

Eye in the Sky: Development of Architecture After Aerial and Satellite Imagery

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Abstract

The contribution investigates the role of the bird's eye view in perception and thus in the design of buildings and the city. The development of satellite technologies and their use on a large scale is considered a threshold towards a new way of conceiving architecture. In fact, the web allows virtual trips around the world and, the first interface with the city and its architecture is often the view offered by satellite image software. Their wide use, also as navigation tools, has changed the way of relating to the city. Whereas once the first interface between the building and the visitor was the façade, today the roof is often the first visible element. This change has also had an impact on the design of new buildings. For example, technical rooms are increasingly being hidden by roofs, and replaced by garden roofs, which are more attractive for viewing from above. Similarly, large-scale urban interventions, from the expansion plans of artificial islands in gulf countries to the mammoth buildings erected in deserts, follow geometries that are easily recognizable from above. They often use formal expedients –symmetrical shapes, bright colors, large logos– already in use in airport design, conceived to be seen from the privileged height of an aircraft. The democratization of the processes of viewing from above has led to a rethinking of the processes of communicating architecture, which no longer interfaces with the limited audience of flesh-and-blood visitors, but with the broader audience of people connected to the web.

Keywords: aerial imagery, satellite, land art, contemporary architecture

Introduction

Until a few centuries ago, men had to climb mountains and build towers, domes, belfries, altanas, or belvederes to have a view of the earth from above. The distance guaranteed by a high standpoint provided a wide field of view and hence a large degree of comprehension of the surrounding space. The possibility of an elevated outlook favored military strategies and commercial trade: enemy armies could be seen in advance, and in maritime cities, ships approaching the harbor could be detected quickly by the merchants on their way to negotiate cargo. Until the diffusion of aerial photography, only a limited number of people could experience a bird's-eye view of land. Although photography from tall buildings, such as towers or skyscrapers, allowed a view of the city from above, the purposes were usually different [Wigoder

2002; Deriu 2016]. Such perspective representations were usually centered on the emotional and realistic meaning of the image, understood as a still of a precise temporal event. Instead, the coupling of the camera to aerial means of locomotion made it possible to focus on larger areas, and on the landscape dimension, too [McKinley 1929; Newhall 1969; Martin 1983; Garcia Espuche 1994; Deriu 2004; Amad 2012; McCabe 2019]. It must be said that the difference between the various methods of aerial photography, which corresponds to a different inclination of the optical plane, also influences the way in which information is conveyed. In the case of a horizontal optical plane and vertical optical axis, the result is a flat projection. By tilting the axis some degrees, one obtains high oblique photographs, which highlight



Fig. 1. James Wallace Black, *Boston, as the Eagle and the Wild Goose See It*, 1860 (The Metropolitan Museum).

the volumetric aspects of space, keeping the object in the foreground and in the background at a comparable scale. Finally, low oblique photographs, with the axis more inclined, are often used to emphasize the vastness of a spatial area. Such a distinction can be compared to that between different drawings from above: vertical photography has much in common with a plan, high oblique can be compared with approximation to an axonometric view, while low oblique can be coupled to those perspectival views enhancing the sublime aspects of the landscape, sometimes also including the horizon line within the frame. The possibilities of aerial photography have been enhanced by satellite images. They make it possible to obtain images of portions of the territory at a larger scale and, with recent technological advances, at a level of detail comparable to aerial photography.

Both aerial photography and satellite imagery, as two acts of the same play, evidently define a clear before and after of architectural perception by providing people with views from above. However, aerial photography did not have the same immediacy and ubiquity of use offered by modern satellite imaging software. Indeed, as has been the case with most recent digital innovations, one of the biggest consequences of satellite imagery involves the degree of diffusion. Nowadays, an immediate step in the study of a site entails a quick web search, followed by a look at its aerial image, which is usually provided by well-known satellite imagery services. The possibility of having a bird's-eye view was once available to only a few people, but today, a screen and a good internet connection enable anyone to reach the remotest places on earth without even taking a step.

How could architects not take these into account when conceiving, representing, and building architecture? How could they not long for an increase in the awareness of the simultaneous chances to be, or be seen by, an eye in the sky? These questions stimulate reflection upon the meaning of viewing from above, considering the introduction of aerial photography and satellite imagery as a threshold in the way of perceiving (and conceiving) landscapes, cities, and architectures.

Between war strategies and urban photography

The historical importance of altitude stems from practical reasons: the aim of ascent was often not so much delight in the view as the observation of sensitive targets. The Venetians were deeply aware of how attractive high-rise



Fig. 2. St Paul's Cathedral after the bombing of the 7 September 1940 (Imperial War Museum, London).

constructions were for those gathering information about ways of penetrating the lagoon. The Turkish ambassador Ali Bey was one of those seeking such information. In 1517, he visited Venice on behalf of the sultan [Sanudo il Giovane 1879, p. 73]. At the top of St. Mark's Campanile, his questioning about the canals and entrances to the city, which he could clearly see from above, illuminated a military concern and proved the strategic value of the Serenissima resolution of prohibiting access to unaccompanied foreigners. The limited access to high-rise structures was overcome when, around the 19th century, urban planners provided the city with public places designed for observation from above. Belvederes in the form of terraces punctuated the major cities of Europe, from Rome to Florence and from Paris to Lisbon. At the turn of the century, the development of elevating systems for skyscrapers supported the diffusion of panoramic elevators and higher observation towers, which offered unprecedented views of the city.

