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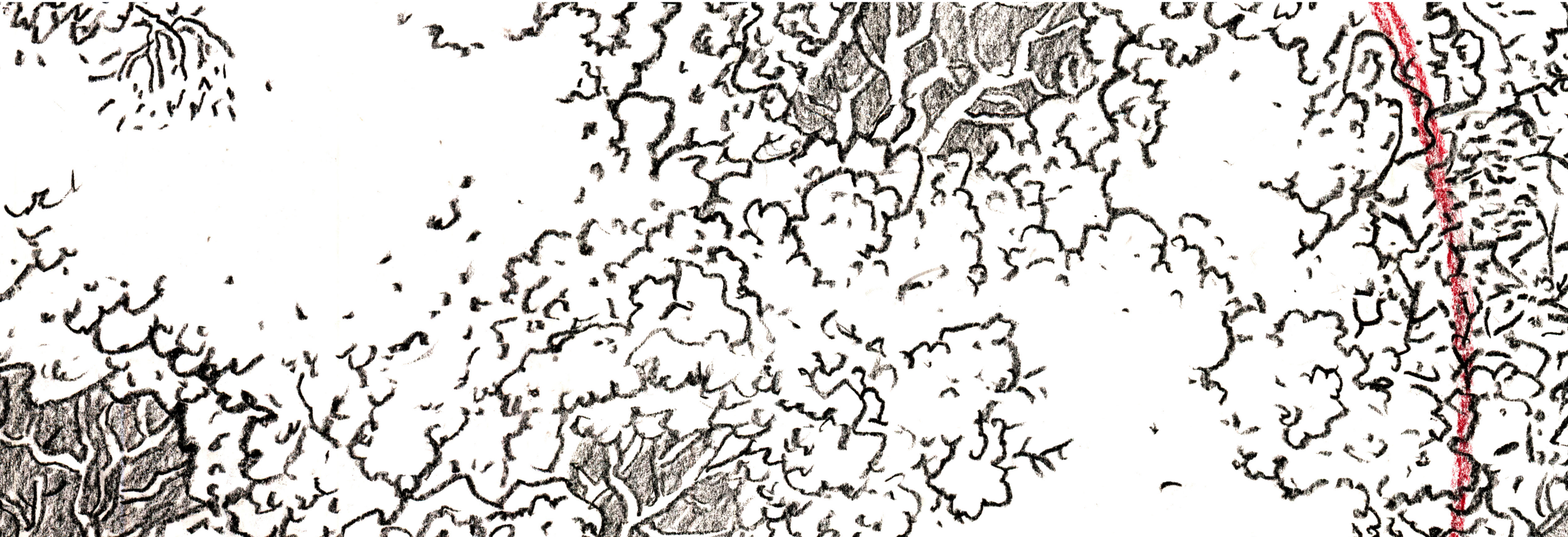

diségno

6.2020

REFLECTIONS.
THE ART OF DRAWING/THE DRAWING OF ART

diségno

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Cover
Oscar Piattella, The tree of diségno. *To UID the sign for the "drawing" of the tree, 2019. Detail.*

The articles published has been subjected to double blind peer review, which entails selection by at least two international experts omn specific topics.
For Issue No. 6/2020, the evaluation of contributions has been entrusted to the following referees:
Fabrizio Agnello, Marcello Balzani, Salvatore Barba, Carlo Bianchini, Fabio Bianconi, Stefano Brusaporci, Pedro-Manuel Cabezos Bernal, Massimiliano Campi, Cristina Candito, Laura Carnevali, Emanuela Chiavoni, Massimiliano Ciammaichella, Alessandra Cirafici, Paolo Clini, Roberto de Rubertis, Laura Farroni, Federica Maietti, Giovanna Massari, Pina Novello, Ivana Passamani, Maria Elisabetta Ruggiero, Graziano Mario Valenti.

English translations of the editorial and of essays of *Arduino Cantàfora, Franco Purini, George Tatge, Michele Dantini, Marco Tortoioli Ricci, Enrica Bistagnino* e *Maria Linda Falcidieno, Lia Maria Papa are by Elena Migliorati.*

Pubblished in June 2020

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6.2020 **diségno**

Editorial

Francesca Fatta

In April of this year, we finally received the notification from ANVUR that the journal *diségno* has been included in the list of scientific journals recognized in Area 08, starting from the first issue. For our scientific society this is the first of the goals we had set ourselves, to the full benefit of the research and scientific activities of Drawing, indicated as early as in the first editorial by Vito Cardone in 2016 in which he wrote "The project phase of the new journal has been long, and thoroughly meditated. It was developed, after the decision of founding the journal deliberated by UID's Technical Scientific Committee in November 2016, by a specific work group of the Committee itself, taking into account the numerous suggestions received from various colleagues after the announcement of the important decision" [Cardone 2017, p. 6]. A heartfelt thanks goes to the commitment of its founder, to the work of the Editorial Board coordination committee and to all the staff who have dedicated themselves with such great rigor, adopting all the ANVUR directives with which a "scientific" journal is required to comply.
The Issue No. 6 is dedicated to the in-depth considerations of the 41st UID Conference *Riflessioni / Reflections* organized by the teachers of the Disciplines of Representation of the University of Perugia.

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The event, which took place on September 19, 20 and 21, 2019, with the scientific responsibility of Paolo Belardi and Roberto de Rubertis, saw a record number of attendees (over three hundred), about half of which were young scholars, PhD students and PhD holders.
It was a conference inspired by the sense of reflection, both tangible and intangible, which marked the joint – thus, reflected, – presence of the University of Perugia and the "Pietro Vannucci" Academy of Fine Arts of Perugia.
The theme of the conference, in this continuous play between the art of Drawing and the drawing of Art, aimed to focus on a principle of duality that regulates the relationships between drawing and four different subjects: thought, knowledge, imagination and communication. The mechanism of duality, which at first glance may seem reductive, almost a predestined game, actually captures the mind and opens to many other "reflections."
The volume opens with a text tinged with intimism by Arduino Cantàfora, taken from *Passaporto per la vita* (Marinotti, Milano 2009). The artist-architect, awarded the Targa d'Oro UID in 2019, enters into the themes of the conference by dealing with the time of reflection. "The time of reflection and, therefore, of the consequent representation, although constructed on chronology, is not only this; it invests in interpretative projects and is immediately transformed into remembered time." The images that accompany the essay are "visionary" representations by the author related to domestic spaces and timeless cities.
The next article is Paolo Belardi's commentary on the drawing that the artist Oscar Piattella created expressly for our association on the occasion of his exhibition *Nel Di-Segno del Colore* set up in the suggestive Rocca Paolina of Perugia. The dedication, "*Alla UID il segno per il 'disegno' dell'albero*" ("To the UID, the sign for 'drawing' the tree"), was meant as an auspicious metaphor comparing our group to a plant that is growing and that must be cultivated with care and wisdom.
The four Focuses feature the lectures of the four keynote speakers who extended the theme of "reflections" to various points of view and gave the proper scientific amplitude that serving as a bridge between art, science and drawing. The first, "Thinking," begins with a contribution by Franco Purini entitled *Random and Provisional Notes on Drawing*. He states that "architectural drawing is […] also a tool, but first of all it is the space in which the idea of architecture reveals itself to its author and to those who will frequent the architecture that the drawing defines. Drawing makes us discover not only what appears to our eyes, but at the same time reveals to us what is unknown, indefinite, transitory".
For the second Focus, "Knowing," the intervention of George Tatge, who with his photographs celebrates the reflections that can be captured in everyday human life: "I like the indefinite, the boundless; I like continual uncertainty".
Michele Dantini opens the Focus "Imagining," with the text *"Exactitude" in the territories of "intuition." Paul Klee at the Bauhaus*, in which the German artist's path towards the "*merveilleux*" is analyzed, with attention to optical-perceptual research and reflected reality, rarefied by light and atmosphere.
The fourth Focus, "Communicating", is introduced by the visual communication designer Marco Tortoioli Ricci, who gives us a historical picture of lettering "…as the center of every identity project, or 'branding' project if you prefer, starting from the design of those letters, so full of imaginative flair, still boasting that eclecticism that permeated the passage between the nineteenth and the twentieth centuries".
Each Focus is followed by the extended versions of the contributions selected among those having received the highest evaluations by the Conference's referees, as well as those awarded Best Paper of each Focus. Once the new abstracts had been presented, they were then submitted to a further double review, and those deemed most deserving were selected.
For the journal's other sections, in keeping with the themes of the conference, Enrico Cicalò, on the occasion of the bicentenary of Ruskin's birth, proposes the rereading of the classic *The Elements of Drawing*, a "drawing manual" that takes us back to the Arts and Crafts theories on drawing in relation to art, science, design and didactics in 19th-century England.
Enrica Bistagnino and Marialinda Falcidieno authored the review of Livio Sacchi's *Il futuro delle città* (La Nave di Teseo 2019); Alessandra Pagliano reviewed Laura Farroni's *L'arte del disegno a Palazzo Spada. L'Astrolabium Catoptrico-Gnomonicum di Emmanuel Maignan* (De Luca 2019); Alessandro Luigini proposes the review of Gilles Clément's *Breve trattato sull'arte involontaria. Testi, disegni e fotografie* (Quodlibet 2019); Alberto Sdegno and Veronica Riavis reviewed the volume by Domenico Mediati and Saverio Pazzano, *M.C. Escher in Calabria. Memorie incise di un viaggiatore olandese* (Rubbettino, 2019).

Of course there were various appointments with seminars and conferences that took place in the second half of 2019 and the beginning of 2020; Giuseppe Amoruso intervenes on the conference *Geometrias'19 Polyhedra and beyond*, organized by Aproged, the Portuguese Association of Geometry and Drawing Teachers; Lia Maria Papa reports on the seminar *Cortona tra archeologia ed architettura. Rilievi digitali e patrimoni documentari*, curated by Paola Puma, DiDA Department of the University of Florence; Camilla Casonato deals with the Study day, *2nd Brainstorming BIM, VR, AR, MR*, curated by Cecilia Bolognesi, Fausto Brevi and Daniele Villa of the Politecnico di Milano; Graziano Valenti deals with *II Simposio dei Docenti della Rappresentazione per lo sviluppo di programmi multidisciplinari orientati all'Internazionalizzazion*e, organized in Matera by Antonio Conte and Stefano Bertocci; Alessio Cardaci informs us about the *Symposium Rip, Model & Learn: dialoghi interdisciplinari sul rilievo e la modellazione 3D per l'architettura e i beni culturali*, organized by Carlo Bianchini, director of the Department DSDRA of the "Sapienza" University of Rome; in conclusion, Ornella Zerlenga tells us about the exhibition *OLIVETTI@TOSCANA. IT Territorio, Comunità, Architettura nella Toscana di Olivetti*, organized by Marco Giorgio Bevilacqua for the University of Pisa.

In this editorial I would like to mention two more important facts concerning the UID.
On the occasion of the members' assembly that took place on September 18th, at the end of the conference, in the splendid Sala dei Notari, the new Statute of the Unione Italiana per il Disegno and the consequent Regulations of the Association were unanimously approved; a work that had taken about six years to complete, carried out under the responsibility of the working group headed by Mario Centofanti. This formal step has made us stronger and more united, clarifying our by-now forty-year history and defining even more clearly the path that awaits us.
Finally, the great participation of young people that characterized the 41st UID Conference has led us to reflect on this important generational heritage that must be cultivated and encouraged. To this end, in November the first UID 2.0-3.0. call was launched for proposals of innovative cultural activities, in a competition reserved exclusively to adherent members, to take place in 2020. The intention is to involve an increasingly numerous and representative generation, inviting them to propose their vision of the future of the disciplines of Representation and Drawing. The call closed in December 2019 and we are now awaiting the final results from the winners.

References

Cardone, V. (2017). Editoriale. In *diségno*, n. 1, pp. 5-8.

A Tin Box

Arduino Cantàfora

Could it have been the remoteness in which I now find myself, or the peculiarity of this house, of this road, of the name of this road, to impose on me these nocturnal wanderings of the mind which, for some time now, I have become used to living with?
Who or what is the true author of this writing, I will not be able to determine, and if at the beginning I could still venture the illusion of autonomous choices, it has been enough, after having gone through a few dozen pages, for me to realize that, slowly or in a rapid hurry, I can no longer guarantee to maintain a firm control of the contents.
As to the late professor of *latinitas*, inhabitant of the floors of this house, which now I, in his place, am treading, I would never have imagined him capable of opening up to me such a necessary perlustration into the protagonists and the anxieties of my life.

To fill his shadow, which to me will, in any case, remain of an absolute vagueness, other shadows have forced the threshold of my vigil and, through a precipitation of events, have crowded together within the walls of this room.
From the distance of memory, dormant for years, they have regained a fluctuating and at the same time vague certainty of presence.
– A thought for me! –
They say, as they look at me with a bit of melancholy.
– Stay a moment longer, don't go away, let me tell you. –
But I am doubtful and in pain, as I do not perceive any reassuring dialogue between them. I do not hear the sound of a voice, of a meeting resumed, as when, in the past, I shared in what they were living.
If I had at least been able to transform myself into the moderator of an assembly, in which each one could re-

Lectio magistralis, non sottoposta a revisione anonima, pubblicata con responsabilità della direzione.

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Fig. 1. A. Cantàfora, Ici les projets eux-mêmes sont souvenirs, 1985, oil on wood, cm 30x40.

late, for himself and for everyone, other significant passages, and to recompose their peace, because there would still be many things to put in order.
Absolutely nothing.
It seems to me that they don't even see each other. They pass through each other's eyes into a total indifference regarding what has ever happened to the other ones.
– But how could you! – I say – I seem to remember that you loved each other. How is it possible that you don't want to remember that now! –
– Look into each other's eyes for a moment. If you don't want to talk, at least take one look! –
But nothing changes. They all keep their eyes on me, and even so, they don't take a single glance at each other.
– Aunt Angelina, you, who have always been so good, just tell your nieces one thing. Tell them now: it was nothing. Through this forgiveness you forgave everyone else and understood the precipitation of situations.
An unbearable illness.
It's impossible, you know, to go back home, and if you suffered undeservedly during the last months of your life, forced onto the horror of that bed, tied up like something disgusting, with tears streaming down your cheeks, yet you don't bear a grudge. –
– If you won't say it for them, say it for me and give me a little peace. –
But then I ask myself: what right do I have to ask her, what have I ever done for her that can justify it.
I can only stop talking and stay quiet.
And then you, like all the others, who with total foolhardiness I have summoned into this room, will you have wished to follow the path I have imposed? And even though they apparently loosened their tongues to tell me about fragments of their lives, will I, in truth, be doing them any service?
Thousands of miles away, why should I ever have deprived them of the absolute silence, there where they are now. A silence for which there is no way back and from where you cannot go forward.
It is certain that they cannot speak to each other, men, animals and things, and although they pass through my memory, they can never exist again.
In an honest reflection, what I can feel, in the awareness of the substantial futility of this convocation, is the undoubted pertinence to the place where it is taking place, in fragile support of my complete selfishness.
Will this be enough to justify it?

Fig. 2. A. Cantàfora, Avec le temps I, 2016, vinyl + oil on wood, cm 70x50.

Fig. 3. A. Cantàfora, Avec le temps II, 2016, vinyl + oil on wood, cm 70x50.

Fig. 4. A. Cantàfora, Finestra I, 2012, vinyl + oil on wood, cm 49,5x29,5.

Fig. 5. A. Cantàfora, Finestra II, 2016, vinyl + oil on wood, cm 49,5x29,5.

It's not an exam, everyone will come out with full marks. I would never allow myself to judge them, here or elsewhere.
The road on the edge of the woods and this house are really an ambiguous microcosm, a true receptacle for everything you want to put into it.
This I have learned, after that initial bewilderment of being there, that had forced me to move with such extreme caution.
They are both in disrepair and rather run-down.
They cannot allow any kind of preclusion.
In the boundless disorder they live in, they wouldn't even notice.
And perhaps it is precisely this chaotic nonsense that has stimulated a pathetic examination of my own origins.
But, perhaps, I'm just trying to put some order among the shards of various lives, that have rained down on me, for wanting to listen to them and to give a possible meaning to mine, almost as though I were playing at Angelino's job...
He, along with all the other ghosts who, within the walls of this house, are feigning a life, in the impossibility of existing.
Exactly the way they had lived it when they were alive.
I'm searching for a concentrated precision, since, evidently, it will do no good.
What's done is done, and it's all water under the bridge now.
And in the name of the road, accomplice to the meaning of the house, I take the opportunity for a vast wandering that is associated, by other clues, with other eccentric and yet precise contents that it itself could mean. As it is of the domestic space in which I live.
Names attribute character to the substance they evoke, and if I live on *the road on the edge of the woods*, the content is declared by the intrinsic meaning of living on the edge. A territory of ambiguous exchange, as are all thresholds.
It doesn't matter, if now I don't see the vanished distinction. It is the name I listen to.
I know I live where two existential orders, along the borderline, have come into conflictual contact.
On this side, I see the streets I frequent, because in cities one has the right to choose and to belong: it is legitimate to have very precise ideas.
One day I would like to write about preferred urban geographies, unfortunately only my own, as I have no possibility to generalize them.
And so I represent them.
I also see, as for every city, pages of sadness, from obtuseness to injustice, from arrogance to suffering, in the wide range of shades so typical of human manifestations, and I cohabit them.
And I see the time of the city and the time of nature that surrounds it or that artificially lives in it. I understand that they are different yet at the same time intimately linked, because the one and the other, the time of the city and the time of nature, place us, the first in history, the second in existence: the two faces of our being humans.
The time of history should be meant as forever, in the sense of *semper*, to imperishable memory, and time is *tempus*: the nail, *clavus*, fixed in the wall of the temple of Jupiter Maximus, at the time of the Ides of September, "[because] there was an ancient law written in archaic characters and words that in the Ides of September a nail was to be fixed in the right-hand side wall of the temple of Capitoline Jupiter, adjacent to the chamber dedicated to Minerva." Thus wrote Livy.
The nails are there to keep count of the years that pass and with them, the events of the community, self-represented in the historicity, to give prominence to those episodes which were to be remembered forever.
It's not really like that, on the contrary, it's nothing like that at all, it's a continuous effort of translation, otherwise everything is lost in an instant and the nails remain there but represent nothing.
Nails are fine when they are able to transform themselves into an equal number of plots for actors well-practiced in the "*commedia dell'arte* of life" who, based on that past, manage to give meaning.
Paths with leaps into the dark are improbable, the original and founding meaning of things forgotten.
Memory precedes History, it is like *memini*: I remember, I want to remember, it is *mneme*, personified by Mnemosine, it is *anamnesis*, like the confession of one's own ailments that still structures the first stage of the doctor-patient relationship.
The time of reflection and, therefore, of the consequent representation, although constructed on chronology, is not only this; it invests in interpretative projects and is immediately transformed into remembered time. And every time, all the rhetoric of human passions reappears in a flash, accompanied by all our verbal linguistic apparatus which, if well-constructed on the time of certainties, of what is and what has already been, is also filled with hypothetical phrases. The Latins made a trilogy of

Fig. 6. A. Cantàfora, Teatri di città I, 2014, vinyl + oil on wood, cm 80x120.

the hypothetical phrase, and we all well remember having paid dearly for it at our school desks with disfiguring blue markers on the timid pages of the homework we handed in.
The specter of the *consecutio temporum* hid behind reality, possibility and unreality. *Consecutio temporum*, the correspondence of verbal tenses, that is to say, that the number of nails is structured on at least three levels.
Among all the possible *fils-rouges* of connection dwells the time of reflection, that can have an infinite duration or last just an instant.

I reflect and represent things in the fullness of the time of thought.
It will always be an instant later, it can never be direct, it will never be the thing, but only a possible reflection on the thing: a hypothesis.
It's a world of mirrors, as in a catoptric image, the content of reflection. And mirrors, however well you polish them, will always remain a little deforming.
Certainly, we can walk through the streets of the city completely distracted or lost in a thousand contingent emergencies, we can go from point A to point B by the

Fig. 7. A. Cantàfora, Teatri di città II, 2014, vinyl + oil on wood, cm 80x120.

shortest path, ignoring everything we encounter, we can also become professionals of indifference, but sooner or later, the moment will come, when in lifting our eyes we will meet her, her, the city, and questioning her we will question ourselves and recognizing the huge worksite of accumulated efforts, we will understand her profound soul and how space and time, in her, tell of these efforts.
Beyond this and beyond big History, although it exists, I think of the small history in which everything slowly metamorphoses, and that gives an account of impossible, never-written books. And the distracted observer will become aware of the lights and shadows that inhabit it, as in a face, and will become aware of its uncertainties and even its bitter folds, as in a face. And he will become aware of the sequence in the very heart of simultaneity and will feel a shiver down his spine, because in an instant he will grasp, in an unrepeatable intuition, the inextricable complexity of the overlapping and juxtapositions.
The time of his intuition will reveal to him, as if by magic, the other time: that of the duration of history.
At this point he will lose his way and (or) change his life or never again raise his eyes to meet it frankly, and he

will let himself be lulled distractedly by the fashions of the idea of progress, based on commonplaces such as globalization, the unification of languages due to inevitable economic factors and ways of life. He will find himself a convinced affirmer, without even knowing the reason for substitution of the metamorphosis, which is the only true, inevitable and fatal encounter between people. But metamorphosis follows the rhythms of life and does not quantify the possession of an immediate expiration. He will live more and more in temporariness, in the eversooner, he will want everything immediately, even before having expressed a desire. He will dream of moving from one place to another in a flash. Where he arrives, he will leave a trace of dirt, and he won't feel at all bad about it. He will turn into an invasive tumor because he will want to be everywhere in any case; everywhere, his model will be the best, and if others haven't understood this yet, they should wake up!
But it shouldn't be like that, because all the beauty of our being human lies precisely in the meeting of types and the patient migration of languages.
The type is meta-historical, conceptually and in its applicative potentiality. For all types it is possible to retrace a path that is, by definition, dialectical and in which everyone can feel a belonging.
The answer, on the other hand, absolutely coherent and a result of the same arrogant indifference, is monocultural farming, murder perpetrated on the territory.
I am aware that we are now very far from the equivalence of the etymon *urbs*: city and *urbum*: "plough," as if to say that the city was founded by its own farmers and that there was an unrepeatable coherence between each city and its own territory. I know, this is no longer the case. And it's not a matter of regretting it, even if it wasn't unpleasant to see the farmers arriving early in the morning from their vegetable gardens just outside the city, between irrigation ditches and troughs, in the fertile soil of the Lombard plain. They arrived with their little horses trotting to the rhythmic jingle of bells. We were on the road to school, and the teacher was explaining the life cycle of a grain of wheat to us.
It was a simple and fundamental lesson, but it was also a very difficult, profoundly ethical lesson that gave form to the meaning of life.
Nature has nothing to do with historicity, it defines for us the sense of eternal return and the pleasure of expectation. Of that expectation for which things are identical to themselves, even in the unrepeatable uniqueness of each subject: it is the Platonic "moving image of eternity" in which the time of existence is situated.
If history is the presence of memories, nature is repetition and renewal, it feeds the other need for memory inherent in us: the punctual expectation of the opening, every time, of the corolla of that flower.
Nature and history, agricultural territory and cities either founded the landscape, or had founded it, in the mutual ability to situate the sense of the infinite.
The city is within the landscape, just as gardens are landscape within the city, that is to say, in the time with no return of history.
Nature has other nails in the temple-time of Jupiter Maximus, or it has only one big nail at the beginning of everything, before all and after all, for which, we humans, ultimately represent an insignificant mishap.
It is only for our own good that we should constantly repeat this to ourselves over and over again, because if nature can easily survive without history, history cannot exist without nature.
Life has preceded us and will follow us in any case; everything will appear as ruins to other spectators, completely indifferent to the anxiety of our science and of our rhetoric of passions.
The Earth has existed for four billion and seven hundred million years, science tells us, that science in which we believe today, I do not know if they are many or few, I respect the life of the universe, I cannot even imagine them, but what I do know, and again it is science and history that tell us, is that, if we give a value of twenty-four hours to those four billion and seven hundred million years of the Earth's life, the presence of our world, founded by the *homo sapiens*, the world of history, the world of the name of things, the world of nails in the wall, cannot be calculated as more than a tenth of a second.
A tenth of a second that is "*traurigfroh*," both desperate and joyful, seeing that one is aware of it.
And here, *in the road on the edge of the woods*, directing my gaze to the opposite side, leaving behind me the bustling swarm of the city, of the city's culture, amidst its lights and shadows, I imagine that on the other side there is the kingdom of nature, of the profound voice of necessity, established along the woodland's meandering paths, where labyrinthine progress was an intrinsic condition of advancing, unless one were able to recover the codes of recognizable signs, as animals know how to do.

Fig. 8. A. Cantàfora, Domenica, 2006, vinyl + oil on wood, cm 80x120.

Fig. 9. A. Cantàfora, Domenica pomeriggio I, 2006, vinyl + oil on wood, cm 80x120.

Fig. 10. A. Cantàfora, Domenica pomeriggio II, 2006, vinyl + oil on wood, cm 80x120.

Inside it, in the heart of the woods, dwells the mystery of the other life. For centuries, those who have ventured there have done so at their own risk. In the forest, western man has moved, not always following a rational order but, almost in the grip of a delirium, thinking that the only possible activity able to justify all the dangers he was facing was robbery.
For generations, one after the other, our world has believed this.
In the forest, no intelligible light could be detected, because we, in our fears, could not see it, in an underlying injustice, superimposing the objective physical danger, for the fragility of our being, to the most ambiguously subtle spiritual allegories that, within it, found an expression of all the possible evil.
It is no coincidence that Dante undertakes his journey there, in the heart of that dark woods, for facts related to his spiritual drama, finding in that image the most appropriate evocation of the place of fear and not of the structured balance that, beyond the human hand, manages to survive very well, as always.
Fatally, with such a thought, the straight path is lost, because we are no longer able to understand it.
The entire patrimony of legends tells of it.
In forests you encounter treasures, guarded by dragons, and only thanks to the cunning that allows you to kill them, will you emerge, after a thousand vicissitudes, with your pockets full of gold. In fact, to be more precise, the vicissitudes always precede the killing. When it is all over, all the impossible paths of approach, as if by magic, will dissolve, and you will come out of the forest in a flash.
The forest has been relegated to meaning the darkness of the conscience, for a contradictory sense of guilt, covering all the evil that has been brought into it.
And in the typical symbolic reversals, veiling the truth of where evil actually dwells, it itself, from innocent, has become the incarnation of sin and guilt.
Thus justified, heroes will pass through it; they will have to travel far and wide, endowed with enchanted swords to disrupt it. Avengers, in essence, of an "unutterable" that, to be honest, dwells more inside, rather than outside us.
But thanks to the alibi constructed through it, the great question will be able to move to an exterior, to accuse those who are not to blame.
In our typical conception of the idea of infection, we will produce little monsters in the test tubes of the laboratories of thought, to spread them in the darkness of the night, at the edge of its boundaries.
In an unpredictable interval of time we will imagine, forgetting that we ourselves introduced them, that they have become enormous and very dangerous and that they have always lived there, and that the time has come to free ourselves from that monstrous slavery, to free ourselves in an act of holy salvation. Only in this way will

Fig.. 11. A. Cantàfora, Domenica pomeriggio III, 2006, vinyl + oil on wood, cm 80x120.

Fig. 12. A. Cantàfora, Domenica pomeriggio IV, 2006, vinyl + oil on wood, cm 80x120.

it be possible to block the horror of the demand of unworthy bloody sacrifices, of unimaginable cruelty, which they continue to ask of us.
But is that true?
Where does evil come from?
From those who brood it in their soul.
And once you set out on a path, there's no going back.
That is the true meaning of destiny.
Until that moment there must occur, every year, on predetermined dates, sufferings and cries of young innocents to offer to the dragon and to the dark thicket of trees and rocks, from which he will emerge, on that day, to claim, according to the predetermined covenant, what is due to him.
My first encounter with these atmospheres, full of obscure extorsions, I had between the folds of my Uncle Gaetano's productions, whose proto-Romantic character seemed to be perfect for keeping them alive and the blank face of "Mezz'ommene" hid the monstrosity of the demands of that entity, halfway between the human and the beastly, the real protagonist of that zone of shadows, of limits and borders. I would like very much, now, to be able to remember in detail the complexity of the dark dramas that my uncle's imagination was able to set in motion, where kings and princesses, squires and heroes, lived together on the small scene of his inventions and, above all, I would like to listen again to the conversations of the family audience that followed with equal participation my anxieties with their nails digging into the skin of their knees.
– But come on, Gaetà...–
Especially if it seemed to them that my anxiety was becoming too intense.
And in the morning, seeing the puppets in the box that was their home and from which they re-emerged only during my stays in Rome, I was amazed that that pile of wood and multicolored fabrics could, in the game of the scene, become living matter, so full of life and so exciting.
I still have a very nice memory of that box, and I can no longer determine how much I have added to it over time to increase its contents. Thinking back on it, I see, imprinted in the enamel of the colored tin, the curtain of a theatre, with the boards of its protruding proscenium. The circular tarpaulin in the white and blue background came alive in the blowing wind, and there was also a red banner, waving in the sudden gusts of wind.
The surroundings were reminiscent of a lagoon landscape. In a field in the background, the apse of a church crumbling away amidst the dead growth of a bramble thicket was sinking into a vague ground, full of fragmented ruins, and in the foreground, also full of ruins, four characters with bizarre headdresses followed the motion of a magpie watching them from one of those capitals disappearing half-way into the earth, like a teacher watching his pupils.

The multicolored lid left me perplexed, not allowing me to understand what the original contents had been, whether a huge quantity of cookies or something else.
What I knew, was the present one, enclosed under a greenish-blue sky, animated by golden clouds that faded into the distance of a marine swamp.
Mezz'ommene and all the others had been enclosed there for such a long time, from long before I had come into the world, and before the debut of the theatrical talent that Uncle Gaetano had shown to his sisters, in their youth, when it had provoked the same tense reactions in them that I was now experiencing.
The time that had passed, the strongly urban Roman context, in a certain sense, must have dampened the immanent urgency of the contents of that story-telling, as it had probably been at the time of their faraway Abruzzo, a time when all the gossip they heard could only corroborate the heartfelt intimacy, in a justified tension, of a true sense of fear.
However, it is certain that his scenic dramas, thinking back now, were not simple banalities and always managed to place themselves on the edge of a frontier condition, where man must cope with an imperious and distressing nature.
And it was precisely here that his perverse taste was situated, when, within the representation of an untroubled celebration, came the cruel request of that Evil, claiming his fatal and necessary portion of happiness.
As though it were not given to men to live, apart from the sufferings of everyday life, another space, without having to pay a price for it.
It was only in this way that one could think of maintaining a peaceful relationship with that severe and cruel nature, more stepmother than mother.
To me, my uncle's fables opened up those greater ones that, along the way, we have all encountered and that are established on the mountain of sacrifice.

Author

Arduino Cantàfora, Scuola politecnica federale di Losanna

This text has been excerpted from Arduino Cantàfora, *Passaporto per la vita*. Parte Seconda. Cap XI. Milano: Christian Marinotti edizioni 2009.

The Tree of Drawing

Oscar Piattella

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The Tree of Drawing

Paolo Belardi

"Among Chuang-Tzu's many skills, he was an expert draftsman. The king asked him to draw a crab. Chuang-Tzu replied that he needed five years, a country house, and twelve servants. Five years later the drawing was still not begun. 'I need another five years', said Chuang-Tzu. The king granted them. At the end of these ten years, Chuang-Tzu took up his brush and, in an instant, with a single stroke, he drew a crab, the most perfect crab ever seen". [Calvino 1988, p. 53]

Initially, when we thought up the program of side events with the members of the organising committee at the 41st International Conference of the Performance Disciplines/Congress of the Italian Drawing Union, hosted in 2019 by the University of Perugia and dedicated to the two-way relationship established between art and drawing, we thought of organising a sculpture exhibition. And, in particular, we imagined exhibiting *en plein air*, in the University gardens, replicas of three famous contemporary sculptures made with a 3D printer and characterised by provocative chromatic finishes. Sculptures like *Dibuixar l'Espai* by Pepe Diaz Azorin, *The Man Who Measures the Clouds* by Jan Fabre and *Study of Perspective* by Ai Weiwei. These are three apparently very different works, because while the work of Pepe Diaz Azorin is firmly planted in the heart of Alicante's university campus, Jan Fabre's work travels between the most important museum facilities on the planet and Ai Weiwei's work is the three-dimensional translation of a photography series. Yet they are also three similar works, since they all embody a hymn to the ability to transcend time and space by virtue of the imaginative power of the drawing-gaze (imaginative in the first case,

Articolo a invito a commento dell'immagine di Oscar Piattella, non sottoposto a revisione anonima, pubblicato con responsabilità della direzione.

cognitive in the second and revelatory in the third). This offers observers a host of questions meant to remain unanswered: why draw in the sky if there's no trace of it? Why measure the clouds if they are constantly changing? And, above all, why pretend not to see what is before our eyes? It would have been an unusual exhibition, but the difficulties encountered in obtaining the necessary authorisations for the creation of the replicas stopped the project in its tracks. So much so that I feared having to disassemble the classic exhibition of author sketches. But then I was lucky enough to attend an exciting lecture by Oscar Piattella, held in the historical "Pietro Vannucci" Library in Perugia's Academy of Fine Arts, where the master from the Marches evoked Yves Bonnefoy's name several times and recited the most poetic passages of his famous essay, *Le dessin et la voix,* published in 2005 in the collection *Lumière et nuit des image*s. Above all, I was struck by what seemed like a genuine sentence: "To draw, to designate. To break the seal, to open the envelope – which remains closed" [Bonnefoy 2010, p. 15]. A sentence that, claiming that drawing can be used like a lockpick to unhinge appearance and reveal what would otherwise be forgotten, summed up in itself the deepest sense of the bond that would have tied together all the replicas of Pepe Diaz Azorin's, Jan Fabre's and Ai Weiwei's sculptures. So, I decided to organise the *On Colour Drawing* exhibition, then curated with critical wisdom by art historian Aldo Iori and set up with minimalist grace by designer Fabrizio Milesi in the Paolina fortress' twilight spaces. An exhibition marked by sophisticated geometric figures (starting with the infinite variations of the *mazzocchio*) and by pasty chromatic textures (mostly done in watercolour or with acrylic colours), but on closer inspection also marked above all by walls. Nor could it have been otherwise, because "the wall – as Alberto Mazzacchera sharply pointed out in the opening words of his introductory essay to the catalogue – through its different forms, directly expresses the many, successive phases of research that almost uninterruptedly mark Oscar Piattella's entire artistic production, especially if the surface is probed and we go to it's core". [Mazzacchera 2019, p. 15]. Perhaps the trees were missing: those trees that, with their own architectural clarity, have always fuelled the poetic vein of Oscar Piattella. So, partly emulating Giotto's virtuosistic gesture, when he gives Pope Bonifacio VIII's messenger a "simple" circle, and partly Chuang Tzu's gesture, when he draws "the most perfect crab ever seen", Oscar Piattella grabbed the charcoal pencil and drew a large circle (surrounded by a large tree whose luxuriance recalls that of the tree drawed by Colombo, aka Maurizio Nichetti, in the initial sequence of the film *Ratataplan*), sealing it with a dedication as evocative as invocative: "TO THE UID THE SIGN FOR THE 'DRAWING' OF THE TREE". By entrusting us with the task of guarding and cultivating the tree of drawing.

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REFLECTIONS.
THE ART OF DRAWING/THE DRAWING OF ART

Thinking

Random and Provisional Notes on Drawing

Franco Purini

"Writing for me is drawing, joining up the lines in such a way that they become writing, or unjoining them in such a way that writing becomes drawing." [Jean Cocteau]

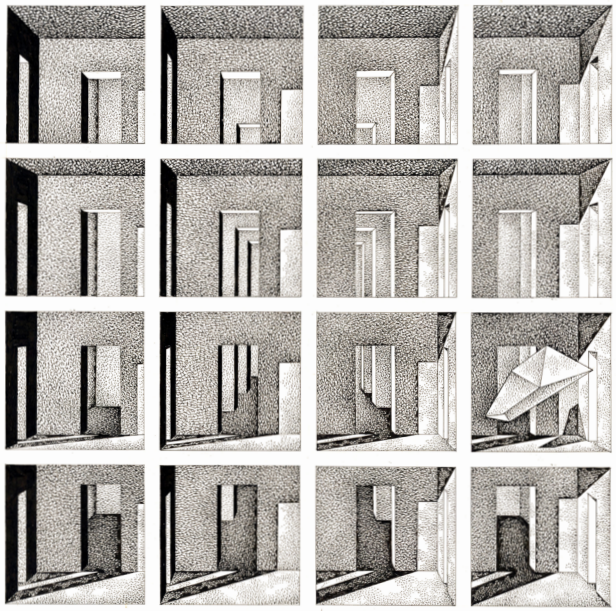
In 1953, Maurizio Sacripanti published a book with not many pages, entitled *Il disegno puro e il disegno nell'architettura* (Pure Drawing and Architectural Drawing) which until a few decades ago, for the quality of its argumentations and for its clear and flowing writing, would be defined as "golden." The Roman architect, who a few years later gained national and international fame with the competition project for the *Peugeot Skyscraper* in Buenos Aires, with its surprising innovative energy materialized in the invention of an extraordinary communicative machine, distinguished architectural drawing from that of painters and sculptors. The author of that book certainly did not consider architectural drawing *impure*, but the distinction proposed meant that he considered it to be a non-autonomous tool, since its role was to display the elements of a building in their relationship with the whole. In the art of construction, however, limiting drawing to the mere illustration of design solutions is not possible, as is shown, in a positive contradiction, by the drawings produced by Maurizio Sacripanti's studio in which (and here I allow myself an autobiographical note) I worked for a few years when I was a student. For this reason, architectural drawing is *also* a tool, but first of all it is the space in which the idea of architecture reveals itself to its author and to those who will frequent the architecture that the drawing defines. Drawing makes us discover not only what appears to our eyes, but at the same time reveals to us what is unknown, indefinite, transitory.

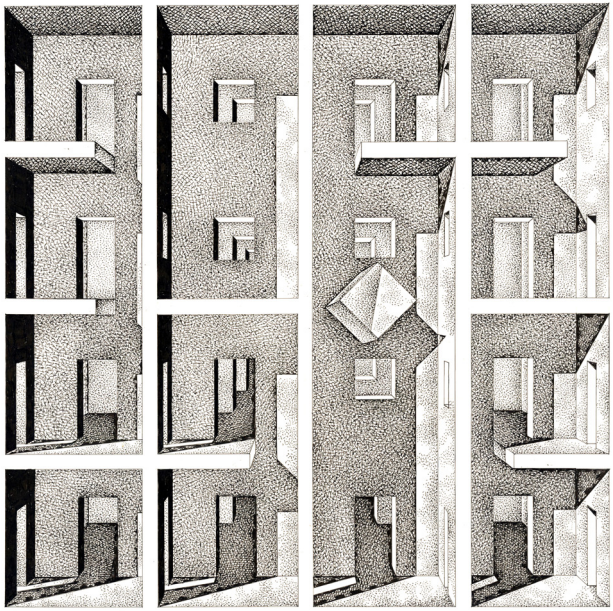
Articolo a invito per inquadramento del tema del focus, non sottoposto a revisione anonima, pubblicato con responsabilità della direzione.

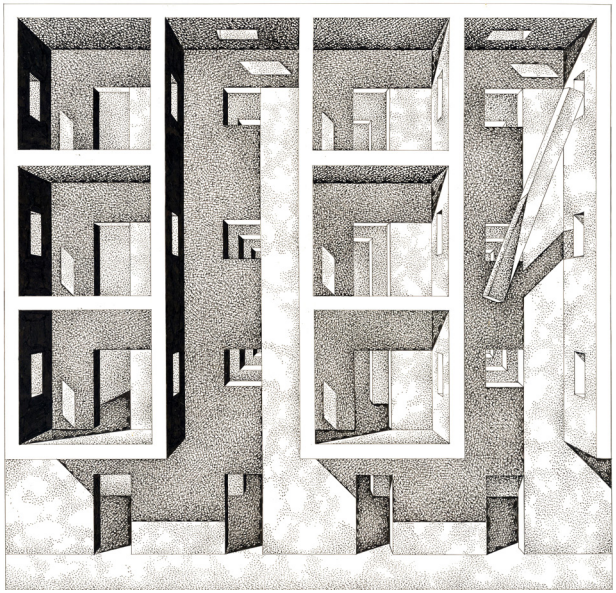
Continuing this premise, architectural drawing has for me an evident artistic dimension, which takes on different gradations according to the type of graphic expression. This dimension is greatest in the impressions from real life, translated into extraordinary images, of Le Corbusier; of Louis Khan, in particular the drawings made with wax crayons including a few masterpieces regarding the Acropolis of Athens; of John Ruskin, especially the studies of the Gothic capitals of the Doge's Palace in Venice. The same artistic intensity characterizes the famous sketches by Erich Mendelsohn, with their enthralling spatial dynamics; by Àlvaro Siza, with their rapid and concise strokes; by Giovanni Michelucci, poetic, neo-expressionist tangled lines. In project documents, such as plans, sections, details, the artistic content is moderate, increasing with the perspective or axonometric views, recalling, in this case, those of Alberto Sartoris. The value of architectural drawings as works of art again reaches its maximum level with *theoretical drawings*, that is, those visions that propose new thematic dimensions nourished by various forms of utopias and by an idealizing intent, as in the tables of Antonio Sant'Elia. To avoid interpretative misunderstandings, it should be made clear that theoretical drawing cannot be didactic or simply narrative. It is always complex, hermetic, rational but at the same time imaginary, at times including irrational elements, in other cases stratified in several thematic, even contrasting, levels. *Drawn architecture*, as it has been called since the 1970s, which in my opinion is only this last graphic exercise among those I have mentioned, is thus a *scientific* and at the same time *poetic* drawing, a drawing that tends towards a formal absoluteness associated with the logicality of a theorem. Finally, it cannot be forgotten that even surveys, as is made evident in Leonardo da Vinci's drawings of Imola and other territories, or in Palladio's studies of Roman baths, can produce drawings of considerable expressive intensity.

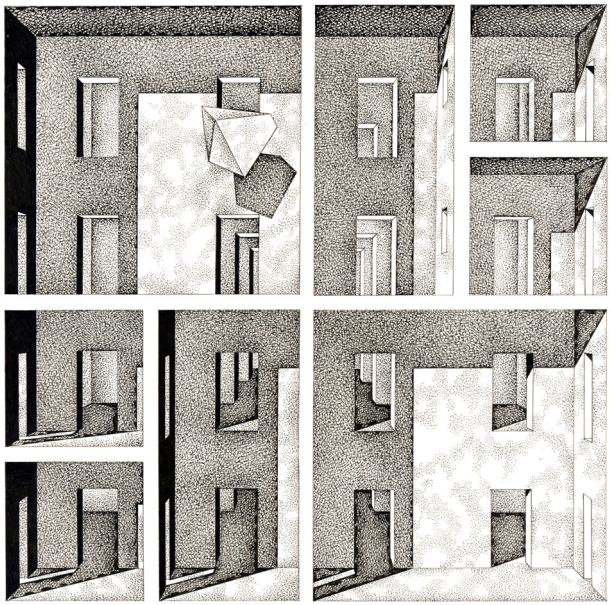
Drawing is an activity indispensable for understanding the world, for remembering and transforming it. If this awareness is widespread among painters, sculptors, architects and more generally among those working in the vast field of the visual arts, it is not equally shared, as instead it should be, by intellectuals and, in general, in every other sector of society, even though there are many people at every cultural level who love drawing as a complementary practice to the one chosen as primary. Many think that a photograph or a description in words is sufficient to allow us to understand the morphology of the elements comprising the scenario of our existence, from landscapes to everyday objects, from cities and buildings, from the whole environment to its single details, while, in fact, a photographic image is not sufficient for getting a fairly accurate idea of reality. To know what a tree is, there is no other way than to draw it, discovering its architecture, that is, how the trunk is anchored by its roots, how branches grow from it, how a leaf is structured, in short, how the tree configures itself as an entity in which all the parts constitute a unitary organism. The same can be done for a rock, for water, recalling Leonardo's studies, for a mountain, as in the famous drawings of Mont Blanc by Eugene Viollet-Le Duc or for the Moon, which Galileo Galilei represented in extraordinary watercolors, reproduced by Ludovico Cardi, known as Il Cigoli, in the Pauline Chapel of Santa Maria Maggiore in Rome. Even the construction of a building is better understood if someone has drawn it at an intermediate stage of its realization. In fact, one would not be able to grasp the surprising coincidence between the ruins of the Roman baths and St. Peter's Basilica in construction without the extraordinary drawings from life by Maerten Van Heemskerck, just as, in reverse, we are able to prefigure the condition of a building in ruin, as in the representation of the Bank of England designed Sir John Soane in the drawing by his collaborator Joseph Michel Gandy and in the graphic description of the reinforced concrete skeleton of August Perret's Théâtre des Champs-Élysées, a conceptual ruin that clarifies the relationship in that work between tectonics and architecture.

After these introductory considerations, to which I add the original coincidence of drawing and writing, as well as the propitiatory, mnemonic and nominal sense of drawing, which designates things, and in a certain sense *creates* them, I believe it is necessary to clarify what the areas of drawing are in their broadest sense. Drawing regards what exists, but also what does not exist but could exist. Furthermore, one can draw what has never existed and could never exist. Finally, one can also represent what exists by projecting it into the future. The imagery of each one of us originates from our becoming aware of the world, of its concreteness, on which to graft an inventive work that transports and transforms the real world into a metamorphic, evolutionary, erratic domain between different temporalities. Through drawing, this imagery, as is the case for us architects, is polarized in complex thematic nuclei, giving life to a *labyrinth* in which the paths overlap and intertwine in knots that are often difficult or impossible to unravel. Proceeding in this rapid excursus into the theme of drawing, the dimension of time



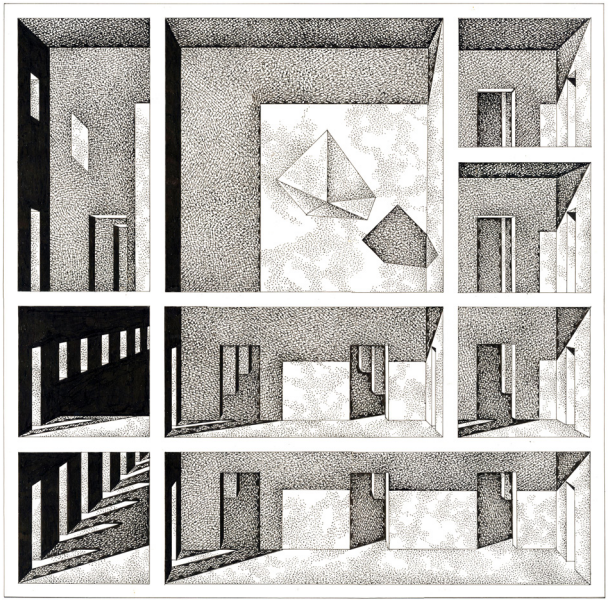


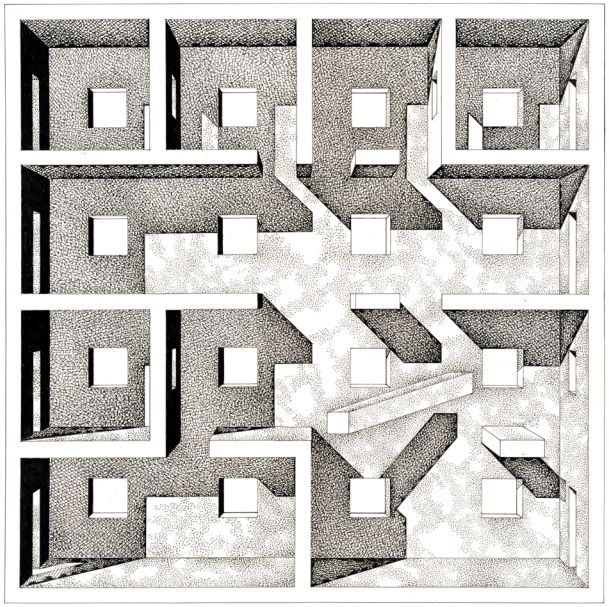


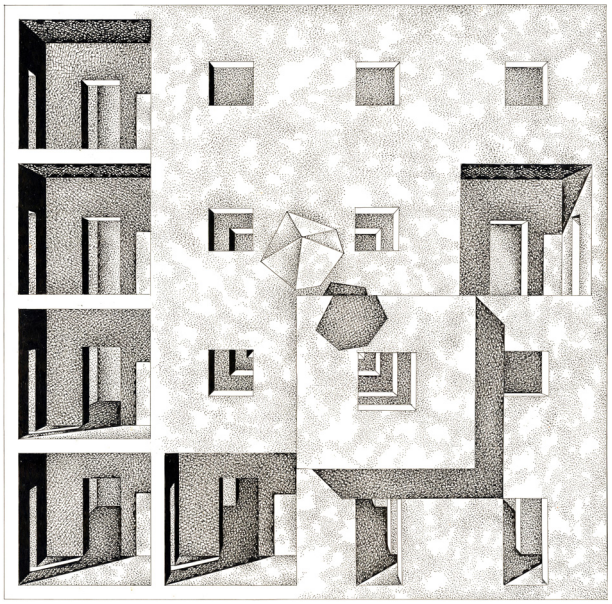


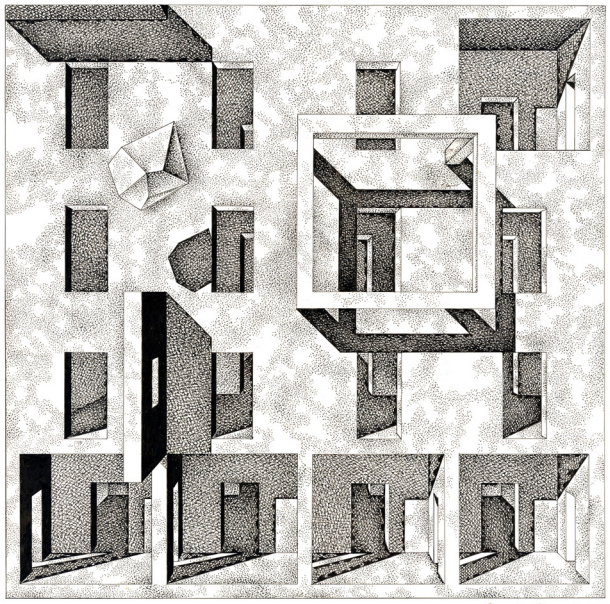
appears in three ways. The first is the time in which a drawing is thought out and realized, a time that always leaves traces that allow us to relive it. Moreover, there is the time that was necessary to conceive and execute a graphic work, from a landscape study to a perspective section, an objective time that goes from the instant of a sketch to whole days for a complex perspective view, but a time experienced subjectively by the author of the drawing, who can consider it either long or short. Moreover, the time of a drawing is the time necessary for the observer to read it. Another one is the time represented in the graphic composition, which can be the past, the present or the future, as in the famous table by Joseph Michel Gandy mentioned earlier. Finally, circulating in every drawing of any age, is the estranged and unreal time of dreams mixed with the functional time of doing.
For an architect, drawing is the true *see*ing, that is to say, the knowing how to decipher the world by going beyond the more accidental *looking*, that is, simple observation, and the assimilation in one's memory of what the eyes have elaborated, going beyond these functions to reach the intuition of the formative laws that organize the world itself, conferring identity to its whole and to its parts, allowing, at the same time, to preserve in the mind, through an appropriate codification, what has been acquired. In this *see*ing, analytical capacity is associated with the synthetic capacity by which things achieve a clear and lasting status. This interpretation takes form as our identifying with the elements of the world and at the same time in our detaching ourselves from them by placing an adequate critical distance between them and what has been the object of our vision. In fact, identification proceeds from the senses and, subsequently, from the intellect and the spirit, but all this would be abstract without an action of *detachment* –the critical distance just mentioned– which allows us to evaluate the visible with greater objectivity without involving emotion and producing transcendences. Realism and metaphysics must therefore come together to make seeing more profound and operative. To identification and detachment, we must then add the tendency toward an evolutionary, and therefore positively unstable, conception of reality. Moreover, drawing must be able, obviously in different ways depending on who is practicing it, to suggest the finite and the infinite, that is to say, the finite essence of things and their sharing an unlimited range of meanings, morphological parallels, and dimensional comparisons.

A free-hand drawing finds in the stroke the unrepeatable identity of the person who has drawn it. This stroke is in fact *unique*. It may resemble similar strokes but cannot be equal to another. In short, every drawing is made of totally autographic strokes. There is a signature even in digital drawing, which can coincide with the hand-drawn one if you use a pen with a graphics tablet, but in the best cases, in which you do not want to adopt an overly homologated language, it is usually the result of evident "personal intuitions" that lead to a recognizable style. In it, however, you will never find the *energy of the hand*, that way of giving cognitive-artistic qualities to a stroke that is inimitable. A quality that is always the result of an *obsession*, that is, a constant tendency towards an end within an anxiety made up of certainties and doubts, of decisive decisions and prolonged hesitations, of accelerations and decelerations, of surenesses and second thoughts during the realization of an artwork. Obsession must undoubtedly be experienced, with all that it entails, but it must also be controlled, kept at bay, so to speak, otherwise what it produces can be confused, unclear, random or repetitive. In the stroke, finally, there is always magic and mystery, because there is something in it that is unknown even to whoever draws it. Sometimes the stroke is actually faster than our thoughts and for this reason it seems to be drawn by our *double*. This provokes a certain bewilderment in us as well as a persistent sense of alienation, as though we were seeing the drawn stroke in its reality for the first time. It should also be kept in mind that those who draw do so within a *historicity of drawing* materialized in a series of conventions that must be accepted if what has been done is to be understood. At the same time, however, it is also necessary that the draftsman has created his own precise and unmistakable graphic language, often the result of inventions that can be extreme. Hence the contradiction between making oneself understood and the singularity, even hermetic, of a personal graphic lexicon. In this regard, studying Giovanni Battista Piranesi's engravings can teach us much about the way in which one can approach this conflictual duality. His figurative, fantastic, excessive, transgressive, extreme world is immediately identifiable through the modes of perspective representation, but this mode representative of space is troubled by a poetic sense of disproportion, by a multiple light, by a perturbing vein of tragicality. The form, the dynamic unity of the form and of its components, the measure of the form, its structure, its explicit and implicit meaning are the contexts in which drawing acts as a place revelatory of the real or the imaginary world, or as a plan for transformation, or both.



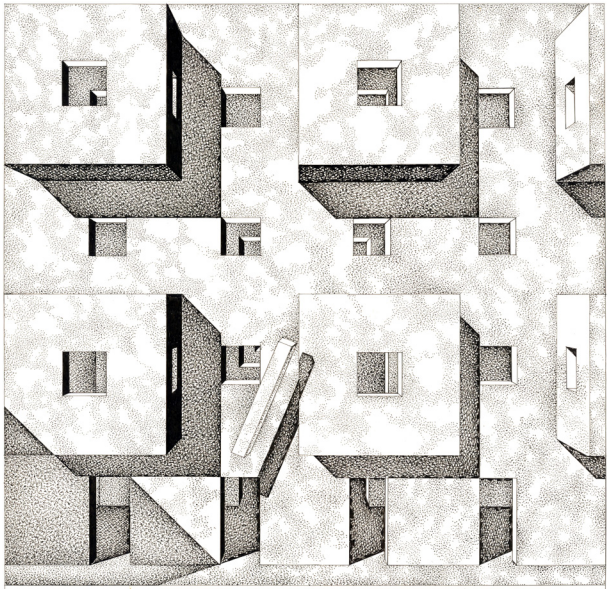


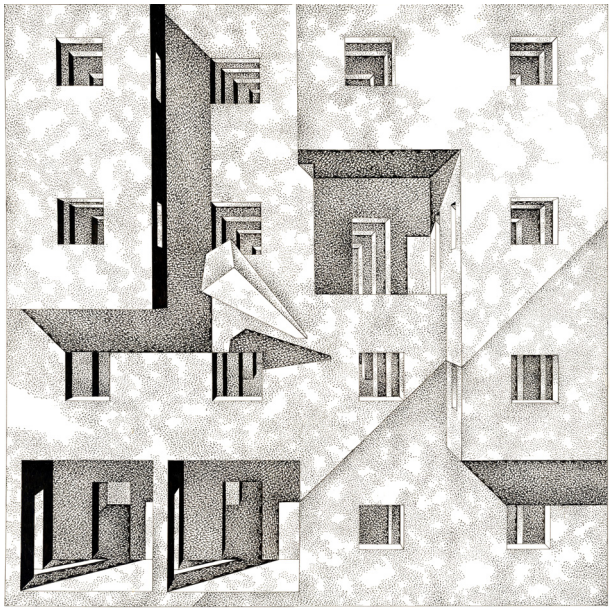


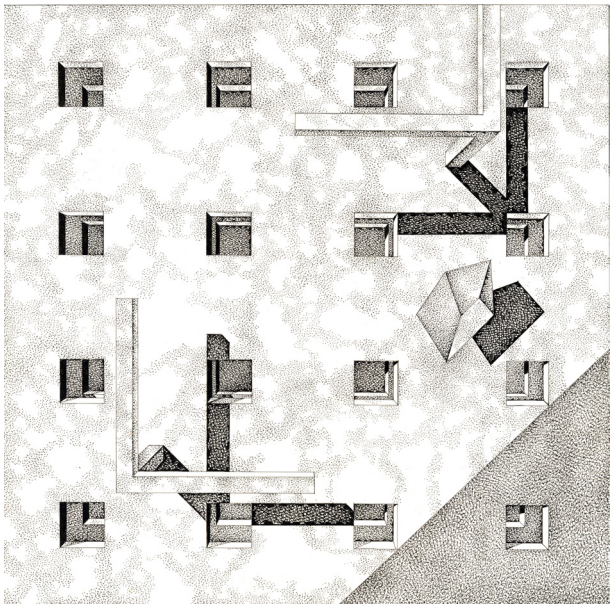


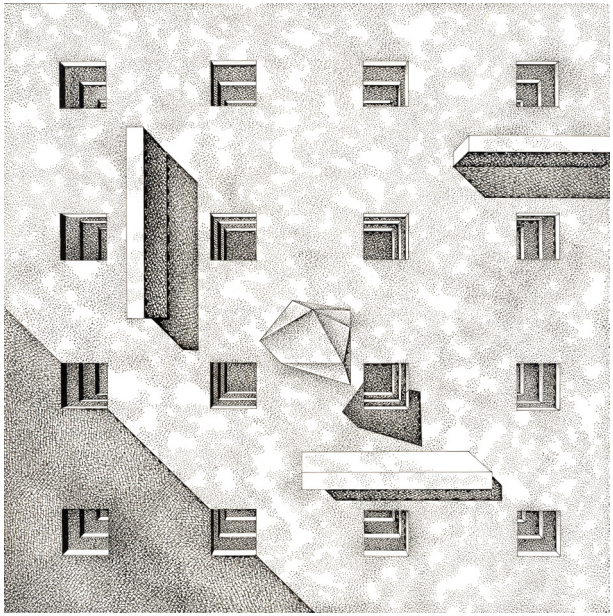
In free-hand drawing, coordination between the mind and the hand is simultaneous and creative, as Henry Focillon recalls, while in digital drawing, this synchronicity is absent. In this, the stroke does not exist, while there is a range of autographic spaces regarding the way the framing, the viewpoint, the colors, the shadows, the iconic tonalities are chosen. The lack of the absolute singularity of the stroke cannot be compensated for by the complex and certainly identifiable character of a computer drawing, despite the indications of William J. Mitchell. This absence, in other words, does not find an alternative in the subjective use of the codes of digital representation, but remains suspended in the architecture, like a question that has no answer. It should be added that coordination between the mind and the hand translates into an existential continuity that gives the creative process its own remarkable naturalness as a tangible expression of a necessity of life, that of seeing the world in its possible transformations in harmony with the contemporary *seeing* in its concrete and ideal aspects.
It is my opinion that in its realization, a drawing encounters a number of oppositions. Among these I believe that the main ones are those of staticity and dynamism, order and disorder, uniqueness and multiplicity, brightness and darkness, analyticity and conciseness, simplicity and complexity, wholeness and fragmentation, openness and closure, completeness and incompleteness. In reality, these oppositions do not exclude one another. They end up, in fact, by integrating themselves into the drawing, producing a constellation of contradictory duplicities that reflect and represent those that we encounter in our existence. Also in this case, the problem of how to govern the co-presence of different tonalities in the same *graphic discourse* arises. It must, in fact, be controlled, as we must do with obsession, in order to give a logical consequence to what is intrinsically illogical. It must also be recognized that the oppositions listed are found in the cosmos, as well as in the microcosm, in our planet as well as in its parts, even in our own thoughts, divided throughout the trajectory of our entire lives between the idea of immortality and that of immanent transience. Every drawing, whatever its quality, is the story of the mysterious coexistence of the contradictions evoked, and of many more. It is a testimony that each draftsman leaves of his vision of the world, of his character, of his imagery, of his ambitions, of his successes. If architecture, according to Edoardo Persico, is the "substance of things hoped for," this substance is announced by the drawing that will then accompany it on its arduous journey until this hope is fulfilled.

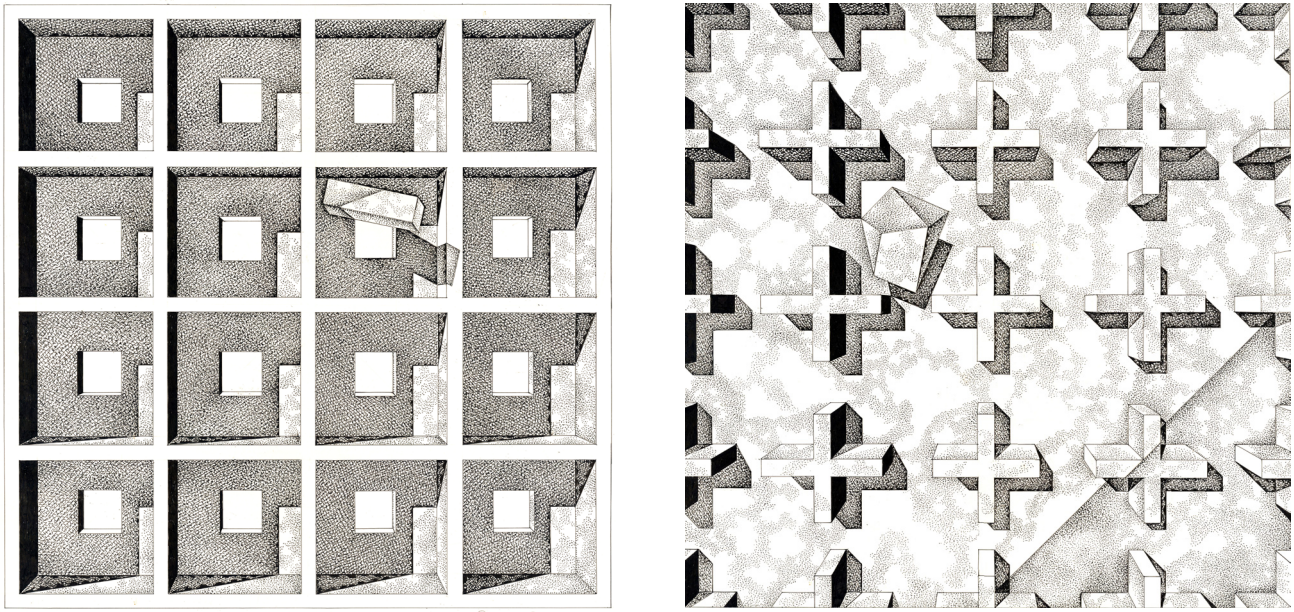
I would like to conclude these notes with a wish consisting of thinking that in the near future free-hand and digital drawing will reach a profitable and lasting alliance. An alliance that today I cannot predict either in its outcomes or in its modalities, but by means of which I am convinced that in respecting the two areas of graphic thought, manual and digital, more moments of theoretical convergence and operational coexistence can be found. The simultaneity between mind and hand, preceded by the irreplaceable interpretative potential of drawing from real life, which in my opinion needs to be reintroduced into our faculties as soon as possible, will continue to illuminate the architect's creative path from the point of view of the infinite availability of data that the virtual universe can suggest, together with its surprising aptitude in making the real seem truer, of revealing an architectural work to us in its hyper-realistic appearance. Obviously the conception of Giorgio Vasari, founder in 1563 of the Accademia delle Arti del Disegno, a theorist of drawing as the very foundation of the arts of painting, sculpture and architecture, a conception later taken up by Federico Zuccari, to whom we owe the institution thirty years later of the Accademia di San Luca in Rome, has over time been misconstrued, opposed, misunderstood. All this following the Romantic revolution, the emergencies produced by the industrial revolution and the theoretical activity of Walter Gropius. In the Bauhaus, founded a century ago, there was a conflict between two opposing concepts, Gropiusian materialism, realized in *functionalism*, and the spiritualism of artists such as Paul Klee, Joannes Itten, Joseph Albers. Functionalism disregarded the expressive values of construction to the advantage of its performance aspects and its social role. From the beginning of the twentieth century to the present day, the conception of architecture as "art," in fact, has been explicitly reduced, if not actually abandoned, in favor of the primacy of technique and function. In a sort of rapid *laicization*, architecture has lost much of its content and its main purpose, that of expressing in its full breadth the sense of habitation, a purpose replaced by the celebration of its more practical, constructive, utilitarian and environmental aspects. Technique has become *technology*, becoming an end and no longer a tool, functionalism has marginalized the Vitruvian venustas, the memory of the architecture of the past has been set aside, places have been abandoned giving rise to a general "atopy" and *non-places*. The artistic value of architecture has been nearly eliminated, translating it into the mediatic efficiency of the image, as well as the incorporation into the image of figura-











Franco Purini, Drawings from the series "Esercizi di claustrofobia", 2018.

tive art solutions, forgetting that the aesthetic dimension of construction is recognized in establishing a necessary, coherent and deep connection between the building and its context, in taking into account and expressing the relationships between space and structure, in transforming the relationship between the visibility of the building and its ability to blend harmoniously with the built environment of cities in an expressive theme. All this while at the same time refraining from imposing the formal identity of architecture, without clamor, but making it emerge with admirable measure, as in the works of Palladio.
I have no doubt that, despite this eclipse of the true beauty of architecture, drawing, which is its generating expression, cannot be considered obsolete or secondary. As instead it is in the opinion of some architects, among them the great Bruno Zevi, contradictorily an enthusiastic advocate of *visual design*, the same thing as drawing in the Anglo-Saxon context. It should be our task to recognize this persistence but at the same time redefine the role of drawing in the arts, especially in our profession. Drawing is knowledge, invention, energy, revelation and affirmation of beauty, as well as *the truest essence of seeing*. In short, drawing is none other than "the life of forms," to paraphrase the title of a book by the great French essayist Henri Focillion, who has already appeared in these notes. Drawing is the outcome of a human aptitude that originates as an intellectual, artistic, and spiritual entity through which one acquires the awareness of being part of a world whose vision always coincides, for each individual, with the desire to bring it ever closer to us, to recognize it more and more as the reason and the essence of our human condition.

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A Descriptive Geometry Construction of VR Panoramas in Cubical Spherical Perspective

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Abstract

Hand-drawn spherical perspectives are increasingly used as both a technical and artistic vehicle for representation of wide-angle views, partly due to their connection with VR panoramas. Recent results have made it easier to draw such perspectives in a systematic way in the equirectangular and azimuthal equidistant cases. In this paper we look at cubical perspective as a special case of a spherical perspective and describe a method to draw it systematically using simple descriptive geometry constructions, by classifying and rendering its geodesics.

Keywords: cubical perspective, spherical perspective, VR panoramas, descriptive geometry, geodesics.

Introduction

Architects and artists have always found it useful to draw wide angle views, both for information gathering and for visualization purposes. Information gathering today relies heavily on complex hardware and software, such as 360-degree photography [Cabezos Bernal, Cisneros Vivó 2016], 3D laser scanning, point clouds [Barba, Fiorillo, Naddeo 2014], etc., and immersive visualization can be achieved through VR panoramas of photographic data or rendering of 3D models [Rossi 2017, pp. 4-21]. These useful tools have their own pitfalls, as they can lead to black-box thinking [Araújo 2018b, p. 16], hence drawing, being a form of thinking through experimentation [Schön 2017, p. 159; Tran Luciani, Lundberg 2016, p. 1491] even more than a form of representation [García-García, Galán Serrano, Arce Martínez 2016, p. 1040], retains its importance. A drawing highlights the personal interpretation of reality in the eyes of the draughtman or his "conceptual model" [Arnheim 1954, pp. 2, 171]. VR panoramas allow for an interesting interaction between digital rendering and traditional drawing, as they can be generated by hand-drawn spherical perspectives.
Flocon and Barre [Barre, Flocon, Bouligand 1967] systematized the first ruler and compass construction of a spherical perspective (in fact only a hemi-spherical view), rendering the anterior hemisphere of an azimuthal equidistant map projection (the so called "fisheye" perspective, which allows for a 5-point-perspective). Their construction was extended to the full spherical view (a total spherical perspective, which allows for a 6-point-perspective) in a recent work [Araújo

2018a] that also provided a general mathematical schema for central curvilinear perspectives based on a redefinition of the notion of anamorphosis. This schema was later applied to solve the equirectangular perspective [Araújo 2018b] with a view to the hand-drawing of VR panoramas.
But if fisheye perspective has a special place among artists and equirectangular spherical perspective has an important practical status among programmers (being the standard format for VR panoramas), cubical perspective deserves special consideration among architects, engineers and artists, due to the simplicity of its line projections [Olivero, Sucurado 2019, pp. 54-57]. By cubical perspective we mean the flat image obtained by projecting a 3D environment conically onto a cube's surface and then flattening the cube. This has the advantage that the projection on each face is a classical perspective, or to be more precise, a plane anamorphosis with regard to the cube's centre. The difficulty lies in managing all six faces in an efficient way, obtaining all vanishing points and line images in an organized and systematic fashion. We will see that simply treating each face as a classical perspective is quite inefficient.
Cubical perspective has been lately investigated with partial results in recent works [Barba, Rossi, Olivero 2018, p. 33; Olivero, Rossi, Barba, 2019, p. 61]. The present work completes the full solution outlined in [Araújo, Olivero, Rossi 2019] by framing cubical perspective as a special case of the spherical perspective schema of [Araújo 2018a]. We argue that cubical perspective is better seen as a spherical perspective, and, as in all such perspectives, most easily solved by first classifying and rendering all images of spherical geodesics. This is what we do in the present work, achieving in this way its complete and systematic solution, that is, a method for systematic and complete construction of all lines images and vanishing points of a given scene, from both direct angular measurements or from architectural plans.

Towards a consistent and efficient method

Let's begin intuitively. Consider a station point O (the observer's eye) and around it place a cube with centre O. Project the 3D environment conically towards O and mark where each ray hits the cube. Now cut and flatten the cube. You get a picture like (fig. 1a). Locally, on each face, it looks like a classical perspective; every line projects to a line segment, and sets of parallels have at most one vanishing point; globally, however, lines are (sometimes disconnected) unions of segments, and all families of parallels have exactly two vanishing points. It was pointed out in [Barba, Rossi, Olivero 2018, p. 33] that it is quite hard, when a line crosses an edge of the cube, to know what angle it will make with the edge where it reappears.
The obvious solution is just to solve the individual classical perspectives of the cube faces the line projection touches. These are four at the most. This would require at least three points measurements for each pair of faces (fig. 1c). Not only is this inefficient, it creates a consistency problem when drawing from direct observation (unlike from plan and elevation), as each measurement of the visual angles (azimuth and elevation) will come with an independent random measurement error. The resulting object will not be a line but a union of segments, which will visibly change direction when seen immersively in the VR panorama (fig. 1c right).
We will solve all these problems by a different interpretation: we will regard a line as a subset of a geodesic and will determine the full geodesic image from just two points. This avoids the consistency problem, is maximally economic, and solves the angle problem automatically.

Cubical perspective

We begin by defining a cubical perspective. Given a point O in the 3-dimensional Euclidean space R^3, a cubical perspective with regard to O is a map from $R^3 \backslash O$ to a compact (i.e., bounded and closed) subset of the plane R^3 obtained in two steps: a conical projection towards the centre O of the cube, followed by a flattening of the cube onto a plane. Given a spatial point P, its conic projection is the intersection of ray OP with the cube's surface (fig. 1d left). We obtain the perspective image of P by flattening the cube. This flattening consists in cutting seven edges and rotating the faces around the remaining edges in such a way as to bring all faces onto the same plane. The projection is defined up to the choice of the cuts. We specify one such flattening: choose two arbitrary adjacent faces, denoted by F (for Front) and R (for Right). Denote the other faces L (left), B (back), U (up), D (down), in the order implied by this choice of relative directions. Name the edges by the faces they separate, so for instance FR is the edge between faces F and R. Then cutting edges UL, UB, UR, DL, DB, DR, BL we obtain the flattening of (fig. 1d right). Edges that are cut in the flattening appear twice in the drawing, so for instance point S appears on the edge UL on both faces U and L.

This procedure defines a perspective that behaves like a classical perspective in each projected face of the cube, but on the whole obtains a full 360-degree view of the environment around *O*. That is, an observer at *O*, looking from inside the cube at the conical projection of a spatial scene painted on the cube's surface would have the impression of seeing the actual spatial scene. This anamorphic effect can be reconstructed from a given cubical perspective by folding it back into a 3D cube. This is just what happens with VR visualization: the planar image is folded onto a virtual cube and the viewer interactively observes a flat anamorphosis (against the plane of the monitor) of the cubic anamorphosis specified by the perspective drawing. This allows us to go from an imaginary or observed flat drawing to an immersive environment (fig. 1b).

Immersive anamorphoses and spherical perspectives

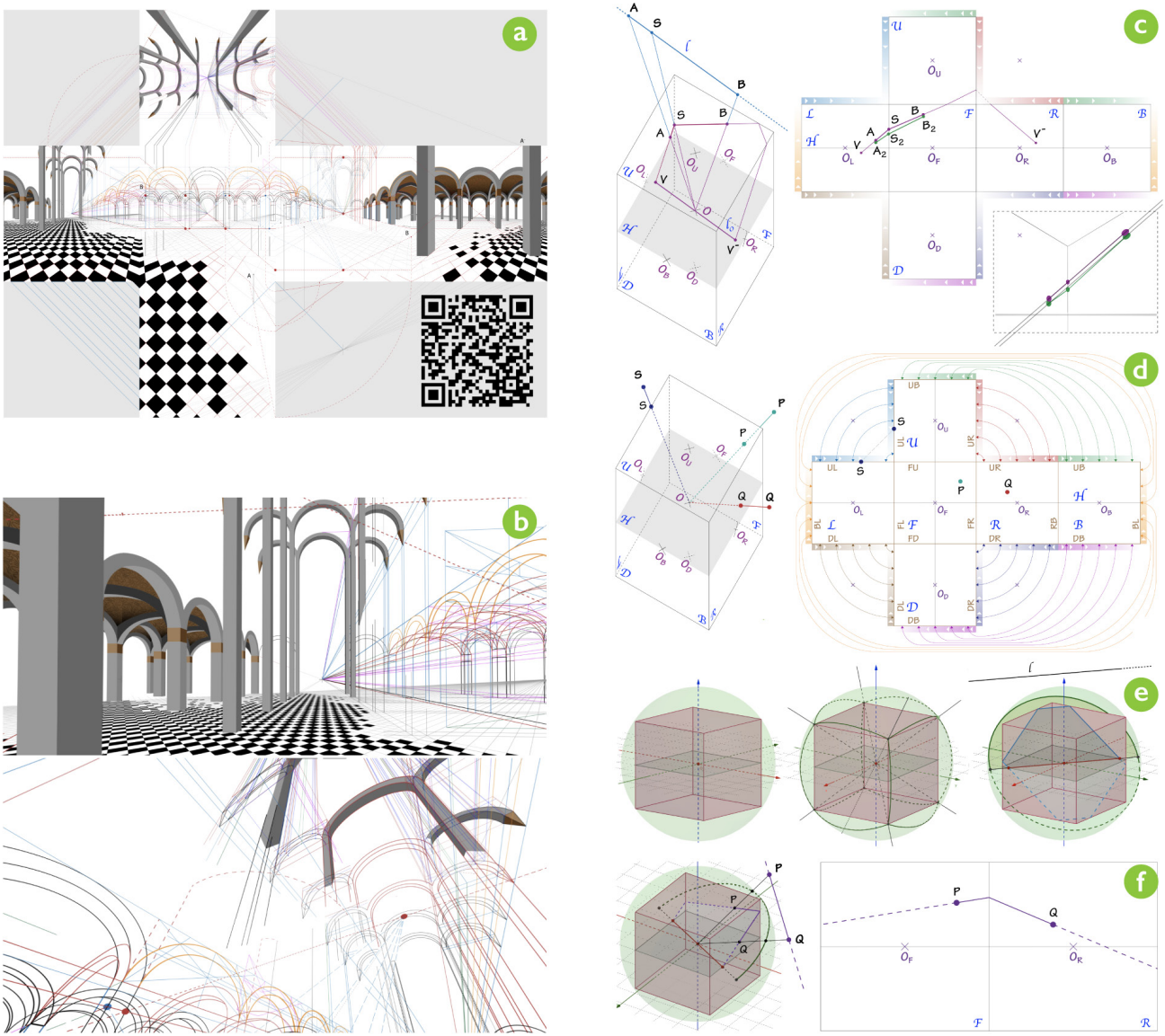
We follow [Araújo 2018a, p. 149] in defining a spherical perspective as a central conical anamorphosis onto a sphere of centre *O*, followed by a flattening of the sphere that verifies certain continuity conditions. As explained in that work, the end result is a topological compactification of the spatial scene that preserves in the plane certain features of the spherical anamorphosis. We now recall some important properties of spherical anamorphosis:
A spatial line l determines a plane π through the centre *O* of the sphere. π defines, by intersection with the sphere, a great circle, or geodesic *g*. The anamorphic image of *l* is one half of *g* (a meridian). That meridian's endpoints are the two vanishing points of *l*, hence any line has exactly two such vanishing points. These are found by translating *l* to *O* and intersecting it with the sphere; hence the two vanishing points are antipodal to each other, i.e., diametrically opposite on the sphere. Given a spatial object, its perspective is the plane drawing obtained from its anamorphic projection by flattening the sphere itself onto the plane.
Now consider that the cube is homeomorphic to the sphere (fig. 1e) – the conic projection towards a centre *O* in common to a sphere and a cube defines a bijection between the two surfaces that is continuous both ways (a homeomorphism). So, the flattening of the cube defined in the previous section is also a flattening of the sphere. Hence cubical perspective is a special case of a spherical perspective. We can characterize it as the cubical spherical perspective.
Through this homeomorphism all concepts of spherical perspective, such as antipodal points or geodesics translate directly to the cubic case. In particular, two non-antipodal points on the cube's surface determine one single geodesic through them.
This means that if we have two points *P* and *Q* on two faces of the cube (fig. 1f), then there is a single correct way of connecting them that corresponds to a possible line segment between any two spatial points that project to *P* and *Q*. This will be part of a geodesic *g*. We also know that *g* must be made up of Euclidean line segments, as cubical perspective is a linear projection on each face.
In order to solve this perspective, we must show how to plot points from their angle measurements; plot antipodes; find vanishing points; classify and draw great circles. These are the common steps to the resolution of all spherical perspectives.

Solving the cubical perspective with descriptive geometry

We will see how to solve the cubical perspective through descriptive geometry constructions over the flattened cube. First some notation. We denote spatial points by bold font letters and both their conic projections onto the cube and their perspective projections onto the plane by the same letter in light font, unless context makes the distinction unclear. We call O_l to the centre of each face l of the flattened cube (for instance O_F for face *F*). This corresponds to the orthogonal projection of *O* onto each face. We say that faces *F*, *R*, *B*, *L* are horizontal faces and that *U* and *D* are vertical faces. This of course refers to relative bearings, not to absolute ones.

l - Antipodes
Let *P* be a point on the cube. We call antipode of *P* to its diametrically opposite point on the cube and denote it by P^-.
Construction l (antipode of a given point *P*): if *P* lies on face *l* then P^- lies on the opposite face, and by the opposite angles theorem, $\angle POO_l = \angle P^-OO_l^-$ (fig. 2a left). P^- can be obtained by a sequence of two transformations on the perspective view (fig. 2a right): first rotate *P* by 180° around the *z* axis, then reflect it across the plane of the horizon *H*. There are two cases: if *P* is on a horizontal face, then the rotation becomes a translation of two cube side lengths to the right (resp. left), if *P* is on faces *L* or *F* (resp. *R* or *B*). If *P* is on face *U* (resp. *D*), then translate *P* down (resp. up) by two side lengths and reflect across the vertical axis through O_F.

Fig. 1. L.F. Olivero, Introducing cubical perspective. a) Imaginary architecture; Scan QR code to see VR as in b); c) Representation of a line l: green segments from measured A, B, S don't align in VR; purple segments from measured A, B and calculated S, do; d) Flattening; e); Cube-sphere homeomorphism; f) Geodesic.



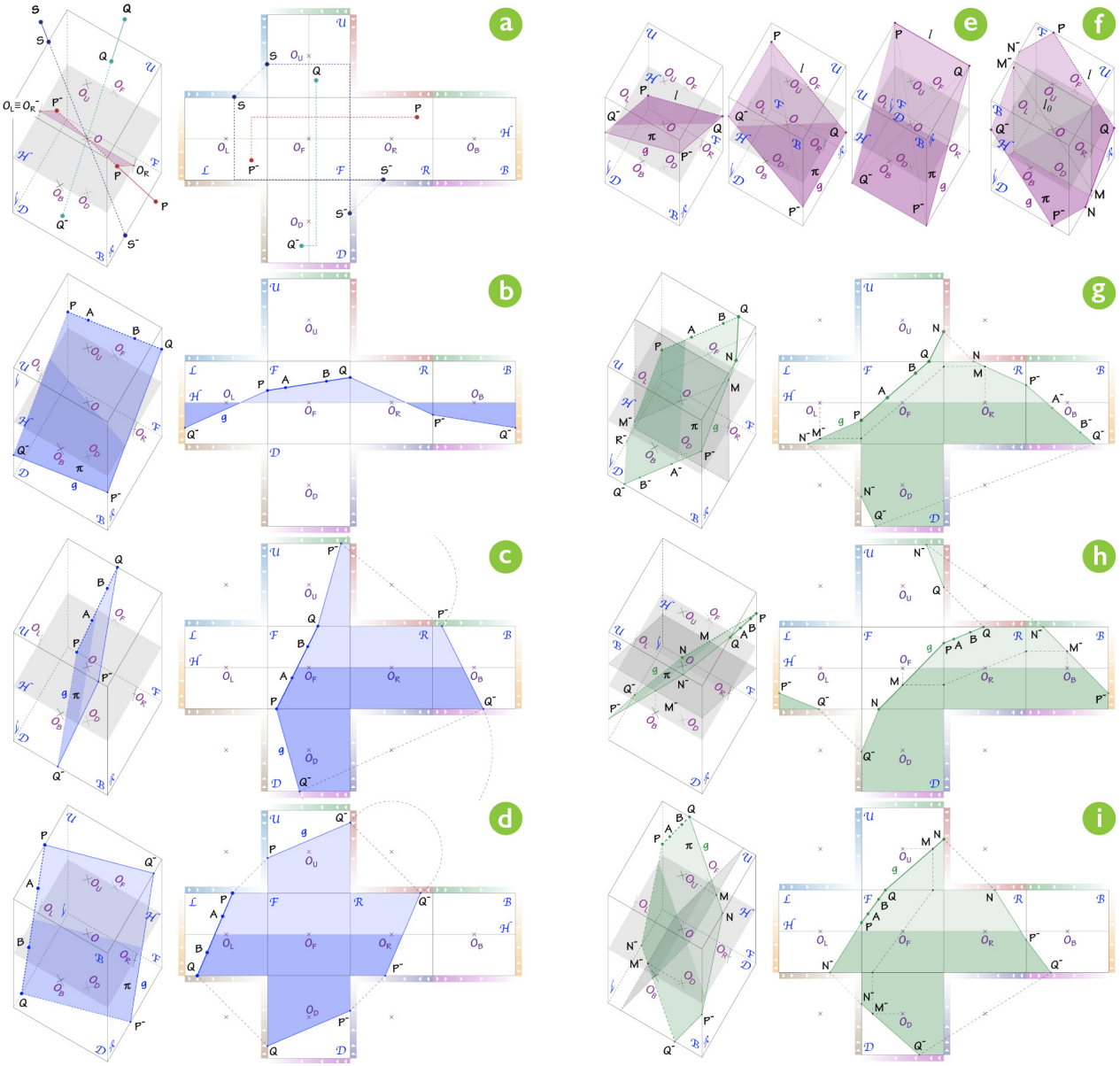
II - Construction of geodesics
We will now show how to obtain the images of spherical geodesics (great circles) on the cube surface and on the flat cubical perspective.
Two non-antipodal points *P* and *Q* on the cube's surface determine a plane $\pi=POQ$ through the centre of the cube and of its concentrical sphere, hence a spherical geodesic. The image of this plane on the cube is a set of connected line segments over the cube surface. We know this since on each face we have the intersection of two planes, hence a line segment. We know these must connect because this is a topological property and the cube is homeomorphic to the sphere. We also know this image must be either 4-sided or 6-sided since for each of its points on one face, there is an antipodal point on the opposite face, hence the number of faces is even, hence it is 4 or 6, since just 2 segments wouldn't connect.
We will now show the properties of the geodesic generated by two arbitrary points *P* and *Q*, according to the relative position of these points, and how to obtain its projection through descriptive geometry constructions. There are several cases to consider, and it is useful to start by isolating the properties of geodesics according to their number of sides.

