camera, like the one Muybridge used) as well as deep photography (through sub-sequential same-frame recording)., Félix Nadar also combined multiple images which had been recorded in sequence while on the move, in order to create the most total image possible in the day of the Earth as seen from the air. But while Muybridge’s and Marey’s images were organized around the spatial third dimension (the movement of the subject through space), Nadar’s revealed the fourth dimension of the space-time continuum (the polyperspective simultaneity across time).[[29]](#footnote-29)

Because of their polyperspective simultaneity, Nadar’s aerial photographs had a direct influence on the birth of Cubism.[[30]](#footnote-30) These images taken up in the sky broke with the Renaissance system of organizing the image-space down on the ground into linear perspective. Artists working in this style depicted objects in their artworks ‘relatively […] from several points, no one of which has exclusive authority’.[[31]](#footnote-31) Theses Cubists, especially Analytical Cubists, used polyperspective to bring different views of the subject, whether objects or figures, together within a single composition. This resulted in images which appear to be fragmented or somehow abstracted. Through such polyperspectivalism, a different perspective is applied to each object. Through a simultaneous view, here the author and their subjectivity were abstracted out of and away from the image.

Around the same time as the Cubist art movement, experiments with computing the image were also being conducted by photographers such as Laszlo Moholy-Nagy, Man Ray, and Christian Schad.[[32]](#footnote-32) Indeed, since Cubism, many artists across the late 20th and early 21st centuries have investigated the role of perspectival systems in the photographic medium, interrupting, manipulating, or even reversing the process of image-making in some way, in order to explore the potentials and possibilities of perspective. These experiments perhaps culminated with the rise of computational photography in works by Herbert W. Franke, and Sonia Landy Sheridan, among others. And today, in the post-digital era, as computational photography flourished, this polyperspectivalism supports the innovation of total images which encompass many different points of view.[[33]](#footnote-33)

## ‘New Medievalism’

The total image, while it is a derivative of photography, does not satisfy any of conditions for linear perspective, as set by Florensky.[[34]](#footnote-34) Total images deny the absolute point of view, the center of perspective introduces more or many viewpoints distributed along the surface, and most commonly the viewer cannot stay fixed to the scene, and the image is anything but static.[[35]](#footnote-35) As a direct consequence of this merging of a vast amount of photographic imagery and data, the polyperspectivalism is being revived. There are many simultaneous views, and they are all dynamic. One single reality may be experienced in a multitude of ways, which in turn produces multiple realities, each providing a coherent picture. Because the basic sense-data interface with polyperspectival systems is produced by visual sense data which has been detached from the other senses, a feeling of immersion in this reality is provided to the viewer or interactor.

Prior to the Renaissance, in non-linear perspectives space was chaotic. Still, a new polyperspectival space is not inconsistent and incoherent as a space Panofsky recognizes as once was Medieval.[[36]](#footnote-36) Besides, the perspective of the total image is not a priorieternal, transcendent, or unchangeable without points of reference or parameters of space, like in the Medieval Period. Rather, the total image is computed out of many parts or pieces; it is assembled.[[37]](#footnote-37) This new polyperspectivalism gives birth as well to a pseudo-philosophy, in which knowledge both objective and neural is understood to be relativistic. Like reverse perspective in the Medieval Period, linear perspective in the Renaissance, absolute perspective in the Baroque, and the mechanical perspective of photographic technology beginning in the 19th century, the assemblage logic of polyperspectivalism logic in the post-digital era characterizes and constrains our capacity for understanding the world. In such total images, the techniques which are used to correct many original photographs in the process of composing one single image of the Earth as seen from above, also dismiss the role and importance of subjectivity and relativity. As Martin Jay notes, even before our entrance into the post-digital, ‘If postmodernism teaches anything, however, it is to be suspicious of single perspectives, which, like grand narratives, provide totalizing accounts of a world too complex to be reduced to a unified point of view’.[[38]](#footnote-38)

In the Renaissance, the centering of images from the viewpoint of the subject also indicated the rising significance of the self and of the individual. And in the post-digital era, the separation of images from subjects may very well suggest the rise of a new amalgamated, generic, or homogeneous selfhood. Thus, from all of the elements which characterize the total image, perhaps most important is the re-distribution of multiple perspectives into a polyperspectival view. Through this process, post-digital photography loses the mechanical perspective which describes not the view angle of any one single subject, but in fact returns to a way of seeing from before the invention of linear perspective. For example, panoramic images are made through recording a series of photographs with overlapping borders. And aerial images are made through recording a series of photographs with orthographic correction. Viewing such images can even cause dizziness or even more serious neurological effect.[[39]](#footnote-39)

