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Cover
Mario Trimarchi Design, Swan, Hansa, detail.

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Editorial

Francesca Fatta

Issue 11 of *diségno* aims to make the comparison between Drawing and Design grow and mature, to think about the limits and margins of two disciplines that deal with the representation of the world of objects and the other with their construction, opening up further spaces on visual communication and visual design.
The issue is edited by Massimiliano Ciammaichella and Valeria Menchetelli, both long since engaged in the teaching of Drawing in Design courses, and therefore involved in collaborative experiences in the field of graphic design and visual communication, in the complex research on graphic languages and visual culture.
The theme is more topical than ever given the success that the L-04 three-year degree courses and LM-12 master's degree courses are having in Italy, also due to the knowledge reform that the MUR (Ministero dell'Università e della ricerca) is about to conclude in which the declarations of the two disciplines they deal with the configuration and communication of tangible and intangible artefacts as a common theme.
In the *Cover* the editors specify that: "Today, the meaning of design has expanded and has gone beyond the limits of artifactual tangibility, claiming the multiple values of a design culture that acts in the variable course of life, in the relationships between people and their interactions with the environment, in and on bodies. Design has emerged on the global scene as a strategic innovation resource indispensable to develop both production and social systems. At the same time, drawing has not remained impassive to the changes of technological innovation: accepting the broadest meaning of the term image, it continuously reformulates its tools and its meaning, and it absorbs a wide range of production and communication modalities, whose fruition is now almost exclusively mediated by devices and their interfaces". This defines the scenario within which we

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move today in relation to the respective scientific and critical methods, trying to best focus theories, research, teaching experiences of Design Drawing.
There is a novelty in the lineup of this issue which concerns the presence of a "special guest". We are talking about Mario Trimarchi, a designer and an architect awarded with the UID gold plate at the 43rd Conference of Representation Disciplines Teachers *Dialogues. Visions and visuality*, held in Genoa in September of this year. Trimarchi proposes a contribution that is an invitation to the daily practice of what he defines as "useless drawing", freeing it from strictly pragmatic or functional purposes, but indispensable "to make good thoughts, or to try to reach the perfection of the agreement or to let oneself go to the 'freer improvisation without rules", a fundamental aspect for the success of a good project.
The image chosen according to the theme of the issue and commented on by Vincenza Garofalo is the famous axonometry by Alberto Sartoris for the *Cercle de l'Ermitage* of 1935. An axonometric cross-section represented in a revolutionary form of visual language between art and artifact.
The three focuses open with as many three invited contributions: for the first focus, *Masters and Practices*, Patrizia Ranzo, full professor of Design at the University of Campania "Luigi Vanvitelli", notes, also from the writings of the Italian masters, how much in the different phases of the project, drawing proves to be concrete thinking, the moment in which "the possible appears".
"This magical aspect of drawing, –writes Ranzo– where things take on substance and meaning, is actually the tool through which the imagination becomes concrete and deals with reality; it is the place where the possible forms".
The second focus, *Theories and Methods*, opens with an essay by Raimonda Riccini, President of the SID (Società Italiana di Design) who, with regard to the design-design relationship and their theoretical and practical-operational status, starts precisely from the confusion often caused by clumsy translations of the two terms. Debating this issue, writes Riccini, "does not only mean dealing with the age-old etymological analysis of the term 'Disegno' and its kinship with the umbrella-word 'Design' (and vice versa), which on many occasions has ended up mixing linguistic issues with substance problems, creating a real quarrel rather than a game. But bickering is often enlightening". So much so that in the beautiful excursus of the plots that link the two disciplines that "chase each other, like two dancers in a splendid choreography, but are destined never to reach each other", the passage of the artifacts from figuration to configuration and their continuous interaction is defined.
The third focus, *Languages and Devices*, hosts the essay by Enrica Bistagnino, expert in graphic design and visual languages, which highlights how much the binomial Drawing-Design (D^2) wants to mark an evident conceptual link between the act of drawing and that of to design. "If, therefore, drawing, through the adoption of methods, techniques, codes, is an active gaze in directing the idea, it is its original and ordering act, the binomial Drawing-Design still seems to well represent that extreme conceptual proximity between the he act of drawing and that of planning which, in some poetic creative dimensions, converge and cancel each other out in a full unity of aesthetic and technical sense".
For the sections inspired by the theme of the magazine, Fabio Quici proposes a reinterpretation of Tomàs Maldonado's text *La speranza progettuale*, published in the first edition in 1970.
The reviews of some volumes follow, respectively edited by Laura Carlevaris, Camilla Ceretelli, Alberto Sdegno and Chiara Vernizzi. And yet the reviews of some of the events sponsored or organized by the UID and a report of the 43rd UID conference.
As usual, *The UID Library* closes with the titles of the volumes written or edited by our associates, and the plaques and awards assigned during the Genoa conference follow.
In the meantime, issue 12 is being prepared with a call curated by Pilar Chías Navarro, Andrea Giordano and Ornella Zerlenga entitled *Points of view from above*: an opportunity to reflect on a specific perspective, built according to a gaze that takes off according to Icarus' dream.
Thanks to the authors, the editorial board, the editorial staff, the reviewers and best wishes to all readers to be able to draw from the following pages the food for thought necessary for research that is always innovative, productive and above all shared.