II.1 4-Sided Geodesics
Suppose that a geodesic *g* contains a segment *l* on a face *l* such that *l* intersects two parallel edges of *l* at points *P* and *Q* respectively. Then P^- and Q^- are points of *g* on the respective antipodal edges of the face opposite to *l*. Segments P^-Q and PQ^- belong to *g* and are located on faces adjacent to *l* and opposite to each other. Joining their endpoints, we get a 4-sided closed loop, PQP^-Q^-, which is the full image of *g*. We call such loops 4-cycle (fig. 2b-2e).
When a *4-cycle* only touches the horizontal faces, we say it is *panoramic*. We say that a geodesic *g* is grid-like if projects on a face *l* as a segment *l* parallel to one of the edges e of that face. Then *l* intersects the two edges of *l* orthogonal to e in two points *P* and *Q*, hence P^-Q^- is the projection of *g* on the face opposite to *l*, and $g = PQP^-Q^-$ is a *4-cycle*. Also, by symmetry, QP^- and Q^-P pass through the centres of their respective faces. In (fig. 2e centre), *PQ* is directly passing through the centre of *l*, and therefore P^-Q^- will also do it in the opposite face. If *l* coincides with e, they are the diagonals of these faces (fig 2e right).
We note that if a geodesic crosses an edge at two points, then its plane contains the line that joins them, hence contains the whole edge, hence is *grid-like*. Then a *non-grid-like* geodesic only crosses an edge at one point at most.
Intuitively, *grid-like* geodesics are those generated by "horizontal" and "vertical" lines.

II.2 6-Sided Geodesics
Suppose a geodesic *g* contains a segment *l* that cuts adjacent edges of a face *l* at points *P* and *Q* (fig. 2f). Then let l_O be the line through *O* parallel to *l*. l_O intersects a face *J* adjacent to *l* at a point *M* that lies on the plane through *O* parallel to *l*. Either *P* or *Q* share a face with *M*. Suppose without loss of generality that it is *Q*. Then there is a point *N* on an edge adjacent to that of *Q* such that the image of *g* on *J* is *QN*. Then joining segments *PQ*, *QN*, NP^-, P^-Q^-, Q^-N^-, N^-P, we get a the *6-cycle* $g = PQNP^-Q^-N^-$ (fig. 2f-2i).

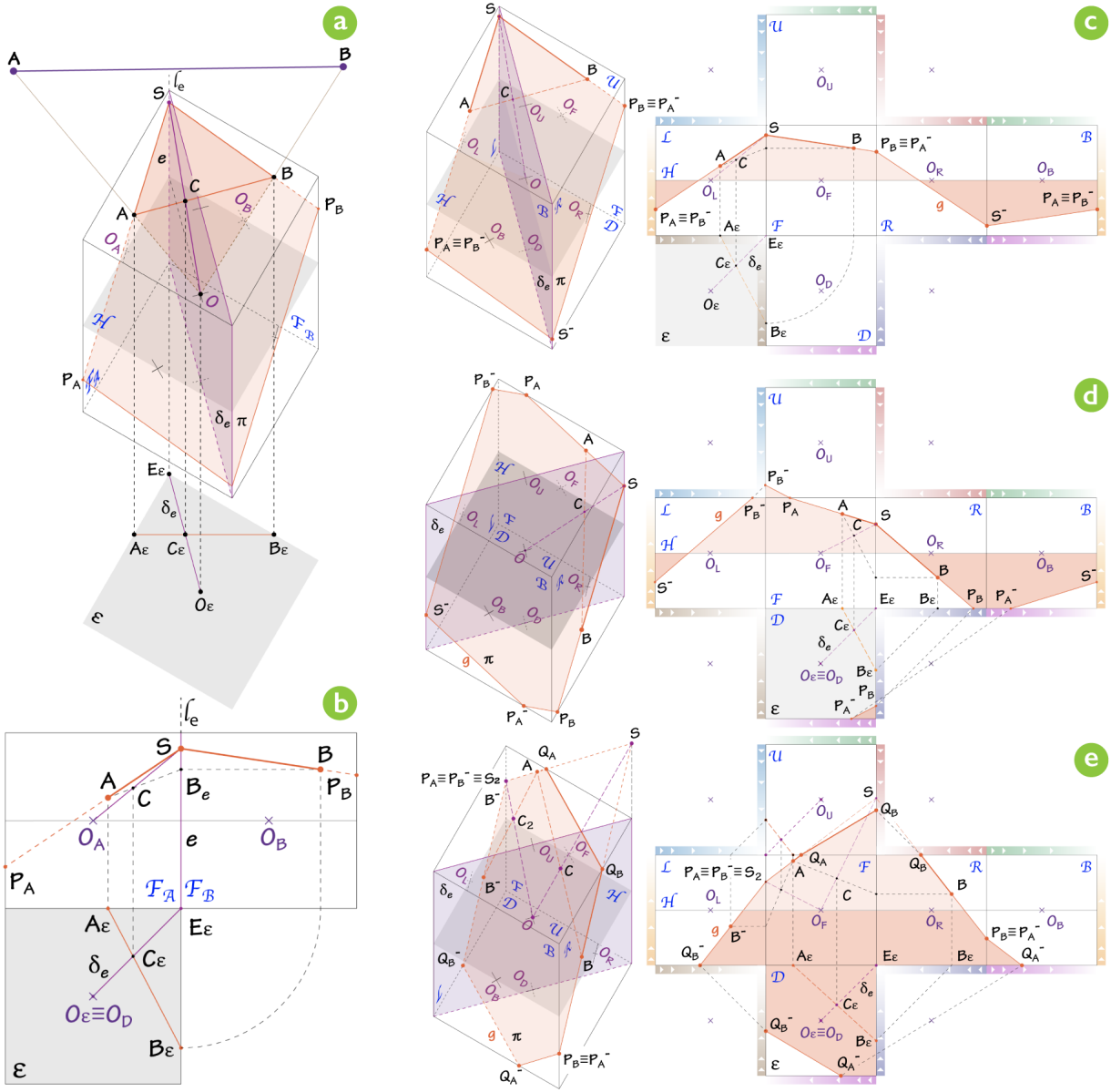
II.3 Descriptive Geometry construction of a geodesic through two given points
Given the perspective images of two points *A* and *B* which are not antipodal to each other, there is a single geodesic *g* through *A* and *B*. We will now use the classification above as a guide to draw the perspective image of *g* using descriptive geometry.
Case 1: Suppose *A* and *B* are on the same face *l*. Then line *AB* cuts the border of the face at two points *P* and *Q*. We must consider several sub-cases:
Case 1.1: *A* and *B* are such that *P* and *Q* are on opposite edges. We have described above the construction, from *P* and *Q*, that results in a *4-sided cycle*. We now show its descriptive geometry implementation according to the faces and edges involved.
Case 1.1.1: *P* and *Q* are on vertical edges of one of the horizontal faces. (fig. 2d) illustrates this case, assuming *A* and *B* on face *F* without loss of generality. Then P^- and Q^- found by *Construction 1*, are also on two further distinct vertical edges of this same set of faces. Further, due to edge identification, one of the antipodes (assume it is Q^-) will appear repeated in the drawing, on a further distinct vertical edge. Hence there are points on five vertical edges, that can be joined to obtain a *4-cycle* geodesic of the panoramic type.
Case 1.1.2: *P* and *Q* are on horizontal edges. If *P* and *Q* are on the horizontal edges of face *F* or *B* (fig. 2c) then P^- and Q^-, are on the horizontal edges of *B* or *F* (respectively). Then edge identification finds P^- and Q^- again on faces *U* and *D*. This gives a *4-cycle* that crosses only horizontal edges of *F*, *U*, *B*, *D*.
If *P* and *Q* are on one of the faces *L* or *R* (fig. 2d), then P^- and Q^- will be on the other. Without loss of generality, we can assume that *P* is on *LU* (resp. *RU*) and therefore *Q* is on *LD* (resp. *RD*). Then by edge identification, P^- is on *RD*

Fig. 2. L.F. Olivero, Antipodes and geodesics. a) Antipodes of points P,Q and S; b, c,d) Geodesics for P and Q on parallel edges; e) Examples of 4-cycle geodesics (central and right examples are grid-like); f) 6-cycle geodesic; g, h, i) Geodesics for P and Q on adjacent faces.



(resp. *LD*) and Q^- is on *RU* (resp. *UL*). Together, these points determine 4 segments on *L*, *U*, *R*, *D* that define a *4-cycle*. All the segments are disconnected on the plane.
Case 1.2: *A* and *B* are such that *P* and *Q* are on adjacent edges. We have seen above that this is a *6-cycle* constructed with the help of the auxiliary points *M* and *N*. We now construct these in the plane projection. To settle ideas, suppose that *A* and *B* are on face *F* and that *P* and *Q* are respectively on *LF* and *FU*, as in (fig. 2g). We obtain a further segment P^-Q^- on face *B* by taking antipodes and two further points, one on *U* and another on *D* by edge identification. We have seen above that we obtain two further points *M* and M^- in the geodesic by taking l_O, a parallel to *AB* through *O*, and intersecting it with the cube. Since *AB* is on *F*, that intersection must lie at the plane parallel to *F* through *O*, hence its plane projections must lie at the vertical lines through the centre of faces *L* and *R*, or at the horizontal lines through the centres of faces *U* and *D*. Then to obtain *M*, we take a parallel to *AB* through O_F. It must touch either the two vertical or the two horizontal edges of *F*. For concreteness suppose it intersects the verticals. Pass a horizontal line through the intersection on *FR* and intersect it with the vertical through O_R to obtain *M*. Draw a line P^-M and intersect it with *UR* to find point *N*. Taking an antipode, we find N^- on *DL*. We now have a segment in each face and a complete *6-cycle*. The choices we made do not lead to loss of generality, as we can obtain all other cases by reflection through the vertical or horizontal line through the centre of *O*, or by cyclical translation of the face where *A* and *B* lie (figs. 2g-2i).
Case 2: Suppose *A* and *B* are points on faces adjacent to each other. In this situation we can have either a *4-cycle* or a *6-cycle*, depending on the relative positions of the given points. We need an auxiliary point to determine the geodesic through *A* and *B*. Let *e* be the common edge of faces F_A and F_B where *A* and *B* are located (fig. 3a). Let $\pi = AOB$ be the plane of the geodesic determined by these points. Then segment *AB* is in π. Let δ_e be the plane through *O* and e. Then *AB* intersects δ_e at a point *C*. Since *C* is in *AB*, hence in π, then the ray *OC* is in π. Let l_e be the line that contains edge e. Ray *OC* intersects l_e at some point *S*, also in π. Then lines *AS* and *BS* will determine the images of the plane π in the faces F_A and F_B.
We now show how to construct the auxiliary point *S* through a descriptive geometry diagram. We take edge e as a folding line so as to draw F_A and F_B on the same plane (fig. 3b). On the same drawing we consider a top view of the two faces, i.e., an orthogonal projection over a plane ε perpendicular to e. On ε, e projects as point E_ε and faces F_A and F_B form two adjacent sides of a square. We draw ε so that the image of F_A on it coincides with the bottom edge of F_A. The projection O_ε of *O* on ε is at the centre of the square defined by F_A and F_B, δ_e is a diagonal through O_ε and E_ε, with A_ε and B_ε on opposite sides of it. We find C_ε by intersecting δ_e with $A_\varepsilon B_\varepsilon$. Let AB_e be the orthogonal projection of *AB* onto F_A. Then *C* is the intersection of the vertical through C_ε with AB_e, and *S* is the intersection of O_AC with l_e. Joining *A* (resp. *B*) to *S* we find the projection of the geodesic of π on face F_A (resp. F_B).
This construction can be easily drawn on top of the flattened cube, thus dispensing with awkward auxiliary drawings. For instance, if the faces are *F* and *R*, the top view can be drawn on top of face *D* (fig. 3d).
S may or may not be on e (figs. 3c-3e). This, as well as the type of the segments obtained, determines the type of geodesic projection. Below we consider these several cases. Note that we insist that all constructions must be executed within the confines of the paper, that is, of the rectangle that contains the flattened cube. So, in *Case 2.2*, when *S* is outside e, we use an alternative construction to remain within the intended bounds (fig. 3e right). This is a general philosophical principle in spherical perspective: just like the drawing itself, its construction should be compact [Araújo 2016; 2018a].
Case 2.1: *S* is in e (figs. 3c, 3d). Then there is a point P_A on an edge of F_A such that $AS \cap F_A = P_AS$ and a point P_B on an edge of F_B such that $BS \cap F_B = P_BS$. We have two possibilities: If P_A is on the edge of F_A parallel to e, then SP_A crosses parallel edges of the same face, hence we have reduced the problem to a previously solved case, and the projection is the *4-cycle* $SPB\,P^-P_A$. Note that this implies $P_B \equiv P_A^-$ (fig. 3c). If P_A is on an edge adjacent to e, then we have reduced the problem to a previous solved case and the projection is a *6-cycle*, with $P = P_A$ and $Q = S$. This implies that P_B must also be on an edge of F_B adjacent to e, and in fact $P_B = N$. So the *6-cycle* is $P_A\,S\,P_B\,P_A^-\,S^-\,P_B^-$ (fig. 3d).
Case 2.2: *S* is not in e (fig. 3e). Then there are points P_A and Q_A in F_A such that $AS \cap F_A = P_A\,Q_A$ and points P_B and Q_B in F_B such that $BS \cap F_B = P_B\,Q_B$. P_A and Q_A must lie in two edges adjacent to each other, because if these edges were parallel to each other, they would both be perpendicular to e defining a *4-cycle* that would not touch the face where *B* is, but this is absurd since *B* belongs to *g*. Hence P_A and Q_A are on edges adjacent to each other, and the geodesic is the *6-cycle* with $P = P_A$ and $Q = Q_A$, $N = Q_B$, that is, it equals $P_A\,Q_A\,Q_B\,P_A^-\,Q_A^-\,Q_B^-$.

Fig. 3. L.F. Olivero, Geodesics for Case 2, with A and B in different faces: b) Construction of the auxiliary point S; c) P_A is on the edge of F_A parallel to e; d) P_A is on an edge of F_A adjacent to e; e) S is not in e.



Case 3: Points *A* and *B* are on opposite faces. Then *A* and B^- are on the same face, which reduces the problem to *Case 1*.

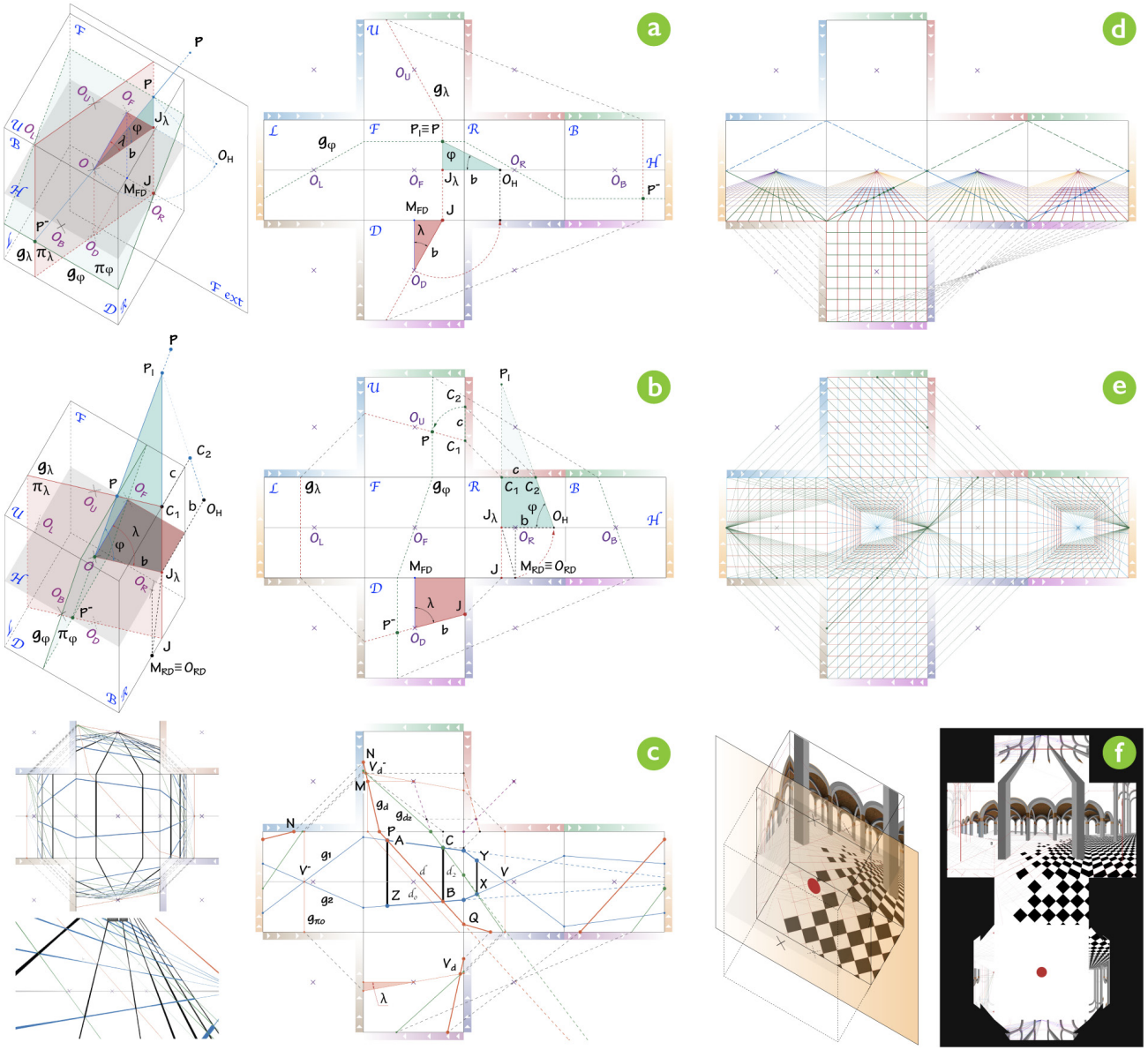
Measuring and plotting points

It may surprise the reader that we have plotted antipodes and geodesics from given points, but we haven't said how to plot a particular point. It turns out that it is easier to plot points once we have classified the geodesics. The projection of a generic spatial point *P* is determined by its two characteristic angles λ (longitude or bearing/azimuth) and φ (latitude or elevation), which are the angles one measures when drawing from observation. λ and φ define two *grid-like* geodesics g_λ and g_φ ,that intersect each other at *P* and P^- (fig. 4a). We will find *P* by constructing these geodesics.
Suppose *P* is not on the vertical line through *O* (if it is, then it just projects as O_D or O_U). Let π_λ be the vertical plane through *P* and *O*. π_λ makes an angle λ with the vertical plane through *O* and O_F. Let g_λ be the geodesic of π_λ. π_λ intersects four faces of the cube. Let *I* be one of the faces not touched by g_λ. Then O_I and *P* define a non-vertical *grid-like* geodesic g_φ. The plane of that geodesic π_φ makes an angle φ with *H*.
Construction 2 (geodesic g_λ): let M_{FD} be the midpoint of edge *FD*. Let *J* be the point of the border of *D* such that $M_{FD}\ O_D\ J = \lambda$. The segment $b = O_D\ J$ defines g_λ and we construct it from the two points O_D and *J* as in section *II.3*.
Construction 3 (intersection of g_φ with g_λ): let J_λ be the intersection of g_λ with *H* and *I* the face where J_λ lies. OP intersects the vertical through J_λ at a point P_I. Rotate the triangle $J_\lambda\ OP_I$ around the vertical through J_λ to bring it to face *I*. We obtain a triangle $J_\lambda\ O_H\ P_I$ such that $\angle\ J_\lambda\ O_H\ P_I = \varphi$ and $|\ O_H J_\lambda\ | = |\ b\ |$. If P_I is on face *I*, then $P_I \equiv P$ (fig. 4a right). If is not, then triangle $J_\lambda\ O_H\ P_I$ intersects either the top (resp. bottom) border of face *I* at C_1 and at C_2, where C_1 is on the vertical through J_λ. Let *c* be the segment $C_1\ C_2$. On the top face (resp. bottom) we rotate *c* over the vertical through J_λ. Then the image of *P* will be the point on g_λ such that $|\ C_1\ P\ | = |\ C_1\ C_2\ | = |\ c\ |$ (fig. 4b).
Note that when *I* is the face *B*, it is easier to plot P^- and then use *Construction 1* to get the antipode.

Examples

The constructions of geodesics obtained above allow us to solve any problem in cubical perspective. We will illustrate this with a couple of examples which are generalizations of classical perspective constructions.
Uniform Grids: let us recall and generalize the standard construction of a tiled floor (uniform grid) in classical perspective. Assuming the floor is horizontal and below *O*, and one of the vanishing points of the grid is centred on a face, then we can assume without loss of generality (since the anamorphosis is independent of the cube's size) that face *D* touches the floor. Hence the grid projects on *D* in true size, as an orthogonal grid of horizontals and verticals (fig. 4d) that intersect each horizontal face in uniformly spaced points. These lines can be extended as halves of *grid-like* geodesics, vanishing to O_F, O_L, O_R, O_B. From the bottom left vertex of face *F* we send a diagonal to vanish at the middle point of edge *FR*. We get the exact construction of Piero de La Francesca's uniform grid [Della Francesca 2016, pp. 102, 366]: the 45-degree line intersects each row of lines going to O_F at exactly one point per row, and through these intersections we pass the rows of perpendiculars, to finish the grid. These lines are all *grid-like*, so they extend to points O_R and O_L as seen in *Case I.1* of section *II.3*. The grid can be completed either by symmetry or by using another 45-degre line on face *B* to repeat the construction.
Here, a note is in order. In classical perspective, the location of the vanishing point of the 45-degree line will depend on the distance of the station point to the drawing plane. But in the cubical perspective that is no longer true: although the distance of *O* to the projection plane varies with the size of the cube, the position of the 45-degree vanishing point is invariant. It is always located exactly at the midpoint of edge *FR* (figs. 4d, 4e). The geometric constraint between the various faces of the cube keeps it there, invariant for change of scale. Angles, not linear measurements, determine the cubical drawing. In a way, the cube is just apparent: the underlying structure is that of a sphere. We note that this invariance of the position of the 45-degree vanishing point is at the basis of the method used in [Olivero, Rossi, Barba 2019, p. 59] to plot horizontal and verticals in cubical perspective.
A small diversion may be enlightening. We note that there is a similarity between cubical perspective and the classical device called a *perspective box* [Spencer 2018; Verweij 2010]. If we restrict our attention to a half-space defined by a plane through *O* and parallel to one of the cube's faces, we get a perspective box (fig. 4f) with especially simple symmetry.

Fig. 4. L.F. Olivero, Examples and plotting points. a,b) Image of P using segments b and c; c) Plot of equally distanced elements and VR visualization; d,e) Grid and extended grid construction; f) Uniform grid on a perspective box, made up of half a cube and perspective box example based on [Verweij 2010, p. 61].



The telephone pole problem: consider now an example involving the plot of equally distanced elements (fig. 4c) from two measured ones. Imagine a scene with equidistant thin columns (e.g. telephone poles) along a vertical plane π that makes an angle with the plane of face *F*. Suppose we measured two points from direct observation and plotted them as in *section III*: point *A* in the upper extreme of the first column and point *B* in the bottom of the second one. Assume also that we measured the angle of π with *F* and we found π to project on face *R* at 10° to the left of O_R. We will show that these three measurements are enough to construct the whole scene.
Following *Case 2* of *section II*, we construct the two geodesics g_1 and g_2 that pass through points *A*,*V* and *B*,*V*. Passing verticals through *A* and *B* we find *Z* on g_2 and *C* on g_1 respectively. Then segments *AZ* and *CB* are the first two columns.
To find the other columns we will define an iterative process based on the vanishing points of the diagonal line $d = AB$. This is a generalization of a well-known construction in classical perspective.
Let g_d be the geodesic of *d*. Since *A* and *B* are in the same face, we construct g_d by *Case 1*. Extending *AB* we get *P* and *Q* in adjacent edges of *F*. Therefore, g_d is a *6-cycle*, and we construct it using points *M* and *N* as in *Case 1.2*. The vanishing set of π is the geodesic $g_{\pi o}$ obtained by translating π to *O*. $g_{\pi o}$ is generated by the vertical on face *R* that passes at 10 degrees to the left of O_R (second case of *1.1.2*) and is a *4-cycle* with segments all disconnected. Because *d* is on π, its vanishing points V_d and V_d^- must be in the vanishing set of π, hence we find them by intersecting g_d with $g_{\pi o}$. We join point *C* with V_d or V_d^- to construct g_{d2} following *Case 2* (in fig. 4c the construction is done above face *R*). Let *X* be the intersection of g_{d2} with g_2. Pass a vertical through *X* to obtain point *Y* on g_1. Segment *XY* defines the third column. We can iterate the process to get as many columns as we like. Since the diagonals go to the same vanishing points, the columns will be equally spaced.
It is important to highlight that in order to construct the same scene using only classical perspective in the plane of the face *F*, the (unique) vanishing point of the diagonals *d*, d_2 and of lines *AC*, *ZD* would be outside of the drawing (by quite a lot in the first case). This worsens without limit as the angle of π with *F* goes to zero. Instead, using geodesics, we draw in a compact way by using whichever of the two vanishing points that happens to be more convenient for the draughtsman. In fact, unlike in classical perspective, we can guarantee that both the vanishing points of a scene and the diagrams required for their construction are within the bounds of the drawing.
In (fig. 1a) we have an elaborate example of both the uniform tiling of the previous section and of the present construction with regard to the columns. The column multiplication is in that case simplified, since π will be parallel to face *F* and the vanishing points of the diagonals of the columns will lie on face *R* and *L* rather than *U* and *D*.

Conclusions

Each spherical perspectives, just like each cartographic map, and exactly for the same reasons, has its positive and negative aspects. Cubical perspective is no exception. Its positive aspects, when compared to the other main contenders –equirectangular and azimuthal equidistant perspectives– are clear: it works as a classical perspective in each face, and therefore requires much less effort from the user's intuition. Also, if classical perspective can be characterized as the single spherical perspective that is still an anamorphosis [Araújo 2018a], hence retains the property of mimesis, then cubical perspective holds a close second place, being a set of six local anamorphoses. Finally, from the point of view of construction, unlike the other two contending perspectives, we have shown that we can construct all geodesic segments from the angular measurements of two given points by descriptive geometry diagrams. In both the azimuthal equidistant and equirectangular cases [Araújo 2018b; Barre, Flocon, Bouligand 1967] this can only be done with the measurement of specially chosen points which may sometimes be inconvenient to measure. Further, this construction is exact, without requiring approximations or interpolations, due to its linearity. As for negative points, the main one is the enumeration of cases that we had to go through in this solution, that is comparatively complex when set up against the other two perspectives and the sometimes troublesome process of dealing with the discontinuities from one face to another [Olivero, Sucurado 2019, p. 57]. The abrupt changes of plane reflect themselves in a comparative inelegance of construction, unseen in the curvilinear cases. All in all, cubical perspective, when treated properly as a spherical perspective, must hold an important place in the growing bestiary of immersive perspectives from which the architect, artist and engineer can choose according to their needs.

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Drawn Reflections and Reflections on Drawing: the "Anti-perspectives" of Abstractionists and Figurativists at the VchuTeMas

Fabrizio Gay, Irene Cazzaro

Abstract

The essay investigates some aspects of the "anti-perspective" – i.e. the drawing that tries to figure the intrinsic spaces of Things, to graphically translate them on the plane with effects of ambiguous, reversible, reflected spatiality, reversing the (topological) meaning of interior/exterior, centre/periphery, enclosed/enclosing – in the opposite formulations of the theme that coexisted in the framework of the Muscovite VchuTeMas. The difference between (Florenskij's) "figurative" and (the constructivists') "abstractionist" anti-perspective is studied by means of a comparison between coeval drawings, emblematic of the two opposite aesthetics. On the one hand (the abstractionist one) it mainly concerns the graphic genre of the unfolded and reversed axonometry, developed through El Lissitzky's projects for the installations of the spatial Proun works, then spread as a visual theme in the abstractionist international in the 1920s and in its subsequent American diaspora. On the other hand (the realist one) it deals with Florenskij's anti-perspective theory, as well as some examples that testify to it: the woodcut covers by Vladimir Favorskij (instructed by Florenskij) in which the techniques of reflection and inversion are highlighted. Translating the opposition between "abstractionists" vs. "figurativists" into the one between "palingenists vs. anachronists", we clarify the difference between the two opposite "anti-perspectives" as a difference between two models of visual signification: the first excludes the "figurative" and allegorical dimension on which the second is based.

Keywords: history of representation, theory of images, descriptive geometry, figuration, graphics.

1921: Archaic and modernist "anti-perspectives"

The twelve studies collected in the volume *Il disegno obliquo* [Scolari 2005] concern themes and times in the history of images that are very far from each other, ranging from the Egyptian writing system to the modes of figuration of building, urban and mechanical devices, to illusive decoration (from the Apulian vases of the 4th century BC to the Pompeian pseudo-perspectives), to the diagrams annotated in the marginalia of the scientific literature, to the modern codes of technical representation in the military art treatises of the 16th century and patented in the 19th century, also touching the 20th century techniques of mimicry, from *camouflage* to disrupting image. Those twelve studies only partially concern the history of the geometric methods of projective representation which led to descriptive geometry and modern axonometric drawing (parallel perspective); they also deal with visual artefacts, theories and practices of figuration which are very different and far from each other, bringing them all together – as the subtitle of the book indicates – as moments of "a history of the anti-perspective", that is, – as the prefix "Anti" suggests – as "antagonists" with respect to Renaissance and modern perspective theory. Therefore, the "anti-perspectives" studied by Scolari constitute an "anachronic" ensemble because they group objects attributable to "other" forms of representation –from some pictographic systems to specific modes of spatial figuration–, geographically distant or chronologically previous, contemporary and subsequent to the Renaissance and modern perspective.

Scolari had already [Scolari 1984] identified a common motivation for these different "anti-perspectives" in the passages of Plotinus' *Enneads*, in which the late antique neoplatonic philosopher, on the subject of painting, affirms the ideal of a figuration purged of the cognitive defects of sight. It is the (regulatory) ideal of a figuration "cured" from "eye diseases", purged from the contingencies of the optical effects of perspective and illumination, that is, freed from the deficiencies of the "percept" with respect to the "concept" of the figured thing. This "good" figuration was what had the Greek name of "icon", intended as "image object", which –unlike the *eidolon*– revealed only the essential and true features of the intelligible idea of what it figures –the traits of its "true" (more adequate) model– in the sensitive matter of the support. According to Plotinus, this figuration set itself the aim of rendering the presence of things by representing them in a "true form", in a "true colour", in a "true distance" and "in full light", doing it through shapes, colours (materials) and the intrinsic textures of the planar body of the figurative support (fresco, mosaic, etching, ceramic painting, …). In short: the icon does not represent, but rather exemplifies something [1].
It is almost impossible to indicate pictorial documents of the third century that show the qualities indicated by Plotinus, that is, the ability to reveal the true appearances of things (by exemplifying them). Generally they are imagined on the basis of what Plotinus could have seen between Asyūṭ and Rome; especially from the few remains of pre-Byzantine paintings, such as those of Dura Europos, or assuming a common hybrid –really *ante-litteram*– origin of the early Christian and Byzantine art. This would involve flat figurations, made with materials that appear as light-bearers, in almost pictographic forms, portraying bodies rendered in a praying iconic planar appearance, including the details of these everyday things (hairstyles, embroidered fabrics, …) and landscapes, but translated into ornamental schemes. If we think, nowadays, of paintings that minimise the difference between naturalist portrait and decorative pattern, we would think, for example, of paintings by Casorati or Campigli; but this is not true. The current domain of the figurative arts is not at all comparable to the sacred dimension, to the ritual (religious and funerary) and theurgical practices that, in the culture of late Greek-Latin antiquity, were carried out through sacred image-objects.
However, the icon –as Plotinus' passages define it– is not just a matter of canons or historical genres of figuration; it is above all a problem that –although it comes from ancient idealist and transcendentalist aesthetics– still arises today, even though secularised and put in technical terms –the "iconic effectiveness" of figuration– even for our conception (the authors' one) that, as opposed to the Plotinian one, it is realist, immanentist and scientific. In our opinion, "icon" indicates today a set of semiotic questions related to the fact that the icon does not represent, but "exemplifies" its (transubstantiated) content in the same substance as its expression.
We will explain this by starting from the fact that the questions of the icon and the anti-perspective, jointly, are found at the beginning of the (first Russian, then European) theories of abstract art –from the "suprematist" mysticism of Malevič, Puni, Rozanova and Lissitzky to Kandinsky's "spiritualism" and Mondrian's "theosophy"– but, in the same years, in Soviet Russia, they found their most argued formulation from an opposite position: the one coming from the anti-abstractionist rearguard that Pavel Florenskij [Bertelè, Barbieri 2015] formulated from 1919, through his writings on the late medieval Russian icon [Florenskij 2012], on the Orthodox liturgical space and with the courses on the "theory of space" that he held at the VchuTeMas in Moscow in 1921-24 [Florenskij 2007].
Florenskij, in the first years following the Soviet revolution, strenuously defended the value of the historical heritage of medieval icons and Orthodox architecture, specifying its relevance as opposed to what he described as "perspectival degeneration of Western art". He explained that the advent of the "linear perspective" was the cause of the impoverishment of the figurative spatiality expressed by the previous pictorial and graphic traditions: perspective blocked the viewer's gaze degrading it to a "point of view", calling him to (ideally) put only one eye in the peephole of an (ideal) prefabricated *camera obscura*: a sort of *ante-litteram* camera. By turning the graphic or pictorial image into the surrogate of a static and monocular optical experience, perspective –according to Florenskij– took away from the gaze the freedom to "wander" on the image plane in order to capture, from different directions and itineraries, the true features of the figured objects according to "images" that he already possesses in his own consciousness. In short, ten years before Erwin Panofsky published the famous essay on *The Perspective as symbolic form* [Panofsky 1961], Florenskij –through an aesthetic of the symbol intended as consubstantial to the symbolised– claimed the primacy of the "symbolic form" for anti-perspective, based on the prototypical value of the medieval icon. However, the argu-

ments conveyed by Florenskij's plotinian aesthetics [2] in the early 1920s were not unrelated to those supported by the constructivist and abstractionist faction –predominant in the VchuTeMas–, a faction that, on the contrary, pursued the constitution of the work of art as a "thing" and not a representation of "things", eliminating the distinction between the domains of visual arts and design. As an example, El Lissitzky's *Proun* works (fig. 1) were de facto considered anti-perspectives, that is, –physically flat and sometimes spatial– objects that do not represent anything, but arouse the sense of an intense, ambiguous, bivalent, multiple and reversible spatiality [Bois 1988, Gay, Cazzaro 2019].

1921-24: palingenists and anachronists

In 1921 and in the same Muscovite circles –in the VchuTeMas laboratories, in the editorial and seminar programmes of the Institute of Artistic Culture (INChUK) and in the psychophysiology department of the Russian Academy of Artistic Sciences (RAChN)– at least two ways of understanding the anti-perspective, and the drawing techniques that derive from it, intersect and collide: the one of the abstract artists and the opposite one of Florenskij. In these environments Florenskij was in contact at least with the abstractionists who supported pure art –against the faction of the "productivists" led by Rodcenko– going so far as to share two encyclopedic projects, initially supported by Kandinsky's direction of the psychophysiological department of the RAChN in the last months of the '21:
1) the programme of a "Scientific dictionary of artistic terms" –on which various departments of the RAChN worked through a "Cabinet of artistic terminology"– which collected an extensive bibliography and started a discussion on different entries: "Absolute", "Empathy", "Point", "Sign", "Sexuality", "Meaning", …, as well as the entry "Space", on which –as Nicoletta Misler explains [Misler 1990 and 2007]– the debate ran aground;
2) the drafting of the *Simbolarium*: a register of the elementary archetypes that would make up the "language of visual forms", a sort of "alphabet" of the "visual entities" of artistic expression in the hypothesis that they constitute a set similar to the "symbols" of the logical-mathematical and kinesic notations [3].
These two projects suggest that opposite abstractionist and realist theories had had common scientific sources – irst of all the perceptual phenomenology [4] of the work of art and

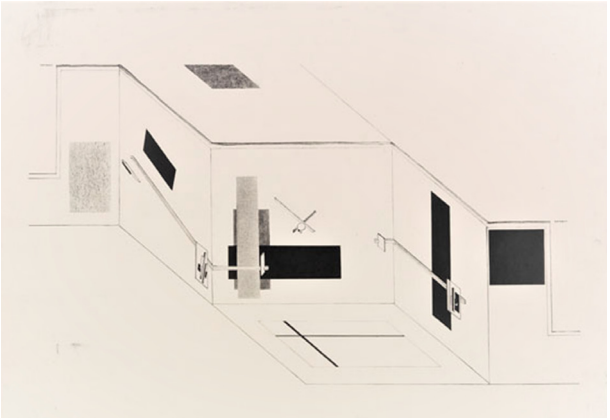


Fig. 1. El Lissitzky, project for the Prounenraum at the Große Berliner Kunstausstellung, cavalier unfolded axonometry, 1923; lithography on parchment paper, 44 x 60 cm, 1st Kestner folder, Stedelijk Museum, Amsterdam.

the aesthetic theories of "pure visibility" [5]– and that both had suffered from the principles of the rising "Russian formalism", that is to say, of an already structuralist and semiotic (rhetorical) [6] conception of the functioning of the work of art: be it literary, auditory, visual or spatial [Tafuri 1979].
Between "figurativism" and "abstractionism" there was no contradiction, but only a difference in degree and values [7], since, by all accounts, the work of art is above all an autonomous and figural object. Florenskij and the (spiritualist and suprematist) abstractionists of pure art shared many traits of an objectivist and purovisibilist conception of the work of art, as well as the study of archetypal (universal) semantic forms of the artistic expression. But how did they differ?
The most salient difference is not the one between abstractionists and realists, but the one that was dug into the dynamics of the Russian (earlier) and Soviet (later) avant-gardes by parthenogenesis of the symbolist movements of the beginning of the century. As it is known, the two revolutions –the Russian and the Soviet one– also marked two profound and subsequent boundaries between the artists theorists of art:
1) at first (1905-08) the opposition between modernly "historicist" movements against the actual modernist and anti-historicist avant-gardes –such as "cubofuturism"– similar to the European art movements, but closer to the political dimension that will mark (then) the Berlin Dadaism in the early 1920s – [Tafuri 1980, pp. 141-182];

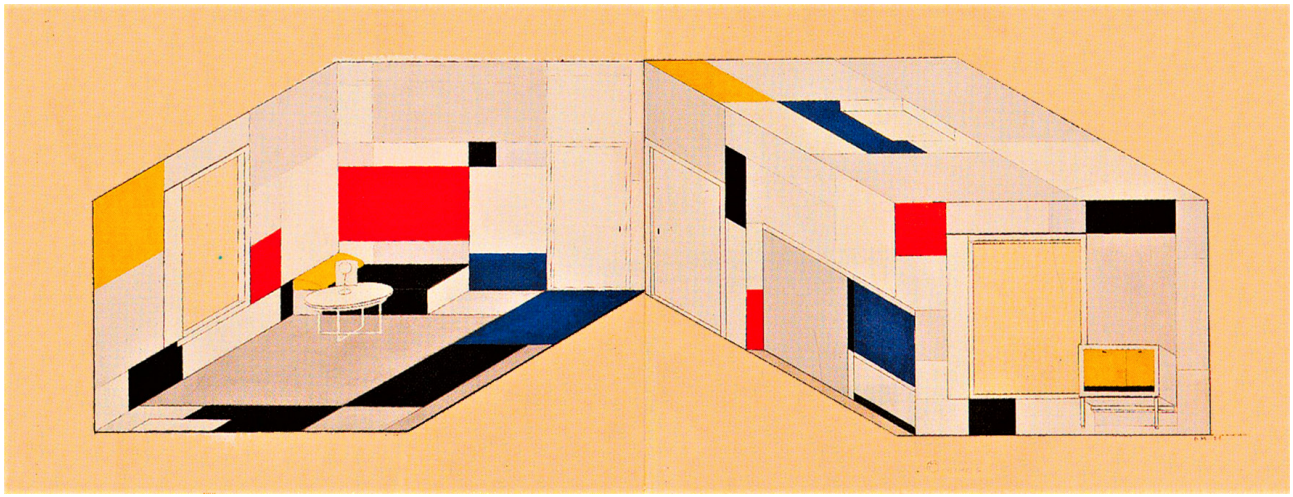


Fig. 2. Piet Mondrian, project for Ida Bienert's study in Dresden, cavalier unfolded axonometry, 1926; gouache and pencil on paper, 37 x 97 cm, Staatliche Kunstsammlung Dresden.

2) then (1917-20) the secession of the avant-gardes, which –by connecting themselves to the political-social dimension and contributing to the first Bolshevik ideals (the "utopian communism")– supported a palingenetic ideal, that is, a "reinitialisation" of History and Arts. Especially the productivists and constructivists tried to position themselves as a revolutionary institution, becoming a "school" and a propaganda tool, considering art as a form of "total design", namely, anticipating the overcoming of any distinctions between arts, design and urban planning, becoming dominant at the VchuTeMas: the first "polytechnic of the arts".
Thus, in the early 1920s, in the classrooms of the VchuTeMas the most radical opposition in the conception of the work of art was the one that separated the "palingenists" –the constructivists and the productivists (Rodčenko, Stepanova, Vesinin, Lissitzky, …) [8] proponents of art as "total design"– from the "realists", supporters of the fact that History and Arts cannot be "reinitialised" and that the revolution can only take an anachronical form, but not a *tabula rasa* of techniques and traditional genres of the arts. Florenskij –who did not despise abstract art but supported a religious dimension of art– sided against the productivist abstractionism in which he saw a form of "artistic nihilism" which –by reducing the arts to design– would have humiliated the –individual and collective, past and present– anthropological reality of the human "lineages" handed down through the traditional domains of the arts.
The opposition between "palingenists" and "anachronists", thus, translated into that between "abstractionists" and "figurativists". Florenskij clarified this, especially in a lecture at the VchuTeMas in 1923-24, in which he contested the "naive" forms of abstraction, believing them to be the promoters of a dissolution of art into pure technique. The abstractionist denial of any form of representation –that is, «taking one thing as such and its action as such, but not their representation»– would have led, in Florenskij's words, only to three possible consequences:
a) "First solution: creating natural things – organisms, landscapes, etc. It is clear not only that this would be impossible, but also that we do not really need it. Nature already exists and duplicating it would be a useless operation";
b) "The second solution is the creation of things that do not exist in nature: the machines";
c) "the third solution is the creation directed towards things that are not physical. A work of this type is a machine as well, but a machine of its kind, a magic machine, an instrument of magical influence on reality. These tools already exist: the political and propaganda posters, for example, are specifically designed to encourage people who look at them to

act in a certain way and even to force people to look at them. In this case the action on the people and the change in their spiritual life must be achieved not through a meaning, but through an immediate presence of colours and lines. In other words, these posters are essentially machines for suggestion and suggestion is the lowest step of magic" [Florenskij 2007, pp. 96-97].
By introducing the solutions "b" and "c" Florenskij refers to the "constructivist-productivist" concept that considers the work of art as a self-referential aesthesic machine (b) used as a tool of ideological propaganda and social conditioning (c). He does not at all despise abstract artwork or political propaganda posters, but contests the naivety and limits of abstract art theory because it flattens the complex semiosis of the work of art into a simple matter of "conditioned reflexes" –stimulus-answer– (b) trusting only on the superstition of the recipients (c).
Therefore, it is essentially a difference of "semiotic model" what opposes Florenskij to his contemporary abstractionist theories. But how does this "difference" manifest itself on the merits of the (technical) theme of the anti-perspective devices?

1923: reflected axonometries and unfolded spaces on the plane

Both the anti-perspectives –that of Florenskij and that of the constructivists– developed in relation to the theme –inherited from symbolism– of the "total work of art", which raises the question of the actual relationships between the artistic object and the physical and ritual environment in which the work of art lives. According to Florenskij, the prototype of the total work of art is the Byzantine-Orthodox liturgical space [9]; on the contrary, according to Lissitzky, the "total work" includes the reformation of the city –i.e. his horizontal skyscrapers for Moscow– and the reinvention of what we would now call "interior design", finding its emblem in the new exhibition spaces, such as his Prounenraum (fig. 1) and museum rooms (fig. 3) in which the work of art, from enclosed space, becomes an enclosing environment. In Florenskij's opinion, it is the anachronic reformulation of the spiritual rite; in Lissitzky's opinion, it is the "re-initialisation" of the categories of the interior, overcoming and hybridising the traditional ideas of home, factory, laboratory, museum, theatre, etc.
It is above all in the design of these exhibition spaces – objects that become an enclosing space – that the architect Lissitzky develops an anti-perspectival, or pan-perspectival, method of representation: the technique of "unfolded axonometry" (figs.1-3) in which the interior is represented unfolded in two contiguous axonometries, captured by two directions of projection symmetrically opposite to the horizontal or frontal positions of the represented space, producing a panoptic spatial image. From the 1923 Berlin Prounenraum, this method spread immediately within the abstractionist international – from the design diagrams by Vantongerloo, Mondrian (fig. 2) – entering into resonance with the synthetic cubism (purism) of Le Corbusier's early works, with Sartoris's rationalism, with De Stijl's analytical elementarism, making axonometry [Reichlin 1979, Bois 1981, Scolari 1984, Bois 1988, Pérez Gómez, Pelletier 2000, Scolari 2005] the figurative label of the modern movement and its schools: from the Bauhaus in Weimar (after 1923) to the Muscovite Vchutemas where Lissitzky introduced interior design.
In interior design, the unfolded axonometry became the method to graphically calculate the spatial (topological)

Fig. 3. El Lissitzky, project for the Kabinett der Abstrakten at the Provinzialmuseum in Hanover, oblique unfolded axonometry, 1927; gouache, inks, enamels and collage on cardboard, 39,9 x 52,3 cm, Sprengel Museum Hannover.

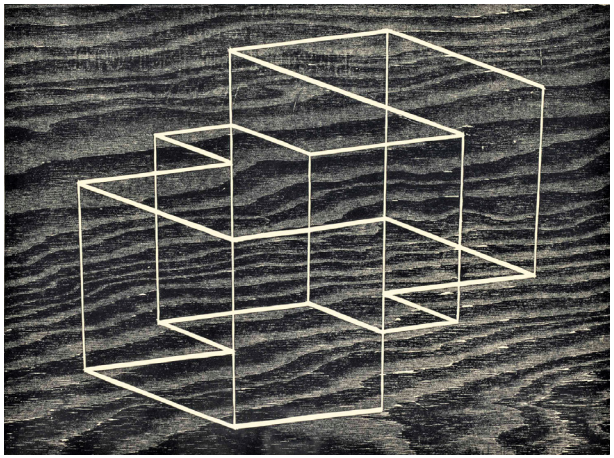


Fig. 4. Josef Albers, Multiplex D, woodcut on Neenah Resolute Ledger paper, 1948, 22,7 x 30,5 cm (image) [31,7 x 41,5 cm, sheet].

concomitance of the eidetic and chromatic formants, just as an orchestral score does with the temporal concomitance of the sounds. But these representations, in addition to their instrumental purpose, also assumed an autonomous artistic value in the course of the geometric and elementary abstractionism as flat images with a perceptually unstable spatial content –such as the psycho-perceptive test of the "Necker cube"– linked to a reflection and diffraction effect of the point of view. An example of this is Albers's series of woodcuts (fig. 4), which facilitates our comparison with other typographic woodcuts, testifying the opposite conception: the realistic and figurative one expressed by Florenskij's anti-perspective.
Florenskij –although an excellent draftsman– was a graphic artist only by intermediaries, instructing the execution of three woodcut covers traced by his friend Vladimir Andreyevich Favorskij: director of the Polygraphic Faculty of the VchuTeMas where he was an exponent of the realist, figurative and archaic faction.
The first of these covers (fig. 6) also allows us to clarify, on the concrete level of drawing, the difference that opposes Lissitzky's geometric abstractionism to Florenskij's realistic geometry. Both wrote about geometry; but it would make no sense to compare Lissitzky's manifesto Kunst und Pangeomtrie [Darboven, Lissitzky 1973] to the mathematical texts by Florenskij who was a professional mathematician and physicist, exponent of a "scientific realism" which postulates both the unamendable "reality" of physical space, and the multiplicity of forms that space assumes through our senses, in our consciousness (fig. 5). According to him, geometry is a batch of models of "abstract space" that may prove relevant to describe aspects of the phenomenal space of perception and physical space where it cannot appear to our senses and our imagination. As a result, he believes i) that mathematical entities are endowed with real existence and ii) that art and geometry are different means of a single philosophy of Nature.

1922: the graphic plane as a stratification of geometric spaces

Imaginary spaces in geometry, the expansion of the domain of two-dimensional images in geometry [Florenskij 2016] is the 1922 book in which Florenskij demonstrates the ontological and physical reality of numbers technically called "imaginary", like the one that expresses the square root of " –1" (imaginary unit). The text also includes a chapter on the "Explanation of the cover" (fig. 6), where it shows how Favorskij's woodcut transforms a (mathematical) "abstract" topic into a "figurative" one, expressing other modes of existence of space, visually "co-present" on the printed page plane.
In order to explain how Favorskij's woodcut on the cover aims at visually showing the "co-presence" of the "imaginary" in a concrete graphic representation on the geometric (diagrammatic) plane of the "real" numbers, Florenskij –according to the imposed order of the mathematical discourse– premises the definition of that "co-presence" in our spatial consciousness. These premises are not mathematical, but

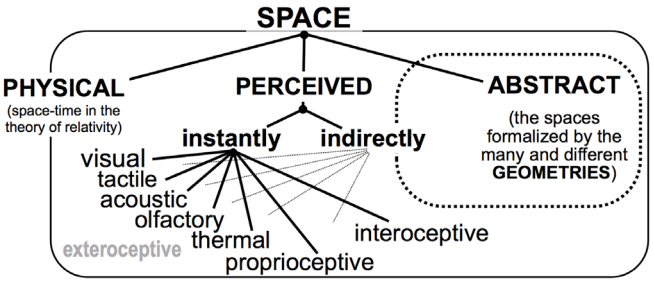


Fig. 5. Tree diagram of the explicit categorisation of the term "SPACE" in Florenskij's works: see for ex. Florenskij 2007, pp. 271-73.

phenomenological and psycho-perceptual. With the example of concrete visual experiences, he argues that the perceived space is always the stratification of the other sensory spaces (fig. 5) *in praesentia* or *in absentia*, that is, exhumed in memory, as if they were (topologically) "framed" in each other.
The recognition of what the cover "represents" is only one of these visual experiences. It can be recognised as a "cardboard page" subjected to the essential registers of typographic layout –title, author, publisher, etc.– and one can recognise the representation of a sort of "open book" with "geometric graphics". Only later are the perceptive levels of the picture 'exfoliated', distinct –in order of evidence– above all from the visual qualities of the textures of the signs.
1°) First of all, we "read" (fig. 7 right) the figures of a plane that Florenskij calls "paradoxical" because it does not even belong to the physical plane of the sheet on which, instead, the actual typographic characters are "quilted": the latter must appear physically present on the paper page, but it is the plane of the pure notational inscriptions of the geometry of the "real plane" that "transcends" the paper support and indicates a space which is only coded in the signs of the vertical axis X and the digits "O", "X" and "Y", the only letters printed in solid black.
2°) The figured book shows us an open page on the left, with a "path" (an ellipse of the XY plane) and, on the right, a flap of that same page that frays in a mysterious "thickness", which Florenskij defines "almost only tactile".
3°) In order of evidence, there is then, in front view, the rectangle of the actual "real geometric plane" (fig. 8 left) marked by a thick horizontal hatch that Florenskij says is made of "warm black" and "fully visible", a rectangle that bears the sharp (black) path (with white edges) of a semi-ellipse whose minor axis is the X axis.
4°) The figure of the "imaginary plane" opens instead on the right side, like a page that, rotating around the X axis, touches the eye of the spectator-reader (fig. 8 right).
5°) The instruction to perceive the image on the right as the "*verso*" of the "sheet" comes to us from the image on the left (on the figured *recto*) which proposes on the opposite side the same cursive figure "O", but mirrored and inverted in its hatching: the black mark of the real "O" (of the *recto* side, on the left) is transformed here into a white section surrounded by a black "scar", i.e. with the effect of a sign "in relief" on the verso of the sheet, a sign "caused" by the impression of the same sign imprinted on the "*recto*". Therefore, the real (optical) reading direction "XO" is also inverted in the imaginary "OX" direction, a dimension accessible only to the touch,

Fig. 6. Vladimir Favorskij, Cover for P.A. Florenskij's book, Imaginary spaces in geometry: the expansion of the domain of two-dimensional images in geometry, woodcut on paper, 1922.

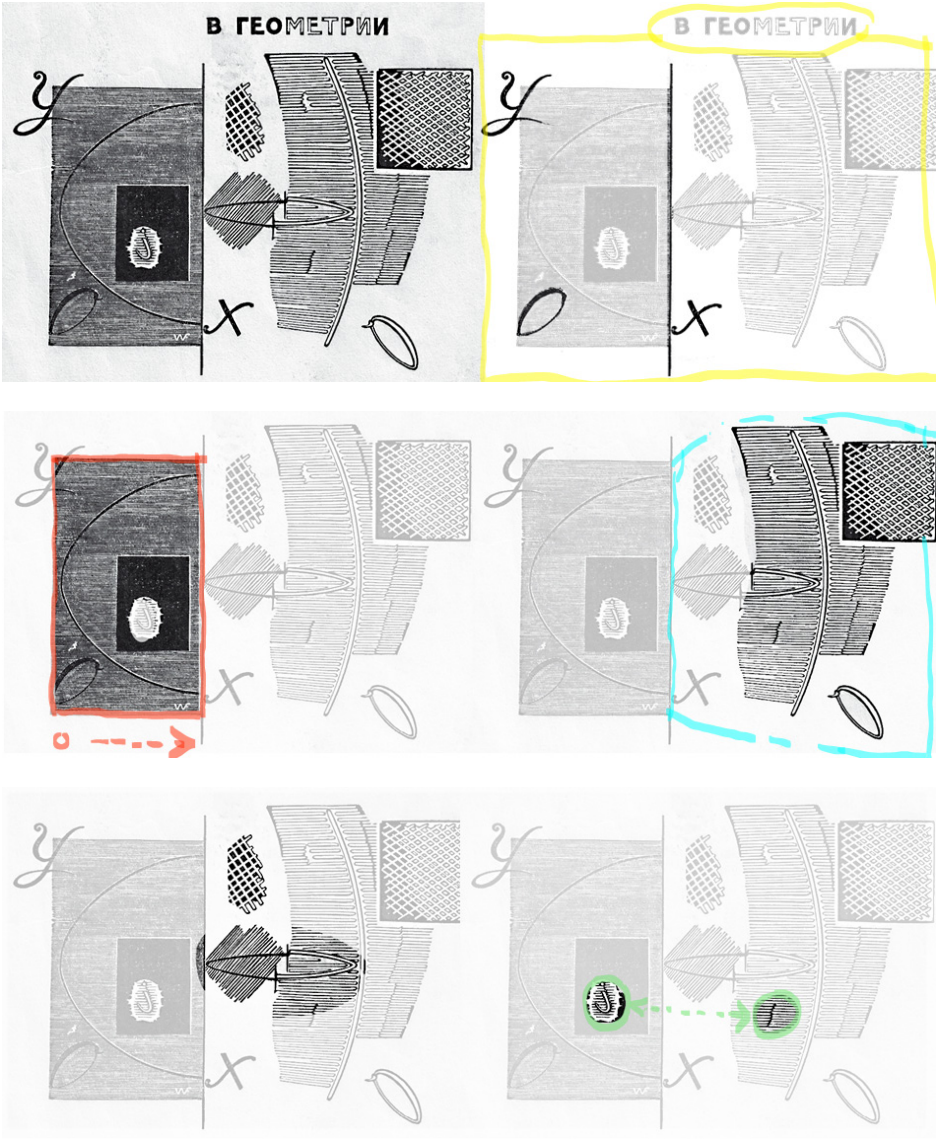


Fig. 7. Analysis of the cover: evidence (with respect to the typographic plane) of the notation indicating "real" geometric plane (left).

Fig. 8. Evidences of the figure of the "real plane" (right) and the "imaginary plane" (left).

Fig. 9. Evidence of the intermediate figures between "real" and "imaginary" (left) and symbol of the imaginary unity (right).

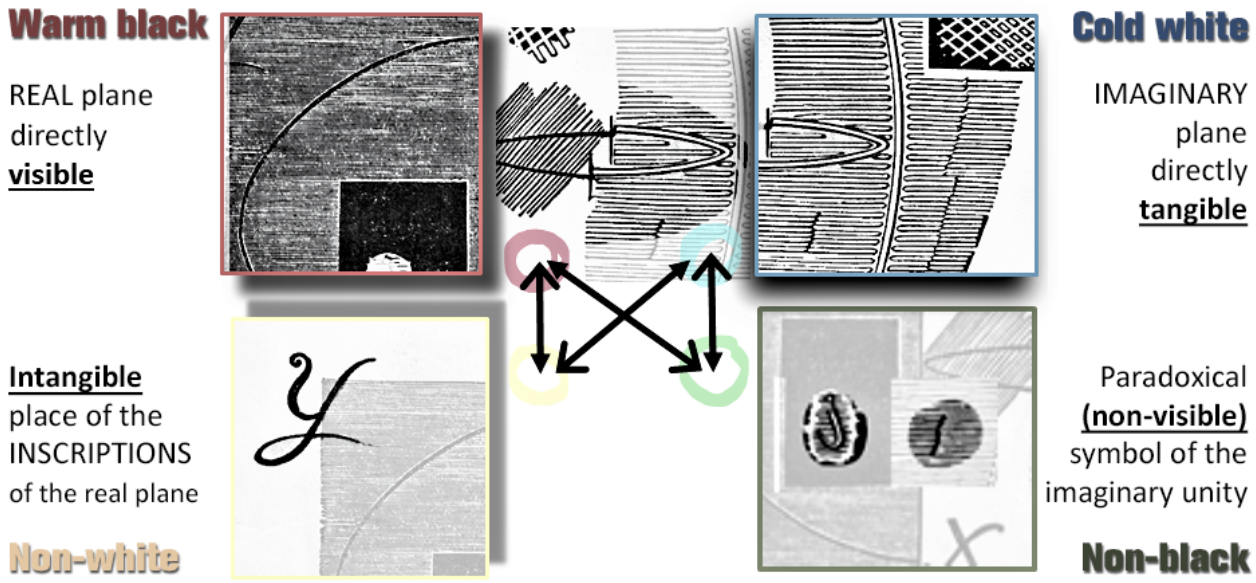


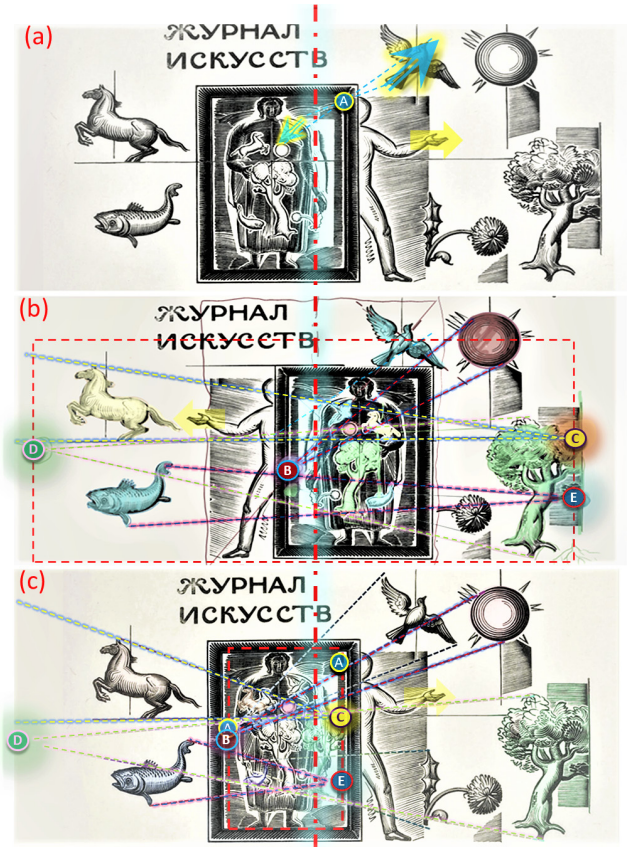
Fig. 10. Semiotic square of the terms used by Florenskij to indicate the categories of the graphic expression on Favorskij's cover.

with the movement of an ideal hand that touches the verso of the sheet, accompanying the eye that runs along the visible side. Even the horizontal hatched pattern of the left portion is rendered with strokes of the same type: white and scarred with black at the edges, signs that Florenskij describes as "cold white". This is also the case of the figure corresponding to the real semi-ellipse, which has become an imaginary hyperbola segment on the right. In short, the whole right side tries to render a tactile perception ("cold white"), therefore the sense of visual distance, of optical scale is lost; consequently the texture is grainy and enlarged in samples, in touches.

6°) Finally, there are (fig. 9) some "pieces" that escape the rigid distinction in one of these two opposite visual categories. At the centre, near the axis, we find (fig. 9 right) a hybrid ellipse: half "real" (warm black) and visible, and half imaginary (cold white) and tangible. Finally (fig. 9 left), the symbol appears –the Greek letter *iota*– designating the imaginary unit (number whose square is = –1) rendered on both sides (*recto* and *verso*) of the figured plane, but rendered, from a graphical point of view, even more paradoxically than the characters O, X, Y of the real plane. It appears as "tactile" on the *verso* (on the left) of the plane and "optical" on the *recto*. In summary, Florenskij builds a (semi-symbolic) system of homologies between pairs of expressive categories and pairs of content categories. These graphical-geometric categories can be represented in the form of the semiotic square (fig. 10) where the opposite terms are the "directly visible and real plane" (in a mathematical sense), and the "imaginary plane", equally "real" (in an ontological sense), but only tangible and made visible thanks to the artifice of the drawing. Among the opposites, the hybrid range of a figured intermediate space lies as if it were the thickness of the sheet, enlarged in a tactile way, where visual information is confused with tactile information. Finally, we must also admit the "sub-opposite roles" of the real geometric notation –the visible but not tangible numbers– and of the imaginary unit, rendered as if it were impressed from the *verso* of the sheet and paradoxically surfacing on the *recto* with the "scar" that connotes it as a tactile entity. These writings seem to escape the senses, but not the graphic artifice of the drawing that presents them.

Fig. 11. Vladimir Favorskij, Proposed cover for the third number of the journal "Makovec", woodcut on paper, 1923.

Fig. 12. Analysis of the Favorskij's cover: the symmetric reversal of the central image (b) of the cover around the vertical axis highlights homographies: direct and inverse homoteties (i.e. "reflections").



1923: an anti-perspectival allegory of drawing

We do not know how Florenskij in 1923 instructed Favorskij's woodcut for the cover of the third –never published– issue of *Makovec* journal (fig. 11), organ of the homonymous association of realist artists. It is only certain that the woodcut was born for didascalic and militant purposes as a sort of figurative "*manifesto*" of the "realistic figuration", presenting itself as an allegory. And as an allegory, it evokes "things" by "depicting" them through figures shaped as "stencils", stereotyped, as if they were "typographic characters", thus reminding us that "images" are above all "social objects".
Therefore, the figure represented at the centre of the woodcut –included in the "frame" that delimits a "figuration within the figuration"– does not indicate the appearance of a man, but "the man": the human being in its intension and generality. The man is shown twice, partially superimposed and turned inside out:
1°) "in the "frame" –picture inside the picture"– the man is rendered as a black field in which the white traces of "little figures of Things" emerge –as if they were his X-rayed bowels– appearing like impressed in the flesh of his memory, in his own mnestic traces. These "Things" graphically traced in 'white on black (and internal) field', seem almost the same "Things" that appear outside, otherwise figured, with black traces on the entire external and (ideally) unlimited white field. But compared to the external ones, the internal ones are inverted in negative and specularly reversed.
2°) among the figures rendered in black traces on the white field outside the figure of the "picture, placed behind the picture", there is still the man, this time figured as an "external Thing" (black on white). This is the reason why the man appears to be doubled: he is in front of the figure in the picture –as in a Byzantine icon rendered in white traces on a black background– and reappears seen from the back, in half, behind the picture, while holding out his open hand with a wide gesture of the right arm, giving us the instruction to mentally reverse the figure.
We do not enter here into the allegorical reading of the "figured Things" by resurrecting the scattered vestiges of Florenskij's *Simbolarium*, but we limit ourselves to seeing the geometric relationship between the "Things" represented within "the man in the picture" and those "outside" him.
a) Following the gesture of the man from the back, we mirror the central figure (fig. 12 b), we see that "Things figured inside" are rendered as homothetic images (similar and similarly placed) of "Things figured outside". And we see that the centres of these homotheties are mainly at the edges of the page.
b) Bringing (fig. 12 c) the figurative "picture" in the centre of the cover to its original state, we see that the "things inside" are rendered as homothetic and mirrored figures of the "things" figured outside the picture, and we see that now the centres of these different homotheties gather on the figure of the "frame of the picture", also rendered with the features of a "Thing outside".
Therefore, the figure of the "frame" of the picture represents what is placed outside the picture at the edge of the space, as if the exteroceptively learned space folded "at the mirror" in the – interoceptively learned – space of the figuration at the centre. Here is, therefore, a radically (figuratively) "reversed perspective": a (figurative and didactic) *manifesto* of (realistic) "Drawing".

Notes

[1] The notion of "exemplification" as opposed to that of "referential denotation" is introduced by Nelson Goodman: Goodman 1976, pp. 51-63.

[2] Cf. e.g. Cantelli 2011.

[3] Cetverikov and the "Choreological Laboratory" of the RAChN, founded in 1923 (under the direction of Sidorov and Larionov) worked on a "dictionary of gestures" that studied the movement of the human body in its various manifestations, from rhythmic, artistic gymnastics, to contemporary dance: Sidorov's "free dance": cf. Misler 2017.

[4] First of all, the psychophysiology of Hermann von Helmholtz (1821-1894) and Ernst Mach (1838-1916) are sources cited by Florenskij as well, especially in his theory of sensory space (fig. 5) as a synaesthesic whole of "states of consciousness": cf. Florenskij 2007, pp. 265-280.

[5] On the evolution of purovisibilist aesthetics in a semiotic perspective cf. Lancioni 2001.

[6] "Rhetoric" in a semiotic perspective, in the sense of Groupe μ 1976 and (for visual Rhetoric) 1992.

[7] From a semantic point of view it is a difference in terms of density of "iconic semes": cf. Greimas 1984.

[8] For an anthology of the abstractionist position cf. Magarotto 2016.

[9] Cf. *The Church Ritual as a Synthesis of the Arts*, in Florenskij 1990, pp. 57-67.

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Knowing by Drawing: Anatomy, Mechanics and Architecture in Viollet-le-Duc's Drawings

Camilla Casonato

Abstract

The present study investigates the relations between technical-scientific illustration and architectural drawings in the context of European Historicism. In the thriving publishing activity that characterised the first decades of the 19th century and aimed at promoting knowledge dissemination, such illustrations take on growing importance in all fields. In such a context, the case of the renowned architect and restorer Viollet-le-Duc is significant due to the quality and consistency of his theoretical elaboration and graphic work, as well as to his undisputed critical and editorial popularity. The tireless French scholar and draughtsman theorised drawing as a fundamental means of knowing the deep structures of reality in every field.
The analysis of texts and images sheds light on a transfer of ways of thinking from the natural sciences to architecture that translates into a sort of "biological" depiction of buildings based on unshakeable rationalism founded on life sciences. In accordance with his surrounding epistemological context, Viollet-le-Duc carries out an inquiry into architecture, and medieval architecture in particular, that was based on the study of the existing relations among the parts and the relationship between conformations and functions, and was borrowed from studies in anatomy and integrated with a reading of the rational efficiency of the architectural organism in mechanical terms. Thus, did organic and mechanical metaphors attain a synthesis that is significantly mirrored in the ways of drawing.

Keywords: scientific illustration, theory and history of architectural drawing, Viollet-le-Duc, mechanical drawing, anatomical drawing.

Introduction

Starting from the 1830's, the dissemination of European technical-scientific knowledge was entrusted to the thriving publishing activity of an encyclopaedic calling that also involved the disciplinary field of architecture. Illustration played an essential role in all fields, also thanks to a simplification in paging and reproduction techniques that led to an increase in the number of images and offered a closer and more direct relation between text and image. In such a framework, and especially in France, significant reflections are highlighted between historicist architectural thinking and scientific knowledge and may be traced back to the wider epistemological context in which such reflections were developing. These connections are even more evident upon examining the relation between architectural drawing and the development of scientific illustration. The imposing theoretical, graphic and editorial work of the famous French restorer Viollet-le-Duc (1814-1879) constitutes a particularly fertile field of investigation in this sense, also thanks to the architect's renown sensibility towards the natural sciences [Baridon 1996, Thaon 1982].

The notion of organization

The tireless and versatile scholar Viollet-le-Duc was known as an extraordinary drawer a true "*machine a dessiner*" ("drawing machine") according to his uncle Delécluze (1781-1863), who was his mentor and a disciple of David

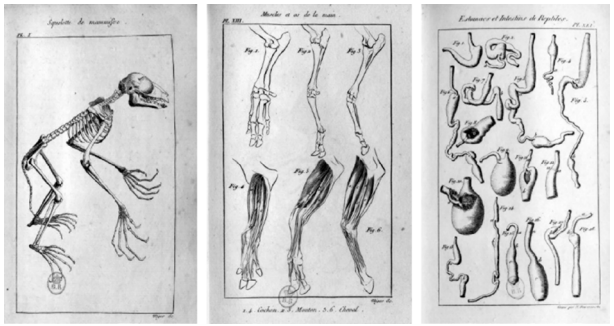


Fig. 1. Anatomical drawings. Frames from Lessons in comparative anatomy (Cuvier 1805, pl. I, XII, XIII).

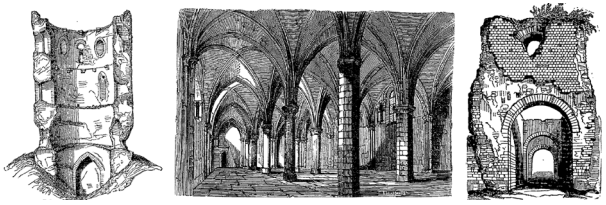


Fig. 2. Drawings of ruins and views from Abécédaire ou rudiments d'archéologie (Caumont 1858, pp. 68, 336, 376).

[Bressani 2014, p. 50]. The architect's numerous publications shed light on his multifaceted interests that ranged from geology to biology, from anatomy to planetology to mechanics. His writings reveal how the notion of organisation appears to him –in accordance with the cultural context in which he operated– as the key to the mystery of nature and life, and how he upholds it as the principle on which his thoughts on architecture and restoration are founded. In fact, Viollet-le-Duc unveiled the solid presence of an elementary principle in each of the various aspects of reality that he investigated. The definition of such a principle is only possible upon analysing its many applications in nature and referring to the appearance, in 19th century culture, of a new way of considering beings that, starting from the secret of their creation, suddenly appeared to be endowed with temporality. In the genesis of a crystal, in the conformation of a sprout, and in geological transformations, nature seemed to be guided by a profound rationality with which man, in his own creations, was called to act in sync.

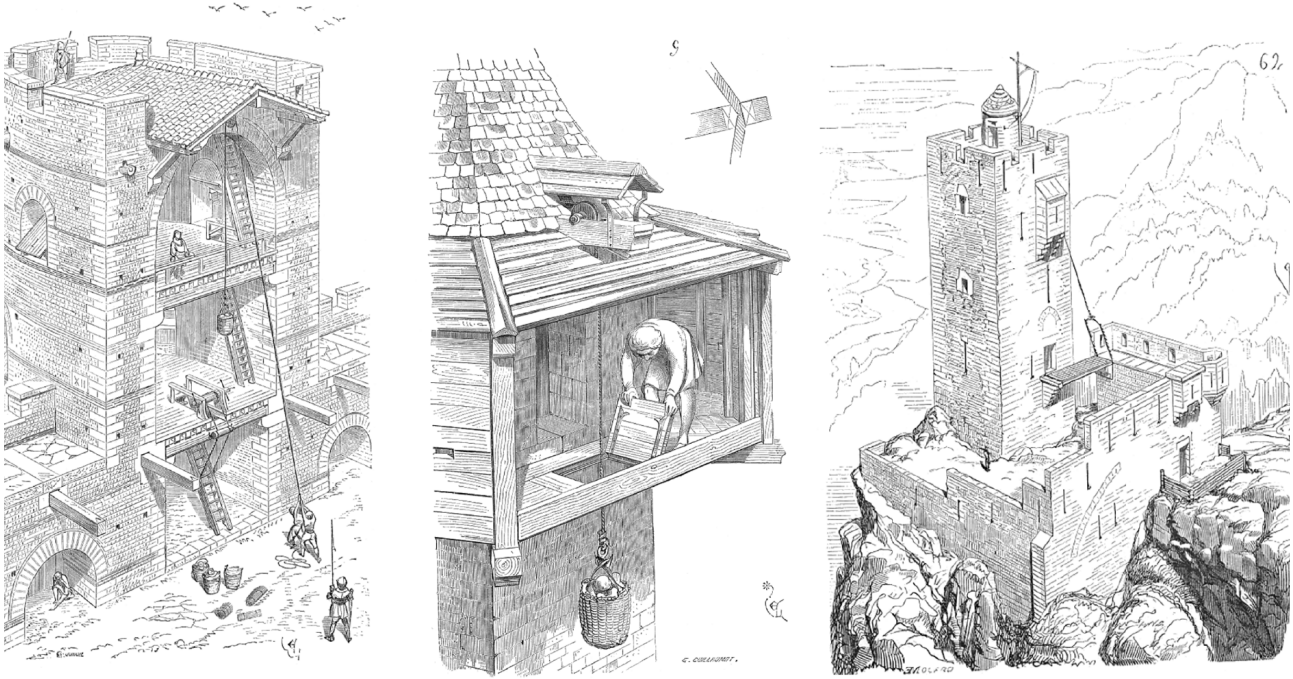
At the end of the 18th century, the natural sciences, which were at first mainly engaged in the great taxonomic endeavour based on the evidence of visible characters, began to inquire into relations instead of coexistences, and into functions instead of mere morphologies. The flat space of the chart of nature thus revealed a hidden depth from which the complex set of relations, the fascinating mystery of finality and the extraordinary variety of solutions emerged along the line of learning processes. It was now possible to make out the accessible echo of an efficient but obscure genetic process under the apparent shapes of the visible [Foucault 1978, pp. 272, 273].

In this context, Georges Cuvier (1769-1832) began his study of the relations between organs by integrating the definition founded on description and that based on function, which were initially rigidly autonomous, thus shedding light on the set of derivations, variables and dependences that lead to the immense multiplicity of living beings. Through reflection on finality, a sort of abstract conception of organs appears as a theoretical and operative instrument and is defined by the very function that it contributes to fulfilling with others. Therefore, regardless of its morphology or position, it is possible to conceive an idea of a part of the body, i.e. the organ, that serves one purpose in general, for example respiration. As a result, it becomes easy to compare and connect specimen that are apparently rather different but are actually similar due to their analogies in structure and function. The idea that hidden functions are what signal the true nature of things, and that visible traits are, on the other hand, only the final and multifaceted expression of few hidden and constant functional units, was thus consolidated (fig. 1).

Viollet-le-Duc was referring to something very similar when he claimed, in his famous *Dictionnaire raisonné de l'architecture française du XIe au XVIe siècle*, that the conclusion prevails over the premises. Since the aim of a room is an empty covered space, such a space is the goal to be reached, while pillars and walls are, and should not be anything but, the way to attain such emptiness [Viollet-le-Duc 1875, p. 198, entry «Trait (art du)»]. At the same time, the goal may be met through different means according to the time, places, principles and constructive means at one's disposal. In this sense, denying

medieval architecture any artistic dignity due to its diversity compared to classical architecture is the equivalent of claiming that «a horse is a deformed animal because its organisation essentially differs from that of a swallow" [Viollet-le-Duc 1981, p. 236, entry "*Proportion*"]. In particular, the harmonic system of Gothic architecture proceeds from the inside to the outside, exactly like the process that leads from one function to a plurality of different solutions in nature. For this reason, the compliance of outside and inside, necessity and shape, finds its full realisation in it. «In these buildings –Viollet-le-Duc explains –the outside appearance is nothing more than exact covering of the internal structure», and further on «the frame that appears externally is only the encasing of the internal conception» [Viollet-le-Duc 1981, p. 217, entry "*Proportion*"]. "We say organism –the writer summarises– because it is difficult to give another name to medieval architecture, which develops and progresses like nature in the creation of beings, starting from a very simple principle that it changes, perfects, and complicates without ever destroying its raw essence" [Viollet-le-Duc 1981, p. 323, entry "*Style*"]. When the scholar defined Gothic buildings like a stone organism, he revealed his profound knowledge of and meditation on the naturalistic thought of his time, as well as his belonging to the epistemological horizon of his time. This aspect emerged with more clarity and evidence by integrating the reading of his texts with an analysis of his drawings, both for their theoretical content, which goes well beyond the graphic description of constructive systems or the documentary portrait of existing buildings, and for their familiarity with the scientific illustrations of the time.

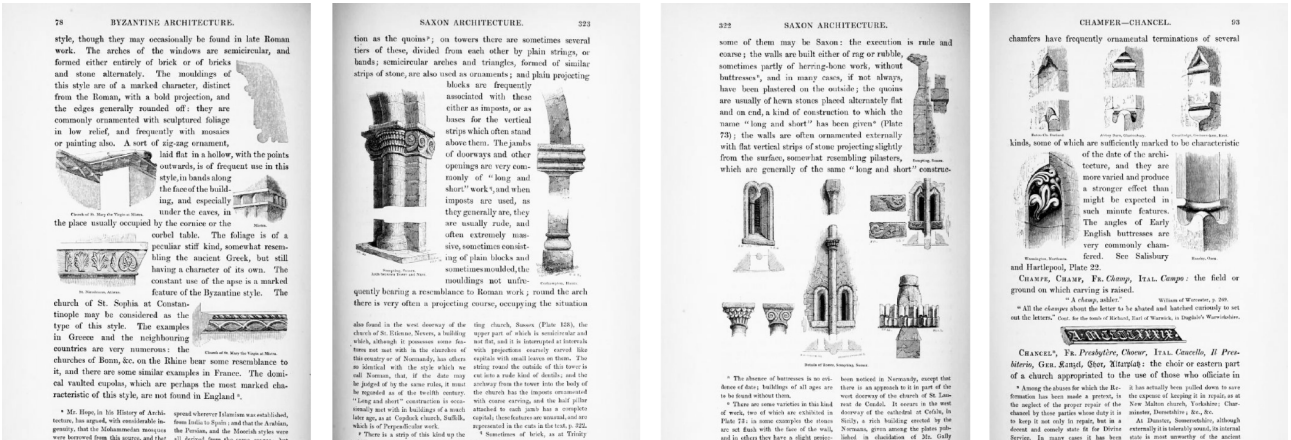
Fig. 3. Analytic drawings with clean and linear strokes from the Dictionnaire (Viollet-le-Duc 1875, vol. IX, entry "Tour", vol IX., pp. 71, 78, 162).