As many authors of perspective theory have emphasized, perspective is not merely a system for visual representation, but also a system of understanding the world, a discourse unto itself. According to Cristoforo Landino, for example, perspective is ‘part philosophy and part geometry,’ used to not only to inform our representation of space, but to influence our ideology about place as well.[[40]](#footnote-40) Since Plato’s allegory of the cave, optical principles and perspectival tools have served to create paradigms of explanation within the context of ideological production, as has been analyzed, for example, in photography and cinema through Marxist theory as well as contemporary theories of the apparatus.[[41]](#footnote-41) Essentially, through a given perspective system, the viewer accepts the position which someone else has created, identifies with it, and accepts its gaze, even if that gaze is misogynistic or racist, for example. Still, whereas the viewer can resist the fullest absorption into cinematic experience, doing so with intense virtual realities becomes more difficult, and this is why some virtual perspectives out of total experience may become total explanations, as theories of flat earth.[[42]](#footnote-42)

1. ‘Stereopipeline’, https://ti.arc.nasa.gov/tech/asr/groups/intelligent-robotics/ngt/stereo/; ‘Skycatch’, https://www.skycatch.com; ‘Altizure’, https://www.altizure.com [↑](#footnote-ref-1)
2. Facebook recently added software which is able to recognize deep fakes, which are created through a type of artificial intelligence called generative adversarial networks (GAN), by detecting glitches in these images of nonexistent people. [↑](#footnote-ref-2)
3. See, for example: Jessica Becking, ‘Records of Representation: Clement Valla’s Postcards from Google Earth’, *Media Theory* 2.1 (2018): 307-315. Further, other artworks made using Google Earth demonstrate how the inspiration for representational art may include not only concrete reality, but also mediated supra-reality. A number of artists use visuals which are realistic, even indexical, from Google Earth. These artists include, for example, Benjamin Grant, who composes satellite abstractions on his blog and in his book *Overview*, as well as Mishka Henner. In the artworks of both of these artists, among others, the world retains its recognizable curvature but is flattened through the use of an aerial view angle. In contrast, Kenny Jacqui, whose artwork *The Agoraphobic Traveler* is based on capturing images from Google Street View rather than Google Earth, includes prints of photos taken with large open-air distances in a low oblique view of urban settlements. Therefore, unlike Grant and Henner, but like to the artwork by Trevor Paglen, Jacqui’s art includes the curvature of a horizon. [↑](#footnote-ref-3)
4. Keller Easterling, *Extrastatecraft: The Power of Infrastructure Space*, London: Verso, 2014. [↑](#footnote-ref-4)
5. Lawrence Bird, ‘Territories of Image: Disposition and Disorientation in Google Earth’, in Steve Hawley, Edward M. Clift, Kevin O’Brien (eds), *Imaging the City: Art, Creative Practices and Media Speculations*, Bristol: Intellect, 2016, 19. [↑](#footnote-ref-5)
6. Angela Krewani, ‘Google Earth: Satellite Images and the Appropriation of the Divine Perspective’, in Solvejg Nitzke and Nicolas Pethes (eds), *Imaging Earth: Concepts of Wholeness in Cultural Constructions of Our Home Planet,* Berlin: Transcript Verlag, 2018, 58. [↑](#footnote-ref-6)
7. Clemena Antonova, ‘On the Problem of “Reverse Perspective”: Definitions East and West’, *Leonardo* 43.5 (2010): 464-469. [↑](#footnote-ref-7)
8. Arnheim, ‘Inverted Perspective in Art’. [↑](#footnote-ref-8)
9. Antonova, ‘On the Problem of “Reverse Perspective”’. [↑](#footnote-ref-9)
10. John White, *Birth and Rebirth of Pictorial Space,* Cambridge, MA:Belknap Press, 1987. [↑](#footnote-ref-10)
11. Yet, some authors criticize the imposition of a Western, linear perspective, because as the criteria of definition of visual representation preceding its era, as well as the norm that any representation is necessarily realistic. [↑](#footnote-ref-11)
12. Zhegin from Antonova. See: Clemena Antonova, *Space, Time and Presence of the Icon, Seeing the World in the Eyes of God*, Martin Kemp (pref.), London and New York: Routledge, 2010. [↑](#footnote-ref-12)
13. Fernando C. Casas, ‘Flat-Perspective Sphere’, *Leonardo* 16.1 (Winter 1983): 1-9. [↑](#footnote-ref-13)
14. White, *Birth and Rebirth of Pictorial Space.* [↑](#footnote-ref-14)
