



The Philosophy of Lines

From Art Nouveau
to Cyberspace

Thorsten Botz-Bornstein

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Thorsten Botz-Bornstein
Philosophy
Gulf University for Science and Technology
Hawally, Kuwait

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CHAPTER 1

Introduction

Perhaps no one before Klee had “let a line dream.” The beginning of the line’s path establishes or installs a certain level or mode of the linear, a certain manner for the line to be and to make itself a line.

Merleau-Ponty, *Eye and Mind*

This book gives a philosophical account of the line as a phenomenon found in culture. It describes lines in many areas but primarily attempts to crystallize a “philosophy of lines” that emerged in Europe around 1850 and developed over the twentieth century to this day. The development was supported by thinkers and artists such as Heinrich Wölfflin, Adolf Loos, Felix Ravaisson, Henri Bergson, Maurice Merleau-Ponty, Paul Klee, Wassily Kandinsky, Piet Mondrian, or Henri Michaux. At the turn of the nineteenth century, a new scientific environment, manifesting in the emergence of non-Euclidean geometry, influenced modern art. However, while the reality of non-Euclidean geometry is abstract, mathematical, and technical, artists of early modernity used lines to create an existential-aesthetic virtual reality. This new geometry would not lead to the line’s *technical* virtualization but rather to its *poetic* virtualization.

I extract, from the works of the above aestheticians and artists, a peculiar philosophy of lines that I find compatible with the aesthetics of lines practiced in East Asian calligraphy and painting. In both the Western “non-Euclidean tradition,” and in Chinese and Japanese calligraphy, lines

are used to represent realities not only through affirmation, but also through negation. On the one hand, this aesthetics negates the concrete spatial dimension of the line; on the other hand, it does not push the line towards purely geometrical or digital abstraction. The line remains linked to a surface, an environment, and a body. This paradoxical concept of the line also inaugurates a peculiar idea of “the virtual” that has become important at the end of the twentieth century. However, in some points, this virtuality is different from, and even clashes with, what is most commonly understood as virtuality today.

I show that several Western aestheticians and artists slowly pushed the line towards various stages of “negativity.” Heinrich Wölfflin perceived the “depreciation of the line as a boundary,” and Maurice Merleau-Ponty saw lines as dynamic phenomena. Ludwig Wittgenstein suggested that lines challenge the human intellect, not through their blurred character, but through a more sophisticated procedure of self-negation. For Kandinsky, the line existed as a negation of forces: the straight line is a negation of the plane. More radically, Piet Mondrian believed that in his paintings, lines “destroy” each other through an effect of mutual opposition. The French poet-painter Henri Michaux relied on a “divestment” (*désaisissement*) of the line, that is, on the line’s “negative values.” More recently, the British artists collective “Tracey” suggested that drawing is “uncertain, defiantly idiosyncratic, marking specific difference rather than aspiring to universal values, stubbornly refusing resolved forms, and incorporating the principle of erasure—the will to unmark” (Tracey: xi). For all these thinkers and artists, the line is not simply present (abstractly or concretely), but its existence is linked to a complex ontology that employs both affirmation and negation. Such reflections go beyond the “implied line” or the “guide-line,” which are known in art and architecture since Vitruvius and Leon Battista Alberti. The implied line is invisible whereas the “negative line” is drawn and most often visible. However, though physically visible, the negative line is not an object (not even a suggested or imagined one) but rather a Heideggerian *Ding*. It is an organism with existential dimensions, which becomes most obvious when we look at the line’s link to the body. Again, this does not mean that the line is animistic or the personification of an ego. On the contrary, the line is “emptied out:” it is divested of all ego notions.

I compare these approaches to the way lines are handled in the East Asian tradition. Japanese and Chinese art, under the influence of Daoism and Zen Buddhism, have always had an understanding of the line that

comes close to the one described above. One reason is that this tradition of lines has never been impacted by Plato or Euclid. Another reason is that it has traditionally operated with an alternative understanding of the virtual.

MY APPROACH

Much has been written about lines from anthropological, philosophical, or scientific points of view. In this book, I concentrate on the most peculiar characteristic of the line, which is its ambiguous ontological status. Lines can be physical phenomena, cognitive responses to observed processes, or both at the same time. My approach is always philosophical or “aesthetic” in the broadest sense. Archaeologists, anthropologists, linguists, or geographers will find interesting philosophical ideas in this book, but they will also recognize that my method is very different from theirs. My purpose is not merely to show that lines as human-made artifacts have had different meanings at different times or in different places. Instead, I concentrate on the “negative line” or the “self-negating line” and detect common patterns in East and West.