Drawing and Design. Declensions of Terms and Practices Actualizations

Massimiliano Ciammaichella, Valeria Menchetelli

Declensions of terms

"It is interesting to think about the relationship between drawing and design, and about the role of drawing in design: this is almost a play on words, but –as often happens– playing can lead us to reflect more deeply. On English-language design courses, the word 'design' is almost always accompanied by another term to specify the field in question: furniture design, car design, lighting design, and so forth. It is perhaps not very well-known, however; that the word 'design' actually derives from the Italian word 'disegno', meaning 'drawing', which in turn derives from the Latin 'design-are'" [Pasca 2010, p. 12].

With this introduction, in the essay *Drawing and Design*, Vanni Pasca in 2010 questioned the positioning of sketching and, more generally, analog drawing as a suitable practice for transmitting a conceptual reflection irreplaceable of project: the manifestation of the idea. Although in some specific areas of design, early approaches to creation do not necessarily contemplate it –guiding choices toward forms of visualization made up of assemblies, disassembles, and reassemblies that synthesize sources of inspiration– drawing once again assumes a central role in recording changes in the entire methodological process, confronting the fleeting or dilated times of production. Moreover, the term is inscribed in the same word that in English denotes both the noun and the verb, binding the subject and the action in the fulfillment of a definition: 'design'.
As Pasca shrewdly observed, the Latin derivation of *designare*, in *signum*, makes the practice of design coincide with that of drawing, which, in several cases, becomes the identity card of those who through signs, lines, trac-

This article was written upon invitation to frame the topic, not submitted to anonymous review, published under the editorial director's responsability.