15. White, *Birth and Rebirth of Pictorial Space*; James Elkins, ‘Did Leonardo Develop a Theory of Curvilinear Perspective? Together with Some Remarks on the “Angle” and “Distance” Axioms’, *Journal of the Warburg and Courtauld Institutes* 51 (1988): 190-196. [↑](#footnote-ref-15)
16. Erwin Panofsky, *Perspective as Symbolic Form*, Christopher S. Wood (trans.), New York: Zone Books, 1996. [↑](#footnote-ref-16)
17. Arnheim, ‘Inverted Perspective in Art’. [↑](#footnote-ref-17)
18. John Berger, *Ways of Seeing*,New York Penguin, 1972, 16; Also, Haraway has named it ‘God’s trick’. See Donna Haraway, ‘The Persistence of Vision’, 1997; *The Visual Culture Reader,* Nicholas Mirzoeff (ed.), London: Routledge, 2002, 678-684. [↑](#footnote-ref-18)
19. Pavel Florensky, ‘Reverse Perspective (1920)’, trans. Wendy Salmond, in Nicoletta Misler (ed.), *Beyond Vision: Essays on the Perception of* Art, London: Reaktion Books, 2002, 197-273. [↑](#footnote-ref-19)
20. Florensky, ‘Reverse Perspective’, 263. [↑](#footnote-ref-20)
21. Friedrich Kittler, *Optical Media,* Anthony Enns (trans.), Cambridge: Polity Press, 2009, 94-96. According to Kittler, this ruler was a tool which assisted in calculating the perspective of any open view of the landscape. [↑](#footnote-ref-21)
22. Berger, *Ways of Seeing.* [↑](#footnote-ref-22)
23. Arnheim, ‘Inverted Perspective in Art’, 125. [↑](#footnote-ref-23)
24. Vasco Ronchi, ‘Perspective Based on a New Optics’, *Leonardo* 7.3 (Summer, 1974): 219-225. [↑](#footnote-ref-24)
25. Bousquet, *The Eyes of War*, 36. [↑](#footnote-ref-25)
26. Bousquet, *The Eyes of War*. [↑](#footnote-ref-26)
27. Bousquet, *The Eyes of War*. [↑](#footnote-ref-27)
28. Such a view is frequent in panoramic photography, where the focus for the photographer as well as the audience is on the clearness of the land rather than the infiniteness of the sky. [↑](#footnote-ref-28)
29. Space-time continuum is also shown in Cubism, while fourth dimension in dynamism by Duchamp or Futurism by Balla. See: Linda Dalrymple Henderson, ‘Four-Dimensional Space or Space-Time? The Emergence of the Cubism-Relativity Myth in New York in the 1940s’, in Michele Emmer (ed), *The Visual Mind II*, Cambridge, MA: MIT Press, 2005, 349-398. [↑](#footnote-ref-29)
30. Other influences on the birth of Cubism included Einstein’s theory of relativity, Minkowski’s theory of the space-time continuum, and non-Euclidian geometry. [↑](#footnote-ref-30)
31. Henderson, ‘Four-Dimensional Space or Space-Time?’, 362. [↑](#footnote-ref-31)
32. For a brief history of these experiments, see: Gottfried Jäger, ‘Generative Photography: A Systematic, Constructive Approach’, *Leonardo* 19.1 (1986): 19-25. [↑](#footnote-ref-32)
33. Both definitions may be missing the point for two reasons; 1. As they define reverse in regard to the linear perspective, presupposing its existence, as well as the knowledge on it. 2. Presupposing that the Byzantine perspective had a systematic rule, as linear had. This argument was stressed by Martin Kemp and Clemena Antonova, in ‘Reverse perspective’ historical fallacies and an alternative view, in Michele Emmer, *Visual Mind II*, Cambridge MA: MIT Press, 2005, 349-399. [↑](#footnote-ref-33)
34. Florensky, ‘Reverse Perspective (1920)’. [↑](#footnote-ref-34)
35. There are a few more conditions, added by Oscar Wulff, that define the reverse perspective, one of which is the inclusion of the viewer inside of the space, as a part of the pictorial space, as for example also in selfies or 360-degree panoramas. See Wuff in Antonova, *Space, Time and Presence of the Icon*. [↑](#footnote-ref-35)
36. Panofsky, *Perspective as Symbolic Form.* [↑](#footnote-ref-36)
37. Merleau Ponty writes about the ‘“baroque” proliferation of generating axes for visibility in the duplicity of the real’. Merleau Ponty, *Visible and Invisible*, Northwestern University Press, 1969, 60. [↑](#footnote-ref-37)
38. Jay, *Downcast Eyes,* 545. [↑](#footnote-ref-38)
39. Commonly explored as neurological problem in aviation. [↑](#footnote-ref-39)
40. Cristoforo Landino as quoted in Margaret Iversen, ‘The Discourse of Perspective in the Twentieth Century’. *Oxford Art Journal* 28.2 (2005): 191–202 [↑](#footnote-ref-40)
41. Sarah Kofman, *Camera Obscura: of Ideology*, Athlone Press, 1998; Jean-Louis Baudry and Alan Williams, ‘Ideological Effects of the Basic Cinematographic Apparatus’, *Film Quarterly* 28.2 (1974-1975): 39-47. [↑](#footnote-ref-41)
42. Laura Kurgan refers to assemblage function of the trace in writings by Vilėm Flusser. Laura Kurgan, *Close Up at a Distance: Mapping, Technology, and Politics*, MIT Press, 2013. [↑](#footnote-ref-42)