This book covers much material, but it tries to tell a certain “story of lines” by following a narrative structure. After a first part containing general considerations of lines in civilization at various époques, the book’s main narrative begins in Part II, starting with pre-Art Nouveau modernity as described by Baudelaire, moving forward to “differential lines” as formulated by philosophers at the turn of the century, and finally addressing the modern painters of the 1920s. The progressive dematerialization and “self-negation” of the line becomes obvious. In Part III these achievements are reflected against the Eastern tradition.

Studies of lines appear in various works and tend to settle in an intermediary field between anthropology and aesthetics; none of it has taken this peculiar philosophical angle. Classics on lines are Erwin Gombrich’s *The Sense of Order* (1979) and Dorothy Lee’s “Lineal and Nonlineal Codifications of Reality” (1950). Recently, several books and articles explicitly devoted to lines have appeared. The most important ones are certainly Tim Ingold’s *Lines: A Brief History* (2007) and *The Life of Lines* (2015). Ingold’s approach is anthropological and does not address the philosophical questions that I am interested in. *The Power of Line*, edited by Marzia Faietti and Gerhard Wolf (2016) gives a good survey about lines in art. Briony Fer, in her *The Infinite Line* (2004) looks at modern art

from 1950 to 1960 from the point of view of an art historian. Daniel Rosenberg and Anthony Grafton show in their *Cartographies of Time. A History of the Timeline* (2010) how timelines have been visualized in history. More closely related to my project is Sybille Krämer's essay "'The Mind's Eye': Visualizing the Non-visual and the 'Epistemology of the Line'" (2011) and, even more congenial is the volume edited by Sebastian Dorsch and Jutta Vinzent called *SpatioTemporalities on the Line Representations-Practices-Dynamics* (2017).

This book attempts to explain the complex ontology of the line. Lines emerge organically from a hermeneutic process of negation and affirmation, which becomes particularly obvious with regard to the stylistic line. Already in Antiquity, the ontology of lines reached from the purely geometrical to the dreamlike. Through the *khora*, lines could be likened to dreamlike expressions. The questions concerning the *khora* are the same questions that are posed by psychologists who examine dreams. Are there lines in dreams or is the dream a kind of non-space in which lines cannot exist? What would be the limits of a dream image? The psychologist Erich Neumann holds that in dreams "the inside and outside are not distinguished one from the other" (Neumann 1954: 276) because there are no framing lines. And yet, inside and outside *do* exist. Vlada Petric writes that if a dream is enclosed in walls, "the walls are understood to exist somewhere in the distance concealed in darkness, enhancing the mysterious and ominous atmosphere of the environment" (Petric 1981: 21). Again, this does not mean that the lines in dreams are blurred. Rather, they are clear like the lines in the paintings of the German Romantic painter Caspar David Friedrich who is not only the painter of dreams but also the painter of crystalline and solid shapes that are precisely drawn and well painted. The lines that mark the rupture of the ice in *The Sea of Ice* (*Das Eismeer*, 1823–24) are very clear and distinct. These paintings are dreamlike precisely because they impress through the distinctness of their lines. It is consistent to apply, in a contemporary context, such thoughts to Virtual Reality. Is Virtual Reality structured by lines? Are there lines in this reality that separate one space from another? Virtual Reality is composed of spatial events (websites) that are separated by temporal interruptions. Notions like "inside" and "outside" do not function as they do in a geometrically structured space. This book attempts to grasp the paradoxical conceptions that animate lines, and which are deeply embedded in cultures.

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PART I

What Is a Line?



CHAPTER 2

Strings, Traces, and Structures

Before engaging in this book's main topic, which is the development of "negative lines" and "virtual lines," it is necessary to give a brief survey of the intellectual history of lines. This first part also introduces key terms that will be used in the subsequent parts. How have lines been seen in Western philosophical discourse? Lines play an important role in all civilizations, as they contribute to the understanding, interpretation, and representation of reality. Lines are basic entities that humans produce, both consciously and unconsciously. "As walking, talking and gesticulating creatures, human beings generate lines wherever they go," writes Tim Ingold (2007: 1). In more sophisticated contexts, lines structure space and time, or emphasize (as contours) the existence of objects. To a significant extent, we perceive reality through lines. Despite this common denominator, lines have been handled differently in different cultures and at different times.