ings and backgrounds leave their mark, summarizing in a sketch the tortuous start of a process made up of rethinking and transformations converging in the final act of realization, whether of a tangible or intangible nature. Just as we have joined the word design into our common vocabulary, at times misusing it, even Anglo-Saxon scholars agree in finding the translation of the noun 'drawing' by '*disegno*' very reductive, because the actions and tools of the former do not necessarily contemplate the semantic charge and cognitive dimension of the latter, whose genealogy traverses a very long history that begins to emerge, textually, from Cennino Cennini's late 14th-century treatise [1].
In addition to documenting medieval techniques, in fact, the *Libro dell'Arte* opens precisely to the stimulation of thought as the painter states that "the intellect delights in drawing" [Tambroni 1821, p. 4]. But it is the theoretical debate, arising from the studies of the most important Renaissance protagonists, that intercepts the epistemologies of a discipline that is as much conceptual as it is demonstrated by empirical research, yesterday as today. Thus, if in 1435 Leon Battista Alberti's *De Pictura* enshrines in the "*circoscrizione*", "*composizione*", and "*ricezione dei lumi*" the necessary conditions for the 'good drawing' of pictorial art [Grayson 1980], Leonardo da Vinci's 1540 *Trattato della Pittura*, on the other hand, defines the latter as a science for which "you must first use drawing, to give with demonstrative form to the eye the intention and invention first made in your imagination" [Tabarrini 1890, p. 44]. Furthermore, referring to Michelangelo's work, Filippo Baldinucci recalls the recurring principle that painting, and sculpture are derived from drawing and contribute to the artificial imitation of nature [Baldinucci 1681].
It is easy to understand how, for the Renaissance man, the conception of drawing should be expanded and should also extend to the *maquette* [Powers 2020], just think, for example, at the description of the fundamental steps by which Filarete arrives at the design of Sforzinda city, appealing to the "*disegno rilevato*" that results in a wooden model [Finoli, Grassi 1972].
In general, the treatises of the fifteenth and sixteenth centuries move on a double register: on the one hand, they document the terminological and linguistic interpretations that contribute to the specification of the different methodologies, technical and operational, used in the depiction of simulated reality and/or designed from scratch, ranging from the sketch to the physical prototype; parallel it explicates subjective conceptions of an intellectual activity devoted to the stimulation of design thinking and the imaginary liberation. This attitude is also confirmed by Federico Zuccari who, in 1608 published *L'Idea de' Pittori, Scultori et Architetti*, making a distinction between external and internal drawing [Zuccari 1608].
Returning to the word 'design' meanings –even before its institutional recognition as a professional activity closely interrelated with the industrialization processes– its Anglo-Saxon origin lies during the Elizabethan period, and over the course of a century it absorbed three different terminological declinations, whose roots are respectively of Latin, French and Italian derivation [3].
Specifically, the noun dates back to 1588 and is used for "a particular purpose held in view by an individual group […]; deliberate purposive planning […]; a mental project or scheme in which means to an end are laid down […]; a deliberate undercover project or scheme […]; a preliminary sketch or outline showing the main features of something to be executed […]; an underlying scheme that governs functioning, developing, or unfolding […]; a plan or protocol for carrying out or accomplishing something (as a scientific experiment), also: the process of preparing this […]; the arrangement of elements or details in a product or work of art […]; a decorative pattern […]; the creative art of executing aesthetic or functional designs" [Mish 1994, p. 313].
But reconsidering the centrality of the word 'drawing', debating rhetorically the concept of design understood as the art of building, is Sir Henry Wotton, English ambassador to Venice who in 1624 published the Vitruvian-inspired treatise *The Elements of Architecture* [Wotton 1624].
Today, we are well aware of how the word 'design' has taken on an international scope in classifying design practices that are inserted onto the various cultural, commodity and production sectors in which they operate; however, if you ask a recent graduate –who is applying to enroll in a design degree program– to formulate a possible definition of the subject he or she intends to study and explore in depth, the answer will most likely be articulated by the following nouns: art, creativity, design, technique [4]. Indeed, art and technique for a long time were regarded as two separate entities in Renaissance and modern culture, only to begin a centuries-long process of reunification in the nineteenth century, when technological advancement began to affect the function

and material of artifacts, however much the replacement of the figure of the craftsman by that of the machine was initially not viewed favorably, especially on the aesthetic side of the results [Vitta 2001].
Today, "design roughly indicates the place where art and technique come by common accord to coincide (and along with them their respective scientific and critical modes) paving the way for a new form of culture" [Flusser 2003, p. 3].
In a context of widespread planning across multiple fields, made up of processes in the making, drawing has always played a preferential role as the language that anticipates and conducts the entire experience. It is sufficient to record the protagonists' thoughts to understand how, for example, for those involved in conceiving products it is essential to resort to the sign on paper to express ideas and give them an order, so the use of drawing analog techniques becomes a necessary condition that transcends the pervasiveness of computer media, the moment one takes possession of the neutral space of the blank sheet.
For Odoardo Fioravanti, the first trace opens to the narrative of an event that expresses the individual identity and subjectivity; therefore, sign and drawing are configured as simulacra of the person and the designer, respectively. For Luca Scacchetti, drawing itself continues to be the project, because it argues its reasons. Alessandro Mendini and Riccardo Dalisi, on the other hand, consider it in the same way as a dance performed by hands [Veneziano 2009]. Indeed, choreographic analogies also affect visual communication design and are evident in Giovanni Anceschi's thinking when he states that while not dealing with three-dimensional objects, preparatory sketches for a graphic design often draw on the visual languages of notational systems [Bistagnino 2018].
Shifting the focus to fashion design, it should be considered that despite having a long tradition related to illustration in advertising –later interrupted by the advent of photography–, the creators' sketches and *croquis* are hardly made public and are considered by them as personal, sometimes intimate, working documents that multiply and evolve before reaching the completeness of technical drawings [5], at plane development processes of paper patterns to be delivered to the tailors departments for garment making.
Some fashion designers do not trust on sketching, opting for conceptual work made up of cut-outs, disassembles and reassemblies of images, flowing into the synoptic pictures of one or more mood-boards from which to extrapolate sources of inspiration; others prefer the manual work of three-dimensional modeling of fabrics to be draped directly on bodies or dummies, exploiting the potentials of *moulage* techniques through which sartorial patterns are easily obtained. But those who do not give up drawing tend to formulate a shareable thought that we could extend to all areas of design: "A drawing can convey numerous and multifaceted unimaginable realities […]. There is an intimate and direct relationship between the hand […] and the medium it uses. A drawing has no boundaries, it is infinite and tactile" [Borrelli 2008, p. 146].