The role of illustrations. *Dictionnaire*'s references between medieval archaeology and scientific texts

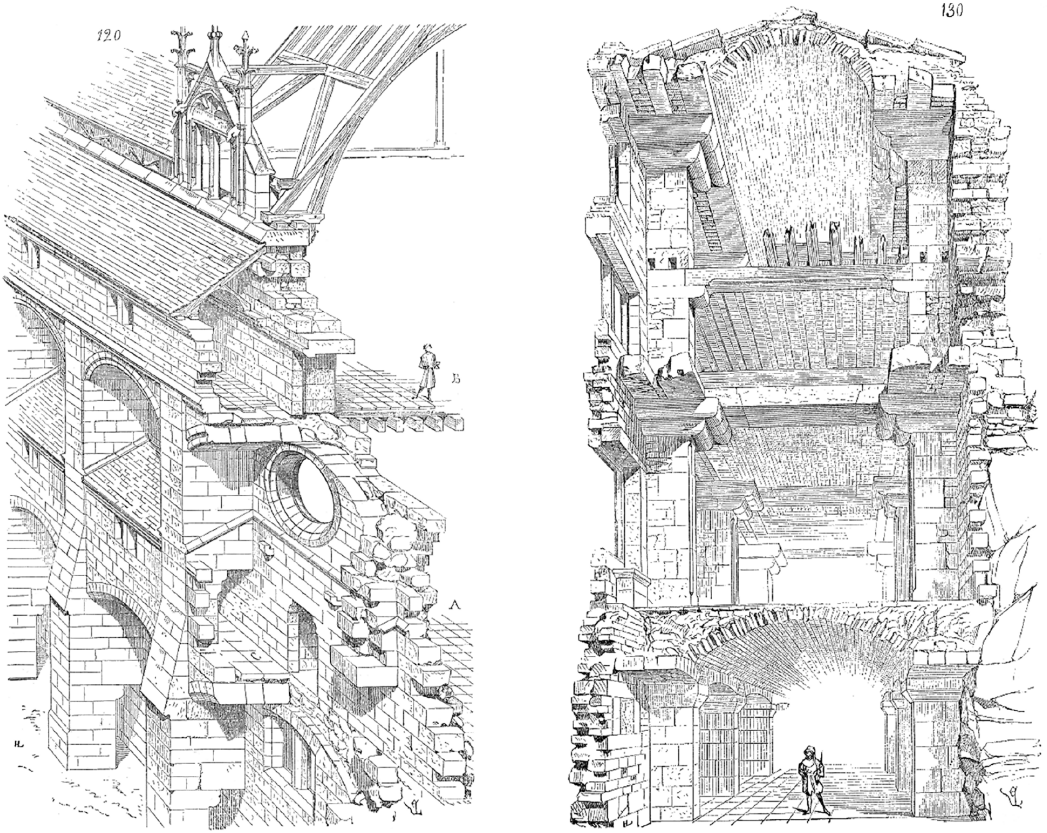
Upon embarking on the ambitious editorial project of the above mentioned *Dictionnaire raisonné de l'architecture*, Viollet-le-Duc had numerous references for the construction of a systematic illustrated dictionary at his disposal, and naturally the first and foremost of these was Diderot and D'Alembert's *l'Encyclopédie* ou *Dictionnaire raisonné des sciences, des arts et des métiers*. However, the passage from the *Encyclopédie* to the *Dictionnaire* is distinguished precisely by the change in paradigm that, upon the turn of the century, substituted the search for a hidden organisation under visible forms with the logic of a taxonomic classification; such a passage may also be read, as we will see, in the corresponding ways of representing. Among the architectural references, it is important to mention the *Encyclopédie méthodique*, which was published at the beginning of the century and whose volumes on architecture were edited by Quatremère de Quincy (1755-1849) but is not illustrated [Quatremère de Quincy 1788-1825]. In contrast, in the *Dictionnaire*, illustrations take on a fundamental role and acquire, as we will see, an essentially scientific nature, and more specifically demonstrate an anatomical approach to architecture. In fact, even in cases in which they recall picturesque ways of representation, they are always aimed at illustrating the "functioning" of the building. The extremely popular *Abécédaire ou rudiments d'archéologie* by de Caumont (1801-1873) [Caumont 1858] presents some important anticipations in this sense, for it contains analytic figures and drawings of ruins that suggest an anatomical orientation [Bressani 2014, p. 243] (fig. 2). Alongside more technical representations, the *Abécédaire*, like the volumes of the *Voyages pittoresques et romantiques en ancienne France* [Taylor, Nodier, Cailleux 1820-1878], the ambitious project on which Viollet-le-Duc himself collaborated [Leniaud 1994, pp. 18-20], presents suggestive views that are often populated with small figures gathered in prayer and rich in chiaroscuro contrasts, with the aim of recreating seductive medieval atmospheres. Bressani observed how Viollet-le-Duc adopted a more analytical drawing compared to his contemporaries, even when he was engaged in this type of "immersive" and evocative image, in the *Dictionnaire* and the drawings that were published in the *Annales archéologiques*. His stroke was clean, linear, and devoid of strong chiaroscuro contrasts [Bressani 2014, p. 245] (fig. 3).
In truth, Viollet-le-Duc's references seemed to be positioned among scientific publications rather than architectural texts. After all, the appearance of a connection between the natural sciences and historical studies on architecture, and medieval architecture in particular, was also highlighted in re-

Fig. 4. Relation between text and images in the Glossary of Terms used in Grecian, Roman, Italian and Gothic Architecture (Parker 1836, pp. 78, 93, 322, 323).



ference to other authors of the time. Buchanan, in his study on engineer, mathematician, and archaeologist Robert Willis (1800-1875), who was professor of natural and experimental philosophy at the University of Cambridge, underlined his adoption of an approach and a lexicon that had been borrowed from sciences like botany and geology, thus highlighting the existence of what is referred to as a "membrological approach" [Buchanan 2013, pp. 97-114] in the author's works on medieval architecture.
Viollet-le-Duc borrowed his visual strategy from manuals of natural sciences in which the insertion of small didactic or analytic drawings had become the norm. After all, the field of archaeology, which is particularly close to natural sciences, quickly adopted this type of illustrations which initially maintained a purely taxonomic intent in texts with an overall narrative tone. However, an anatomic orientation that had been borrowed from scientific texts and aimed at investigating ancient buildings in depth to discover their secret "functioning", progressively gained ground. This manner of proceeding found its full expression in the *Dictionnaire* [Bressani 2014, p. 243]. Its nine volumes contain more than 3700 images, all directly drawn by the author and inserted into the text to accompany the reader throughout a systematic analysis of architectural bodies. The great popularity of the work,

Fig. 5. "Anatomical" representations of buildings. Illustrations from the Dictionnaire (Viollet-le-Duc 1875, entry «Construction civile», vol. IV, pp. 215, 233).



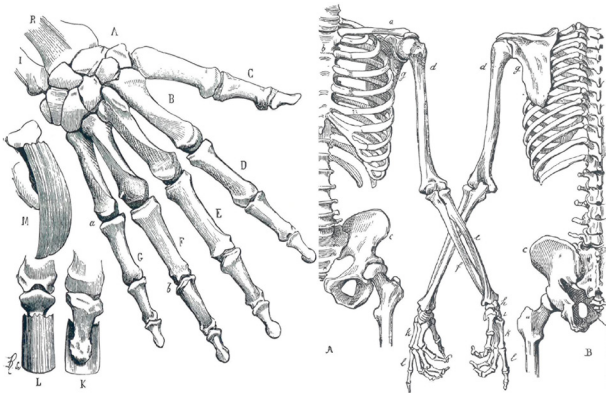


Fig. 6. Depiction of the human skeleton from Histoire d'un dessinateur (Viollet-le-Duc 1992, pp. 78, 85).

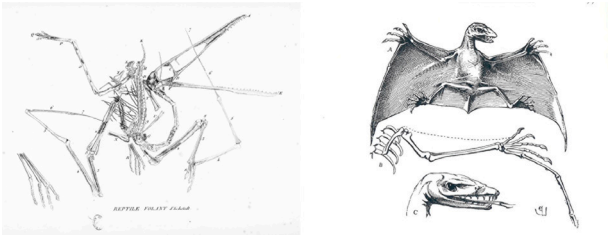


Fig. 7. On the left: "Reptile volant" (Cuvier 1812, vol. 4, s.p.). On the right: "Pterodattilo" (Viollet-le-Duc 1992, p. 77).

which was printed in multiple editions, is mostly due to this extraordinary iconographic apparatus. The illustrations and their relation to the text are not univocal, but rather were modified in the project, which started as a lexicon consisting of short articles that are, for the most part, illustrated by small schematic figures of a taxonomic sort. Its structure is similar to that of Parker's (1806-1884) contemporary *Glossary of Terms used in Grecian, Roman, Italian and Gothic Architecture* [Parker 1836], which established a standard in the terms of the quality of the illustrations and in which larger figures that competed with the test already made their appearance (fig. 4). Starting with the entry «Arch», and then definitely the entry "Architecture", Viollet-le-Duc embarked on a true graphic experiment: the figures here are larger, varied and start to take on the peculiar "anatomic" trait that characterises the entire work. In following the interaction between the text and the figures that penetrate the depths of the analyses of the buildings, thus raising one "layer" after another, the reader has the sensation of being initiated into a complex and hitherto unknown world [Bressani 2014, pp. 232-233] (fig. 5). These linear drawings, in which the chiaroscuro contrast is reduced to a minimum, are to be read as a mathematical demonstration, for the clarity of their strokes is equal to that of the writings, and images visually meld in perfectly with the text [Baridon 1996, pp. 125-130].

Anatomical and mechanical metaphor

The interest that Viollet-le-Duc directed towards studies in anatomy may be traced back to the beginning of his learning and lasted throughout his entire life (figg. 4-6). His uncle Delécluze, who represented a fundamental figure for the architect's training, enabled his nephew to meet anatomy scholars and, most importantly, to attend to their works. The *Dictionnaire*, like Cuvier's ***Leçons d'anatomie comparée*** [Cuvier 1805], conveys his desire to find the role of each object within an entirety by means of the comparative study of different types of said individual object. In fact, the author aims at grasping the connection of each part of the architectural system with its surroundings since each "organ" interacts with those near it and influences their conformation. At the same time, he showed the different types of each element that may resurface in distinct examples in space and in time, in accordance with different conditions [Baridon 1996, pp. 34-38]. The structural conception that Viollet-le-Duc sets at the head of medieval architecture, which is illustrated by examining each form in its logical and tectonic relation with the one that surmounts it, starting from the vaults and descending to the foundations, pertains to this logic precisely because each element is explained by means of the role it takes on in the system.
Within this theoretical system, the anatomic metaphor is accompanied by a mechanical metaphor, and it is interesting to notice how the architect's visual references in the field of anatomy showed a degree of affinity with the mechanical drawing. In the course of the 19th century, architectural drawings manifested important connections with mechanical drawings [Salerno 2000, pp. 11-33]. In the architect's last work, *Histoire d'un dessinateur*, the relations between architectural, anatomical and paleontological thought are made

explicit. The text describes the learning process of Jean, a young man devoid of means but endowed with a sharp spirit of observation and destined to become successful thanks to his systematic and reasoned exercise in drawing. In the story, the young man's encounter with the industrial environment was preceded by a methodical observation on nature and, in particular, by two lectures in comparative anatomy [Viollet-le-Duc 1992, pp. 71-93] (figg. 6, 7). With the same clear immediacy with which simple frames equate (human) joints and (mechanical) joints or compare muscle interactions with the articulation of connecting rods, a direct language straightforwardly overlaps the metaphor of a machine with the description of the functioning of limbs and ligaments (fig. 8). In following the precepts of rational pedagogy, the book invites readers to look at the world with great attention, to "disassemble" it like a machine in order to understand its inner laws and then be able to proceed with a new "assembling".
In the description of natural phenomena, the author openly adopts a technical-mechanical lexicon and the identification of organic and mechanic structures is clearly argued in virtue of the analogous rational nature. It is claimed that the analysis of the structure of bodies is useful for the study and understanding of machines because in mechanics man does nothing more but apply the same principles to anatomy, so "it is necessary […] study animal mechanics while trying to learn everything possible, or in other words finding the appropriate form for the object" [Viollet-le-Duc 1992, p. 90]. After all, references to the mechanical precision of animal structures –like those to the perfect efficiency that is typical of natural creations and may resurface in the highest human achievements– were already recurrent in the *Dictionnaire*: "[the bird] flies, and its wings are a perfect machine that enables it to fly" [Viollet-le-Duc 1981, p. 312, entry "*Style*"].
Machines, meant here as a set of devices capable of conducting, regulating, and directing trajectories of forces and motions, have become the model of an architecture in which formal genesis, static conformation, and material realisation attain the essential collaborating necessity that is attributed to the machine itself. In reading medieval architecture, the organic metaphor of the building is thus associated with the mechanistic one: it is a tense and balanced set of interacting forces that are conveniently led by means of a structure that is as efficient and elastic as an animal body that is precise, essential, and rigorous like a functioning machine. "The law of equilibrium, applied to this architecture for the first time –Viollet-le-Duc writes– provides a sort of life for these monuments by opposing reverse actions within its structures,

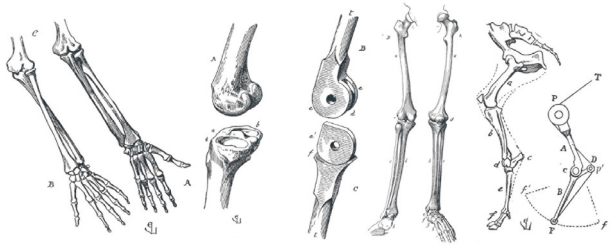


Fig. 8. Comparison between human and mechanical joints. Illustrations from Histoire d'un dessinateur (Viollet-le-Duc 1992, pp. 86, 87, 88, 91).

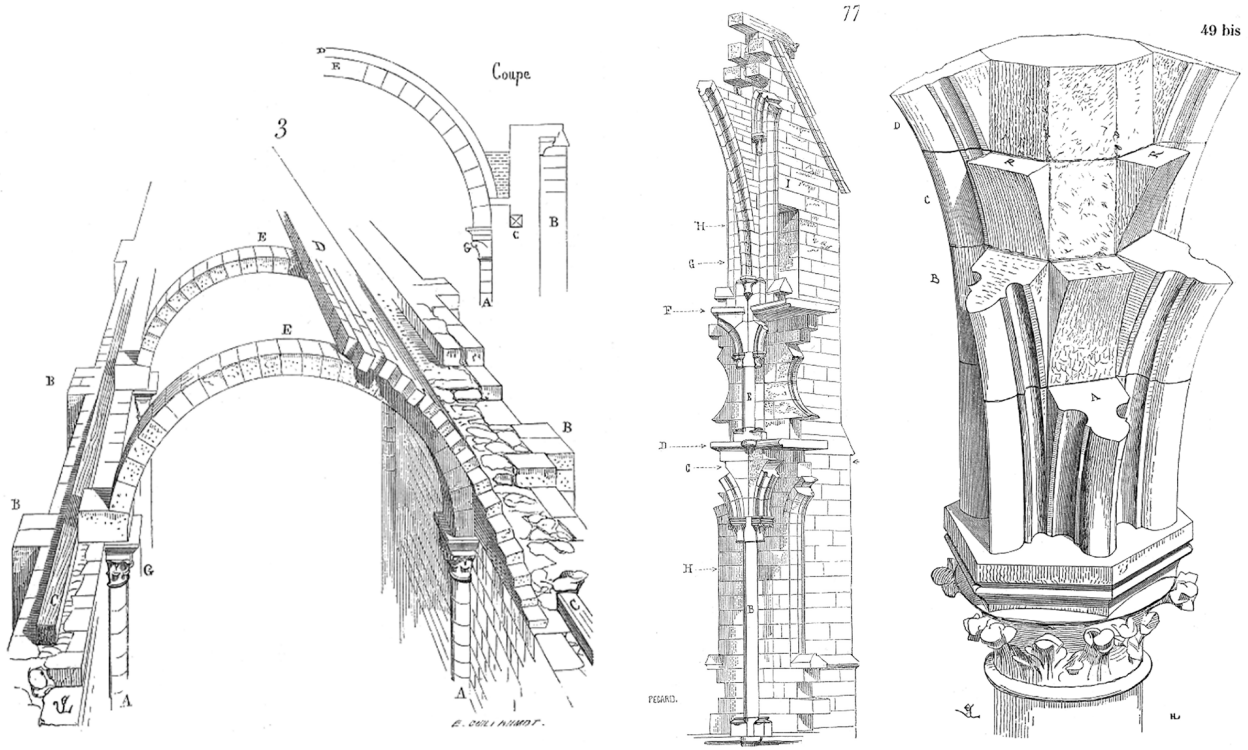
pressures to pressure, counterweights to overhangs, dismantling weights to cast them far away from the point in which they vertically lean, giving […] each stone such a function that it could not be suppressed without compromising the whole. Is this not life, to the extent to which man is allowed to convey it to the work in his hands?" [Viollet-le-Duc 1981, p. 323, entry "*Style*"].

Body and machine: the "anatomical" drawing of architecture

The architect's words reflect the certainty of the existence of an intrinsic coherence between science and nature, engineering and natural formation. Such positivistic faith was made possible by the sincere conviction of the absolute rationality of every thing that science (considered objective and neutral) could reveal. The homogeneity of the various natural and artificial expressions of the real enabled a permeability of methods of scientific investigation among the various disciplinary fields, an inquiry that Viollet-le-Duc claimed should be primarily conducted through drawings. After all, graphic representation was configured as the privileged instrument of that rigorous analysis of organisms' visible traits –including architectural ones– that enabled the in-depth investigation of the relations between hidden function and apparent forms in the attempt to identify the underlying reasons for formation processes, and consequently the founding laws of the real.
It was thus possible to bear witness to the transfer of the methods of mechanic and naturalistic (and in particularly anatomic) drawing to the field of architecture. In particular, the author borrowed two types of representation from scientific illustration: the *écorché* ("the peeling away"), which, like anatomical figures, dissects and lifts tissues in order to

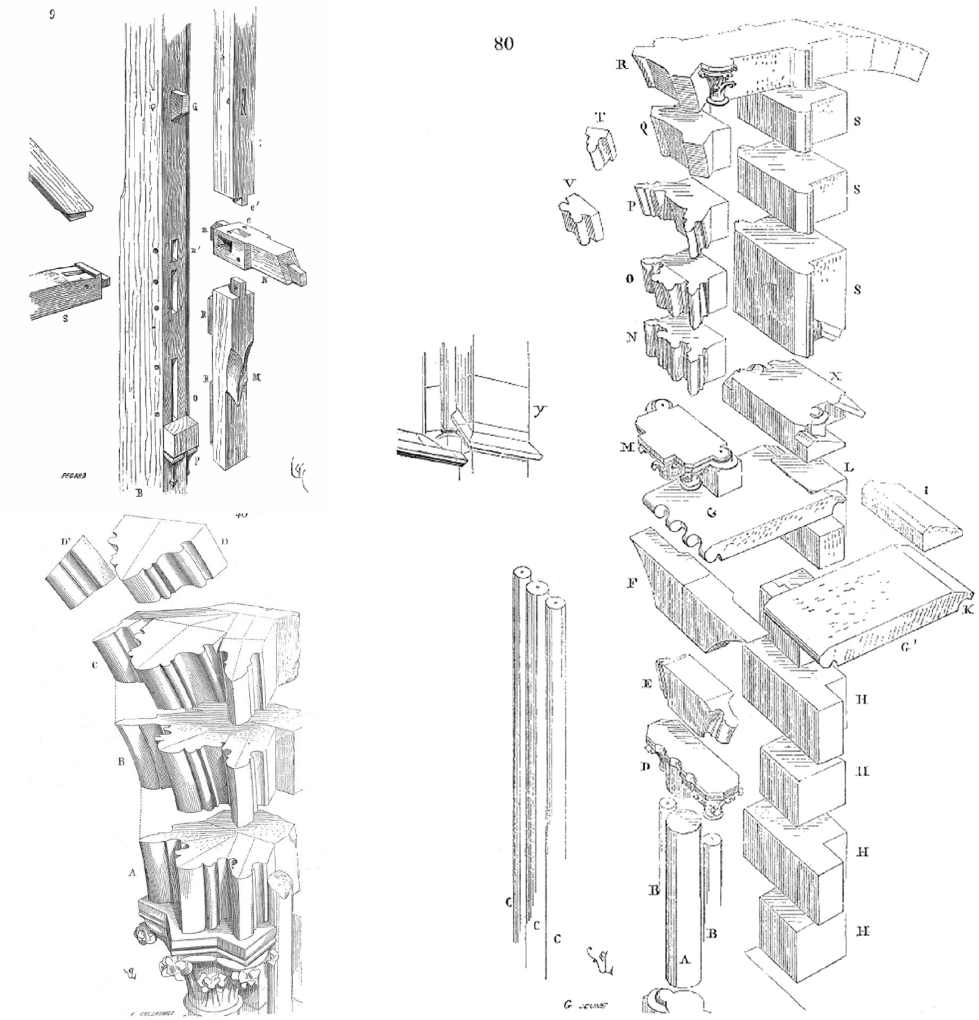
show the insides of bodies (fig. 9), and the exploded view that architects and scholars in anatomy alike borrowed from mechanic drawings.
These connections naturally had precedents: for instance, the previously mentioned versatile scholar Robert Willis, author of a series of structural studies on Gothic vaults, adopted a mechanic approach in his reading of medieval buildings, thus disassembling and analysing its parts in order to distinguish between the structural and decorative elements and compare different solutions [Buchanan 2013, p. 71]. Willis carried out interesting axonometric studies on the constructive systems of vaults that would later exercise a determining influence on Choisy. His drawings for the fifth edition of Parker's *Glossary*, which was published in 1850, included a sort of prototype of an anatomical écorché that Viollet-le-Duc later used in his *Dictionnaire* [Bressani 2014, p. 246]. It is therefore possible to unveil relations between mechanics, anatomy and medieval archaeology in other authors and contexts.
However, in the work of the French restorer, the reference to scientific illustration takes on particular significance. Under the entry "*Construction*" in the *Dictionnaire*, the author progressively penetrates into the details of the structure of the Notre-Dame of Dijon. By using the text, as well as the ordered sequence of illustrations, he led the reader to true knowledge of the object, going from the mere exterior appearance to extracting the innermost laws of its tectonic functioning. Having reached the description of the nodal point of the transmission and neutralisation of contrasting forces, he explicitly claims that he wants to "dissect" the construction piece by piece and proceeds to graphically di-

Fig. 9. Application of écorché to architectural drawings, examples from the Dictionnaire (Viollet-le-Duc 1875, entry "Construction", vol. IV, pp. 15, 94, 133).



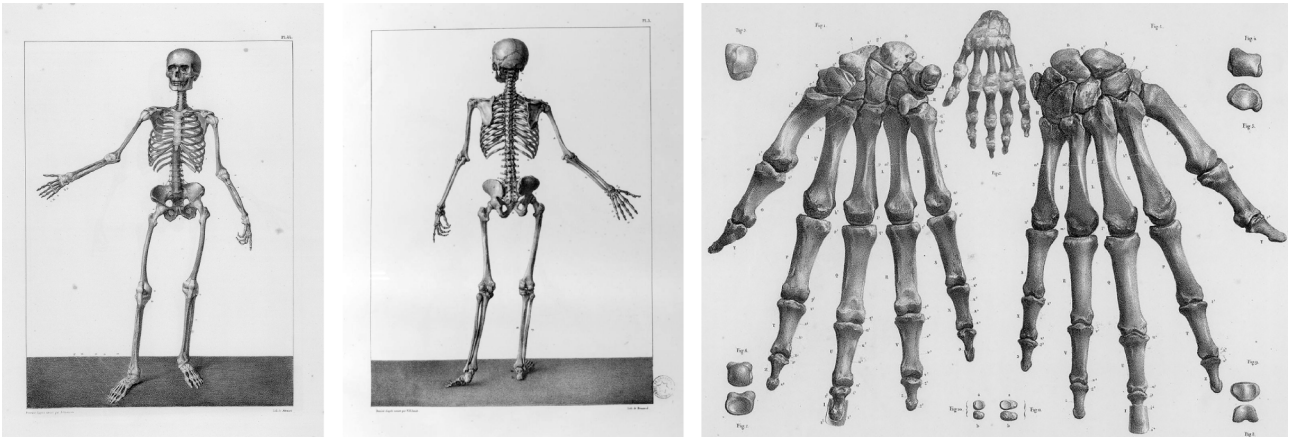
smantle the building and then display them in a spatial order to indicate the solution to their assembly in accordance with the finest tradition in technical drawing [Viollet-le-Duc 1981, pp. 136-139, entry "*Construction*"]. This results in the renown exploded prospective of the element in which the forces of the vault and those of the buttress converge (fig. 10). This drawing summarises not only Viollet-le-Duc's entire conception of a Gothic structure in equilibrium, but also his way of using drawings as a mental act of deconstructing a Gothic building into disjointed limbs and recomposing it within a

Fig. 10. Application of the exploded perspective to architectural drawings. Examples from the Dictionnaire (Viollet-le-Duc 1875, entry «Pan de bois» vol. VII , p. 47 and entry "Construction", vol. IV , pp. 92, 140).



hitherto unseen entirety [Bressani 1996, pp. 29-30; 2014, p. 251]. The reference to analytical methods that had been borrowed from anatomy texts result to be quite evident here from its use of illustrations, as well as the adoption of a specific lexicon, as well as of a procedure of analysis that was inspired by scientific methodologies. In fact, although it consists in images that are perfectly consistent with the ways of architectural representation, the rigorous sequence that oversees their disposition, the analytical trait that is emphasised by the punctual use of indexes, the increasing schematisation that oversees the progressive "elimination" of layers with the intent of discovering their inner mechanisms, all led Viollet-le-Duc to conduct a true anatomical dissection in these pages.
Contemporary scientific illustration provided models to this type of depiction. In particular, it is necessary to quote the work by physician Jean-Marc Bourgery (1797-1849), whose treatise on anatomy [Bourgery 1832-1854], which had been officially praised by Georges Cuvier himself, had impressed Delécuze for the effectiveness of its illustrations (figg. 11, 12). The latter observed how the treatise's "sections" of anatomical parts induce the learning of an abstract idea despite representing real objects, exactly as a drawing made by the Monge's method projection would by emphasising the unique contribution that they bring to the understanding of the relationship of the separate parts with the whole [Baridon 1996, pp. 34-35]. In the first volume of the treatise, which appeared in 1832, there is an extraordinary exploded perspective of a human skull (fig. 12). According to Delécluze, this image summarises Bourgery's entire work, showing the articulations of each bone with the adjacent one as well as its position within the system [1]. The illustration of the skull and that of the exploded perspective of the Gothic vault share their extraordinary ability to convey a mental act. In fact, these drawings make the deconstruction and restoration processes, on which the treatise on anatomy and the dictionary on architecture are based, immediately visible.
In these depictions which aim at grasping the relations between the internal and structural conceptions and the external layers, the construction appears as an organism formed by the necessary and progressive development of superficial tissues on hidden functional nuclei. Therefore, when inside and outside, structures and encasing, and organs and tissues are visible in one, synthetic same image thanks to the skilful use of the three-dimensional cross-section image, the very secret –and almost "biological"– rationality of man's work, in accordance with that of nature, is represented.
The reference to the later axonometric cross-sections with which Choisy (1841-1909) illustrated his *Histoire de l'architecture* [Choisy 1899], is inevitable. He explicitly theorised the effectiveness of a drawing having the same immediacy in reading of a perspective while allowing the object to be measured and presenting a plan, elevation and section in one synthetic representation. Nevertheless, Viollet-le-Duc's

Fig. 11. Anatomical drawings from the Traité complet de l'anatomie de l'homme (Bourgery 1832-1854), vol. I, pl. 2, 3, 36).



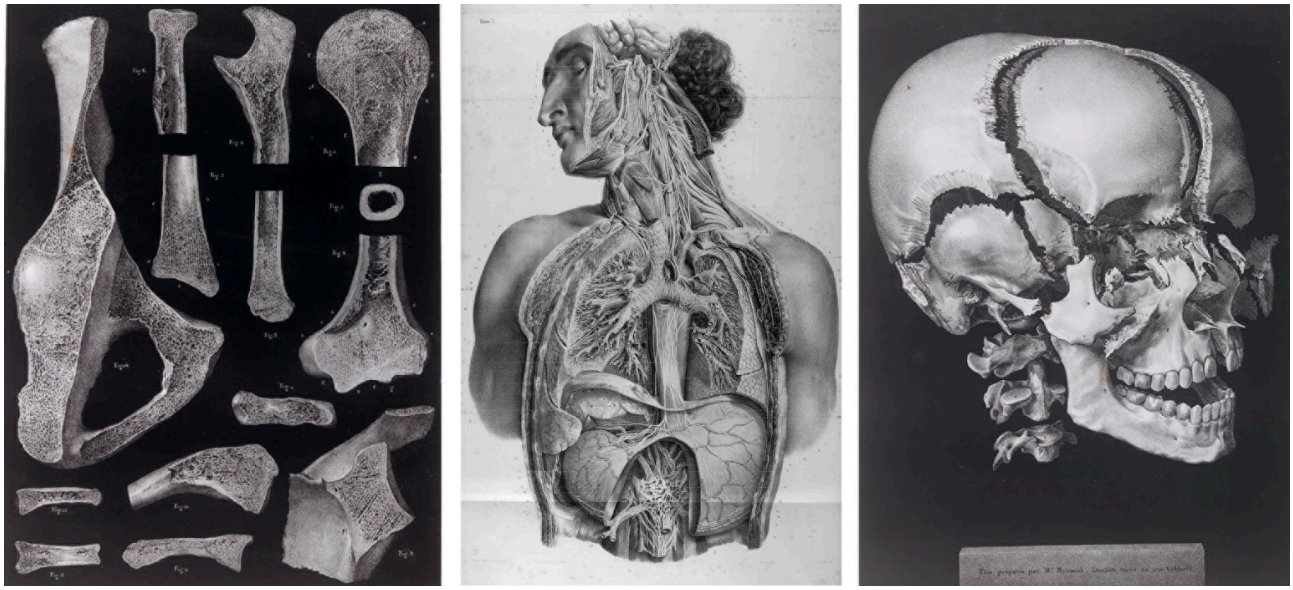


Fig. 12. Anatomical drawings from the Traité complet de l'anatomie de l'homme (Bourgery 1832-1854, vol. VIII, pl. 30, 42, 65).

drawings are not real axonometries: if extended, the straight lines that seem parallel at first reveal themselves to be converging, albeit on lengths that are incompatible with the immediate perception of the drawing. After all, in the author's thought system, there is no swerve between main internal generators and visible formal results, but rather a clear and necessary deviation. In this sense, that which is offered to be viewed has the precious function of revealing the underlying rational principle to the observer. Perspective, being a means to observe and restore the appearance of things, also becomes a means for investigating its secret functioning and intrinsic logical rigour. As a matter of fact, Viollet-le-Duc's perspectives can neither be reduced to the reproduction of simple views, nor can they be limited to the construction of evocative picturesque views but are rather built with geometrical parameters that are chosen from time to time in relation to precise representational goals. In cases in which the intent of the drawing consists in underlining the structural and constructive traits of the buildings, or in identifying its various elements and related syntax, the vanishing points actually result to be unavailable, and the representations thus become similar to parallel projections (fig. 2). The result consists in images that are aimed not so much to the representation of the object in space, as to the space of the object itself. Such images are figures that fulfil a sort of "spatial demonstration" of the object's functioning and manufacturability, a task that was traditionally carried out by axonometric projections [Scolari 1984]. Moreover, it is necessary to bear in mind that the author's didactic vocation imposes a sort of representation that must immediately be read, is realistic, does not require specific competencies and capacity for abstraction: all this resulted in the great predominance of perspectives among his illustrations [Bressani 1996, p. 29]. By adopting perspective, Viollet-le-Duc clearly renounced measurability: after all, references to sizes are rarely present in his works. In his texts, references to metric data are limited to rare graphic scales, isolated dimensions and sporadic notes, indicating the essentially theoretical trait and strictly exemplificative role of the illustrations.

Conclusions

The overview of the connections between scientific and architectural illustrations in the context of European Historicism is rather articulated and would certainly deserve a more extensive treatment that could be supported by the analysis of further specific cases, starting from the English context. On the basis of the examples mentioned in the present study, however, it is certainly possible to claim that Viollet-le-Duc's work is an emblematic case, in which a sort of "biological" representation of architecture reflecting a form of rationalism founded on life sciences appeared. Moreover, the outlined context makes it possible to claim, more in general, that the ways of representing XIX century architecture of which Viollet-le-Duc certainly constitutes a significant example for the quality, consistency in production and critical popularity, present interesting analogies even with fields that appear to be rather distant, such as anatomy, botany, and mechanics. Such similarities find their reason of being in the common epistemological context in which the authors move, and therefore in the contamination among forms of knowledge that connects natural sciences, mechanical engineering and architecture, especially in the positivist system of thought.

Notes

[1] The reference is to: Delécluze Étienne-Jean, Varieté. Traité complet de l'anatomie de l'homme comprenant la médicine opératoire par M. le D. Bourgery. Journal des dèbats, 15 Novembre, 1834, quoted in Baridon [1996, p. 35] end Bressani [2014, p. 255].

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Knowing

Metaphorical Photography

George Tatge

I would like to thank Paolo Belardi for the invitation to speak today in such a specialized context. I was rather perplexed by the invitation, I don't deny it, but he insisted. I am a photographer and I will not talk about drawing, but about my photography. There is, however, a link: the first commercially published book illustrated with photographs, issued shortly after the invention [of the process] (a sales flop), was entitled *The Pencil of Nature*. It contained the first experiments with paper negatives by the British photographer Henry Fox Talbot.
The "focus" of my section of the conference is entitled *Knowledge*, with three "topics" related to history, survey and technique. In the rare workshops I hold, these are all themes that I emphasize from the very first meeting. In fact, one of the questions I ask each of the participants to answer is "which book has most deeply impressed you?" The basis of every artist must be knowledge, also gained through reading.
I would say at once that my first love in life is literature. I would have liked to write, but fate took me in another direction, which perhaps has allowed me to live better among people. It's already a very lonely job, that of a photographer, at least the way I practice it. This also explains the word "metaphor" in my title, a literary device, from the Greek *phoreo*, that is, "to transport" an object or an idea onto another plane. Thus, an allusion. This image (Fig. 1), one of my favorites precisely because of its metaphorical power, is not just a field of corn after harvesting, with the stalks seen through the fog of a November dawn. The row of cypresses in the background alludes to what most people perceive. It is a photograph of a state of mind.
In the introduction to his book of essays *Meditations on Quixote*, José Ortega y Gasset explains to his readers that the themes he touches on may be important or modest.

Articolo a invito per inquadramento del tema del focus, non sottoposto a revisione anonima, pubblicato con responsabilità della direzione.

Fig. 1. George Tatge, Campo nebbioso (Field under Fog), 1998.

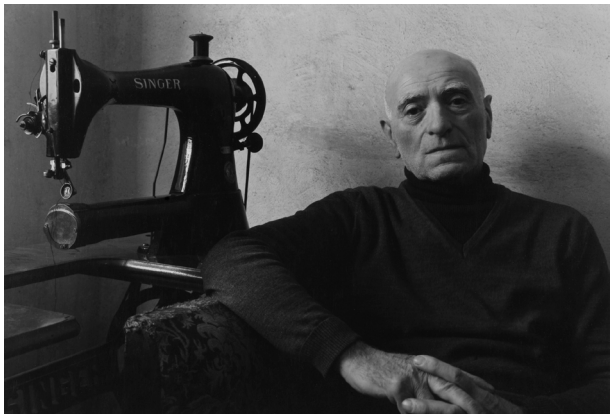

Fig. 2. George Tatge, Caligola calzolaio (Caligola the Shoemaker), 1976.

Fig. 3. George Tatge, Francesca, 1976.

Fig. 4. George Tatge, Paris, 1979.

He writes that his intention is "to place the objects of all kinds which life, in its perpetual surge throws at our feet like useless remains of a shipwreck, in such a position that the sun as it strikes them may give off innumerable reflections" [Ortega y Gasset 1986]. I find this to be the most perfect description of my photography, a search, often amidst modest places and objects. It's not by chance that I carry my camera around with me. When I take photographs, that's all I do. My mind has to be free of thoughts in order to give my mental reflexes the right concentration and hope for their agility and perspicacity.
How did I come to choose this way of photographing? It was my meeting, at university, with Michael Simon, a Hungarian professor who had fled his country due to the persecution of Jews. In his first lesson he made each of us cover the viewfinder of our camera and go out pointing it instinctively towards whatever meant something to us. From the first reading of these images of ours, it was clear that each of us had a different way of looking at and of interpreting the world. It was the most revealing lesson on the power of photography as a means of expression, as a means of self-analysis. I have an enormous respect for photojournalism (and I say this in a city that celebrates journalism every year and that, in 1949, witnessed the meeting of Paul Strand and Cesare Zavattini, who together produced one of the most beautiful books in history, *Un paese*) [Zavattini, Strand 1955], but I think there is also room for more introspective photography. In short, I think it is a duty to know the news of our world (preferably from newspapers), but I think it is also a right to be able to decide to take a novel or a book of poems in our hands. There is certainly room and a need for both.
About two years after my arrival in Italy in 1973, I decided to change photographic format, switching from a small format camera to a 5x7in. Deardorff view camera. I am still in love with it. I love its slowness, its sharpness, its ability to correct perspective lines, its irrational projection of the image on frosted glass (rotated and upside down). And this is where the discourse on technique necessarily comes into play. It is not a camera for those with an approximative approach. Unlike digital (which, however, is practical for obvious reasons of speed and cost) errors are not

Fig. 5. George Tatge, Il Po (Flooded Po River), 2001.

Fig. 6. George Tatge, Cerchio d'acqua (Circle of Water), 1996.

Fig. 7. George Tatge, Piscina e mare (Swimming Pool and Sea), 2010.

easily recoverable. The decision to set up the tripod is, in my opinion, the most fundamental: the relationship of the subject with the background can vary meter by meter. It becomes a sort of survey, like what topographers do with their measuring instruments.

Now I would like to show you images from a series of past exhibitions, but first some portraits from the volume *Al di là del tiglio* (Figs. 2-4) [Tatge 2002], a book about my adopted town, Todi, where I lived for twelve years and where my wife Lynn gave me our wonderful children, William and Alice. It is interesting to think about portraits using this camera. The subject doesn't look into the lens to connect with the photographer's gaze. It's not an exchange between the two. I'm not hidden behind the camera that is spying on him. I'm standing to the side, and I observe the subject, who is looking at the lens on his own, as though he were looking into a mirror without being able to see himself. For the subject it becomes a kind of meditation on himself. When I see that the mask has disappeared, then I snap a photograph. This book was an act of love towards the citizens of that town. By chance, while I was shooting for the book in 2002, inserting new images after 15 years of absence, I was reading *La luna e i falò* by Cesare Pavese, who talks about the "American" who returns to his village in Piemonte after years in the United States. And here is the magnificent passage that I found so pertinent to my state of mind: "you need a village, if only for the pleasure of leaving it. Your own village means that you're not alone, that you know there's something of you in the people and the plants and the soil, that even when you are not there it waits to welcome you." [Pavese 1950].

Presences, Italian Landscapes is an exhibition that I inaugurated in 2006, after my experience at Alinari which lasted sixteen years [Tatge 2008]. It is a sequence that follows the evolution of the landscape from an (almost) virginal land to a space worked by man and finally to a reality where the hand of man dominates the landscape creating a sort of land art (Figs. 5, 6). Returning to the theme of metaphor, I would like to read you a passage from Italo Calvino's *Invisible Cities*: "You walk for days among trees and among stones. Rarely does the eye light on a thing, and then only when it has recognized that thing as the sign of another thing" [Calvino 1972].

Fig. 8. George Tatge, Arco Etrusco (The Etruscan Gate), 1983.

Fig. 9. George Tatge, Facciata (Façade).

Fig. 10. George Tatge, Bomba Rosa (The Pink Bomb), Livorno, 2015.

Fig. 11. George Tatge, Passaggio murato (Walled Passageway), Florence, 2012.

Italia metafisica is the title of the exhibition I inaugurated in 2015. Like *Presences*, this exhibition was also hosted in Perugia the following year. I chose this title not because I am particularly attached to the art movement of this name, even though I was very happy with choice made by Contrasto for the cover. [Tatge 2015]. It is certainly the image most inspired by De Chirico (Fig. 7). A clear backlight, the sea, the poles, an open space. There are also the perspective lines that the artist drew on the stages under his mannequins. The catalogue won an IPA award in New York and the Premio Ernest Hemingway in Italy: a real satisfaction! I chose this title, instead, to underline the metaphorical aspects of my work. The motive (not to say the meaning) of the shooting is often to be found beyond the physicality of the place represented. Here we find architecture ranging from strong places (such as the Etruscan Gate, Fig. 8) to humble huts (Fig. 9). I still do not understand how it is possible that the history of architecture is not taught in schools! Painting and sculpture are taught, but to enjoy them you have to enter a church or a museum. While architecture surrounds us everywhere, day after day. We go in and out of buildings constantly without lending them a fragment of thought. Most people wouldn't know a 19th-century building from a Renaissance palace. So many contemporary works by enlightened architects are not even noticed in our hectic passage, while they would be there to delight us, if only we had the means to appreciate them. Although I have worked professionally with color for many years, I had never considered it for my personal research. I called myself a black and white photographer. Well, in 2011

Fig. 12. George Tatge, Cenci rossi (Red Rags), Prato, 2013.

something very particular happened. My mother, Italian, came back to Europe for her last trip and we went to Paris together, where my parents had lived for five years. There was an exhibition at the Grand Palais entitled *Odilon Redon, Prince of Dreams*. We saw, room after room, his "*noirs*," his charcoal drawings and his lithographs. We wondered where the famous paintings and pastels were. They were relegated to the last rooms. And the reason, then, was obvious. He had hardly touched color until he was almost 60! I was left speechless, and at that moment I wondered if it was not time to turn the page and try to use color film. I know that this story may sound presumptuous, that is, to say that I could think of emulating the experience of such an important figure. And yet, that's exactly what happened! It's thanks to my visit to this exhibition that I started taking pictures in color.

The exhibition that will open soon at Palazzo Fabroni in Pistoia, curated by the brilliant art historian Carlo Sisi, is called *Il Colore del Caso* [Sisi 2019]. It is a selection of the images that I have created over the last seven years, since I "converted." Those who have seen these images always recognize my hand. I am always attracted by precarious, allusive, sometimes surreal, ironic subjects, where reality is often in conflict with artifice. But, with chromatic possibilities, the eye-brain reflex works in a completely different way. If before, with black and white, it was the line, the shape and, above all, the light that caught my attention, now it is often the element of color. It's as if colors give off a distinct scent to attract me. It can be a delicate scent or a very strong one. If in black and white the object was the starting point for my work, now the subject has become color itself (Figs. 10, 11). As the great historian Carlo Bertelli recently wrote to me "yours are photographic images of colors and not color photos." The series of rags found in Prato is perhaps the most emblematic (Fig. 12). Each color has its own character, its own expression.

I feel that the joy of being able to use color has perhaps led me to produce images that are a little less melancholic. In any case, color is not enough. As Kandinsky wrote: "color is the keyboard, the eyes are the hammer, the soul is the piano with many strings" [Kandinsky 1968]. Images must be inspired from within us.

The other important word in the title of the exhibition is the word "*caso*", that is, chance. I don't like programs. I prefer to wander. As I read at an exhibition by Gerhard Richter, one of my favorite painters, "I pursue no objectives, no systems, no tendency; I have no programme, no style, no direction. […] I like the indefinite, the boundless; I like continual uncertainty."

I think that chance is one of the fundamental and fascinating aspects of photography. No other artistic medium can "take advantage" with such elegance. Life itself, with its combination of chromosomes, is determined by chance. It is often chance that brings me to a place at a certain hour with a certain quality of light. "Fortune rewards the bold." Therefore, we still have to work hard, but we mustn't denigrate chance. "He just got lucky with that shot!" A stupid comment. Instead, we should celebrate chance. As photographer Larry Fink said, "if you don't take a chance, you don't get a chance."

I thank you for your attention and I invite you to Pistoia to see the exhibition, which will run until mid-February.

Author

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Neapolitan Theaters. Iconographic Sources and Constituted Realities in Comparison

Ornella Zerlenga

Abstract

Naples is a city full of theaters and the most famous of these, the Teatro di San Carlo (1737), represents the city all over the world. This study is divided into two parts. In the first part, the San Carlino (1740), Fiorentini (1773) and Children's (1940) Neapolitan theaters (disappeared today) are the object of investigation. In the second part, it is analyzed the geometric configuration of the Italian theaters San Ferdinando (1790), Sannazaro (1847) and Bellini (1864), still existing.
The first study relates to the identification and digital visualization of the geometric-spatial configuration of the Fiorentini, San Carlino and Children's theaters. Based on the few existing sources, the planimetric systems of the stalls area, the subdivision into dais and the arrangement of the seats in the stalls, the altimetric configuration of the internal environments through photorealistic views were returned. For the Children's theater, designed by Luigi Piccinato, reference was also made to the urban plan for the 1940 Mostra d'Oltremare, designed by Piccinato, and to his vast experience in the theater field.
The second theme relates to the graphic analysis carried out by analogies and differences in the geometric configuration of the aforementioned theaters with respect to the typology of the Italian theater in relation to both the Manuale dell'Architetto*, 1905-35 (*Architect's Manual*, 1905-35) of Daniele Donghi and to the item "Theater" contained in Diderot and D'Alembert's* Encyclopédie*, 1751-72.*

Keywords: Neapolitan modern theaters, architectural survey, graphic analysis, digital modeling and visualization; virtual reconstruction.

Introduction

This research resumes the study of the digital identification and visualization of the geometric spatial configuration of three Neapolitan theaters, now completely disappeared and of which there remains no exhaustive iconographic trace that documents its form: San Carlino (1740), Fiorentini (1773) and Children's theater (1940) [Zerlenga 2019]. Alongside this theme, the research also includes the survey and representation of three other Neapolitan theaters, still present, San Ferdinando (1790), Sannazaro (1847) and Bellini (1864), whose geometric configuration is significant in relation to both the typology architectural style of the Italian theater as described in the *Architect's Manual* of Daniele Donghi (1905-35), which in the entry "Théâtre" contained in the *Encyclopédie* of Diderot and D'Alembert (1751-72). The research, with the aim of returning an unprecedented graphic visualization and analysis of these theaters, it was scientifically coordinated by the writer with the collaboration of the arch. Vincenzo Cirillo and conducted in team with the architects: Vincenzo Laezza (Fiorentini theater), Giuseppe Marino (San Carlino theater), Gianluca Cappiello (Children's theater), Pasquale Dello Iacono (San Ferdinando and Sannazaro theaters) and Raffaele Liguori (Bellini theater).

Neapolitan disappeared theaters

San Carlino Theater
In 1891, Salvatore Di Giacomo (1860-1934) dedicated a large monograph to the history of the San Carlino theat-

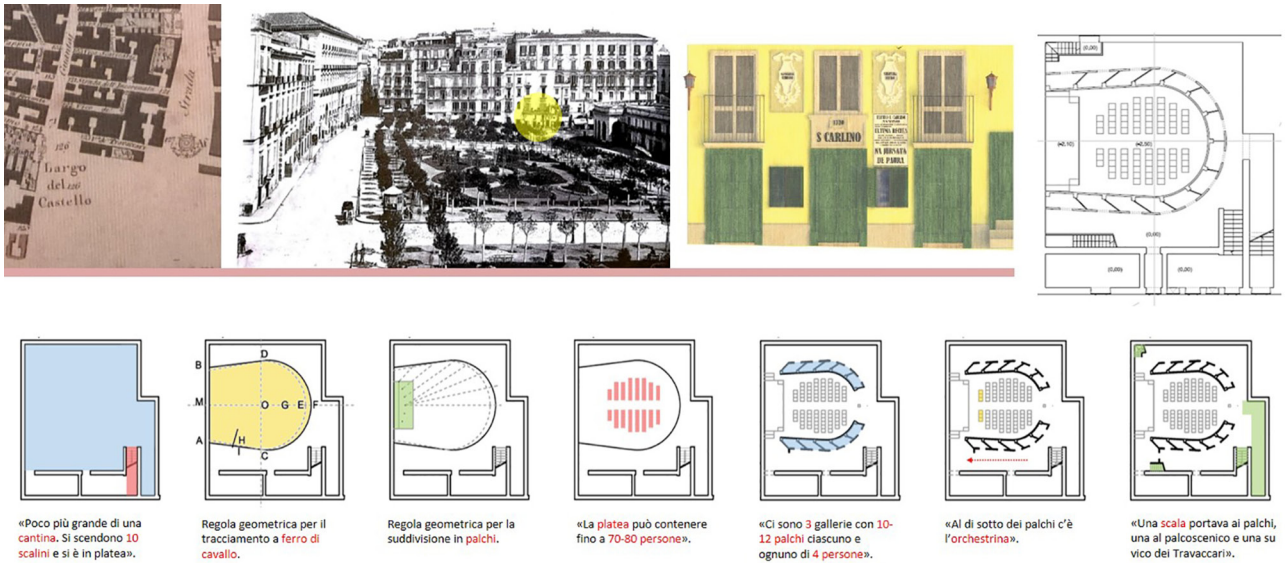


Fig. 1. San Carlino Theater: cartography (Marchese 1804), photo (Arena 1870-1875), elevation and plans (elab. by Giuseppe Marino).

er. The theater, destined for comedy and popular comedies, had as its protagonist the mask of Pulcinella and, therefore, it was called 'San Carlino' in evident antithesis with the lyric theater of San Carlo (1737). The first San Carlino, built in 1740 and located in *Largo Castello* next to the church of *San Giacomo degli Spagnoli*, was little more than a wooden shack. In 1770, at the request of Tommaso Tomeo to Ferdinando IV of Borbone, the theater was located inside a lot between *vico de' Travaccari* and *Largo del Castello*, as shown in the *Mappa Topografica della Città di Napoli* of the *Duca di Noja* of 1775 and in the Naples Plan of Marchese of 1804 where the theater is oriented in the longitudinal direction of the block (scene, to the west; audience, to the east) and to the reference *Aq* we read: "S. Carlino, which is represented prose works according to the taste of the people" (fig. 1).
When Tomeo died in 1801, the management of the theater passed to his son Salvatore, followed by Vincenzo Cammarano, Salvatore and Antonio Petito (who died on the scene on May 24, 1876) and Eduardo Scarpetta, known for the mask of Felice Sciosciammocca and new manager with which closes the history of the San Carlino. On May 6, 1884, the block in which it was the historic theater of Neapolitan comedy, now famous throughout the world, was demolished for the Piazza Municipio building, whose project can be seen in Schiavoni's topographical map.
The new San Carlino theater was built in 1770 by the architect Filippo Fasulo and, according to the abbot Sacco, the structure had "twenty-eight daises, and an stalls area capable of one hundred and eighty people" [Sacco 1796, p. 333]. In the 1845 guide we learn that the theater had "two orders of daises with a long and narrow stall" [AAVV 1845, II, p. 206]. Di Giacomo describes in detail the constructive vicissitudes of the theater which, by Tomeo's will, was built "in his old houses in the block in Piazza del Castello. The floors of three adjoining shops were smashed and the only basement that turned out was turned into an stalls area: the daises were built around to respond with their second row at street level. [The auditorium contained] seven rows of wooden benches used for the so appealed *Piccionara* (pigeon house), fifteen rows of wooden chairs with their respective backs and sides, forming chairs 177, and another row that forms the sixteenth attendant for the stage, five small seats in the stalls, and two rows of daises in number of 26 with parapets and gilded wood witches. [From the visit in 1765 of the

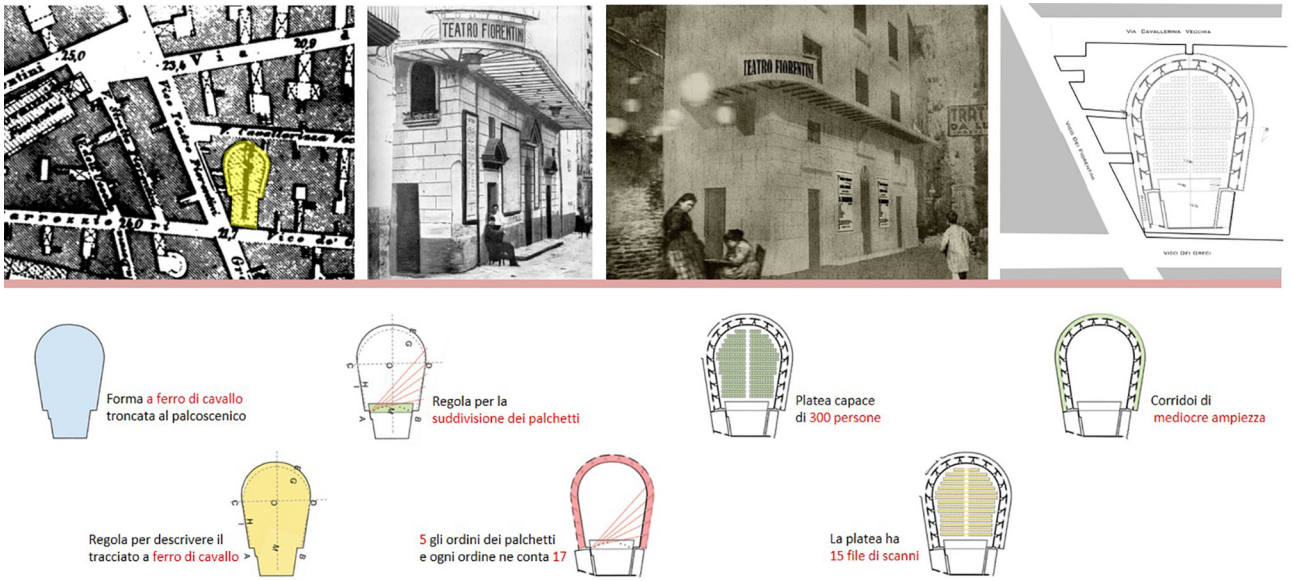


Fig. 2. Fiorentini Theater: cartography (Schiavoni 1872-80), photo (private collection), renderings and plants (elab. by Vincenzo Laezza).

Englishman Samuel Sharp] the theater is slightly larger than a cellar […]. Go down from the street level, ten steps and you are in the stalls. This can hold seventy to eighty people when it is crowded […]. A gallery divided into ten or twelve daises runs around the stalls, each capable of four people, who can comfortably sit there" [Di Giacomo 1967, pp. 111-112, 204, 363].

Fiorentini Theater

In the *Dizionario geografico-istorico-fisico del Regno di Napoli* (1796) the abbot Francesco Sacco states that in the Fiorentini theater "not only works of music are represented, but also works in prose" [Sacco 1796, II, p. 333]. In the guide *Napoli e i luoghi celebri delle sue vicinanze* (1865), one can see the reason: "since in the first half of the sixteenth century the Spanish comedy was introduced with us [Naples], a small theater opened at the church of S. Giovanni Evangelista of the Florentine nation, from which he took the name" [AAVV 1845, II, p. 203]. In the early fifties of the last century, church and theater were demolished due to the damage caused to the masonry structures by the bombings of the Second World War (1940-45), although their position in the building of Charity was much more favorable to killing [Cislaghi 1998].

The original configuration of the blocks and the theater can be seen in sheets 11 and 33 of the *Mappa Topografica della Città di Napoli* (1775) by Giovanni Carafa Duca di Noja (1715-1768), written in a scale of almost 1:4.000 and where the numerical references refer to the church (409) and to the theater "said of S. Gio. de' Fiorentini" (410) and for which in legend it is noted: "this was erected for the comedian Spaguoli; in today, scenic performances in music are represented". The *Mappa* […] shows the planimetric trend of the theater with a stall on the west and a stage on the east. Intended later as a melodramatic theater, it was renovated in 1773 by architect Francesco Scarola, a pupil of Ferdinando Fuga, who completely modified it [AAVV 1845, II, p. 203; Venditti 1961]. In the cartography of Luigi Marchese [Marchese 1804, tab. 1: 4.000], panel of the *III Quarter* of Naples, both the stage (to the south) and the stalls (to the north) are represented, and the *Ap* reference to the legend shows that the theater, erected around 1600, it was rebuilt around 1780. The *Pianta Topografica* of 1872-80 [Schiavoni 1992, tab. 1:2.000] by Federico Schi-

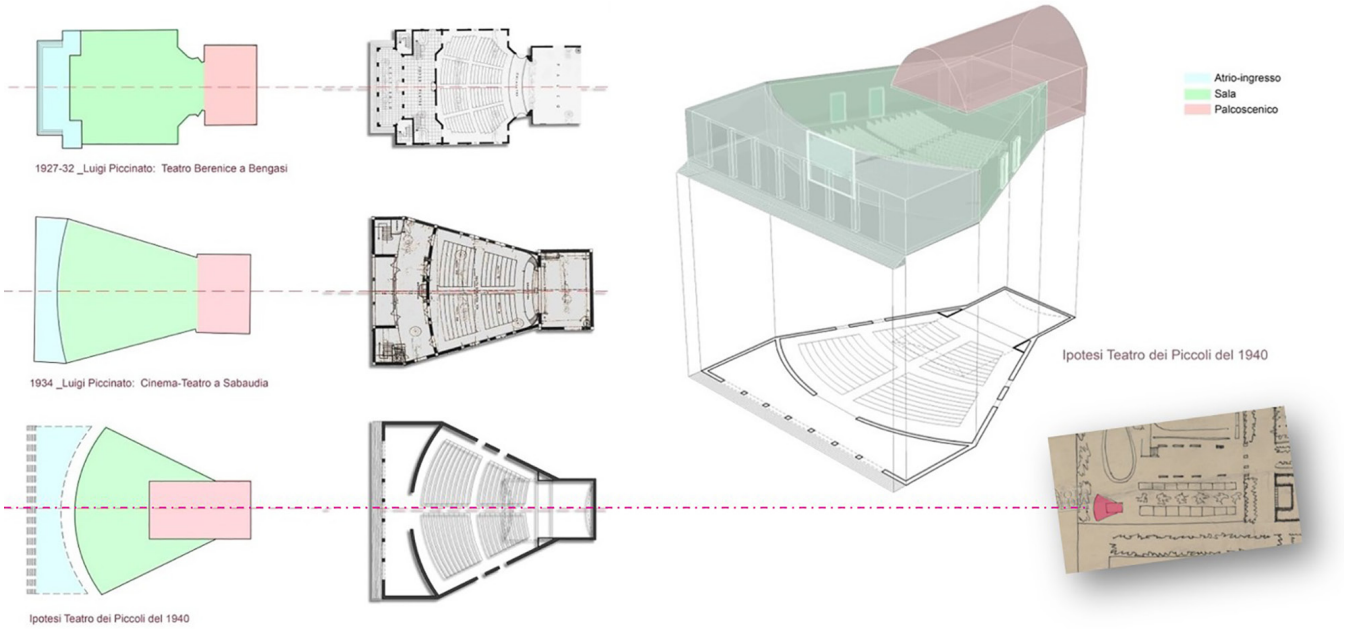


Fig. 3. Children's theater: iconographic sources (Piccinato Archive); graphic analysis, reconstruction of the theater (elab. by Gianluca Cappiello).

avoni (1810-1894) details even more the new structure as well as the insertion in the site (fig. 2).
The scope of the new stalls area is documented in the 1796 source as "capable of three hundred people" while other technical data are meticulously reported in that of 1845: "The theater, of beautiful and just capacity, is a construct of a more strictly elliptical form than that of S. Carlo; and the ellipse is cut off from the stage in a nice measured point of inclination. In the hall there are five orders of daises, spacious rather than not; every order count seventeen, excluding those that open on the wider face of the pillars of the proscenium. They are ascended by double stairs, and the corridors have mediocre amplitude. The stalls have fifteen rows of benches, whose compartments are long and comfortable; and its great door almost immediately leads to the street" [Sacco 1796, p. 333; AAVV, 1845, II, pp. 203-204].

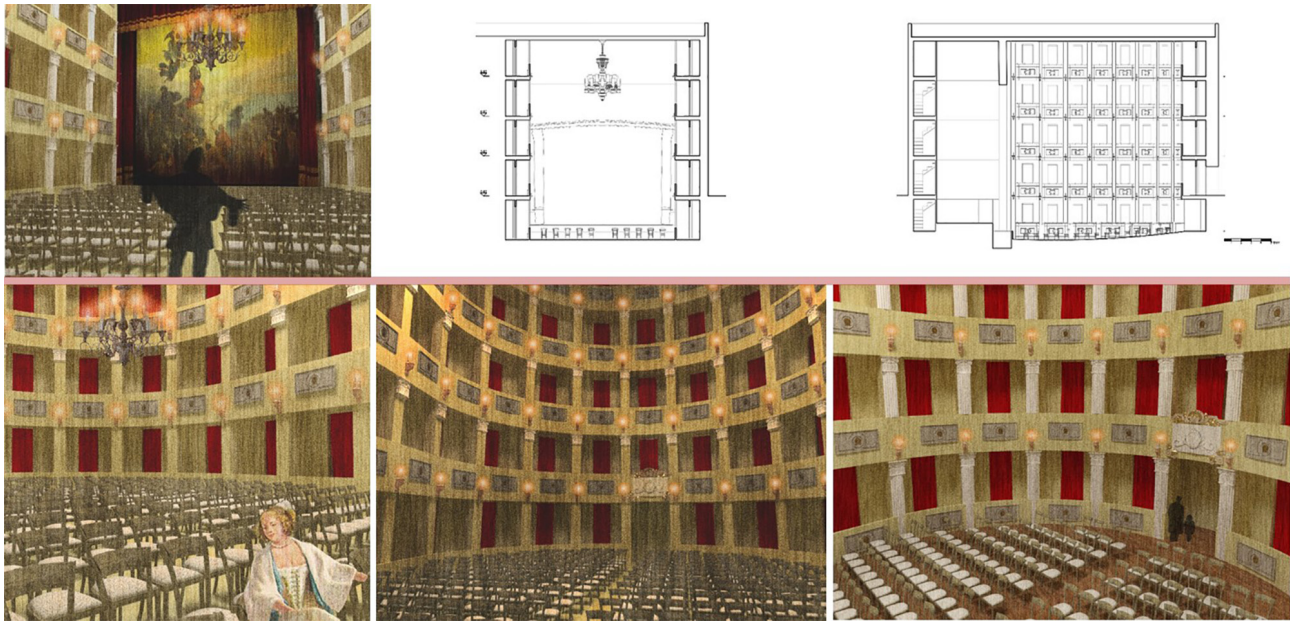
Children's Theater
The Children's Theater was a temporary structure built by Luigi Piccinato (1899-1983). Created for the inauguration of the *Mostra d'Oltremare* in 1940 near the Amusement and Wildlife parks, the theater was intended for children's entertainment and it is documented in a sketch by Piccinato in the urban plan of the Exhibition [Archivio Luigi Piccinato 2016] (fig. 3) and in a front photo.
From the sketch, the theater is immersed in greenery and the plan consists of two interpenetrating bodies: one, rectangular oblong; the other, an isosceles triangle with a circular base and convex towards the outside. In the photo you can see a stairway, a straight porch and, in a backward position and with greater height, a parallelepiped and a volume with a parabolic course.
The damage caused by the Second World War caused the destruction of the theater. In the 1950s, the efforts of the writer and journalist Lea Maggiulli Bartorelli (1900-1987), known as Zietta Liù, led to the reconstruction of Children's Theater ex-novo. The project was entrusted to the architects Delia Maione and Elena Mendia who, starting from 1952, built a new reinforced concrete structure destined to host shows for children.

The new theater (of which there is partial documentation in the Mendia Archive) was constrained by the position of the trees and oriented differently from the sketch by Piccinato with the scene to the north and the stalls to the south. The hall, capable of seating 500, was preceded by a *foyer* with a bar and services and a porch with a staircase. With the few funds available, the designers personally took care of the decoration, including: the glazed majolica cladding of the rear elevation and of the tiers; the mosaic flooring of the small *foyer*; the designs of the curtains, of the railing preceding the orchestra pit, of the lighting systems in the porch and in the stalls [Zerlenga 2019].
At the beginning of the 1970s, the theater was leased to the University of Naples and relived a season of neglect due to lack of maintenance until, at the end of the same years, a fire compromised its functionality. In 2008, the restructuring of the *Mostra d'Oltremare* was launched with European funds. The Children's Theater was rehabilitated by the architect Marisa Zuccaro, who preserved the structure and part of the pre-existing decorative plant, except for the destroyed neon-lit puppets designed by Maione-Mendia, which were replaced by works by Riccardo Dalisi in enamelled sheet metal.

Redrawing the missing theaters

Sharing the position that the design and drawing contains within itself the creative dimension (drawing as a privileged means of knowledge and planning) and communicative (critical description of material and immaterial realities through methods, techniques and technologies of representation) [Cervellini 2016; De Rubertis 1994], the study was based on the integration of the sources and on the application of the graphic analysis methodology. This allowed the subsequent drawing phase, oriented towards the unpublished representation of the three Neapolitan theaters.

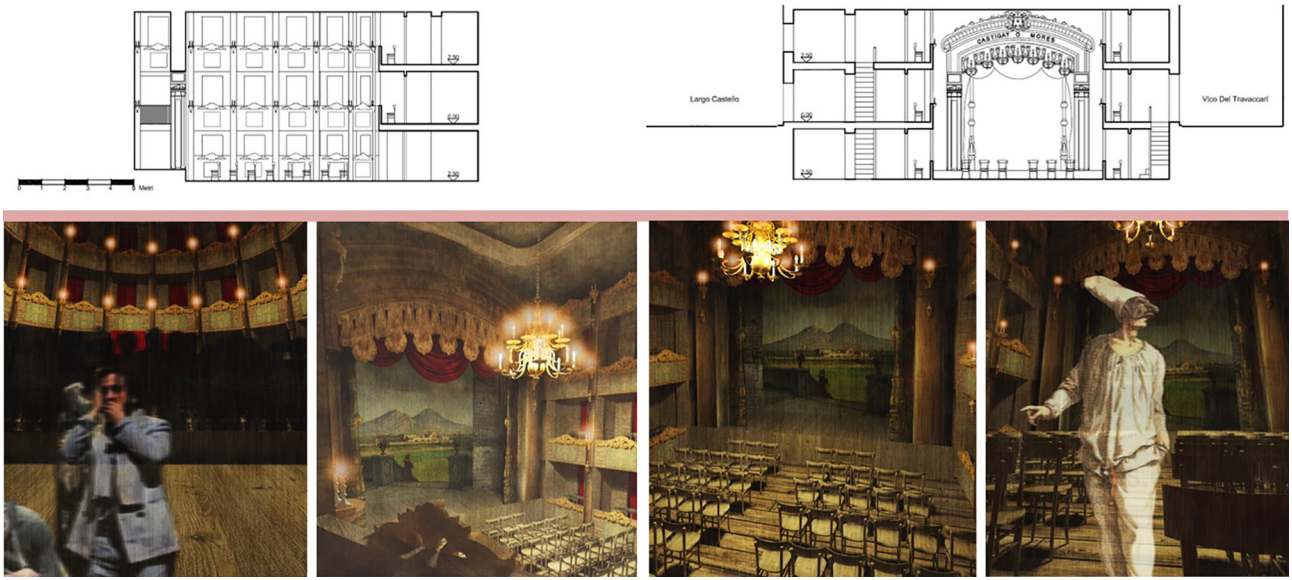
Fig. 4. Fiorentini Theater: reconstruction of sections and interiors of the theater (elab. by Vincenzo Laezza).



In the absence of graphic documentation on the form of the Fiorentini and San Carlino theaters, now disappeared, if not the cartographic map on an urban scale, the critical reading of the data collected was oriented towards the reconstruction of architectural drawing and the urban context. Referring both to the technical indications contained in the *Manuale dell'Architetto* by Daniele Donghi (1861-1938) on the typology of Italian theater [Donghi, 1930] and to recent research on the geometric-constructive configuration of this typology [Di Paola 2012; Biagini 2015; Mele, Ziosi 2016] and, integrating the iconographic data with the descriptions reported in the sources of 1796 and 1845, it was possible to hypothesize and represent the geometrical-spatial configuration of the Fiorentini theater, restoring: the 'horseshoe' planimetry of the stalls area; the subdivision of the 17 dais for each order; the distribution in the stalls of the 15 rows of seats for a total of 300 seats. Moreover, integrating the cartographic data with period photographs has been hypothesized the altimetric development of the theater in the 5 orders of dais (figs. 2, 4).

The same methodology was applied for the virtual reconstruction of the San Carlino theater, for which the context photos were relevant and what was preserved at the San Martino Museum in Naples in the 'Theater Section': a perspective drawing of the theater facade and reconstruction in 1:1 scale edited by Di Giacomo of stage.
In this sense, it was possible to hypothesize and represent the spatial configuration of the historic popular theater, in which: the 'horseshoe-shaped' stalls was placed in a plane subjected to the 10-step street level and capable of containing 70-80 seats; the dais, in numbers of 10-12 per order, have been subdivided according to the geometric rule of the Italian theater and proportioned to contain 4 seats each; two independent staircases connect the ground floor respectively with those below and above; another staircase joins the stalls with *vico dei Travaccari* (figs. 1, 5).
For Children's Theater, starting from the current structure and based on the interview with the architect. Elena Mendia in October 2018 and the drawing of the

Fig. 5. Teatro San Carlino: ricostruzione sezioni e interni del teatro (elab. Giuseppe Marino).



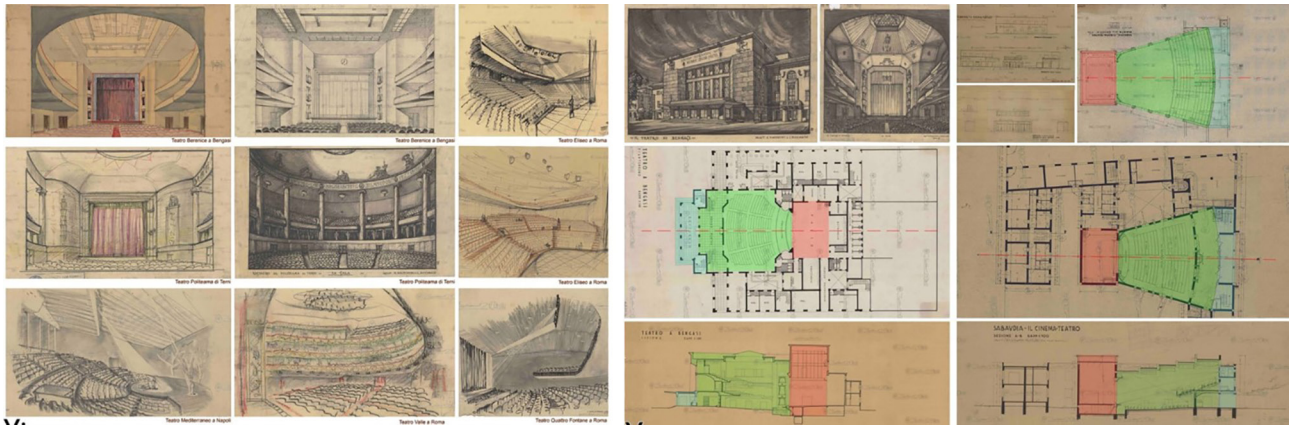


Fig. 6. a) Luigi Piccinato's theaters (left); b) the Berenice theater in Benghazi (center); c) the cinema-theater in Sabaudia (right) (Piccinato Archive).

decorative elements by her own hand, we proceeded to visualize the structure of the theater both in the 1950s and according to the original project by Piccinato, whose return due to scarce sources still leaves some open interrogative (fig. 3). In his prevalent drafting of town plans, Luigi Piccinato often had the opportunity to be interested in the design of theaters and places for the show [Savorra 2015]. Starting from his professional beginnings until the early fifties of the last century, Piccinato not only designed theaters but was interested in this theme with studies, conferences and articles on aspects of scenography and, above all, on the modern typology of prose theater. This interest shared the need manifested in those years by the fascist regime both for the architectural updating of the existing theaters, and for the realization of new more functional theatrical types for popular comedies and dramaturgical works and, above all, for mass shows and film screenings. In this sense, in his research Piccinato addressed not only the theme of the typological study of theater for the creation of an architectural space in which prose, opera and cinema coexisted, but also that of mass theater, a highly debated topic during the 1930s (fig. 6a).

In this perspective and, especially in relation to the Children's Theater project, Piccinato's projects for the Berenice theater in Benghazi (designed and built between 1927 and 1932) (fig. 6b) and that of Sabaudia (fig. 6c) are important. The Sabaudia theater was inaugurated in 1934 and built together with Gino Cancellotti (1890-1987), Eugenio Montuori (1907-82) and Alfredo Scalpelli (1898-1966). This theater was the demonstration of a radical rethinking of the theatrical space. Having to contain 600 seats and function as a cinema, the building was therefore based on the overcoming of the traditional concept of Italian theater and, therefore, conceived as a circular sector plan with a roof sloping towards the stage and a sloping stalls area. The boundary spaces (under-stage, accommodation for the "first" ascents of the backdrops, dressing rooms) became functional to the modern theater and the projection booth was placed above the *foyer*.

Thus conceived, the Benghazi and Sabaudia theaters appear particularly significant for formulating a spatial hypothesis on the original geometric configuration of the Children's Theater (fig. 3). Referring to the sketch of the plan of the Children's Theater, visible in the urban plan of the Mostra d'Oltremare designed by Piccinato, these three theaters have a common axial succession between the entrance hall, hall and stage. Furthermore, the planimetric layout of the Sabaudia cinema-theater, designed in 1934 by Piccinato, shows a remarkable analogy with the planimetric layout of the Children's Theater (also confirmed in the subsequent project signed by Maione-Mendia) in that in both drawings the hall is conceived as a radial sector and developed with a fan profile.

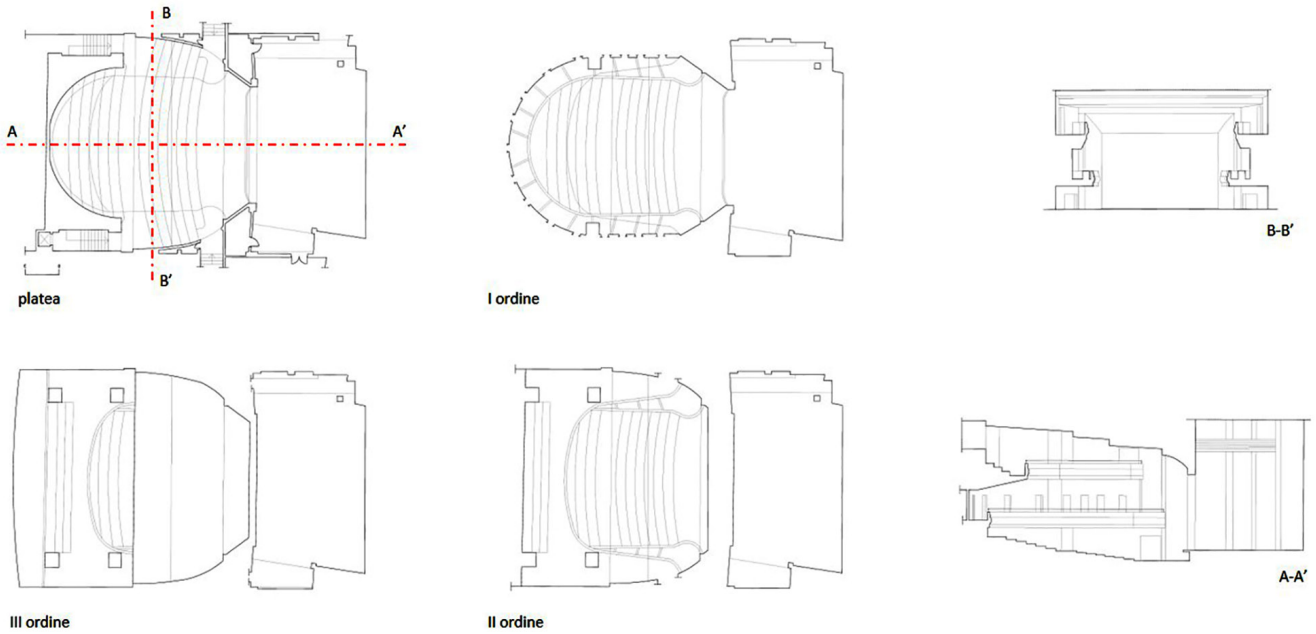


Fig. 7. San Ferdinando Theater: architectural survey of plans and sections of the theater (elab. by Pasquale Dello Iacono).

The tradition of Italian theater in Naples

The Italian theater is an architectural typology that spread in the XVIII-XIX centuries. The first forms date back to the seventeenth century when the drama for music was affirmed and the musical show went from a private event to an increasingly public one. This new form of exhibition required the adaptation of the previous types to new functions. The stage became wider and more divided from the stalls area, destined to welcome a considerable number of spectators from different social backgrounds. Therefore, the plant gradually lengthened. To accommodate users, an arrangement of overlapping galleries divided into dais was introduced. The gallery orders ranged from 3 to 5. Each order could contain 20 to 30 daises with a beehive structure. The last order was a gallery without internal divisions. Stalls and stage were independent. Complex stair systems and ring corridors gave access to the stages. This model, which spread throughout Europe, found an excellent Italian example in the Teatro di San Carlo in Naples. Built in 1737, this theater established itself on the European scene for its characteristic 'horseshoe' plan.
In relation to this masterful example, many other theaters were built in Naples including San Ferdinando (1791), Sannazaro (1847) and Bellini (1864), whose historical events and consequent spatial configurations constitute significant experiments in relation to the type architectural style of the Italian theater. On the basis of already existing and/or updated architectural surveys with the scientific coordination of the writer (2019-20), these theaters have been the subject of a recent graphic analysis to draw up a synoptic table between the spatial systems of these different theatrical architectures (fig. 11).

San Ferdinando Theater
The original San Ferdinando theater was built in 1791. Inaugurated with the work *Il carpenter* by Domenico Cimarosa, today nothing remains of its primitive spatial configuration as it was destroyed in 1943 by American

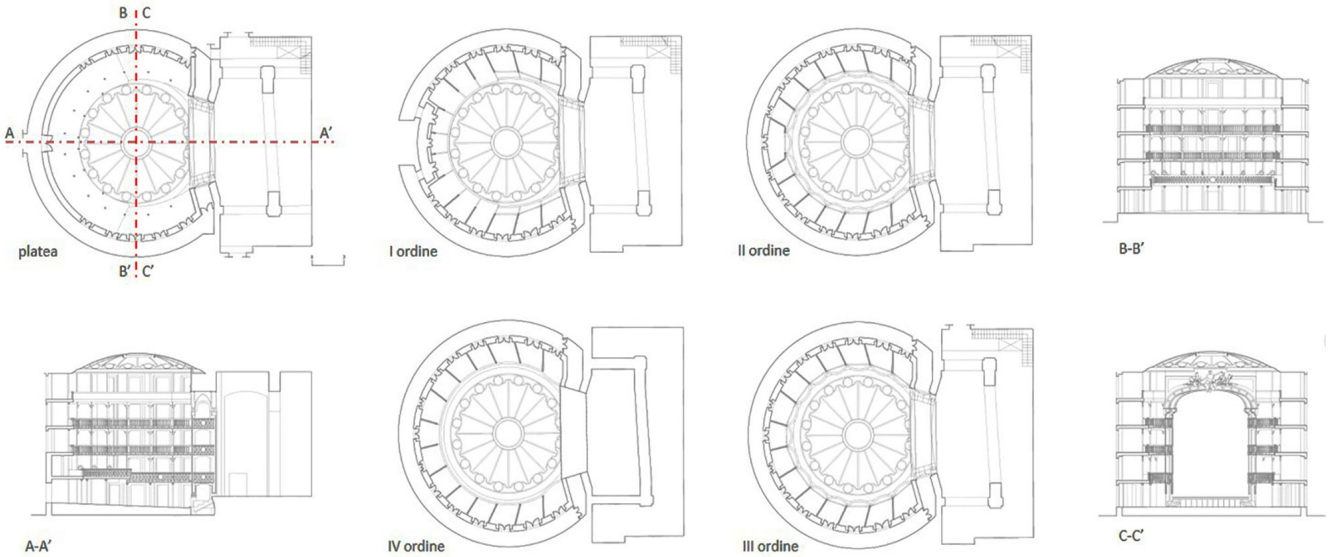


Fig. 8. Sannazaro Theater: architectural survey of plans and sections of the theater (elab. by Pasquale Dello Iacono).

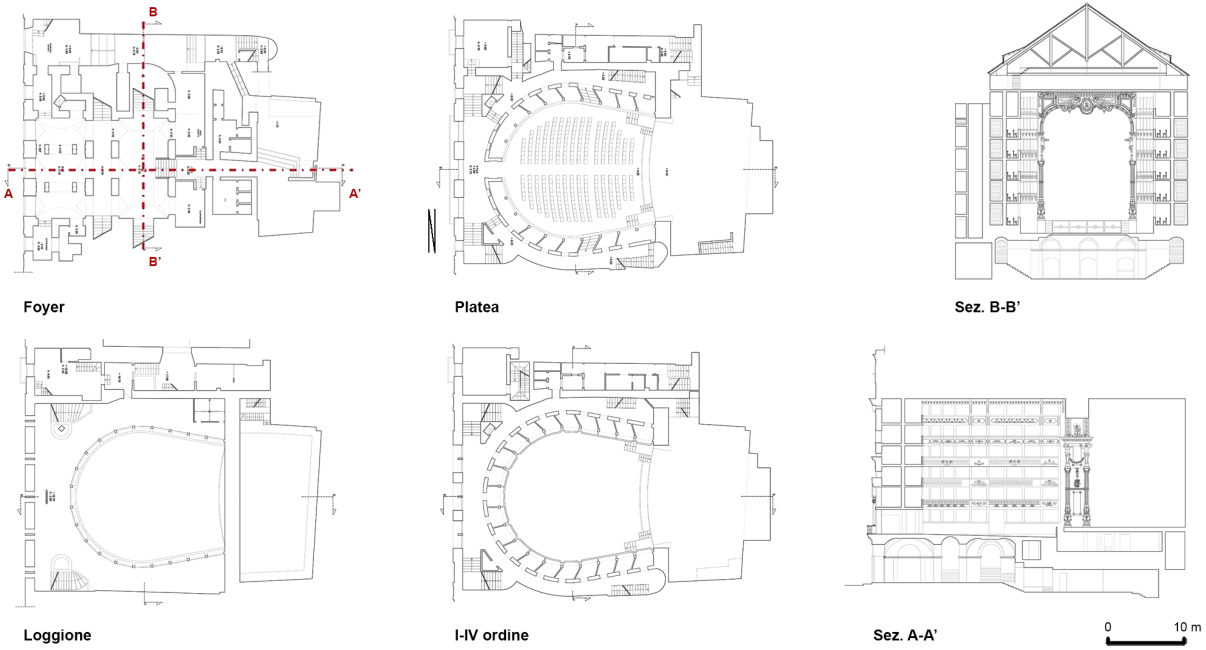
and German bombs that hit the city. The new theater owes the current structure to Eduardo De Filippo who bought it in 1948, starting its reconstruction around the remains of the original stage [De Simone Minaci 1954]. The project, while referring to the model of the Italian theater, configured a renewed system introducing the most recent dictates of modern theater. Overall, the new theater developed into three orders articulated around a large stepped stall, which housed the armchairs. The second order was constituted by a continuous row of 17 daises, arranged according to "U" planimetric profile or a semicircle connected to the scene with segments tangent to it in the extremes, finding reference in Inigo Jones's project for the London Cockpit Theater of 1617. The third order, on the other hand, presented a more modern breath, articulated in a tiered gallery, arranged in front of the stage. In this study of configurative analysis of the space, the representation of the longitudinal section in which the relationship between the stage and the stalls area is clearly visible, the graded trends of the first and third order (stalls and gallery) to ensure visibility, the overhangs of the second and third order intended for the daises and the gallery (fig. 7).

