# **EPHEMERAL ATMOSPHERES.** CLOUDS, POINTS AND THE REPRESENTATION OF NATURAL ELEMENTS

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POINT CLOUDS
ART
REPRESENTATION

In the first part, the text describes some significant episodes related to the representation of clouds in the history of Western painting, particularly in the Renaissance and Baroque periods, highlighting a relation to theatrical representations of sacred scenes belonging to the medieval period. What is most important are the symbolic aspects linked to this atmospheric element, often related to its mystical role. Mention is made of the function assumed by the representation of clouds in traditional Sino-Nipponese painting, in this context the characteristics of mutability and vagueness explain their use. But the cloud is also an element that enchants the observer and is therefore employed by contemporary artists in their installations for unexpected performances, where the cloud itself is the protagonist. The second part of the article is dedicated to the relationship between data collected by laser scanners (point clouds) and their use as representation tools, beyond metric information. The rendered images of these data highlight artistic values in the field of digital art.

> Eh! qu'aimes-tu donc, extraordinaire étranger?
> J'aime les nuages… les nuages qui passent…
> là-bas… là-bas… les merveilleux nuages!
> (Charles Baudelaire, L'Étranger, 1869, p. 4)

Clouds have been depicted, especially in sacred painting, as elements of transition and boundary between heaven and earth, between human and divine dimensions. In Renaissance painting, clouds are often used to amplify the effects of aerial perspective, although their indefinite shape was difficult to adapt to the mechanical grid of the 'science of art'. These laws, as well as those relating to the depiction of sacred subjects, could be broken for symbolic reasons. In many paintings showing religious scenes, clouds play a mystical role by opening a door to a celestial dimension. In this context, they do not need to be depicted in accordance with the laws of optics because they transcend the realm of human perception. It is significant to mention what Hubert Damisch (1928-2017) observes in relation to the famous experiment of perspective tablets carried out by Filippo Brunelleschi (1377-1446), where only architectures were represented in perspective, while the sky space was replaced by a reflective surface: "Perspective only needs to 'know' things that it can reduce to its own order, things that occupy a place and the contour of which can be defined by lines. But the sky does not occupy a place and cannot be measured; and as for clouds, nor can their outlines be fixed or their shapes analysed in terms of surfaces. A cloud belongs to the class of 'bodies without surfaces', as Leonardo da Vinci was to put it, bodies that have no precise form or extremities and whose limits interpenetrate with those of other clouds" (Damisch, 1972, p. 124).

These paintings are accompanied by a strong illusionistic tendency. So, clouds become aerial elements to break through the space of ceilings and domes of churches, ideal atmospheres in which to insert, for example, an assump-

**Fig. 1** G. B. Gaulli, *Trionfo del nome di Gesù*, (1661-1679), fresco, plaster statues and wooden panels, Chiesa del Gesù in Rome. Photo by the author.

tion or glory of divine entities. This vocation for illusionism, which will become even more intense in the Baroque period, will find formal solutions combining painting and sculpture: one example, among many others, is the work of art entitled *Trionfo del nome di Gesù* (1661-1679) by Giovanni Battista Gaulli (1639-1709), known as Baciccio, at the Chiesa del Gesù in Rome (Figures 1-2).

This work adorns the lunettes barrel vault covering the main nave. It consists in several elements painted with fresco technique, such as the sky immersed in divine light and framed in the central part, which is accompanied by characters in relief (plaster statues) and clouds, with representations of angels and the damned, painted on panels

**Fig. 2** G. B. Gaulli, *Trionfo del nome di Gesù*, (1661-1679), fresco, plaster statues and wooden panels, Chiesa del Gesù in Rome. Rendering of the point cloud by the author.

detaching themselves from the intrados surface. The 'materiality' of the depicted clouds creates an opposite visual effect: the distance of the observer's point of view from the ground (approximately thirty metres from the work) makes impossible to distinguish what is painted and what is modelled. The clouds again, which interrupt the central golden frame in some parts, seem to float in an infinite space; their shadows are congruent with the light source at the centre of the composition.