Practices actualizations

The articulation of the semantic mosaic so far outlined and the complexity of the connections that exist between drawing and design have seen their scope further actualized and expanded, with the progressive redefinition of both terms in the light of the transformations that have stratified them through the ages and given them over to contemporaneity. The current scenario represents, at the same time, the outcome of a series of revolutionary changes in approach, which have contributed to tracing new and more fluid disciplinary margins, and the starting point of a cultural framework still in the making, nourished by a multiplicity of meanings and application fields. This multiple dimension emerges from the breadth and pervasive diffusion of design practices and systemic strategies that contribute to defining an updated epistemology of design and that are rooted in a conceptual substratum from which an open vision of the drawing discipline originates, in its value as both a creative and representative act.
Concerning design, its more traditional meaning relates it almost exclusively to the formal definition of the designed object, identifying it with the product sphere and taking root extensively in common language, so much so that the use of the specification 'design' as a qualification of a generic artefact –often to label it as 'bizarre'– still pollutes the collective consciousness regarding the term. In recent decades, however, the discipline has undergone "a strong development linked to the expansion of its research areas and its theoretical and methodological contents, as well as its fields of intervention" [Tosi 2021, p. 17]. This exten-

sion of disciplinary horizons has more distant origins, as it spans the entire 20th century and matures in consequential stages. Its evolution has been punctually recorded – and thus historicized– through a series of landmark documents that have witnessed over time the evolution and configuration of a knowledge and skills set that has now become decisive, both in terms of its highly persuasive role and consequently its ability to guide choices, and in terms of its cultural influence at a global level.
Tracing the evolution of design thinking through these manifestos [Bollini 2003; Piscitelli 2020] allows us to understand how that value of 'critical consciousness' associated with a field that is both theoretical and applicative, that "precise *mandate* […] that goes beyond the albeit noble objective of optimally combining form and function" [Riccini 2020, p. 415, translation by the authors], is the result of a continuous process of redefinition and sedimentation as well as of renewal and attribution of a cultural role.
Already between the lines of the programmatic *First things first* manifesto [Garland 1964] lay the basis for the awakening of consciences on the theme of the rejection of capitalist logic and the aggregation of designers in a corporative form animated by ethical principles. A form which recognized its theoretical origins in Tomás Maldonado's thought, who "notes […] the tendency to sacrifice the design hope too globally and too hastily" [Maldonado, cited in Piscitelli 2020, p. 194], affirming instead that "the project intertwines political themes and major social and environmental issues" [Riccini 2020, p. 416]. Later, it is with the *Design memorandum. Dall'etica del progetto al progetto dell'etica*, signed by the ADI (Associazione per il Disegno Industriale) in 1987, that the call for a multidisciplinary vision of design becomes even more explicit, with the definition of three main design assumptions: the environment, the culture of peace, and the respect for rights and duties. The designer figure is now capable of bringing together "the functional dimension, the communicational dimension, the dimension of desire" and becomes the bearer of a global design thought, "able to set new cultural references" and to "make synthesis from the various elements of knowledge to create objects and systems charged with aesthetic qualities" [ADI 1987, p. 2]. The *Munich Design Charter* of 1990 acknowledges this vision by placing design in the European scenario, defining it in terms of "a balance between technological and humanistic aspects of culture" as well as "one of the most extensive ethical theorems of European thought" based on three "humanistic theorems" pivoting on the word ecology: of complexity, of design, of relationships [The Munich Design Charter, pp. 74-76]. The dimension of sharing triggered since the 2000s, with the democratization of critical thinking through the web, "amplifies the culture of responsibility previously relegated to the self-referential confines of designers to open up to intellectuals, thinkers, scientists and institutions" [Piscitelli 2020, pp. 198, 199], determining a global involvement and widespread feeling in which any user becomes active and responsible. This dialogical condition places design at the center of a collective debate that emerges in the most recent *Montreal Design Declaration*, published in 2017 and updated in 2019, which configures itself as an open document on a participatory level synthesized by the mode of the call to action, whose writing and updating assume a character of temporal continuity [*Montreal Design Declaration* 2017].
The transition of design "from being a functional activity of the production and market system to the complex contemporary galaxy of design as critical thinking (critical design)" [Riccini 2020, p. 415] requires an analysis in the light of its relationship with drawing. Always the expressive language of choice for any form of project, drawing has radically changed and expanded its semantic scope and field of investigation and application too. In recent decades, through the debate on visual culture, a series of turning points have followed one another, corresponding to as many critical positions formalized on several occasions in the field of visual studies [6]. Theoretical reflections centered on the visual domain have focused on studying the cultural dimension of vision and images, examining "all the aspects […] that contribute to situating certain images and certain acts of vision in a precise cultural context" [Pinotti, Somaini 2016, p. XIV]. In this field, the genealogy of visual studies [Luigini 2020] has brought to light, with different declinations in the Anglo-American and European contexts, the concepts of pictorial turn –understood as the occurrence on a global scale of the actual technical possibility of "a culture completely dominated by images" [7]– of iconic turn – defined by parallelism with the linguistic turn, that is, establishing a "comparison […] between those two twins that are image and word" [Boehm 2012, p. 129]– and, in a broader sense, of visual culture – understood as both "cultural construction of vision" and "visual construction of culture" [Mitchell 2002].