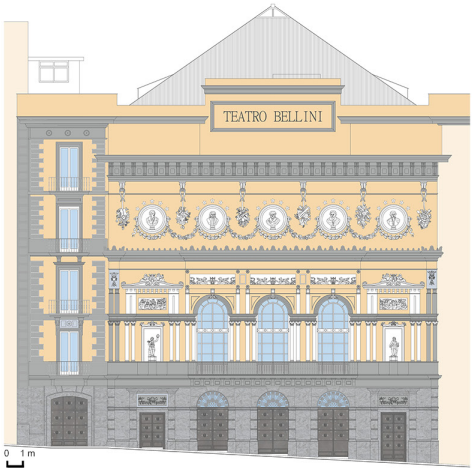
Sannazaro Theater

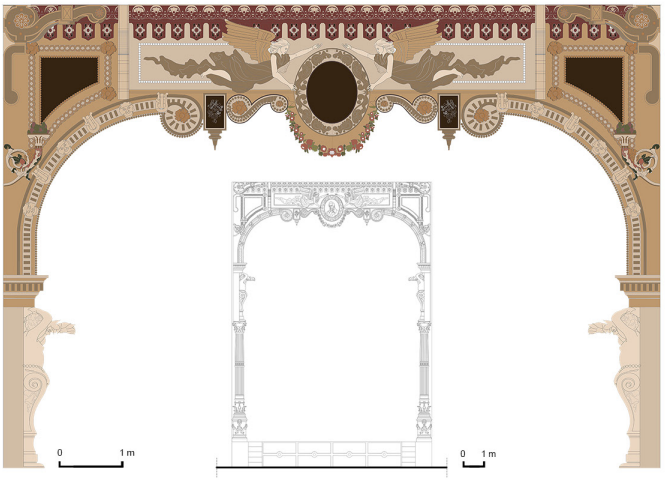
Work on the construction of the Sannazaro theater began in 1847 on the area of the ancient cloister of the church of Sant'Orsola in Chiaja by the Spanish Fathers of the Order of Santa Maria della Mercede, at the time intended as a cemetery for the monks. The project was by Fausto Niccolini, son of Antonio [Regina 2004]. The theater was inaugurated in 1874 and immediately intended for high prose shows for the aristocracy and the upper Neapolitan bourgeoisie, counting the illustrious names of Eleonora Duse and Tina Di Lorenzo among the theatrical actresses. At the same time, the theater also accepted the French tradition of *Café-Chantant*, an activity recently resumed with theatrical representations of operettas and ballets. The chronicles of the time defined this theater a *jolie bouquet* for the richness of the internal decorations in the white and gold colors of the painter Vincenzo Palliotti (1831-1894). While taking up the tradition of Italian theater, the Sannazaro was configured with a circular stalls area, cut off in its connection with the stage. On the stalls overlook 4 orders of superimposed galleries, each divided into 15 daises. The ceiling has a very low dome in which there is an ornamental

Fig. 9. Bellini Theater: architectural survey of plans and sections of the theater (elab. by Raffaele Liguori).

Fig. 10. Bellini Theater: architectural survey of the elevation and proscenium with details (elab. by Raffaele Liguori).







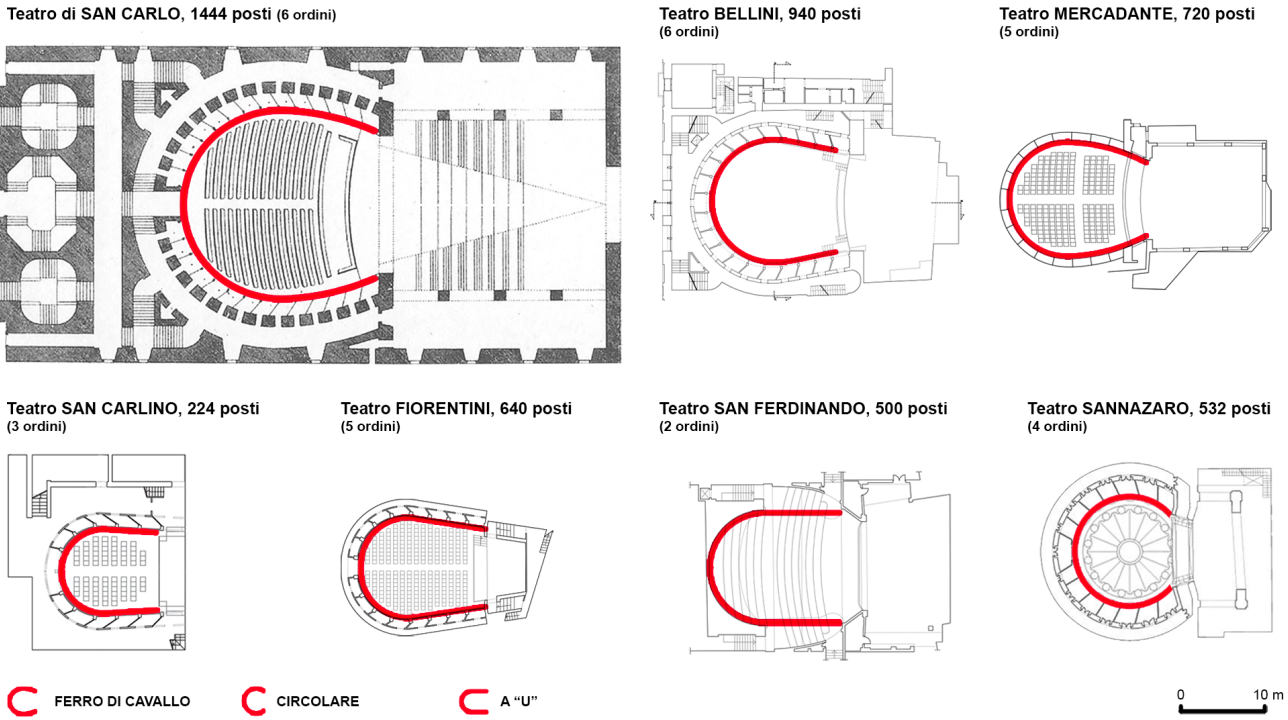


Fig. 11. San Carlo Theater (Mercoli 1789) and Neapolitan theaters: stalls shape and capacity (elab. by Vincenzo Cirillo).

motif organized according to a rotational symmetry of order 16. The whole appears very light especially for the presence of pillars with a very contained section, which support the four orders of galleries and divide the stages (fig. 8). This model of an Italian theater with a circular stall was later adopted in Naples also for the theater of the Trianon Viviani people which, inaugurated in 1911, consists of a stalls area, 4 orders of daises and a gallery.

Bellini Theater

The historical events of the Bellini theater are manifold. Built in 1864 near the then largo Mercatello (today Piazza Dante), this theater was destroyed in 1869 by a fire. The new Bellini was then rebuilt in the historic area of Naples called 'Fosse del Grano' in the current Via Conte di Ruvo. Inaugurated in 1864, the theater hosted both circus and equestrian shows and opera performances [De Simone Minaci 1954]. The theater was built with reference to the Italian model but with a circular plan, a single order of daises and two orders of gallery. The need to expand the theater to accommodate lyrical works subjected the theater to a subsequent intervention by the architect Carlo Sorgente, who was inspired by the *Théâtre national de l'Opéra-Comique* in Paris and reconfigured the theater with an iron 'horseshoe' stalls, five orders of daises and one intended for gallery (fig. 9). The theater was inaugurated on February 6, 1878. Acclaimed by the people, who shouted from the gallery: "San Carlo for greatness, Bellini for beauty" [Il pungolo 1878, 7 febbraio], the renovation of Bellini by Sorgente was the subject of considerable criticism for the excessive presence of decorations and

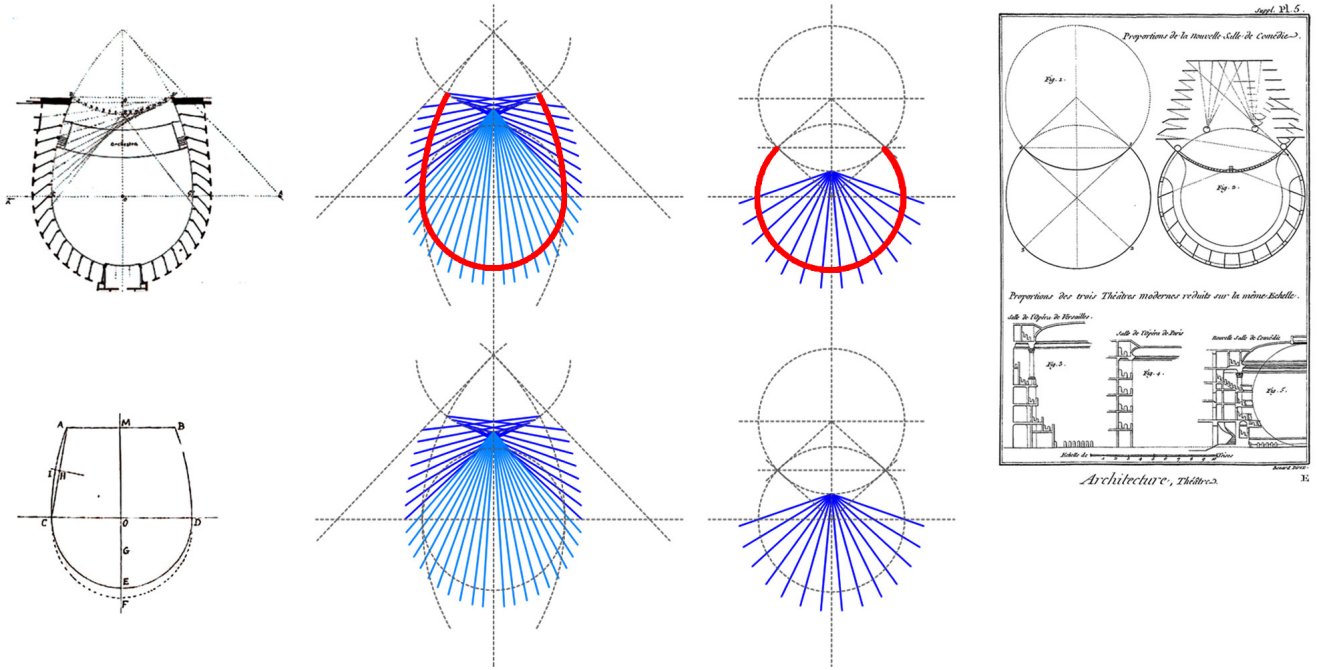


Fig. 12. Geometric tracing of the stalls in Donghi (1930, pp. 350-351) and D'Alembert, Diderot (1765, tav. 5) (elab. by Vincenzo Cirillo).

pomp, both in the hall and in the facade (fig. 10). On the pages of the popular political newspaper of the evening, *Il Pungolo*, published in Naples since 1860, regarding the new set-up of the theater it was read that: "the decorations are in bad taste, bordering on the ridiculous, and they are also superfluous. A theater is neither a hotel nor a tavern, in need of many decorations. The interior of the theater strikes the eye, dazzling it, with an opulence of colors, gilding, reverberations, glitters of white, red green and gold. Faced with all that splendor of very rich ornamentation, a little heavy and a little baroque, made of cherubs, monsters, garlands, crowns, masks, intertwined in a round along the six orders of daises; in front of that overloaded decoration and that gold so profuse, which has all the appearances of the massif, you understand one thing: that the owner of the theater, the distinguished baron La Capra Sabello is a millionaire" [Il pungolo 1878, 7 febbraio].

Constituted realities in comparison

Based on the survey and/or representation of the Neapolitan theaters examined, the graphic analysis carried out here has related both the proportional relationships between the theaters by evaluating their capacities (fig. 11) and the shape of the stalls, identifying their tracing (fig. 12). In this regard, the geometric constructions reported in the *Encyclopédie* of Diderot and D'Alembert under the heading "*Théâtre*" were significant [D'Alembert, Diderot 1765, pp. 227-238] and in the second volume of the *Architect's Manual* by Daniele Donghi, 'Distribution' (Part One), 'Public performances' (Section IV), were significant [Donghi 1930, II, pp. 348-384]. In these sources, the profile of the stalls (which originates the cylindrical shape of the galleries of the daises) is given, in Donghi, in a 'horseshoe' and in Diderot and D'Alembert, 'circular'. Comparing the Neapolitan theaters, the geometric shape mainly used is that of the

'horseshoe' profile (typical of the San Carlo Theater) while the 'circular' one is used for the Sannazaro; instead, in the hypothesis of virtual reconstruction of San Carlino and in the survey of San Ferdinando, the profile of the stalls area refers to the "U-shaped" solution (fig. 11).

Conclusion

The objectives pursued have returned as a conclusion of the research the spatial knowledge of Neapolitan architectures disappeared but significant for the theatrical history of the city as well as the comparison by graphic analysis of the Neapolitan theaters built according to the Italian model. The drawing, therefore, was critical to build knowledge and communicate it. The reading methodology, based on the integrated verification of the sources found and the use of graphic analysis, has allowed us to relate the constituent elements to formulate a hypothesis of the theatrical spaces examined coherently with the sources and architectural typology of the theater as well as to formulate a synoptic table of comparison (fig. 11). Furthermore, based on similar research experiences on Naples [Cirillo 2017], the virtual reconstruction of the three Neapolitan theaters has stimulated a wider project of returning to the city of peculiar testimonies in favor of a wider public such as tourism cultural. The digital processing of videos and 3d reconstructions for the Fiorentini and San Carlino theaters allows us to hypothesize in the future a possible integration with the most advanced augmented reality techniques to propose new explorations of the history of the city and create the conditions for immersive visits (figs. 4-5).

Acknowledgments
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Perspective Ingenuity. Methods and Tools for the Construction of Applied Perspective

Marta Salvatore

Abstract

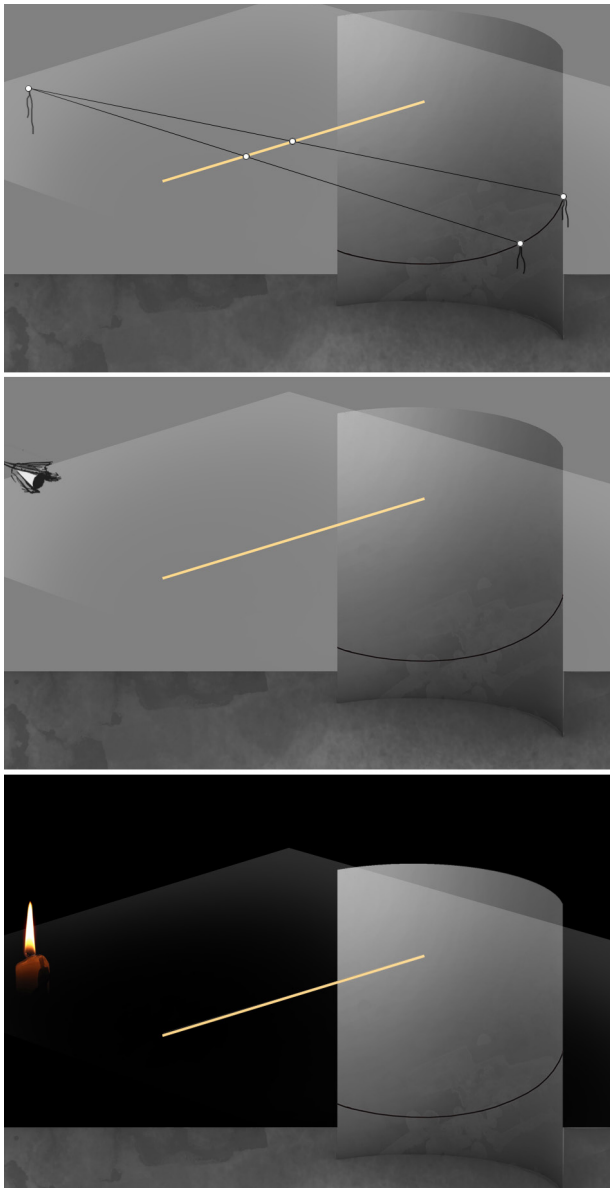
Between the Renaissance and the Baroque eras, perspective is expressed in different forms in the applied arts, from architectural perspectives, to the great anamorphoses and to theatrical scenographies. Its "practical construction" assumes a central role, attracting the interest of artists and mathematicians who alternated theoretical speculations with practical experimental solutions. The perspective building sites of the time became real natural-scale laboratories, where projective operations acquired physical form. Reproduced on site by means of ropes, shafts and lamps, they allowed the experimental verification of the enunciated theories. In these workshops of illusion, theoretical abstraction found its raison d'etre, revealing that fortunate union between art and science on which perspective tradition is based. This operational practice is evidence in a fragmentary way of the perspective treaties of the time, in particular with regard to the chapters dedicated to application. A critical transversal reading has permitted definition of a common modus operandi, based on the projective principles of perspective itself and which resolves the problem of construction of the traces in terms of absolute generalization.

Keywords: perspective, architectural perspectives, scenographies, anamorphoses, perspective machines

Introduction

In the Renaissance and Baroque eras perspective reached its apex and its maximum expressive potential. Intended as a privileged tool for reality representation, it was used to deceive and astound, expressing in different forms in the applied arts, ranging from architectural perspectives, to large anamorphoses and theatrical scenography. The wide diffusion of perspective construction sites in the European courts, made the "construction" of perspective a central question, such as to attract the interest of artists and mathematicians, who experimented and theorized in a search for increasingly effective methods and tools for the physical reproduction of perspective machines.
Numerous treatises flourished, some of them speculative, dedicated to the definition of the projective theories at the basis of perspective, others manualistic, mainly oriented to the operability of the method. The practical interest of the artists found fertile ground in places where theoretical perspective acquired physical form. At the same time, these places also attracted the speculative interest of mathematicians, who considered them as perspective laboratories in real scale, to experiment and verify the validity of the enunciated theories. In fact, in the perspective construction site realized in those years, the projective operations acquired physical form. Reproduced in space using ropes, shafts and lamps, they allowed the representation of the *apparent lines* of perspective [1].
Therefore, the practical construction of perspective interested, in a transversal way, all the applied arts that found,

Fig. 1. Projective operations with ropes, lamps and sight (author's elaboration).



in the projective principles of this science, their theoretical foundation. The main problem, common to the prospective building sites of the time, was the frequent inaccessibility of the points of distance and/or points of concurrence, which operationally precluded the construction of perspective through its geometric rules. Hence, it was necessary to conceive effective procedures to reproduce particular perspective images on generic picture planes, such as for example, the surface of a vault or a not necessarily flat wall. This problem had extraordinary appeal and became an opportunity to experiment with different procedures in practice. Among these, those of a projective nature assumed a leading role due to its ability to resolve the question in terms of absolute generality [2].
We have received evidence of these procedures through some of the perspective treatises of the time, where the problem finds space, in a discontinuous way, in the chapters dedicated to applications. A transversal reading of these contributions has revealed the existence of a common *modus operandi*, able to resolve the problem in terms of maximum generalization through surprisingly modern projective methods.

Projective methods of "perspective construction"

The problems related to the realization of architectural perspectives, theatrical scenographies and anamorphoses found a common reason in the projective procedures used for their "construction". These procedures usually point up two different approaches to the problem, according to which:
- the perspective was built directly on the building site;
- the perspective was built by transporting a sketch reduced in scale or a grid superimposed on it.
The first approach generally involved the construction sites of theatrical scenography, while the second approach was more frequent in the case of architectural perspectives and anamorphoses, although the transversal contamination forms of these two methods were recurrent. Whether it was direct construction or transport, the question was resolved by materializing the projection and section operations on the construction site. Here, the construction of perspective traces was reduced through the projection of a geometric entity, usually a line materialized by a taut rope, from a projection center on a generic shaped picture plane, such as a wall, a ceiling, a vault or a backdrop of theatrical scenery. In this projective operation the point of view was given by the per-

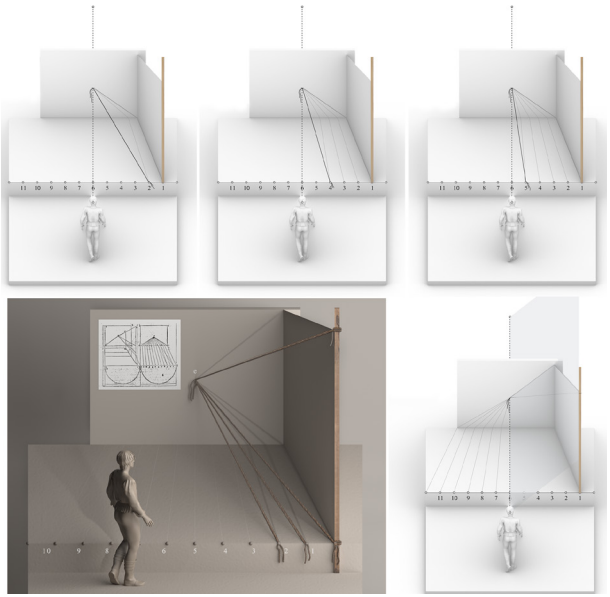
spective, a taut rope represented the entity to be projected –an objective line in the case of direct construction of perspective or a line of the grid in the case of construction by transport– finally the picture plane was the wall or ceiling to be painted.
Three types of instruments were used to physically perform these projection operations, described in most of the applied perspective treatises of that time: ropes, lamps and sight.
With ropes, or more precisely with a "projecting rope", the points of a second taut rope were projected until their intersection with the wall to be painted. An adequate number of points would have allowed the representation of the perspective of this line on any surface. Instead, with the lamps it was possible to obtain the continuous perspective image of the projected straight line, because of their shadow produced on the picture plane. Finally, by sight, the image of notable points of the projected line was determined, with the help of an assistant. The projective operations by sight, like the others, were based on the belonging of the projection center, the line to be projected and its perspective to the same projecting plane. In fact, the perspective image of the straight line is confused with the objective straight line if it is observed from the projection center. From that position the observer could give indications to an assistant close to the picture plane, able to mark notable points of the perspective image (fig. 1).
If from a projective point of view, the procedure appears exemplary, the same cannot be said from an operational point of view. The ropes, especially if imagined particularly long, are subject to bending, therefore they could hardly give an accurate result over long distances. Likewise, the poor illuminating power of the lamps could not project sharp shadows at those distances. Finally, the same problems regard sight projections, ineffective from this distance. However, ropes, lamps and sight projections constantly recur in the perspective treatises, and the reason is simple: the projection operations could be performed from any point on the same projecting plane.
We observed how the perspective of a straight line and the straight line itself appear confused in the same image if observed from the projection center of perspective. This happens because the observer's eyes, the line to be projected and the perspective image belong to the same projecting plane. If we imagine moving the projection center on any point of this projecting plane we can observe that congruence between the objective line and its perspective image remains unchanged.

The possibility of projecting generally oriented classes of straight lines, from a projection center defined "auxiliary" and placed in every point of the projecting plane, permitted a significant reduction in distance. This reduction made effective the use of ropes and lamps and favored projective sight operations. This method freed the projective operations from the position of the point of view, testifying to the extraordinary capability of perspectival artists of the time, to operate, in an exemplary way, through the use of projecting planes.

Projective methods in operating practice

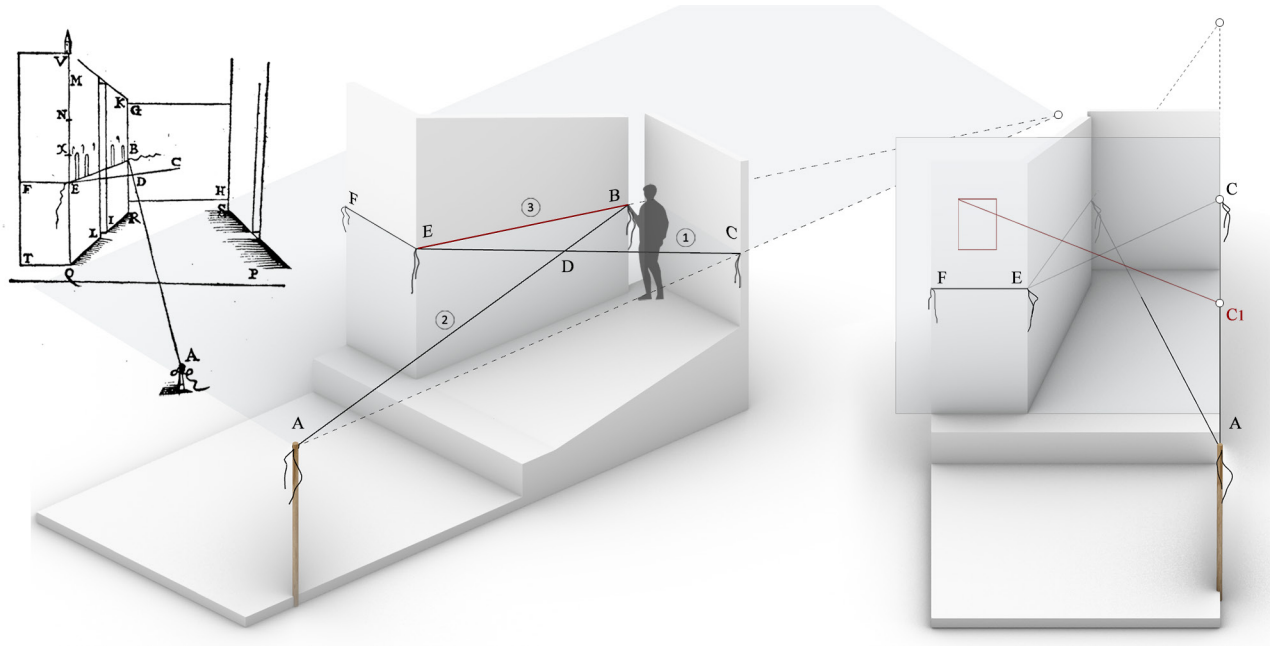
In the first half of the sixteenth century the most significant contributions to perspective in practice resolved by projective methods are given by Daniele Barbaro and Egnazio Danti. In chapter VI of the *Pratica della perspectiva*, in which the tragic scene is treated, Barbaro describes the method employed by Pompeo Pedemonte to construct

Fig. 2. Pompeo Pedemonte's method for perspective construction of straight lines in a theatrical scenography (author's elaboration).



the scenes: "*homo industrioso, e pratico s'ha imaginato un modo di accordare le fabbriche delle scene con le pitture dei muri e pareti di modo che le pitture pareno fabbriche e ciò che si vuole* (this industrious and practical man has imagined a way to arrange the buildings on the scenes with the wall paintings so that the paintings look like buildings and what you want)" [Barbaro 1568, p. 155].
Pedemonte's method consisted in dividing the stage floor into a series of parts, 12 in the proposed example and, on the side ones, elevating the perspective of different buildings on the stage. In order to execute these partitioning operations, a "rope like that of a mason" –as defined by Barbaro– was fixed to a nail on the backdrop plane, at the height of the horizon line. This rope was then anchored to the different division points of the floor on the stage front. Placing oneself at the point of the view, the taut rope had to be observed, since it makes a shadow. In the text, in part ambiguous, the use of a lamp is not explained except for the resulting shadow it produces and restores the sought after perspective.
In one of the dialogues of the *Mascara*, written in 1596, Ettore Bottrigari compares the method used by Daniele Barbaro with the one described by Egnazio Danti a few years later in his *Commentari* to *Le due regole della prospettiva pratica di Vignola* [Vignola 1583]. In the dialogue, Bottrigari reports Barbaro's construction highlighting its limits, with reference to a series of uncertainties concerning the position of the point of view and the height of the lamps that would project the shadow [Bottrigari 1596, p. 251]. Bottrigari's comments suggest that the lights were mobile on the scene and had to be positioned at the right height, established by the overlapping of the taut rope with its shadow, observing the scene from the center of projection [3]. In this context, the most significant aspect of Barbaro's

Fig. 3. Egnazio Danti's method for perspective construction of straight lines in a theatrical scenography (author's elaboration).



contribution consists in delineating a practice in which a straight line perspective was obtained by a projection of a second straight line, materialized by a rope. This second rope was not the objective line to be used to construct the perspective, but any line belonging to the projection plane, defined by the projection center and the objective straight line [4] (fig. 2).
Even in *Mascara*'s dialogue one of the actors seems to prefer Egnazio Danti's method to Pedemonte's, which proceeds "*per gli sbattimenti et ombre degli spaghi e fili tirati poco certi* (by the flappings and shadows of taut twines and strings with little certainty)", unlike Danti, il quale "procede sempre con gli incrociamenti e termini certi de' fili e spaghi tirati (who always proceeds with defined crossings and terminations of taut twines and strings)" [Bottrigari 1595, p. 258], although both come to the same result. Danti's contribution is particularly significant because it concerns different aspects of practical perspective and because it confirms the interest of mathematicians in the applications of this art [5]. The incrociamenti certi (defined crossings) of Danti's method are described in the chapter dedicated to the construction of the perspectives of scenes [Vignola 1583, pp. 90-94]. Around the mid-sixteenth century, the buildings arranged on the sides of the scene were partly three-dimensional, partly painted [6]. The three-dimensional ones were covered with cloth, on which doors and windows were represented.
Thus, Danti teaches the construction of the perspective of a window by projecting ropes with other ropes. Also in this case the projected rope, EC in fig. 3, is not the objective straight line, which would be orthogonal to the front of the scene. It is instead a generic straight line of the projecting plane which passes through the principal point C and another point chosen on a building of the lateral wing, through which the window perspective sill must pass [Vignola 1583, pp. 90-91]. The continuity with the scene painted on the backdrop is given by the principal point, where the images of the straight lines perpendicular to the picture plane converge. Instead, the perspective of the same lines on the front of the scene had the principal point precisely on the front of the scene.
Before dealing with scenography Danti describes "*la più difficile operazione che possa fare il prospettivo […] [sulla quale] fin qui da nessuno (che io sappia) n'è stato scritto poco né assai* (the most difficult operation that the prospectival artists can do […], [on which] until now no one, [that I know], has ever been written about)" [Vignola 1583, p. 89]. Therefore, he deals with the problem of constructing perspectives on vaults and describes a procedure used by Ottaviano Mascherino to paint the Bologna room in the Vatican. This procedure involved transferring the degraded sizes of three rows of columns out of the work, on a cardboard reproducing the profile of the vault, and then repositioning the cardboard on the vault. The control of the verticality and horizontality of the represented straight lines was conducted once again using the projecting planes, observing a tri-orthogonal system of taut ropes. This system consisted of a plumb line hanging from the principal point of the perspective and of a pair of ropes, orthogonal to this and between them, presumably mobile, taut along the impost plane of the vault (fig. 4). "*Perché se bene nell'opera le linee perpendicolari & le piane vengono storte per conto delle concavità della volta, come esse rispondono alla linea del piombo, & a quelle del livello, appariranno all'occhio sempre di stare a piombo, & in piano* (although in the work the perpendicular and flat lines are distorted due to the concavity

Fig. 4. Egnazio Danti's method for the construction of perspective on the vaults (author's elaboration).

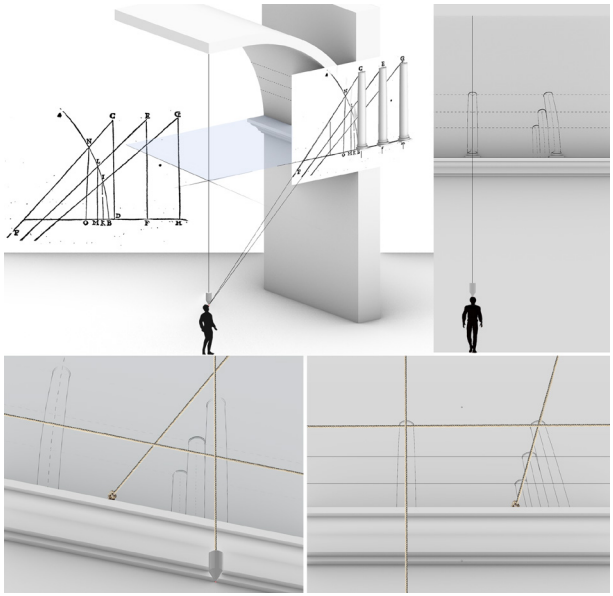
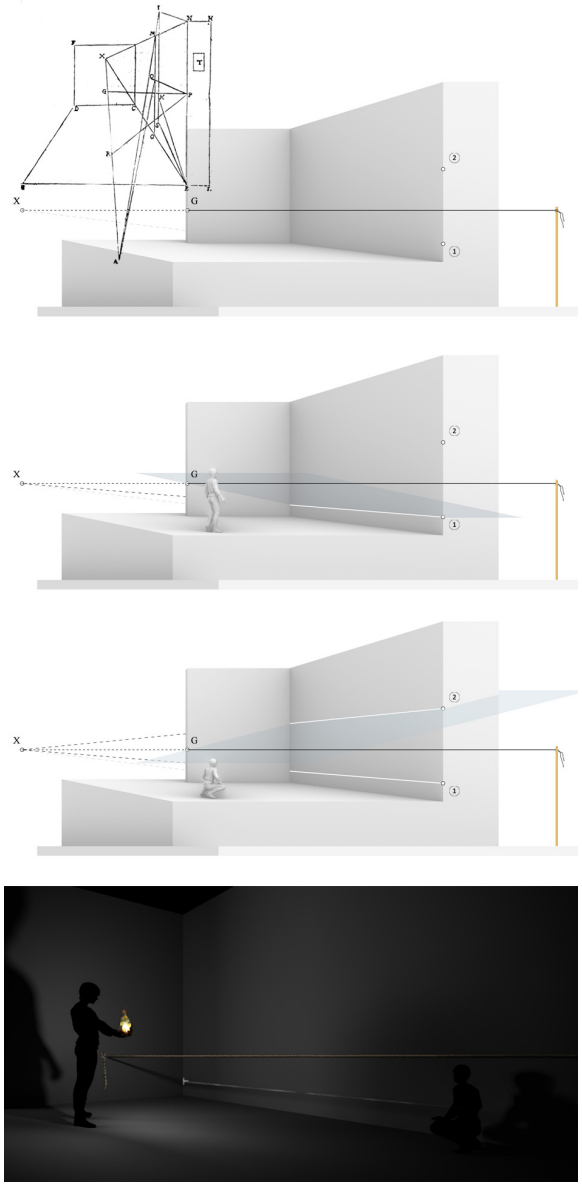


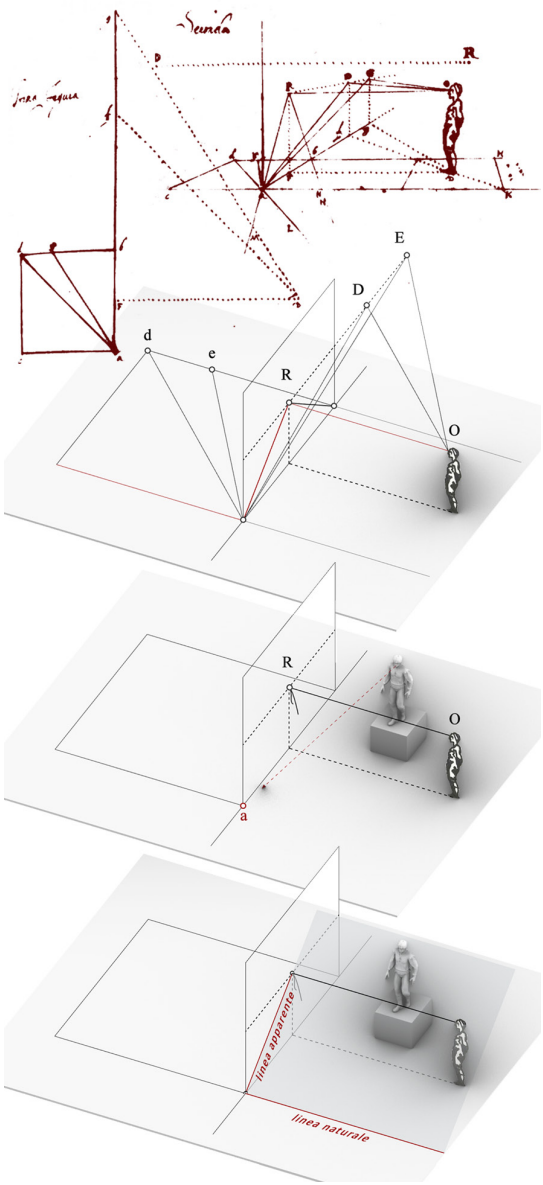
Fig. 5. Guidobaldo del Monte's method for the perspective construction of straight lines in a theatrical scenography (elaborated by the author).



of the vault, when they respond to the plumb line and level lines, they will always appear to the eye to be at plumb and flat)" [Vignola 1583, p. 89].
Both Barbaro and Danti do not describe invented procedures, but methods currently in use at the time which, around the middle of the 16th century, testify to the consolidated use of ropes, lamps and sight in the practice of perspective and the ability to move the entities to be represented along the same projecting plane. This operating procedure, described in the work of Guidobaldo del Monte, owes to this mathematician, its scientific reasoning and rationalization. In *De scenis*, the sixth book of *Perspectivae libri sex* [Sinisgalli 1984], Guidobaldo describes a method for constructing scenes in which he makes explicit, in terms of absolute generalization, the method that we can define as the "method of projecting planes" [7]. Having to represent the contracted scenic box, according to the tradition of the Renaissance court theater, with doors and windows painted above the wings, he describes a way of operating by sighting from any point of the projecting plane by eyesight or alternatively with ropes and lamps that which we define as the straight line projecting a given straight line. The construction of the concurrence points described by Guidobaldo in the first book of the treatise operated through straight lines parallel to the given straight line passing through the projection center, that we define today as "projecting". Thus, on stage, the projecting line in question was built by means of a taut rope; in the wing or on the stage floor, the point where its perspective would have to pass was established; the projecting line was observed from any point of the scene, from a height such that the image of the line and that of the point appeared coincident (fig. 5). An assistant would have easily marked on the wing one or more points belonging to the perspective sought [Sinisgalli 1984, pp. 218-232]. This *modus operandi*, which allowed the representation of generic classes of lines in space, was used both for the construction of the scenic box contracted and for that of the lines on the wings and the backdrop.
Guidobaldo's lesson was partly accepted by Accolti, who in 1625, in *Lo decanno degli occhi*, still applied it to the scenes through the projection of a pair of ropes with lamps, for the representation of classes of orthogonal lines to the front of the scene [Accolti 1625, pp. 89-94].
Next to the publication of Guidobaldo's treatise, Ludovico Cardi, or Cigoli, was working on his unfinished practical treatise on perspective [8]. In the *Terza Regola* (third

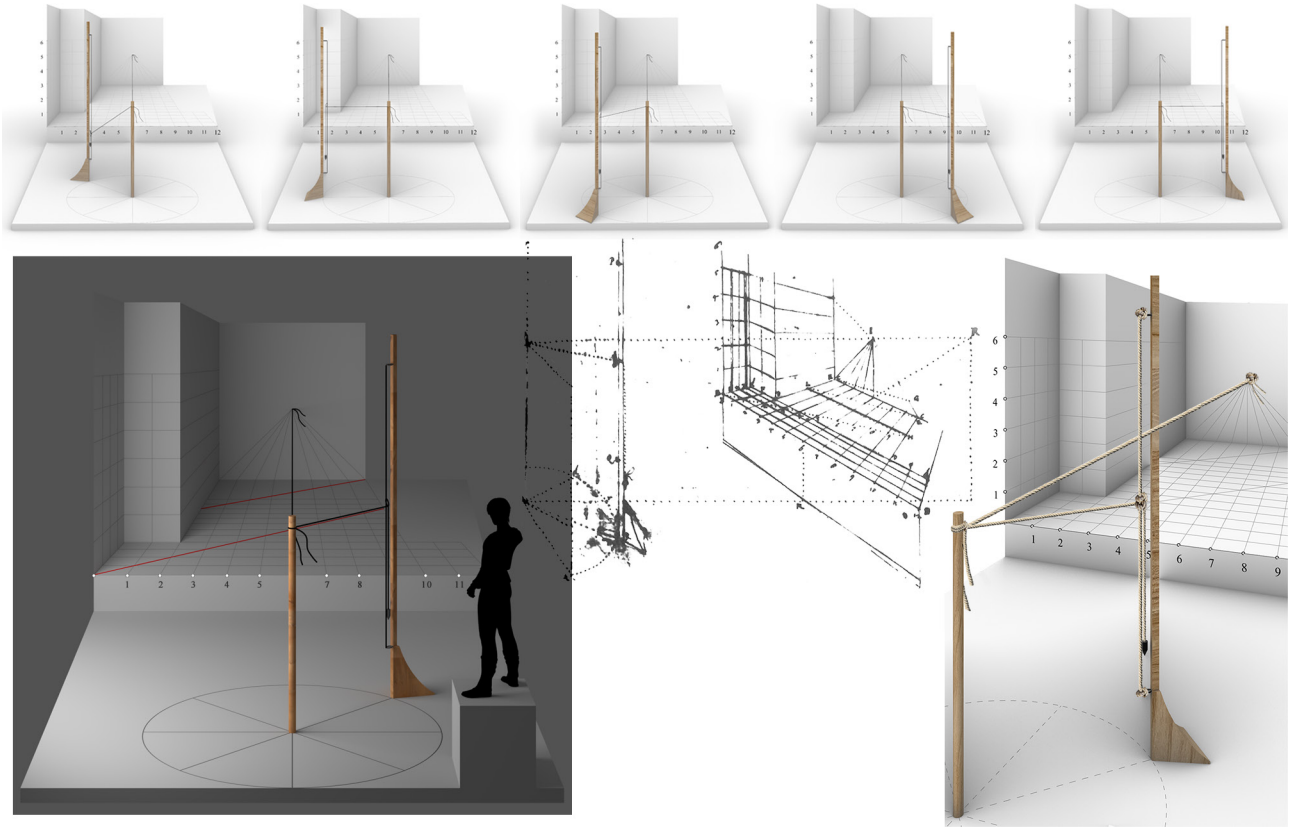
rule), described in the second book and applied to the scenes, Cigoli teaches how to construct the perspective in practice, reproducing the theory of concurrence points, presumably inspired by Guidobaldo's work [Andersen 2007, p. 376]. He describes the construction of the apparent straight line (i.e. perspective) of a natural line (i.e. objective line), given the direction of the related projecting line. This straight line was realized by a taut twine between the projection center and the section, namely the picture plane. This was laterally projected by a lamp or by sight, thus providing its perspective image on one or more sections (fig. 7).
This construction found direct application in scenography, where Cigoli describes a method similar to the one already illustrated by Guidobaldo. The original contribution concerns rather an instrument used in the scene to construct, with the aforementioned method, generically oriented classes of lines in space. This instrument consisted of a vertical shaft fixed in the center of projection connected by a twine to a second shaft, able to support itself and be free to rotate at a constant distance around the first one. The twine that connected the two shafts and that we can imagine horizontal or inclined between them, materialized infinite classes of objective straight lines in space. The latter, viewed by an observer placed beside them, provided infinite perspective images of lines having the twine as projecting line [Profumo 1992, pp. 125-134] (fig. 8).
In the first decades of the seventeenth century the possibility of operating along the projecting plane is a consolidated practice, which concerns both the theatrical scenographies and architectural perspectives. With regard to the latter, the work of Abraham Bosse entitled *Moyen universel de pratiquer la perspective sur les tableaux ou surfaces irrégulières assumes particular importance*. Published in 1653, it is a unique work of its kind, because entirely dedicated to the problem of the construction of perspective traces. This work addresses the question of perspective transport on generic shaped surfaces, according to increasing levels of complexity. Object of the transport is a perspective grid at the base of Desargues' perspective, constructed through the method of perspective scales that he theorized in those years [9]. The grid in question was the perspective image of an orthogonal grid superimposed on a drawing in scale, representing the perspective to be projected (fig. 9). This reticulum was reproduced on an ideal auxiliary plane, through taut

Fig. 6. Cigoli's third rule for perspective construction of a straight line (author's elaboration).



ropes converging at the principal point of perspective. The ropes of the reticulum were then projected by means of other ropes or lamps free to move along the principal distance on the projecting plane, or otherwise by sight [Bosse 1653, pp. 55, 56].
The possibility of moving the lamp to increase the sharpness of the shadows, explicit in Bosse's work, recurs in the transport operations used about fifty years later by Andrea Pozzo in the St. Ignatius Church in Rome. This is described by Pozzo himself, who in the first book of *Perspectiva pictorum et architectorum* to the one hundred and one figure, illustrates the way to make the graticola in the vaults. The comment on the figure describes the theoretical principle of projection of the grid which, positioned at the level of the impost plane, would have been projected with a candle from the center of projection on the vault. Pozzo then commented on the impossibility of practicing this operation because of the excessive distance of the point of view from the vault and because of the wooden floor that would have prevented projection of the shadow. Therefore, he describes the procedure he used for the construction of the false vault in St. Ignatius, using an

Fig. 7. Cigoli's tool for perspective construction of generic lines in a theatrical scenography (author's elaboration).



additional grid, obtained by projecting the first one with ropes from the projection center. The distance between the two grids was such as to be able to walk under them with a lamp and project, twine by twine, the shadow on the vault:
"*Così fec'io in HG; e poiché essendo più del solito quella vicina alla volta, le potei camminar sotto in tempo di notte, e trasportando un lume acceso di spago in spago, secondo che quelle gettano l'ombre molto visibili, e distinte, andai segnandole con color nero, di maniera che al giorno chiaro, trovai formata tutta la graticolazione prospettica* (I did so in HG, and since it was closer than usual to the vault, I was able to walk under it during the night, and transporting a lit lamp from twine to twine; producing those very visible and distinct shadows, I went to mark them in black, so that on a clear day, I found the entire perspective grid formed)" [Pozzo 1717, *centesimaprima*].
The description given by Pozzo suggests also in this case use of the projecting planes. The ropes of the lower grid and those corresponding to the upper grid belonged by construction to the same projecting plane, therefore a lamp, positioned on a twine of the lower grid, or more simply on the intervals corresponding to this grid, would have correctly projected the corresponding twine of the upper grid on the vault (fig. 10).

Perspective machines

The aforementioned applications of perspective concerned architectural perspectives and theatrical scenographies. A separate discussion requires the great anamorphoses, particularly in relation to those realized in the convent of the Minimi brothers in Rome in the first half of the seventeenth century by Fathers Emmanuel Maignan and Jean François Niceron. Like the architectural perspectives and scenographies, anamorphoses also recur in the treatises of practical perspective of the time. From Piero della Francesca onwards, many authors had proved their knowledge, including Daniele Barbaro, Egnazio Danti and Grégoire Huret and albeit with some uncertainty, Pietro Accolti and Solomon De Caus, to mention just a few [10].
The construction of anamorphoses was generally executed by transport. A grid placed above a scale drawing was projected on a surface orthogonal to it, from a center of projection near to the surface in question. This transport operation was, more than any other, suitable to be resolved through the use of perspective machines, especially if the anamorphoses were large in size. The use of such instruments is illustrated by Jean François Niceron in the *Thaumaturgus Opticus* published in 1646. Here described is an instrument used by Emmanuel Maignan for the construction

Fig. 8. Abraham Bosse's method for the construction of perspective on irregular surfaces (author's elaboration).

Fig. 9. Method used by Andrea Pozzo for the construction of the perspective on St. Ignatius' vault in Rome (elaboration by the author).

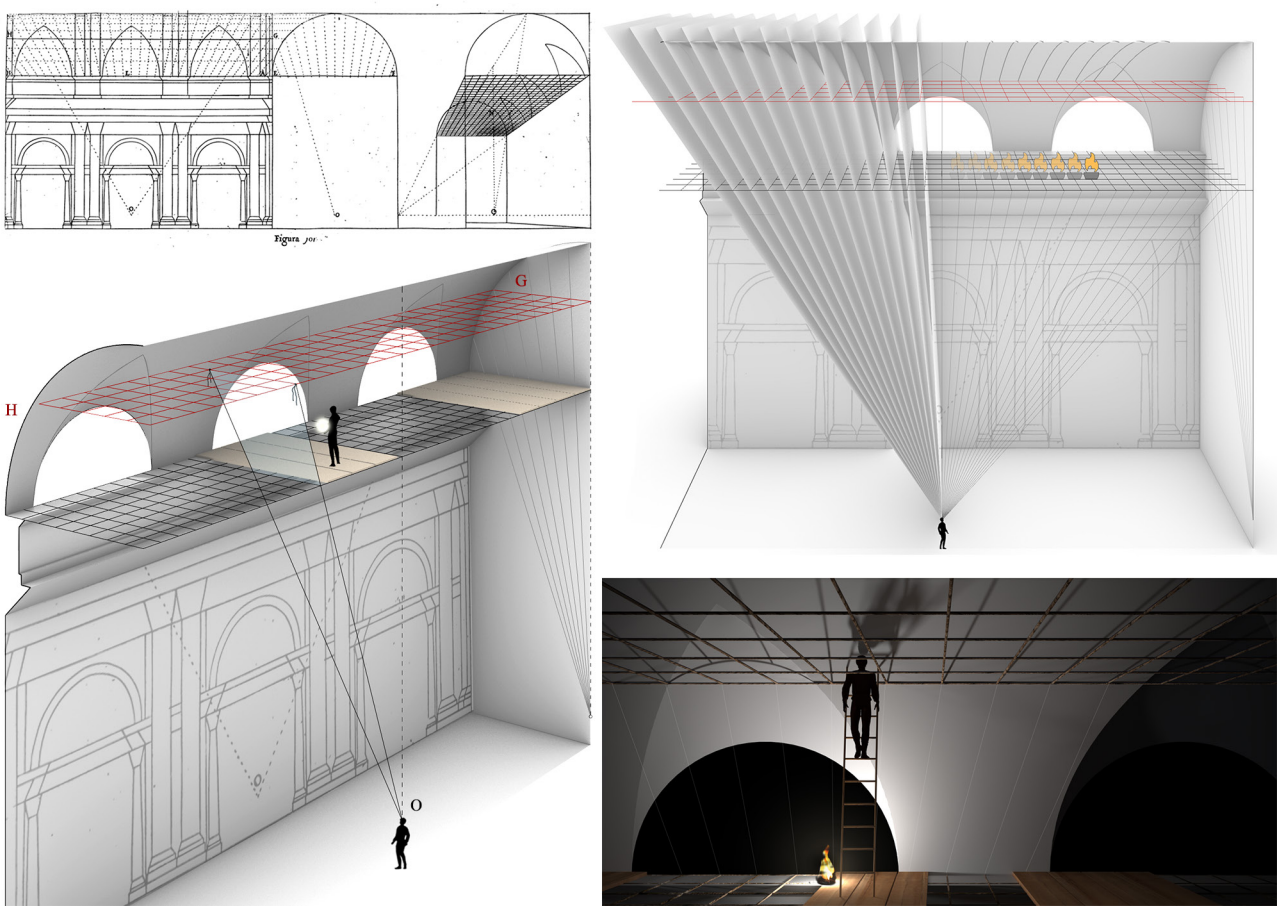
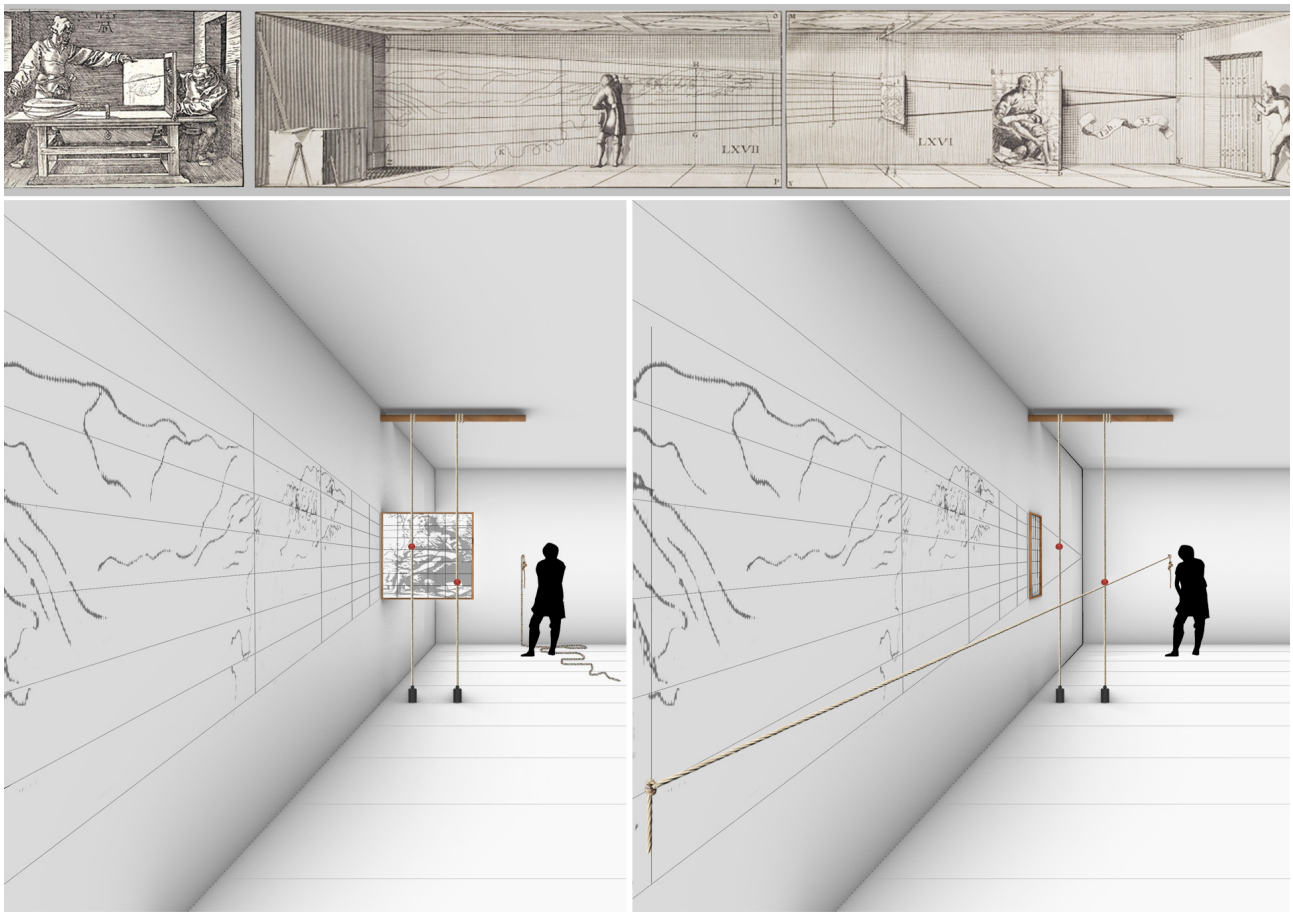


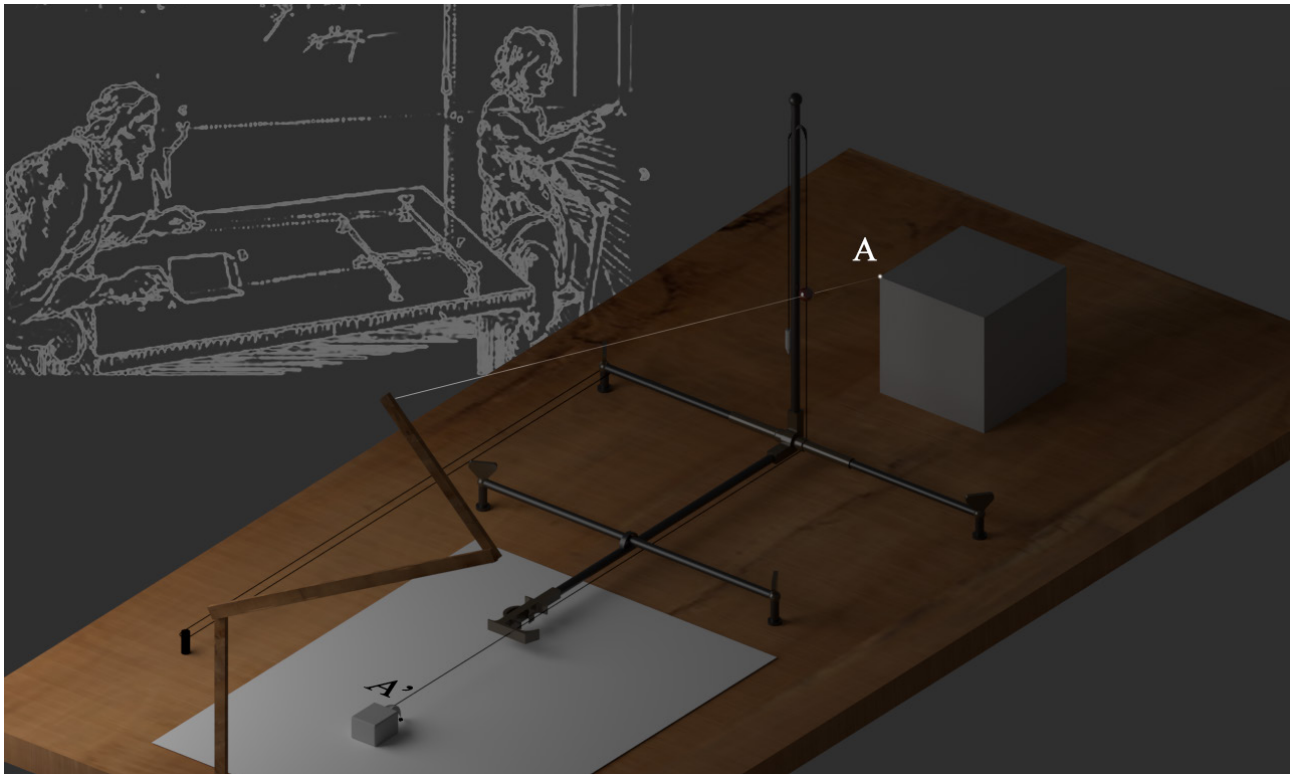
Fig. 10. Tool described by Jean François Niceron in Thaumaturgus Opticus for the transport of anamorphosis (author's elaboration).



of the painting of San Francesco di Paola in the Trinità dei Monti convent in Rome, mentioned by Maignan himself two years later in his *Perspectiva Horaria* [Camerota 1987, p. 85]. The instrument, which can be read as a reinterpretation of the "*sportello* (door)" designed by Albrecht Dürer about a century earlier, consisted of a sort of fork, fixed to the wall, on which a framework, in fact the door, was hinged, free to rotate around its hinges [Baltrusaitis 1978, p. 64]. On the framework there was positioned a drawing with a superimposed grid. From the fork hung a plumb line –more than one in Niceron's reinterpretation– along which a gem was free to slide. When the frame was placed orthogonally to the wall, a particular point in the reticle (or in the drawing) corresponded to the gem. Once the position of the gem was established, the frame was closed along the wall and, from the center of projection materialized with a nail, a rope was stretched, capable of projecting the gem on the wall to be painted [11] (fig. 11).

However, in Niceron's work the praises of a second instrument are sung, one not used as far as is known for the anamorphoses in question, but which is presented as the universal instrument for transport operations of this kind: the *Scenographum catholicum*. It is the revision of a perspective machine conceived at the beginning of the century by Cigoli, which Niceron saw in Paris, in the Cabinet of the Advisor to the King of France, Louis Husselin [12] [Camerota 1987, p. 90]. The instrument was a reinterpretation of Dürer's "window". An L-shaped square could slide horizontally on a pair

Fig. 11. Tool conceived by Cigoli for the construction and transport of perspective (author's elaboration).



of fixed guides, through ropes that were maneuvered by the draftsman's left hand, ideally describing the window during the motion.
A plumb line with a marker was placed next to the L-square, and ran up and down along it by a marker located in the draftsman's right hand. The eye was fixed at a point in space by means of an articulated shaft. With the eye fixed in the center of projection, the draftsman would slide the square left and right and the plumb line up and down with the marker, until it coincided with the image of a point on the object to be represented. This was marked on a sheet of paper, determined by the position of the marker. Between the ideal point on the window, indicated by the marker, and the point on the paper, a relationship was established, today called homological. Cigoli hypothesizes the direct and inverse use of this instrument [Profumo 1992, pp. 149-159]. Designed to construct perspective given the object to be represented, it could effectively be used to project a given perspective, in scale, onto a wall of large dimensions to be painted, such as a quadrature or a large anamorphosis (fig. 12).

Conclusions

This partial recognition around the operational methods for constructing a practical perspective opens a window on the Renaissance and Baroque perspective construction sites, the beating heart that nourished research and experimentation in the field of perspective in those years. In the places where illusions are made the abstract projective theories that govern perspective find an operative reason, revealing that fortunate combination between art and science on which the tradition of perspective is based. The projective methods mentioned above help to illustrate this bi-univocal relationship, declining in various forms aimed at resolving, in a shared way, the perspective "construction" in terms of absolute generality. Therefore, perspective construction sites assume a central role in the history of perspective, i.e., experimental laboratories in which the perspective machine acquires physical form demonstrating, in practice, the strength of theory.

Notes

[1] Nel suo *Trattato pratico di prospettiva* [Profumo 1992] il Cigoli definisce *linee apparenti* le immagini prospettiche delle rette da rappresentare, dette invece *linee naturali*.

[2] La ricognizione che segue considera procedimenti di tipo proiettivo, che risolvono il problema in termini generali. Oltre a questi ne venivamo impiegati degli altri, alcuni dei quali facevano ricorso agli sviluppi piani, nel caso in cui la superficie da dipingere fosse stata sviluppabile.

[3] Se così fosse la pratica del Pendemonte avrebbe anticipato le successive teorizzazioni di Guidobaldo Del Monte sulla questione.

[4] A questo piano proiettante appartenevano infatti il punto principale e, e uno dei punti di divisione del fronte del palco, estremo della fune da proiettare.

[5] Si presume che già Piero della Francesca fosse attivo nel settore teatrale [Mancini 1966, p. 18].

[6] Rispetto ai tre modelli di scene introdotti da Serlio alla fine del Cinquecento, i casamenti ricorrevano nella scena tragica e in quella comica.

[7] Sulla portata del contributo di Guidobaldo alla pratica prospettica attraverso operazioni di proiezione da un punto qualsiasi del piano proiettante si veda [Baglioni, Salvatore 2017].

[8] Il trattato del Cigoli, a cui lavorò presumibilmente dal 1605 al 1613, rimase inedito fino alla fine del Novecento [Profumo 1992, p.10].

[9] Per approfondimenti sul metodo di Desargues, l'uso delle scale prospettiche e i metodi di trasporto descritti da Abraham Bosse, si veda [Salvatore 2018].

[10] Alcuni autori, come Danti e Huret introducono un'imprecisione nella proiezione del reticolo, la cui rette orizzontali appaiono parallele piuttosto che convergere nel punto principale.

[11] La gemma era posta in luogo della coppia di fili tesi usati da Dürer per definire il punto sul quadro. Questa modifica era stata introdotta, usando una *perletta*, dall'*Accolti ne Lo inganno degli occhi* [Accolti 1625, pp. 84-85].

[12] Niceron non conosceva l'opera del Cigoli, ma apprezzò subito le potenzialità dello strumento.

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Imagining

"Exactitude" in the Territories of "Intuition". Paul Klee at the Bauhaus

Michele Dantini

For Hannah Arendt, who wrote about it in 1948 in *The Origins of Totalitarianism*, the Bauhaus directed by Walter Gropius was a unanimous presidium of rationality applied to the transparency of procedures. "The elite", wrote Arendt, "took anonymity seriously to the point of seriously denying the existence of genius". And she continued: "all the art theories of the twenties tried desperately to prove that the excellent is the product of skill, craftsmanship, logic and the realization of the potentialities of the material. The mob, and not the elite, was charmed by the 'radiant power of fame' and accepted enthusiastically the genius idolatry of the late bourgeois world". Such a contraposition between elite and mob, between the late-bourgeois world and the revolutionary avant-gardes, between the cult of "genius" and the technical instance of impersonality and reduction is undoubtedly simple and suggestive. It somewhat helps us to understand the "political" fortune of the Bauhaus in the period after World War II – already initiated, and with full merit, by an exhibition in its own way admirable and decisive, which ensured the continuity, so to say "diasporic," of the Bauhaus legacy in the United States, entitled *Bauhaus, 1919-1928*, curated by Herbert Beyer, Walter and Ise Gropius at MoMA in 1938 (fig. 1) – when knowledge of the horrors perpetrated by the totalitarian dictatorships spread throughout the world and the school founded and directed for years by Gropius and closed, instead, by the Nazis, became a legitimate symbol of civic responsibility and democratic legality. The contraposition proposed by Arendt, if effective from ideological points of view is, however, scarcely plausible from a historical standpoint, especially if, in the context of the "first" and "second" Bauhaus, (periodization is important! because many things changed, at the Institute, after 1923) we consider the activity of painters such as Klee, Kandinsky and Itten.

Articolo a invito per inquadramento del tema del focus, non sottoposto a revisione anonima, pubblicato con responsabilità della direzione.

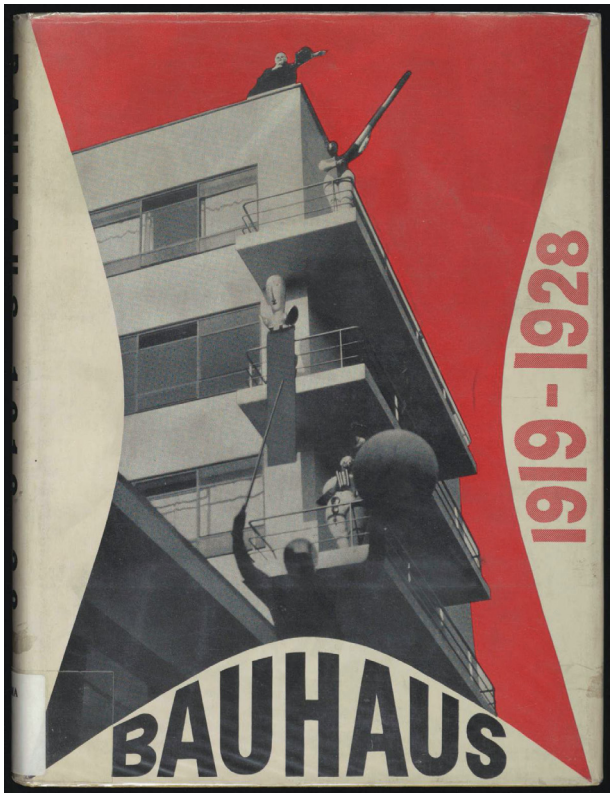


Fig. 1. "Bauhaus, 1919-1928", MoMA, New York, 1938, cover of the catalogue.

Which Bauhaus? A periodization

We shall start with periodization, then, which to us is useful for making a first clarification; and with the preeminence recognized to artists of "spiritual" tradition –we have just mentioned their names– in the Bauhaus of the origins. Itten has the greatest importance in this institutional and educational context. An expressionist and an expert on oriental religions, Itten showed great interest in the cult of what we might call the "living image". He was responsible for the Preliminary Course, and this means that he welcomed or oriented all the students who enrolled at the Bauhaus. In the catalogue of the New York exhibition *Bauhaus, 1919-1928*, mentioned above, we read that the importance of the Institute rested "on the courageous acceptance of the machine as an instrument worthy of the artist." This statement may seem surprising, if we consider Itten. An adept of Mazdeism, the ancient Iranian religion of those who profess faith in the teachings of Zoroaster, the Swiss artist strived at that time to propitiate the union between art and magic, aiming to awaken the "cosmic" or astral Self. This is what the "tactile" experimentations with the most different materials proposed to students in his class were intended for. Far from proposing an "abstract" or "materialistic" art, Itten pursued "spiritual" dimensions that had nothing to do with industrial design and the use of the machine. Quite the opposite: they moved from assumptions in many ways to the contrary. In proposing the image of himself (and of the artist in general) as a saint of the new religion, Itten appears to us, in part, an unorthodox and radical pupil of Kandinsky, who would arrive at the Bauhaus after him: and from Kandinsky he drew, in fact, his aversion to the most tumultuous and sensualistic pre-war avant-garde movements, such as the Italian Futurists (propagators of an "aesthetics of the machine") and the Expressionists of *Die Brücke*.
Klee's invitation by Gropius to join the Bauhaus belongs to this hyper-romantic and post-expressionist context, shaped by myths and orientations of religious origin of lesser or greater consistency and sincerity. One spoke, at the time, of "new gnosis". In the later years of war, starting in 1917, Klee benefited from a flattering notoriety in the "cosmic" circles of the Zurich Dada movement, among artist-intellectuals such as Hugo Ball, Hans Arp or Waldemar Jollos, for example, hostile to the war and in favor of a peaceful Europe, scattered, as if for a re-edition of the High Middle Ages, with small working communities of artists-monks, amanuenses and devout artisans. Our current knowledge of Klee, of his authentic works, of the printed texts published during his lifetime or released posthumously, and even more so of the correspondence, only in small part published, certainly does not allow us to portray Klee in the way he is often presented to us by the earliest critics-intellectuals and admirers, that is to say, in subtly promotional or oleographic terms, of the artist-child, of the oriental wise man mysteriously transplanted in Bavaria, of the Mystic reclining on his snow-white daisy. Klee is an artist full of anger and idiosyncrasy, reactive to the historical and social scene, irritable to the highest degree; at the same time able to outline new artistic and cultural scenarios, to temper the bitterness and the "nihilistic" destructiveness of his generation by painting images, in their own way irenic, of sylvan temples, flowers and magical hermits [Dantini 2018]. It was, however, the "cosmic" and initiatic fame, verging on monasticism, appre-

ciated by both Itten and the early Gropius, utopian and "expressionist," that brought Klee to the Bauhaus (his collaboration with the Institute began in January 1921): a fame that by then had spread throughout German-speaking countries, and was about to extend to Italy as well –thanks to *Valori Plastici,* the journal founded by Mario Broglio to which Carrà, Tavolato and the De Chirico brothers contributed– and which subjugated his first students. Neither Klee nor anyone else at the Bauhaus in that period had anything to object to in the notion of "genius," despite Arendt's opinion. Indeed, it was claimed for himself by Klee, who detested the artist-showman, always in search of praise, without intrinsic motivations and his own formal vigor; but he was careful not to throw out, together with the showman's bath water, the baby of the classic-romantic tradition. "Genius," therefore, yes, in his eyes, in the sense of rarity and election; and again yes, in the sense of a full right of the artist (who is *Meister* at the Bauhaus, that is, "master" in the Dürerian sense) to the deployment of imagination.
The arrival of Moholy Nagy in 1923 was bound to change things. Not only because of the easy and belligerent charm of the Hungarian-born artist which captured Gropius, but also because of the fact that the Institute was in a serious crisis and the openings to the world of industry and technical design promised to solve at least the most basic economic needs. Moreover, the aeronautical industry had just developed a technique for bending tubular steel that could be usefully employed in the manufacture of furniture; this, too, was an apparently contingent circumstance, but which gave great impetus, with the first projects for chairs and armchairs designed by Marcel Breuer as well as others, to the birth of a "second" Bauhaus.
Between 1923 and 1924, the relationship between the Bauhaus and several painters became stormy. Moholy-Nagy himself insisted on abandoning traditional techniques, destined, in his opinion, to produce a few objects of great cost for the individual luxury goods market; in favor of photography, cinema, architecture, more capable than the former of dealing with the demands of social transformation. Painting, sculpture, individual "charisma," clairvoyance, "genius": all this began to create problems, and the consequences were not long in coming. Itten, as we know, left the Bauhaus. For Klee, who in his letters to his wife Lily often wrote of his discomfort at the growing ideologicalization of the Institute's students and the iconoclasm of the "modernists," and for Kandinsky, who arrived in 1922, a difficult season was beginning, which saw them operating in the context of the Institute, but in a low-profile and not always recognized position. Lectures or short writings by Klee dating back to the period of the "second" Bauhaus reveal his anxiety: what really interested the artist, on every occasion, was to defend the need of "intuition" and imagination from practical purposes or rational procedures perceived as too constricting. His attitude was prudent and apologetic: he did not venture into frontal confrontation, instead he cultivated a moderate position in attempting to assimilate what, in Dada/Constructivist or functionalist research on new techniques and materials, could best suit his role of *Meister*, creator of symbols and "constructor" of visual enigmas.

A scrupulous and detached teacher

We have thus outlined the background against which Klee's teaching at the Bauhaus appears: we cannot cultivate, in its regard, "systematic" expectations or seek there, as done in the recent past, the luminous dogmatic certainty of early-Renaissance *Books* or *Treatises on Painting*. Klee does not venture into the regions of geometry confident of possessing the keys to Creation, nor does he study Nature with the intention of deciphering the hidden plan of the universe. His ambitions are more restrained, partly mediated by his familiarity with Goethe's studies of natural science, and partly marked by an almost crepuscular humor, and refer to even contingent needs. The didactic texts, which he himself collected between 1921 and 1922 under the title *Beiträge zur bildnerischen Formlehre* (*Contributions to a Pictorial Theory of Form*) (figs. 2, 3), some of which remain in the state of comments in notebooks or on loose pages, stem from observations and ideas jotted down or memorized in previous years, gone back to and modified several times by the artist during his years of teaching (in the past, all this was referred to as Klee's *Pädagogischer Nachlass*, or *Pedagogic Estate*). The editorial history of the *Pädagogischer Nachlass* is intricate, marked by vicissitudes [Eggelhöfer 2018]: for the Italian reader, it concludes with the publication of the two volumes of the *Teoria della Forma* e *della Figurazione* published by Feltrinelli, which reproduce the distortions of the German edition edited by Jürgen Spiller [Klee 1959-1970].
If we consult the Pädogischer Nahclass in its original form, possibly leafing through it online [1], here we find Klee intent, through countless, often very synthetic notes, sketches and "technical" drawings, on clarifying the principles of his activity, often transforming insights dating back to the *Blaue Reiter* years, if not earlier, into "didactics"; which certainly had not originally required to be transformed into rules or axioms. Let's make this clearer. The interest in the "pathologies" of

Fig. 2. Paul Klee, "Beiträge zur bildnerischen Formlehre", 1921-1922, cover, Zentrum Paul Klee, Berna.

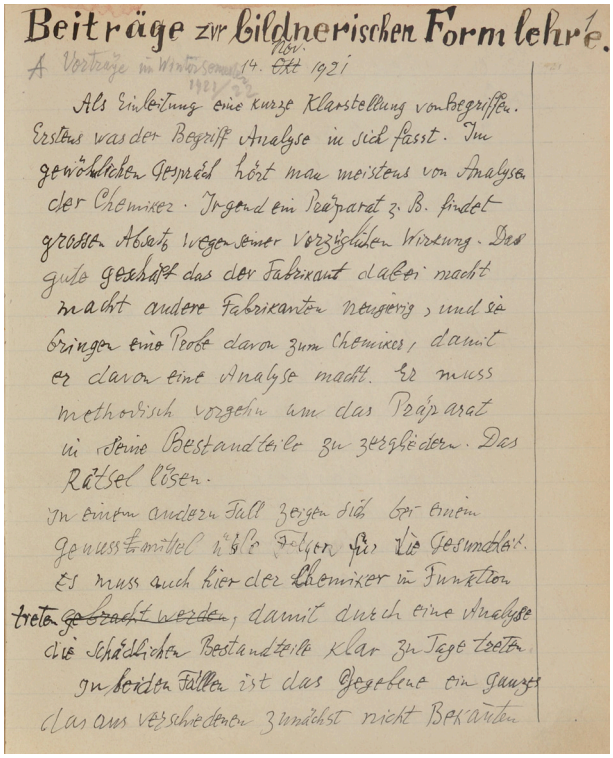


Fig. 3. Paul Klee, "Beiträge zur bildnerischen Formlehre", 1921-1922, introduction Zentrum Paul Klee, Berna.

form refers to the research on the propagation of light and the distortions of outlines dating back to the years of Klee's "post-impressionism", between the first and second decade of the twentieth century. The use of geometry for, shall we say, "metaphysical" purposes, to investigate the intimate constitution of a star or the "genesis" of a flower, refers instead to the Expressionist period and carries an infatuation for ancient German painters, Dürer among them, mediated by a few isolated and in part archaicizing figures of Romantics, such as Philipp Otto Runge. The geometrical realm, to whose lesson Klee makes continuous reference (figs. 4-6), provides ideas and compositional germs to combine from time to time and to animate, perhaps, in a figurative sense. Thus the world of colors, on whose reciprocal behavior, on whose rules of attraction and repulsion he does not cease to question himself, almost as though he were looking for a deep "colored bass note," that is, a "mechanics" of states of mind, to use in painting (figs. 7-9). The study of Nature, carried out on the dual levels of botanical and zoological morphology and of the elements (figs. 10, 11), engages Klee in targeted observation on a daily basis, clears the murky fumes of *décadence* –a risk, this, of melancholy, of abatement, of extinction, with which Klee measures himself on several occasions– and, again, provides repertoires from which the creative process can move effortlessly every day [Wind 2007, p. 84 e passim].

In Weimar, the artist was a colleague of motivated teachers, some of whom we have already mentioned. To Itten and

Fig. 4. Paul Klee, "Beiträge zur bildnerischen Formlehre", 1921-1922, didactic drawing, Zentrum Paul Klee, Berna.

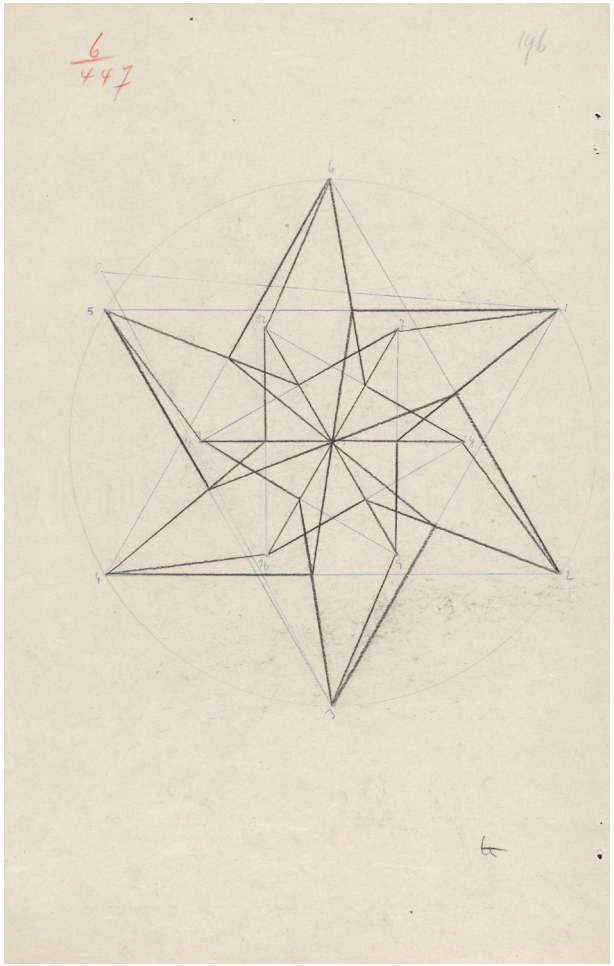
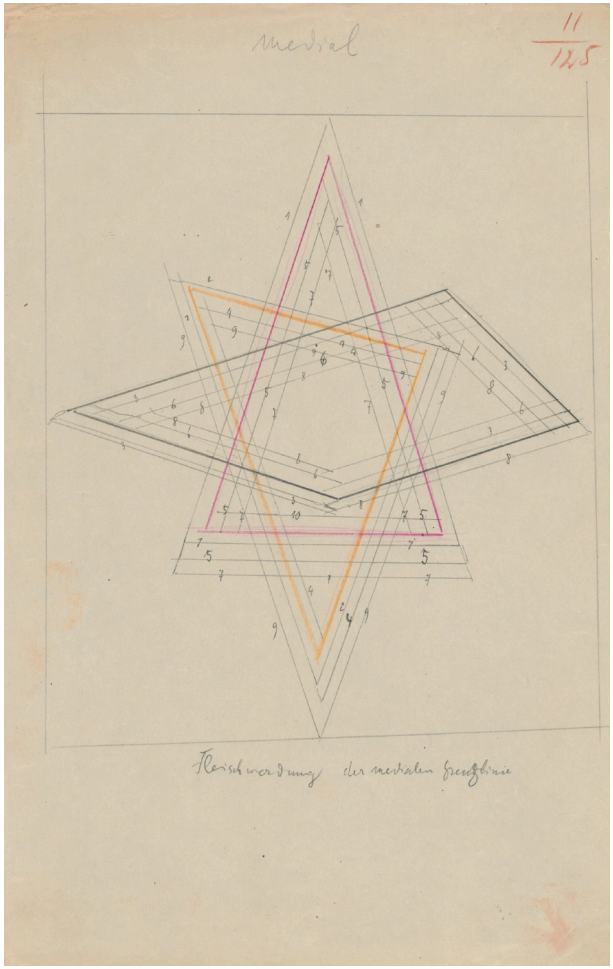


Fig. 5. Paul Klee, "Beiträge zur bildnerischen Formlehre", 1921-1922, didactic drawing, Zentrum Paul Klee, Berna.



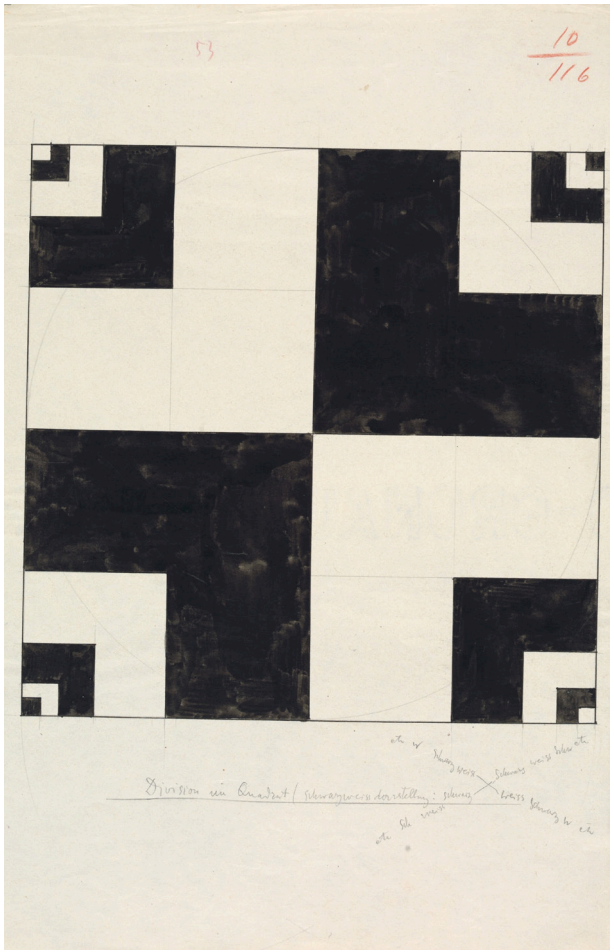


Fig. 6. Paul Klee, "Beiträge zur bildnerischen Formlehre", 1921-1922, didactic drawing, Zentrum Paul Klee, Berna.

Moholy-Nagy we now add Oskar Schlemmer. Klee's motives were more subtle. He doubted the public relevance of the *Meister* but approved the project of a community of craftsmen-artists. What's more, the teaching position brought economic security –Klee had only recently come to enjoy a certain celebrity: his income remained unstable– and the differences within the school did not worry him. He wrote to Gropius just after his arrival in Weimar: "I welcome the fact that forces so diversely inspired are working together at our Bauhaus. I approve of the conflict between them if its effect is evident. […] In general, there is no right or wrong, but the work lives and develops through the play of opposing forces just as in nature good and bad work together productively".
The artist was initially the head of the bookbinding workshop, then of the glass-painting atelier, where he had Josef Albers as his only pupil. His main activity consisted in theoretical teaching intended for students in the first and second semester. Klee gave his lectures by reading *ex cathedra* or led practical exercises held every other Monday. As already mentioned, over the years the Institute's teaching had increasingly taken on a technical and scientific character, to which the painters were forced to adapt. Klee enacted a prolonged, honest dissent. The teacher's dedication was beyond question; his courses, however, were distinguished by the absence of binding stylistic and formal indications: by characteristics that were, essentially, contrary to those considered exemplary in the 1950s and 1960s, when, among Grohmann and Giedion-Welcker, Spiller, Haftmann and Argan, he authoritatively became the systematic theorist of abstraction. "With Klee everything was indefinite" – remembers Gunta Stölzl, a pupil in Weimar, later director of the weaving workshop. "It was possible to draw [from his teaching] as much as one wished." The artist knew he was not lecturing to future expressionists but to industrial designers and adapted his teaching to his audience. It is easy to give examples of this. He left outside the classroom his deep-rooted interest in children's or psychiatric art, of little use in dealing with the theory of form and function, and multiplied the references to Nature, whose study he defined the conditio sine qua non of artistic education: sand dunes at the shore, the ribs of a leaf or the geometric structure of the cells of a beehive, he pointed out, are just some of the patterns that can be derived from the observation of organic or anorganic regularities. The way in which he articulated the formal elements of a representation, moreover, or dealt with the problem of the surface –"form," in his eyes, results from the conjunction of motif and "structure," the latter having qualities

of regularity and modularity– reflected his familiarity with the ornamental grammars of Owen Jones, William Morris and Walter Crane. Rarely did he offer free exercises of figuration, such as the inventions or botanical-biological caprices so frequent in his work, but instead alternated extremely elaborate formal analyses with striking and idiosyncratic statements, mostly "cosmic" in tone. Klee was a liberal pedagogue, keen to deny characteristics of universal validity to simple preferences in taste or stylistic conventions prevailing in a given historical period. His respect for the most individual aspects of the creative process was greatly appreciated by his students, who experienced, through him, the possible coexistence of solutions otherwise considered antithetical. "His formulation of problems," –recalls Helene Nonné-Schmidt, a student from the Dessau period– "often sounded like the formula of a mathematician or physicist, but we considered it pure poetry." He prepared his lectures carefully, educating young artists to a conscious and controlled use of the primary elements of figuration –line, color, surface– but he feared that the rationalization of intuitive processes would negatively affect creativity. He was concerned with awakening fantasy activity by establishing its primacy over theory and rational procedures. "The picture has no particular purpose", he warns, in flagrant disagreement with the functionalist guidelines. "It only has the purpose of making us happy. It should be something that preoccupies us, something we wish to see frequently and possess in the end". In the same period, in his activity, he used pre-industrial materials, being perturbed by the introduction of new industrial materials –glass, steel, Plexiglas– and accentuated the artisanal character of his compositions by manipulating the support – he applied, for example, paper on cardboard or fabric on canvas, often torn. He applied tempera or watercolor over an unpolished plaster primer and often painted over an already finished and rejected painting. In this way he preserved, beneath the final layer of color, a clandestine trace, a *graffito*.