This Baroque example finds its echo in the tradition of medieval sacred theatrical performances where some stage devices called 'heaven machinery' or 'cloud machinery' used to be employed, according to numerous records, eyewitness descriptions and drawings. Alessandra Bucchieri (Bucchieri, 2014) highlights how, starting from the medieval period, sacred theatres employed platforms, made of wood and iron, camouflaged by clouds of cotton wool, whose function was to raise or lower statues or sacred figures from artificially constructed paradises located above the altars. Lights, songs and music joined artificial clouds

to impress the believer and charge the atmosphere with mysticism.

These few but meaningful examples highlight the symbolic role of clouds in Western art: even when realistically depicted as atmospheric elements, their presence does not seem to belong to human dimension, remaining suspended on the border between metaphysics and physical reality. Certainly, the reasons for this have strong religious motivations, but I believe they are also linked to their ephemeral nature: the cloud changeability and distance from the earth make them abstract bodies crossing space without truly occupying it, floating and intangible like the air that sustains and moves them. I have observed how the intangible nature of clouds has determined their absence from any schematic representations in Renaissance painting perspective. However, clouds are protagonists of aerial perspective, whose three-dimensional effect was normally achieved depending on the painter's trained eye.

Their abstract character takes on equally significant connotations in the forms of landscape representation within Eastern artistic tradition. In this field, axonometric projection was favoured as a form of representation. In Sino-Japanese painting, particularly in those works painted on horizontal or vertical scrolls (in Chinese *chou*, in Japanese *kakemono*), the low-lying clouds have the function of suspending the represented space and narrative time (something analogous could be said for other natural elements like waves or tree branches). The use of axonometry and the non-use of perspective, means that objects further away from the point of view are not reduced in size compared to those in the foreground. The clouds, therefore, connect horizontal parts of the visual narration where the objects still occupy different areas and belong to different scales (Figure 3). It is relevant that in European tradition, clouds are painted as seen from below, so that is, observed from the earth. In contrast, in Eastern painting they are often seen from above, so that is, from a point of view not

**Fig. 3** T. Yuan, *Mountain Pavilion of the Immortals*, 1000 a. C., Collection of the National Palace and Central Museum in Beijing.

coinciding with the man's gaze. This type of depiction does not aspire to be an anthropocentric representation, such as the Western Renaissance central projections, but rather it evokes a more objective reality, the one observed from an infinitely distant gaze, the divinity's one. Also in this case, the clouds play a mediating role, acting as elements of nature that participate in both human and supernatural experience. According to Agostino De Rosa, there would be a correlation with the concept of emptiness, "which is then

assumed as a real presence in the pictorial scene, becoming concrete and perceptible in the form of clouds or fog, and which can be interpreted again through a temporal reading of the painting: in fact, during the unrolling and rerolling of the traditional support, it allows successive images to emerge from the void and then re-immerse in it, this way reproducing the progressive phases of pictorial elaboration" (De Rosa, 1998, p. VII). Hubert Damisch (Damisch, 1972, pp. 288-317) argues that clouds, in the conception of Chinese painting, are the recapitulation of the landscape, within the brush strokes that outline them, one finds the outlines of mountains or watercourses. Their depiction was not always done through brush lines; ancient techniques include the *keou-fen* (literally 'tracing the dust') or the *chui yun* (literally 'blowing the clouds') methods: these techniques seemed suitable enough to define the vagueness of the shape represented by the clouds.

In both Eastern and Western pictorial traditions observed so far, clouds represent elements of space transition, even if conveying different symbolic (or religious) and figurative roles. Beyond the different cultures or eras in which they have been represented, like other atmospheric elements such as fog, rainbows, sunsets, etc., they are able to evoke a strong emotional impact, a sense of dreamy wonder. This further characteristic was used extensively by the surrealist avant-garde in the 20th century. It was in this context that clouds started to be seen not only as protagonists of the weather, but also as unexpected characters floating in the terrestrial sphere. The clouds in René Magritte's (1898–1967) paintings are allowed to cross domestic spaces and pass through thresholds between conscious and subconscious. So, the clouds in *La Vengeance* (1938), *La Victoire* (1939) and *La corde sensible* (1952) – just to mention a few of his most renowned works – became elements of destabilisation, highlighting the difference between reality and its representation, where every association is permitted. The fantastic dimension evoked by clouds is also employed in

**Fig. 4** Berndnaut Smilde, *Nimbus Green Room*, 2013. Image courtesy the artist and Ronchini Gallery. (Photo: RJ Muna).

contemporary art and not only in the field of painting – such as the clouds 'blowed' by Berndnaut Smilde, part of the series entitled *Nimbus*.