WHAT IS A LINE?

The twofold status of the line as both a physical fact and a concept grants the line a unique place in human civilization. A line can be material, such as when it is represented by a string, or it can be non-material, as it is in geometry. While in mathematical terms, a line is simply a consecution of points, in non-mathematical contexts, lines can appear in many different ways. Lines can be mere thought products, or they can be intricately linked

to bodily action, as it happens in calligraphy or dance. A line can be visually (or acoustically) assumed and yet simultaneously be intellectually challenged. Furthermore, lines produce spatial or temporal experiences, not only in the one who draws them, but also in the observer. How can a phenomenon that shifts back and forth between the material and the non-material be experienced?

Despite big advancements in geometrical presentations of lines, nobody (not even Euclid) has actually attempted to give a truly comprehensive definition of the line. Euclidean geometry defines lines as one-dimensional bodies. In his *Elements* (*Stocheia*), Euclid suggests that “a line is a length without breadth” (Euclid 2007: 8). The question is, of course, whether we are able to observe anything that has no breadth: normally visibility is connected to the second and third dimensions. The complexity of the line arises from these initial constellations. The line is not an object, though mathematics has often treated lines as such. Richard Trudeau explains, in his *Dots and Lines*, that lines are interrelated objects: “Nobody knows what planes, points or lines are except to say that they are objects which are related to one another in accordance with axioms” (Trudeau: 5). This definition is too narrow because lines are not necessarily objectified. The fact that a line is not only a material but also a mental phenomenon is demonstrated by one of the most basic lines humans have ever encountered: the horizon. The line of the horizon is both a visual limit and an abstract place in which the finite and the infinite meet. It is both a limit and a non-limit that creates its own logic of visualization. The horizon is not an object because it is not simply “seen,” rather, its existence is due to a coordination of the visible and the intelligible. Henri Lefebvre explains: “The line of the horizon, the ‘infinite’ flight and the encounter of parallels, determines a simultaneously intellectual and visual representation, bringing the gaze’s focus to a sort of ‘logic of visualization’” (Lefebvre 1974: 51, my trans.). Strictly speaking, there are two lines, the intellectually *understood* one and the visually *seen* one, and the simultaneous perception of both does not lead to a clash because the human mind is able to coordinate the information given. Henri Poincaré, who worked on non-Euclidean geometry in the nineteenth century, attributed the perception of three-dimensional figures to the same cerebral process. The retina receives two dimensions but “the third dimension is the result of an effort of accommodation that we need to make with our eyes and the necessary convergence” (quoted in Jouffret: iv).

The differentiation between the visible and the intelligible and the potential bridging of both goes back to Plato. In “The Simile of the Divided Line” Plato differentiates between perceptible and intelligible phenomena (Republic 6: 509d–511c). He clarifies this further in the *Allegory of the Cave* (7: 514a–517a). The ever-changing realm of physical objects (particulars) is separate from the invisible and eternal universals, ideas, or “forms,” which leads Plato to the establishment of four different levels of cognition. The highest level is the realm of ideas that we perceive through reason (*noesis*). The second highest level is the realm of mathematical objects or abstract ideas that are cognized not through reason, but through intellect (*dianoia*), and geometrical lines exist in this realm. Physical objects cognized through opinion (*doxa*) or through trust (*pistis*) exist on a lower level. The lowest level in Plato’s scheme is the realm of images and appearances of objects. Where would lines with concrete aesthetic qualities, such as lines drawn with traits and strokes, be found? These lines would reside somewhere between the second and the third level.

According to the observations of Lefebvre and Poincaré, when we perceive lines, we often mix the visible (empirical, tactile) and the intelligible components. This is not only important for the perception of a natural line like the horizon and for three-dimensional geometry (Poincaré’s example), but it applies to all lines that are not purely mathematical. Sybille Krämer aptly writes: “In the empirical stroke we see a non-empirical line; in a phenomenon we see a concept. The activity of the ‘mind’s eye’ depends upon this ‘seeing-in’. It is connected with the tactile handling of the continuous line: perceptivity and tactility are combined” (Krämer: 278).