Viewing from above was also facilitated by the development of photographic technology [McCabe, Padley 2019]. In 1858, the French photographer and balloonist Nadar (1820-1910) shot the first aerial photographs of Paris from an aerostat. Two years later, James Wallace Black (1825-1896) and Samuel Archer King (1828-1914) captured the city of Boston (fig. 1). Their balloon view of the city permitted an unusual reading of Boston that underscores its relationship with its harbor and highlights the radial confluence of the streets near the port. The development of photographic technology, which is also linked to other flying 'devices' (such as kites, dirigibles, and pigeons), also prompted its adoption for military purposes [Mead 1983]. In 1862, the Union Army spied the Confederate troops through photographs taken from a hot-air balloon. However, it was the invention of the airplane that mostly favored the spread of aerial photography. Since the first airplane outfitted with a camera was used by the Italian army during the Italo-Turkish War (1911-1912), aerial reconnaissance has become a fundamental phase of military strategies, and its use particularly increased during the First World War. Sensible objectives, such as industries, barracks, and government buildings, and reference points were identified through their zenithal images. For this reason, camouflage techniques were applied to conceal them from the view of aircraft [Solomon 1920; Reit 1978; Hughes 2019]. For instance, the Kilburn White Horse geoglyph (Kilburn, North Yorkshire) was partially covered during Second World War to prevent German pilots from using it as a

navigational landmark. Other popular cases include the concealment of the Kremlin buildings to evade bombardment, and the masking of the Hollywood Burbank Airport with a camouflage netting disposed by scenographers and artisans from the main movie studios of Hollywood, which made it resemble a rural area [Patowary 2010]. During the Second World War, photographs shot from airplanes became fundamental in the quantification of war damages. For instance, the famous aerial photos of St. Paul's cathedral among the ruins in London permitted an unusual view of the buildings, both the surviving and blitzed ones (fig. 2).

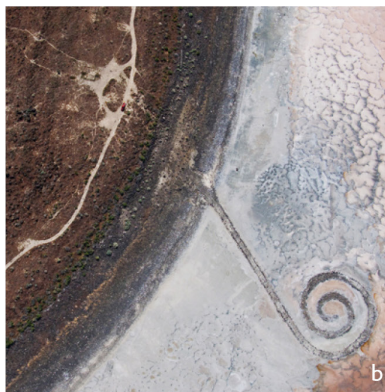
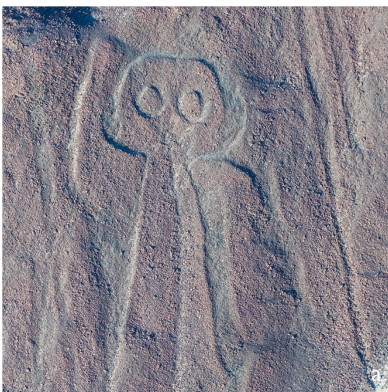
Signs in the land

This important role of aerial imagery in reading buildings' plans and footprints is particularly evident in the relevance given to aerial photography in archaeology [*Fotografia aerea* 1971]. In particular, observation of crop, soil, and frost marks has permitted the discovery of many buried constructions. It has also allowed for reading of ancient divisions of cultivated lands, to which streets were later aligned, and interpretation of large-scale images traced on soil.

An example of these large-scale drawings is the geoglyphs of Nazca (fig. 3a). Mysterious lines forming ancient geometrical and figurative drawings fill a vast section of the Peruvian desert. Their aerial readability has generated different creative speculations about their function and the possible benefi-

ciary of such a design effort. The most accredited theory is that they are ritual pathways connected with water sources in the desert. The Nazca lines underscore the key point of reflecting on the gap between experiential use and reading through a view from above. Despite they are something to be used on earth, they seem to require the public to be in the space to be fully appreciated. They lead us to reflect on the exigencies of ancient societies to connect elements in the landscape in order to make them more understandable through the materialization of perceived links. Large-scale planning/design seems to reflect the inability of the human mind to fully dominate those connections: human comprehension would rather go through physical experience. Such premise lies at the base of Robert Morris' (1931-2018) consideration about the tendencies of art of his time. The renowned artist took inspiration from the Nazca lines to write the famous essay *Aligned with Nazca* [Morris 1975]. In his opinion, the drawings, whose lines cannot be read from street level, are in fact a perfect paradigm for the attempt to force the experience of space while using art to build perceptive and emotional relationships with the landscape. Also inspired by the Nazca trenches, the Spiral Jetty (1970, fig. 3b) by Robert Smithson (1938-1973) constitutes an earthen dock formed by natural elements of the Salt Lake, such as mud, salt crystals, and basalt rocks. Its sinuous shape is perceived as an artifact when seen from afar but not when the observer walks within its counterclockwise track. Indeed, Robert Smithson used to travel by plane to investigate landscapes and identify appropriate areas for his

Fig. 3. a. Astronaut, Nazca Lines; b. Spiral Jetty; c. Lady of the North (Google Earth images).



interventions and it was during one of these flights that he tragically lost his life.