The Dutch artist creates installations (which we could also define performances) which last few seconds, and 'project' clouds in indoor spaces with controlled temperature and humidity, thanks to a fog machine and a secret mixture (Figure 4). His clouds are the emblem of what is evanescent and changing; what remains after the cloud has dissolved are photographs and videos shot by the artist. The light calibration and the choice of locations are fundamental: churches, modern buildings, neoclassical villas, abandoned factories, etc. are perfect settings that contribute to produce a state of wonder in the observer.

The wonder lies in the domestication of the cloud, which from an aerial element in the open sky finds a new existence, even if only for a few moments, in spaces inhabited by humans (Cattan & Faret, 2021, p. 1911).

Now it is essential to refer to the concept of clouds in the digital realm, in order to evaluate possible aesthetic links with the analogue clouds mentioned above. The term 'cloud' has become widely used in the field of information technology, without any artistic intent. It is generally used to refer to a collection of large amounts of data, gradually implementable, that are shapeshifters. As Rebecca J. Rosen states: "Much like the billions upon billions of bits of information we store, clouds can have whatever meaning we give them, whatever meaning we see in them"[1] (Rosen, 2011).

Certainly, this concept has nothing to do with the pictorial, romantic or mystical clouds that we have been discussing so far, but some 'digital clouds' can be considered as form of artistic expression. For those who are involved in drawing and surveying, nowadays the word 'cloud', associated to the term 'point', is immediately linked to measurement operations through laser scanners 3D or multi-stereo photogrammetry methodologies. A point cloud is a discrete set of data points in space; it can be considered a 3D model of reality, even if it is not made of digital surfaces. Whoever invented the term 'point cloud' could have thought to associate dots to suspended water drops forming clouds in the sky, according to me.

As it is known, in elementary geometry, the fundamental elements of space are the point, the line and the plane. These concepts are abstract; their definition often delves into philosophy or metaphysics. It suggests a focus on the non-dimensional point, which cannot be represented. An ancient oriental treatise on geometry invites us to imagine it as a sphere whose diameter tends towards zero. Point is also the ancestral generator of the other two elements. This is because the one-dimensional line is made up of infinite aligned points, and the two-dimensional plane is created by

**Fig. 5** Georges Seurat, *A Sunday on La Grande Jatte*, Georges Seurat, (1884), Metropolitan Museum of Arts, New York.

infinite straight lines. The synthetic nature of point makes it suitable for representing the complexity of forms and point clouds are good example of this potentiality. The abstract value of the point has been recognized since ancient times, influencing philosophy and science.

Euclid in his *Elements* (300 b.C.) states that "Point is that of which no part exists" (Vita, 1982, p. 101), while in the *Metaphysics*, Aristotle (384-322 b.C.) distinguishes it from the arithmetic One with these words: "The One indivisible according to quantity is called unity if it is indivisible in all ways and has no position, it is called Point if it is indivisible in all ways and occupies a position" (Vita, 1982, p. 105). The concept of 'minimum and indivisible' finds different entities in the field of mathematics with the One and the field of geometry with the Point, this last considered as something that cannot be represented because it has no dimensions but can be identified in space through its position.

**Fig. 6** A. Bortot, *Natural point cloud*, 2024, Ex Polveriera di Romans d'Isonzo (Gorizia). Rendering by the author.

This fundamental concept supported all those involved in surveying: the ancient land surveyors who, with their groma, used to define land alignments by tracking points, or astronomers who recorded the positions of celestial bodies with the use of astrolabes, and so on[2].

During the history, the description of the shape complexity through the use of point have supported also artistic operation, first of all the ones of sculptors: an 'analogue' and practical point cloud, was the one obtained by sculptors through a mechanical instrument called 'Crocetta'. The three-dimensional croquis modelled in clay and then transposed in plaster through a cast of the sculpture, was discretized thanks to the insertion of nails: first in significant points - those where the surfaces had greater prominence or concavities - and gradually in intermediate ones. The Crocetta tool, consisting of three articulated arms hinged to each other, allowed the points taken from the sketch to be transferred to the marble using the procedure called 'messa a punti'. The reference points allowed the stone block to be rough-hewn using the mallet and chisels, to finally finish the modelling. This process was used, for example, by Antonio Canova (1757-1822) in the 18th century (Clerin, 1987).