ANCIENT LINES

In ancient Greece, the line as a representational device underwent a peculiar development. According to Onasch and Schnieper, in Greek culture, lines and drawing are older than painting. However, the Greeks had a single word to describe writing, drawing, and painting (*graphe*), which establishes an interesting connection with Eastern calligraphy. The Greeks held that the line partitions a form or a pattern out of *apeiron* (formlessness), and that once this form is achieved, the line is extant and essential (Onasch and Schnieper 1997: 121). This means that the line was seen as arising out of nothingness. More precisely, lines were supposed to fix a reality that would otherwise be only “unreal” shadows. Massimo Scolari

explains that “in classical Greek, the shadow (*skia*) is the actual origin of painting itself, of conformity and of measure. Greek tradition makes recourse to the shadow to provide a basis for the invention of drawing. The first painters began by creating a contour (*perigrafe*), with a ‘line outlining the shadow of man [*umbra hominis lineis circumducta*]’” (Scolari: 73). Though the Greeks recognized lines as existent forms and shapes, in general, they never saw lines as material objects. Nor would they see them as substances. Aristotle refused to treat lines as substances when writing: “Again, the solid is a sort of substance; for it already has in a sense completeness. But how can lines be substances? Neither as a form or shape, as the soul perhaps is, nor as matter, like the solid; for we have no experience of anything that can be put together out of lines or planes or points, while if these had been a sort of material substance, we should have observed things which could be put together out of them” (*Metaphysics* XII 1077a 32–4). Despite its non-material and apparently non-substantial character, the line would remain an important feature of the Aegean and also Egyptian cultures. Gradually, the line would be taken over by the plane and the sphere and become increasingly dependent on its position within the latter (see Cheng et al. 1991: 16). In the end, the line could establish itself as a representational device for the production of images with autonomous forms and dimensions.

Byzantine art occupies a peculiar position within the history of pictorial art since it exalted the element of the line to obtain a sense of stability in the two-dimensional world of space and bodies.¹ Nonetheless, Byzantine art never broke with the principles of late antiquity but only “harden[ed] the late antique illusionism” into line-like forms (Panofsky 1951: 50). Lines never became “mere lines” because the painterly element was never entirely forgotten: “Byzantine art could not decide, as it were, to form the world in a completely linear rather than painterly fashion; thus its adherence to mosaic, whose nature is to hide the inexorably two-dimensional structure of the wall by spreading a shimmering coat over it,” writes Panofsky (50). Only in Romanesque art and architecture did the line become “merely a line, that is, a graphic means of expression *sui generis* which finds its meaning in the delimitation and ornamentation of surfaces” (50–51).

¹ See my article on perspective in icons (Botz-Bornstein 2004); also Chapter 2 of Botz-Bornstein 2009.

RENAISSANCE LINES

Renaissance artists gave the line an unprecedented exalted status. However, it was not the “real” line that primarily attracted their interest. Renaissance artists expanded on the ancient ideas of linear perspective, as expressed through the line of the horizon or the vanishing point. Late antique and early Christian art was “not yet a purely linear and two-dimensional world, but rather still a world of space and bodies, even if everything is oriented to the surface” (Panofsky 1951: 49). Only Renaissance art would come to render the world in a truly linear fashion.

Renaissance artists emphasized the abstract line that cannot be seen in reality but can only be thought. Through these lines, painters installed a three-dimensional space and produced a vision of space that can still pass as commonsensical today. Abstract lines helped establish the typical “Western” perspective, with a third dimension that emerges along fixed lines. Renaissance perspective is a geometrical vision, established around a precise central point in space, to which all other points relate. This makes the space, as well as the image, static and uniform. Objects are framed and fixed in position.