Art is not untouched by the aesthetic of aerial viewing and, more than other disciplines, it critically reflects on the drastic changes in perception this standpoint may cause [Dreikausen 1985]. Indeed, an eye in the sky, or at least at a relevant altitude, is needed to fully comprehend many examples of land art. The shift in the experience of a space from a ground-level view to an aerial one stresses the identification between the viewer and the creating entities, which are traditionally believed to reside in heaven.

In her famous essay *Sculpture in the Expanded Field*, Rosalind Krauss investigates how art in general and sculpture in particular has been eager since the 1960s to conquer the spatial dimension, crossing the usual border between the different disciplines' fields of action [Krauss, 1979]. In this sense, art, to become land art, has to learn to operate at a scale comparable with that of landscape design. If the land art tends to configure as a gesture, we can look at landscape design as the discipline of deeply remodeling earth. It is interesting to notice how processes of confrontation and modification of the natural landscape can be based on both mathematical and geometrical relationships, stressing the idea of an arithmetic order that underlies nature, and an illustrative attempt of figurative subjects. The work of the architectural theorist and landscape designer Charles Jencks (1939-2019) undertook both artistic directions; in *The Garden of Cosmic Speculation*, he dialogues with scientific phenomena and the laws of the universe (black hole, fractals), thus giving shape

to a unique example of an abstract garden, while in the *Lady of the North* (2005-2012), he shows the anthropomorphic figure of a reclining woman made of uplands and valleys, modeled through massive earth movements (fig. 3c) [Jencks 2003; Politakis 2017]. Jencks was aware that technology had brought a different way of perceiving the city, whose shape had been changing accordingly. For instance, dealing with the fractal growth of metropolises such as London and San Francisco, he stressed the importance of viewing from above to read their morphology: "Fly over them at night, or better, get the satellite view, and you can begin to understand the truth of these supple bodies, whose life depends on constant death and renewal through the growth of small businesses" [Jencks 1997, p. 11].

Reading Human Settlements

Jencks' words emphasize the importance of satellites as monitoring tools of urban agglomeration, but this technology-driven observation highlights an intrinsic feature of drawing in plan: its regulatory power [Haffner 2013]. Indeed, the organization of new settlements and towns –from the stellar borders of Palmanova in the Friulan plain, Italy, designed in 1593 by a group of military engineers headed by Giulio Savorgnan (1510-1595) (fig. 4a), to the circular layout of the Chaux Saltworks, France (1773-1806, fig. 4b), designed by Claude-Nicolas Ledoux (1736-1806)– emphasizes the everlasting primacy of horizontal plans in

Fig. 4. a. Palmanova; b. Chaux Saltworks; c. Brasilia (Google Earth images).



urban design [Branch 1948; Constantin 2021]. When aerial experiences were almost inconceivable, imaginative aerial perspective drawings were used to report determinations giving new shapes to growing cities. This kind of representation materialized a superimposed order that, although not experienced directly through vision, corresponded to transcendental concepts – be it those of Renaissance Neoplatonism or social utopia. However, given the impossibility of experiencing aerial views in real life and due to nearby, some explanatory expedients were required to underscore the new geometrical assets of sites. This was the main reason for the hexagonal squares in the middle of Palmanova, or the semicircular enclosures of Chaux.

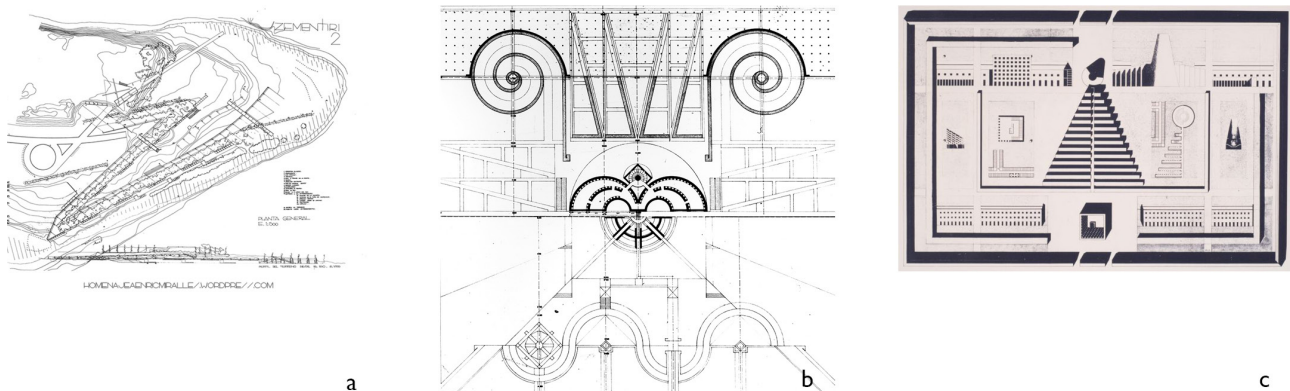
In the last century, the reading of urban shapes greatly benefited from the wide spread of civil aviation, especially in the post-war period. This new perceptive possibility must have affected the creative sensitivity of Lúcio Costa (1902-1998), who designed the central area of the city of Brasília –the new capital of Brazil– in the shape of an airplane (*Plano Piloto*, 1956, fig. 4c). The mirroring phenomenon between an observed city and the observers on an aircraft, whose image is reflected in the city itself, creates metacognition, which is a recurring feature of artistic practice [1].