Geometry, "construction" and mnemonics

The essentiality of "clairvoyance" is characteristically intertwined, in Klee, with the scrupulousness of the artist-scientist, respectful of the specificities of the different procedures. The antithesis between "construction" and "intuition", between "structural" and "individual" elements (or between geometry and imagination) is formulated in Klee in propaedeutic and never definitive terms. In his view, the spark of the "invention" is produced within a repeatable and controlled process

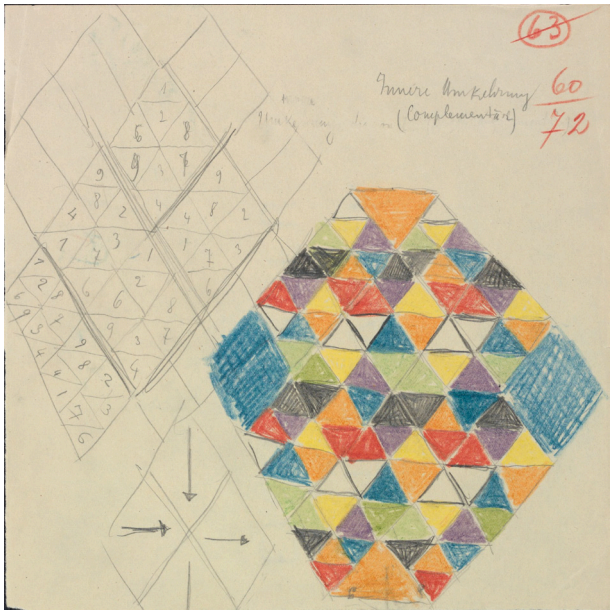


Fig. 7. Paul Klee, "Beiträge zur bildnerischen Formlehre", 1921-1922, didactic drawing, Zentrum Paul Klee, Berna.

of composition (or "figuration") in almost random circumstances. "In our time worlds are already open or are opening up before us […] into which it is not possible to enter with one's eyes alone," he confided to Lothar Schreyer, who visited him in his studio, late one evening, in Weimar. "You have to do rather like children, savages, the insane. I refer to the realm of the unborn and the dead: the realm of what can and must come, the intermediate realm." He added, however, as a warning: "imagination is the greatest danger for us all. It is the wrong way, the fatal way for the so-called artists […] for those who lack an inner reality and must thus employ, more or less consciously, illusion" [Schreyer 1956, p. 170].
It is worth dwelling on a single point. For Klee, it was the simplicity of the primary elements of "figuration" to distinguish contemporary art from art of the classical-Renaissance tradition. Here we are talking about a deliberate simplicity, certainly not a simplification attributable to external circumstances: we are talking about the refusal of imitative techniques. For the artist, however, it was not a question of abolishing figurative "illusion" *tout court* (to arrive at "ab-

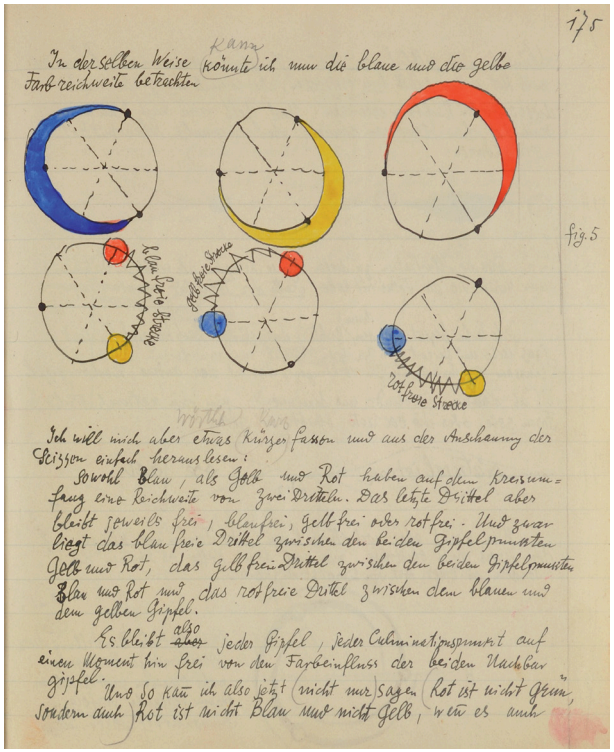


Fig. 8. Paul Klee, "Beiträge zur bildnerischen Formlehre", 1921-1922, didactic drawing, Zentrum Paul Klee, Berna.

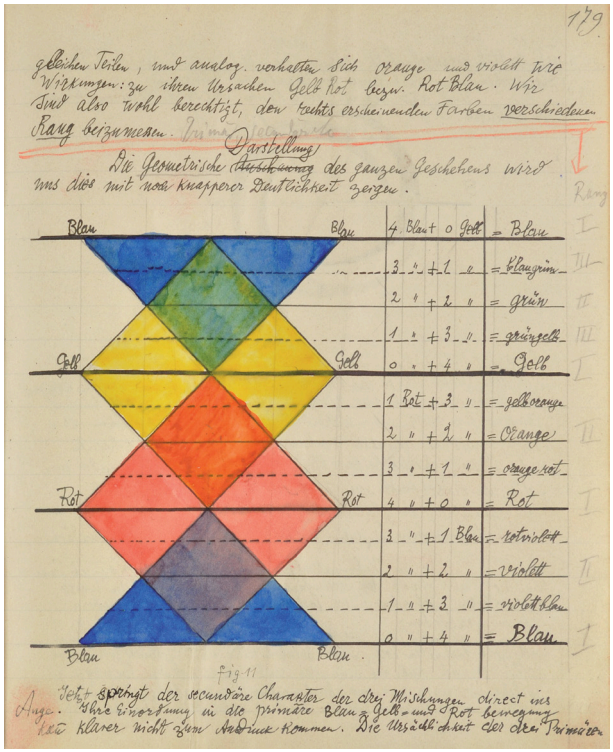


Fig. 9. Paul Klee, "Beiträge zur bildnerischen Formlehre", 1921-1922, didactic drawing, Zentrum Paul Klee, Berna.

stract" painting or sculpture) but of intimately joining illusion and the unmasking of illusion in every work. In other words: for Klee it was necessary to arrive at the "figure" with only the fundamental plastic elements –with reference to the picture: lines, surfaces, colors– without ever breaking away from the grammar of the plane or the surface. In *Exacte Versuche im Bereich der Kunst* (*Exact Experiments in the Realm of Art*, 1928), he exclaimed, "We should have to give assignments such as: construction of the secret. *Sancta ratio chaotica*!" During his lectures he often explained how, in him, fantasy activity followed (and did not precede!) the "compositional mechanics": that is, it was a precipitate. We understand that Klee was not far from conceiving the "construction" itself in terms of mnemonics: a technique therefore of "invention" by association and "projection." A more or less regular tracing of lines or the simple play of muted shades can act as a stimulant, awaken ghosts that have been waiting for ages in our imagination and bring forth "figures" (or if you prefer, favor "visitations") at first unforeseen [2].

To achieve the "figure" with only the fundamental plastic elements, as we said earlier. However, this expedient –or maxim or principle, if you prefer– restrictive in itself, allows a humorous variation that Klee developed with great inventiveness. That is, from his point of view, free "figuration" is allowed as long as the "models" used in the secret of his atelier are revealed. Here I am using a technical meaning of the term "models" and I am referring to those "models," recognizably artificial, on which artists traditionally rely when painting a picture or modeling a sculpture, in the absence of (or in substitution for) "flesh and bone" models: wood-

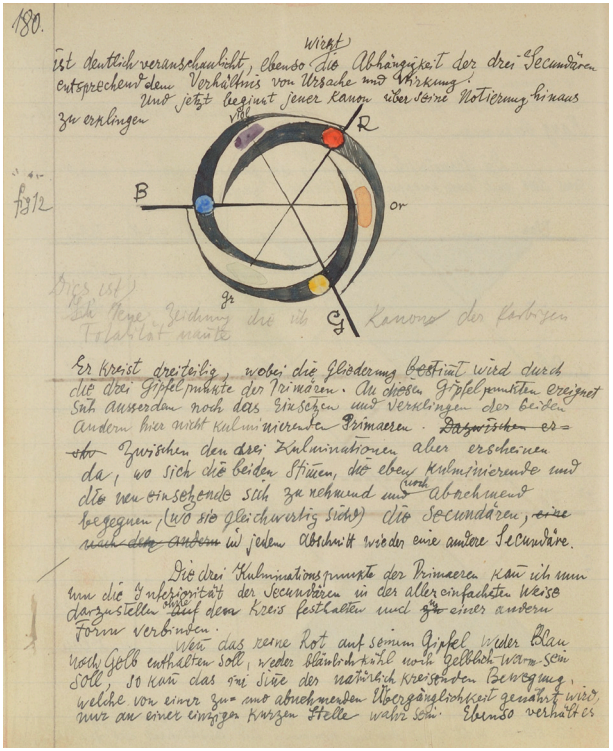


Fig. 10. Paul Klee, "Beiträge zur bildnerischen Formlehre", 1921-1922, didactic drawing, Zentrum Paul Klee, Berna.

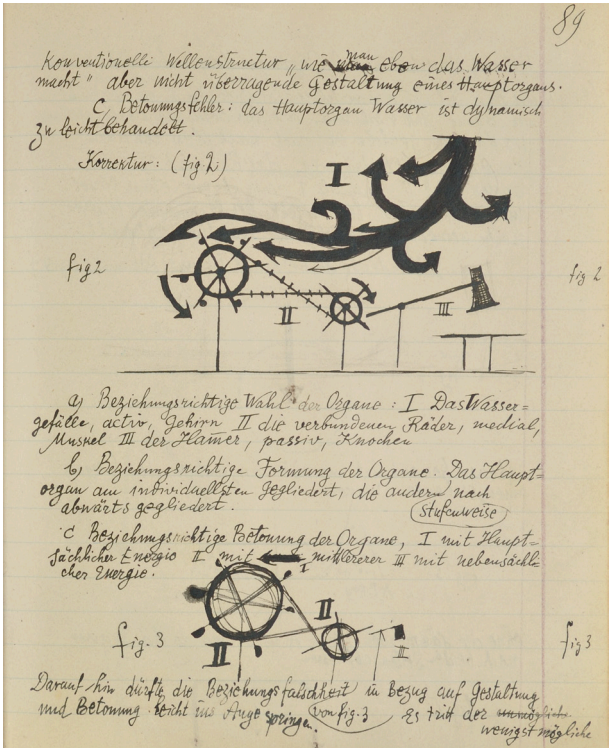


Fig. 11. Paul Klee, "Beiträge zur bildnerischen Formlehre", 1921-1922, didactic drawing, Zentrum Paul Klee, Berna.

en or wax mannequins, for example, but also prototypes made of paper, wire, fabric or other materials – of people, animals, houses, plants, trees, clouds, etc. Over the course of the 1920s, Klee displayed a wide array of alternative "models," often referring, in doing so, to forgotten segments of Western art history or to techniques considered "minor". In the rough draft of an essay written between 1923 and 1924, he himself compared the artist to a magician capable of evocations and spells (it is to a "magician", after all, that he was compared by the critic and author Wilhelm Hausenstein, one of the first to "discover" Klee and to launch his art in a "mystical" key in the immediate post-war period). The comparison between artist and magician, presumably suggested to him by his knowledge of Picasso and Braque's collages and, even more so, of their small assemblages in paper and other materials [3], is pertinent, even if referred to his own activity. With a few simple everyday materials and a fertile imagination, "illusion" is awakened, that is, effects of animation are created. Moreover, by way of greater force and bizarreness, the contemporary magician (and *bricoleur*) agrees to make the artifice transparent [4].

The previously mentioned *Exakte Versuche im Bereich der Kunst* is the essay to which Klee's fortune as a "theorist of abstract art" is linked: we can consider it the artist's greatest contribution to rationalism between the two World Wars. It appeared in the Bauhaus journal when the Institute, violently opposed by the right-wing opposition, had left Weimar and Thuringia to move to Dessau, at the invitation of a more hospitable social-democratic administration: a calm tone prevailed there, almost a proposal for conciliation. Klee

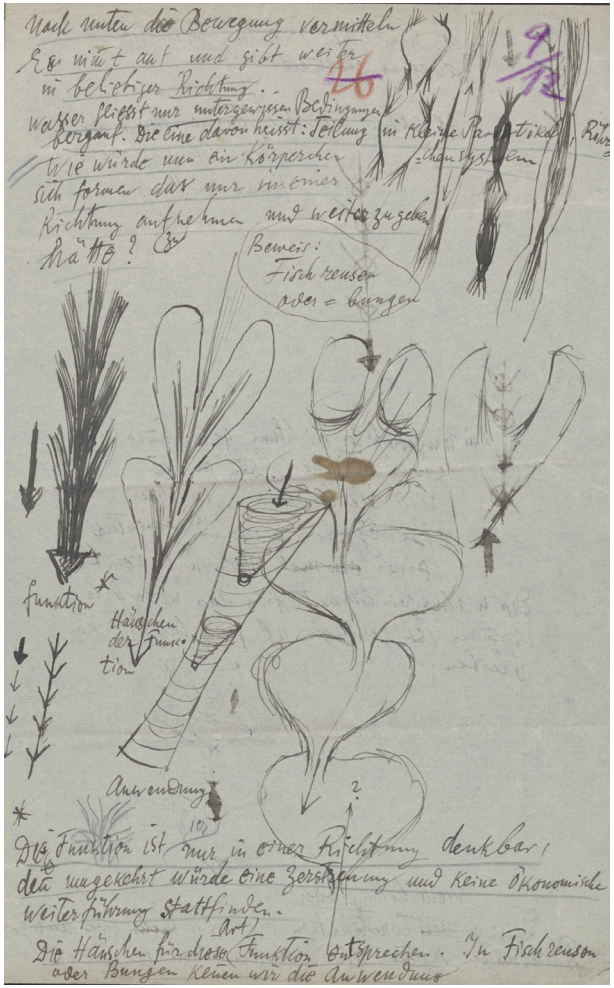


Fig. 12. Paul Klee, "Beiträge zur bildnerischen Formlehre", 1921-1922, didactic drawing, Zentrum Paul Klee, Berna.

attenuated the previously established contrast between "intuition" and "construction," leaning towards a balanced composition of the two. He allowed himself only sporadic moments of irritation, declaring "We construct and construct, and yet intuition still has its uses". In the same period, in his figurative activity, there emerged a growing attention to architectural design and technical-industrial design considered both as specific figurative genres. However, the terms of the relationship between art and "project" need to be better defined: in the eyes of the artist there was no equivalence. Let us consider for example *Denkmäler bei G.* ("Monuments at G.[iza]", 1929, 93), today conserved at the Metropolitan Museum in New York: executed in watercolor on his return from his trip to Egypt, this composition shows how Klee's adherence to "rational" aesthetics –even in the Dessau years– was contingent and paradoxical.

Between December and January, the artist visited Cairo, Luxor and Aswan and made excursions to Giza and Karnak, in the Valley of the Kings. The atmosphere was fascinating, the beauty of the landscape prevailed over the disillusions caused by the nascent mass tourism – "[in Egypt] tourists of all nationalities meet," he wrote to Lily, who remained in Bern. Then he added, with an annoyance that we would later learn to define as "Frankfurtese": "unfortunately [you meet] Americans too, the only ones who don't know how to behave". Again traveling by sea, enthralled by the elements, he asked himself: "what is the whole of history […] compared to this water, this sky, this light!" He studied the landscape from a geological, ethnographic and anthropological point of view. He was amazed that only "animals and servants […] as in the days of the pharaohs" worked and he carefully observed the ancient irrigation techniques. On the morning of December 26, 1928, he finally visited Giza and its famous pyramids. "They are located on relatively high ground. The air is extraordinarily healthy", he noted, with sober topographical-hygienic considerations typical of a rationalist architect. At the end of the trip, back in Germany, he painted four small watercolors with linear motifs worthy of a *peintre-voyageur*, then two of his most famous compositions, *Denkmäler bei G.* and *Hauptweg und Nebenwege* ("Main Street and Side Streets", 1929, 90), the latter dear to the musician Pierre Boulez.

Considered in "grammatical" terms, the view of Giza is a geometric composition. Klee makes use of the fundamental elements of figuration –line, surface, color– without ever detaching himself from the plane of representation and limits his range of colors to only five shades, the same that characterize the observed landscape: reddish-brown, green, yellow, ochre,

orange. Horizontal stripes running at almost identical distances cover the entire surface of the painting, divided into color modules, and generate "structure". The diagonal lines, on the other hand, produce discontinuity, that is "figures": they break the flow of the horizontal lines and outline the pyramids in a simple frontal view, like a silhouette. Scattered hints of vegetation visible along the lower edge are the only mimetic features of a composition that seems to show purity of construction and extraneousness to nature. With reference to the "static-dynamic" composition of the painting, what has already been established for the "cosmic" watercolors of 1922-23 is again valid here: Klee arranged the sequence of tones so as to produce effects of movement from the bottom upwards and to "dramatize" the view as a context of history and religion. In magically animating itself, *Denkmäler bei G.* offers movement and variation combined with the greatest regularity, with that "economy" of figurative means highly appreciated by the artist. At the same time, the temporal aspect of the painting, which reproduces within itself the sunrise and sunset on vertical planes, opens the "construction" to unexpected mythical-symbolic resonances [6].

Shortly before his trip to Egypt, Klee reflected on the possibilities of producing "wonder" in painting without resorting to chimerical motifs or literary tradition, exclusively through "optics." "Marvelous optical effects" –he noted in his pocket diary, mindful of the Cézannian passage technique– "result from the interruption of form due to the atmosphere." Favorable professional circumstances were not unrelated to this reflection. In November of 1925 he was invited to exhibit with the Surrealists at the first exhibition of the movement headed by André Breton at the Galerie Pierre in Paris, and his own work, from that date, entered into an artistic-cultural constellation established around proposals of "le *merveilleux*," the marvelous – the term is Breton's. Klee willingly welcomed the surrealist acclamation. However, he feared that the new figurative trends gave too much credit to the illustrative aspects of paintings. It was here that his search for the "marvelous" took optical-perceptive paths, in other words, physical; without conceding anything to the rhetoric of the "unconscious," of dreams or of "automatism." Was this an elegant way for Klee to belittle Parisian "fashions" and to reaffirm his own North-European identity, oriented towards the severity of geometric "construction"? It is reasonable to assume so. *Denkmäler bei G.* amazes thanks to simple compositional devices. First of all, the bird's eye view, which persuades the eye to follow, in its progressive perception, the movement of the sun. Secondly, "the interruption of contours," which causes the pyramids to open to the "atmospheric element." Thus it occurs that, by effect of "light" co-opted as a "structural" principle, the millenary constructions vibrate, distinct and weightless, against the background of the desert, similar to modern (Taut-Scheerbartian) crystal architectures; and the regularity of the composition, far from closing in on itself, takes on the unexpected semblances of an enigma, of an initiation.

Notes

[1] http://www.kleegestaltungslehre.zpk.org/ee/ZPK/Archiv/2011/01/25/00001/ (accessed 2020, 10 May).

[2] This is also suggested by Wilhelm Hausenstein, for whom Kleeian drawing is "reminiscence": Hausenstein 1921, p. 118.

[3] An immediate reference, for Klee, are presumably the sculptures in paper, newspaper, tinfoil, wood, wire mesh that Picasso created between 1912 and 1913, reproduced by Apollinaire in *Les Soirées de Paris* on 18 November 1913; and perhaps also the still lifes in painted wood and strips of fabric, also Picasso's, from the early months of 1914.

[4] In *Arte e Illusione* (*Art and Illusion*), a book that takes Klee as a constant reference, Gombrich comments: "the true miracle of the language of art is not that it allows the artist to create the illusion of reality. In the hands of a great master the image becomes transparent. Teaching us to see the visible world with new eyes, he gives us the illusion of looking into the invisible realms of the mind, if only we know, as Philostratus says, how to use our eyes": Gombrich 1965, p. 473.

[5] https://www.metmuseum.org/art/collection/search/483171 (accessed 2020, 10 May).

[6] From the painting It is not clear if we are in the presence of a sunrise or a sunset. It is possible that Klee wanted to create precisely this ambiguity. In *Vom kosmogonischen Eros* (*Of Cosmogonic Eros*) Klages compares the condition of the initiate to the "Dionysian intoxication" described by Nietzsche in the *Birth of Tragedy*. In doing so, he evokes the "contemporary voluptuousness of rising and setting, so voluptuous that death becomes a transformation both painful and happy […]. In the moment of eternity that the perfection of the erotic-cosmogonic experience unlocks, there is dionysian delirium or crystalline rapture". The reference to Klages' text also seems to explain the visual metaphor (or model) that Klee refers to in *Denkmäler bei G.* (*Monuments at G.*), created as an imitation of an electromagnetic field or floodgate device. "Eros is called cosmogonic or cosmic or elementary –writes Klages– because those who are seized by it feel themselves as if crossed by vibrations and flooded by an electric current which, similar in essence to magnetism […] transforms the very means of every activity, the space and time that separate bodies, into the omnipresent element of an Ocean that supports and surrounds them with its waters: and thus joins, without harm for their irreducible diversity, the *poles of the world*": Klages 2012, p. 51; with modifications.

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Imagine the 'Reconstruction'. A Small Manual on the Public Housing

Francesco Maggio, Stefano Dell'Aria

Abstract

This study, starting from the unpublished graphic transcriptions of Giuseppe Vaccaro, subsequently published by Francesco Moschini in the volume "La casa di serie. Appunti sull'abitazione 1940-1942", intends to trace the elements of a part of the design thinking that pervades rationalism and finds its strong expression in the form of the 'scheme'. The short manuscript of the Bolognese architect is a real manual on the mass production houses written between 1940 and 1942 when he was called to participate in military actions during the second World War. The text, the schemes and the drawings elaborated by the Bolognese architect on the one hand not only seem to anticipate the housing crisis that would have occurred at the end of the conflict, but on the other they highlight its imaginative power held firm both by the careful knowledge of the manuals and from the existenzminimum themes.
The representations accompanying the manuscript represent an imaginative and prefigurative path of the future that would materialize shortly thereafter, tackled by Vaccaro in a different way as regards the building typology but not for the studies on the accommodations that are affected, in an evident way, of the previous analysis of Alexander Klein and Enrico Agostino Griffini.

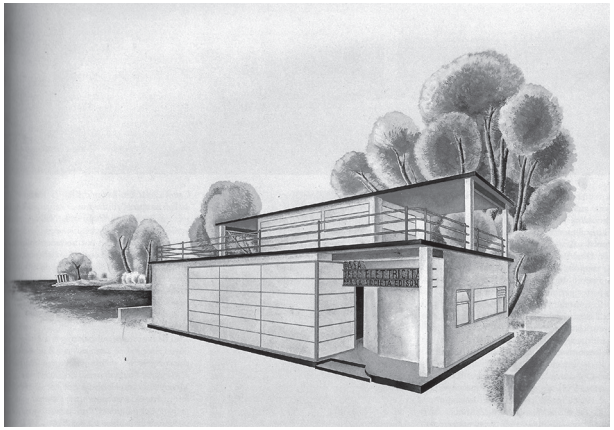
Keywords: project, scheme, imagination, history, existenzminimum.

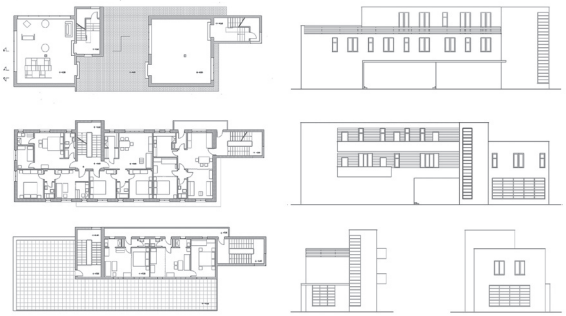
Introduction

In 1982, Francesco Moschini organized an exhibition at the A.AM./COOP in Rome, also publishing the relative catalog, in which he exhibited the manuscript and related drawings by Giuseppe Vaccaro about his studies on the house theme. The small volume is what remains of the Bolognese architect's studies drawn up during his forced exile at the front and is the only source for the development of some considerations regarding an investigation into a topic related to the themes of post-war reconstruction.
Giuseppe Vaccaro with his manuscript marks an important step in his professional career and, although the definition of the study has never reached a definitive drafting, it represents an accomplished and in-depth intervention on the theme of the public housing. By working towards this goal, he becomes part of two historical paths: the first, started in the early years of the century by the architects of the Modern Movement, which inspired by the themes of the *existenzminimum*, the home for all and the new post-industrial social contingencies, tries to give a new definition to the theme of the house; the second, in potential form, as a spokesman for the manuals that since the end of the nineteenth century in Italy had seen generations of architects trained in manuals that have gone down in history as educational reference points.
In fact, Vaccaro represents the figure of the architect who, observing the social contingencies in which he lives, cannot avoid using his knowledge to design houses that would overcome the vast problems that Italy faced in the mid-1940s,

Fig. 1. L. Figini, G. Pollini. The electric house. Watercolor perspective (Maggio, Villa 2008, fig. 531, p. 178).

Fig. 2. P. Bottoni. Group of elements of public housing (elab. Francesco Maggio).





such as urbanization of the population and, especially in the Italian case, the need for housing due to reconstruction after the conflict.
To better understand Vaccaro's *modus operandi*, it is appropriate to investigate the influences that rationalism had on manuals "the manuals, which, stimulated and influenced by rationalist research, were produced and published in the following years, before and after the second World War, characteristics substantially different from the classic manuals of the treaties; while the latter was a collection of paradigms and stylistic rules, post-rationalist manuals offer a systematic classification of the building types, the functions connected to them, the distribution schemes and the dimensions and characteristics of the equipments involved. The basis of these manuals is human being, the goal that 'human measure' sets itself; they start by reconnecting in this to the models of humanism, to the ideal man designed by Leonardo da Vinci, from the measurements of the human body and gradually provide the data on the clothing, furnishings, tools and machinery that man uses in carrying out his activities" [Baffa Rivolta, Rossari 1975, p. 39].
The first example of this current can be considered the one by Ernst Neufert, 1936, which was updated with subsequent editions and translated and published in various languages; it was inspired by the manuals of Mario Ridolfi and Irenio Diotallevi and Franco Marescotti.
The Modern Movement, throughout Europe, had already given concrete results, deepening the theme of the *existenzminimum* and standards with even apparently contrasting declinations.
In Italy the situation was strongly backward, on the one hand because the regime did not directly address the problem and on the other because the class of Italian architects seemed to be uninterested in the topic.
In reality, not everyone and not everything was silent; the themes of the house and of the *existenzminimum* were developed at the Milan Triennials starting from 1930. Interesting is the experimentation in the field of electrical services for housing inside the *Casa Elettrica* (fig. 1) presented at the Milanese exhibition from *Gruppo7*.
Three years later, on the occasion of the *V Triennale*, it is setted up the *House exhibition* in which the *Group of public housing elements* designed by Enrico Griffini, Eugenio Faludi and Piero Bottoni for the S. Siro district of Milan is presented (fig. 2).
Giuseppe Pagano was one of the few professionals who were interested in the matter and who in more writings in

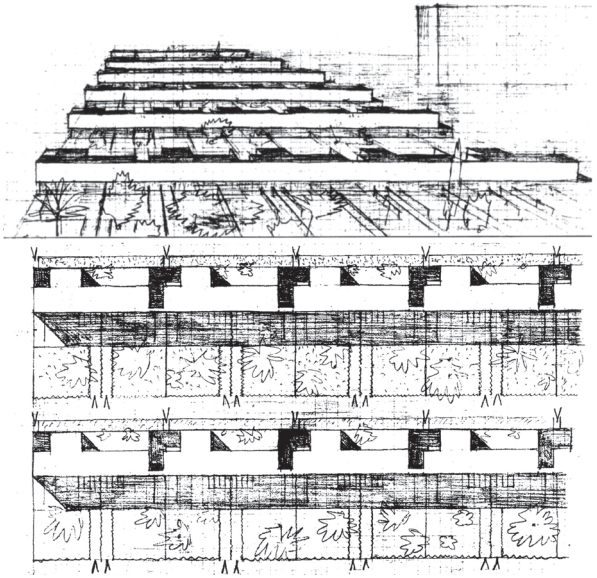
the pages of *Costruzioni-Casabella* is sensitive to the subject, and not least is the contribution of Giuseppe Samonà in making manifest the Italian situation comparatively to the European one in his book: *La casa popolare degni anni '30* [Samonà 1930].
The book, published in 1935, is proposed as an extensive overview of what happened in Europe on the theme of the public housing accompanied by numerous graphic and theoretical references. In it the author will be able to grasp, starting from the typological and architectural specificity of the various interventions, the relationship between the constructions and building policies in the various countries by making a careful analysis of the Italian situation and finally proposing a paragraph dedicated to the studies of Alexander Klein [Baffa Rivolta, Rossari 1975], emblematic figure of the research on the public housing and link between many of the protagonists of this path. Parallel to these events it is useful to observe the contribution of those authors who, with the preparation of manuals aimed at the modern reinterpretation of the theme of building have introduced linguistically, theoretically and technically a new way of understanding architecture in Italy, providing a theoretical and graphic basis on which generations of architects will be trained later.

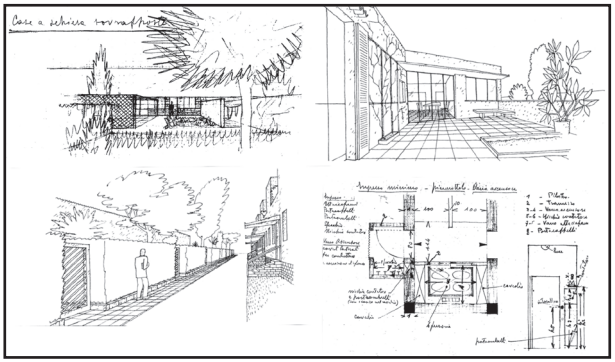
The public housing between the two World Wars. Brief history of manuals

There were three manuals published in the time segment defined by the two World Wars and which had a profound impact on the users of the time. The first is the manual by Enrico Griffini, *Costruzione razionale della casa*, published in 1931 [Griffini 1931]. The text contains extensive excerpts of Alexander Klein's works and research on the house but not yet widespread in Italy. "The merit of Griffini is having received a work, such as Klein's, which has remained marginal for a long time compared to the achievements of the rationalist movement in Europe, but which contains elements of profound novelty in the method of designing the residential building type. Klein introduces systematic elements for a rational assessment of housing qualities" [Guenzi 1993, p. 195]. In the manual the innovations introduced by the modern movement to the theme of the *existenzminimum* are documented, but the ability to grasp the differences that characterize the Italian contingencies compared to the European ones is missing, failing to analyze the question of the house in relation to the socio-political territorial issues.

Fig. 3. G. Vaccaro. Terraced houses. Plan and perspective sketch (Moschini 1982, figg. 2, 6, pp. 50, 52).

Fig. 4. G. Vaccaro. Terraced houses. Plan and perspective sketch (Moschini 1982, figg. 2, 6, pp. 50, 52).





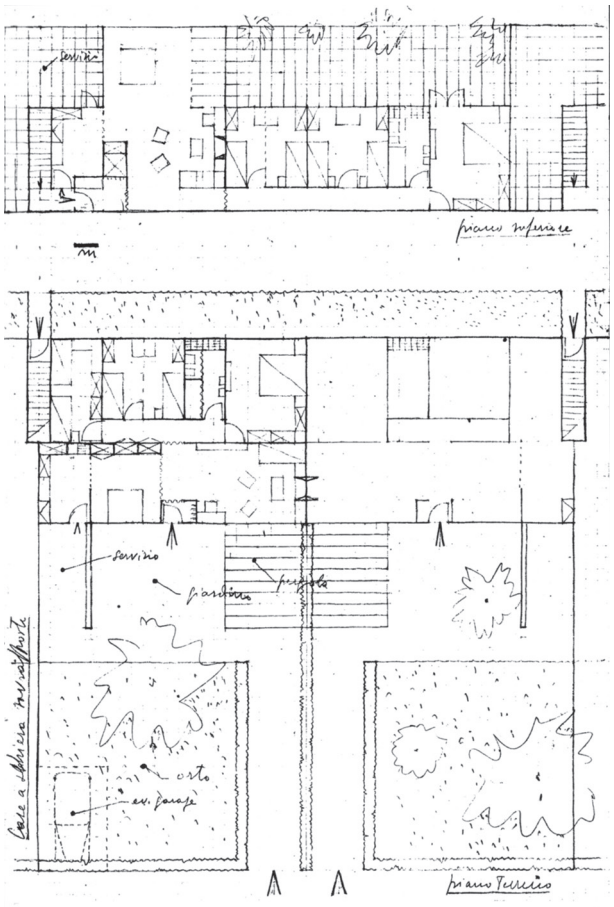


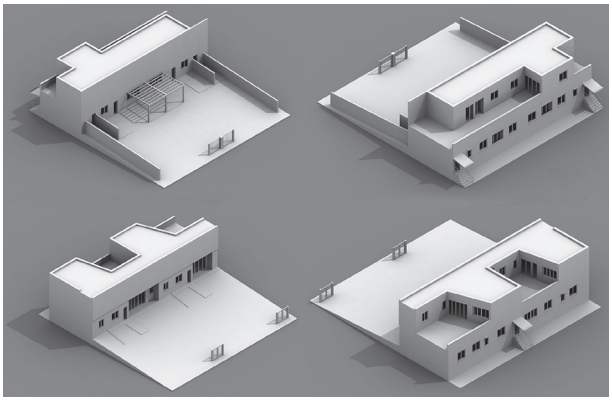
Fig. 5. G. Vaccaro. Terraced houses. Perspective sketch, perspectives and detail of the entrance (Moschini 1982, figg. 3, 9, 15, 16, pp. 50, 55, 60, 61).

Edoardo Persico in 1933 from the pages of *Critica letteraria* will negatively judge the group of public housing projects designed by Griffini and he will say that starting from petty bourgeois premises, he resolves everything in a series of stylistic compromises: "In Griffini's project […] the public housing is instead a bourgeois taste transition, extraneous to any real solution of the problem» [Guenzi1993, p. 197].
The second manual is that by Irenio Diotallevi and Franco Marescotti. They will produce, in the late 1940s, a series of very in-depth studies on the public housing first published in *Costruzioni-Casabella* and later collected in the volume *Ordine e destino della casa popolare* (1941). Starting from 1948 the volume will be published in a free cards format and titled as *Il problema sociale, costruttivo ed economico dell'abitazione* [Diotallevi, Marescotti 1948].
The two architects, aware that the rationalist movement had failed to show itself correctly in our country, try to present the rationalist method no longer as an aesthetic outcome but as something that extended to more different moments of the construction cycle. Within this perspective, the authors perform an enormous census, cataloging and analysis of European, especially German, projects, highlighting the great synergy, characterized by a scientific and professional system present within the decentralized policies of the regions which will find its theoretical peak in the Bauhaus of Dessau. The design intentionality of these analysis consists in showing the large scale as well as the construction detail.
Regarding public housing, some authors state: "We do not think that the character of public housing should only reside in economic factors… An house, in its immediate "order" expression, arises from moral and immutable needs, therefore , initially, the "social conditions" is neither a necessity nor a constraint: there are only initial distributive and collective issues, and their particular details may vary, which must maintain their character as an unitary solution" [Guenzi 1993, p. 204].
Among the most problematic aspects of social housing, Diotallevi and Marescotti underline sanitary conditions as the most important. Through social analysis, derived from the European progressive current, they highlight how precarious hygienic conditions influence people's life, and also mortality, relating how the accommodation, or better, the domestic condition linked to it, influences the social characteristics of a community. No less important is the study of the urbanistic phenomenon and its relative overcrowding, criticized for its speculative principle of putting as much "human mass" as possible in limited sized areas.

According to the authors, the urbanistic phenomenon allows a programmatic plan view; aware of this, they dedicate a big part of their writings to social housing and their future perspectives. On the other hand, new possibilities were showing up in those years with the growing decision-making autonomy that the "*Istituti Autonomi per le Case Popolari*" were acquiring; those Institutes allowed more room for improvement, arising from the willingness to operate in much bigger lots for social housing project, compared to the past [Guenzi 1993, p. 206].
Last in chronological order is the *Manuale dell'Architetto* by Mario Ridolfi, compiled by the CNR in 1946. This is presented by the author as "an Architect's Manual which in limited space contains the greatest amount of information useful for planning [...] especially urgent in view of the vast program of work that awaits all the Italian construction workers in the reconstruction work" [Guenzi 1993, p. 216].
In the Manual, Ridolfi shows his previous experiences gained in contact with the German world and late rationalism, not only Breymann and Neufert, but the most in-depth experience in the field of Klein and Hilberseimer on public housing. The *Manual* is based on maximum practicality and clarity, it provides cards that favor the graphic aspect together with the use of tables and schemes in accordance with the new instances of representation then developed within the manuals linked to constructive empiricism in America. Developed with rationalist, organic and local Italian contributions, the Manual finds its validity precisely in being, as desired by its promoters, a useful tool and non-abstract guide in the process of rationalizing the building product also through the attempt to normalize many details constructive. The innovation that the Manual brings is in the rational and realistic control of the project in relation to the construction processes available suitably optimized. A concrete vision that interfaces with the reality of the construction site, a tool to guarantee procedures and techniques that can have immediate feedback.
After the great season of the manuals of the end of the 19th century, which was the moment of transition between historical treatises and modern manuals and which finds its best known and widespread implementation in the Italian Manuale dell'architetto by Daniele Donghi [Donghi 1905], they are positioned as bridges between the old and the new school.
Griffini's manual analyzes the problems posed by progress in the study of the home and tends to place itself in an anticipatory attitude towards the future of architecture. Diotal-

Fig. 6. G. Vaccaro. Terraced houses. Plans of the four types of lodging (Moschini 1982, figg. 11, 12, 13, 14, pp. 56, 57, 58, 59).

Fig. 7. G. Vaccaro. Terraced houses. Axonometrics (elab. Stefano Dell'Aria).



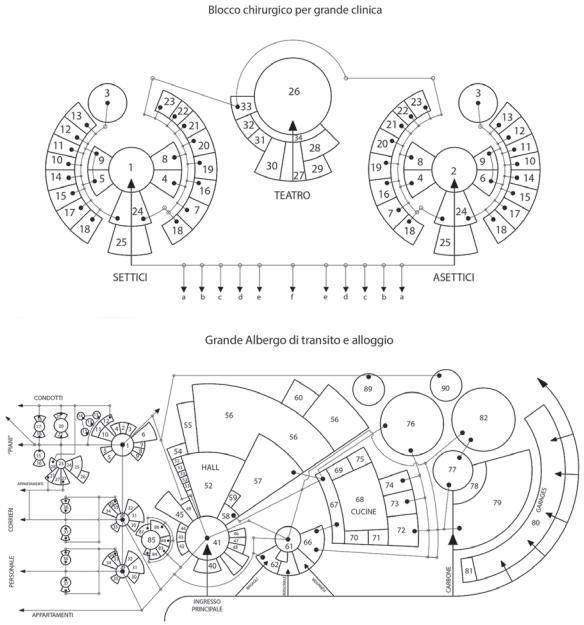


Fig. 8. G. Vaccaro. Diagrams for the planning (Vaccaro 1933, pp. 22, 46).

levi and Marescotti, on the other hand, have the advantage of setting in motion a colossal machine for cataloging and analyzing data, with the only flaw of establishing a very large database that tends to document technologies of limited use in our country; the opposite case is the Ridolfi manual which seeks to recompose the relationship between the project commitment and the experiences gained from our construction practice.

These manuals can organically be considered, within the Italian framework, three fundamental experiences for the development of the public housing in the post-war period, because they propose aspects and experiences that will transversally integrate the new visions of the themes elaborated between the two wars, from the point of theoretical, technical-constructive and graphic view. The common value that these publications have had is that of having formed a new *humus* of experiences and references capable of creating a new class of professionals who faced a new world changed by needs and necessities, and which found in the study of the house, from its urban size to that of the construction detail, an inevitable testbed for understanding the new dimensions of architecture. "[The] manuals, which, unlike the treatises, is based on a 'Theory of architectural design' and tends to constitute technical knowledge, capable of implementing and controlling construction practices. Just as the treatise uses significant analogies very often –and not only at its origins– so the manual, by exemplifying, shaping and offering a paradigmatic system, classifying and logically ordering its elements. […] a clear systematic logic is found in the latest manuals: that by Neufert and that by Ridolfi and that –beautiful– by Irenio Diotallevi and Franco Marescotti" [Ugo 1994, p. 151].

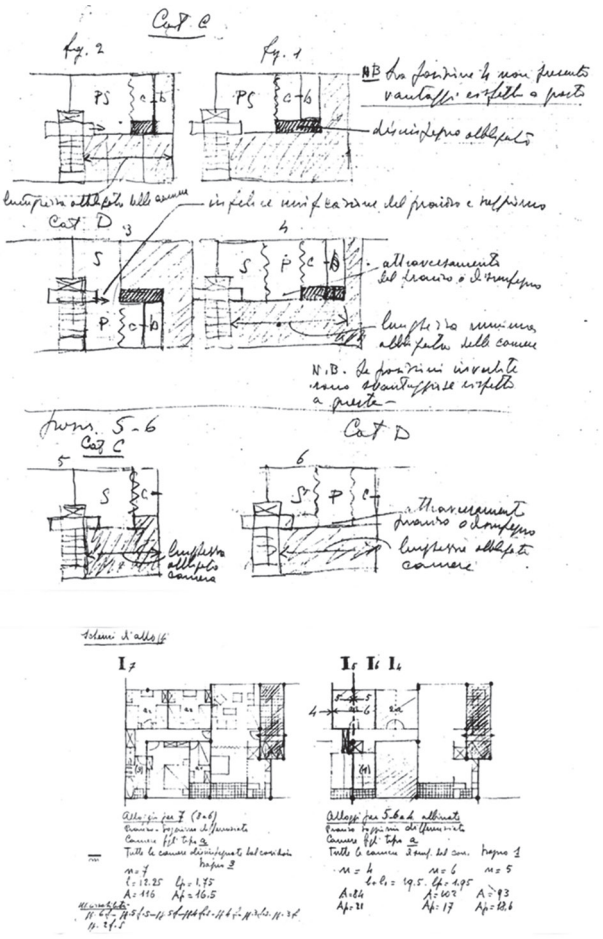
In short distance from Diotallevi-Marescotti's publications two writings by Adalberto Libera and Giuseppe Vaccaro were published in 1943. The first is *Per la carta della casa* in which the authors recognize the great value of the analytical work carried out by Ridolfi thus recognizing its educational value [Libera, Vaccaro 1943a, p. 12]; in it the analysis conducted by Libera on the home address, with a rich graphic production, every aspect of the problem: from the minimum scale of the fixtures and furnishings of the kitchen and bathroom to the planimetric schemes of the neighborhood unit. "Unlike his friend Libera, who between 1943 and 1945 will redirect his research with a ruthless act of removing past experience, in no condition Vaccaro reaches, in fact, 'to the point of forgetting architecture' just compare, in this regard, "the constellation of signs as depersonalized and objective

as possible' that characterize the typological studies of Libera with the clear image offered by the overlapping terraced houses […] rightly defined by Ponti as 'an architectural invention'" [Mulazzani 2002, p. 12].
The second essay published on *Architettura Italiana* with the title *Per un metodo nell'esame del problema della casa* [Libera, Vaccaro 1943b], reconnecting to the theme of the mass-produced house, investigates the technical and aesthetic aspects. Both texts are of great importance because they are fundamental in the approach to the theme of the public housing and because they highlight the backwardness of our country with regard to studies on residence, industrialization and series production, aiming for a precise method that goes from the analysis of functions to that of the elements of the accommodation. The two texts can be seen as a premise, or better as an integrative tool, for understanding the manuscript of Vaccaro *Studi d'abitazione. La casa di serie* [Moschini 1982]. In fact, among the personalities described so far, Vaccaro represents one of the most sensitive and attentive designers on the issues of the house; the notes elaborated on the housing problem, with the intention of publishing them after the conflict, are a profound reasoned reflection on the basis of what is described above.
Vaccaro, faithful to his pragmatic spirit, shows, in fact, very shrewd and far from idealistic naivete, well understanding the relationships that are established between politics and operators and within the latter group the inevitable need to distribute specific skills regarding the various aspects of the project. This vision cannot but be the natural conclusion of considerations made not only on the basis of one's personal experiences, but in them we can see the echo of European experiences most likely acquired also thanks to the contribution of the authors who made up the history of Italian manuals.

The manuscript of Giuseppe Vaccaro

The Bolognese architect's manuscript was drawn up between 1940 and 1942, but this cannot be defined exactly as the dating cause the time period is obtained from an annotation placed on the file, present in the Vaccaro archive, which contains the drawings.
It can be considered unique in the work of Vaccaro, an architect who was always reluctant to put the theoretical component of his business on black and white. Indeed, in this sense the manuscript must be interpreted differently; in fact,

Fig. 9. G. Vaccaro. Diagrams of the lodgings for the multi-storey building (Moschini 1982, figs. 18, 21, pp. 64, 66).



it does not present any aesthetic-conceptual orientation, nor does it use the style of the poster, but rather outlines itself as a proto-manual, thus remaining in line with Vaccaro's attitude towards the conception of the architectural problem divided between practical and aesthetic. The strategies found in it are probably the result of first-person experiences and theoretically acquired by the architect throughout the period of the 1930s, a decade in which he participated in the elaboration of PRG (general urban development plan) and the design of areas for public housing. Perhaps even more important, and certainly not to be overlooked in the formation of a thought on the theme of the mass production houses, are the years preceding the war, those of theoretical comparisons with Libera on the theme of the house; in fact they publish together *Per un metodo nell'esame del problema della casa* [Rossi 1989, p. 8].
This article fills the gap in Vaccaro's small manuscript by presenting a series of theoretical and programmatic reflections that find no place in the latter. In the article, the authors place firm points on their concept of mass production, arguing that it is necessary to evaluate and reorder all the experiences acquired and to know at that point to organize their exploitation. Under the guidance of the State, projects that aim at the highest quality based on the stage of studies achieved, studies carried out not by an elite of architects, but with a group of specialists ready to give their contribution both from the design point of view and from the implementation-industrial one; in practice, they propose a series of active figures for the realization of these projects in order to make their construction as speedy as possible in the now devastated post-war scenario. At the end of the article there is a reflection on the aesthetic problems arising from mass production: Vaccaro argues, in defense of this, that the accusations made by official culture to the average aesthetic quality of public housing is due to the fact that until then no one had dealt with the topic in depth. From a literary point of view, the manuscript is elaborated with an essential style and works in an attempt to reach concrete solutions without seeking the apology of the result, proposed as the most rational and coherent possible in relation to the problems faced; it is rarely propagandized in the terminology and in the emphasis, the treatment remains constantly adherent to the topics covered without granting disquisitions on collateral topics.
Giuseppe Vaccaro, giving concrete form to his thought, proposes in the manuscript a sort of garden city consisting of a parallel terraced houses system with four types of accommodation (fig. 3) and also, but not with the same depth, multi-floor buildings.
The representations contained in his notes are divided into clear and evident 'representative categories': sketches, diagrams, plans and detailed insights (figs. 4, 5).
Vaccaro completely omits the use of axonometry by referring the description of spatial intuition to perspective and orthogonal projection; this sort of renunciation is a constant in Vaccaro's work which allows us to glimpse the coherence of his training path characterized by the preference for forms of representation that most likely derive from his training.
Vaccaro's notes refer, from the beginning of the manuscript, to an evident and necessary industrialization understood as an "urgent necessity in which it is legitimate to see the possibility of a vast contribution to the diffusion in the masses of the benefits of civilization and social justice, and also the possibility of reaching in form a harmonious and true expression of our time" [Moschini 1982, p. 8]; further on, the Bolognese architect expresses the concept more clearly by specifying that "the unification of the types of elements implies the determination of the corresponding types of housing intended as 'assembly schemes' of the ele-

Fig. 10. Graphic elaboration of the concept of scheme (elab. Stefano Dell'Aria).

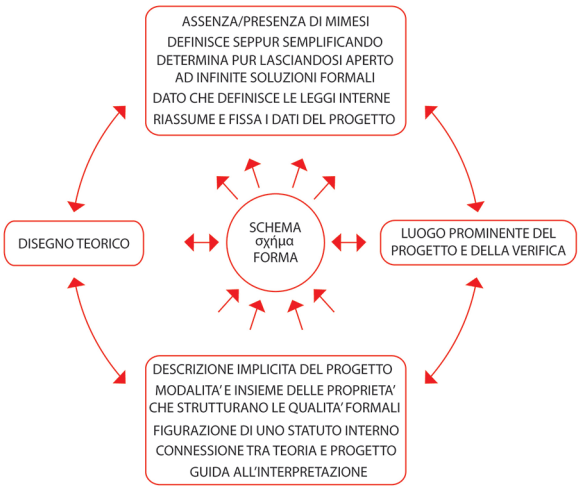
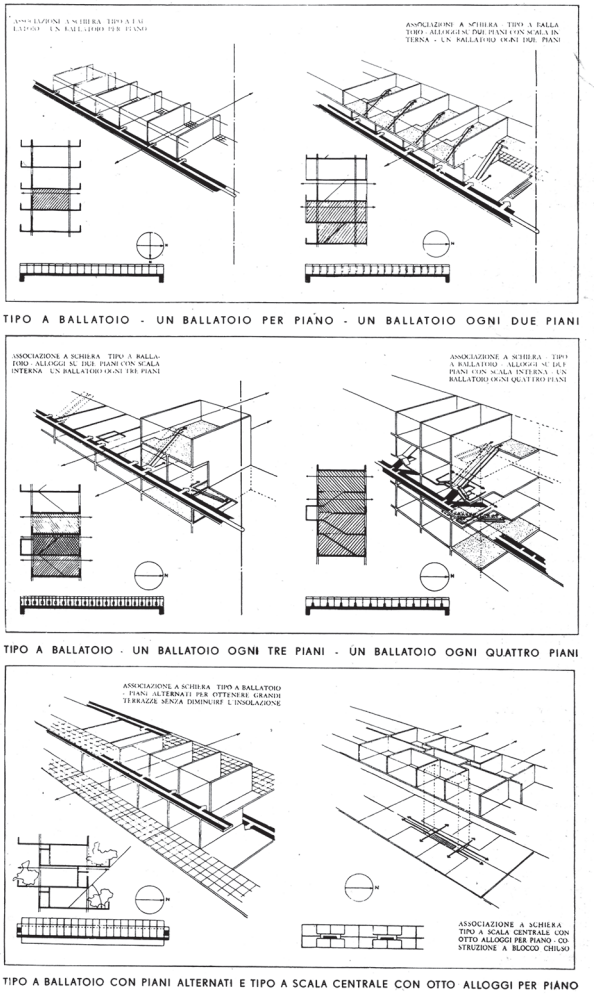


Fig. 11. Excerpt from a table by Alexander Klein (Guenzi 1981, Fig. 1, p. 193).

Fig. 12. I. Diotallevi and F. Marescotti. "Housing association". Plans, sections and perspective schemes of cell aggregation according to different solutions. (Guenzi 1981, Fig. 1, p. 203).



ments themselves. These 'assembly schemes' represent the 'complete mass production house'' [Moschini 1982, p. 9] (figs. 6, 7).

The scheme in Vaccaro's work

Giuseppe Vaccaro, a tireless author who is always directed to a pragmatic vision of designing, senses and develops in his personal design experience elements that will be proper to the cosmogony of the rationalist universe; elements constituting the basis of the thought and history of the movement such as the social housing, the *existenzminimum*, functionalism, mass production and manuals.
In the manuscript, attention it is devoted to a particular element of the paradigm of architectural culture, which in its contemporary graphics conceptual connotation is also a child of the rationalist culture. The ''scheme'', an element to which Vaccaro himself dedicates a small book in 1933, *Schemi distributivi di architettura*, in which this 'conceptual' representation is taken as an essential help and guide to the design: ''to summarize and fix in a synthetic and immediate form I perceive all those objective data of the project, which come from preliminary recognition in the special field of science and human practice that affects the particular building case; and also those data which –although coming from his personal science and experience– can be objected to as essential study cornerstones. A well-traced distribution scheme will make this choice technically safe, even among the imagination of the invention; which in turn can develop serenely without the constant concern of tracing some scattered practical constraint which it must also obey'' [Vaccaro 1933, p. 3] (fig. 8).
He is a supporter of this tool and it can also be clearly seen from the amount of diagrams present in the manuscript which are a significant part of the graphic section (fig. 9). In fact, in the small volume of 1933, Vaccaro wrote that thanks to the scheme the architectural solution will be: ''straightforward and harmonious of the problem; during the study of it, it is not the overwhelming a priori aesthetic synthesis (inevitable in any true artistic temperament), which mutilates –ahead of it– the functional integrity of the factory; nor the constant concern of tracing the parameters of this indispensable functionality, to compromise that unity and freshness of the architectural creation that already characterized the masters' work. Sometimes the functional scheme –constituting an equal compendium of typical bu-

ilding needs– cannot be fully applied in the actual project; but it will then allow a safe and reasoned choice of renunciations, according to a clear hierarchy of the importance of the elements of the factory with respect to its financial and space economy" [Vaccaro 1933, p. 6]. Vaccaro underlines how the tool of the scheme is the result of contingent needs of the twentieth century, since the quantity of data, which has increased enormously compared to the past, is inevitably destined to a schematization in order to obtain 'rationality' and 'functionality'.
The Bolognese architect implies the importance that the scheme assumes in modern architectural culture, an importance that authors such as Vittorio Ugo not by chance relate precisely to Klein's studies and to the manuals between the two World Wars where the scheme «assumes its own autonomy and a significant role of mediation and synthesis between thinking and building» [Ugo 1994, p.108].
The word "schema", deriving from the Greek *σχήμα* [*skhèma*] and is one of the many possible words of the Greek language with which the word form [Ugo 1987] can be translated. This leads to interesting considerations as the scheme in this case underlies the image of the building; the concept of image is strongly connected to *mimesis* but nevertheless the scheme detaches itself by binding to the geometric-conceptual value of the form.
In agreement with Ugo's theoretical positions, the scheme is stripped of the functional aspect only by entering the 'implicit' description of the project; genetic material of the work itself, underlying aesthetic conjugation, potential and revealing of the origin of the project. In fact, the scheme is not assimilated to any of the canonical 'projective' representations, it does not attempt, through the codification of the graphic-projective language, to return the object's *mimesis,* but refers to a series of knowledge that are at the basis of the design. A scheme does not represent a particular building but all that structures it. It is a figuration of an internal statute that may not manifest itself if the study is of a purely theoretical-graphic nature or can manifest itself in infinite variations, as Vaccaro also suggests. "A design problem –even if determined in its objective data– is still a problem with infinite solutions. It will be the subjective (technical and artistic) interpretation of the distribution body summarized in the functional scheme, what will discriminate between the possible solutions" [Vaccaro 1933, p. 4]. The scheme represents a binary moment of the project: in the visualization it declares a reading code, a practical guide to interpretation. On the other hand, in the sphere of thought it is theoretically, if not philosophically, referring to the positions of thought in a concrete way with all its articulations and organizations. Thus defined, the scheme rose in the past century as an ideal instrument of the functionalist-rationalist school (figs. 10-12).
Thus ends, also with Vaccaro's work, the era of the example, of the only compilation presentation of projects in succession, of the scheme sought above the real data; the systematic use of the scheme revolutionizes the genesis of the project. It is no coincidence that Klein's theories and studies are largely based on the usefulness of the scheme as a useful tool for the designer, becoming a paradigm of the design method, the cornerstone of a theoretical system that is based by analogy precisely on the theoretical system which manifests itself in the graphing of the schemes. A position shared by Giuseppe Vaccaro who, in line with his professional character, senses its great practical utility for the purposes of the profession by arguing the advantages that the architect can obtain from his rational use during the design process.

Credits

While sharing the positions expressed in the article, the result of common elaborations, the paragraphs: Introduction, *The public housing between the two World Wars. Brief history of manuals,* and *The manuscript of Giuseppe Vaccaro* are to be attributed to Francesco Maggio, while the paragraph *The scheme in Vaccaro's work* is to be attributed to Stefano Dell'Aria.

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Between Drawing and Simulation: a Digital Reconstruction of the Project for the Civic Museums in Padua by Maurizio Sacripanti

Paolo Borin, Cosimo Monteleone, Rachele A. Bernardello, Angelo Gazzetta, Carlo Zanchetta

Abstract

Which is the value of unbuilt heritage? A key point is how configurative and technological meanings enable other structures. This seems interesting to describe and analyze unbuilt heritage, from the documents and drawings, exploiting digital tools which perform historical analysis within simulation environments. From the digital reconstruction of the work, which represents the digital clone of the building as it could be, it is possible to start a series of structural, lighting and fluid dynamics analyses to examine the work according to a process here named "Hypothetical Engineering".
This study deals with the digital reconstruction of the project designed by Maurizio Sacripanti for the Civic Museums in Padua. Each simulation studied the solutions as proposed by Sacripanti, which have been compared with past and coeval construction practices and standards, to demonstrate design originality, made it possible by Sacripanti's geometric skills.

Keywords: BIM, Sacripanti, Civic Museum, simulation, Hypothetical Engineering.

Introduction

"In Padua, I designed a museum by rethinking how museums were born and where artworks used to stand. An image of the Madonna was related to kneeling, to certain gestures […] however the visitor will enjoy it, because instead of seeing one work he can see 27 of them" [Sacripanti 2015, p. 82]

This study deals with the digital reconstruction of the project designed by Maurizio Sacripanti (1916-1996) for the Civic Museums in Padua. Although this project ranked first in the national competition, occurred in 1966, it has never been built because of the critics related to the costs, that such a bold architecture would have required. Since then, the project assumed the aura of a myth and, also for this reason, it has been scarcely explored [Albisinni, De Carlo 2011]. This study proposes a reasoned re-reading of this revolutionary work by means of different interpretations: linguistic, technical and performance [Gazzetta 2016]. The research was carried out through the critical examination of the project drawings, also comparing them with the Sacripanti's general production. In this sense, this study belongs to the Italian tradition in using representation to analyze a building geometrically and functionally [Sgrosso 2000; Docci, Chiavoni 2017]. In a second phase the information was summarized within a BIM model, as a useful tool for organizing knowledge.

In this study the BIM model is not just a database that associates information to geometries, but it embodies the starting point for a set of virtual simulations involving structure, lighting and insulating devices, thermal comfort conditions, to fully understand the actual value of the project.

Independence and Evolution in Sacripanti's Drawing

Many clues suggest that Sacripanti (1916-1996) was firmly convinced that the arts had a single purpose, indeed, he attended the artistic circles of Rome in the post-war period. In the Sixties he actively participated in the neo-avant-garde movement and he was even very attentive to the music experimented in the United States by John Cage (1912-1992). In those years Sacripanti had established friendly relations with the greatest protagonist of the Roman artistic scho-

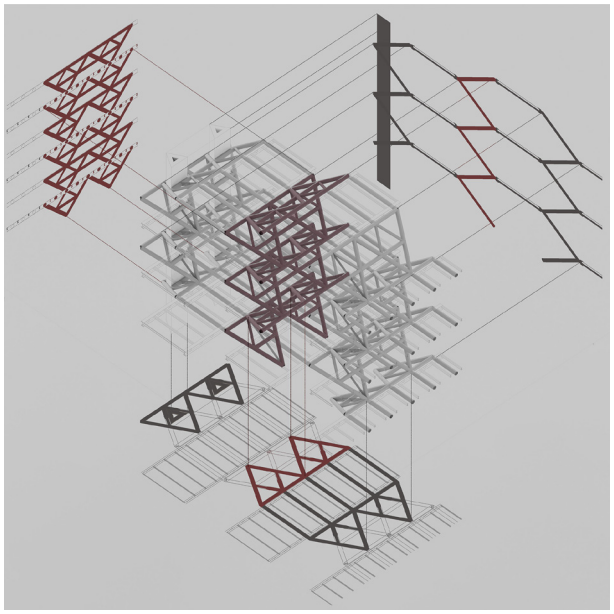
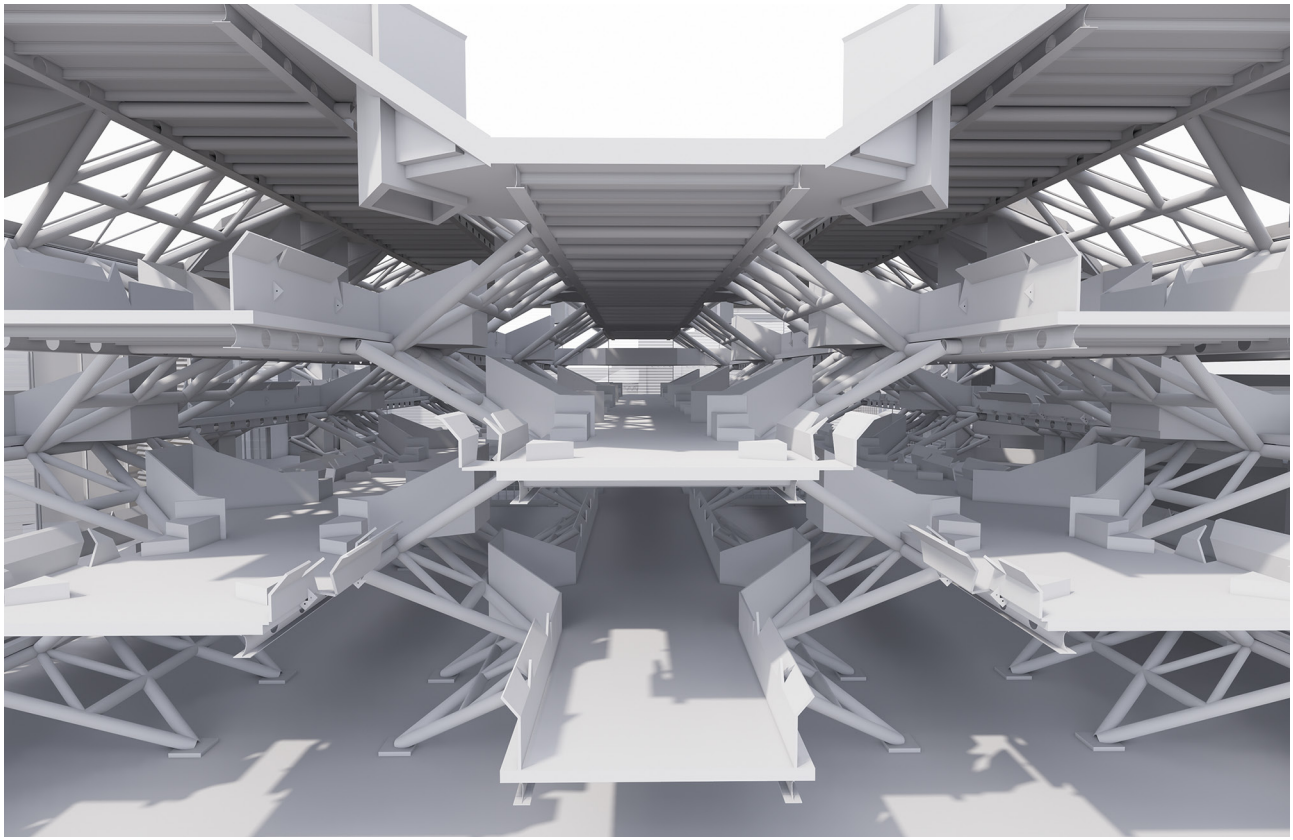


Fig. 1. Structural model: axonometric view of steel sloped abutment (Image by P. Borin).

ol, Mario Mafai (1902-1965), and with some other painters, such as Achille Perilli (1927) and Gastone Novelli (1925-1968). This brief biographical note is necessary to fully understand the primary and independent role that the Roman architect assigned to architectural drawing, intended as a tool to visualize the idea of a project.
In such a fluid and articulated artistic context, like the one that emerged in the capital in the middle of the last century, the drawings for the Eremitani museum in Padua stand out as a descriptive revolution brought into the Italian panorama of the time. The Eremitani museum is an architecture in which rationalist modularity is the basis of an *ars combinatoria* that regulates growth and evolution of the individual elements as well as of the whole. The drawings reveal a compositional procedure that orders the surfaces by repeating a lozenge-shaped module, whose translation generates a specific stratification of the graphic sign. Franco Purini, who in the Sixties began to collaborate with the master, has said Sacripanti's drawings would be interpreted not so much as a "substitute for realization, but as a parallel sphere in which his proposals lived a condition of active suspension, a condition in which they were, so to speak, present in the design culture as models that could be regained and modified" [Purini 2011, p. 36]. Therefore, the principal aim of Sacripanti's drawings for the Eremitani museum in Padua is to express at the same time a visionary attitude and a sense of strong concreteness. Indeed, his way of representing architecture has its own formal autonomy that brings his graphic expression closer to a work of art. The drawings for the Paduan museum express a precise idea, namely that the constructive audacity that the project requires to become reality is entirely possible.
On the role of architectural drawing Sacripanti has left a significant theoretical work entitled *The Pure Drawing and the Drawing of Architecture* that clarifies an aspect of his way of representing a little investigated by the critics, that is the relationship that exists between the evolution of the 'drawing skill' with the thought of architecture [Sacripanti 1953]. Indeed, with pioneering intuition he had understood in the middle of the last century –so long before the digital revolution– that drawing is not only a tool to represent architecture, but also a means of ex-

Fig. 2. Architectural model: cutout view of the exhibition spaces (Image by P. Borin).



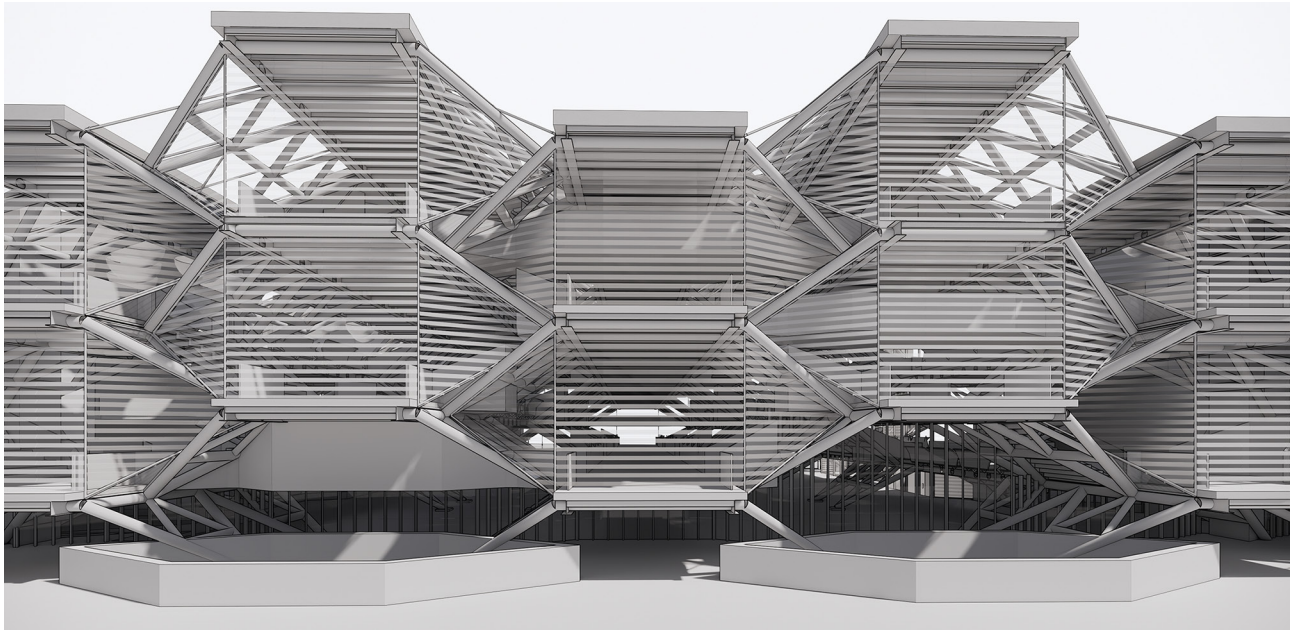


Fig. 3. Architectural model: view of the South façade (Image by P. Borin).

pression that changes over time, following historical evolution of technologies. For the Roman architect every representative technique, conceived in the evolutionary history, constitutes a different tool to represent and introduce new expressive grammars. It is in these terms that the following digital analyses must be interpreted, because the 'evolutionary times' are now mature to investigate a renewed virtual life donated to the project of the museum of the Eremitani of Padua.

BIM modeling of the Civic Museum in Padua

"Parts of elements will be prefabricated in the workshop, according to transport requirements, and assembled on site using bolted flange joints" [1]

The project for the Civic Museum in Padua represents a Sacripanti's general choice of realizing prefabrication-oriented buildings, already expressed in other design experiences. In accordance with this approach, structural BIM modelling aimed at first the definition of the components of the structure, as consecutive portals composed by trapezoidal sloping abutments, and latest the structural simulation (fig. 1). The study concerned the modeling of sub-parts of the abutments, evaluating their feasibility and transportability [Bernstein, Gudgel, Laquidara-Carr 2011]. By digitally constructing the pre-fabrication process, it was possible to define three solutions, different for the dimensions of sub-components to be welded off-site, number of bolted joints, estimating those on sight for aesthetic reasons, trips necessary to transfer prefabricated elements in construction site and auxiliary constructions useful for their assembly. In detail, a multicriterial analysis highlighted the effectiveness of a solution which minimize supporting structures.

Geometrically, the module is composed by five macro-elements: three tripods that form the main support and two V-shape elements necessary to complete the trapezoidal system. This constructive solution would have an obvious impact on the project costs and also it would influence the structural analysis.
For architectural purposes, the aim of this phase was to achieve an in-depth knowledge of the project, specifically in those issues that could have conditioned the building process. Indeed, the architectural model has made possible the study of vertical and inclined closures, floors, vertical connection such as stairs and ramps, the furniture for exhibition purposes (fig. 2). The design of the facades is a series of inclined surfaces, alternately upward and downward, respectively opaque and transparent, in order to avoid the direct solar radiation. The complexity of these elements should not be underestimated: while the façade at the conclusion of the "bridges" is vertical, some parts follow the geometry of the trapezoidal structure, making installation of the surfaces particularly difficult (fig. 3).
A second element of the design analysis was the furnishing system designed by Sacripanti, according to a "parametric" scheme based on folding components. These elements, becoming at the same time railings fulfill the aesthetic function changing the internal spaces, and the exhibition role as support of the art pieces. The case study allowed to construct a BIM library of Sacripanti's objects, as a replica of design drawings, in which seven wooden panels are described with triangular, rectangular or trapezoidal base. They are then assembled in three different configurations, thanks to hinges with triangular section: if the first guarantees the exposure of small objects, possibly becoming a seat, the second and the third are coupled with steel elements for the display of the artworks. Sacripanti completed the exhibition experience by diagrams as "*invasi adatti ai vari tipi di allestimento*". Each diagram consists of a set of the three configurations described above: it is sufficient to assign a quantity take off to each scheme to obtain the overall control of costs. In this sense, the BIM model replicates the computation method described by Sacripanti. Within the drawings for exhibitions setting, the designer specifies a potential ventilation system, choosing to integrate building elements. A steel square section distribution duct is anchored, thanks to steel flanges, to the HE400 longitudinal beams that connect the trapezoidal structure. In this case, the duct is rotated by 45° in order support, geometrically and statically, the triangular hinges of the parametric furniture system (figs 4, 5).

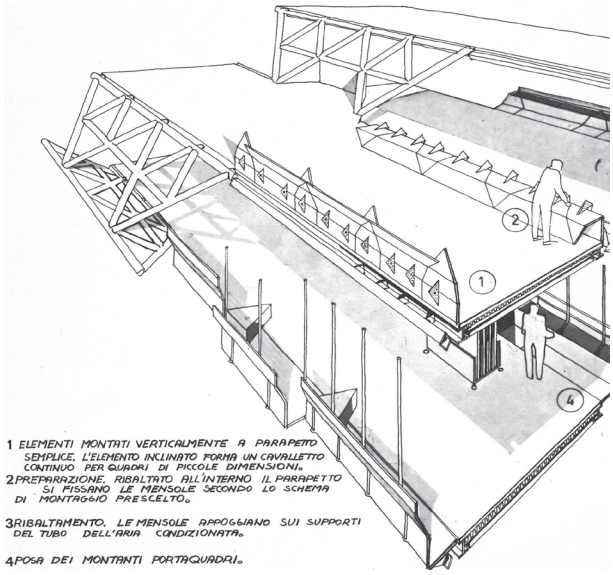


Fig. 4. Assembly of the wooden exhibition systems (Sacripanti 1973).

The evolution value of information modelling in the modular method to the design

The Sacripanti's design language, based on the reiteration of the integrated technological components, finds an ideal actualization, by the technological and methodological point of view, in an interdisciplinary information model translation that have the ability to highlight the technological limits of the propose and the organizational and implementation aspects that this underlines.
The project points a possible develop of a design language based on modular component with mutual

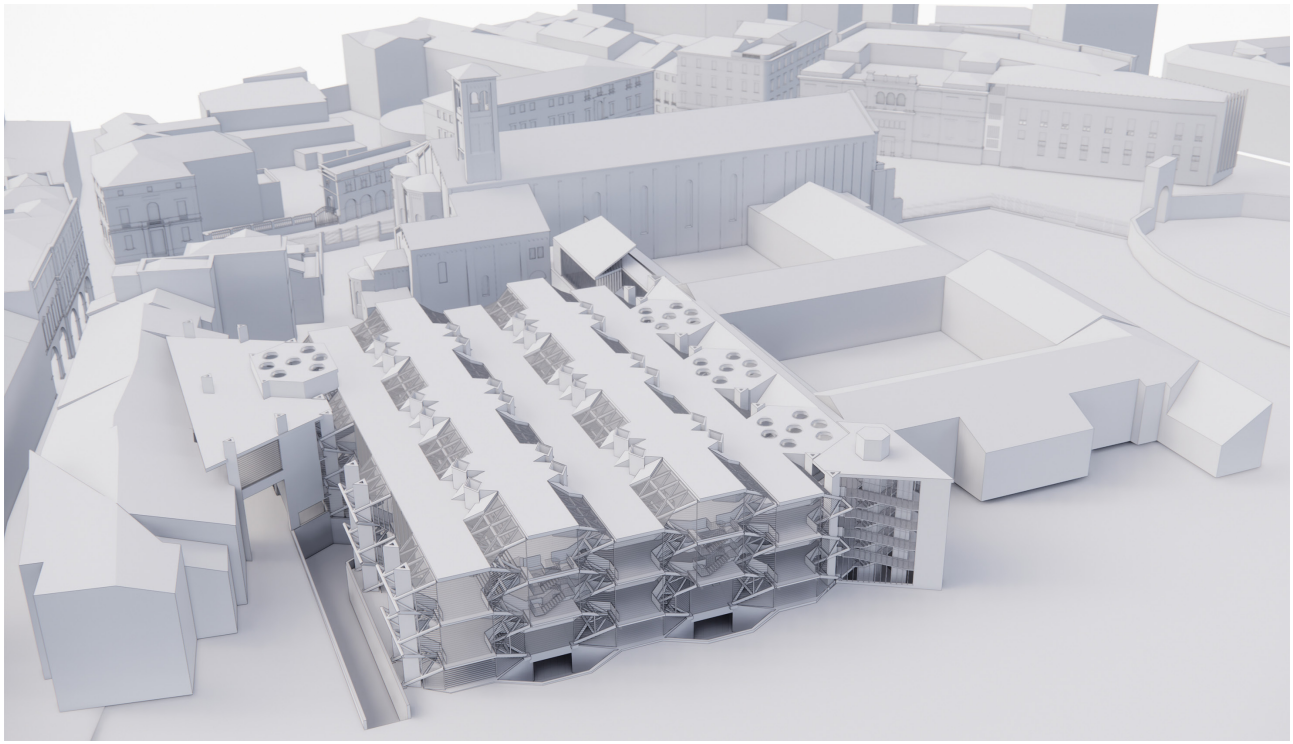


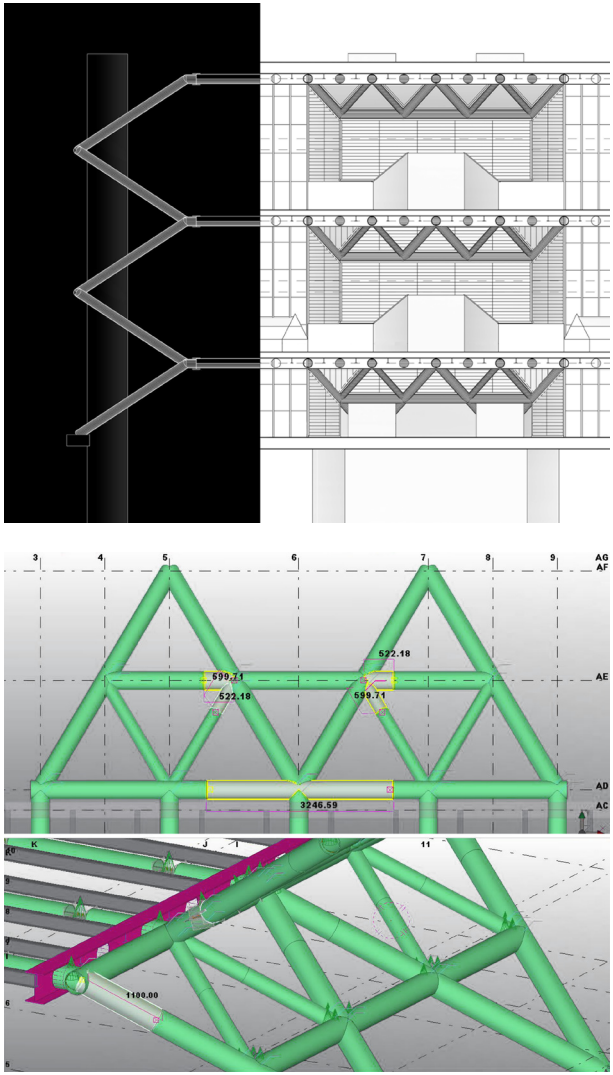
Fig. 5. Bird view of the urban landscape in Padua (Image by P. Borin).

behaviour, which enriches architecture rather than depleting it.
This operation, in addition to having a disciplinary historical value, allows to develop a reflection on the value of the prefabrication and modular design, as well as on the potentiality of the Building Information Modelling as an investigation instrument of the project.
The spread of BIM favoured the diffusion of prefabrication systems in the building process: since the BIM favoured an approach to design oriented directed to the definition of systems and subsystems, objects could easily assembly in prefabricated parts of work [Sacks, et al. 2011]
At the same time this leads the necessity to design in a sustainable way and with LEAN methodologies, adopting procedures to check performance and the quality of the process. Even if the main stakeholders which benefit from the implementation of this method are the building companies, the real purpose of this innovation is the achievement of a sort of custom prefabrication also named mass customization [Thuesen and Jonsson 2009]. This approach sees in the development of variable and variously integrated components the possibility of placing customized products on the market based on industry production, promoting better quality, cost reduction and a consequent greater marginality.
By favouring a design based on parametric models of technical elements, BIM significantly supports an approach of this type. [Nawari 2012] The parametricity of these components makes explicit the rules

that derive from their production [Singh, et al. 2015] allowing for customized modelling, but at the same time oriented towards standardization. [Van Nederveen, et al. 2009]
It is interesting to evaluate, through the informative modelling of Sacripanti's design, how its architectural language makes explicit the potential mentioned, in an era in which assisted design did not yet exist.
From this consideration connected to the methodology and operational instrumentation relating to precast-oriented projects, another more important assumption follows, namely that all the benefits brought by prefabrication can be enjoyed only if this is spread over the entire construction process. Ensuring the transfer of the project and the information system to the implementation phase means thinking through construction processes or implementing what MacLeamy calls Building Assembly Modeling or BAM [Thomas, et al. 2015]. This goal raises questions that address the current limits of interoperability in the construction sector operating on IFC by introducing the theme of the connection between BIM and Product Lifecycle Management (PLM) [Jeong et al. 2009]. Although IFC is a very rich scheme, it is not an appropriate format to transfer specific data related, for example, to the manufacturing sector. Moreover, facing the challenge of the information integration means thinking of information exchange standards between different platforms or, in legal terms, defining an IDM (Information Delivery Manual) that describes the component construction processes, to be able to regulate the integration processes information to the variation of the digital models that represent them.
These are the themes underlying the digitalization exercise of a radical project as Sacripanti's one. The availability of an information model has in fact made it possible to highlight some essential aspects of the architectural project in relation to its conformity and its buildability.
From the point of view of compliance, the availability of an interdisciplinary model allows us to understand how that type of architecture in that historical phase represented sometimes excessive challenges compared to the available knowledge to designers

Fig. 6. Longitudinal section. Assembly of beams and vertical elements highlighted (Image by A. Gazzetta).

Fig. 7. Structural model: hypotethical steel connections in Trimble Tekla (Image by A. Gazzetta).