But the theoretical issues have not only concerned the interpretation and signification of the gaze and the role of images in society. The international debate forms itself and debates from different points of view regarding the activity of image production, that transdisciplinary field of studies constituted by the visual sciences – those areas of research, culture and academic studies that deal with "the elaboration of visual images" [Cardone 2019]. This definition, now fully mature, represents the arrival of an evolutionary path that has seen the appearance, firstly, of the field of visual science –which proposes to bring together in a single body the competencies based on spatial thinking, representation and geometry [Bertoline 1998]– and secondly, of the field of image science – through which emerges the aforementioned approach to the image defined as a new and complex investigation object [Mitchell 2018].
With the evolution of critical thought around the graphic sciences, different taxonomies have been proposed, which have analyzed their uses and diffusion in the most varied spheres of knowledge; among these, the river diagram elaborated by Massironi has proved particularly suitable to reflect the changing nature of this field of study, precisely because of its flexibility and ability to adapt and reconfigure itself over time [Massironi 2001]. Cicalò's updated proposal of the diagram recomposes the evolutions brought about by the post-digital era into a unitary framework, confirming, on the one hand, the validity of such a methodological approach –inclusive, open, and liable to further implementations in the future– and offering, on the other hand, its indispensable actualization concerning the multiple complexities of the current scenario [Cicalò 2020].
The result of the two processes –chronologically parallel and disciplinarily intertwined– of semantic expansion of the fields of 'design' and 'drawing' can be read through the references that define their research topics and application contexts in the academic sphere, specifically the most recent declaratory of the academic disciplines first [8] and then the academic recruitment fields [9].
Concerning the "ICAR/13 - Design" academic discipline, the contents of the first declaratory (2000) are expressly declined about "theories and methods, techniques and instruments of the design of the industrial product –material or virtual– in its productive, technological-constructive, functional, formal and utilitarian characteristics and the relations that it establishes with the spatial and environmental context and with that of industry and the market". However, the concluding words already make explicit a conceptual frame of reference that concerns "design as an interdisciplinary practice", from which "specific areas of research in continuous evolution" arise. The second –and current– declaratory (2015) for the "08/C1 - Design and Technological Planning of Architecture" academic recruitment field, regarding the sector of design, broadens the scope to "theories, methods, techniques and instruments of the design of material and virtual artefacts", introducing the theme of user-centered design and making explicit the concept of "economic, social and environmental sustainability". In addition, the reference to "design thinking as an interdisciplinary practice and moment of synthesis of the multiple knowledge involved in design" is emphasized and further specified, delimiting "the areas of research and application [of] product design, communication, interior design, fashion and their systemic integrations", perhaps still reductively concerning the theme of person-person and person-environment interaction.
Concerning the "ICAR/17 - Representation of Architecture" academic field (simply named "*Disegno*" in Italian), the declaratory of 2000 refers first of all to the "representation of architecture and the environment", identifying the disciplinary pillars in the principles of descriptive geometry and the survey; the opening towards a broader panorama is affirmed by the definition of "drawing as a graphic, infographic and multimedia language, applied to the design process from the shaping of the idea to its executive definition". The subsequent 2015 update substantially confirms the approach of this concise formulation, except for some necessary clarifications regarding the current tools, techniques, and procedures. A greater adherence to the multiple dimension that characterizes the present panorama of the uses of drawing, as a transdisciplinary language and as a space of dialog common to a variety of sectors, emerges from the proposal for the revision of the declaratory of the "08/E1 - Drawing" academic recruitment field, formulated by the UID Scientific Society [10]. This proposal makes explicit a polysemous disciplinary character of transversal application, in which "two main areas exist, with possible interrelationships one scientific-technological and one social-humanistic". The domains and fields of application range from concept to modeling, prototyping, communication, and thus "management of the entire life cycle of products, including digital ones". The sector operates in the context of research and didactic-educational activities,