Later, this view would be criticized precisely because of its lack of reality. According to Francois Jullien, “the practice of perspective in particular has come under indictment because, in claiming to render the real at its most complete, that is, in three dimensions, it fails quite simply because it chooses to perceive from a single point of view” (Jullien 2009: 43). The Renaissance shift towards a single point of view had still another effect. The substance of the world, which the pre-Renaissance mode of reality could still render through symbolic pictorialism, would be replaced with a vision based on one single perception. This introduced objectivity as a prime criterion. Reality could now be described from a single point of view that everybody could or should assume. Supported by lines, presentation would move from various subjective views to a single objective vision of reality. However, this shift towards the objective happened only to a limited extent. Perspectival “objectivity” remained relative, which becomes clear when one considers that despite its geometric approach, Renaissance aesthetics never made an effort to establish a *single* correct way of drawing or painting. It never became *simply* geometrical. Merleau-Ponty highlights this fact when writing that Renaissance painters were always aware that “no technique of perspective is an exact solution and that there is no projection of the existing world which respects it in all aspects and deserves to

become the fundamental law of painting. They knew too that linear perspective was so far from being an ultimate breakthrough that, on the contrary, it opens several pathways for painting” (Merleau-Ponty 1970: Engl: 174/French: 50). This point of view may be unique, but in perspectival painting, there still remain many ways of assuming this point of view. It can be concluded that the state of being objective is limited to geometrical lines but that in other contexts, lines are allowed to remain subjective experiences.

The straightest line is the line traced by light, and it is no coincidence that (at least in most languages) Enlightenment thinkers chose this physical phenomenon as a metaphor for their cultural movement, through which they introduced new scientific and ethical values. However, modern thought had become “linear” a hundred years earlier, with Descartes’ philosophy of geometry. In the seventeenth century, “linearity—as opposed to pictoriality—[creates] modernism of painting, sculpture, dance, [and] architecture,” writes Brodsky Lacour (8). This is also visible in philosophy. Descartes’ ‘I’, which speaks for itself, steps back “from discursive meaning to the representation of words as letters, and of letters as lines” (4). It is what characterizes modernity: the cancellation of discursive figures of thought and the adaptation of methods from architectonics, which “is also literally the drawing of a line” (8). Modern philosophy “occurs not as a linguistic picture or image but as line, an iconoclastic line, a ‘line of thought’” (8).

Obviously, Descartes liked straight lines: he despised ancient cities that developed organically (“par succession de temps”) and celebrated the “well-ordered public squares that an engineer traces on a vacant plain according to his free imaginings.”² In the second edition to his *Meditations* (where he answers questions), he vows that he will “try everywhere to imitate architects” (1044–45). In his scientific work, Descartes translates geometry into mathematical terms and leaves math to the physicists. In his letter to Mersenne, sent right after having finished the *Géométrie*, Descartes states that he looks for “another kind of geometry, the one that takes for its questions the explication phenomena of nature” (Brodsky Lacour: 54).

² “Places régulières qu’un ingénieur trace à sa fantaisie dans une plaine” Discours (*Œuvres* I 579). In Brodsky Lacour: 32.

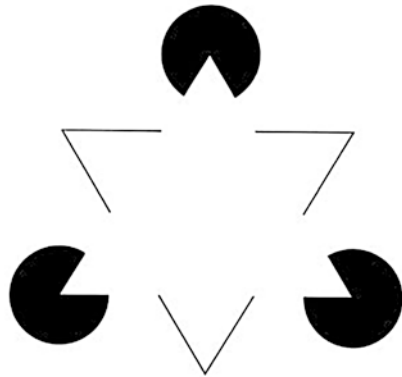
However, soon he will leave physics for metaphysics and apply the geometrical way of thinking to philosophical problems.³

VIRTUAL LINES

The above process of the negation or the self-negation of lines culminates in the phenomenon of the virtual line. Virtual lines have no physical existence because they are neither actual nor potential. At the same time, they are not just appearances (*eikones* for Plato) created by our imagination. Virtual lines are real and objectively extant because they can be intellectually assumed as real in some sense. In which of the four Platonic realms should virtual lines be put? Though they are real, they are not “real” in the way geometrical lines are real. As a matter of fact, there is no place for them in the Platonic scheme.

The meaning of the virtual line can be well demonstrated by looking at a famous optical illusion. In the Kanizsa triangle (Fig. 2.1) three circles with angular shapes bitten out of them are placed in a way that the bites define a triangle. The triangle exists, but the lines of this triangle do not exist as drawn lines. How do they exist? I do not believe, as does Brian Massumi, that the existence of the triangle is a matter of potentiality (Massumi: 57). True, the triangle is not *actually* present, but it is not a matter of a potential “could be there” either. The triangle is there, not just

Fig. 2.1 The Kanizsa triangle



³“J’ai résolu de quitter que la Géométrie abstraite, c’est-à-dire la recherche des questions qui ne servent qu’à exercer l’esprit” (Letter of 27 July 1638. AM 2, 362–63). In Brodsky: 51.

subjectively but also objectively because everybody can see it, and everybody sees it in the same way: different individuals do not see different triangles in different colors, sizes, etc. Nor is it a matter of imagination: different individuals do not *imagine* different colors, sizes, etc.