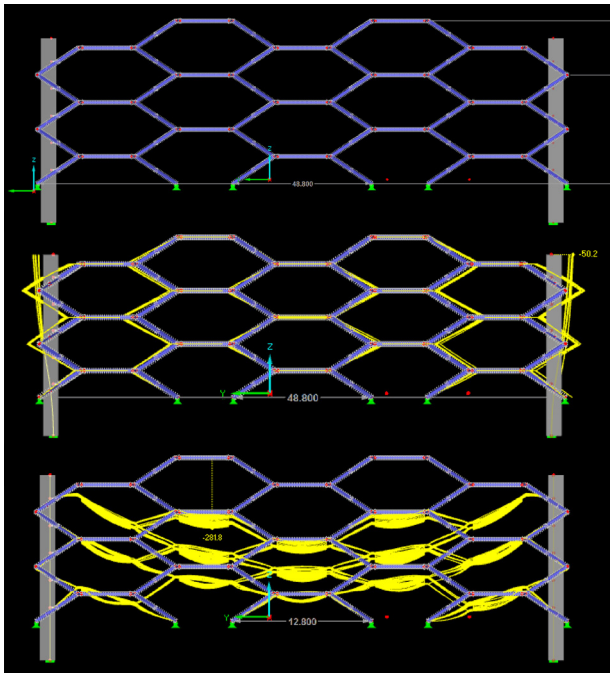


Fig. 8. Structural model: structural analysis model in Dlubal RFEM. Vertical and horizontal displacement (Image by A. Gazzetta).

and installers. In fact, the project exposes, in addition to the lighting and thermo-hygrometric limits highlighted in this article, also a problematic structural approach.
At the same time, in the constructability way, the definition of the assemblies and the respective interfaces determines technological issues that cannot be referred to the manufacturer since, precisely as a function of the definition of the technological interfaces, the design limits highlighted by the analysis are resolved on the compliance of the project.
The structure is thought as a series of identical reticular metal trestles superimposed on staggered modules. Each module unloads the weight, of the afferent deck, on four support points. The first deck is linked to the ground, while the levels above unload, in staggered floors, onto the lower levels. The pattern that is generated is that of a reciprocal structure in which the horizontal forces are gradually compensated by the presence of the underlying decks or by the perimeter buttresses (figs. 6, 7).
The structural analysis show that the proposed solution suffered from two substantial problems:
- the static scheme of the overlapping trestles highlights lability problems if the nodes of the single trestle were not designed to constitute a rigid internal constraint;
- the buttress system was not sufficient to limit the maximum displacement required by law (fig. 8).
Both the problems highlighted are answered in the production processes of the trestles as:
- the division into prefabricated segments allowed to resolve the internal lability by being able to act directly on the welded joints in order to create the node continuity;
- a subdivision into segments that placed a joint in correspondence with the catwalk - impost node would probably have prevented being able to correct the critical points previously highlighted.
Three possible solutions of simple components have been identified, intended as sub-modules that could compose the typical frame module respecting the design parameters (fig. 9):
- type 1: subdivision of the impost into flat segments of beams with horizontal development;
- type 2: subdivision of the trestle into segments which maintain the continuity of the node between the imposts and the deck;
- type 3: subdivision into jointed segments in the connection between the impost and the floor deck.
For the evaluation of the best type of assembly, it has been hypothesized to evaluate qualitatively on a scale from 0 to 3 the main characteristics that influence the design of prefabricated components. In addition, a weighing criterion was adopted that allowed to increase or decrease the constraint level of each parameter. It has been considered to adopt a coefficient 2 for exposed joints and for forecast structures.
A coefficient 1 was maintained for the number of trips, while a coefficient 0.5 was assumed for bolted joints. This type of proposal is taken in a qualitative way to allow for a scale of importance, of course the weighing could be varied according to the needs of the client, the designer or the manufacturer.

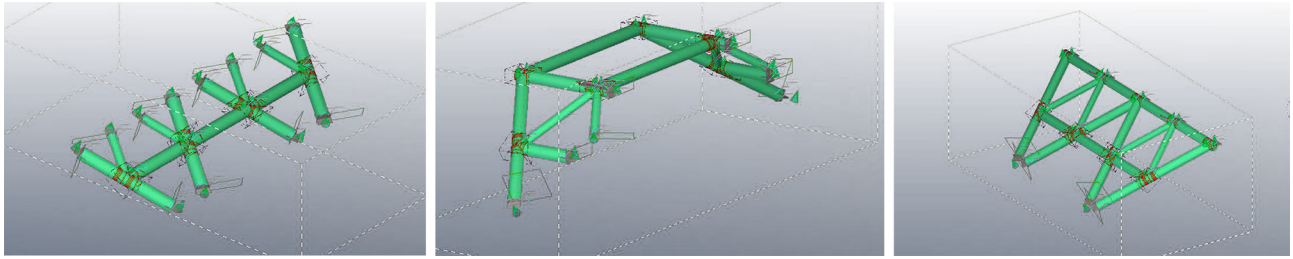


Fig. 9. Construction model: steel assembly hypothesis 1, 2, 3 (Image by A. Gazzetta).

Assembly	Type 1	Type 2	Type 3	Weight Criterion
# bolted joint	0	2	3	0,5
# trips	3	0	1	1
# forecast structures	1	3	0	2
# exposed joints	0	1	3	2
TOTAL weighed	5	9	8,5	

The best proposal for the structure assembling, according to this weighing method, is the second one, because it has the advantage of not needing forecasting works. There are also a few bolted joints to be fixed on site. It should be noted, however, that if in another way of weighing the aspect of the number of trips was considered more binding (especially given the important cost of exceptional transport, compared to the forecast works), the solution 3 would be the best one, but it would have exposed important criticalities in terms of the general static scheme.

MEP performances in the project of the Civic Museum

The design solution of Sacripanti for the project of a museum, raised some doubts regarding its feasibility, especially about the functional and MEP aspects. In the analysis of the project, a part was dedicated to the aspects that even then were critical, adopting the information modelling process that link the architectural, structural and MEP design to the possibility of simulating the performance of the building during its operating phase.
In the project of a museum and an archive it is important to find the balance between the thermal comfort and the energy reduction through the optimization of the HVAC systems, the conservation needs the interior comfort and the conservative standard [Karmann, Schiavon, Bauman 2017]. The implementation of lighting (fig. 10) and fluid-dynamics simulations for the civic museum project, inherent to the internal microclimate conditions, has allowed to increase the awareness of the project, starting also from the few available documents. Furthermore, the BIM project allows to face a second question, centrality today, related to the management of

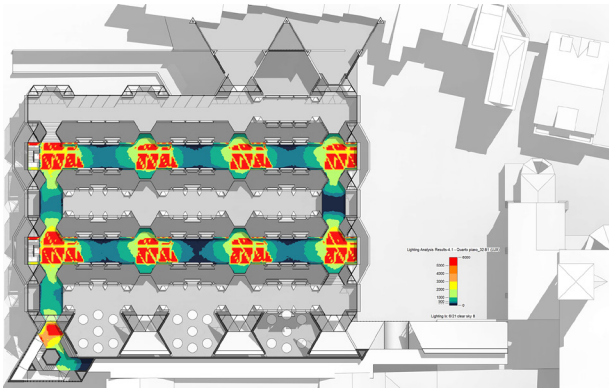


Fig. 10. Architectural model: cumulative illuminance analysis at summer solstice (level 4) (Image by R. A. Bernardello).

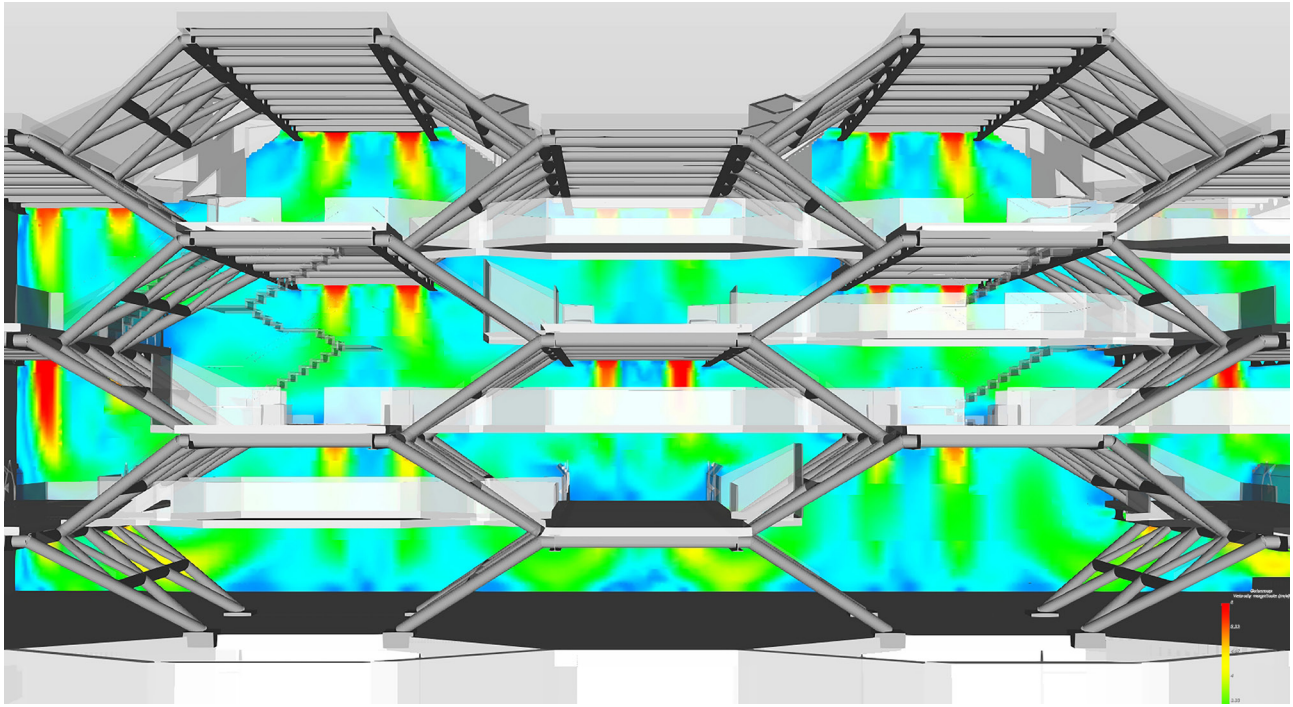


Fig. 11. CFD model (summer): cutout view. Airflow velocity (m/s) (Image by R. A. Bernardello).

the prefabricated MEP systems in the architectural project for complex building, to guarantee the performance described above.
The variation of the external environmental conditions, the age of the buildings, the number of visitors, the lighting are the main external factors that can influence the fast deterioration of the artworks in the museum. The main features of the building are significant to argue the two themes defined above. It is in fact a succession of linear spatial-functional elements, supported by a hexagonal "bridge" structural module, which are placed jointly in a single project environment. The use of large glass surfaces even inside, of which the designer was called to provide more details in a report about the adopted solutions, makes the MEP engineering solution even more critical [2].

The design requirements of an air conditioning and heating system and the use of materials were critically analysed, to make lighting and fluid-dynamics simulations more reliable, in particular for glazed surfaces (translucent double athermic glasses for ceiling skylight, horizontal opaque plastic strips facing upwards and alternating with transparent strips facing downwards, for the vertical walls), within the BIM process it was possible to exchange information between the two types of simulations by implementing the setting of parameters in the CFD analysis with the data obtained from the lighting simulations, in particular relating to the radiation on the ceiling skylights and the floor (figs. 11, 12).
The project of the MEP elements, the clash-detection, the computations of the elements and the preparation of the mechanical model, are some of the

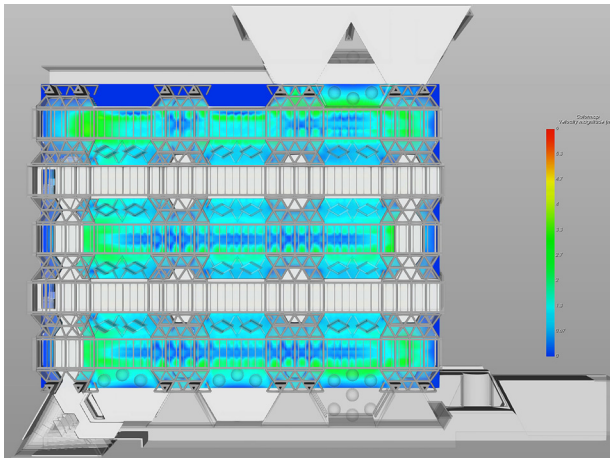


Fig. 12. CFD model (summer): plan (level 3). Airflow velocity (m/s) (Image by R. A. Bernardello).

actions that in a BIM approach would have been tested to guarantee the correct feasibility of the project. The evaluation of interior comfort conditions according to the system designed by Sacripanti, which included an air heating and cooling system, was implemented in the CFD environment. The inserted information and objects represented the starting element of the simulation, but it was useful to work on the project to assure the current standards of regulation and the correct performance of the MEP-system. The case study therefore envisaged the sizing of the operative parameters of the MEP-system, such as the air speed inside the pipes and the height of the rooms that effect the speed of air flow in the rooms.
The BIM model appears to be a useful environment in which the standardization of the MEP elements meets the architectural forms already in the design phase in order not to be a limit, but a tool to guarantee the optimal performance of the building, the interior comfort and the balance between functionality and economic resources' management.

Conclusions

This study is inspired by the "evolutionary theory" of the representation of architecture, formulated by Sacripanti in its theoretical work on drawing and actualizes, although only virtually, the unbuilt project Civic Museum in Padua. It highlighted an easy conversion of the project into BIM modelling, particularly the specification of its structural and spatial components and museum devices. The in-depth study of the first led to a specific design solution. On the other hand, some issues have been highlighted: thermal comfort is difficult to reach in a one-space solution, as well as achieving lighting and acoustic requirements of museum environments.

Credits
The introduction is written by Paolo Borin, the paragraph *Independence and Evolution in Sacripanti's Drawing* by Cosimo Monteleone, *BIM modeling of the Civic Museum in Padua* by Angelo Gazzetta and Paolo Borin, *The evolution value of information modelling in the modular method to the design* by Carlo Zanchetta and Angelo Gazzetta, *MEP performances in the project of the Civic Museum* by Rachele Angela Bernardello.

Notes

[1] AMCPd, Titolo 12, b. 229, *Relazione tecnica di progetto di Maurizio Sacripanti.*

[2] AGCPd, Fondo LL.PP. ex-Mazzonetto, serie 1 Edifici storici, piazze e monumenti, b. 5, Relazione Sacripanti ed allegati. Lettera Aerotecnica Marelli Milano 06/02/1968.

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Tra-visare.
Self-Portrait as Intentional Representation

Giovanna Ramaccini

Abstract

The proposed contribution investigates the topic of self-portrait, limiting the analysis to cases where the subject is represented within a reflective surface. The consecutive logical link, mirror-view-knowledge, is varied where the surveying subject coincides with the detected object and the mirror, at the same time an instrument of knowledge and communication, is represented by introducing specific characterizations to the surface in relation to the prefigured effect: distorted, distorted, misrepresented. Although the study is approached through interpretative keys proper to relief and representation, a horizontal approach is proposed at the same time, because opened to contaminations deriving from the fields of art and human sciences. In particular, starting from an introductory reflection aimed at framing also from a historical point of view the deep link between reflection and self-representation, the analysis focuses on some case studies selected from the history of representation. Finally, the contribution opens up to readings on the relationship between self-knowledge and the communication of one's own image in contemporary times, with specific reference to the spread of artificial intelligence.

Keywords: representation, interiority, knowledge, reflection, art.

Introduction

The news of the touching virtual encounter between a mother and the accurate holographic reconstruction of her missing daughter, broadcast by the South Korean television company MBC as part of the documentary *I met you*, has recently spread. Beyond the understandable ethical considerations, the story opens a reflection on the role of representation as a mnemonic support, where it, in its different technical declinations, through the introduction of a substitute image becomes the tool to deal with the loss (or fear of loss) of a loved one. In these terms, the contemporary story is similar to the well-known legendary story about the origins of the drawing narrated by Pliny the Elder during the Roman imperial age (fig. 1).

"Butades, a potter from Sicione, was the first to invent clay portraits, using nothing else but the earth itself, by his daughter, who, having taken love for a young man and having to leave him, in the light of a skylight outlined the shadow of his face on the wall and on these lines her father, having imprinted clay, made a model that he left to dry together with other terracotta objects and then baked them" [Ferri 2000, pp. 252-253].
The figure portrayed, of which Pliny the Elder speaks, obtained by circumscribing the projected shadow, is characterized by a fundamental aspect for the purposes of this contribution, namely the relationship of similarity with the subject represented. The model, in fact, in order to ensure the recognizability and to preserve the

Fig. 1. Left, I met you, 2019, frame. Right, Jean-Baptiste Regnault, L'origine de la peinture ou Dibutade dessinant, 1785, detail.

memory of the individual, must be as referable as possible to a given physiognomy [Magli 2016, pp. 129-130]. An aim more hardly achievable through the use of the word [Derrida 2015, pp. 67-70]. In this regard, in enunciating the item "Encyclopédie", Denis Diderot introduces the anecdote of a man who, driven by the desire to own the portrait of his lover, made a description of the latter as detailed as possible, breaking it down into a plurality of fragments. He then recorded the proportions of the head, the size of the forehead, eyes, nose and mouth and sent the same description to a hundred painters, asking them to translate it into an image on canvas. Finally, the client received the hundred works in which the individual details, although perfectly faithful to the description, were recomposed within a hundred portraits, all different from each other and all dissimilar from the face of the beloved woman [Diderot 1778, pp. 377-378].

It is well known how Platonic philosophical thought, starting from the famous cave myth in particular, gives rise to an "oculentric" culture, where cognitive activity is considered to be closely linked to visual activity [Stoichita 2015, pp. 22-23]. In this context, the passage from the world of appearances (illusion) to the world of the real (knowledge), is marked by a profound ambiguity about the cognitive value associated with shadow and reflection, whose mutual relationship, also because of the common evanescence and transience, has been a topic long debated in philosophical discussion. It is only in the passage dedicated to *mimesis* that Plato himself, uniting the image painted with the reflection on the mirror, introduces the latter in the context of "epiphenomenal representations". The mirror, therefore, is identified as the mimetic instrument par excellence, capable of reproducing everything (though only in the form of a copy) and comparable for its way of working to the imitative arts, with specific reference to painting. According to the Romanian historian Victor Stoichita, it is precisely from Plato's philosophical interpretation that "the work of art will bend to the demands of the mirror paradigm and the projection of the shadow will play only a marginal role. This does not mean, however, that the shadow will be completely eliminated from the arsenal of representation, but that it will be forever the poor relative of every reflection, the dark origin of every representation" [Stoichita 2015, p. 26].

The mirror, as a device of vision, or knowledge, is gradually associated with self observation. Diogenes Laertius tells how Socrates, in accordance with the motto "know thyself", invited young people to an educational practice consisting of aiming at the mirror, interpreting it as a true instrument of knowledge [Gambetta 2012, pp. 88-100].

Similarly, about five hundred years later, Seneca expresses itself in the following terms. "Mirrors were invented so that man might know himself, drawing many advantages for the future, first of all knowledge of himself, then useful suggestions for dealing with different

situations: if beautiful to avoid dishonourable actions; if ugly, to know that one must redeem with virtue all the shortcomings of the body; if young, so that in the blossom of age he might be warned that it is time to learn and to dare daring deeds; if old, to abandon all that is unsuitable for dogs, to think a little also about death. In view of these things nature has given us the opportunity to look back on ourselves" [Vottero 1989, I, 17, 4]. When at the beginning of the twentieth century the French psychoanalyst Jacques Lacan introduced the mirror stage, he underlined how this has to do in a particular way with the identification of the "I", associating instead the shadow with the identification of the "other". [Bazzanella 1998]. It is no coincidence that in the Plinian tale, in which the craftsman (the surveyor subject) and the model (the surveyed subject) are two different persons, the act of circumscribing the shadow leads to a figurative outcome that guarantees the similarity between the real image and the represented image and that the same technique, if used in the self-representation, as imagined by Giorgio Vasari (fig. 2), leads to an image without a visibly significant relationship with the represented subject. [Stoichita 2015, pp. 37-40].
Before going into the specifics of the topic, it seems appropriate to underline that this contribution, although developed through the interpretative keys of survey and representation, includes important contaminations from the world of art and the humanities. If only for the origin of the term itself. The term "self-portrait", in fact, was coined in the 19th century, that is, at the same time as the spread of psychoanalysis, in which the relationship between the individual and interiority takes on a central value [Gigante 2011, p. 274]. With respect to the use of the self-portrait as an instrument of analysis of the psyche, it seems appropriate to recall Franz Xaver Messerschmidt's character heads. They are sixty-nine busts that reproduce as many grimaces interpreted as reflections of the artist's moods (fig. 3). It is known that this is a series of variations of self-portraits recorded by the artist posing in front of a mirror [Sdegno 2017, Husslein-Arco 2013]. A process, that of the voluntary alteration of one's own face, only apparently ironic and reminiscent of Italo Calvino's exercises narrated in the story *The Mirror, the Target*, in which the protagonist lightens the responsibility of being himself with a series of grimaces made in front of the mirror through which he pretends to be other people [Calvino 2018].

Fig. 2. Giorgio Vasari, L'origine della pittura, Firenze 1573, detail.

Fig. 3. Matthias Rudolph Toma, Franz Xaver Messerschmidt: physiognomic busts, 1839, detail.

From self-drawing to self-withdrawing

According to the English journalist Elisabeth Day, the first image published with the hashtag #selfie would have appeared on the Flickr website in 2004 [Day 2013; Brooke 2014]. Since then, every year the social channels are flooded with hundreds of millions of digital images that record the author's face inside the screen of a smartphone. An extremely widespread practice that allows you to capture, edit and share images in seconds, subjecting them to uncontrolled media overexposure. Because of the relationship of equivalence with the author's face, the selfie is often associated with the more traditional self-portrait. Significant in this sense is the experience known as *Museum of Selfies*, born in 2014 from an idea of the Danish art director Olivia Muus, in which the hand and camera of a smartphone are turned in front of a series of portraits simulating that the subject of the painting is the author of a selfie [Borzello 2018, p. 231-232] (fig. 4). However, history shows us that the self-portrait is not always exactly a faithful representation of the author's face. In fact, if the selfie, as it is centered on the concept of sharing, is mostly aimed at recording one's outward appearance because it is easily recognizable by an external observer, in the

Fig. 4. Olivia Muus, Museum of Selfies, 2014-2020.

Fig. 5. Cameron Jamie, Untitled, Venezia 2019.

case of the self-portrait, by virtue of the close link with one's own self-consciousness, particular attention is paid to the representation of identity characters, and therefore not necessarily physiognomic, by adopting a look turned inward. A concept conveyed in an evocative way by the installation presented by the American Cameron Jamie on the occasion of the 58th. International Art Exhibition in Venice in which the artist, addressing the public with the interiors of a series of ceramic masks fixed to the wall, offers the viewer alternative ways to represent his authenticity (fig. 5).

Wanting to offer a definition of self-portrait, one could argue that it consists of an intentional representation of a specific individual, based on the criterion of identification rather than similarity, and that for this reason it cannot disregard self-knowledge [Gigante 2011]. As stated above, the operation of the artist's retreat is an act of projection of his own interiority and therefore not necessarily linked to a realistic representation. In virtue of the above, three fundamental aspects are outlined in the interpretation of the self-portrait: representation, identity and knowledge. In this context, as anticipated in the introductory paragraph, the mirror assumes a central role. It is no coincidence that the mythical story of Narcissus, allusion to self-knowledge, arises precisely from the relationship with one's own image reflected from the surface of the water. And it is the figure of Narcissus himself that Leon Battista Alberti placed at the origins of painting, precisely by virtue of the act of mirroring. Painting, in fact, allows you to "embrace with art that surface of the source" [Alberti 1804, p. 39] thus fixing an ephemeral apparition. There are many artists who mention the mirror, recognizing its usefulness as a technical aid. Among them, Cesare Ripa, who in *Iconology* includes it among some of the more traditional measuring instruments, such as the compass, the ruler and the square. [Gambetta 2012, pp. 145-155]. But if on the one hand the artist considers the mirror as a technical aid, functional to the realistic representation and to the control of the exactness of the represented subject, on the other hand the need to synthesize the information obtained is highlighted. The mirror, in fact, produces virtual images (and not signs) by temporarily recording what affects it and exactly how it affects it [Eco 2018, pp.

27-31]. In this regard, in the field of ancient optics, the expedient of marking points on the surface of the mirror in correspondence to the reflected image was known so that it could be determined in graphic terms. As Decius Gioseffi pointed out. "Moreover, the cutting of the cone (or of the visual pyramid), which is the foundation of perspective, is widely used in ancient optical demonstrations (starting with Euclid) and regularly practiced in catoptrics, where the geometric construction of the mirror image ('virtual', 'inverted' and 'behind the mirror') requires the cutting of the virtual pyramid through the surface of the mirror. That this 'intercision' did not go unnoticed is, ad abundantiam, demonstrated by the expedient of marking points on the surface of the mirror in correspondence to the image, practiced by Ptolemy, Hero and –for Hero's testimony– by Archimedes himself" [Gioseffi 1963, p. 279].
A real operation of discretization of reality, in which the complexity of the reflected image is reduced through the definition of significant points [Ippoliti 2000]. On the other hand, the *trahere* root of the italian verb *ritrarre*, with the meaning of "to draw lines" [Alberti di Villanuova 1825], has had different semantic derivations identified by the prefixes re- (as in the case of the Italian ritratto) and pro- (as in the case of the English "portrait") that highlight opposite cultural interpretations linked respectively to a repetitive sense (*rĕtrăhĕre*) and a substitutive sense (*prōtrăhĕre*) of the action [Migliore 2014, p. 120].
This interpretation, therefore, introduces a double meaning to the action of portraiture. On the one hand the portrait is understood in an iconic sense (that is, a repetition of the observed image) on the other hand in a symbolic sense (that is, a drawing of something in place of something else).
From a methodological point of view, the artistic references mentioned in this contribution have been selected for the evident tendentious use of the reflective surface and therefore as significant in the interpretation of the self-portrait as a practice of "inventive survey" [Belardi 2001], where the information recorded by the mirror surface is interpreted by the author, at the same time a surveying subject and a surveyed object, making the self-portrait first of all a product of the memory and imagination of the author. In this sense, it seems significant to mention the

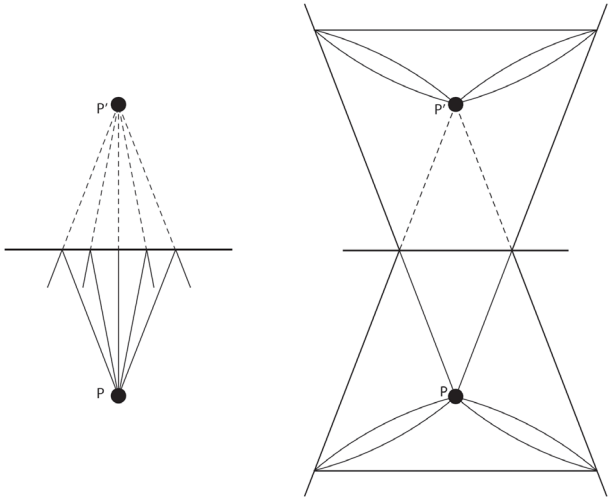

Fig. 6. Left, reflection scheme of a specular flat surface. Right, representation of the principle of the mirror according to Michelangelo Pistoletto (graphic elaboration by the author).

personal interpretation of the functioning of a flat mirror by Michelangelo Pistoletto that exemplifies the principle at the basis of his works. The observer, reflected from the surface of the mirror, defines a structure interpreted as the maximum extension of the human figure: the emotion reflected in reason and rationality reflected in emotionality (fig. 6). A continuous specularity within which the mirror assumes the role of "balance of the opposite parts". On the other hand, as argued by the American architect and academic Georges Teyssot, the mirror is "a device that multiplies and internalizes. […] In so far as the mirror is a replica or double of the painting, a reverse of it or an image seen from behind, the 'abyss' effect determined by reflection is not based on a mere principle of repetition. In the first place, nothing is ever repeated as it is, since the mirror, and in particular the convex one, tends to deform; in the second place […] the repetition (and duplication) made by the mirror is a celebration of what occurs only once, in time and space, *hic et nunc*. In both cases, the act of representation is clearly recognized by the role of painting as an image, in reference to the mirror's

ability to reflect, to the memory of a specific event – and at the same time acts as both a document and a memory" [Teyssot 2000, pp. 30-31].
In this context, without prejudice to the instrument used, the purpose of the operation is central. In fact, if the advance of technical developments over time has made it possible to obtain mirrors with perfectly polished and transparent surfaces that have considerably reduced the error of the reflected image [Melchior-Bonnet 2002], at the same time, the practice of the self-portrait gradually moved away from the faithful repetition of the reflected image and the symbolic representation, a sign of the style, idea and theory of its author, took over from the physiognomic representation, imitative of somatic characters. To punctuate this ascending climax of self-denial connected to the tendentious use of the reflective surface, the self-portrait of Parmigianino (fig. 7) in which the introduction of the convex mirror is aimed at highlighting one's technical skill and the refinement of the representation, unlike what happens four hundred years later with the famous series of self-portraits with reflecting sphere by

Fig. 7. Girolamo Francesco Maria Mazzola (Parmigianino), Self-portrait within a convex mirror, 1524.

Fig. 8. Maurits Cornelis Escher, Hand with reflecting sphere. Self-portrait in a spherical mirror, 1935.

Fig. 9. Mario Cresci, Self-portrait, 2015.

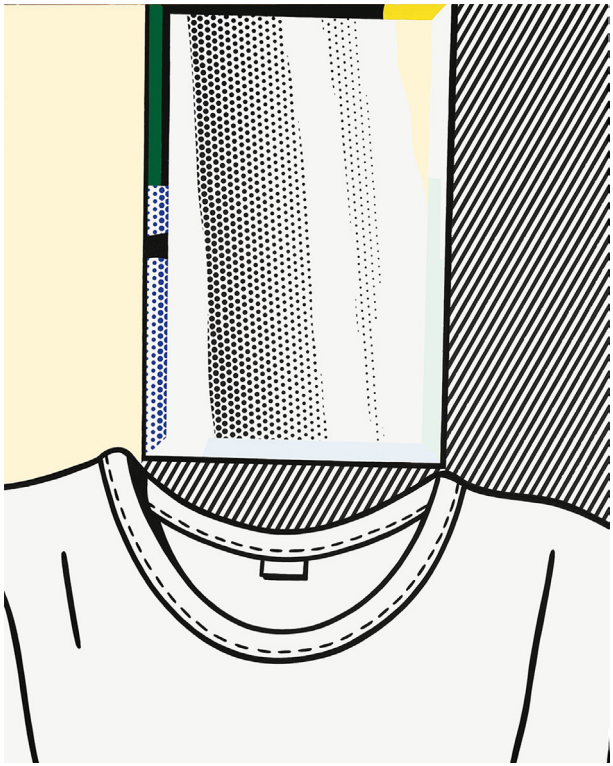

Fig. 10. Roy Lichtenstein, Self-portrait, 1978.

Maurits Cornelis Escher (fig. 8) where the choice of the convex surface is aimed at accentuating the sense of ambiguity and paradox that characterize the artist's works; in his photographic self-portraits Mario Cresci (fig. 9) replaces his own face with a convex mirror reflecting the camera, the protagonist of the private spaces in the centre of which it is placed from time to time (his own studio, a bedroom, etc.); finally, for the purpose of this contribution, the self-portrait conceived by Roy Lichtenstein in 1978 is enlightening [Waldman 1999] (fig. 10). Here again, the artist replaces his face with a flat mirror that is, however, devoid of reflected images. A total concealment that reaffirms the privilege of inner space. An absent, subtracted, "withdraw" face.

Conclusions

Walking along the Vasari Corridor at the Uffizi Gallery we come across the Collection of self-portraits that brings together famous faces, such as those of Raphael, Canova, or Guido Reni, but also the conceptual self-portrait of Emilio Isgrò or the grimace of Oliviero Toscani. Whether iconic, paradoxical or provocative, the self-portrait is undoubtedly a form of interpretation and critical representation of one's individual identity. A process during which the information accumulated and recorded over time is analyzed by bringing out significant elements that are recomposed, related and then formed [Augé 2011, pp. 8-9]. The mirror, as a reflection device "acts as an inter-mediary between two worlds, giving access to

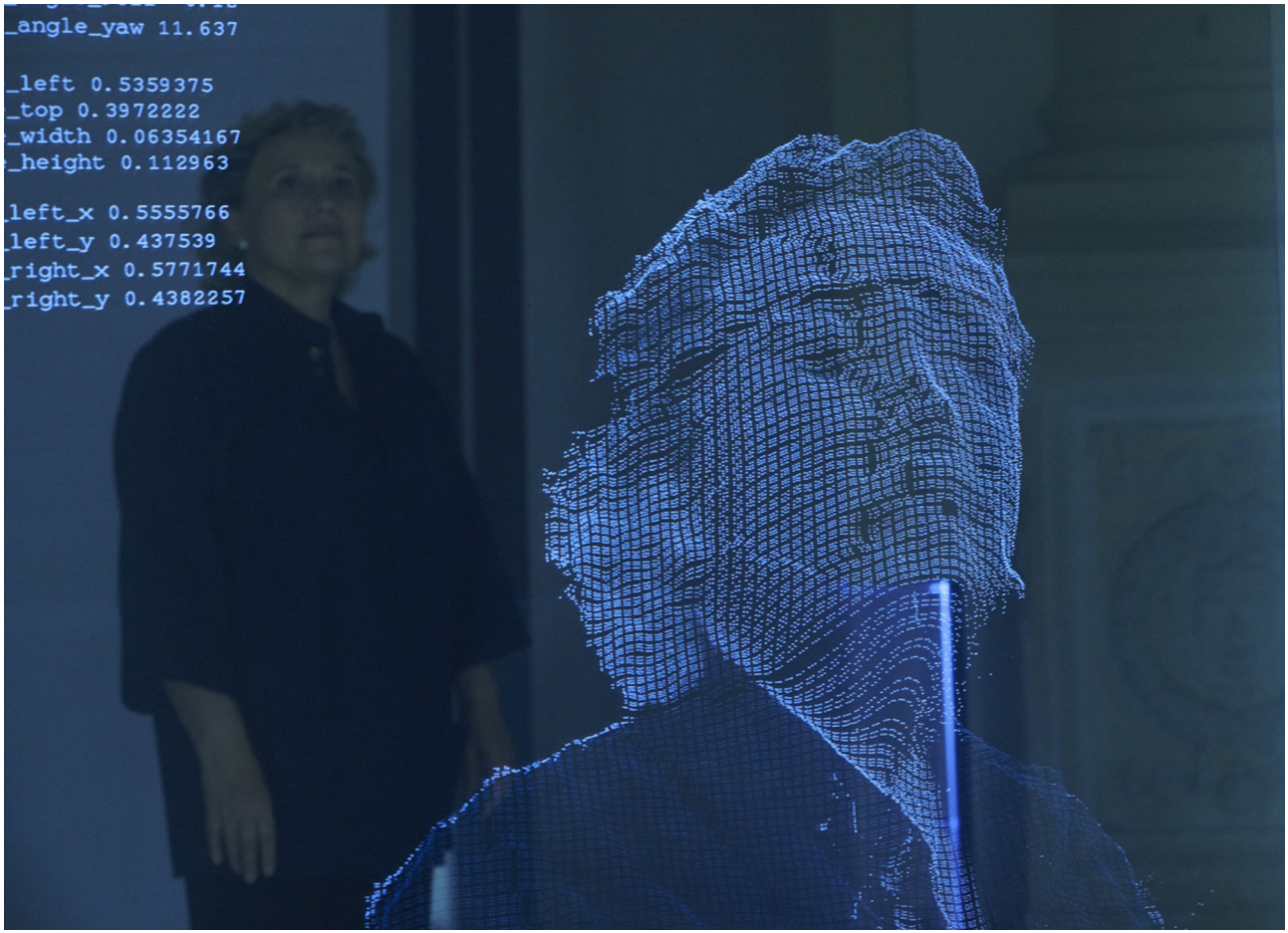

Fig. 11. Neural Mirror, Spoleto 2019.

the imaginary and the illusion […]. As well as a medium between spirit and matter, between ideal and real, it is also traditionally a link between eternity and finiteness, the infinite and the finite, or between inner and outer" [Teyssot 2000, p. 29].
Science, however, speaks to us of a rather different future. The American Kevin Kelly, writer and scholar of digital culture, talks about the beginning the mirror world, where every place and thing in reality will have a digital twin and life-size [Kelly 2019]. In this new platform we will interact with the virtual dimension by moving into the physical one. This is the concept behind *Neural Mirror*, the installation designed by Ultravioletto, the Roman interaction design collective, which was presented during the 62. Festival dei Due Mondi di Spoleto (fig. 11). The human figure is scanned and translated into a cloud of points by means of a Face Recognition algorithm, becoming a flow of information (from one's physical state to one's emotional state) decoded by the artificial intelligence that re-elaborates the image in real time. What appears in the mirroring interface is the interpretation of the subject by the machine, a reinvented body and mind, from biological beings to digital alter egos. Will the *Neural Mirror* make room for the self-portrait? Whatever the answer is, we can only hope to provide our best "points" for the future.

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Communicating

Communication Design. The Basis of Every Identity is Made up of Letters

Marco Tortoioli Ricci

Communication Design, a title that when read carefully may appear a contradiction in terms; we can unequivocally interpret design as a unilateral and arbitrary gesture, rarely objective, if not in the intentions of those who devote themselves to the design of systems (but even in that case, objectivity is all to be verified), an act that is often authorial, apodictic, affirmative, bearer of discrimination and not easily capable of gathering unanimous approval, except in cases where history or criticism have brought attention to the most recognized authors. If we speak instead of communication, we are speaking of the dialogic process par excellence: there must be a sender and a receiver, as well as a common acceptance of that pact by which the information transmitted is equally important for both parties involved. Therefore, what possible conciliation of such an opposition [can be introduced] as the basis of our brief discussion?

We start by noting that the Italian phrase "*disegno della comunicazione*" is semantically more valid than a possible usage of the more widely adopted English expression "communication design." For one thing, as Vilém Flusser reminds us in his *Filosofia del Design* (Philosophy of Design) [Flusser 2003], in English the word "design" has lost its ancestral meaning of action that did not distinguish between drawing and writing, becoming, in fact, both a noun and a verb whose use is often self-referential (a phenomenon typical of design). And this shift of meaning is confirmed, in the same essay, by Flusser himself, specifying that in the contemporary use of the word "design" we must glimpse that implication, in its facilitating of functions and actions, of a real deception. A door-knob is a deception, a tool that facilitates the opening of a door that would otherwise present itself to us in all its hostile entirety, difficult to "de-

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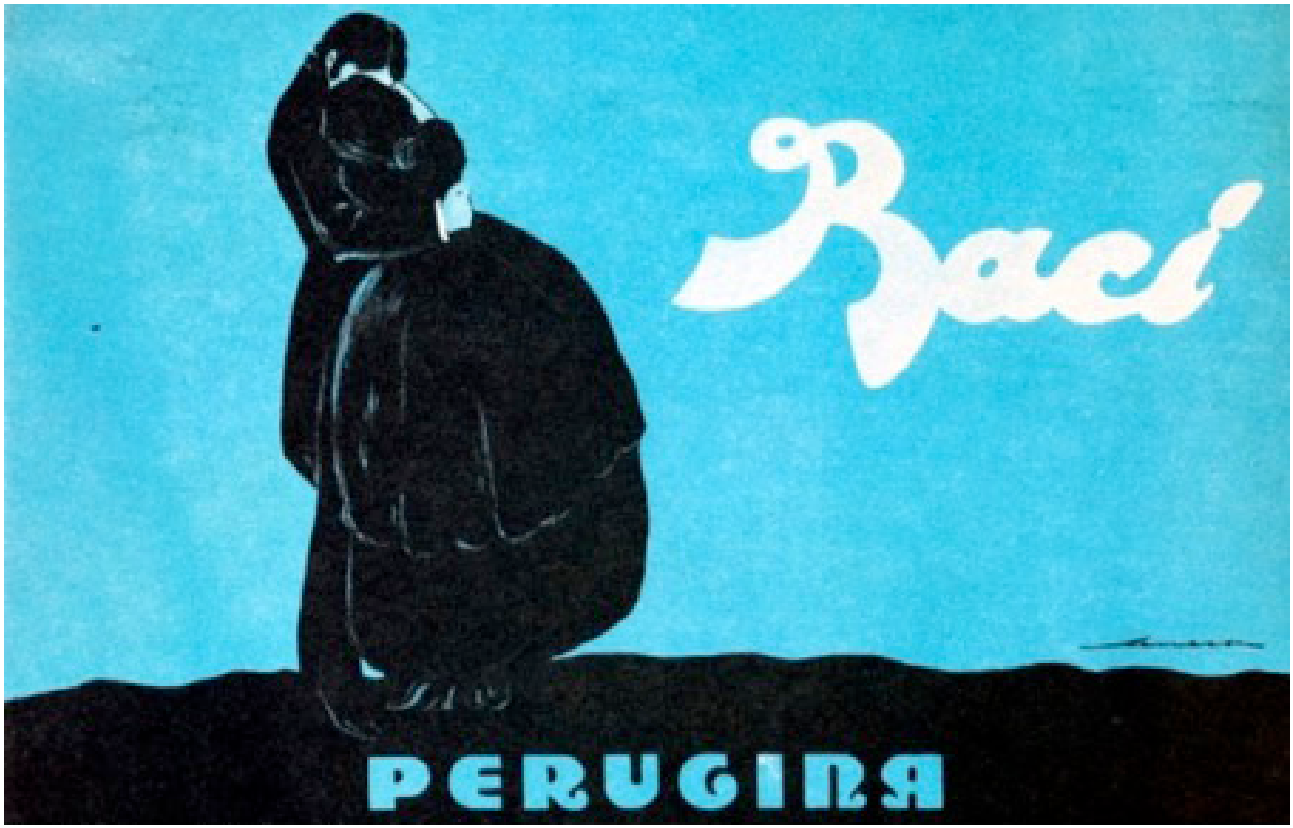


Fig. 1. Federico Seneca, Baci Perugina, 1930 ca.

ceive" if not thanks to the problem-solving tool that design makes available to us. Design, therefore, through its mission of problem-solving, goes so far as to deny the objective nature of things, often difficult to deal with if not made easy by, precisely, some design tool.
But the Italian word "*disegno*," while the literal translation of the English "design" should signify "project" or "plan," alludes instead to a difficult and precise gesture, that is, to tracing and giving shape to an idea thanks to signs that are a direct representation between the abstract world (idea) and reality (artifact). There is a precise moment when this correspondence is more visible: I am referring to a precise season in our history of visual communication design in which the visual design of any message required a holistic action that could not have distinguished between the composition of figures and of letters.
I have many young graphic designers as students and the hardest thing to ask them is to make a drawing of what they would like to include in a layout. It has become instinctive to use keyboard and mouse, to compose the different notation systems that our computers make available to us without that ancient mediation that is the "sketch." It would sound strange today to any young designer that composing a title or the written message of a poster could be conceived as a single design gesture. At that precise moment in the history of graphic design in Italy that we

identify as the season of the great poster designers, a period that irreverently unites Toulouse-Lautrec and Armando Testa, designing included figures and letters, a single "pictorial" action, no text input tools and a posteriori keyboard typing, just as no compulsive choice of fonts pursuing a successful combination found by chance. The composition of figures and letters came from a single compositional action where often the expressive design of the typography responded to the need for an incessant stylistic and formal dialogue with the world of images, to which it served as a counterpoint and a narrating voice. It may seem paradoxical, but it is that moment in which the dimension of a new urban tribality, a consequence of the flight from the countryside and the World Wars, restored to the visual medium that identifying and narrating function that must have greatly resembled those drawings drawn on the stone of caves at the dawn of our human and social history.

I have thought to approach the subject of letters as the center of every identity project, or "branding" project if you prefer, starting from the design of those letters, so full of imaginative flair, still boasting that eclecticism that permeated the passage between the nineteenth and the twentieth centuries, which Federico Seneca designed to compose the word "*Baci*" on the box of the famous "Perugina" chocolates (Fig. 1). It may seem strange to many, since the orthodoxy that studies the so-called "corporate image" phenomenon, as it was defined until the 1970s, would certainly not start from a figure like Seneca, nor from any of the exponents of that period: Boccasile, Dudovich, Cappiello, Cambellotti or the French Cassandre. Instead, that study starts with figures like Peter Behrens, to whom we will come later, because the theme of the coordinated image is linked to a need for the systematization of visual communication, in its progressively accompanying the growth of industry and infrastructures. But what I am interested in pointing out is, rather, how visual communication design had matured in those "roaring" years, in a culture that was still not yet specialistic and specialized, according to genuinely intuited, expressive forms, without letters, backgrounds and figures being the outcome of different compositional moments, but belonging instead to a common semantic field, where the need was pursued of giving visual form to thought and to the novelty that in that period was taking shape and that borrowed from avant-garde artistic movements such as Futurism.

On the famous box, Seneca actually reinvented the famous painting by Francesco Hayez, "*Il Bacio*" (The Kiss) (1859), purifying it of every contextual element and painting the couple in front of an intense blue background, a night sky where the letters of the word "*Baci*" are there as the moon would have been, and have the same luminescence and roundness. Thus the letters give up part of their notational function, but are enriched with a capacity for dialogue, within the scene, with the protagonists themselves; they become a substantial part of that landscape which we, spectators, would like to be part of. In this way that identity transference is activated for which only by buying the chocolate, which Seneca himself would think to enrich with the famous love notes, romantic messages written on slips of paper placed directly inside each silver wrapping, can we ourselves become part of the same scene. The letters were then drawn by hand by Seneca himself, with a unique compositional gesture through which the lovers would be represented together with the Perugina logo itself, whose typographical design in Art Nouveau style would remain unchanged up to the present day.

A similar case, in many aspects, is that which tells us about the vital and seminal collaboration between Fortunato Depero and the industrialist Davide Campari, a *liaison* which, among the first in the history of visual arts, elevated advertising for a commercial brand to the status of art. A figure, that of the tireless artist from Rovereto, who soon realized how the contribution of art to the world of industry would have constituted an explosive unicum capable, more than any other form of expression, of embodying the transition from the rural to the industrial and urban nation of the early 1900s in forms, colors and new rituals. In the early 1920s, he gave life to what he would call the *Casa d'Arte Futurista Depero* (Depero House of Futurist Art), in fact, a prodrome of modern advertising agencies. As in the case already mentioned for Seneca, his way of working was all-encompassing: author of an expressive poetics, with geometrical and dynamic lines, his compositions feature color, figure, background and typography combined through a unique compositional act. But in this case, in the work of the artist from Trentino, the letters, the main code of the shouting voice of advertising as well as of Futurist rhetoric, were used as the space of an immersive dialectic with the spectator-user; no longer just notation of words, they extended to plastic and architectural space, the first example of the transactional use of brands. The cases that enlighten us in this sense are represented by the 1927 project of the Book Pavilion for the Treves publishing house, defined deliberately as "typographic architecture," as well as the project

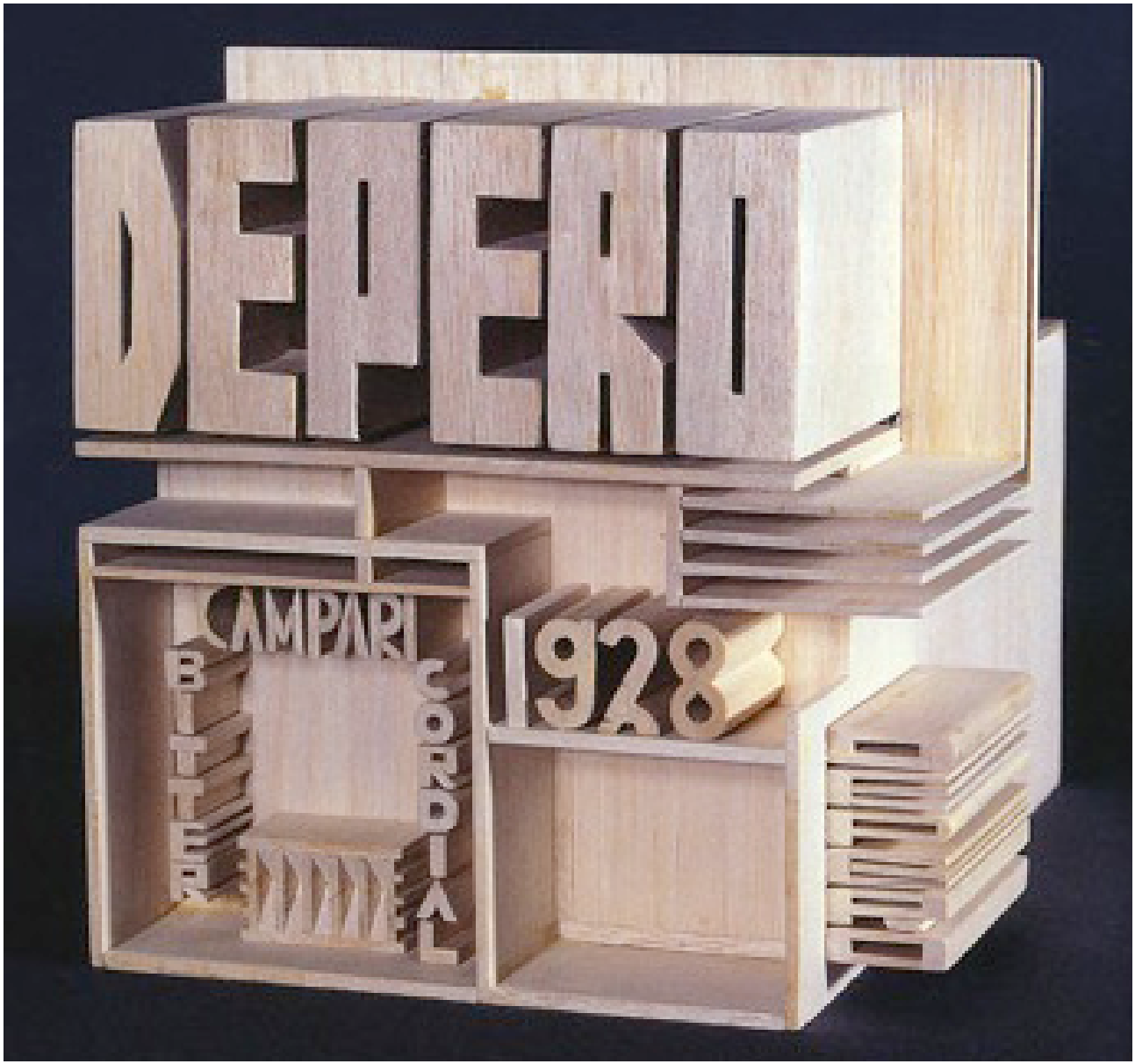


Fig. 2. Fortunato Depero, Campari Pavilion, wooden model, 1928, MART Museo d'Arte Moderna e Contemporanea di Trento.

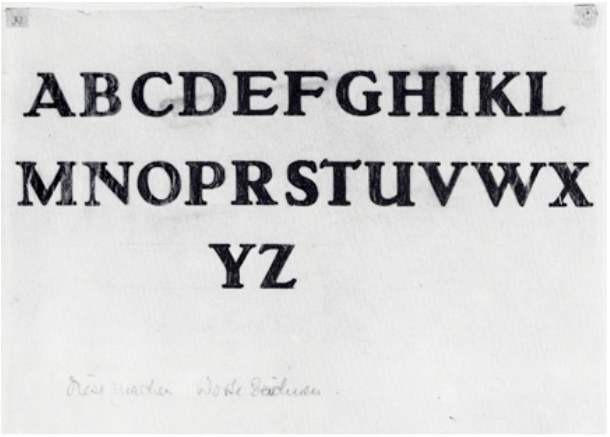
for the Campari Pavilion, an authentic compositional hyperbole in which the letters, condensed, extended, developed in length, were extruded to completely adorn the three-dimensional space of the pavilion (Fig. 2). Thanks to this extreme extension of the typographic forms into planes, the play of light and shadow due to the inextinguishable intersecting of volumes was multiplied, thus realizing a plastic painting in continuous mutation, capable of giving value to the viewpoint of the observer, who thus found himself at the center of the compositional dynamics. It is the value of the design gesture that in Depero's work overcomes its traditional limits and anticipates the polysemanticality, if not the "*sinsemie*" of the transmedia communication systems that we are used to analyzing in contemporary projects. A real flight forward in time. The Campari identity project, the first complex identity system, therefore, originated from an artist's expressive drawing, but ended with the first true example of total design, passing from two-dimensionality to three-dimensionality, to become the most long-lived product design, that we still admire today, that is, the Campari Soda bottle, whose design derives directly from Depero's work, "Puppet drinking Campari Soda," of 1926.

It is impossible in this rapid survey on the subject of communication design, as mentioned above, not to mention the case of Peter Behrens, a versatile architect who worked as a teacher in the so-called Darmstadt Artists' Colony (1889-1903) and from 1901 on, while continuing his work as an artist and draftsman, also practiced as an architect. It was this versatility, capable of moving between typographic and architectural design, that caused him to be commissioned by Paul Jordan, managing director of AEG (Allgemeine Elektricitäts-Gesellschaft) to design the complex system of corporate communication.

In fact, his work for the large German company, for which he designed the typeface that became the basis of the first redesign of the popular brand (Fig. 3), Behrens Antiqua (Fig. 4), was the first real example of modern corporate identity, tackling as never before the theme of the organicity of corporate identity in all its aspects, at all required levels of communication. Therefore, his work was not limited to the design of the brand and its applications; Behrens designed the complex grid system that allowed him to give organicity to the publication of an infinite number of covers and printed materials, he dealt with advertisements, exhibition structures, expanding his project to the architecture that was to host the pavilions for international trade fairs and some of the period's most representa-

Fig. 3. Peter Behrens, AEG, brand, 1907.

Fig. 4. Peter Behrens, Behrens Antiqua, typeface design, 1907.



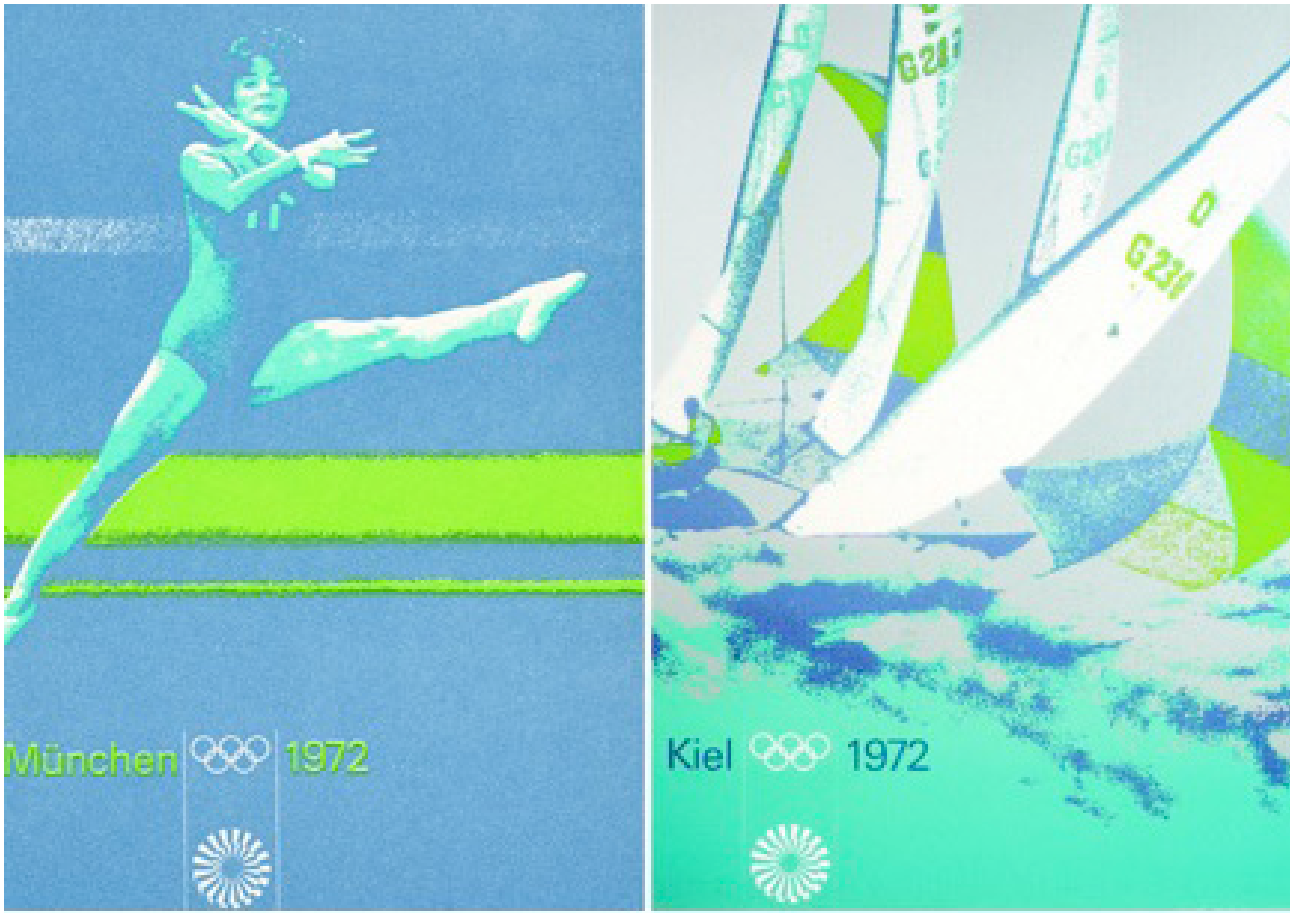


Fig. 5. Otl Aicher, Monaco 72, book covers, 1966-1972.

tive industrial buildings. What Behrens produced was a real mutation regarding the area of design responsibilities usually assigned to the architect or designer. His work defied definition in specialized disciplinary terms and opened up to responsibility in a "directorial" and multidisciplinary key that would only become the object of ethical and professional reflection in the 1980s. Therefore, a significant anticipation of the holistic approach to which project designers should tend in considering the theme of corporate communication as a complex ecosystem rather than a simple set of hierarchically organized tools.
His work would interest major names, acknowledged fathers of the "corporate image." It is worth remembering, firstly, one of the most well-known, undisputed masters, in methodological and disciplinary terms, that is, Otl Aicher, co-founder and lecturer at the Hochschule für Gestaltung Ulm from 1953. He inaugurated the modern application of the coordinated image manual as a tool for the

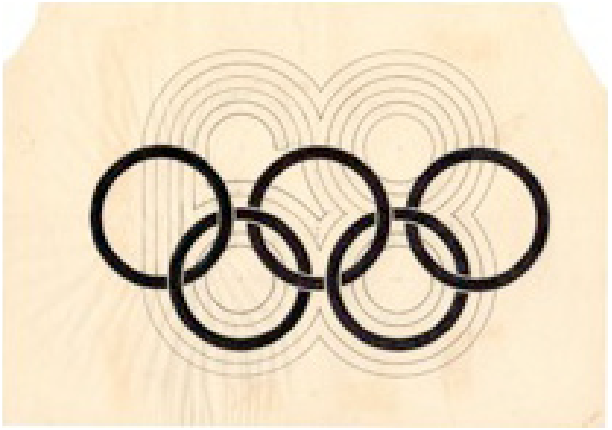


Fig. 6. Lance Wyman, Mexico 68, logotype, construction design, 1968.

Fig. 7. Lance Wyman, Mexico 68, murals, 1968.

systematic organization of numerous application plans, with the identity project in 1968 for Lufthansa for redesigning its brand and logotype, together with the students of his course. His consecration came later, from 1968 to 1972, as the author of one of the most famous, complex and articulated visual systems, namely, that for the 1972 Munich Olympic Games (Fig. 5).
The identity system of the German games inaugurated the first icon signage system useful for orientation and facilitated reading of the games' complex program, making a vast information system accessible to audiences from all over the planet.
In the previous four years, furthermore, another great example of an identity design project, that of the Mexico Games 1968, was based on the system of organic communication as a scheme for the development of an extended communication project. The multidisciplinary design team was directed by designers Lance Wyman and, for urban design, Eduardo Terrazas. A key element in this case was the ethnographic approach of the project, whose visual system managed to reconcile two seemingly distant elements of inspiration, namely, references to the optical art typical of the time and the cyclical and rhythmic patterns of native folk art (Figs. 6, 7). The design of an extended identity and communication system was meant to constitute an instrument of national redemption and, on an international level, a true gateway to the modern world.

An element common to these two illustrious examples is again a design approach to identity which is accompanied, in an experimental form, by multidisciplinary work teams, powerful apparatus dedicated to the mapping of characteristic territorial elements and, for the first time, a careful analysis of the perceptions and possibilities for reading and fruition by interested audiences. Here project characteristics were inaugurated that would become distinctive in the years to come, namely, the pervasiveness and ubiquity of the communication project, which began to occupy not only the areas hitherto typical of information and promotion, but to extend to areas closer to environmental, industrial, fashion and costume design. For the first time, communication design, conceived as an orchestral and multiform communication system, consciously faced the responsibility that from then on it would be entrusted with as a tool necessary for defining the cultural identity of a country, as a factor of distinction and collective development.
Cultural expression as the purpose of visual communication design is precisely what we intend to deal with in presenting an example in discontinuity with the previous ones. This need is represented by the desire to complete a survey whose purpose is not disciplinary nor technical, but rather to represent the role of the "draftsman"/designer as one who firmly occupies a distinct position in society and the community. To conclude this brief overview, it is useful to know the work of an artist - in the

Fig. 8. Joan Brossa, Fachada ayuntament Mollet-Valles, 2002.

Fig. 9. Joan Brossa, Poema visual transitabile en tres temps, 1984.

most eclectic sense of the term. We are speaking of the Catalan Joan Brossa, a great visual and concrete poet, performer and author of numerous verbal/visual installations still visible in different parts of Barcelona. He moved his first steps in the world of art in the desecrating and pervasive current of the Dadaist and Surrealist movements, then he soon made himself known as an anti-Francoist with his civil poems and finally affirmed himself definitively with the fall of the regime. All his work is dedicated to the ironic and surreal experimentation of poetic composition, to the translation of those "hypnagogic" images he considered crystallized intuitions at the origin of his poetics. A work that did not, however, stop at form in verses, but soon became visual and typographical composition: his intention to suspend meaning became pervasive. His limit was not the page and his compositions soon conquered pieces of the city, on buildings, streets and squares. His aim was to use letters to give plastic form to poetic thought and bring it into the urban reality, to take it out of the printed page and transform it into landscape, objective, natural, as trees and buildings are. The poetic composition thus became visual, it stopped being an elitist production, dedicated to scholars, but was transformed into a permanent performance, a hypnotic space that, by transforming us into new Lilliputians, offers us a new candor, the possibility to again marvel in wonder and thus venture into a revealed dimension, to be able to traverse the text, the spaces offered by the large letters that, as though emerging from the two dimensions of Flatland, become a new landscape, allowing us to become, we ourselves, a living part of the story (Figs. 8, 9).

At the end of this short journey, we have perhaps reconciled that oxymoronic dissonance that the title offered us as a theme. We have restored to the design gesture, in various ways, its more "political" function as an activator, not as a simple work to be admired in a sort of stylistic standstill, but a new responsibility, assigned to all of us, as spectators and actors in the communication process, to be active parties in keeping that same process alive, transforming us all, in turn, into potential designers and draftsmen.

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Relief Representation in Museum Itineraries

Tommaso Empler, Alexandra Fusinetti

Abstract

The paper has the aim to explore relief representation mode able to transfer meanings of objects present in museum itineraries into an effective language understandable by people with visual disabilities. The research, also supported by issuing of indications by the General Directorate of the Museums of MIBACT, which require facilitating the communication of cultural heritage to all types of users, arises from an analysis of European museum realities that highlights the different approaches to this topic. The development of a methodology has, as its basis, a study of perceptive abilities and learning procedures of the visually impaired, which is accompanied by some considerations on methods of relief representation. From these premises some procedures and good practices are developed, which seek to identify effective and efficient solutions for a correct communication for the haptic perception of cultural information towards visually impaired people.

Keywords: visual impairment, relief representation, tactile panel, tactile communication, visual-tactile representation.

Introduction

Relief representation has several characteristics depending on the field of use.
Tactile Maps are used in case of Wayfinding (connected to "cognitive or mental maps", that people form in their minds when they explore more or less known places); Tactile Information Panels are used in museum communication, both for closed and open-air museums (parks or archaeological areas); finally Tactile Plates are used in a tourist communication or as a learning tool.
Further variables are constituted by the nature of supports used (aluminum sheets, acrylic sheets, sheets of cardboard with relief printing, or thermoform) and processing techniques (rapid additive or subtractive prototyping).

Syntax of *relief representation* is linked to that of visual representation and results in identification of methods that take into account different factors, from haptic discrimination (to facilitate reading with fingertips and for the use of the visual residue by the visually impaired), to the kind of blindness (blind from the birth or in a late age).
Relief representation, thanks also to the "Guidelines" of 6th July 2018 issued by the General Directorate of Museums of MiBACT, which introduce the *Plan for Elimination of Architectural Barriers* (PEBA), is increasingly requested in the form of Tactile Maps to guide visitors in museum, Tactile Information Panels to be associated with objects present in the exposition area, and finally Portable Tactile Plaques to allow consultation of information during a museum tour.

Recent solutions

Relief representations are used in different cultural contexts, to allow effective communication for the visually impaired and the blind.
Are analyzed solutions used in some museums, according to the 2019 report provided by the non-profit association Themed Entertainment Association in collaboration with AECOM, among the 10 most visited in the world:
1 - Paris *Louvre* (10,200,000 visitors);
6 - *British Museum* of London (5,869,000 visitors);
9 - *Natural History Museum* in London (5,226,000 visitors).
To these is added the *Cité des Sciences et de l'Industrie* where there is also a library for visually impaired.

Louvre Museum, Paris
Louvre Museum presents three different tactile communication solutions for the visually impaired: maps/information tactile panels referring to the building and rooms of the museum; tactile panels referring to permanent collections; tactile panels for temporary exhibitions.
Tactile panels referring to the museum, section of the "*Pavillon de l'Horologe*", use a form of representation with mongian projections in plan and section/elevation, where is displayed a tactile visualization of the current museum and of the foundations area of the Castle of Louvre dating back to 1380. In the Islamic Art section there are some points of interest with tactile panels reproducing three-dimensional objects that cannot be touched by visitors (fig. 1). Finally, in the section of temporary exhibitions, such as the one present in 2019 called *Techniques et Gestes*, there are tactile panels, in addition to reproducing the phases of the first forms of printing, representing some tools for the mobility of characters and for drawing on the plate with burin.

British Museum, London
In the British Museum there are portable plates for the visually impaired placed in special pockets at the entrance/exit of each room. In some rooms are present 3D models that reproduce architecture or objects from the classical world, such as the Parthenon in Athens.

Natural History Museum, London
Natural History Museum has some points of interest where are reproduced 3D paleontological finds, organized to be explored aptically by the visually impaired.

Cité des Sciences et de l'Industrie, Paris
The museum has been very careful to blind visitors since

Fig. 1. Touch point of interest to "read" objects that cannot be touched by visitors. Louvre Museum, Paris.

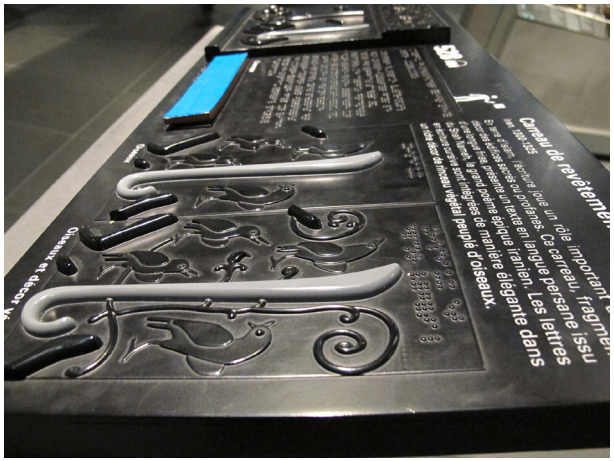


Fig. 2. Bronze tactile map that describes the spatial articulation of the building and its surroundings. Cité des Sciences et de l'Industrie, Paris.

its building, in fact it has a reading room for the visually impaired. The spatial organization of the building and surrounding gardens are displayed in a tactile map located in the external access points (Fig. 2). Inside, in the main hall, there are several 3D representations that allow the understanding of the overall spatial organization. Tactile information panels are also present in permanent or temporary exhibitions.

Italian scientific literature has been dealing with the topic since the early 1990s: 1993, MURST research coordinated by Prof. Emma Mandelli with the outcome of the seminar *Il disegno per l'apprendimento delle forme da parte dei soggetti non vedenti* (*Drawing for the learning of shapes by blind people*); 1996, issue 26 of the journal *XY, Dimensioni del Disegno*, single issue entitled *Il disegno oscuro* (*The dark drawing*); 2006, monograph by Lamberto Nasini and Hasan Isawi, *Una geometria per comprendere lo spazio senza percepirlo visivamente* (*A geometry to understand space without perceiving it visually*) [Nasini, Isawi 2006]; 2013, article *Universal Design: ruolo del Disegno e Rilievo* (*Universal Design: role of Drawing and Survey*), in the journal *Disegnare Idee Immagini* n. 46; 2018, Summer School organized in September by the UID on the theme *Rilievo dei Beni Culturali e rappresentazione inclusiva per l'accessibilità museale* (*Survey of Cultural Heritage and inclusive representation for museum accessibility*).
Occhio della mente (*Eye of the mind*) conferences organized by the Chiossone Institute in Genoa since the mid-1990s.
Manuals are: 1994, Fabio Levi and Rocco Rolli with *Disegnare per le mani. Manuale di disegno in rilievo* (*Drawing for the hands. Relief drawing manual*) [Levi, Rolli 1994]; French instruments for *Dessin en Relief* (DER) [Brie, Morice 1996].
Some indications of "normalized" procedures refer to braille and "black" characters (that is, letters written in relief in the Latin alphabet):
ISO 24503:2011, defines the characteristics of braille points;
ISO 17049:2013, identifies the spaces that must be kept free to allow Braille read in signs and panels in general (relief models, panels and tactile maps);
ISO 19028:2016, refers to information that must be present in a tactile map, defined as: "information map for the visually impaired that provides a good idea of public spaces, public transport, parks, which is made recognizable using, for example, convex lines (raised) and/or convex or hollow surfaces (engraved signs), tactile signs, braille and/or raised characters, and/or enlarged characters, and

Fig. 3. Visual-tactile map, detail of the braille characters. Museo delle Mura, Rome.

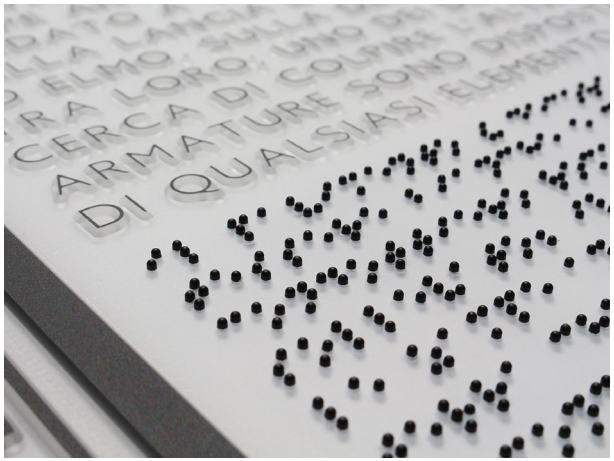
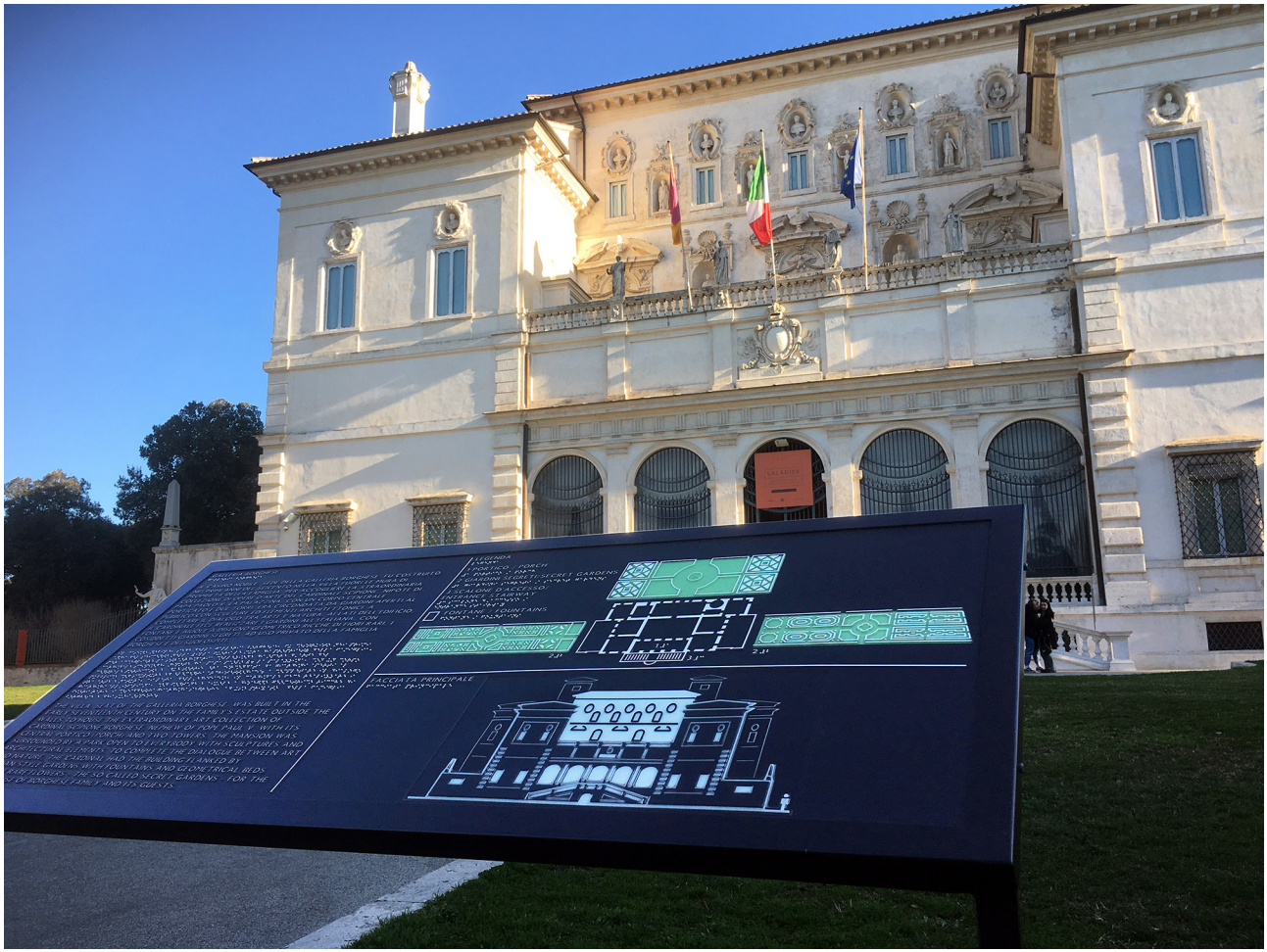


Fig. 4. Exploring a map. Hands analyze the plan following non-linear paths.

Fig. 5. Visual-tactile map. Example of a process of synthesis and graphic reduction to facilitate recognition of the visually impaired by haptic exploration.



can be of two types: tactile map installed in buildings, etc. o have the format of a portable booklet";
ISO 24508:2019, provides guidelines and design requirements for tactile symbols and fonts used to provide information to people who need non-visual or non-auditory information. It is applicable to products, structures and equipment in homes and transport, services and packaging, where tactile symbols and characters can be used;
UNI 8207:2003 (Undergrounds – Signage for travelers – General requirements) regards the signs to be installed in stations and along underground lines, the dimensions of letters in "black", in relief and the height of the braille.
Reading tactile solutions, in literature and of normative rules, shows a great heterogeneity in terms of graphic signs used and captions supporting the panels, where there are not always words written in "black", and braille presents "heights" outside the provisions of ISO and UNI standards.
In the past, some attempts have been made, conceptually incorrect, to insert, for example, the transposition of the value "500 lire" on the coins of the Italian Republic. The size of "braille" was scaled and compared to the size of the coin, resulting undetectable by haptic exploration. Blind people were able to recognize the coin because it was made of a double metal alloy (like the current 2 Euro coin), which sounds, on percussion, unlike those made with only one metal.

Methodology

Like the definition of the syntax of a language [Gibson 1950], where rules and variations are defined with use over time, the same procedure is necessary for a representation in relief for the visually impaired, a discipline/ language of new acquisition. Today there are no codifications recognized by the scientific community and users regarding the transcription of "visible" reality.
Only recognized language is Braille alphabet, which takes its name from its creator Louis Braille. It developed from the first half of the 19th century, organized according to a system of 6 points in relief, of univocally determined size, placed on a 2x3 matrix, where each textual character (so-called in "black") corresponds to an equivalent braille character, formed by a combination of the 6 raised points on the matrix; syntax and punctuation remain the same as in "black" writing (fig. 3).

Braille alphabet allows only a "translation" of the textual area, while "visual translations" are increasingly required, especially in the museum context.
How can I translate the visible?
From a graphic point of view, implications are the same as those related to a composition of representation, that is to identify the characteristics of the sign (trace), the phenomenal position of representation plane, to evaluate the process of emphasizing-excluding the elements compared to the purpose of representation [Massironi 1982].
The search for normalization paths of relief representation procedure was born from the need, in museum context, to emphasize a textual descriptive communication of some phenomenal realities and to facilitate their understanding.
Sign can have different thicknesses (generally expressed in millimeters), different types of weft (solid line, dashed line, dot line, in turn with different intervals between the different elements that compose it), multiple combinations to form textures as a filling of closed geometric figures, with or without margins. In relief representation it can assume the characteristics of object, outline or weaving functions.
Phenomenal position of representation plane generically contemplates all modalities expected by descriptive geometry, from the generic position of the perspective with

Fig. 6. Visual-tactile map, detail of different depth levels. Galleria Borghese, Rome.

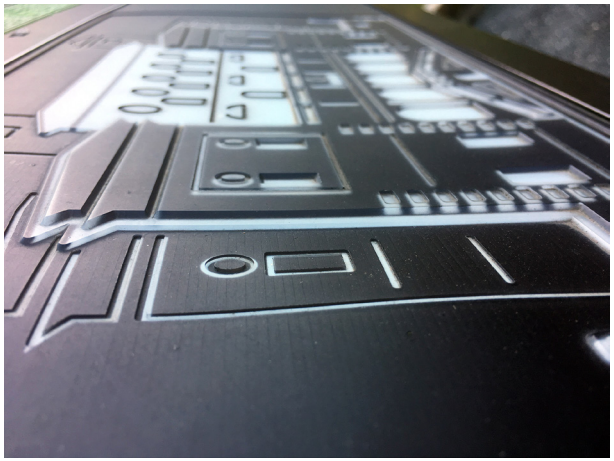
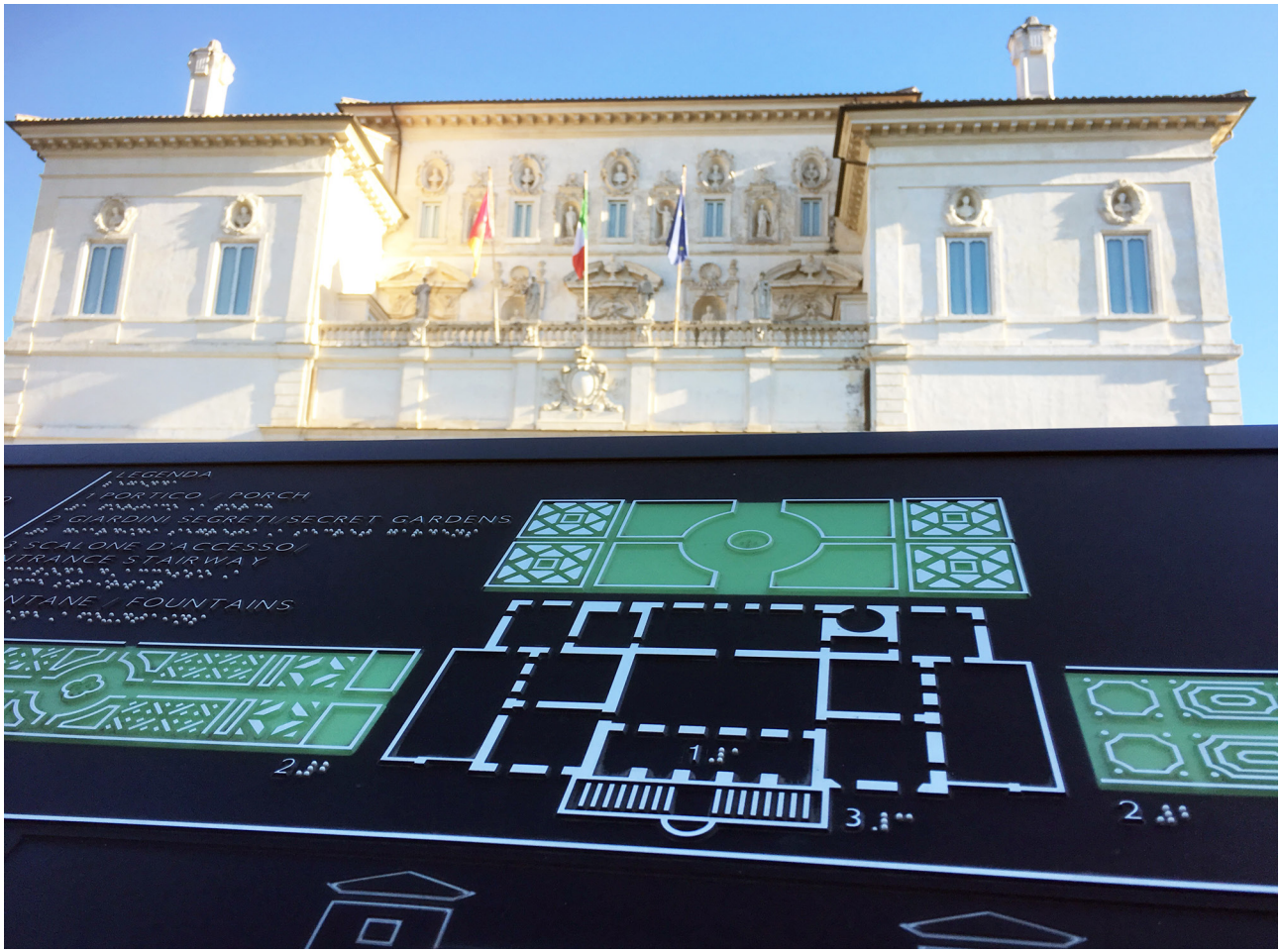


Fig. 7. Visual-tactile map where color is used to highlight the gardens. Galleria Borghese, Rome.



an inclined frame up to particular cases of orthogonal projections (table of the twelve methods) [de Rubertis, 1993]. As for tactile perception of the visually impaired, a frontal projection is more understandable, using orthogonal projections, since a mental abstraction process better includes a transfer of geometric shapes, however arranged in space, using an improper perpendicular projection center on the representation plane.
Emphasis-exclusion process is the main tool that representation makes available for making critical choices with the use of signs, which can emphasize some aspects or exclude others. This is the reason why the representation of a landscape, for example urban landscape, critically highlights some parts of the city, deliberately excluding everything that does not want to be emphasized, unlike photography, which however artistic and targeted it cannot make a selection, therefore excluding, what is not relevant in the communication process.
Emphasis-exclusion process depends on the ability to perceive the signs with the use of haptic exploration.
Coding a relief symbology requires a thorough knowledge of characteristics of the sense of touch, of haptic perceptibility and of mental processes of memorizing information acquired by a visually impaired person with that medium. Touch is, in fact, analytical and a perception of the whole is obtained through the organization of a sequence of partial information. Synthesis is therefore a complex process and can become difficult if a representation exceeds, for example, maximum dimensions allowed by the movement of the arms of a person, considering also that for exploration, mainly, two hands are used side by side or separated (fig. 4).
Furthermore, haptic exploration should not be understood as a succession of acts along a linear path or in any case always the same in all directions. The work of the hands is very complex and varies every time: it depends on the image to be analyzed, on its shape, on its complexity; by the characteristics and experience of the person who is exploring; from the level of depth of his analysis; from the time he thinks he has available, from intermediate results he has gradually achieved, from any aid he has, etc. [Levi, Rolli 1996].
Furthermore, haptic discrimination is limited and incapable of grasping very small details, so these must certainly be represented larger than those perceivable by sight: for example, a raised line is not perceptible below 0.5 mm of thickness, while braille dots must be at least 1 mm high.
Main requirements of "relief representation" are:
- careful s*election of elements to represent*, simplifying signs to be made in relief, taking into account that thickness of the sign must be contained within the minimum and maximum threshold of the perception of the fingers;
- *control of proposed forms in relief* within the geometric

Fig. 8 Visual-tactile map, detail: example of a line used as a texture. Museo delle Mura, Rome.