declaring for the term drawing the "broadest meaning of cognitive means of the formal structure, of instrument for the analysis, transmission, fruition and dissemination of existing values, tangible and intangible".
Although a new update of regulatory references, linked to the reform of knowledge, is on the horizon, these steps appear indicative of a growing awareness of the multiple, dialogic, and inclusive dimension of the discipline of drawing. An open and flexible perimeter that reflects the nature of the field –specifically referring to the use of graphic sciences– when it enters relation with other disciplinary fields.

Conclusions

Today, the meaning of design has expanded and has gone beyond the limits of artifactual tangibility, claiming the multiple values of a design culture that acts in the variable course of life, in the relationships between people and their interactions with the environment, in and on bodies. Design has emerged on the global scene as a strategic innovation resource indispensable to develop both production and social systems. At the same time, drawing has not remained impassive to the changes of technological innovation: accepting the broadest meaning of the term image, it continuously reformulates its tools and its meaning, and it absorbs a wide range of production and communication modalities, whose fruition is now almost exclusively mediated by devices and their interfaces.
In this complex and articulated scenario, drawing amplifies the boundaries of its positioning, governing the different phases of the design project and projecting itself towards new methodologies, becoming a seismograph of the present in anticipating the future.

Notes

[1] The first printed edition is dated 1821 (edited by Giuseppe Tambroni).

[2] The origin of the manuscript is unknown, and it is assumed that Francesco Melzi collected the drawings and annotations of Leonardo da Vinci, contained in the Urbino codex 1270, in c. 1540.

[3] *Designatio*, *Dessain*, *Disegno* [Côrte-Real 2010].

[4] This survey was carried out at the Università Iuav di Venezia and confirmed by Massimiliano Ciammaichella's admission interviews for the degree course in Product, Communication, and Interior Design –Product Design and Visual Design curricula– in September 2022.

[5] Also known as *croquis*.

[6] So called by James Elkins [Elkins 2003] and defined as "a field of academic studies that have as their object the visible and the practices of the gaze in culturally organized forms" [Terrosi 2015].

[7] It is the awareness that "a culture totally dominated by images, has now become a real technical possibility on a global scale" [Mitchell 1992, p. 91].

[8] D.M. 4 ottobre 2000, Allegato B.

[9] D.M. 30 ottobre 2015, n. 855, Allegato B.

[10] The revision proposal was approved by the Scientific Technical Committee on 22 March 2021.