The triangle is neither actual nor potential. It is cognitively and objectively assumed as extant and thus real (as opposed to apparent). However, it is only virtually real. It is not as real as the geometrical figures that we can find on the third level of Plato's Divided Line. For Deleuze, in *Difference and Repetition*, "the virtual is opposed not to the real but to the actual [but] *the virtual is fully real in so far as it is virtual*" (Deleuze 1997: 208). The virtual is "absolutely real," meaning that it occupies a new dimension of reality. No further grounding in reality is required for the existence of the triangle's virtual lines. If we really take this for granted, then Deleuze's claim turns out to be not radical enough. Contrary to what the author of *Capitalism and Schizophrenia* suggests, the triangle is not potential as opposed to actual because a potential triangle would still need an ontological grounding in a "could be." The lines of a potential triangle must be either thought or imagined in order to exist. Here, in the Kanizsa triangle, the lines do not need to be thought but the triangle can be *seen*. In this sense, the Kanizsa triangle is different from Wittgenstein's duck-rabbit example: it is impossible *not* to see the triangle. No thinking is involved here, but the lines (though they are not drawn) simply support the triangle and the triangle supports them. No further ontological grounding is necessary. In this sense, the reality of the Kanizsa triangle supports itself, which is why it is virtual. The virtual overcomes both the potential and the actual.⁴

THE GRAPHIC AND THE GEOMETRICAL

Nature and culture abound with many different lines, but one basic distinction remains obvious whenever we see a line: the graphic line (the line drawn by hand) is different from the geometrically constructed line. Drawing remains intrinsically linked to lines: traditionally, lines could *only* be drawn while the painter could paint lines as well as other items. The drawn line is more concrete than the geometrically constructed line as its

⁴I adopt this definition of the virtual as a reality cancelling any distinction between the actual and the "non-actual" or between the actual and the potential, from Gilles Granger's book *Le Probable, le possible et le virtuel* (1995). See pages 13–14, 17, and 33 in particular.

existence depends—among other things—on the skill and the personality of the artist. Chinese calligraphers speak of the “flesh and the bones” of lines and distinguish between the shape of the line, which is produced by the brush; and they speak of the tone of the line, which is produced by the ink (see Ryckmans: 100).

The geometrical line can also be drawn, but most of the time this process requires technical assistance, which is why I call it geometrically “constructed.” Modern technology has made the line even more abstract. Today, with computer assisted design, the line is no longer necessarily drawn; it does not even need to exist on a concrete support. The graphic line (the drawn line or the written line) needs a support as it must be drawn on a surface. Today, most geometrical (non-drawn) lines that we come across in everyday life have no surfaces since the computer screen is not a surface on which the line reposes. This can appear surprising given that originally, “geometry” meant “earth measurement” with the earth acting as a surface upon which lines were drawn.⁵ The new surfaceless lines come close to the virtual lines that we perceive in the Kanizsa triangle: strictly speaking, they are not drawn, at least not in a “geo-metrical” fashion, but they still exist *in reality*. And yet they are not simply psychological phenomena (imagination, dreams, hallucinations, appearances) either.

Initially, drawing means to leave a trace on a surface, but when we say that we “draw” on a computer, drawing has a completely different meaning, and this has important implications. Lines “drawn” on a computer are real, but they have no environment. The “classical” drawn line refers not simply to itself but also to an environment with which it entertains a concrete relationship. Walter Benjamin noted that the graphic line is only defined “by its contrast with the area” (Benjamin 2002: 83), which means that we see the line only because it differs from the surface upon which it lies. For Benjamin this contrast is not merely visual but has metaphysical dimensions. Though line and background are different, both are intimately linked because the line confers an identity to the background, which is obviously not the case for the line on a computer screen. The surface is important: there is a dialectical exchange between line and surface, that is, between the rational and the sensible. The line can be deprived of any particular characteristics such as body, color, or texture, but the surface must have a color, a width, and often also has a texture, a patina,

⁵ “Earth measurement” is an Egyptian term, which the Greek philosopher Thales translated into Greek as “geometry.”

etc. The coordination of line and surface is one of the most fundamental principles of aesthetics. The “surfaceless line,” now possible in virtual reality, perturbs an aesthetic order that has been valid since ancient times, and thus invites new reflections.