Aristotle affirmed that the point is "invisible", but its position in space can be identified. This is a basic idea that gives meaning to contemporary point clouds. As we know, these latter are characterised by a set of points in space, each one defined by x, y and z coordinates within a Car-

**Fig. 7** A. Bortot, *Natural point cloud*, 2024, Ex Polveriera di Romans d'Isonzo (Gorizia). Rendering by the author.

tesian reference system. The position of each point is determined by the emission of multiple laser pulses that intercept physical opaque and non-reflective surfaces (that are generally not read by the scanner and so seems to be invisible)[3]. As we know, each point is also characterised by 'colour co-ordinates' in the form of a RGB value.

The point clouds' chromatic coordinates reveal another connection with art history, in this case more aesthetic than geometric: towards the end of the 19th century, the painting technique known as Pointillism was developed in France within the Neo-Impressionist movement. Georges Seurat (1859–1891), one of the movement's leading figures, referred to this technique as 'peinture optique' or 'chromoluminarism' (Russell, 2019; Chastel & Minervino, 1972). Seurat's painting theory was based on the optical laws of vision and the perception of complementary colours, which were published by the chemist Michel Eugène Chevreul (1786–1889) in his book *De la loi du contraste simultanée des couleurs* (1839). This theory was already known to Eugène Delacroix and the Impressionists, but it had never been applied with such scientific accuracy. This kind of technique, scientific and artistic at the same time, was based on the

scientific deconstruction of colour applied to the canvas in small dots that blend optically in the observer's eye through a perceptual process known as 'retinal recomposition' (Figure 5) (Previati, 1929). More recently, the contemporary artist Marco Tirelli created his *Untitled* pieces by applying small, coloured brushstrokes to the canvas, which are only visible when the painting is viewed from very close, while the paintings appear greyscale when viewed from a certain distance (Soldaini &Locatelli, 2022).

The colouring of points clouds is achieved by the association between the points recorded with the spherical projection of the laser beam and the pixels of a spherical photo associated to each scan. The overlap is ensured by the coincidence between the instrumental centre of the scanner and that of the camera, so the forms are recorded thanks to geometrical principles, while colours are collected thanks to optical tool. We could also notice that point position is objective instead of their colours that are light dependent: this is similar to how reality is perceived by our sight.

Laser scanners and photogrammetric techniques are usually used to survey buildings or parts of land, providing metric, two- or three-dimensional information. They are used more for practical purposes than artistic ones, even though some publications have highlighted their aesthetic value, creative applications or epistemological framework[4]. If we consider point clouds only as a form of representation of reality, as if laser scanner would be a sort of camera obscura, rendering performed shows images similar to a form of 'digital neo-pointillism'. We can speculate that at first glance, some of the renderings produced are quite reminiscent of watercolours.

This is the case when the digital gaze is placed far into the virtual space, allowing the dots in the cloud to thicken, so that the void between them cannot be perceived (Figure 6). In other cases, the virtual camera zooms in on smaller scanned areas, revealing the subject in the foreground to be composed of tiny dots of laser pulses, like brush touches.