This figurative approach to the design of cities was also applied at smaller scales, particularly in specific typologies of cities, such as necropolises. An interesting case is the cemetery designed in 1967 by Alessandro Anselmi (1934-2013) for the small town of Parabita, Apulia, Italy [Conforti,

Lucan 1997, p. 198]. The plan of the project (fig. 5b) evokes the capital of a classical column, while its elevation, made of plain walls, is subsidiary to the horizontal layout. Nevertheless, the different altitudes of the site suggest a certain three-dimensional projection that would sanction the imperfection of a purely zenithal perception in favor of an angled aerial view. We could also mention several other projects of cemeteries that sustain the prominence of aerial views through the adoption of highly symbolical plans. For instance, the famous plan of the extension of the San Cataldo Cemetery in Modena, Italy (1971, fig. 5c), was organized by Aldo Rossi (1931-1997) through a succession of pure forms (squares, triangles, circles); the original plan (1984) of the Igualada Cemetery (fig. 5a), Spain, by Enric Miralles (1955-2000) and Carme Pinós (1954), was shaped like a 'Z', the initial of the Catalan word for 'cemetery' [Tagliabue 1989].

The diffusion of figurative schemes to be seen from above, which occurred toward the turn of the millennium, followed the development of zenithal photography, which was boosted by satellite technology. On October 24, 1946, the rocket V-2 shot several sub-orbital images of the Earth, while the satellite Explorer 6 produced the first orbital satellite photographs of Earth on August 14, 1959. However, despite the development of satellite imagery, its cost initially limited its use within the military and scientific fields. The broadening of the catchment area was mainly due to its matching with software, such as Keyhole EarthViewer

Fig. 5. a. Enric Miralles and Carme Pinós, Igualada Cemetery, plan 1984. Fundació Enric Miralles; b. Alessandro Anselmi, Parabita Cemetery, plan. From Lucan, Conforti 1997; c. Aldo Rossi, Gianni Braghieri, Cemetery of San Cataldo, Modena, plan, 1971 (The Museum of Modern Art).



(launched in 2001), which was later renamed *Google Earth* (2004). The use of platforms dealing with satellite imagery and their integration into online maps or Geographic Information System are providing architects and other users a different tool with which to approach landscapes, cities, and their architectures [2].

A matter of roofs

For a long period, façades have been the chief and the first interface between buildings and people. Their representative function is highlighted by eloquent architectural features that represent communication between buildings, their owners, and the world outside – precious surface finishes, dedicatory inscriptions, loggias, windows, and door frames. By contrast, in the twentieth century, the first reading of a building derived not only from a view of its façade. This was clear to Futurist artists, who created aeropaintings, which portray aerial landscapes, and to Benito Mussolini, who celebrated the audacity of airplanes [Frome 1993]. One decisive factor that convinced him to approve Gruppo Toscano's project for the new station of Florence (1932, fig. 6a) was that the building, when seen from above, resembles the fasces. Similarly, when viewed from the sky, the Palazzo M in Latina (1938-42), seems to outline the initial of the dictator to which it is dedicated (fig. 6b).

Today, people often approach architecture through horizontal projection, captured by satellites and transmitted to the screens of computers or phones. Human-scale/façade-side encounters are still how we primarily experience buildings, but aerial imagery is now definitely a major method of encounter. Indeed, people have become accustomed to a preventive knowledge of architecture because of the web. Therefore, before traveling to a place, people exhibit a widespread habit of searching the place on the web and looking for directions. In the planning of a trip, the first to appear is an aerial image of the location, which usually shows the rooftop.