THE IDEALIZED LINE

The Greeks were the first to understand that geometry could be applied, not only to *describe*, but also to *reveal* features of nature and reality. Though the line—just like the point and the plane—is an idealized entity, it can refer to something real. In this sense, geometry makes things clearer because it accurately expresses relationships in “the ever-changing, irregular, and imprecise world of human experience,” as Euclid writes in his *Optica* (Pérez-Gómez and Pelletier: 13). This corresponds with Plato’s ideas of clarity expressed, for example, in the *Theaetetus* (208e). Illusionistic representation is condemned, and precision is exalted, which remains still important in Neoplatonism. Proclus, in his commentary on the first book of Euclid’s *Elements*, says that it is necessary to detach ourselves from the tangible world and be able to see all things without dimensions and parts. Mathematical reasoning shows things that appear difficult to understand in order “to be evident, trustworthy, and undisputable simply by means of images” (Scolari: 221). For geometrical lines, seeing *means* understanding.

It is true that in geometry the merging of seeing and understanding can be a difficult task. However, the seeing is facilitated because the line is extracted from its real-life context. Here, understanding takes place on a purely abstract level, which is one advantage of geometry. For Descartes, geometrical intuition is “simple and pure” and there is no need for artificial support” (Rule XIV, in *OP* 1: 168). Edmund Husserl insisted that geometrical propositions are understood “instantaneously” without having to trace the proposition of a “historical” origin (Husserl: 205).

The Euclidean line has no qualities, it is infinitely thin, colorless, and textureless. By becoming thinner and more intangible, it becomes more absolute, which is, strictly speaking, a paradox. The negation of the line’s concrete qualities does not lead to its disappearance but makes it even more present *as a line*. The thinner the Euclidean line, the more “real” it is. It is not real because it functions as the contour of a real object or because it is drawn on a real surface, but because it refers only to itself. The thinner it is, the more self-sufficient it becomes. The Euclidean line thus

has an absolute degree of reality, which means that it cannot become “more or less” real. Drawn lines can be “more or less” real.

At the same time, the line’s relationship with reality is more complex than what the above considerations suggest because the line does not simply describe something. The line also *transcends* reality in the same way in which metaphors transcend physical objects. Since Pythagoras, geometry has been endowed with a poetic quality. The line and the plane are not just what they are, but all sorts of items can be constructed with them. The stylized representation of a man reduced, with the help of a few streaks, to a silhouette, can mean “all men.” The same is true for geometrical *space*. Geometrical space is not just the concrete space of the field or the town square, but it can be the space of many things. It can even be “all space” or “space as such.” In the same way, concrete figures drawn with lines can be “geometrized,” which has a similar effect.

NON-EUCLIDEAN GEOMETRY

When I describe, in this book, various intellectual approaches to lines, I address many periods from Antiquity onwards. However, most of the Western material covered in the chapters focuses on the period beginning with the nineteenth century up to the present. In the nineteenth century, non-Euclidean geometry had a strong influence on everything associated with the line. It influenced, for example, painters like Pablo Picasso and Paul Klee, and Virtual Reality is one of the late consequences of this geometrical revolution.

Non-Euclidean geometry criticized the ontology of traditional Euclidean lines. In the nineteenth century one found that Euclidean lines do not represent reality at all. However, the reason was not that they do not match the reality of the concrete world. Rather, one suddenly had reasons to assume the existence of “another reality,” a reality even more abstract, which Euclidean geometry could not grasp. The non-Euclidean critique did not shift geometry back to more concrete expressions, but it replaced the Euclidean line with an even more abstract model. This has had enormous impacts on the development of lines in Western philosophy, art, and culture.

While common sense has difficulties grasping the new geometry of “another reality” in which Euclidean standards are no longer valid, painters and philosophers integrated non-Euclidean geometry rather quickly and instinctively. Merleau-Ponty writes in his *Eye and Mind* that “the line