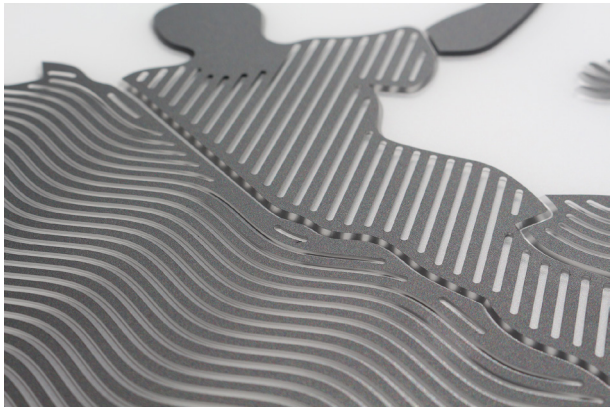
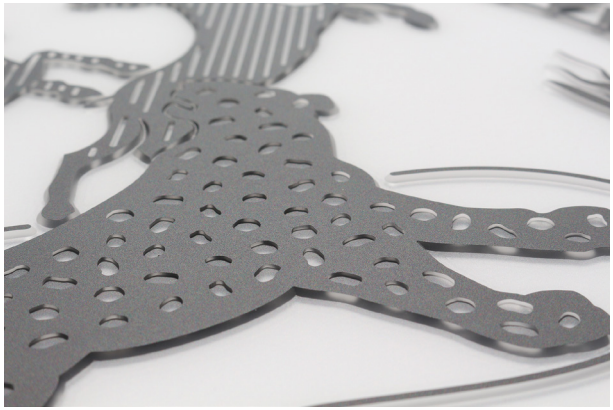


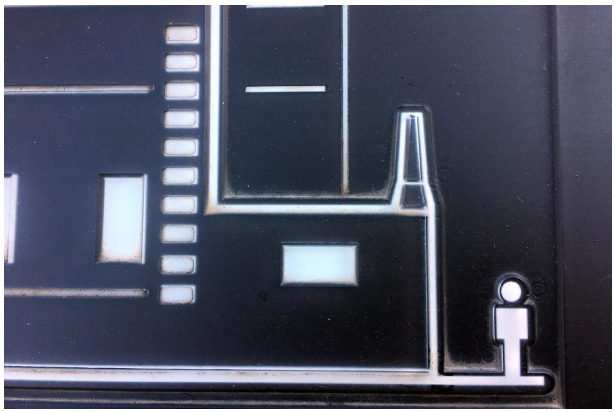
Fig. 9. Visuo-tactile map, detail: example a surface with texture that describes the spotted skin of a cheetah. Museo delle Mura, Rome.



and semantic recognition of the elements that are described;
- *pleasantness in the haptic perception* of lines and surfaces that are proposed to document the phenomenological reality;
- *scale of representation*, known elements of reference help to understand the size of the objects represented;
- characters according to ISO 24503: 2011, ISO 17049: 2013, ISO 19028: 2016, ISO 24508: 2019, UNI 8207: 2003 and ANSI A117.1: 2003;
- *compatibility of graphic language* and representation methodology used with the medium.

Selection of objects to be represented is a part of the emphasis-exclusion procedure, previously mentioned, and also contemplates figure-background relationship. Relief representations should be devoid of elements that make images more pleasing to the eye, given that the goal is to make them recognizable to the touch sense and that "complementary" information is misleading respect to recipients and the level of communication to be obtained. In addition, often, there are difficulties due to the constraint of using orthogonal projections, since it is necessary to make people understand different depth levels of objects, or their spatial development (fig. 5).
This criticism is overcome by using a particular production technique, with tactile panels made of transparent methacrylate and processing by CNC machine. Upper part of the panel is excavated and/or engraved, using some levels (on 3 mm thick slabs, there are 3 layers that can be used) where is established a hierarchy of elements that must be placed lower and those that must be placed higher (fig. 6). Plates are printed in the rear part, so that they can be read from above, all informations that must not have tactile but only visual relevance. Even this type of information must go hand in hand with the hierarchy of elements that are made in a "tactile" way.
Another element, to complete the emphasis-exclusion path, is the coloring, that can be given as a base to the transparent methacrylate plate: in the part below the area that is not printed, it has a background color that must make the reading of the elements placed at the top optimal, to facilitate reading for the visually impaired and, consequently, to all those who use sight as a privileged communication channel (fig. 7). These characteristics make the information panels visuo-tactile.
Control of proposed forms in relief provides different levels of geometric and semantic recognition: for points, care must be taken that they are not confused with the letter-points of the Braille alphabet; lines must be at least 0.5 mm wide, as a minimum graphic perception threshold. Furthermore, a distinction must be made between the "object line" (to represent a filiform object), the "contour line" (which delimits a surface) and the "weaving line" (when it constitutes the weaving/texture that serves to sample a surface) (fig. 8). Surfaces, in order to be better recognized, must be of the closed type, considering that only raised contour is not sufficient to satisfactorily define a surface, requiring textures; textures must be at least 2 mm away from the contour lines, while, in the internal part, between them, they can also be closer [Levi, Rolli 1994] (fig. 9).
Pleasantness in haptic perception involves the study of a texture as a function of exploration through fingertips and possibility of recognizing inserted geometric shapes. Also in this case a distinction must be made between symbolic textures, with respect to the meaning of what to express, or iconic, such as rectangles arranged in parallel rows to document a masonry in *opus latericium*, or the use of an oblique texture to 45 degrees.
Scale of representation is a decisive element to help understand the size of an object represented. In fact, for objects that have a size greater than what can be perceived by the simultaneous use of two arms (and therefore cannot

Fig. 10. Little man represented on scale, referring to the represented object, facilitates the understanding of the whole dimensions. Galleria Borghese, Rome.



be perceived in their entirety, which the view allows), dimensional scale must be understood with respect to a known element, which can, for example, be the figure of a man (fig. 10). A further consideration is a correct correspondence of the elements that semantically compose the representation to the haptic perception, since in many cases a correct metric scale ratio can lead some geometric elements to assume, in a reduction path, the dimensions that can no longer be discriminated by use of touch.
In addition to responding to ISO and UNI standards indicated above, "*braille*" *and* "*black*" characters must include a minimum distance between geometric elements in relief and the position of descriptive text in "black" and in braille, defining functional fields. The "black" text must use a sans serif typeface in capital letters, to allow a better distinction of those letters of the alphabet that can create misunderstandings of recognizability from lowercase, remembering that only 30% of the blind knows braille, while the majority recognizes letters of the Latin alphabet.
Finally, *compatibility of graphic language* must be related to the type of support where "relief representations" must be placed, according to the degree of workability by CNC machine with subtractive prototyping.

Conclusions

In *relief representation*, the process of defining sign elements and their syntax is the subject of research into the field of representation. Hope is a possibility of defining some normalization paths for procedure tested to fill the gap still unresolved by entities accredited for this purpose at national and international level such as ANSI, ISO and UNI.
Methodology reported in this paper has been tested favorably (with satisfaction from stakeholders) on multiple projects, but does not claim to be a solution to a problem that requires transversal skills of scholars of cognitive psychology, representation and forms of production associated with different types of graphic output and by typhlologist (experts who know the problems related to blindness at 360 degrees). It is hoped that the scientific disciplinary sector of representation will constitute a proposing part of meetings and further experiments, to define a representative framework based on recognizable and shareable rules with all those people interested in dissemination of tactile messages to complement communication-based on visual messages.

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Figures on Surfaces. Murals between Context and Narration

Marta Magagnini, Nicolò Sardo

Abstract

Mural surfaces are situated in an experiential dimension with a high rate of technical and artistic experimentation. This essay investigates wall-sized graphics and, in particular, images present from the birth of architecture itself, which stores them based on a two-dimensional narrative project that involves spatial experience.
Interior and exterior walls have revealed their primary vocations with some important areas of interaction. On the one hand, interior walls act as windows that –instead of opening towards the real, present landscape– frame landscapes of thought and, particularly with photomontages, allow the observer to intuitively understand true urban theories. On the other hand, exterior façades are characterized as communicational devices immersed in the city: from mosaics to typography, 'wall-size' graphics are transformed and express the sense of their own time.
While extensive literature has analysed the histories of art and the technique of façades and interior walls separately, the objective of the present study is to combine these topics in search of common threads in virtue of both the common nature of the material –the predominance of the surface over other formal aspects– and, as a consequence, the common calling to act as screens for visual communication.

Keywords: photomurals, façades, graphics and architecture, photomontage.

Introduction

A wall is a sign [De Fusco 2019], something which is well known by architects, who trace it, and semiologists, who investigate it. A wall is a sign that defines separations, limits, prohibitions. Walls, however, also often host other signs, figures that inhabit the entire surface, from one extreme to the other, from the base to the top, that mean something else beyond the limit. Those signs generate a recollection that attracts those who wander near the wall [Barthes 1999, p. 66]. This is known well by graffiti artists and street artists, just as it has always been known by the great powers, who have charged artists in every era with decorating the long walls of churches and the high walls of the fronts of government buildings. This is known, though, once again, by architects who, in modern and then contemporary projects, have used the communicational power of these large surfaces to give a voice to the walls they are tracing and transmit on them their own architectural and urban theories.
The object of this study is therefore the signs that architects have wanted to leave on the surfaces of walls, not as an aesthetic solution, but as a medium, taking advantage of the always new techniques and technologies of visual communication: elements present as "urban graphics", especially on façades, and in interior arrangements and walls. The goal of this reflection is to reunify exterior and interior surfaces in a single history of technique in search of a common thread, delineating a single investigation of the strategies of wall-sized visual communication.

Topics and relevant examples of buildings are considered for both types, where the relationship between art/graphics and architecture is resolved in sharing a surface: the interior surface as a place for formal experimentation and techniques that continuously cross time, and the exterior surface where signs configure communicational devices, thereby instilling a special relationship with the city space. Interior walls transport us to mental and experiential landscapes even far from the building in which they are found, while exterior walls speak to us of the physical place they represent. In this article, the authors aim to highlight the path through which both interior and exterior walls become the protagonists of an inexorable transformation of architecture into representation.

Ephemeral/Figurative Murals for interiors

The Reinvention of a Medium

In 1937, Adalberto Libera won the competition for the Palazzo dei Ricevimenti e dei Congressi for the 1942 World's Fair in Rome (E42). The original idea of the project entailed covering the high part of the walls of the central room with gold mosaic, thereby dissolving the perception of the corners of the quadrilateral plan and suggesting a "ring-shaped" space [Marcello 2010, p. 9]. Fascist rhetoric later imposed a figurative cycle dedicated to the glory of Rome, from the myth of its origins to the new Mussolini Empire; this, however, was never realized, allowing us today to perceive that pure, undecorated space in all its modernity.

In the same year, Giuseppe Pagano exhibited the mosaic *L'Italia corporativa* (8 m x 12 m) by Mario Sironi at the Paris International Exhibition. Like a large fragment discovered in an archaeological excavation, it was not fixed, but suspended in the air, propped up on the wall by iron girders, which also allowed the public to see the irregular surface of the back [Golan 2018, p. 578].

By reading these episodes, it is clear that in 1937, probably due to temporary political reasons, the modern interior mural still had not achieved its independence and artistic peculiarity and was still not stamped with comparisons with the great art of the past.

This is not true only of Italy and does not only entail a relationship with the tradition of mosaics: it may also be referenced in relation to large-scale painting. For example, still in 1937 and for the Paris Expo, *Guernica* by Pablo Picasso, in all its 3.49 x 7.77 meters, was exhibited for the first time on an outer wall of the area in front of the heart of the exposition area of the Spanish Pavilion, nearly counterbalancing the didactic murals of the internal arrangement [Arnheim 1964].

From these examples it is clear that interior murals had by then crossed over their traditional collocation and connotation and taken steps towards a true reinvention of the medium. From *instrumentum regni*, the static, centralizing sign in institutional sites, they had become part of a path that involves spatial experience in temporary expository contexts.

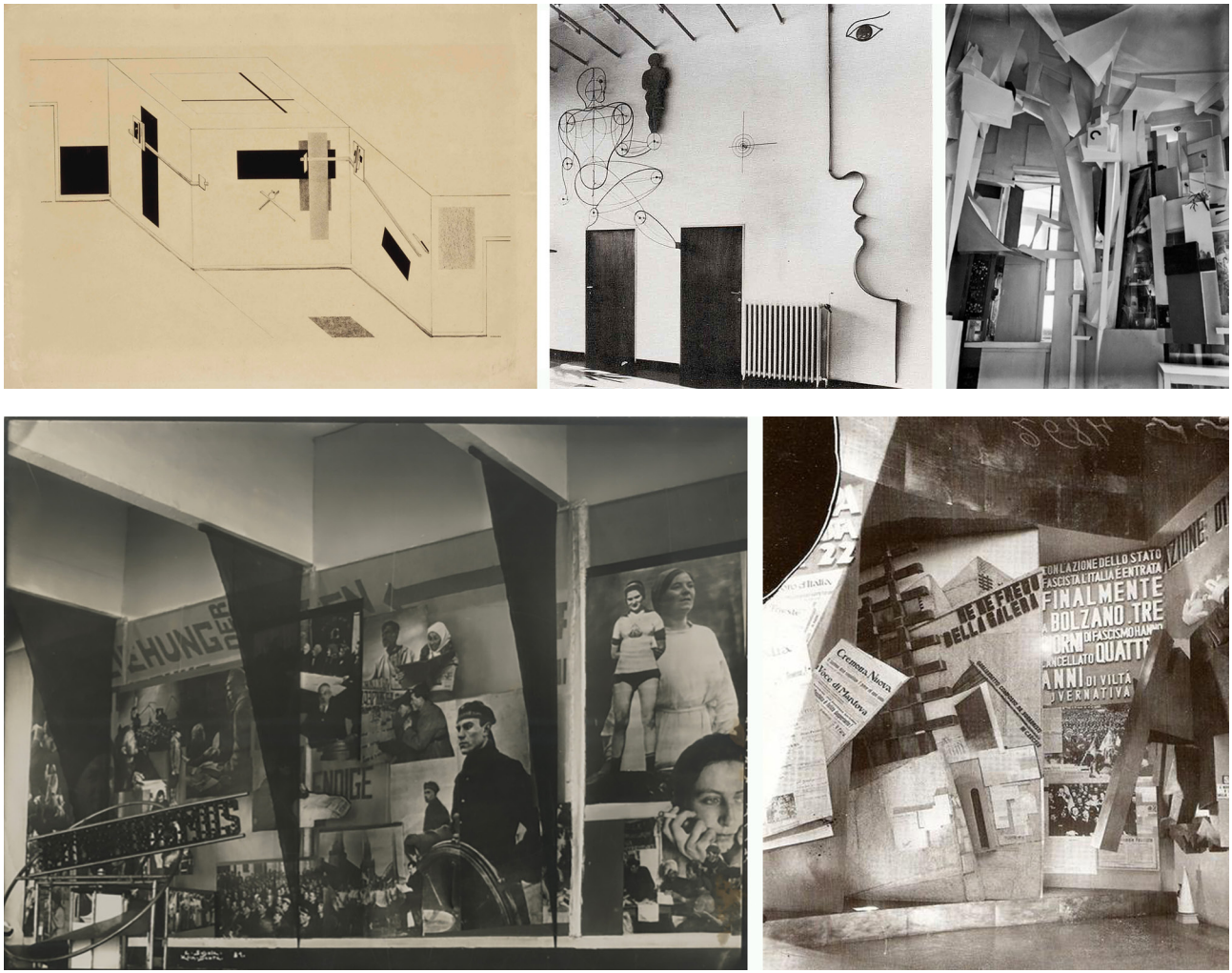
The 'ephemeral' potential is, in fact, the most innovative and distinctive character of interior murals. In these contexts, architects may appropriate the narrative element, contemplating it in the project itself, animating it in theoretical speculations.

Up to the 1930s, interior walls were decorated almost exclusively with painted works, but the advent of technical reproduction opened the way to an entire series of experiments, achieving results well beyond the prerogative of traditional decoration. Pertaining to this key is the most varied avant-garde experimentation at the beginning of the 1900s, from the installations of the Russian Constructivists, the *Proun Room* by El Lissitzky (Berlin 1923), the sculpture-painting created within the Bauhaus by Oskar Schlemmer with Willi Baumeister (Weimar 1924), up to the extreme three-dimensionality of the *Merzbau* by Kurt Shwitters (Hanover 1923-1937) or Italian experimentation with *plastica murale*, an application of Futurist polymaterialism of wall décor explicitly inspired by examples from beyond the Alps [Pirani 1992]. *Plastica murale*, as intended by Filippo Tommaso Marinetti, but especially by Enrico Prampolini, places particular emphasis on interior murals, which become the main object of their research. "Today, the modern architecture derived by Antonio Sant'Elia lacks its *plastica murale*, especially within, and is often troubled by the depressing anachronism of mismatched and out-of-place frescoes, paintings, or sculptures" [1] [Marinetti 1934, p. 3].

Avant-garde murals therefore oscillate between painting and sculpture, between surface and model, making the catalogue of possible techniques and materials nearly infinite (fig. 1).

Fig. 1. a) El Lissitzky, Prouneraum [Proun Room], 1919-1923, axonometric projection, © Collection Centre Canadien d'Architecture/Canadian Centre for Architecture (CCA), Montreal (left). b) Oskar Schlemmer, interiors of Rabe House, Zwenkau, 1930-31 (center). c) Kurt Schwitters, Merzbau, Hannover, 1933 (right).

Fig. 2. a) El Lissitzky with Sergei Senkin et al., Photofrieze, Soviet Pavilion at the Pressa Exhibition in Cologne, 1928 (left). b) Giuseppe Terragni, Exhibition of the Fascist Revolution, Sala O, Palazzo delle Esposizioni, Rome, 1932 (right).



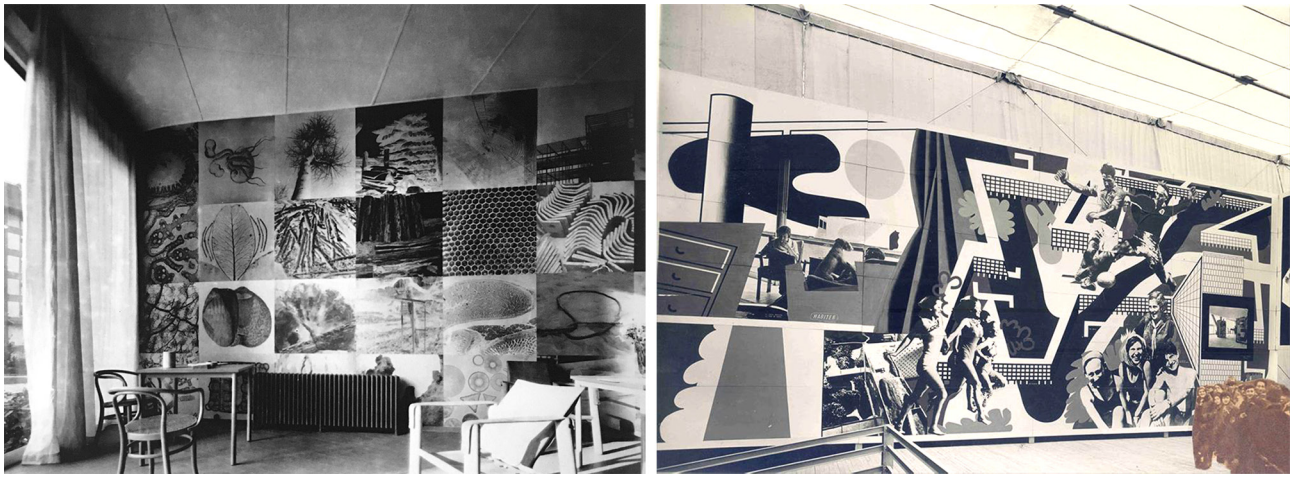


Fig. 3. a) Le Corbusier and Pierre Jeanneret, Photomosaic for the Swiss Pavilion, Paris (1929-1933) (Photo Marius Gravot. © Fondation Le Corbusier, Paris) (left). b) Photomural Habiter (Dwelling), installed in the Temps Nouveaux Pavilion at the Paris International Exposition, 1937 (Photo Albin Salaün. © Fondation Le Corbusier, Paris) (right).

But the search began to be circumscribed and became an operation of sense only when the mural returned to the figurative dimension, to historical narration inhabited by human figures. The reason lies in the fact that the human figures of representation act as guides to codify the story, allowing the observer to become totally 'immersed' in the speculative environment that, in modern projects, changes from two-dimensional to three-dimensional, even if it would be decommissioned or destroyed at the end of the exhibit.
Photography, or rather the enlargement of photographic prints to the large scale [Lugon 2015], would play a fundamental role in this direction. Photography as a technique would define the new model of modern murals, inhabited by narrative figures. Even before large-format photographs, which in the 1980s would favour "the artistic recognition of photography and be equated with a contemporary form of the painting, or 'tableau'" [Lugon 2010], from the environments of agitprop the photomontage would reach the great international exhibitions at the end of the 1920s and go on to characterize the following decade (fig. 2a).

From Figurative to Photorealistic: Photomurals
Photomurals represent a type of mural that since the 1930s has never abandoned the scene of expos, shows, and museums [2].
A mural photograph is both a document and a work of art. In 1933, Le Corbusier created a photomosaic to cover the curved wall of the library of the Swiss Pavilion in Paris: forty-four 1 x 1 m "tiles", enlargements of black and white photographs and negatives of disparate images of the natural world and human constructions, microscopic and panoramic views (fig. 3a). In reality, the Swiss master would have left the wall in bare concrete, but the president of the *Cité Internationale* requested the creation of a decoration: large plates depicting rocks, snow, glaciers, etc., that recalled home for the students who came to lose themselves in treacherous Paris. In satisfying his customer's request, Corbusier said, "I have therefore decided to realize, in two, three days, the first photographic mural considered not as a document but as a work of art" [Naegele 2013, p. 151]. The result is a work, unfortunately lost, that is strongly evocative and educational, a message to students residing in the Pavilion: "Inside to outside: serene perfection. Plants, animals, trees, sites,

seas, plains or mountains. Even the perfect harmony of natural disasters, of geological cataclysms, etc. Open your eyes! … Architecture is an extraction of the spirit and not a trade" [Petit 1970, p. 82].
The strength of a photograph resides precisely in its highly communicational aspect, which is more or less explicit and becomes propaganda in photomontages, especially those on the architectural scale. This was abundantly clear in the 1930s, when the technique was even abused to support both socialist and Fascist content. Indeed, it is indisputable that the Soviet model was adopted by the Italians in the Exhibition of the Fascist Revolution in 1932 (fig. 2b), despite the effort to mask the debt to agitprop with manipulations, swelling, and archaizing that deepened the 'Roman' nature of the photomurals [Golan 2010, p. 84].
Even Le Corbusier made a large installation of photomontages within the Temps Nouveau Pavilion in 1937 to explain the four functions of modern urban design [Rüegg 2012, pp. 82-106] (fig. 3b). Despite the authority characterizing both their content and representation, the contribution made by Le Corbusier did not add any innovation to what had by then become common and which, in those years, would have tired the critics [3].
It is precisely this strong identification with this historical period –and with the jumble of shouted, politicized proclamations– that has compromised the use of mural photomontage since the Second World War. The technique of montage in itself was "recovered" by the so-called "radical" architects in the late 1960s, but it did not coincide with the recovery of murals. The case of Arata Isozaki is curious, however. Nearly 30 years after creating his collage *Re-ruined Hiroshima* (1968), he reused it for a photomural at the Venice Biennale in 1996 [Lehmann 2017].
In fact, only at the end of the century did photomontage reappear in art and design, without fear of the large scale and even being integrated with the most advanced multimedia immersion products. This was done, however, without betraying the monitoring and "politicizing" component of the medium. In the field of design, examples of this include many museum installations of memorials, while in the world of art, photomontage characterizes the work of some "dedicated" artists who focus on the dynamics of the consumption society and therefore on the great crisis of architecture and the city (fig. 4).

Fig. 4. Botto & Bruno, Society, you're a crazy breed, Fondazione Merz, Turin, 2016 (photo R. Ghiazza).

Fig. 5. Robert Venturi, Denise Scott Brown, and Steven Izenour, in collaboration with Stephen Shore, Signs of Life: Symbols in American cities, Renwick Gallery, Washington DC, 1976.

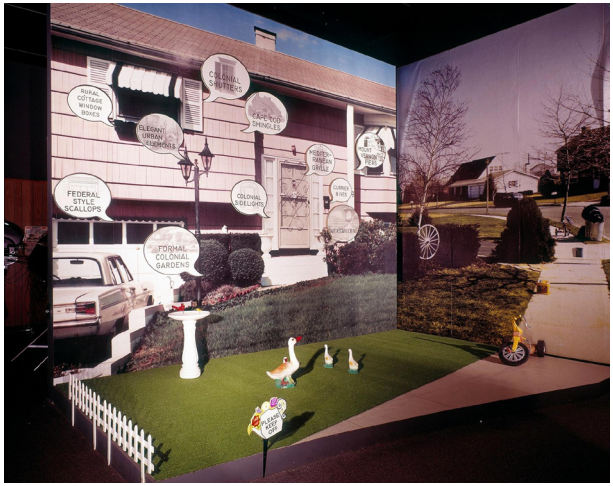


Fig. 6. OMA and 2x4, Florification, wallpaper for the Prada Epicenter, New York, 2019. The wallpaper, 60 m long, was printed digitally based on a graphical project by the studio 2x4. It is replaced every 6 months and is often accompanied by video and interactive installations.

Among the main characteristics of photomontage, from its avant-garde beginnings to contemporary examples, from collages to photomurals, the effectiveness of black and white is incontrovertible, an aspect that first reconciles a technical need (before colour printing) with a communicational strategy (the emphasis of visual contrasts corresponds to emphasis on the message). The use of colour necessarily results in the tones of the messages being lowered, but also opens up to other media.
From the 1950s to today, large-format colour photographs have pervaded publicity in the public space, both indoors and out, and –once they became extremely accessible– have even conquered the market of domestic decor, especially in the United States.
In this context, photomurals became a media image without artistic legitimacy, but perhaps because of this, Robert Venturi and Denise Scott Brown, together with their collaborator Steven Izenour, chose a colour photomural to design the exhibit *Signs of Life: Symbols in the American City*, commissioned by the Smithsonian Institution to celebrate the American bicentennial and inaugurated at the Renwick Gallery in Washington on 26 February 1976 (fig. 5). With the collaboration of the photographer Stephen Shore, the show presented to the larger public investigations of the American city, which also formed the basis for the publication *Learning from Las Vegas* [Venturi, Scott Brown, Izenour 1972], very careful research on urban planning that highlighted how architecture and the city, beyond the categories of space and function, is also a question of images, symbols, and communication. The architects' intent was to make the survey as neutral as possible and the colour photographs were thus not manipulated; the show, however, was loaded with other signs: speech balloons focused attention on this or that element, which our eye was invited to recognize more than decipher. From rhetorical, the message became caricature: the main estrangement was the fact that what was ordinary was allowed to inhabit the spaces of a museum. Venturi and Scott Brown's idea was to cross the models of billboards (an image made for drivers' distant, fleeting, distracted attention) with newspapers (high informational density) in a ready-made game inside out [Lugon 2015].
Today, now that photography has conquered the walls of museum space and the market of contemporary art, both in the frame dimension and in the large light box, the presence of photomurals has decreased significantly and interior walls have reached the apex of their ephemeral dimension, nullifying any critical dimension of the overlying image. Contemporary mass communication has reached commercial space and expository space equally, and the same can be said for internal dividers that partition shops, restaurants, and museums: ever less functional and increasingly the carrier of changing messages, palimpsests of interchangeable images or screens animated with projections as needed (fig. 6).

Thoughts and Words. Other Figures of City Walls

Theories
While Barthes already clearly showed the "city as writing", in buildings' surfaces, this "writing" surpasses any metaphor and is made real. "The city therefore constitutes a discourse and this discourse is a real word: the city speaks to its residents, we speak our city, the city where we are found, simply inhabiting it, passing through it, watching it" [Barthes 1967, p. 11] [4].

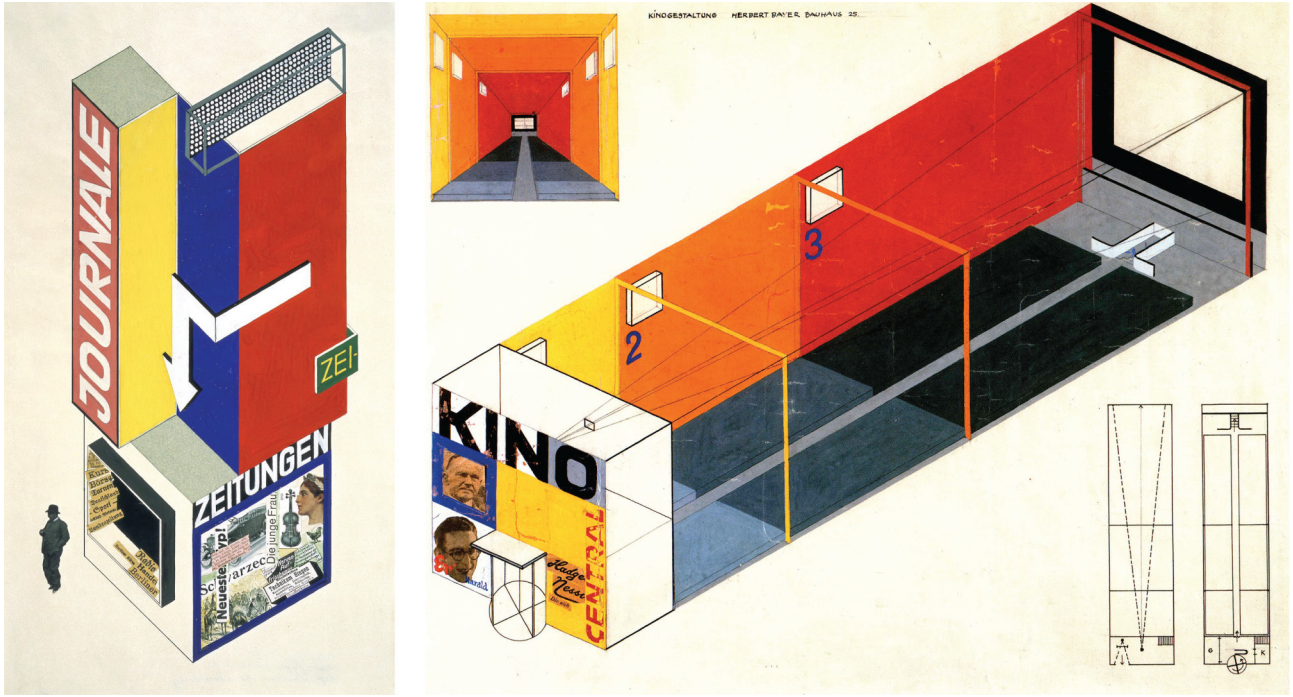


Fig. 7. Herbert Bayer, Kiosk (left) and Design for a Cinema (right), 1924.

Façades are configured as communicational devices: graphic design on the scale of the wall transforms it and the sense of time itself is expressed on the surface. As a support for visual constructions, the surface, by changing, highlights not only aesthetic choices but is also capable of communicating theoretical explorations [5].
A game of superposition integrates the construction with a narration that participates strongly in the spatial experience and the definition of the urban environment. This is favoured once the wall has overcome its "mechanical" essence as a diaphragm between interior and exterior. "Once the skin of the building became independent of its structure, it could just as well hang like a curtain or clothing. The relationship between structure and skin has preoccupied much architectural production since this period and remains contested today. The site of this contest is the architectural surface" [6].
The external surface, in its graphical characterization as an artefact of communication, thus lives within the "representation/conformation" binomial, albeit with various degrees in the significance of the two components [7]. The graphical signs used are not only a characterization of the surface, but can also reinforce the identity of the building and transmit information. The façade exists in an ambiguity given by its simultaneously being a "sign" tied not only to the building to which it belongs, but also to the city. "In fact, the façade, as a 'figure', is as a rule a two-dimensional surface that constitutes precisely a figure of the envelope-signifier of the building. At the same time, however, it is a 'figure' of the 'meaning' of the urban-planning mark, which is no longer an interior

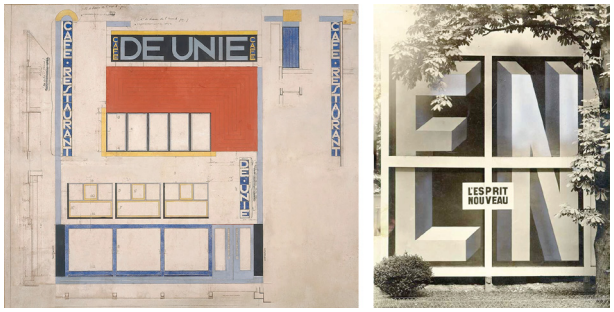


Fig. 8. a) J. J. P. Oud, Café De Unie, Rotterdam, 1925, drawing of the façade project (left). b) Le Corbusier and Pierre Jeanneret, Esprit Nouveau Pavilion, Paris 1925 (right).

but rather an external space, a street or square" [De Fusco 2001, p. 159] [8].
In urban perception, the "cinematic walk" [9] pauses. The façade itself is transformed into a screen in place of the 'show', and expects the observer's attention. "It is thus that architectural experiences –which imply the dynamics of space, movement, and narration– are tied to the cinematic effect and its wandering, even incorporating it" [10]. What is instituted is a "phenomenal transparency" [11] that transports the observer to a virtual space, a transparency that "implies more than an optical characteristic; it implies a broader spatial order. Transparency means a simultaneous perception of different spatial locations. Space not only recedes but fluctuates in a continuous activity" [Kepes 1990, p. 81].
The extreme case is when the architectural construction in its totality is transformed into a graphical artefact. Emblematic of this are the building-signs of Herbert Bayer [Cohen 1984], who, with forms, colours, and writings, declares their function (fig. 7). This attitude manages to transform the nature of the building, turning it into a sort of oversized packaging as in different projects by Neutelings & Riedijk Architects [Neutelings Riedijk Architects 2018]. This behaviour is also highlighted in works by Robert Venturi, where the American architect reiterates his desire to build an "architecture of communication" in many of his projects, refining it in different ways [Venturi, Izenour, Scott Brown 2018].

Techniques
The mode of dealing with façades can be rather diverse: sign, colour, text, and light define the building's surface, often intersecting each other. By weaving them together, the graphical forms –in different degrees of abstraction– become ingrained, oscillating between recognizable signs and their dissolution into patterns (fig. 10).
Typography is refined as a message and specifies the building's identity, but it can also be exhibited as "decoration", textures in the deepest and primordial sense of the term (fig. 11).
While the presence of writing also often contributed to characterizing façades in antiquity, it is especially with modern architecture that the use of "typography" became a true component of the composition. A key example is the façade of the Café De Unie in Rotterdam designed by J.J.P. Oud in 1925 (fig. 7b). The presence of typography –with modifiable texts and a clear advertising function– also characterizes other de Stijl buildings such as the one for the De Volharding Cooperative designed by Jan Buijs in 1928 [12] (fig. 9a).
Le Corbusier, always attentive to signs, characterized one of the external walls of the Esprit Nouveau Pavilion with what one could consider a true logotype (fig. 8b).
In contemporary architecture, the use of typography in façade design has become increasingly widespread [Heller, Ilić 2013]: words "decorate" building surfaces, but also communicate the activities that they perform (fig. 9). The use of typography may also be refined in particular procedures such as in the work of the Indian artist Daku, who created an installation in Delhi in 2016 where letter outlines were fixed orthogonally to the surface of the wall, which was "decorated" by the continuously changing shadows projected there [Lynch 2016].
Colour, as a characteristic of structural or decorative components, articulates the elements that configure the façade and become one of its 'decorative' elements; colours made of pigments, but also of light.
Light informs the façade both through 'transparency' –with translucent surfaces– and through 'emission' – becoming a generator of signs [13]. Light as a dynamic element also distinguishes some creations by Gyorgy Kepes after the Second World War. The most impor-

tant include the neon light mural for the Radio Shack building in Boston (1950) [Poulin 2012, p. 135] (fig. 9b) and the KLM Office Building in New York (1959) [Bacsó s.d.]. Kepes' work naturally grew out of the seminal work developed by László Moholy-Nagy [Moholy-Nagy 1936; 1947].
Another important aspect is technology, wherein devices, often complex ones, characterize building façades [14]. The most emblematic of these include the unusual panels that Jean Nouvel installed for the Arab World Institute in Paris in 1990 and where the "design" –while evoking Oriental decorations– is composed of diaphragms whose opening is controlled by photosensitive cells. In recent years, experimentation has been increasingly tied to digitalization. Important examples include creations such as the *GreenPix* [15] wall in Beijing and the *Ziggo Dome* [16] in Amsterdam, both of which are characterized by façades suspended between stability and mobility, composed of LED 'pixels' that make them shimmering and functional, also serving as communicational devices [17] (fig. 12a).
The surface may also create a profitable relationship with the mode of art. The most important examples in recent years include works by Yayoi Kusama such as the decoration created for the Louis Vuitton flagship store in New York (fig. 12b).
This also includes 'limited' approaches such as those by the French artist JR, where a strong planning of his works –which rely primarily on photographic images applied to the surfaces of buildings– mark his photographic installations with the apparent closeness to typical street-art methods [Thompson, Remnant 2019]. Works such as those by Anish Kapoor are also capable of characterizing the urban space and at the same time –through "reflection"– absorbing and representing it, altering it [Codognato, D'Orazio 2015]. And yet photographs are the main character in the iconographic repertoire used by Botto & Bruno to 'redress' the surfaces of the Banchette industrial system [18].
A particular operation on the relationship between writing and wall surface situated midway between art and graphic design was promoted by Ruedi Baur [19] and other Swiss artists and developed in 2016 and 2017 with installations that also make use of calligraphy [Ménine, Baur, Baur 2018].

Fig. 9. a) Jan Willem Eduard Buijs, Coöperatie De Volharding Building, The Hague, 1928 (left). b) György Kepes, Photo-electric mural banner for Radio Shack storefront, Boston, 1950 (right).

Fig. 10. a) Jacques Herzog and Pierre de Meuron, Production and Storage Building Ricola, Mulhouse-Brunstatt, (France) 1993. The façade – made of polycarbonate panels – is silkscreened with a repetitive plant motif, the image of an Achillea Umbellata leaf by the German photographer Karl Blossfeldt (1865-1932). (Photo © Margherita Spiluttini) (left). b) Neutelings & Riedijk Architecten, Netherlands Institute for Sound and Vision, Hilversum, 2006 (Photo Scagliola/Brakkee) (right).

Fig. 11. a) Massimo Vignelli, 712 Fifth Avenue Barrier, New York, 1987 (left). b) Paula Scher (Pentagram), New Jersey Performing Arts Center, Newark, 2001 (right).

Fig. 12. a) Simone Giostra and Partners Architects and Arup, GreenPix, Pechino, 2008 (left). b) Yayoi Kusama, Outdoor installation for the Louis Vuitton flagship store, New York, 2012 (right).

Conclusions

The goal of this research was to reflect on "images" overlaid on architecture, where they grow out of a dedicated graphical project –and not from the occasional stratification of signs, as mainly occurs in street art– especially in order to integrate the construction with a narration that participates in the spatial experience. Interior and exterior walls often follow separate paths because they grow out of different purposes: interior walls are designed to take us outside the building –historical *trompe l'œil* comes to mind– both physically and with our thoughts. Exterior walls, on the other hand, speak about the "here and now". They represent the building and the functions it houses –not infrequently commercial– or reflect some peculiarity of the urban area where they are found.

In both cases, though, the meaning is expressed starting from research on ever current representation, which reaches architecture from the worlds of art and technology in pure synergy.

On the one hand, the relationship with art is a particularly effective circumstance because it represents the matrix that theoretical research is based on, the development of new themes, and new reflections on the urban space. However, art itself is increasingly occupied with architecture and realizes this on the front line (associated art and architecture firms such as those by Olafur Eliasson or Vito Acconci come to mind). The temporary interventions themselves are also increasingly projects to 'redesign' and renovate urban spaces and not irregular or self-referential actions by artists rejecting relationships with institutions.

On the other hand, it is technological innovation, increasingly driven, that acts on the surface of the wall, redefines it, and extends its characteristics.

Although with a diversity of solutions and constructions implemented between interior and exterior, the scope of the register of examples presented here is to recompose the events of the mural surfaces beyond their functional, technological, and narrative distinctions. In addition, there is no lack of instances in which exterior and interior are placed in continuity through surfaces of limits and "filters": from large mirrors to the architectural/urban scale, to true coordinated, reunifying projects.

The aim is to reveal and highlight how, in the stratified, often occasional, environments of signs of the contemporary city, design continues to be revealed as a necessary tool for initiating different processes of effective narration.

Notes

[1] Translated by the author.

[2] In this text, *photomural* implies both the enlargement of a single image and an architectural-scale collage of photographic fragments. It is specified in the text when this implies a photograph or photomontage.

[3] In 1935 Ferdinando Reggiori wrote: "These shows now begin to be saturated: we should fight photomosaics" (In: La Mostra dello sport italiano al Palazzo dell'Arte di Milano. *Architettura*, 14, 1935, pp. 447-495, cited in Golan 2010, p. 85).

[4] Translated by the author.

[5] See: Herdeg 1982; Belardi, Empler, Quici 1999; Poulin 2012; Empler 2012; Dawson 2013; Bruno 2016; Poulin 2017; Cooke 2018; Adams 2018.

[6] Leatherbarrow, Mostafavi 2002, p. 8.

[7] For a deeper look at this concept, see: De Fusco 2001, pp. 166-168.

[8] Translated by the author.

[9] This terminology makes reference to Bernard Tschumi; see: Bruno 2006, p. 53.

[10] Ibid, pp. 53-54. Translated by the author.

[11] Reference is naturally made to the concept developed by Colin Rowe; see Rowe 1990.

[12] The façade of the building presents bands of opalescent glass with a structure that makes it possible to overlap writings composed of metal letters. Artificial lighting makes the visual impact of the communication even stronger. An important precedent in the use of the façade as a publicity tool is what was created in 1924 by Aleksandr Rodchenko for the Mosselprom warehouses in Moscow.

[13] On the relationship between artificial light and architecture, see Ackermann, Neumann 2006.

[14] See Gasparini 2009; Haeusler 2009; Haeusler, Tomitsch, Gernot 2012; Lewis 2015; Hespanol, Haeusler, Tomitsch, Tscheerteu 2017.

[15] The project, completed in 2008, is by Simone Giostra Architects and Arup.

[16] The structure, completed in 2012, was designed by Benthem Crouwel Architects.

[17] On the use of "dynamic graphics" on building surfaces, see also: Krasner 2013, pp. 158-160.

[18] The structure is a cogeneration centre for the district heating plant. It is located near Ivrea and the images used are 'montages' of photographs of Olivetti buildings.

[19] Baur is the most important graphical designer interested in environmental graphics. With respect to the topic presented here, his visual project for the Cologne Bonn airport is of particular interest.

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Drawings, Diagrams and Communication in Collective and Action Architectures. Three Manuals as Graphic References

Alberto Bravo de Laguna Socorro

Abstract

Three selected manuals, publications of the Iconoclasistas, Lacol and Recetas Urbanas collectives, leave us evidence of the fundamental and intentional role of graphic strategies in their works and actions. Iconoclasistas, Lacol and Recetas Urbanas, in representation of the wide and heterogeneous scope of the collective and the action, record the suitability of the format of the manual to project, materialize, socialize and disseminate their alternative forms of work, around architecture, urban planning and social action.

Keywords: collectives, communication, diagrams, drawings.

Introduction

The graphic components have a fundamental presence projects and materializations of the architecture generated within the areas of the 'collective', the 'social' or 'activism'. The different ideas and purposes of the groups of architects around the 'collective' derive in very diverse architectures and other productions, the important attention to the graphic will be a common component among this heterogeneity. The dissemination of his architecture and his processes are, in general, essential objectives in the approaches around the "collectives"… plans, drawings and models will be an ideal material to spread his work and ideas in publications and on the networks.

A very extensive and diversified inventory of active spanish and international groups such as: PKMN, Enorme, Eeestudio, Zira 02, Leon11, Zoohaus, Basurama, Zuloark, Assemble, Elii, LAB.PRO.FAB, Recetas Urbanas… among others, make up a panorama really wide graph (fig. 1). The 'collectives' of architects supposed a kind of 'boom' with the arrival of the 2008 crisis and the real estate bubble, relieving in these times of scarcity some previous architectural movements –such as Superstudio, Cooperativa Amereida, Comunidad Tierra… among others– , pioneers in different ways of exercising the trade, "a tabula rasa architecture, an autarkic and community option, which departs from the dominant social system, creating an alternative and disaggregated, foundational and epic, mystical and poetic" [Montaner 2002, p. 144]. These

Fig. 1. Logos of various collectives, extracted from https://arquitecturascolectivas.net/

groups, which are usually assigned by default the status of alternatives or anti-system, have become the object of interest of the system, as established: "In the search for alternatives, the architect groups are taking more and more prominence. These are proposals by creative groups and activists who are looking for the possibility of making their proposals and those of the social environment, and which is advancing in the shaping of what would be a city of new subjectivity and alternative urban planning. the objective that characterizes these groups is to project and do useful and significant things with few means and economy of resources in close relation to their context […] It is also true that these groups are of disparate quality and can be ephemeral: there are more radical ones and committed and others are only concerned with finding a professional niche for financing and promotion" [Montaner 2014, p. 151].

Indeed, one must be aware of the unequal valuation that these architectures have, we will find favorable texts and opinions compared to others that expose a critical and opposite vision before some of these manifestations within the collective and architecture [Massad 2013; 2015], But going deeper into it is not the object of this communication, which is concerned with observing the role of the graphic.

When making a first approximation, it could be affirmed that the care in the "graphic" is generalized when approaching their project strategies and dissemination of their work. In a joint view of the complex panorama of the 'collective', the 'social' or 'activism' spheres, in the face of such diversity of cases and components, this property could be seen as a shared invariant. This first invariant in the production of these studies would be in tune with the definition of advanced architecture from the Metápolis dictionary. The need for a more communicative architecture was already considered, one that works with the individual and plural and establishes new connections with society: "A menu of opportunities for an architecture capable of producing menus of results. An architecture destined to combine individual and heterogeneous situations in new plural scenarios […] An architecture that would work with the individual and plural at the same time. […] A more communicative architecture" [VV.AA. 2001, p. 74].

Communicative, plural, diverse and interactive, among others, will be common properties. By fixing the view on the graphic, being very different cases, they coincide in a widespread and intentional dedication to graphic expression that makes it possible to materialize the required plurality, diversity, interaction and communication. With drawings, diagrams, plans and models, a high level of communicability and a clear didactic desire are sought, reinforced with an undeniable visual appeal.

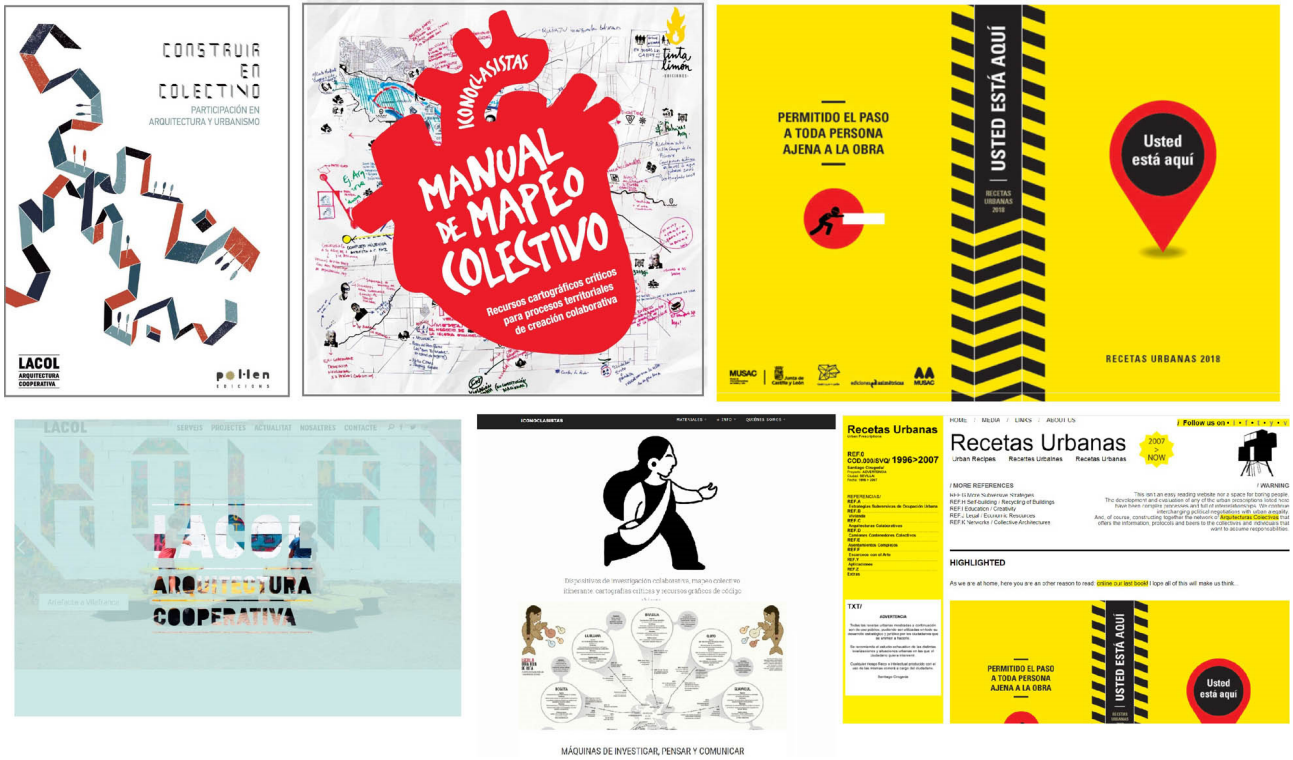

Fig. 2. Covers of the manuals and web pages of Lacol [Lacol Arquitectura Cooperativa 2018], Iconoclasistas [Risler, Ares 2013] and Recetas Urbanas [Guzmán 2018].

About the three publications

From the extensive inventory of cases that can be studied, three are extracted as significant in the use and prominence of the graphic components. Three different groups are selected, Iconoclasistas, Lacol and Recetas Urbanas, and of them, three publications (fig. 2), they will bring together various graphic approaches that we could estimate as recurring and representative of the graphic strategies of the groups around to the 'collective'. In these publications we can see some ideal "catalogs" of graphic strategies, both books bring together a large inventory of components that we can find in different doses in these collective, activist, action, social or community architectures. Hence his interest in this article.

The publications of these cases are presented as manuals, with a didactic purpose, which shows and gives instructions on how to proceed with architecture and other actions, incorporating collective participation. The main interest will be in observing how flat drawings, photographs, models, diagrams or pictograms contribute to it. This priority given to the dissemination of action strategies will also imply an intense and constant presence of their own graphic strategies.
The authors or persons in charge of these different publications, have distant origins from each other and a different professional approach, but they share approaches in their social interventions. Lacol, a collective of architects, works on architecture and urban planning on different scales and supports. Iconoclasi-

stas, a group led by a graphic designer and a sociologist, works on territorial transformations that affect social changes, fundamentally through collective mapping, the collective elaboration of plans in common with various social agents. Urban Recipes, led by the architect Santiago Cirugeda is a group concerned with social action and the intervention of architecture through participatory strategies that involve its users. The focus of this article is directed towards 'the graphic', without in any way impairing or not recognizing in these publications other architectural, urban or social values, which could be explored in other analyzes. When selecting Iconoclasistas, Lacol and Recetas Urbanas as objects of study, there is no intention of placing them as representatives of the ways of working of collectives or activists in the field of architecture or urban study, given the diversity of existing approaches, in any case we could stick to unitary interpretations about them.
In line with the exploratory condition of the article, we start from the joint view of the selected cases, opting for a mosaic view of the images extracted from the publications, which implies their presence in small size, which will imply a non-detailed perception. Consciously, the images are collected to form a subjective selection, which shows the diversity of strategies. The chosen images seek to be a reflection and representation of the wide and varied field from which they are extracted as references. The interpretation of the images is structured in sections derived from an observation focused on the graphic. Two texts, two referent publications that have provided numerous guidelines for ordering this approach have influenced the selection of cases, the article "Well into the 21st century, the architectures of post-capitalism?" [Zaera-Polo 2016] and From diagram to experiences, towards an architecture of action [Montaner 2014].

Diagrams and pictograms

The ability to communicate will be a priority factor. López Manuera makes an interesting reflection on the graphic representation in the collectives, raises the need for other ways of representing in this architecture. Its alternative character and different from what is established, should be reflected in the graphic: "A way of understanding architecture that also requires a different way of approaching representation (…) the architecture of these groups also requires an unknown approach to representation. Images that are based on pop functional considerations –because they look for other representative systems outside of architecture and because they respond to a specific need– that can range from appointments inserted in architectural culture to more distant ones, such as graffiti. In fact, many of his actions are limited to the illustration itself as an element that generates architecture" [López Manuera 2010, p. 18].
LaCol, Iconoclasistas and Recetas Urbanas, come together in this "different way of approaching representation", they are clear users of different ways of representing their productions (fig. 3). The ability to communicate will be a common determining factor, which will imply an intensive use of the diagram, a graphic resource generally linked, although not exclusively, to the collective architecture. In From diagram to experiences, towards an architecture of action, Montaner dedicates a section to this direct relationship between diagrams and these architectural proposals: "Collectives of architects: activism and networks" [Montaner 2014, pp.150-154]. Montaner will define the diagram as "a graphic tool that visualizes phenomena or flows, both of reality and of the project", it will be, therefore, an ideal tool to develop projects that "prioritize facilitating action and the creativity of its users" [Montaner 2014, p. 23].
In the extensive bibliography around the diagram, there are various definitions, Paredes describes it as a "graphic organization device, which uses visual means to compress information in the form of consolidated situations, techniques, tactics or functions" [Paredes Maldonado 2015, p. 169], for Marcos it will be a resource that allows us to "analyze, narrate, record the project process, map the context and prefigure the architectural form" [Marcos 2011, p. 105] for Solana and Gutiérrez "geometric drawing used to demonstrate propositions, solve problems, or graphically represent the configuring law of a phenomenon; in another formulation: it consists of a drawing to show the relationships between the parts of sets or systems" [Solana Suárez, Gutiérrez Labory 2017, p. 49]. The relationship between diagram and groups will be a constant, terms and actions such as organization, information, analyze, record, narrate, solve, relate, conceptual load, drawn

Fig. 3. Diagrams and pictograms, graphic resources in the manuals of Lacol [Lacol Arquitectura Cooperativa 2018], Iconoclasistas [Risler, Ares 2013] and Recetas Urbanas [Guzmán 2018].

from the previous definitions, confirm the effective coexistence of this resource.
Diagrams and pictograms are going to characterize the representation in the collective, an ideal medium due to its informative condition. Lacol writes about the diagram "Diagrams are graphic representations that help us make concepts that can be very complex understandable. They are very effective tools to collect, share and discuss information" [Risler, Ares 2013, p. 94] in coincidence with the role assigned to Lacol pictograms "Clear and schematic images that inform, signal and allow complex readings on various topics (…) They make it possible to establish links, identify key figures, review practices, and make visible articulated forms of organization and territorial transformation" [Risler, Ares 2013, p. 54].

Collage, comic, graphic action and fragmented aesthetics

Different trends are distinguished in the use of graphic components in these architectures. Zaera [Zaera-Polo 2016] enunciates an extensive inventory of ways of tackling the graphic, they would highlight: the imaginary of the comic and certain architectures that are resolved within a fragmented aesthetic, represented by collages, and that is formed by bringing together forms of diverse origins such as pop and postmodernity or easily recognizable prefigurations for a general observer (for example: gabled roof, cabins, towers, industrial or factory spaces…).
In these manuals these graphic practices and strategies are present (fig. 4), with a main purpose, the need to make their approaches understandable and disseminate to the social groups to which they are directed. As Zaera points out: "Architectural drawings have gained unusual relevance as objects of worship, and it is common for emerging professionals to enjoy producing elaborate drawings, not to make buildings, but to polish their image and publish their work in magazines, or post them in the vast flourishing field of the Internet" [Zaera-Polo 2016, p. 12].
The collectives, with implicit emergent status, incorporate drawing into their actions in different ways. The drawing and narrative structure of the comic will be some dissemination resources that will make your messages more accessible and friendly. The presence of traditional or recognizable architectural forms will also allow a better understanding of their proposals by the general audiences to which they are directed. From there. as Zaera also points out: "The coupling between the populist and neo-naïve aesthetics and the politically conscious practices is one of the most distinctive features of the new activism, establishing a radical contrast with the harsh, contrasted and resolute aesthetics of the traditional practices of the modern avant-garde" [Zaera-Polo 2016, p. 12].
In the Iconoclasistas manual, "The use of visual resources and illustrations in the mappings collaborates in the intervention of the participants, stimulating participation through the use of simple, metaphorical or symbolic images with a lot of information" [Risler, Ares 2013, p. 46]. In the Lacol manual, the same is emphasized, it is stated that it will be essential to "propose a good communication strategy and dedicate a proportionate effort" [Risler, Ares 2013, p. 60], and for this "we must make the most of all the possibilities of the visual environment". In reality, the entire work of Recetas Urbanas is an extensive manual, in fact, the name of the studio itself reflects this: "From the beginning of his career, Santiago Cirugeda has conceived his actions and proposals as realistic, empirical and informative essays that, regardless of his achievements, can provide usable knowledge for all. That is why it has been organizing them in the form of the pleasant compendium of "urban recipes" that gives its architecture studio its name. An archive whose raison d'être is not so much to document its work as to make available to anyone an open source architectures manual that shows the protocols necessary to carry them out" [Álvarez Benítez 2018, p. 24].
In Recetas Urbanas the communication strategy is essential, combining technical and legal resources will enable your architectural and social proposals to materialize. The manual, and the graphic resources inserted in it, is the fundamental medium for the dissemination of these recipes, open to public use. Simplified assembly techniques using sequential comic strips and simple pictograms, all these elements combined in the manuals' recipes make its architecture possible. In the selected publications, it will be agreed that "ablirquitectura has to be fundamentally readable […] emerging practices are dedicated to the re-circulation

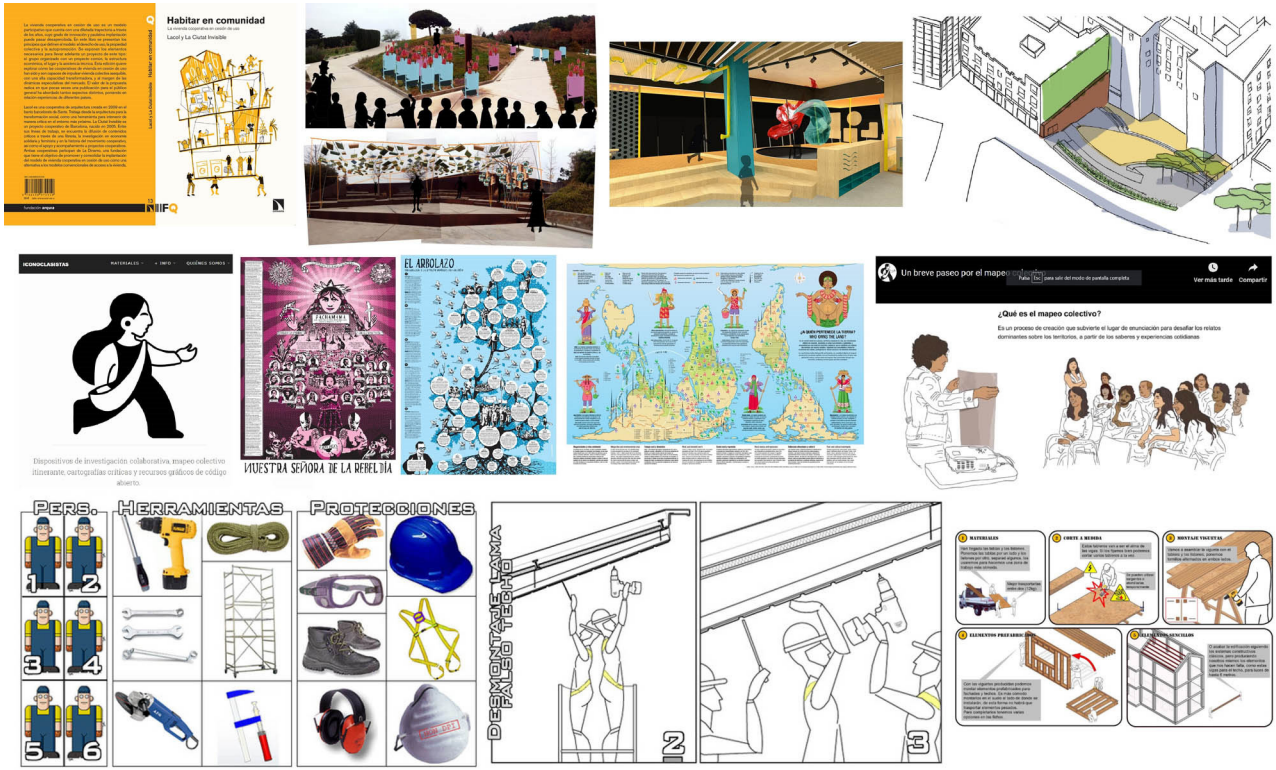

Fig. 4. Graphic trends: comic, fragmented aesthetics for graphic action in the manuals of Iconoclasistas [Risler, Ares 2013], Lacol [Lacol Arquitectura Cooperativa 2018] and Recetas Urbanas [Guzmán 2018].

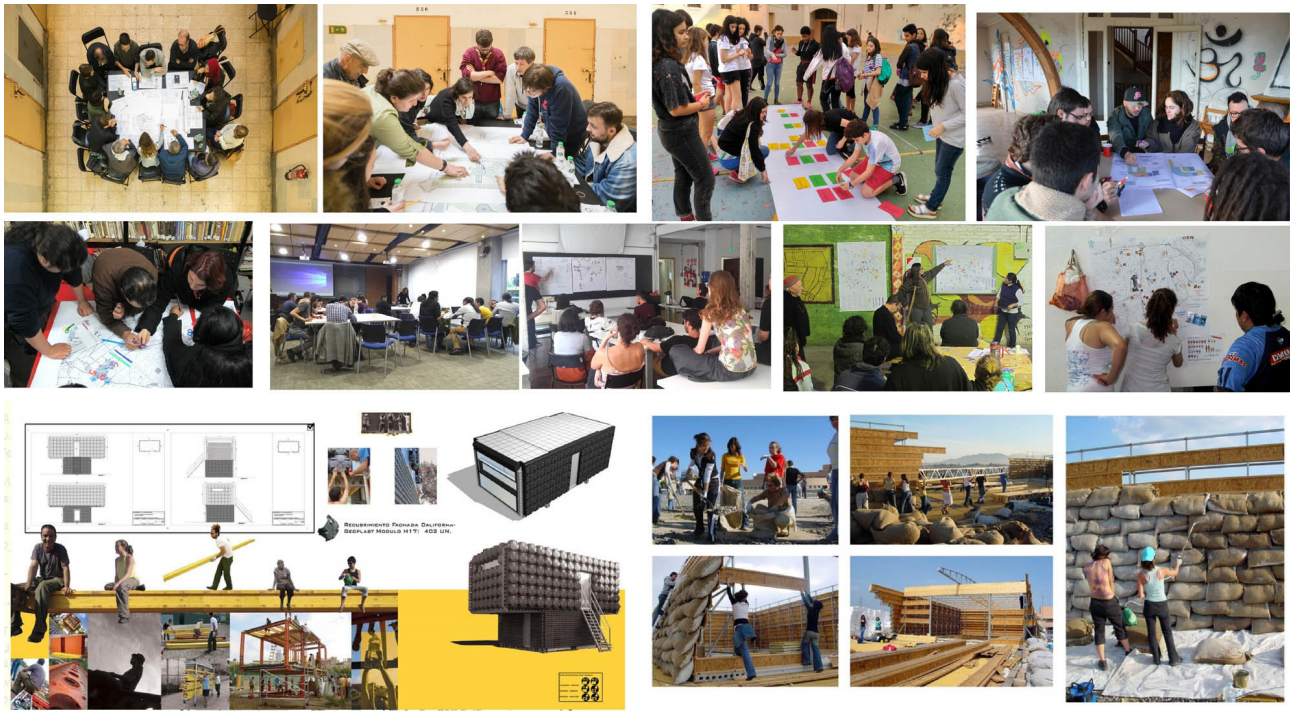

Fig. 5. The graphic action, scenes of participation from the graphic in the manuals of Lacol [Lacol Arquitectura Cooperativa 2018], Iconoclasistas [Risler, Ares 2013] and Recetas Urbanas [Guzmán 2018].

of archetypes and languages" [Zaera-Polo 2016, pp. 7-8], both in architecture and in proposals for action on the territory. With these combined resources the essential task is guaranteed, connecting with the user and the general public.

Conclusions

In the productions of Lacol, Iconoclasistas and Recetas Urbanas the graphic aspects will be conditioned by the need for transmission and communication to society of their productions. A common goal is to involve society even in its graphic strategies (fig. 5). In the Lacol manual constant declarations of intention are made about it: "In order to ensure informed and inclusive participation, it is essential to establish clear methods that make decision-making processes readable. The repertoire of existing methodologies is very wide and largely depends on the field in which they are applied" [Lacol Arquitectura Cooperativa 2018, p. 46].
In the same way, in the Iconoclasistas manual this need is highlighted: "The construction of new territorial stories and narratives requires tools that promote participation and that encourage reflection based on dialogical views. In this sense, the design and activation of an arsenal of visual resources (iconographies, pictograms, graphic and cartographic devices) establish a work platform that encourages the remembrance, exchange and signaling of the themes" [Risler, Ares 2013, p. 14].
In the work of Recetas Urbanas, the user's need for participation and involvement is implicitly linked to his ideas, it is a structural part of his work, his work has no place without them: "For Urban Recipes, architecture is an incentive for people to come together. They have made this collaborative approach their lifestyle, their hallmark of work. More than the finished building, it is the relationships and networks fostered through collaborative practice and the social functions that their projects serve that have the greatest value […] Urban Recipes believes that their work is pure social action and cannot be marketed in the market. In fact, there is a lot of technical documentation of their projects that can be downloaded for free from their website" [Guzmán 2018, p. 323].
The objectives are clearly stated, the role of the graphic in this is evident in the resources used. Diagrams, pictograms, collages, comics, collective graphic actions and a fragmented aesthetic, with recognizable forms drawn from pop, postmodernism or the vernacular, are, among others, an active part of his graphic strategies. These manuals serve as references, bringing together a whole repertoire of forms of representation for very diverse architectural proposals. The collectives in general expose and explain their working methods, drawing on extensive graphic documentation associated with the projects and alternative projects they propose. From a panoramic and general vision, some generic conclusions can be drawn, the simultaneous presence of the large number of graphic options indicated in this article becomes evident. If we ask ourselves if the collectives or the action architecture have their own graphic representation, it is concluded that it is not possible to answer in a simple, general or schematic way, before the vast and complex panorama that unfolds in a common interpretation. As a sample of the large inventory of groups, through these manuals we can affirm that, in general, the use of a graphic expression involved with their works and actions, in different degrees and tasks, is stated. The graphic will play an active and determining role in your activity.
In Lacol, Iconoclasistas and Recetas Urbanas manuals, a high level of communicability is sought, with an evident didactic desire and a sought-after visual appeal. Drawings, diagrams, plans and models are carefully and strategically planned for this purpose. Extracted between the diversity in "the collective", it could be affirmed that in Lacol, Iconoclasistas and Recetas Urbanas the general protagonism that graphic expression has is reflected. "The graphic" will be a fundamental means of communication, with which to disseminate and make known their ideas, their works and actions, which will prioritize involving a society they seek to transform. The use of the manual will be an ideal channel for this.

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RUBRICS

Reading/Rereadings

Readings/Rereadings

The Elements of Drawing by John Ruskin. Drawing between Art, Science, Design and Education in XIX century in England

Enrico Cicalò

Written in 1857 [1] and translated in Italy for the first time in 1898 [2], *The Elements of Drawing* is the first explicitly didactic work written by John Ruskin [1819-1900], as well as the one that gave him greater fame as an expert in drawing in the English cultural scene of the mid-XIX century [Levi, Tucker 1997, p. 175]. Since its *Preface*, the work is defined as "a manual of drawing" addressed to a well defined and at the same time unidentified public: adults, or in any case students aged at least 12-14 years, self-taught dilettantes who want to learn the rudiments of art, without the supervision of a master [Ruskin 1857, pp. V-VII]. Indeed, the manual is mainly structured in three letters addressed generically to the reader and two additional appendices to guide the autonomous learning; the XIX century equivalent, we might hazard, of what today could be a course articulated in three tutorials, conceived as a support to "distance learning" and containing the indication of numerous links to in-depth resources and supplementary didactic instructions that the students can find and consult autonomously.
The manual is part of the wide and important production of didactics books coming from the dilettante tradition, which was established between

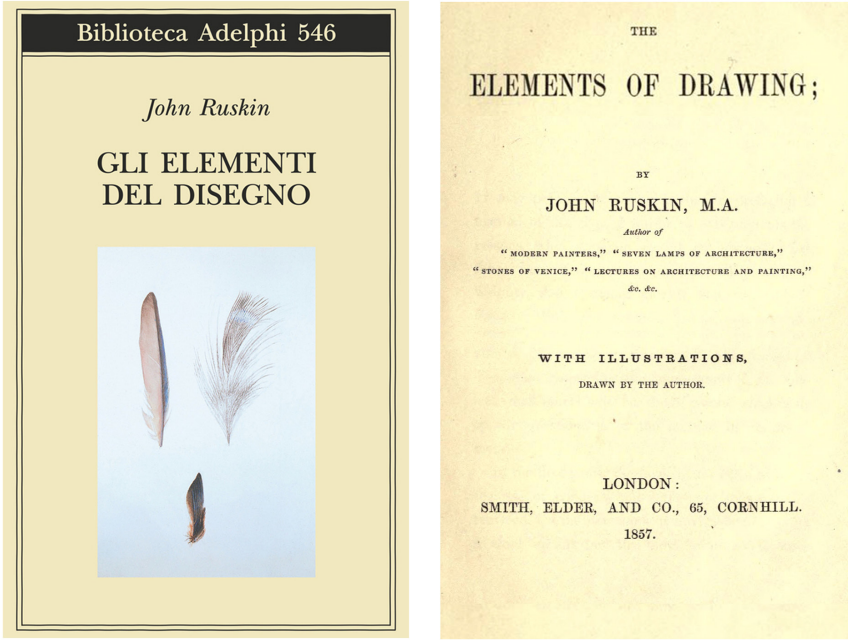

Fig. 1. Cover of the Italian edition currently on sale [Ruskin 2009] and frontispiece of the first edition [Ruskin 1957].

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the end of the XVIII century and the beginning of the XIX century and which in those years made the fortune of drawing and of the masters who taught it. In fact, by the end of the eighteenth century the practice of drawing had become widely established in the wealthy classes as polite recreation, contributing to the spread of manuals and drawing lessons, especially aimed at young students. This was the dilettante context in which both Ruskin's training in the field of drawing and his activity as a teacher began [Contessi 2000, p. 168].

In Ruskin's vision, dilettantism does not have the negative connotation attributed by contemporary culture, but rather recalls its etymological roots by referring to the word *diletto* (from the Latin dēlectāre, to delight, to give pleasure). In fact, according to this interpretation, a dilettante is who practices an activity only for pleasure, free from the constraints and obligations that characterize the activity of professionals [Levi, Tucker 1997, pp. 181-183]. Although contemporary culture and language diminish the value of the dilettante's work compared to that of the professional, in Ruskin's view the values appear to be inverted. The dilettante works for pleasure, i.e. moved by a virtuous and free pleasure towards knowledge and contemplation, thus differently both from the search for complacency typical of amateur practices, and from the mechanicism of those professional practices that characterize the emerging design schools that are marking the distinction between art and applied art, between intellectual work and manual work.

The three approaches to education in the field of drawing that would then characterize the English educational scene of the second half of the XIX century are thus outlined: the first linked to the tradition of the past and which saw the Royal Academy of Arts as the most representative institution; the second linked to the new demands of industrial production represented by the School of Design and the Department of Science and Art; finally, the third, non-institutional, which is identified in guide of Ruskin and is focused on overcoming a utilitarian conception of drawing towards a recognition of its role as a means to refine vision, to acquire and communicate knowledge as well as reading, writing and counting. According to this approach, drawing becomes "a means of obtaining and communicating knowledge. He who can accurately represent the form of an object, and match its colour, has unquestionably a power of notation and description greater in most instances than that of worlds; and this science of notation ought to be simply regarded as that which is concerned with the record of form, just as arithmetic is concerned with the record of number" [Ruskin 1905, p. 143]. This third approach to art education will be the one that will have the greatest influence on the didactic approach of some important artistic movements of the twentieth century, such as the School of Art and Craft and the Impressionism [3], and more generally on the history of art and drawing education, also through the works of Ruskin's students who continued and deepened his ideas [Read 1943, p. 115].

The work

Several of Ruskin's earlier works had already had a strong educational connotation but had been mainly dedicated to the dissemination of ideas and general principles rather than practical methods, such as *Modern Painters* [4], of which *The Elements of Drawing* is a synthetic re-proposal conceived in relation to his teaching experience at Working Men's College [Harrison 2013, p. 68]. In turn this last manual will then serve as the basis for other didactic works such as *The Laws of Fèsole* [Ruskin 1904a, p. IX], written between 1877 and 1879 on the occasion of his teaching experience at the University of Oxford [1869-1884] as "Slade Professor of Art".

The years at the Working Men's College are intense from the point of view of educational reflection and will stimulate the writing of other books such as *The Elements of Perspective* (1859) and the annual *Academy Notes* (1855-1859). *The Elements of Drawing* is a mature work by Ruskin, who at the time of the publication was thirty-eight years old and has already completed important works that will influence the contents and approach of the manual, such as the first four volumes of *Modern Painters, The Seven Lamps of Architecture* (1848) and *The Stone of Venice* (1852).

The work, considered by several authors inspired by Leonardo da Vinci's *Treatise on Painting* (Nicolello 1898; Cook 1968), is presented as a progressive and gradual method, similar to what he had learned from his teacher James Duffield Harding in 1841 [Levi, Tucker 1997, pp. 60-64], divided into three parts –*On First Practice*, *Sketching from Nature* and *On Colour and Composition*– structured in an epistolary literary form, which makes explicit the author's aim of writing a manual not specifically to support the lessons of his courses in the school but rather in function of the self-learning of other students.

In *On First Practice* the proposed educational program is of grammatical kind. Aimed at progressively learning the elements of the language of drawing, it starts from the experimentation of tones and tints and then gradually moves on to lines and contours, shading, alphabets, two-dimensional shapes, colour and chromatic scales, three-dimensional volumes, uniform chromatic campiture, and chromatic tonal values. Therefore, the themes of the exercises range from the simplest to the most complex; as well as the drawing tools indicated –from pen to pencil and finally to watercolour– and the recommended subjects – from natural subjects to the works of artists such as Joseph Mallord William Turner, Albrecht Dürer and Rembrandt, in coherence and continuity with the suggestions given to the students of the Working Men's College. Among the artists to be observed, studied and replicated, Ruskin obviously gives particular emphasis to Turner, whose work he had already focused on as a critic in *Modern Painters*, recommending in particular the edition illustrated by Turner of the book of poems *Italy* by Samuel Rogers (1763-1855), a work that was fundamental in Ruskin's path since it was given to him as a child by his father's business partner [Ruskin 1983, p. 26].
In the letter titled *Sketching from Nature*, Ruskin invites the reader to move from the drawing of static subjects to that of dynamic ones that make more difficult that strictly imitative drawing he always criticized. In particular, the subjects examined are the natural elements such as water, sky and clouds, while for the drawing of the land he recomend the reader to refer to what has already been discussed in *Modern Painters* [Ruskin 2009, p. 150]. Also in this second letter there is strong reference to Turner because "no other artist ever yet drew the sky: even Titian's clouds, and Tintoret's, are conventional" [Ruskin 1857, p. 153] and "Absolutely right, in difficult river perspectives seen from heights […] no one but Turner ever has been" [Ruskin 1857, p. 180].
The third letter is On Colour and Composition. In *The Elements of Drawing*, composition, "putting several things, so as to make one thing out of them" [Ruskin 1857, p. 244], is considered "the type, in the arts of mankind, of the Providential government of the world" [Ruskin 1857, p. 245] and becomes a specific field of investigation. According to Ruskin, however, composition cannot be taught. However, although the invention cannot follow rules, seven laws are illustrated for the arrangement of objects (figs. 4, 5): the law of principality, the law of repetition, the law of continuity, the law of curvature, the law of radiation, the law of contrast, the law of interchange, the law of consistency and, finally, the law of harmony.
The last editions of the volume closes with two *Appendixes*, the first –added after the first edition– dedicated to the *Illustrative Notes*, including brief notes on the contents and the second dedicated to the *Things to be studied*, divided into works to be viewed in the galleries and works published and reproduced to be procured, in addition to those of Turner, Rembrandt and Dürer already emphatically recommended within the volume.

The context

Conceived during his teaching experience at the Working Men's College (1855-1859), *The Elements of Drawing* was considered nearly as an its official text. The foundation of this school was inspired by the same utopian socialist ideals with a Christian background that characterized Ruskin's entire critical and political work and was part of a broader policy of initiatives in support of the lower classes. In this historical moment –following popular protests, social division and public health problems linked to epidemics– adult education is actually considered a primary need as much as that for children, since education is seen as a possible means of concord between the classes and an instrument to contain extreme radicalism.
The College aims to offer the poorest classes a liberal and high education, aimed at training the man and the citizen rather than the worker; therefore, an education not strictly professional and aimed at improving technical skills to increase earnings. Among the subjects taught in adult schools there are Latin, Greek, literature, foreign languages, logic, diction and drawing; the latter considered to be an important discipline for the eye and the head as well as for the hand, in addition to being the link between the humanities and science [Maurice 1849, pp. 17-18].
Among the inspiring ideas of the College was the willingness to approach disciplines of seemingly only practical use from a broader and integrated perspective, which would allow workers to "feel that they are men and not machines" [Levi, Tucker 1997, p. 130], in contrast to the process of dehumanisation of work at that time occurring in the industrialising England. It was precisely these inspiring principles that made Ruskin see the school project

as an opportunity for experimentation, and convinced him to enter the school as drawing teacher [Haslam 1988, p. 69]. His arrival marked a split from the more utilitarian and professionalizing didactic approach that was spreading in those years in the emerging Schools of Design.
Indeed, Ruskin denounces and contrasts the traumatic separation between intellectual and manual work that would lead, from his point of view, to the impoverishment of both and the fragmentation of society. In this way Ruskin enters into a controversy with the supporters of the distinction between art and applied art and of the methods proper to the design schools, focused precisely on the emphasis of the latter. Art and applied art, drawing and design were not separate fields from his point of view [Levi, Tucker 1997, p. 115], because both representation and invention had to be educated exclusively through the refinement of perceptive abilities [Ruskin 2009, p. 17].
Ruskin in *The Stone of Venice* writes: "You can teach a man to draw a straight line, and to cut one; to strike a curved line and to carve it; and to copy and carve any number of given lines or forms, with admirable speed and perfect precision; and you find his work perfect of its kind: but if you ask hit to think about any of those forms, to consider if he cannot find any better in his own head, he stops; his execution becomes hesitating; he thinks. and ten to one he thinks wrong; ten to one he makes a mistake in the first touch he gives to his work as a thinking being. But you have made a man of him for all that. He was only a machine before, an animated tool" [Ruskin 1904b, pp. 191-192].

However, a highly utopian approach that could only be disorienting for those who had to accomplish humble graphic tasks in their work [Levi, Tucker 1997]. In addition to discouraging some pupils, this incompatibility between method and public ended up discouraging Ruskin himself, who left school in 1858. After his departure the school abandoned and denied the method, the approach and the principles argued by him. In later teaching experiences, Ruskin chose to differentiate the educational paths in relation to the students, adapting the method to their worlds and expectations, although maintaining the willingness to include all social ranks. Therefore, Ruskin recognized that he had always taken for granted in everyone that acute visual faculty which was a natural gift in him. This awareness led him to renounce the republication in 1861 of *The Elements of Drawing:* the drawing manual he had written to support and divulge this method [Levi, Tucker 1997 p. 227].

The method

The method proposed in the book is presented as totally different from those generally adopted by the masters of drawing [Ruskin 2009, p. 16]. Ruskin claims that there are no methods applicable to anything and there is no a recipe for drawing [Ruskin 1904a, p. 97]. In fact, he is convinced that "when once we see kneely enough, there is very little difficulty in drawing what we see" [Ruskin 1857, p. XI] and that therefore the excellence of the artist depends on the refinement of perception and that this must be the aim of the masters.

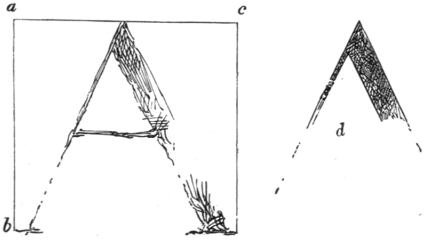

Fig. 2. J. Ruskin, Giving shape to the letters with hatching (Exercise 5), from: Ruskin 2009, p. 45.

In Ruskin's vision, drawing is the discipline par excellence, in fact he wrote: "teaching art, as I understand it, means teaching everything" [Ruskin 1907a, p. 86]. The lessons of his course at the Working Men's College included the presentation of several kinds of works such as prints and engravings by artists of all times, which became the starting point to discuss the lives of painters and to introduce lessons with a more historical, cultural and theoretical approach, such as those on the meaning of the symbolic languages of heraldry and emblems, alphabet drawing (fig. 2) and miniatures.
The manual does not provide recipes or technical prescriptions as was common in the coeval manuals. Instead, it rejects the systematic rules on which are based visual prejudices and graphic stereotypes that prevent from seeing reality. Rather, he invites to the direct observation of natural data, considering a multiplicity of possibilities for their representation; differently from the univocity of method generally argued in the literature of that time.
The manual contains exercises that have been experimented in the Working Men's College's but adapted to a teaching mode that today we

will define as "distance education". The volume recalls, for example, the first lesson of the College's drawing courses, consisting in the drawing of a sphere [Ruskin 1857, pp. XIII-XIV], materialised by a ball of chalk hung from a string. This exercise obliged the students to confront themselves not only with drawing *from* reality but above all with drawing *of* reality, avoiding the use of line as a necessary expedient to describe forms and forcing them to observe, recognize and represent shadows; a highly programmatic exercise, considered at the time almost scandalous because it immediately made the students face the naked three-dimensionality of reality [Emslie 1904, p. 39]. In this way Ruskin stimulates the return to "the innocence of the eye" (Ruskin 1857, p. 6) understood not as ingenuous perception, but rather as an indispensable means for understanding the truth and helping the student to overcome those visual prejudices that often interfere with the perception of reality [Haslam 1988, p. 75]. The next steps of the school's educational path included the drawing of casts of natural objects, again to emphasize the chiaroscuro effect, and then move on to real objects of increasing size and complexity (fig. 3). This path was then followed also in the manual, where the subjects of the exercises are progressively more and more complex.