Looking at roofs gives an unexpected point of view that can elucidate the intention of both ancient and contemporary designers and lead us to consider how satellite imagery af-

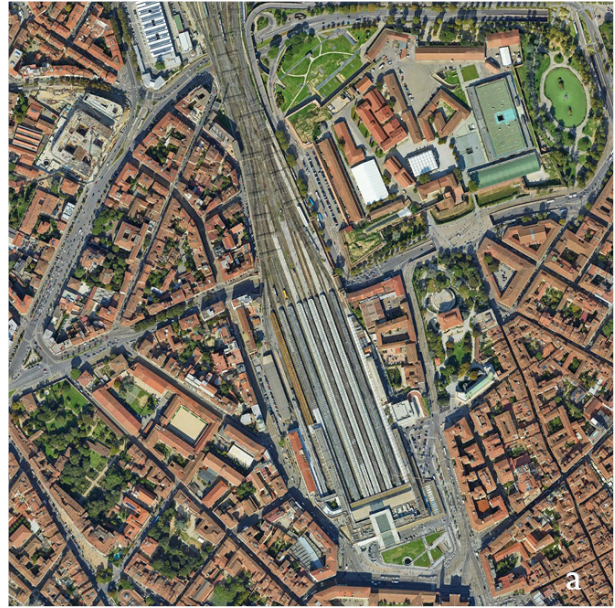


Fig. 6. a. Santa Maria Novella Station, Florence; b. Palazzo M, Latina (Google Earth images).

ected, or is affecting, our way of conceiving architecture. The aerial imagery of historical buildings works perfectly as a detector of specific geometric layouts and constructive devices not supposed to be seen before entering such buildings.

Thus, we can now see in advance that the polygonal volume of Palazzo Farnese in Caprarola, Italy, contains a circular courtyard (fig. 7a). Similarly, without crossing the threshold of its porch, we learn that the symmetrical façade of Palazzo Massimo alle Colonne is not aligned with the courtyard behind it (fig. 7c). This case, like many others, shows how the apparent symmetry, regularity, and compactness of early modern architectures is often merely simulated by architectural or decorative devices. For instance, when seen from above, the solid volume of Palazzo Farnese in Rome, Italy, the so-called *dado Farnesiano* (Farnesian dice), appears to be pierced by a small courtyard that is concealed behind the regular scheme of the window aediculas on via del Mascherone (fig. 7b).

The projection onto the optical frame in the case of a viewpoint at a considerable distance, such as that of a satellite, allows the roof surface of a building to be schematized as flat. The roof thus becomes a large sheet on which to draw graphic messages for viewers. The ornamental eloquence of the façade has in fact shifted from the vertical to the horizontal plane of the roof. After all, the Italian architect Vittorio De Feo used to say that the design of a floor has the same relevance as an elevation [3].

The rotation of the interface from the vertical to the horizontal plan also meant that roofs were provided with the textile character that Gottfried Semper, in his famous

essay on *Style*, attributed to architectural ornament [4]. Picking up on the parallel the German drew between architecture and fabric, one could, for instance, draw a correspondence between carpets and the top representation of many pieces of contemporary architecture [5].

Contemporary building practices, indeed, often give a nod to 'sky spectators' who view architectures from above with ease. The first implication is the careful design of roofs and terraces, including elaborated pavement design, such as the mosaic patterns designed by Giuseppe Capogrossi (1900-1972) for the terrace of the Confindustria building in Rome (1972) (fig. 8a) [6]. Moreover, the zenithal vista has caused the sudden disappearance of utility volumes, including the rooftop units of air-conditioning systems. In addition, the diffusion of satellite imagery is probably extending our visual concept of landscape. Since, besides shadows, aerial imagery does not give us a detailed perception of altitude, rooftops and natural grounds appear to be in continuity. This, together with the increasing attention for sustainability, may be the basis of the wide spread of terrace gardens and green roof solutions.

The material and visual continuity between inclined walkable surfaces and roofs can also be seen as a product of a view from above. This is particularly evident in the City of Culture of Galicia in Santiago de Compostela (1999-2011, Fig. 8c) designed by Peter Eisenman (1932). The plan derives from the superimposition of graphic layers that overlay a square mesh on the grid of ancient medieval streets. The modelling of the resulting geometries creates

Fig. 7. a. Palazzo Farnese, Caprarola; b. Palazzo Farnese, Rome; c. Palazzo Massimo alle Colonne, Rome (Google Earth images).

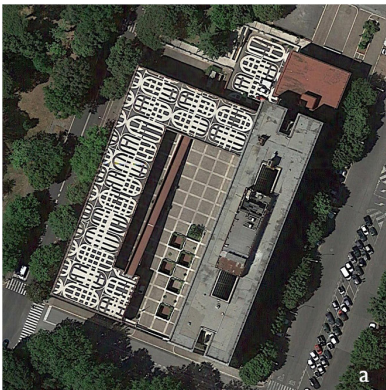


a hollowing of the terrain, in an approach that can be compared to the one employed by Alberto Burri in the conception of the *Grande Cretto* in Gibellina (1984-1989) [7]. From the top, it appears as a flat texture of intersecting grids, as if it were a tartan cloth stretched over a surface full of bumps.