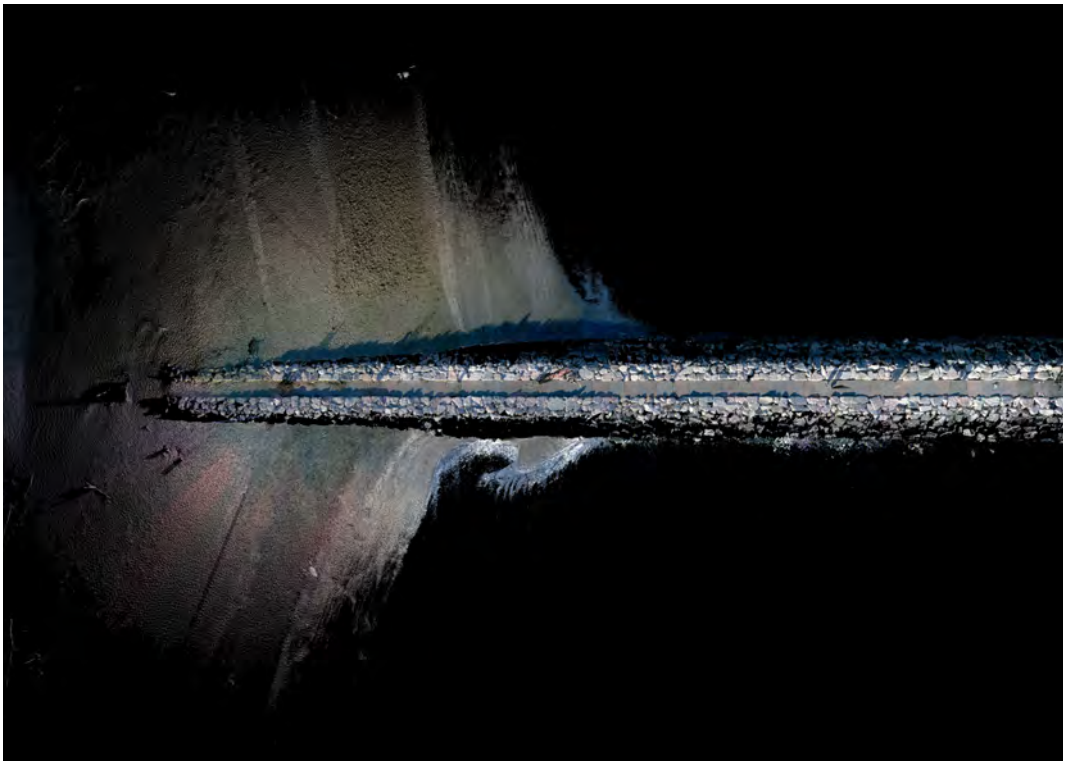

**Fig. 8** A. Bortot, *Natural point cloud*, 2024, Venice lido (Venice). Rendering by the author.

This makes it transparent, showing the cloud behind it as if was through a thin veil. Because of perspective, the cloud appears thicker in the distance.

The laser instrument produces fascinating effects precisely because of its operating limits. The non-instantaneous nature of the scans, each of which can last several minutes, implies a different representation of human and natural creations. Buildings are always in focus with sharp profiles, while vegetation, affected by atmospheric currents, is sometimes blurred and subject to a *moiré* effect that highlights its living nature. (Figure 7). In other words, the moving subject is recorded in different positions as three-dimensional, point-like fragments, much like in a long-exposure photograph. The same thing happens to shades and shadows, which are also in motion since they are influenced by the changing position of the sunlight.

**Fig. 9** A. Bortot, Natural point cloud, 2024, Venice lido (Venice). Rendering by the author.

This is a kinematic motion that is certainly slower than that one produced by the wind in the branches, but it is still influential in defining the shadow profile.

Transparent or reflective elements, such as seawater with its infinite variations in wave patterns, are not detected by the laser scanner. A dock appears to be suspended in infinite space (Figures 8-9). In conclusion, the results are liquid images, something suspended like a cloud of dust. Although a cloud of points is geometrically more 'real' than a photograph, as it represents an intangible digital clone of a space and its physical elements.

It is certainly difficult to compare contemporary point clouds with the pictorial representations from the first ones we started. However, we can see how surveying instruments produce new forms of digital representation that give images an ephemeral and changeable feel, like particles of water vapour suspended in the sky. Perhaps the appeal of these new digital images lies precisely in this point: an indivisible entity capable of reconciling artistic and scientific aspects and of "measuring by depicting and depicting by measuring" (Monti, 1980).

## NOTES

**1** About the metaphor of cloud in computer science and social media, refer to: Tung-Hui, 2016; Peters, *2016*.
**2** For an examination of the surveying instruments used in antiquity see: Docci, & Maestri, 1984, pp. 17-190.
**3** The position of each point in space, relative to the instrumental centre (with 0,0,0 as coordinates), is determined by the time between the emission of the laser pulse and its return after intercepting an opaque surface. Other types of laser scanners, instead, calculate the phase difference between the light waves emitted and those received.
**4** See for example: Chapman, McGregor, W., and R., 2018; Ivsic, Rajcic, McCormack, & Dziekan, 2021; Pearce, 2015; Bortot, 2024.

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