Fig. 3. J. Ruskin, How to draw a stone (Exercise 8), from: Ruskin 2009, p. 57.

Despite these evident similarities, in the *Introduction* Ruskin wants to clarify that even if the method proposed in the manual is strongly inspired by the teaching experience in the College, it is to be considered different from the one adopted in his lessons to the students of the school, who could benefit from the constant presence of the teacher.

The drawing concept

In the context of an England becoming aware of the new needs linked to economic and social development, two different positions can be distinguished in the debate on design education. The first refers to a concept of drawing aimed at imitation, through the education of the ability to draw skillfully so as to emulate the works of artists, the second is linked to a drawing aimed at production, through the education of the mastery of geometric shapes that can be used to draw quickly and economically for manufacturing industries.
Both these conceptions are overcome by Ruskin who in the first one sees only the possibility of "emulate (at considerable distances) the slighter work of our second-rate artists" [Ruskin 1857, p. IX], in the second the confusion of "art as applied to manufacture, with manufacture itself" [Ruskin 1857, p. IX]. In particular, on this second point Ruskin highlights the distinction between drawing and design, between the skills needed to draw an artifact and the skills useful for the reproduction of that artifact on an industrial scale. In fact, in those years the debate was focusing on the practical aims and mechanical modalities of drawing rather than on its dignity on the mental and cognitive level,

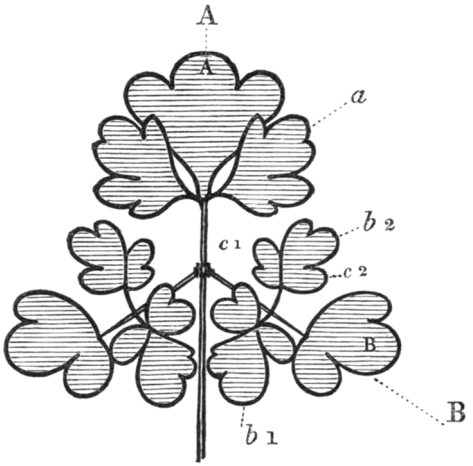

Fig. 4. J. Ruskin, Schematic representation of a columbine leaf, from: Ruskin 2009, p. 217.

which Ruskin will instead try to defend [Cook 1968, p. 390].
Therefore, *The Elements of Drawing* is thought as a didactic method to be opposed to the official approach widespread in government schools [Haslam 2000] in which "The kind of drawing that is taught, or supposed to be taught, […] is not drawing at all. It is only the performance of a few dexterous (not always even that) evolutions on paper with a black-lead pencil; profitless alike to performer and beholder, unless a matter of vanity" [Ruskin 1857, pp. 2-3]. According to Ruskin, the reasons why one should learn to draw are not so clearly definable, as argued by the utilitarian approaches of design schools, but are so numerous and important that they cannot be enunciated in a few words [Ruskin 2009, p. 16]. For this reason, the manual aims at a very general objective, that is to teach how to draw in order to represent in a clear and useful way images of things that cannot be described in words, both to help memory and to

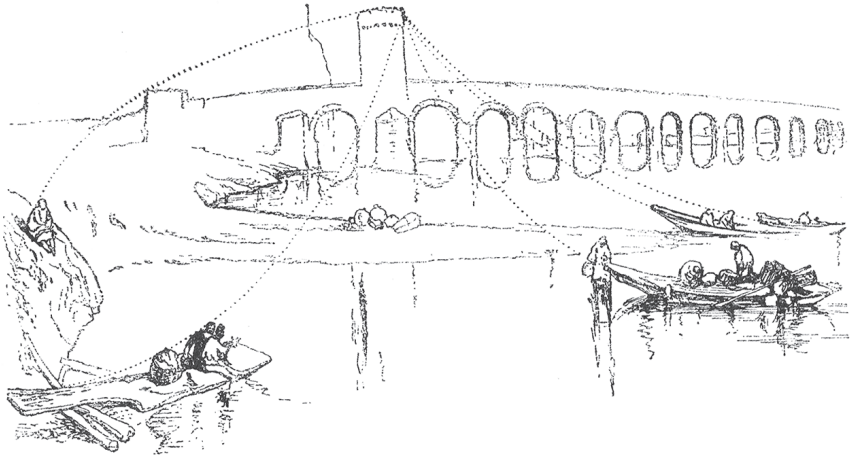

Fig. 5. J. Ruskin, The law of curvature illustrated by the Koblenz bridge by Turner, from: Ruskin 2009, p. 203.

give others a precise idea of them [Ruskin 1857, pp. 1-2]. Drawing is for Ruskin a tool for precise documentation and research, rather than a means of aesthetic gratification.
This conception of drawing was experimented and deepened by him during the years of his journey in Italy, in which drawing takes the form of graphic notes and memoranda that become for him a fundamental instrument of research and investigation that constantly accompanies his theoretical-critical work. The bad condition of preservation of the artworks and monuments cause him indignation that leads to the anxiety to detect, record and study as long as it was still possible the architectures in an advanced state of degradation. This need for study and preservation stimulates even their first exact measurements of the architecture. So, his drawings assume the role of mere memoranda which Ruskin describes as "ugly, for I consider my sketch only as a written note of certain facts, & those I put down in the rudest & clearest way as many as possible" [Shapiro 1972, p. 189].

Drawing and morality
Originally destined to a religious career by maternal will [Ruskin 1983, p. 20], Ruskin chose to turn his gaze to art and resolve his inner conflict giving art an almost religious mission. For this reason, in *The Elements of Drawing* the education to drawing assumes the role of moral formation of the individual, consistently with the tendencies of the XIX century Victorian culture. Lightness, firmness and control of the hand, sharpness and refinement of the eye become expedients to educate the individual to patience, constancy, determination and fatigue. Ruskin gives moral meaning to all his lessons, as when he invites to the transition from static to dynamic subjects: "Now remember, nothing distinguishes great men from inferior men more than their always, whether in life or in art, knowing the way things are going. Your dunce thinks they are standing still, and draws them all fixed; your wise man sees the change or changing in them, and draws them so" [Ruskin 1857, p. 121].

Drawing and truth
According to Ruskin, drawing is a method for questioning reality and engaging in dialogue with the elements of nature in search of truth: "Try always, whenever you look at a form, to see the lines in it which have had power over its past fate and will have power over its futurity, Those are its *awful* lines; see that you seize on those, whatever else you miss" [Ruskin 1857, p. 121]. At the basis of the graphic representation there is the contemplation aimed at the description and understanding of natural phenomena, so Ruskin writes about the drawing of clouds that "clouds are not as solid as flour-sacks; but, on the other hand, they are neither spongy nor flat. They are definite and very beautiful forms of sculptured mist; sculptured is a perfectly accurate word; they are not more drifted into form than they are carved into form, the warm air around them cutting them into shape by absorbing the visible vapour beyond certain limits; hence their angular and fantastic outlines, as different from a swollen, spherical, or globular formation, on the one hand, as from that of flat films or shapeless mists on the other" [Ruskin 1857, p. 190].

Drawing and nature
"Watch nature constantly – and let the spirit of your contemplation be a perpetual 'Why'" [Ruskin 1909, p. 21]. Therefore, the observation of natural phenomena and the understanding of the laws from which they derive is fundamental because "most if the

artists learn their rules mechanically, and never trouble themselves about the reason of them" [Ruskin 1909, pp. 20-21]. Those are the reasons that Ruskin incessantly investigates in drawing when he observes that "When you are drawing shallow or muddy water, you will see shadows on the bottom, or on the surface, continually modifying the reflections; and in a clear mountain stream, the most wonderful complications of effect resulting from the shadows and reflections of the stones in it, mingling with the aspect of the stones themselves seen through the water. Do not be frightened at the complexity; but, on the other hand, do not hope to render it hastily. Look at it well, making out everything that you see, and distinguishing each component part of the effect. There will be, first, the stones seen through the water, distorted always by refraction, so that if the general structure of the stone shows straight parallel lines above the water, you may be sure they will be bent where they enter it; then the reflection of the part of the stone above the water crosses and interferes with the part that is seen through it, so that you can hardly tell which is which; Mid wherever the reflection is darkest, you will see through the water best, and vice versa. Then the real shadow of the stone crosses both these images, and where that shadow falls, it makes the water more reflective, and where the sunshine fails, you will see more of the surface of the water, and of any dust or motes that may be floating on it: but whether you are to see, at the same spot, most of the bottom of the water, or of the reflection of the objects above, depends on the position of the eye" [Ruskin 1857, pp. 182-183]. Therefore, drawing proves to be not only a manual skill, but above all intellectual and cognitive, as well as visual.

Conclusions

Recently, the celebrations for the bicentenary of Ruskin's birth were concluded. They provided an opportunity to re-read his work from different points of view and different disciplinary perspectives, but they only marginally highlighted the strong connections between drawing and John Ruskin's theoretical, didactic and artistic work. However, despite the fact that his conception of drawing as a science did not succeed in the XIX century in comparison with that of drawing as design and drawing as figuration, his vision and thought are still relevant in several ways. Having recognized to drawing the dignity of a science useful to the general formation of the individual rather than only to the professional and specialized one, having given to drawing the value of language for the notation of ideas and concepts that cannot be described only with words, having attributed to the discipline of drawing the role of connection between the humanistic and scientific spheres, having highlighted the importance of drawing in the process of production of ideas but distinguishing it in terms of skills and training from the process of production of objects, having understood the potential of drawing as a learning method applicable to a wide variety of disciplines, are just some of the most current aspects that emerge from the figure of Ruskin, of which *The Elements of Drawing* represents an emblematic work in relation to the historical and cultural context in which it was written and in relation to the author's development of critical reflection on the role of drawing in work, school and society.

Notes

[1] The first edition published in 1857 was entitled *The Elements of Drawings*. In *Three Letters to Beginners* and was published by Smith, Elder & Co., London.

[2] The first edition translated into Italian in 1898 was entitled *Gli Elementi del Disegno* e della Pittura and was published by Fratelli Bocca, Turin, with notes and preface by the translator E. Nicolello.

[3] In the introduction to *The Elements of Drawing*, published by Dover Publication in 1971, the editor Lawrence Campbell writes that in a 1911 article in *Contemporary Review 99* (March 1911) entitled "What is Impressionism?" Monet confided to journalist Wynford Dewhrst that ninety percent of the theory of Impressionist painting is contained in Ruskin's handbook.

[4] The work is composed of 6 volumes written between 1843 and 1860, whose first four were written before *The Elements of Drawing*, between 1854 and 1857.

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Reviews

Reviews

Livio Sacchi
Il futuro delle città
La nave di Teseo,
Milano 2019
pp. 541
ISBN 9788834601334

Reviewing Livio Sacchi's volume on the future of cities is certainly not an easy task, given the complexity and profundity of the content, which unfolds–with a very pleasant and flowing prose–for more than 500 pages without illustrations of any kind; an intriguing book, therefore, starting from the particular structuring and the happy choice of the *La Nave di Teseo* publishing house, known not for a technical-specialist characterization, but for its dealing with international fiction, non-fiction and poetry, while also maintaining a constant attention to the classics.
The volume is divided into two parts, the first of which is an excursus on theoretical themes–from the very idea of the city, to the professional condition–that investigate presuppositions, conditions, conditioning influences, potentialities and criticalities of urban nuclei, while the second proposes, in a narrative and at the same time analytical manner, examples of cities/megalopolises throughout the world.
Thirteen chapters make up the first part, five the second; a true *opera omnia*, in which themes linked to the very nature of being a city coexist dialectically alongside readings on places throughout the world, organized by continents. It is difficult, therefore, to bring all this together in outlining the main aspects of the work; the best way seems to be that of indicating the key words that emerge during the course of reading the essay and that can become a guide for personal interpretation.
The first key word that presents itself to the reader is RESPONSE, the answer that the city gives to the desire for change, for individual growth and for overcoming the limits imposed by a sub-urban origin; the fortune of urbanism should be considered in this sense, in its responding to the needs of individuals driven to seek independence and disconnection from their own origins to enact a freedom of thought and of action that can also correspond to the potential affirmation of one's own being. And this is what is still happening today, with ever increasing passages of scale, which see the transformation of cities into metropolises and megalopolises, in search of ever-increasing opportunities, up to the vision of a globalization of interests and possibilities.
Closely connected to the previous word is TERRITORY, which implies reflections on the birth and the expansion of urban nuclei, on their link with the disposition of the portion of the world on which they rise, on the *genius loci* and the consequent possible conditioning, on the response of the man-builder in terms of respect for such a conditioning or the will to deny and/or overcome it. Territory also implies the concept of landscape, but above all, it implies the concept of anthropization: the imprint that man gives and that is expressed through construction, at all levels. In particular, this means tackling at least two fundamental questions: on the one hand, the

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relationship with the past and with the traces–more or less intense and invasive–which must be confronted and, on the other hand, the architectural language, understood as the visualization of the identity of a place... only these two frames of reference open the way to the majority of critical reflections for the conceptual choices that a designer has to face before the realization, often conditioned or at least guided by the respect of complicated and at times strict legal constraints.
Again linked to the territory, seen as the frame within which the urban nuclei are located at different dimensional scales–but this would call for a separate discussion–is the reflection on SUSTAINABILITY, in the contemporary world a true emergency, unfortunately not infrequently interpreted as a slogan; in a purposeful way, however, we refer here to the contribution that digitalization is giving even today in terms of effective globalization and continuity of interpersonal relationships–related to work or not–as a support to the maintaining of a difficult and complex equilibrium.
Instead, the social DISEQUILIBRIUM of cities, but above all, of metropolises and mega-cities, is easily perceivable in the dualism, often in contraposition, between the center and the suburbs, which can even lead to possible segregations: "wealthy" neighborhoods closed and inaccessible in a sort of voluntary segregation, but also "poor" neighborhoods, equally segregated and separated, often due to their physical distance from each other. In addition, there is a burning contemporary issue, that of migration and of the flows that could potentially constitute an enrichment and a rebalancing of civil society–also given the widespread problem of the demographic decline in some parts of the world and the overpopulation of others–but which instead are mostly transformed into social/political contrasts and further forms of segregation. Above all, the theme of the regeneration of urban spaces and the proposition of behavioral models that through new architectures propose new forms of urbanism.
The last important key of interpretation is TECHNOLOGICAL INFRASTRUCTURE, which embraces and connects, almost like a common thread, all the construction of cities, regardless of their size and formation, whether derived from transformations of ancient sites or designed ex novo. Today it is no longer possible to envisage a vision of a future city that does not use technologies suitable for the construction of important physical and digital infrastructures, to allow equally fast and effective wide-ranging mobility–from elevators for the distribution of increasingly tall skyscrapers to subways, roads and railways systems that allow high speed travel, the challenge that the builder faces is a daily one, potentially limitless–and to further strengthen the current processes of sharing that take place at multiple levels–cultural, commercial, financial, political etc.
These, in extreme synthesis, are the reflections that Livio Sacchi's volume on the future of cities opens to the reader; all-encompassing reflections, accompanied by the splendid descriptions of fascinating, highly urbanized places of the contemporary world, in which the city appears, in all its power, to satisfy those possibilities of which we spoke at the beginning; and the provocation of Serge Latouche's "happy degrowth" cannot but come to mind... Thus, perhaps, the question widens and intersects reasonings on ethics and on the concept of limits, in the awareness that even the tensions regarding the future of cities will have to take into account the geographical redesign that the increase in urban expansion involves, with the occupation of waters, high-altitude connections, the leveling of mountains; the transformation of the population, already underway, and the formation of new civil societies; the permanence of the memory of the past; the limitation of environmental degradation.
Not the renunciation, therefore, but the proposition–through the present–of a thought on the future of cities, made up of new models of buildings, of infrastructures, of internal relationships that design for us the cities of the future.

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Reviews

Laura Farroni

L'arte del disegno a Palazzo Spada. L'Astrolabium Catoptrico-Gnomonicum di Emmanuel Maignan

De Luca editori d'arte,
Roma 2019
pp. 143
ISBN 978-88-6557-410-2

Laura Farroni's book entitled *L'arte del disegno a Palazzo Spada. L'Astrolabium Catoptrico-Gnomonicum di Emmanuel Maignan*, with contributions written by Maria Luisa Toscano, Matteo Flavio Mancini and Giulia Tarei, is a research promoted by the Council of State, housed in Rome, in palazzo Spada, whose knowledge and valorization the text is dedicated to. As already evident in the title, the investigation is not only limited to the architecture of this precious 16th century Roman building, but deepens one of its most valuable rooms, the long barrel-vaulted gallery, located on the 1st floor, whose surfaces house one of the most complex and refined instruments produced by the scientific knowledge of the time, the majestic catoptric sundial that measures the Sun's true time by means of the positions a small luminous ellipse produced by the reflection of sunlight, incident on a small mirror which is properly positioned near a window in the same room. Designed by Father Emmanuel Maignan and painted by Giovan Battista Magni in 1644, the *Astrolabium* is a masterpiece strongly desired by Cardinal Bernardino Spada in his palace as a representative work of the scientific culture achieved in the 17th century.
The author establishes from the very beginning of the book her methodological approach and the disciplinary field in which the research will move, i.e. the representation, declined according to its many peculiarities of both artistic and scientific discipline, but above all the key for an indispensable reading of this inestimable asset of our cultural heritage.
From the very first pages it is evident that the *Astrolabium*, but more generally the gnomonic discipline, are to be brought back to drawing and geometry, which made measurable on Earth what seemed immeasurable in heaven. Gnomonics still needs to be reinterpreted through the disciplines of its ancient roots, after about two centuries of analytical-mathematical specialisms and/or abstractionism that have led to its progressive dispersion. Drawing and geometry therefore claim their role as necessary and indispensable tools for interpreting and co-ordinating the numerous values coming from different fields of knowledge that converge in the design and realisation of a scientific instrument, but having a very high artistic value, such as the *Astrolabium*, a masterpiece representing the link between art and science in seventeenth-century culture. The author also denotes a research methodology totally embedded in the disciplines of the Drawing scientific, making use of modern integrated surveys of the building, compositional analysis of the image, study of ancient survey instruments and perspective methods used for the grid

of the lines of the catoptric solar dial, as well as 3D modeling to simulate and verify the projective processes described by Father Maignan himself in the treatise *Perspectiva Horaria sive de Horographia gnomonica tum theoretica, tum practica libri quatuor* retracing backwards the construction process from the first conception phases to the construction process, with particular attention to the instruments used to transpose the design geometries along the vast vaulted surfaces, supported also by the didactic experimentation with the students of the course of Mathematical Machines, who tested their actual functioning. The volume also deals with the study of the historical building, from the foundation to the transformations commissioned by Cardinal Bernardino Spada who, from 1632, employed Francesco Borromini and father Emmanuel Maignan. Of a large part of the building, the volume shows several points clouds and drawings obtained by means of an accurate integrated survey, which aims to read the building as the tangible result of a speculative act that could verify, and show, how perspective theories and astronomical sciences applied to architecture. The distribution criteria of the rooms are thus reread according to the reasons for a project that intended to make palazzo Spada the place of application of the knowledge that the church was acquiring and developing with its active participation in the cultural debate of the time, characterized by the "exaltation of mathematics to arrive at wonder, study of ways of observing, of looking […]" [p. 24]. During those years, the palazzo Spada took on an articulated configuration such in a game of continuous visual references between interior and exterior spaces. Visual cones and targets, painted architectures and illusory perspectives: of the latter are proposed some perspective returns and three-dimensional modeling of the virtual spaces painted in the quadraturism of the Great Hall. The integrated survey of the building also allows the author to proceed to a comparison between the current state and the data exposed by Maignan in his treatise, in order to verify what is theoretically stated in the geometrical methods for determining the astronomical alignments and what has then been done. The second chapter, by Maria Luisa Toscano, aims to frame the geometric and astronomical skills of the minimal Father Emmanuel Maignan, an esteemed French mathematician, who was the author of a catoptric astrolabe in the Roman Monastery of Trinità dei Monti, within the wider scientific panorama of the seventeenth century that inherited, from the previous century, one of the most historically important scientific revolutions, due to the innovative approach to natural phenomena according to the heliocentric cosmological system, introduced only a few decades earlier by the studies of Niccolò Copernico, Tico Brahe and Galileo Galilei. Chapter four, by Matteo Flavio Mancini, explores the geometry of the pictorial techniques related to the barrel vault morphology analyzing the processes described in the major perspective treatises of the sixteenth and seventeenth centuries, and then, supported by the graphics of specific three-dimensional models, deals with the scientific interpretation of each grids of curves detected in the *Astrolabium*, each pne identified as a gnomonic representation of a precise astronomical phenomenon. The fifth chapter, by Giulia Tarei, aims to analyze the geometry of the *Astrolabium*'s painted lines and their projective genesis as Maignan indicates the construction process, but not the original drawing, as the author herself states. By bringing back each grid of curves to the planes passing through the gnomonic centre of the whole system (that is the centre of the mirror reflecting the sun's rays), are thus highlighted the geometrical-projective processes and the relationships between the curves painted on the vault and their projection on the horizontal plane. The book, dealing with a subject closely related to positional astronomy, is provided at the end of a glossary and several illustrations to explain the numerous technical terms encountered by the reader in the volume. The book ends with the afterword by Agostino De Rosa, which involves the reader in the in-depth interpretative analysis of the drawing that, in Maignan's aforementioned treatise, supports the *Propositio LIV*. The image presents a perspective from the inside of the catoptric sundial gallery of palazzo Spada in which four characters are depicted while observing the grid of curves painted along the barrel vault surface. Through the distinctive features of the physiognomies and the clothing details, De Rosa formulates his hypothesis on the identity of the four observers, recognizing in them the main actors of this ambitious project that connects the sky with the earth through geometry, but we prefer to leave the reader discovering. In the appendix, there are some short pages about the experimental paths between teaching and research

undertaken by the author in deepening the case study of palazzo Spada with students and undergraduates, whose results are summarized. The book ends with an overview of all the events and initiatives for the valorization of the Astrolabe conducted by the authors of the volume on the occasion of the European Researchers' Night 2018.

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Reviews

Gilles Clément

Breve trattato sull'arte involontaria. Testi, disegni e fotografie

Quodlibet,
Roma-Macerata 2019
pp. 112
ISBN 9788822902283

The book published by Quodlibet in the series *In Ottavo* in 2019–original edition of 1997–is the outcome of a collection of glances by the author of the *Third Landscape Manifesto*, collected in the years previous its publication, in the form of images, drawings and short notes. The slight format of the Italian edition–about 100 pages in 14.5 x 21 cm format–makes it partly similar to the romantic image of the *flâneur*'s notebook, in the meaning given at the word by Walter Benjamin in his *passages* [Benjamin 2002]. And as in Benjamin, it is not a book of idle thoughts, melancholy memories or simple highlights of journey: as the title of the work states, the literary form is the treatise, in which the introduction to the subject is followed by a taxonomic exposition and concluded by very brief synoptic considerations.

The book declares its intent from the beginning, in which Clément seems to write a text poised between the *manifesto* and the *dedicatory*: *manifesto* because its language is allusive, poetic, visionary, and defines a field of observation of the world, *dedicatory* because it appears as an epistolary writing between an observer–the author–and any other latent observer–the readers: "*For those who can observe, everything is art. Nature, the city, man, the landscape, the atmosphere, what we call 'mood', and, finally and above all, the light*" [p. 13].

The combination of a holistic vision, the look at the landscape and the style of writing, are certainly not new in the French landscaping, and bring to mind another *incipit*: "everything is landscape […] and every landscape is a form of civilization, a union of natural and cultural, at the same time voluntary and spontaneous, orderly and chaotic, hot and cold, wise and trivial" [Kroll 1999, p. 3].

This correspondence, among many others possible, seems to suggest that the extension of the gaze presented in this brief treatise can be considered a natural extension of the concept of landscape that the author–and a large part of the landscape movement–has developed in recent decades: with the fortunate neologism of the third landscape Clément does not aim to re-evaluate the aesthetic qualities, sometimes romantic, of abandoned places–what architect who formed in recent decades has not been fascinated by the photographs by Luigi Ghirri, Gabriele Basilico or Francesco Jodice?–but to investigate how these places seeming as 'residues' of man's passage can become a resource for the planet's biological system. "If you stop looking at the landscape as the object of a human activity you immediately discover […] a quantity of undecided spaces, devoid of function on which it is difficult to put a name. This ensemble belongs neither to the territory of shadow nor to that of light. It is located on the margins" [Clément 2005, p. 10].

A further step back to trace the roots of Clément's work leads us to the *Mission Photographique de la DATAR* promoted

in 1984 by the *Délégation à l'aménagement du territoire et à l'action régionale* [DATAR 1984]–a systematic landscape photography campaign animated by a narrative and non-documentary aim–which facilitated, probably sanctioned, the collective awareness of the aesthetic qualities of marginal spaces.
The eye placed on the marginality of such spaces, it is not surprising that it then produced the recognition of the aesthetic qualities even of sets of elements configured–sometimes apparently, sometimes literally–in an accidental way.
Clément describes as involuntary art "the happy result of an unforeseen combination of situations or objects organized according to the rules of harmony of the case" [p. 13], and in this definition he encloses his entire program: Clément's involuntary art is a combination of situations or organized objects, not a pure result of chaos. There is no intention, but there is an organization that, regardless of its *raison d'être*, produces a configuration that in the eyes of a predisposed observer acquires an aesthetic value.
Although apparently distant, another parallel could assist us in focusing the substance of Clément's book: in the development of the child's sign an essential step is the *fortuitous realism* phase, that is the stage when the child begins to a posteriori identify shapes and objects from his own scribbles, marked without representative aim. It is possible to imagine that the child's surprise at identifying a ball in one of his doodles–traced without the intention of reproducing a ball–is similar to the surprise of the landscaper–or the careful observer–who comes across an installation of involuntary art, which no one had thought of as such, and which also fears in his eyes with unexpected vigour.
The author provide us an ample example of his approach, and tries to classify it by proposing a taxonomy of eight distinct categories of involuntary art: *Flights*, *Accumulations*, *Islands*, *Constructions*, *Erosions*, *Installations*, *Traces* and *Apparitions,* outlining the categories: *Flights* and *Accumulations* have to do with the wind, *Islands* with the relationship between solid and fluid, *Constructions* and *Erosions* with the work of man, *Traces* tells of uncertainties, *Apparitions* of animated beings and, finally, *Installations* collects configurations similar to art installations [pp. 15, 16].
The eight classes in which Clément organises his examples of involuntary art have the character of an accidental landscape grammar. A grammar symmetrical to the founding grammar of architectural thinking, as, by way of example only, in the series of drawings *Come si agisce / Dentro l'architettura* by Franco Purini exhibited at the Brera Academy in 1994, in which the graphic sign stands as a demonstration of a conceptual theorem on the categories of architectural thinking, untranslatable – in the author's opinion–in a praxis [Purini 1996]: *Bending*, *Overlapping*, *Thinning*, *Measuring*, *Wrapping* and many others are the components of an analogical and structural design thinking that seem to suggest a parallel with *Flying*, *Accumulating*, *Isolating*, *Building*, *Eroding*, *Installing*, *Tracing* and *Appearing*, involuntary actions that precede the taxonomy proposed by Clément. But the symmetry and, therefore, the distinction between these grammars is all too clear: while the Purinian grammar underlies a poietic event, Clément's grammar accentuates the self-poietic value of the residual landscape narrated in the book.
The tools used by Clément in his narration are verbal, graphical and visual, in a happy coexistence that demonstrates further the mutual distinction between them: sketches and photographs are at the heart of the book, described and commented on in the brief texts accompanying it, and in this balance between three languages–verbal, graphical and visual–the book acquires a specific value for scholars of representation. In the first instance for the distinction between sign and image, between graphical and visual domain, which although strongly correlated refer to symmetrical processes, a distinction that justifies the alternative use of drawing and photography: there seems to be a distinction between the involuntary works of art represented with a proximity gaze, and therefore perspective and visual–through photography–and those represented according to parallel projection models and the graphic medium–through drawing. The latter, in fact, are perhaps more effective in identifying that *organization that conforms to the rules of harmony* of the case by accompanying the observer's gaze into otherwise inaccessible points of view. This is the case for the rice fields of *Kerobokan*, in Indonesia, whose system of bamboo xylophones animated by the wind to dissuade birds, ends up producing a visual landscape despite their essentially sound function, or for the *fencing of the golf course of Mauille-Point*, a district of Cape Town in South Africa, where the author probably felt the need to isolate some elements with the drawing, from others that would have entered the photographic frame, documenting their value as a morphological rather than visual system.
But the key reason for this book's interest is that the role of drawing in Clément's work seems to adhere to that "paradoxical archaeological point of view" which "should be addressed to concrete objects in order to grasp […] the *drawing*", and which Fabrizio Gay

points out as the second of three instances of a correct eidetic theory [Gay 2014, p. 166]. "This is an ideal anthropological point of view–as Gay wrote–that should be addressed archaeologically to objects, that is without knowing in advance 'what they are', ignoring the mutual functional, commodity and literary gender boundaries between the arts and the techniques that produced them. Only through this effort of categorical extraneousness, of 'learned ignorance' of the current artistic and technical categories, is the image of objects reconstructed (archaeologically) *a posteriori*" [Gay 2014, p. 167].
From this point of view Clément seems to realize precisely that archaeological look that a posteriori acknowledges the image, and therefore, the drawing. That is, the project, but in an eidetic backwards path.
And yet, in conclusion, it would seem to lack that original impulse of intentionality that would be necessary for the recognition of the artifact as a work of art, but in Clément's work, like *ready-mades*, it is precisely the recognition by the author of the aesthetic value of that *organization that conforms to the rules of harmony* of chance that makes plastic bags dispersed in the environment and carried by the wind on the *fence of the golf course in Mauille-Point* an artwork. Involuntary in its realization, of course, but intentional in its acknowledgement.

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Reviews

Domenico Mediati, Saverio Pazzano

M.C. Escher in Calabria. Memorie incise di un viaggiatore olandese

Rubbettino Editore,
Cosenza 2019
pp. 115
ISBN 978-88-498-6041-2

In human history, the theme of travel is an experiential opportunity of personal growth, characterized by the own inner discovery and by the knowledge of places, people and traditions other than that of origin. In particular, these reasons inspired several artists to undertake journeys to increase their cultural background and to make their own the explored and visited lands.

The book written by Domenico Mediati and Saverio Pazzano, of the *Parco dei Greci in Calabria* series [1], focuses on the journey that Maurits Cornelis Escher made to discover Calabria from 28 April to 25 May 1930. The young Escher, together with his intellectual-artist friends Giuseppe Haas Triverio, Robert Schiess and Jean Rousset, visited this foreign reality of southern Italy moved by the curiosity to find new inspirational materials for their research and productions.

They traveled the Calabrian territory by train and by bus, then moving to the inner areas of the region on foot or on mules, discovering a rugged and fascinating land that faithfully reflected the dual character of the local people met along their way.

At that time, that places and people were completely different from those appreciable during the European Grand Tour: Southern Italy showed a simple and authentic beauty whose identity was still uncontaminated. The landscape, the stories, the legends and the relationships with the humble population became for Escher an important source of inspiration for his subsequent artworks. In fact, in his continuous search for synthesis between art and science, in his travels in the South of Italy Escher collected several ideas and suggestions that characterized his mature graphic production and his complex studies on the forms that undoubtedly made him a unique personality in the art scene.

Through the analysis and reorganization of his travel notes, sketches and drawings, the book retraces the Dutch artist's itinerary by focusing on multiple analogies between the places visited and the subsequent woodcut and lithographic engravings also made in the late graphic masterpieces of the Flemish genius. A reconstruction based on a few elements available and recoverable from the souvenir photographs of the experience and from the artist's travel diary, where he wrote down the kilometers traveled, the costs incurred, the names, the phonemes and the images of the multiple Mediterranean aspects that captured his attention.

The reconstruction of Escher's Calabrian days of stay is within the volume divided into sections: the first part is a chronological narration that reconstructs the travel diary; instead, the second part is a scientific analysis that deepens the relationship between the places visited and the artworks created.

The first part–*News of a new snake*–is structured according to the narration day-journey or day-leg of trip. The reader himself is involved in Escher's travel expe-

rience, reconstructed by the authors with personal eye and suggestions: a likely narrative, but based on real information. The involvement in reading increases with the possibility of seeing the places visited by Escher thanks to interactive photographs, precisely geographically located in the points of photo shooting.
Key elements traceable in the first part, are then extensively investigated in *Drawings and visions of Maurits Cornelis Escher in Calabria*. In this second section the narrative changes, taking on a scientific treatment. Escher's figure is biographically presented in relation to the historical, political and cultural context in which he lived. An artist-wayfarer who, like Theodore Brenson, Edward Lear and Karl Witte, visited Calabria and drew inspiration from it. The part provides an accurate artistic and graphic comparison between drawings, suggestions and "grecanici" engravings, the object of perceptive experiments and reminders in Escher's artistic evolution. In support of the scientific treatment, the study of the artworks is presented through various graphic analyzes related to excerpts from the original prints, decomposition of landscapes by graphic elements and reflection schemes to better understand principles of the realization techniques.
The two different sections have in common the Dutch artist's incessant search for harmony, which seems to trace in the relationships that exist between the landscape, built and anthropological context of the Calabrian peninsula. *Balance that lives in differences, in opposites*: the verticality of the rocky hills overlooking the sea or inland, the perched buildings, the strong chromatic contrasts and chiaroscuro effects, the ancient languages, legends and traditions. In addition, Mediterranean flora and fauna, holders of metaphors and memories that accompanied Escher in different engravings of his artistic *excursus*.
The volume is a research made of in-depth content and graphic analyzes in which the different correspondences between lived, annotated and reinterpreted places highlighted through Escher's artworks. The book also presents an enrichment of infographics thanks to its interactive dimension available through Augmented Reality [2]. This interesting tool allows the reader to overlay the graphic analyses of the engravings on the photographs taken in the same points of view; it is possible to verify the changes in the landscape context and any corrections made by Escher in his panoramic representations. In addition, the technology refers to the original images available on internet and it is possible geographically locate them in the points of view identified by the research. Therefore, it is a multi-information book, where a valid graphic contribution is added to the textual and descriptive content. The different forms of representation and images proposed by the authors constitute an appropriate and innovative support for understanding the itinerary, re-reading the visited places and all analysis of the engravings by Escher that bear the signs of the Calabrian days.
Furthermore, this literary and scientific work well reflects the intent of the series to promote, enhance and memorize the cultural stratification belonging to the local Greek heritage, stimulating the reader and the art lover the curiosity to retrace those places and to seek the same suggestions of the Dutch engraver, lived in those lands of uncontaminated and authentic beauty.

Alberto Sdegno e Veronica Riavis

Notes

[1] The Series of the Parco dei Greci di Calabria is an initiative born within the *Neo Avlaci* (*Nuovo Solco*) Local Development Program financed with the resources of the PSR Calabria 2007/2013.

[2] Through the *HP Reveal* App and looking for *Escher in Calabria*, it will be possible to frame the images marked for enjoy further insights.

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Events

Events

Geometrias'19 Polyhedra and beyond. The Geometry of Drawing

Giuseppe Amoruso

Since 2013 *Aproged*, Association of Teachers of Geometry and Design in Portugal, organizes the *Geometrias* conferences, an international community of academics, artists, mathematicians, data scientists, and students promoting research and practical applications in the field of advanced representation, a disciplinary field nowadays revolutionized by emerging digital tools. The 2019 edition of *Geometrias*, the fifth organized by Aproged, was held from 5 to 7 September 2019 at the Mathematics Department of the Faculty of Sciences of the University of Porto.

The global science par excellence, the geometry of drawing, finds extensive space in the conferences *Geometrias*, to be exploited in its paradigms and encourage interdisciplinary discussions and connections between theoretical research and practical studies: polyhedra and geometric constructions but also spatial visualization and computational analysis of art, invention, mechanics, economics of forms for an evolutionary strategy of the most innovative scientific thought. The geometry of drawing, as Riccardo Migliari wrote, is also the process that plans the construction of physical objects, which geometric science controls in shape and size [Migliari 2012]. In short, it is the connection between idea and its practice. Building according to a creative process that combines form, order and structure following an algorithmic and repeatable process. Graphic synthesis of imagination, geometric place of inventiveness, which expertly uses different tools, persevering in the discovery of the most rational and productive method, even in an optical of beauty and harmony.

All the presentations of *Geometrias'19* (plenary sessions, papers, and posters) favored, with eclectic and productive contributions, discussions on the importance of the geometry of polyhedra for the development of projects and research in architecture, art, engineering and materials science as well as the teaching of geometry. In this regard, keynote lectures of invited speakers, Henry Segerman, Javier Barrallo, Manuel Arala Chaves, Michael Hansmeyer and Rinus Roelofs, were crucial in emphasizing the importance of an accurate geometry and modeling expertise, practicing both physical and virtual reality or including 3D printing at the final stage, an essential workflow, nowadays, to improve visualization in mathematics. Inevitably, computational and generative projects and the enormous possibilities that are now accessible through digital tools have been key to many of the lessons presented and will certainly continue to be a source of inspiration for upcoming research on the conference topics.

The previous editions of *Geometrias* have progressively contributed to a scientific universe closely linked to geometry and its numerous operations which, as Buckminster Fuller reminds us, play the role of researching and anticipating, to scientists, designers and artists, models to rule spaces, structures, materials and architectures [Gabel, Walker, 2006]. A world whose historical foundations are distant in time and linked to philosophical thought to explain the natural phenomena and that cosmos to which the Greek philosopher Plato, in 360 a. C., refers in his book which takes its name from the Pythagorean Timaeus of Locri [Platone 2009]. To the four fundamental elements of nature, water, air, earth, and fire, Plato associates as many regular polyhedra. The need to give order emerges with great vitality still today by the numerous works presented at *Geometrias'19*, it's an ancestral desire to understand the appearance of things and to go beyond the nature phenomenology: building physical relations between structures, now governed by algorithmic modeling, hold together form and function in formal

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Fig. 1. Event banner.

characterization but also need to untie ideas and things, according to an ideal of harmony that geometry continues to bring in its representations and manifestations. The tetrahedron by fire, the icosahedron by water, the octahedron by air, and the cube by earth; but there remained the fifth combination of faces, edges and vertices and the "demiurge", the divine creator, used it to explain the total image of the universe: it was the figure that Plato loved most, the dodecahedron, the quintessence of a world often mysterious. To make it less intrinsic and hidden, Henry Segerman (Oklahoma State University), in the 2019 edition, presented a keynote lecture entitled *Artistic Mathematics: Truth And Beauty*; his research mission is to realize accurate and effective images, models and visual experiences of mathematical concepts exploring connections between geometry and three-dimensional topology. Author of the book *Visualizing Mathematics with 3D Printing*, Segerman, a modern demiurge, transfers mathematical art and visualization of complex shapes through 3D printing and virtual reality explorations [Segerman 2019].
Illustrating polyhedra, among the focuses of *Geometrias'19*, through projective applications, modeling, interactive visualizations of augmented reality becomes increasingly a tool in scientific research to expand knowledge and suggest new applications. How can we overcome the boundaries of the imagination in an era where digital manufacturing makes it possible to quickly print constructions in 3D?
Some answers were formulated by Michael Hansmeyer, architect and programmer, who researches on algorithms to generate and fabricate architectural shapes. In his opening lecture, to address research about what he defined "tools of imagination" Hansmeyer provoked the scientific community with the key question "But can we fabricate more than we can design?"
His words drew attention to how urgent it is to study tools for research and creative exploration of phenomena, rather than simply apply control and execution routines. The designer must be able to experience an iterative cycle that uses technologies and its applications according to a new practical concept of analysis and discovery, moderating processes and incorporating feedback, discovers and proposals from digital resources. For Hansmeyer cosmos is the one that intertwines art, mathematics, and architecture according to generative processes and computational

architectures; his projects are theatrical scenes, sets and installations, arabesques and three-dimensional grotesque as those built for the recent exhibition *Mutations-Créations/ Imprimer le monde* (Centre Pompidou, Paris 2017). Tools are investigated to increase efficiency and precision in representation, according to Hansmeyer, must also evolve in the ability to imagine creative trajectories to overcome the limits of geometry and show the face of complexity, in his words, "to draw the unimaginable and to imagine the unimaginable".
An event of particular interest, held during *Geometrias'19*, was the workshop *Making Paper Polyhedra Models proposed* by Rinus Roelofs and dedicated to the first book historically dedicated to the theme *Underweyssung der Messung*, also known as the *L'arte della misura*, published in 1525 by Albrecht Dürer [Dürer 1525]. One of the illustrations in this book is the folding plane from which the icosahedron is derived. Most likely, Roelofs reminds us, Dürer was not aware of the fact that the same folding plane could be used to create another uniform polyhedron, the tetra-helix: the same plane, the same plane figures to fold but two different models of polyhedra! The author has proposed a series of "dishes" based on polyhedra (his workshop was organized as a lunch with appetizers, first, second and dessert!) proposing combinations and assembly of two solids in a single model: the tetrahedron combined with a cube, then the cube inside the dodecahedron, the star of Escher (designed by the Dutch artist in his namesake woodcut) or the rhombic dodecahedron following Kepler and Poinsot. The polyhedra "dessert", the final assignment, was a tribute to

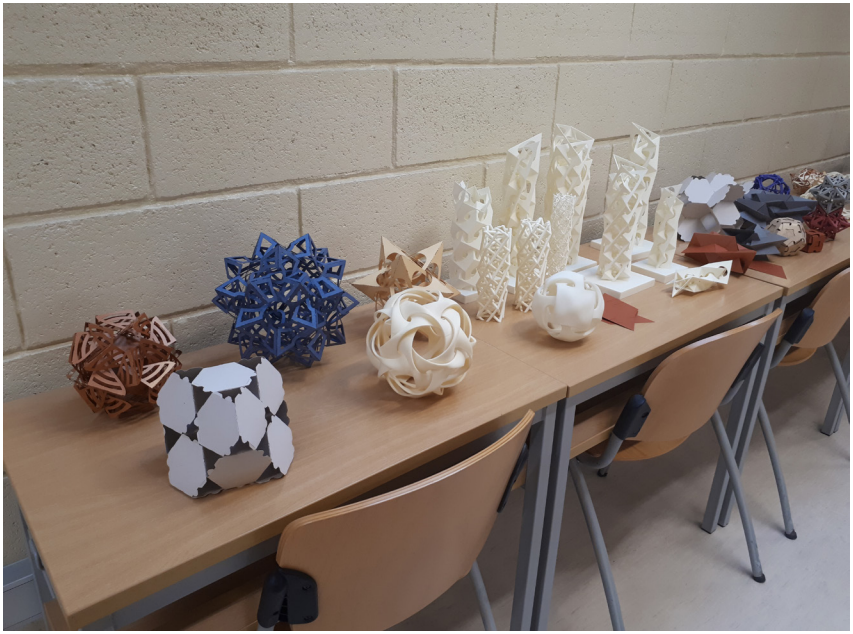

Fig. 2. Some models exhibited during the event.

Branko Grünbaum who in 2003, published some methods through which it is possible to create new uniform polyhedra. One of his methods is called "doubling the faces" or reorganizing the connections of the squares in such a way that twelve square faces again form a normal polyhedron.
During the conference, knowledge, and applications of polyhedra and geometric structures have been widely achieved thanks to the extraordinary commitment of Helena Mena Matos and João Pedro Xavier (Universidade do Porto) and Vera Viana (president of Aproged), promoters of *Geometrias'19*, which once again contributed with multifaceted mastery to enrich the interdisciplinary dimensions and operational tools of international research on geometry and to bring the world of the arts closer to the world of science.
"Seeing two different worlds in the same place and at the same time makes us feel like we're at the mercy of a spell. Only an artist can give us this illusion and arouse in us an exceptional sensation, a completely new experience of the senses" [Ernst 2007, p. 73] wrote Maurits Cornelis Escher masterfully crystallizing in his works, defining himself as an artist, techniques, and rules of geometry in a harmonious relationship between mathematics and art where senses, surprised and suspended, let appear, to the curious gaze of the observer, one or the other.

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Events

Cortona between Archaeology and Architecture. Digital Surveys and Documentary Heritage

Lia Maria Papa

The Seminar of Studies: *Cortona between Archaeology and Architecture. Digital Surveys and Documentary Heritage* was held on September 22, 2019, at the Museo dell'Accademia Etrusca e della Città di Cortona (MAEC).
The event was promoted by the University of Florence, with its Department of Architecture (DiDA), together with the Accademia Etrusca di Cortona, the MAEC (Museo dell'Accademia Etrusca) and the Municipality of Cortona, and was sponsored by the Unione Italiana per il Disegno, which on the previous day, in Perugia, had concluded the *41st International Conference of Teachers of the Disciplines of Representation*. Therefore, an intentional continuity of initiatives on topics of common interest, particularly in the field of survey and digital representation, as also evidenced by the presence at the Seminar of researchers and teachers of Drawing from various universities.
The setting for the event was the Etruscan Academy Museum of the City of Cortona (MAEC), which not only houses a very rich repertoire of archaeological evidence from the Etruscan period, but also features sections dedicated to all the other periods of the city's history, with finds related to the Academy's long life and works. A place, therefore, that while narrating the history of Cortona, also plays a central role in a vaster project embracing the local archaeological, as well as architectural, heritage.
As pointed out by Paola Puma (University of Florence), curator of the initiative, the Seminar intended to attest the fertile and long-standing scientific collaboration between the promoters of the Seminar, and to share, in addition to the provisional results, the aims, methodologies and tools of a project for the survey and enhancement of the town's cultural heritage. Therefore, starting from specific research, an opportunity was created for comparing different experiences on the topic of digital survey and for a common reflection on the realization and dissemination of the documentary heritage of historicized contexts.
The Seminar's program included contributions organized into two sessions, with a concluding round table discussion. After the opening greetings extended by representatives of the local institutions and of the University of Florence, the *Digital Surveys* Session, coordinated by Stefano Bertocci (University of Florence), was opened. In his presentation, Bertocci underlined the long tradition of the University of Florence in the field of survey at different scales and in different contexts, both Italian and international, with the use of advanced technologies; the town of Cortona specifically represents a place of particular cultural and architectural significance. In ancient times, it was one of the twelve Etruscan city-states which, according to tradition, formed a powerful alliance of economic, religious and military character, and is located in a hilly position that from the time of its origins proved to be strategic; in the fifteenth century, having become a city subjugated to Florence, it benefited from a new cultural and artistic impulse, gradually consolidated over time.
Stefano Bertocci's presentation was followed by the interventions of Paola Puma, Federica Maietti (University of Ferrara) and Alessandro Luigini (University of Bolzano).
Paola Puma presented the *Cortona Heritage Project. Survey for the enhancement of architectural and archaeological heritage*, which motivated the Seminar. "Why have we spoken about survey and digital representation? Because this is the theoretical and applicative scenario, basis of the current potentialities of virtual heritage. This approach has allowed the DigitCH group, which I created about 5 years ago in the Department of Architecture of the University of Florence, to work on interactive heritage systems for cultural communication that can make use of various devices, languages and outputs. Virtual heritage, therefore, plays a crucial role by exploiting its, I would

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Università degli Studi di Firenze - Dipartimento di Architettura DiDA
Accademia Etrusca di Cortona/Maec/Comune di Cortona
con il Patrocinio dell'Unione Italiana per il Disegno

Seminario di studi
Cortona tra archeologia e architettura
rilievi digitali e patrimoni documentari

Cortona, 22/09/2019 | MAEC
Museo dell'Accademia Etrusca e
della Città di Cortona

Cortona tra archeologia e architettura, rilievi digitali e patrimoni documentari si svolge nell'ambito della pluriennale collaborazione scientifica tra il Dipartimento di Architettura dell'Università di Firenze e il Comune di Cortona, dove si sono svolte una serie di attività di didattica e ricerca relative alla documentazione del patrimonio archeologico e architettonico della antica città di origine etrusca.
Il seminario nasce come occasione di incontro per una riflessione sul tema del rilievo digitale dei contesti storicizzati e della costruzione e divulgazione dei relativi patrimoni documentari.

Comitato scientifico
Francesco Attesti, Comune di Cortona
Marcello Balzani, Università degli Studi di Ferrara
Paolo Belardi, Università degli Studi di Perugia
Stefano Bertocci, Università degli Studi di Firenze
Paolo Bruschetti, Accademia Etrusca di Cortona, Maec
Antonio Conte, Università degli Studi della Basilicata
Luigi Donati, Accademia Etrusca di Cortona
Francesca Fatta, Università Mediterranea di Reggio Calabria
Paolo Giandebiaggi, Università degli Studi di Parma
Alessandro Luigini, Libera Università di Bolzano
Paola Puma, Università degli Studi di Firenze
Pietro Zucchini, Comune di Cortona

Fig. 1. The flyer of the Seminar.

say, ontological property of finding itself at the intersection between Digital, Culture and Technological innovation". With these words Paola Puma described the essence of the project which aims, at the same time, at the dissemination of cultural heritage and scientifically validated research, characterized by the intention of strengthening the unitary perception of the various material and immaterial expressions which also make Cortona a town highly appreciated and visited by many tourists, and uses virtual heritage to configure tools useful for valorizing the rich local cultural heritage and making it more accessible. The speaker went on to explain that the three-year research program was developed according to strict measurement and representation standards, and has operated at different scales, as shown by the case studies analyzed, which go from a section, about 200 meters long, of Cortona's city wall, to the grave goods consisting of about 50 finds among the precious ones present in the MAEC, and finally, to two important Hellenistic tombs, the Tanella of Pythagoras and the Tanella Angori; all episodes that *Cortona Heritage* intends to connect in an exhibition highlighting the common historical and cultural nature of the case studies.
The creation of a visual repository makes it possible to present, in a unified way, the offer of the assets of the so-called diffused museum, and in a precise way, the in-depth analysis of the selected works, and to then move on to the engineering of the interactive environment for digital and on-site use, with IOT technologies.
After Paola Puma's lecture, Federica Maietti presented her contribution: *Methodologies of survey and digital models for the documentation and enhancement of historical-architectural heritage: the experience of the Incep-*

Fig. 2. Cortona Heritage: the concept of the project. (from Puma et al., 2019).

tion project. The speaker described the main phases and objectives of the project, which aims to develop innovative methodologies for the realization of 3D models with an inclusive approach to cultural heritage, developing interoperable models able to enrich the interdisciplinary knowledge of European cultural identity by various groups of end-users, from scholars to researchers, professionals and curators, to non-expert users.
Effective cognitive experiences in immersive digital environments for the Generation Alpha was, instead, the topic addressed by Alessandro Luigini, with specific reference to digital environments whose experiences are now a major part of Western society, especially for the younger generations.

Documentary Heritage was the theme of the second session, coordinated by Paolo Giandebiaggi (University of Parma) which presented four scheduled speakers, starting with Paolo Bruschetti, from the Etruscan Academy, who dwelt on the richness of the historical documentary heritage collected thanks to the work of the Etruscan Academy, founded in 1727 by a group of members of noble families from Cortona, who used to meet in the rooms of Palazzo Casali, located in the center of town, to discuss history, culture and, of course, archaeology, since in this period the first Etruscan discoveries were made in their lands.
Cultural and documentary heritage: from measurement to the interpretation of data was the title of the intervention by Marco Bini (University of Florence), focused on the importance of the methodological and operational definition of the survey project, with particular reference to archaeological sites and to the specific skills required.
The two concluding contributions of the Session, those of Alberto Sdegno and Andrea Giordano, presented two experiences of research on the theme of the representation of historicized architecture and urban contexts with the use of digital technologies, and with the intent to communicate, manage and share cultural heritage.
Digital restitutions of Roman works in Friuli was, in fact, the title of the contribution presented by Alberto Sdegno (University of Udine), while *Visible Padua: making archaeology hidden by urban transformations visible* was the title of

the intervention by Andrea Giordano (University of Padua), describing the process that led from the knowledge to the virtual dissemination of the ancient city of *Patavium*, through a transdisciplinary methodology.
After the lectures, a round table discussion, coordinated by the President of the Unione Italiana per il Disegno, Francesca Fatta, took place. The participants included, together with Paola Puma, Francesco Attesti, the Councilor for Culture of Cortona, Marcello Balzani, Paolo Belardi (University of Perugia), Stefano Bertocci, Antonio Conte (University of Basilicata), Luigi Donati, of the Accademia Etrusca and Paolo Giandebiaggi.
Appreciation for the initiative and for the interventions was combined with a series of considerations regarding the evolution of Drawing, which assumes an important role in the critical definition and in the experimentation of rigorous processes of representation of cultural heritage, which are constantly changing in relation to the transformations of the socio-economic contexts of which they are, at the same time, both memory and engine of development; this translates into a combination of humanistic knowledge and technical-scientific knowledge that contributes to the acquisition of information, its management and dissemination, as well as to its visualization and communication, with the identification of strategies that allow better interaction between cultural heritage and users, so that the latter can become a part of the cognitive experience.
In this process, cultural goods acquire, in addition to their original identity, a new digital identity generating a different heritage that must be managed and preserved.

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Riference list

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Events

BIM, Augmented, Virtual and Mixed Reality. A Brainstorming at Politecnico di Milano

Camilla Casonato

Last autumn the Politecnico di Milano launched a new invitation to share reflections and experiences on the most advanced developments in virtual reality and parametric modeling. The congress entitled *2nd Brainstorming BIM, VR, AR, MR*, organized by Cecilia Bolognesi, Fausto Brevi and Daniele Villa under the patronage of the Unione Italiana per il Disegno (UID), was held on October 21st, 2019, thanks to the collaboration of three different departments of the Milanese university.

At the opening, in the context of the large conference room dedicated to Ernesto Nathan Rogers, Ilaria Valente, dean of the School of Architecture, Urban Planning and Construction Engineering (AUIC) and Francesca Fatta, president of UID, welcomed the over 200 participants, including teachers, PhD students, students and professionals. The institutional greetings were followed by an introduction to the topics of the conference and a focus on the importance of the development of advanced lines of research in the fields of parametric drawing, building design and management and digital modeling, highlighting their strategic role both in the scientific and educational context. During the day the dean of the University for the area of Drawing, Rossella Salerno, made an initial summary of the results of the seminar. The scholar stressed the scientific interest of the initiative and the importance of serious theoretical reflection and constant graphic research in exploring the potential of digitization.

The conference is in continuity with the previous edition entitled *Brainstorming. The BIM model,* organized in 2016 by Cecilia Bolognesi on the same campus and focused on the role, critical issues and potential of *Building Information Modeling*. The meeting was designed to encourage debate and exchange of experiences between different Italian universities and explored the applications of BIM systems for the control and management of architectural design, in particular for new buildings. On that occasion, a poster session made it possible to draw a first census of research groups active on the territory in the exploration of boundaries in the field.

The 2019 edition was held in continuity with the previous one, proposing a debate on the progress of research in the light of the new phase of development that BIM modeling is experiencing that looks beyond the construction of documentary databases and moves towards new uses and new goals. Then the new *Brainstorming VR AR MR* focused on the theme of modeling and interoperability of systems, combining the reflection on BIM with an exchange of ideas on virtual, augmented and mixed realities and mutual interactions. Virtual reality, in this sense, is a space in which multiple dimensions coexist capable of integrating and enhancing information models, opening up to innovative forms of representation, knowledge, management, use and communication of reality. At the same time, an area specifically dedicated to direct experimentation allowed many students who daily pass through the exhibition space next to the conference room to test first-hand digital products and immersive experiences.

In recent years, virtual reality has become increasingly important in the communication and fruition of cultural heritage thanks to increasingly advanced experiments of interaction between real and virtual and sensory involvement.

The search for effective processes for the application of information systems and parametric modeling tools to the built heritage has advanced, in the direction of increasing automation, in order to integrate survey and modeling and to effectively manage the complexity of historical architecture. These lines of research have been witnessed by numerous and diversified interventions that testify to the plurality of experiences in progress.

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In this framework, an important role is played by the so-called 'scan to BIM' processes that combine advanced survey campaigns with TLS (Terrestrial Laser Scanner) technologies, sometimes integrated by photogrammetric processes and the use of drones with the construction of strategic parametric models for the documentation of the historical phases of the building and the management of interventions. Numerous experiences have been presented that focus on the modeling of complex geometric shapes to be manipulated within virtual reality systems, such as the one described by Alberto Sdegno, Paola Cochelli end Veronica Riavis on the reconstruction of some environments of the Modern Movement for immersive experiences or those proposed by DAda-LAB of the University of Pavia (intervention of Anna dell'Amico and Sandro Parrinello).
The translation of a complex and articulated architectural organism into the rigid and serial language of parametric modeling notoriously poses the problem of the necessary segmentation of the body of the building, which can be helped by an accurate semantic analysis that allows to discretize the building into interacting composing elements, as shown by the work carried out by Carlo Bianchini and Giorgia Potestà on the Baptistery of San Giovanni in Florence. The discussion also showed how the difficult task of creating information models on historical buildings and associating heterogeneous data sets to these models can be usefully supported by an integrated use of BIM and other forms of mathematical modeling based on algorithm generation. In this direction, the theme of interoperability between BIM systems and VPL (Visual Programming Language) systems has been addressed by two presentations (by Adriana Caldarone, Tommaso Empler and Maria Laura Rossi; and by Massimiliano Lo Turco, Michele Calvano, Elisabetta Caterina Giovannini and Andrea Tomalini).
The research in the field of immersive experiences related to the reconstructions of hypothetical or existing environments intended for an increasingly wide audience presented at the conference were different. These are crucial systems of immersive visits to document cultural heritage, for example in the field of archaeology, as evidenced by the case presented by Davide Borra of the 3D agency *No Real Interactive* of Turin, dedicated to the archaeological site of Augusta.
Besides, in the context of Italian design, Cecilia Bolognesi and Damiano Aiello proposed an experience developed with funding from the Ministry of Economic Development for the dissemination of digital practices in small and medium industries. This is the translation of a museum space, the Achille Castiglioni Foundation's studio-museum, into an interactive virtual environment, designed to deliver the experience of an important cultural asset to a wider public. On the contrary, the *M.I.R.A. Morandini* (intervention by Gabriele Pitacco, Antonio Giacomin) was born as an exclusively virtual museum, proposing the Extended Reality (XR) not so much as an instrument to design and visualize physical spaces, but as a project of a new spatial experience and therefore as a product. In both cases it is about edu-games, i.e. experiences destined to spread culture in an experiential and involving way.
Always in a museum context, the Piranesi project "*beyond the real*" (presented by Simona Calvagna, Federica Grasso and Cettina Santagati) proposes the virtual experience as the result of an interpretative process and as a tool for the "fruition" and understanding of the drawn space, also offering an interaction between virtual models and *maquettes*.
A less frequented topic emerged from some experimentations aimed at the enhancement and communication of

Fig. 1. Flyer of the event.

Fig. 2. Work session of the conference.

cultural heritage in schools, between virtual paths, augmented reality and gamification. Among these is the project dedicated to rural life in the Pusteria valley (presented by Alessandro Luigini and Alessandro Basso) which proposes the serious game as an educational path in virtual immersive reality aimed at primary school children to foster effective learning experiences. Finally, the scientific debate has not lacked connections with the productive, industrial and telecommunications world. In this context, the case study presented by Fausto Brevi in collaboration with the Q-id studio (represented by Lorenzo Naddei and Lugi Spinazzola) exemplified the applications of VR in design and decision-making processes in the automotive design sector. The research presented by Anna Osello and Daniela De Luca, on the other hand, showed a possible application of parametric digital modeling to the field of business management through the reproduction of an interactive virtual warehouse functional to the optimization of organizational and production processes.

The potential for development in the field of VR and AR connected to the 5G network was finally highlighted both in the field of storytelling for the enhancement of cultural heritage (intervention of Stefano Brusaporci, Pamela Maiezza and Alessandra Tata) and in the field of communication of the architectural project. The project presented by Daniele Villa and Lorenzo Ceccon, developed with the engineering firm Altran (represented by Ioannis Paraskevopoulos) proposed a workflow to realize advanced communication products starting from BIM systems. The

experimentation, made possible by the 5G network, was applied to the project by Renzo Piano and ODB Architects for Politecnico di Milano, translated into an AR application in a real urban context. Many of the researches presented will be collected in a volume now being published by Springer edited by Cecilia Bolognesi and Daniele Villa. The book, entitled *From building information modeling to x reality* which also includes new contributions, aims to offer a comparison between different experiences in order to give a further insight into the progress of research in the field.

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Events

UID Symposium for the Internationalization of Research 2019

Graziano Mario Valenti

The *UID Symposium for the internationalization of Research* reaches its second edition, highlighting, albeit young, considerable interest and participation by teachers and researchers, as well as the particular vivacity of the contents.
The Symposium is therefore confirmed as an indispensable and remarkable opportunity, capable of connecting researchers and sharing knowledge and experience of research relating to and affine to the national scientific area of the representation expressed internationally.
It is an indispensable initiative because, in addition to focusing the contents of the research products, it directs attention in particular on the qualitative aspects of the comparison: the greeter, the pervasiveness, the usefulness that our scientific products show in the various cultural fields that characterize the international scenario. A sharing of methodologies and relational, communicative, and operational scenarios that enrich and prepare the participants to perfect and innovate their international activity.
It is, again, a remarkable opportunity, because it gives light to local excellence, with both large and small operational dimension, by directly pursuing and synergistically, even indirectly, the objective of coagulating their operational and proactive management skills.
Qualities that are necessary to be visible and competitive today in the complex and heterogeneous global scenario and to create a common operational front, which has appropriate organizational and infrastructural means to plan, access, and support an international research path.
Finally, it is a product sprouted within the UID internationalization commission which, in carrying out its institutional tasks, represents a broad and shared vision of the problem that assumes the role of a fundamental critical entity for identifying, designing, activating and supporting, with relationship-connection actions between potential participants, the research that wants to meet the international challenge.
The second edition of the UID Symposium, which was curated by Antonio Conte and Stefano Bertocci, has been scheduled in two events. The first, experimentally conducted remotely–anticipating forms of communication that have become current today–was held on June 6, 2019, facilitating the vast participation of researchers geographically distributed and coming from: China, Singapore, Albania, Greece, Turkey, Lithuania, Portugal, Spain, Mexico, Brazil.
The second event, carried out in the form of an assembly in-presence, took place in the city of Matera, on 22 October 2019. In addition to expanding and perfecting the communications framework, this second in-presence event was essential to complete the interaction between the participants.
It allowed, in fact, clarification and exchange of views on the detail of the research actions, in a dedicated communication relationship one by one among the participants; thus integrating the more general communication, one to many, which took place remotely.
The two main events were also joined by two mainly programmatic and organizational meetings, which held in July in Alghero and in September in Perugia, in conjunction, respectively, with the IMG *Grafiche* conference and the UID *Reflections* conference.
The thematic articulation envisaged by the call expressed the complexity and variety of possible international actions and, consequently, of the expected contributions.
The first macro area has focused Research and training, activities which are further distinct and divided into *Projects already financed or candidates for funding* and *Academic Collaboration Projects* (with co-financing by foreign partners).
The second macro area, instead, concerned *Didactic Experimentation Activities*. In this case, actions are distinct in *Teaching positions at foreign or supranational research* institutes and *Summer and Winter schools*.

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Fig. 1. Locandina dell'evento.

The articulation of the topics is completed by three specific areas dedicated to presenting and summarizing prospects of funding opportunities or dissemination activities. The set of contributions received was finally divided by distinct geographical macro-areas in America, Europe, and Asia, Africa.
In the three geographic macro-areas, for obvious reasons of proximity and common support tools, research activities appeared more numerous in Europe.
The main research themes concern the survey expressed from the landscape and urban scale to the typological unit and the single architectural partition, up to, in a particular case, the survey and 3D reconstruction of the pages of a treatise: the Laurentian code ASH. 361, Treaty of civil and military architecture by Francesco di Giorgio Martini.
By referring to the website for a detailed list of the people who intervened and the contributions presented, we want to underline some aspects, under a methodological and application point of view, of all the products shared during the event.
From a methodological point of view, an integrated approach is generally found, which starts from the collection and analysis of documents and continues with the data acquisition and normalization activities and then leads to the creation of integrated digital models, the representation of which is curated up to dissemination and scientific divulgation processes.
At the scale of the landscape survey, the contribution provided by analog drawing is considerable, aimed at capturing suggestions and expressive syntheses that are not easily and directly translatable in the representation of digital models. A scenario that confirms the great experience and the high quality acquired and consolidated by the scientific area in this field, which is deducible from the significant degree of attractiveness and appreciation that the research actions presented have shown to have at an international level.
Although mainly oriented towards the survey, within these studies, in-depth analyzes are revealed which capture specific features within other key themes of the scientific area of Representation, which ranging in the live drawing, geometry, perception and visual communication.
Visual perception, in particular, seems to be experiencing a second youth thanks to the digital aid that allows it to investigate results more and more objectively and design their applications
The didactic activity presented, compared to what emerged from the research, appeared more uniformly distributed in the geographical areas and is even more heterogeneous and dedicated to detailed topics, in the developed themes.
The reports clearly showed how much the ability, specific to training and in particular of Italian high education, to conduct and transmit the application and operational aspects within a methodology is appreciated abroad. A methodology that always has a broad vision and attention for the historical and theoretical qualitative factors, which characterize and influence the interventions: the critical ability to contextualise teaching on the application object, enriching the process of acquiring the know-how also and always with the ability to think \ to reason.
If the sessions dedicated to research and teaching, by means of comparison, helped to activate the creative thinking of the participants in imagining and developing new opportunities for intervention, the final session, dedicated to consultative relations on the one hand

and future opportunities from other, provided the necessary pragmatism to descend from the imaginary-design level to the more concrete and operational level.
The scientific contributions illustrated in the two days of the symposium were collected in a practical and useful open access publication, freely accessible via the internet [1].
The airship of Mario Manganaro, the logo chosen for the symposium to signify vision, progress, travel, sustainability and connection, for this second edition has passed through the city of Matera, European capital of culture for the year 2019: the suggestive context and the excellent and welcoming organization made the quality of this event even more admirable.

Notes

[1] <https://issuu.com/dida-unifi/docs/il_simposio_uid_di_internazionalizzazione_della_ri> (accessed 2020, May 30)).

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Events

Rip, Model & Learn: Interdisciplinary Dialogues on 3D Survey and Modelling for Architecture and Cultural Heritage

Alessio Cardaci

The survey is knowledge and documentation; it is an instrument of historical, metric, material understanding and the state of conservation of the built heritage. The discussion on the survey of cultural heritage, in recent years, has been enriched with new reflections for technological and methodological advancement. In particular, the need for an interdisciplinary approach is increasingly being highlighted; a new vision that knows how to combine the interpretative needs of surveyors architects with the technical ability to acquire data from geomatics engineers.
The last century saw the ideological contrast between the 'architects' survey and engineers' one'; a division that highlighted a different approach to the metric knowledge of buildings, justified by the different development of the degree courses. In fact, before the advent of digital, the photogrammetric treatment of images and topographical operations required a profound technical-applicative capacity based on a solid physical-mathematical basis; a path possible only at engineering schools where the study of history, representation and conservation of architecture was limited. On the other hand, training in architecture, while providing high skills for understanding the geometry and proportions of buildings, as well as for reading the techniques and construction elements indispensable for the knowledge of the history of the monument, was sometimes incomplete on the technical-methodological aspects. The IT revolution, by simplifying the processes of construction and restitution of 3D models, brought the two worlds closer together, allowing for ease of interaction; today the teaching of disciplines related to the detection of cultural heritage in the new degree courses in Architecture and Building Engineering-Architecture (especially those in class L17, L23, LM24 and LM4) have a sufficient number of credits to sensitize students, both to read the architectural heritage and to provide it with the theoretical-practical bases necessary for the management of the data acquired with sensors.
Despite everything, some divisions remain, the result of an old cultural heritage that is slow to change; they contrast – instead of integrating – the different scientific fields. Contrasts that seem to be accepted and encouraged by a part of the academic world that considers the disciplines related to Cultural Heritage as sequential; consecutive stages of a process that starts from the capture of the data, to then continue with its processing and end with the representation to document and enhance the monument.
The thematic subdivision is often the cause of seminars on topics of common interest which, however, are lacking in the involvement of the various actors of the knowledge process. Conferences built based on a 'scientific complementary' instead of an 'integration of study and research', without a general contextualization and a critical analysis free from ideological preconceptions; events that did not allow to start a constructive dialogue between the various disciplinary areas but, on the contrary, increased their distances.
A fragmented and segmented vision that requires Geomatics creators of information models designed for maximum accuracy and not optimized for understanding the monument; restorers who are simply users of a final result of which they are not the architects, therefore, without being aware of the phases of the survey; the draftsmen-surveyors useful complementary figures to the documentation and enhancement of the skills related to representation and graphic communication.
A point of view that fortunately is not shared by many scholars who seek, instead, a multidisciplinary and broad interdisciplinary dialogue, in a common sharing of intent.

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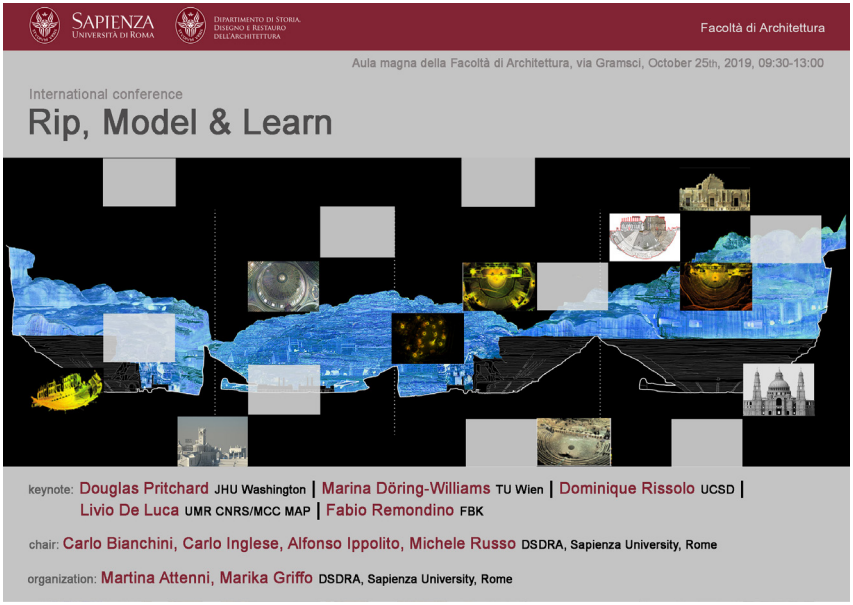

Fig. 1. The flyer of the "Rip, Model & Learn" symposium.

This is demonstrated by the success of numerous international initiatives which have attracted great interest and participants. Workshops and seminars, promoted and/or sponsored by the UID, which highlighted the importance of our field of study (SSD) in building a virtuous exchange, sharing and experimentation of new approaches in the detection of complex systems.
An important contribution to the creation of an interchange between doctrines to develop a unique language for sharing content. The year 2019 opened with the *3D-ARCH 2019* international conference which took place in February at the University of Bergamo, a first appointment organized by designers, geomatics and conservators aimed at launching new reflections to which the *CIPA 2019* international seminar followed in September, promoted by the local Universidad de Salamanca in the city of Avila. Valid examples of this new understanding that have materialized through the formula of the traditional conference.
The *Rip, Model & Learn* symposium, in this context, was an opportunity to highlight the centrality of the Drawing on the knowledge project and to reiterate, with greater force, the importance of integration between the various skills. The meeting was on the morning of Friday 25 October 2019 in the hall of the *Aula Magna* of the Faculty of Architecture of Valle Giulia in Rome; promoted by the Department of History, Drawing and Restoration of Architecture (DSDRA) of the Sapienza University of Rome, it has represented an important and valuable opportunity for international comparison on the topic of acquisition, management but, above all, the interpretation of electronic data for the documentation of cultural heritage. A communicative formula designed – under the scientific coordination of Carlo Bianchini, Carlo Inglese, Alfonso Ippolito and Michele Russo – on the use of Webinar Online Conferencing and Web-Streaming. The diffusion of the event was done both in leverage and the deferred way [1].
The reports, brief and entrusted to important researchers from different professional and cultural backgrounds (architects, engineers, historians and archaeologists), have allowed significant reflections related to the development of information acquisition and treatment technologies for the detection of historic buildings, and contemporary, with 3D range-based and 3D image-based technologies, terrestrial or with Remotely Piloted Aircraft Systems (RPAS).
The greetings to the speakers and participants were brought by Eugenio Gaudio, Magnificent Rector of the Sapienza University of Rome and by Anna Maria Giovenale, dean of the Faculty of Architecture. Carlo Bianchini, who then took the floor, started the work with a brief introduction, followed by the five *lectio magistralis* of the invited keynote speakers.
The first report *Documentation of the Built Environment* was by Douglas Pritchard of the Krieger School of Arts & Sciences of Johns Hopkins University in Washington. He illustrated his recent experiments on the new Zoller+Fröhlich instrumentation in

particular complex and multifaceted structures, such as the Cologne Cathedral, a site included in the UNESCO world list, and the CERN in Geneva, the famous European laboratory for nuclear research.
The second one was *Learn, Rip, Learn, Model and Learn* by Marina Döring-Williams of the Vienna University of Tecnology. A classical and expert scholar of the late ancient and medieval world, she highlighted the importance of an accurate survey – which she considers a consequent passage to direct observation – for stratigraphic reading and construction techniques, to understand the historical evolution of monuments.
The subsequent presentation was by Dominique Rissolo, of the Center of Interdisciplinary Science for Art, Architecture, and Archaeology of the University of California in San Diego, with the presentation *Beyond the Model*. An interesting examination of various case studies, including the baptistery of Florence, which have underlined how too frequently the creation of 'perfect' digital models makes one forget that 3D data is only one of the many essential characteristics of historical heritage. A particular observation point by an expert archaeologist who knows the detection systems, who has dedicated many of his years to the study of the Mayan coastal settlements on the Yucatan peninsula, evaluating the complexity of the architecture due to the cultural and social growth of its inhabitants.

Fig. 2. The final moment of the round table.

So Livio De Luca, architect of the Centre National de la Recherche Scientifique (CNRS) in Marseille, with the report *Towards the massive reality-based 3D semantic annotation of heritage artefacts*, brought an interesting reflection on the possibility of digital technologies used for multidisciplinary crossings analysis, specific to the study of cultural heritage not only in the field of information technology and engineering, but also in the human and social sciences, as well as in architecture and conservation science.
Finally the Fabio Remondino, engineer of the 3D Optical Metrology (3DOM) of the Bruno Kessler Foundation (FBK) of Trento, with a speech entitled *Machine and Deep Learning strategies for the classification of heritage 3D data* have opened a discussion on the association of semantic information to spatial data with automated classification procedures based on learning approaches based on artificial intelligence (Machine and Deep learning). At the end of the presentations, an articulated and lively round table was held, in which there was a direct comparison between the speakers and the topics they addressed.

Notes

[1] The conference is still available online at the link: <https://www.youtube.com/watch?v=dmiPUv0cP3A> (accessed 2020, June 6).

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Events

OLIVETTI@TOSCANA.IT
Territory, Community, Architecture

Ornella Zerlenga

The exhibition entitled *OLIVETTI@TOSCANA.IT Territory, Community, Architecture in Olivetti's Tuscany* took place from 20 December 2019 to 13 April 2020 (with a subsequent extension) in the headquarters of the *Museo della Grafica*, located in the historic palazzo Lanfranchi in Pisa. The exhibition was curated by Marco Giorgio Bevilacqua, Mauro Ciampa, Lucia Giorgetti, Stefania Landi and Denise Ulivieri. The promoters of the initiative were the Departments of 'Civiltà e Forme del Sapere' and 'Ingegneria dell'Energia, dei Sistemi, del Territorio e delle Costruzioni' of the University of Pisa as well as the Museums of 'Grafica' and 'Strumenti per il Calcolo', both of the University of Pisa and, the first, also of the Municipality of Pisa.
The exhibition, introduced on the inauguration day by Chiara Bodei (president of the Pisan University *Sistema Museale*), Alessandro Tosi (director of the *Museo della Grafica*), Fabio Gadducci (director of the *Museo degli Strumenti per il Calcolo*), Massimo Dringoli (councilor to the Town Planning of the Municipality of Pisa) as well as by the curators, it was set up on two floors of the Palace and through the exhibition of the materials (distributed in fifteen rooms of the same) it documented Olivetti's 'presence' in Tuscany through the definition of three main focus: territory, community, architecture.

As is known, in recent years the Olivetti Industry has been the subject of many studies and research that have deepened the themes of innovation, design, social sensitivity, the 'enlightened' figure of Adriano, son of the founder Camillo Olivetti. Little, however, is known of the role that the Olivetti Industry had in Tuscany, the region in which the *Pisan Electronic Calculator* was designed, the first computer in Italy resulting from the synergy between Olivetti and the University of Pisa, and where within the *Laboratorio di Ricerche Elettroniche* of Pisa *Elea 9003* was developed, the first fully transistor electronic calculator and awarded in 1959 by *ADI, Associazione per il Disegno Industriale*, with the 'Compasso d'Oro' for the innovative design curated by Ettore Sottsass. On this basis and from the curators' will, the idea was born to deepen this theme, first through research, then with the dissemination of the results through an exhibition that, from the beginning, was conceived by them as an itinerant. The result, therefore, of several years of research, the exhibition tells an Olivetti story "in the round", which spreads an idea of social community and is based on respect for people, culture and art in an epochal context that sees transposition in Tuscany and, in particular, in Massa, Viareggio, Pisa, Florence, Donoratico (fraction of Castagneto Carducci in the province of Livorno) and, more specifically, in the Valdera and Pontedera districts, the Olivetti ideas of the *Movimento Comunità* that will lead the then so-called 'urban planners led' (among which the person of Francesco Bagatti stands out) to experience his interest in community experiences of territorial planning open to social and human needs. On an architectural scale, however, the Olivetti branch in Florence (of which the architecture with a modern and innovative formal and structural conception is highlighted) and, above all, the Olivetti Synthesis plant (built in the Apuan Industrial Zone in Massa) represent the mass in the work of a social ideal, a factory conceived on a measure of 'person', women and men. The project of the Olivetti Synthesis factory, where metal sheet filing cabinets are first produced, then modular and modular open space office furniture and systems (including the *Spazio* series, *Compasso d'Oro* in 1962), is conceived as an island happy surrounded by greenery where architecture and nature are integrated into an idea of beauty as a comfort and redemption tool for workers and their families. Equally attentive to the quality of life of the families of Olivettian workers are the architectural projects for

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Fig. 1. Flyer of the event.

the complex of thirty-six apartments for the employees of the Synthesis plant and the building complex for the *Olivetti Colonia* in Marina di Massa, documented here on display through the recent photos of Eva Mulas in which the structure appears in a total state of abandonment and degradation.

At the same time, in the cultural field the Tuscan Olivetti story sees the intertwining of the ideas of different personalities such as Adriano Olivetti and Carlo Ludovico Ragghianti on different projects: from the editorial idea for the worldwide distribution of the famous bimonthly magazine of public culture in the field of arts visual, *seleARTE*, to its transformation into the cinematographic theme that will produce the '*critofilm*', works in which on the indication of Ragghianti the art criticism will be realized with cinematographic means. The research shown in the exhibition highlights how the center of interest of Adriano Olivetti was the well-being of a 'concrete' community capable of interacting intimately with the territory in which he lived to produce products (from typewriters to calculators, to furniture for office) recognized all over the world as works of design, expression of a culture not only technological but artistic, full of a social value supported by the welcome of the architecture of the workplace and of the social services supporting the community, and the At the same time, it is spread throughout the world through new forms of visual communication such as graphics, another fundamental protagonist in the creation of the image of the 'Olivetti style'.

Organized in cognitive paths in compliance with the different intervention scales, the exhibition *OLIVETTI@TOSCANA.IT* was set up in several rooms on the basis of the archival documents found by the curators at the *Archivio Storico Olivet-*

ti of Ivrea, the *Archivio della Fondazione Centro Studi sull'Arte Licia e Carlo Ludovico Ragghianti*, that of the University of Pisa as well as Frediani and private individuals. In this sense, the history of an Olivetti Tuscany built as a cultural, social and productive system inspired by an idea of community as a set of human, territorial and architectural values was manifested and returned to the community. Distributed in the suggestive rooms of palazzo Lanfranchi, with frescoed vaults and whose recent philological restoration of the internal spaces allows you to admire the different construction phases that characterize the history of the building, the exhibition narrated the Olivetti presence in Tuscany through the integrated exhibition of photos, films and drawings (historical and recent), advertising posters, models and vintage industrial products, from the first calculators to the now iconic typewriters, from furniture to office furnishings. Among the films presented and projected on screens, often set up as hanging and / or interspersed with the display panels, we mention the aforementioned '*critofilm*' *Comunità millenarie* (1954), *Lucca città comunale* (1955), *Storia di una Piazza (la Piazza del Duomo di Pisa)* (1955), *Terre alte di Toscana* (1961), as well as the approximately twenty interviews conducted by curators with Olivetti workers. These documents and objects exhibited in the exhibition have been commented by the curators with comprehensive captions and / or descriptive panels which, from time to time, have introduced visitors to the various Olivetti fields of interest and action, as well as collected in a catalog of the exhibition at limited edition published by Pisa University Press (2019).

In conclusion, the exhibition *OLIVETTI@TOSCANA.IT Territory, Community, Architecture in Olivetti's Tuscany* curated by the interdisciplinary team of Marco Giorgio Bevilacqua, Mauro Ciampa, Lucia Giorgetti, Stefania Landi and Denise Ulivieri gives the social and scientific community a cross-section full of history but above all of ethical value: an Olivetti and productive Tuscany, which bases its work both on the dignity of workers (women and men) and their families, and on the added value, social and cultural, of the work itself. As in Ivrea, also in Tuscany the engineer Adriano Olivetti but, above all, the enlightened entrepreneur surrounds himself with architects, urban planners and men of culture interested in experimenting in the field of socio-community experience, as well as designers attracted by innovation industrial product and visual communication as an opportunity to build social identity values rather than a mere commercial vehicle. Finally, in drawing attention to the state of degradation in which this building heritage is facing today, the exhibition launches a further theme, just as little studied, that of *Olivetti in the world*, whose architectural significance in Northern Europe, South America and the Far East and the names of the designers involved (Zanuso, Aulenti, Albini, Kahn, Tange, Stirling, to name a few) suggest new and unprecedented lines of research.

The exhibition *OLIVETTI@TOSCANA.IT Territory, Community, Architecture in Tuscany by Olivetti* was created in collaboration with the *Fondazione Centro Studi sull'Arte Licia e Carlo Ludovico Ragghianti* of Lucca and the *Associazione Archivio Storico Olivetti* of Ivrea, with the contribution of the *Regione Toscana, Fondazione Pisa and Acque S.p.A.*, and with the

Fig. 2. Exhibition set up in the halls of palazzo Lanfranchi (photo by Gianluca Giordano).

patronage of the *Regione Toscana*, the Expo Gallery of Milan and the UID, *Unione Italiana del Disegno*. The photographic campaigns were curated by Gianluca Giordano and Eva Mulas (with the collaboration of Mario Mulas, Olivetti photographer for years in charge of realizing numerous photographic campaigns of the locations between Europe and the United States) while the exhibition set-up project was performed by Dedalo Building Lab.
The next stages and developments of the exhibition, as well as in the intentions of the curators and Covid-19 permitting, are planned at the institutional offices of the Department of Architecture and Industrial Design of the University of Campania 'Luigi' Vanvitelli and of the Department of Architecture and Design of the Polytechnic of Turin.

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The UID Library

The UID Library

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