More evidently, in the design for the new market of Santa Caterina in Barcelona, Spain (1997-2004, fig. 8b), Enric Miralles and Benedetta Tagliabue used the roof to reveal to the rest of the city the visual spectacle taking place in the interior [Miralles, Tagliabue, 2001]. Indeed, the architects restored the old market by adding a roof that is made of steel, wood and clad with octagonal ceramic tiles, whose disposition recalls the shapes and colors of the vegetables sold underneath. A street-level view can offer only a limited experience of the vibrant canopy, since only a glimpse of the colorful ceramics is perceivable. Not even the highest floors of the residential buildings on the borders of the square are high enough to allow a complete read of the drawing on the roof. Likewise, a very long distance is needed to appreciate the painting of Seurat, whose reading would benefit from a zenithal view because of the folded surface. A vibrant still life is obtained by decomposing the drawing in hexagonal tiles colored with 67 different hues – a process recalling the foundation of digital imaging based on pixels. In the work of Miralles Tagliabue EMBT, such architectural surfaces as roofs serve as a proper canvas where figurative experimentations are revealed with the impactful use of color:

Another project of Miralles Tagliabue EMBT features an analogous solution for a canopy. In the Centro Direzionale Station of the Naples Underground (2005-ongoing), Italy, which is in construction, the roof is again used as a wavy canvas for an image that assumes a symbolic value in the context. Like its Spanish counterpart, the Neapolitan building was conceived to expose a figurative illustration that is expressly intended to be seen from above. The original intention was to portray the face of Latin poet Publio Virgilio Marone (70-19 BCE) as an eminent figure related to the city. Although born in Mantua, the poet had a sentimental connection with Naples so deep that he asked to be buried there. However, the decoration of the roof, which was conceived as an artistic intervention involving the participation of the Cuban American artist Jorge Rodriguez-Gerada and meant to be experienced in large-scale drawings to be seen from space, has been cancelled due to budget issues and delays. The architectural and landscape designs of the Spanish architectural practice are often imbued with a figurative taste that serves as the driving force in the development of architectural projects. This approach to projects is materialized in the strong connection between drawings and results: the plans submitted to explain such projects are made of photos and organized in creative collages to make them as eloquently expressive as other kinds of drawings [8]. Plans and roofs are not only represented vividly but also concretely intended as eloquent sculptural objects whose shapes are firstly determined through their horizontal projection [Contreras 2013, pp. 174-177].

Fig. 8. a. Palazzo Confindustria, Rome; b. Market of Santa Caterina, Barcelona; c. City of Culture of Galicia, Santiago de Compostela (Google Earth images).



Sculptures and logos

The speaking capacity of roofs sometimes translates into the speaking capacity of the buildings themselves, which with some outstanding architectural features become eloquent symbols if observed from above. The widespread use of buildings with circular shapes, for example, ties in well with the need for recognizability in satellite representations [9]. Thus, architecture has begun to adopt the same stratagems as graphic communication.

On 22 April 2017, Cosmo SkyMed, one of the satellites belonging to the constellation put into orbit by the Italian Space Agency (ASI), returned an image of the Third Paradise in the garden of the Agency's Headquarter in Rome (fig. 9). It was a large-scale drawing of three connected circles by Italian artist Michelangelo Pistoletto. The work is clearly legible thanks to the reflective material used, and thanks to the geometric accuracy of the architecture by which it is framed. The observation from space seems to pay homage to the strategy that architects 5+1AA (Gianluca Peluffo and Alfonso Femia) sought to pursue when designing the new ASI headquarters (2005-2012, fig. 10a). The architects, called upon to intervene in the heterogeneous and unregulated urban context of Tor Vergata opted for concentrating the program within a series of volumes with pure geometries conceived as black monolithic blocks. The planimetric composition responds to the narrative of a sudden moment of equilibrium in the absence of gravity. The aerial views were the testing table for experimenting with a compositional action that takes the distance from the scattered settlements spread in the southeastern sector of the Roman countryside. The architects rather privileged pure forms, such as the parallelepiped and the circular arch that, in their perfection visible from the sky, evoke the mythical dimension of science and space.

Large-scale buildings offer an incomparable opportunity for experimentation in this sense. Difficult to understand in their complexity at the human scale approach, architectural manufactures such as museums, airports, large companies' headquarters, constitutes the chance for a sculptural gesture comparable to the craftsmanship that brings objects to life at one's hand scale. The aerial view of the site hence becomes the architect's working table in the initial phase, a compelling communicative image once the building is complete.

Aerial views are particularly important for airport buildings, which are inevitably seen from above by passengers



Fig. 9. The third Paradise at the Italian Space Agency HQ. Foto radar satellite Cosmo SkyMed (Thales Alenia Space Italia).

who are taking off or landing. This is the reason they are often easily recognizable in their iconographical eloquence: their layouts tend to symmetrical geometries, and their high-tech surfaces are frequently modeled like precious fabrics, aerodynamic car bodyworks, or fluent design objects [10]. For instance, the aerial images of Studio Fuksas' Shenzhen-Bao international Airport makes the suggestions recalled by the architects stand out clearly (fig. 10b). The huge travel incubator evokes a tunnel shaped by the wind which turns at one end into a giant manta ray, ready to take off together with airplanes. The iconographic value corresponds to the functional program. The linear offshoots fulfil the need for different landing points, while the organically shaped head signals the main hall. The project materializes the architectural search for a 360-degree visibility, interconnecting interior and exterior spaces. The surface, wrapping like a skin the spaceframe structure, both inside and out, has a double function. The honeycomb motif with which it is perforated guarantees a constant daylight and decorates surfaces like a fabric. At the same time, the iterating geometric motif of the hexagon is adapted through complex parametric process to the interior surfaces. In a great leap in scale, the same tessellation also decorates the furniture of the gates, check-in, and passport control areas. The loss of scale or the fluent transition from extra-large to the extra small in terms of design made the furniture responds to the same leading concepts used to solve the masterplan.

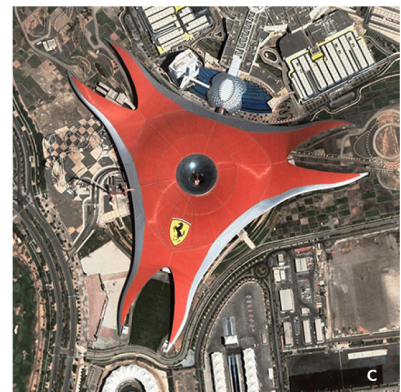
Another eloquent example of this plastic approach to the large scale is the Ferrari World, an indoor theme park dedicated to the iconic car manufacturer, opened in Abu Dhabi in 2005. It was designed by the architecture firm Benoy as a space frame structure adapted to an imaginative shape that evokes the sinuosity of the Ferrari chassis (fig. 10c). The result is an out-of-scale architecture dominated by an imposing aerodynamic roof with a rotational symmetry of order three. The roof is painted the Italian race car color *rosso corsa* and is decorated with the Ferrari symbol facing the sky. The Ferrari World building embodies several themes intersecting in contemporary architecture, from digital modeling to marketing. They are somehow all linked by the possibility to see a building from the sky, at distances that can be provided by satellite imagery. Indeed, the roof serves as a large billboard for the Ferrari shield, if not a graphic symbol itself: advertising set up for aerial viewers [11]. After all, the Emirates abound in architectures and landscapes that are meant to be seen from a certain altitude, including the artificial Palm and World islands, which lie off the coast of Dubai. Similarly, the sinuous shape of the digitally modeled roof suggests a creative form-finding process that was traditionally a main prerogative of sculpture, applied art, industrial design, and therefore smaller objects. Modern construction technologies allow designers to indifferently realize a table and a building with the same shape; both are sculptural objects perceived by a user three-dimensionally also from above. The contemporary affinity be-

tween design pieces and large-scale buildings, enabled by the advent of modeling software in architecture, has also been enhanced by the possibility of aerial access to architectures. Satellite imagery programs allow viewers to easily zoom in and out of terrestrial surfaces – from small architectures to colossal megastructures; the loss of scale, derived from the availability of digitalized images and models, has deeply influenced people's perception of buildings [12].

Conclusion

The revolutionary role of technology in upsetting the viewing scale was perceived by the 1957 book *Cosmic View*, by Dutch educator Kees Boeke, which presents many images of several levels of dimensions –from the cosmic to the atomic [Boeke 1957]. The book inspired the short film *Powers of Ten* (fig. 11), directed by Charles and Ray Eames in 1977 following a previous prototype (1968) [13]. The film visualizes the size relationships of elements in a flow through space, which can be easily likened to the experience offered by contemporary satellite imagery programs. The Eames' film, despite providing the viewer with the dimension of the images represented, proves how a galaxy and an atom have the same dimensions when projected on a screen. Similarly, buildings and furniture can have the same size when seen from a satellite.

Fig. 10. a. Italian Space Agency (ASI) HQ, Roma; b. Shenzhen Baoan International Airport, Shenzhen; c. Ferrari World, Abu Dhabi (Google Earth images).



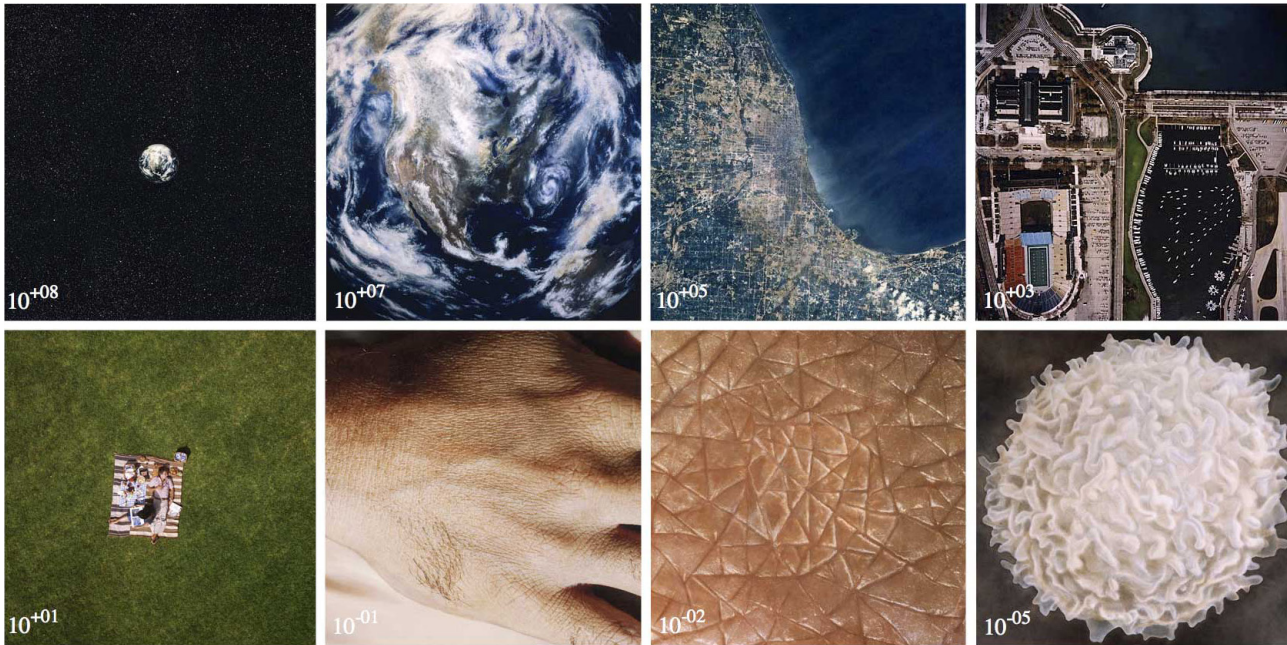


Fig. 1 | Still from *Power of Tens*.

The way in which the eye perceives reality has been affecting architecture since the primordial awareness of spatial representation. With aerial photography and satellite imagery, for the first time, the orthogonal view from above has become a primary way of experiencing places, not just an abstract method of representation. Technology has unveiled another point of view on buildings that is independent of the body's position in space and is accessible to a theoretically infinite number of users. Moreover, the scalar versatility of these images makes them prone to inexhaustible degrees of detail.

Consequently, this perceptive approach seems deeply embedded in the design conceptions of recent architectural projects. At the same time, the diffusion of aerial and satellite imagery has helped to create a new awareness of people towards land transformations [Hayden 2001]. As this contribution has shown, by changing the way the world is seen, the way the world is designed and governed has also changed. Now more than ever, we may be able to affirm that contemporary architecture and urban planning deal with projects for the space age: buildings and landscapes to be observed by an 'eye in the sky'.

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Notes

[1] See, for instance the *Gallery transplants* in which Dennis Oppenheim (1938-2011) traced the plan of an art gallery on the soil, then exposed the photographs of the geoglyph in the gallery itself.

[2] On *Google Earth* as a powerful tool to observe the planet see Scheffers et al. 2015.

[3] The episode was recalled by Maria Grazia D'Amelio.

[4] "[textiles] can be seen, as it were, as the primeval art from which all other arts –not excepting ceramics– borrowed their types and symbols" [Semper 2004, p. 113].

[5] If the parallel is obvious in the case of landscape architecture –to carpets, one can easily juxtapose the paving that Dimitris Pikionis designed for the Acropolis in Athens, or the sinuous pattern of the floors that Roberto Burle Marx created for Copacabana, in a practice reminiscent of the tradition of flower carpets made all over the world– the affinity of many contemporary architects with textiles underlines the common roots between architecture and textiles. Think, for example, of the carpets designed by Zaha Hadid or the activity of architect and textile designer Petra Blaisse.

[6] The reading of patterns was boosted by a view from above, as proved by the flooring and garden designs of Roberto Burle Marx (1909-1994) or the Superkilen Park (2012) by Bjarke Ingels Group and Topotek1, which can be fully seen and understood only in plan or through aerial photography.

[7] This idea of the footprint as topography would also be proposed by Herzog e De Meuron for the 2012 Serpentine Gallery Pavilion.

[8] For example, see the plan for the Bremerhaven published in Zaera 1995, p. 10.

[9] See, for instance, Herzog & de Meuron's Skolkovo Institute in Moscow (2018) or MVRD's project for the Innovation Park Artificial Intelligence in Heilbronn, Germany (2023).

[10] We could mention the several airports designed by Foster and Partners (Honk Kong, Mexico City, Kuwait, Panama, etc.) or Studio Fuksas.

[11] The upsized reproduction of a commercial brand, the brilliant colors and the estranging effect of a huge iconic shape evokes some creative and conceptual mechanism of pop art.

[12] The quick passage from infinitesimal small which has proved to be also a major theme in architectural drawings, where the digital space has questioned the validity of representative fractions. Analogously, the shift in the scale influences the perception of artworks, as proved in Anapur 2016.

[13] *Powers of Ten: A Film Dealing with the Relative Size of Things in the Universe and the Effect of Adding Another Zero*, directed by Charles and Ray Eames, voice by Philip Morrison, music by Elmer Bernstein, Pyramids Films, 1977.

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