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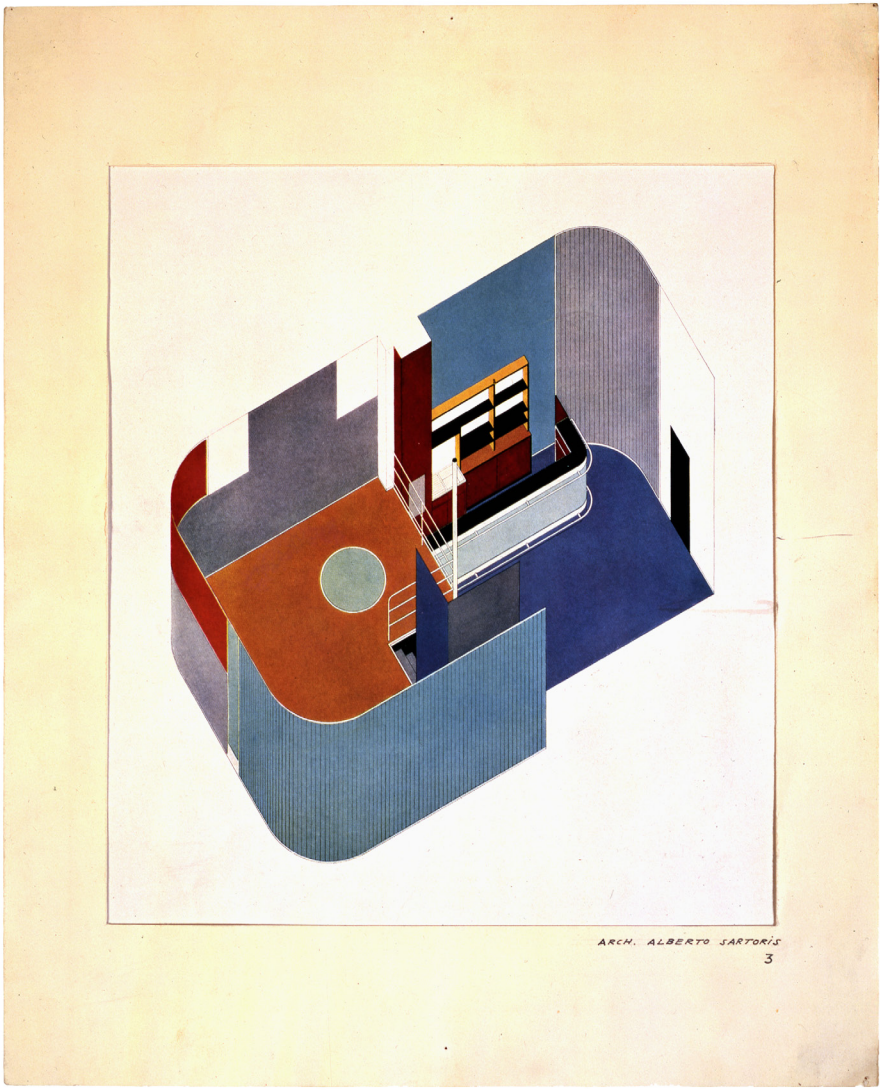
Cercle de l'Ermitage à Epesses

Alberto Sartoris



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The *Cercle de l'Ermitage* by Alberto Sartoris. Axonometry as a Synthetic Representation of the Project

Vincenza Garofalo

A chromolithograph by Alberto Sartoris, published in 1936 in *The Architectural Review* [Morton Shand 1936], depicts an axonometric cutaway of the dance floor and bar of the *Cercle de l'Ermitage*, designed and realised by the architect in 1935, transforming an old mill into a cultural and social centre for international exhibitions, a private club for artists [1]. Sartoris articulated the interior with a succession of superimposed platforms "in a radically modern way, in order to embody and conceptualize the space into a manifesto of rationalistic architecture, without modifying the outer envelope" [Dunant 2016, p. 78], as requested by the Swiss authorities [2].
The choice of oblique isometric axonometry is a constant in Sartoris' projects, allowing him to control, in a geometrically rigorous manner, the design process, both when he represents the exterior through overall views of his architecture, sometimes hyposcopic views, and when he needs to focus attention only on the interior. In the second case, by means of axonometric cutaways, Sartoris extrapolates the detail of a part of the project, as he does, for example, for the library of the "House for the painter Jean Saladin van Berchem in Auteil" (1930) or for the studio designed for his "Ideal house in Florence" (1942) [3]. "In the actual experience of the object, the overall meaning is revealed little by little: the perception of a complex space is a process that takes place over time. The axonometric drawing conveys an integral and simultaneous message. Thanks to axonometry, all the dimensions of the building are perceived at a single glance: time becomes space" [Colquhoun 1992, p. 21, authors' translation].

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The representation method often allows Sartoris to draw an ideal architecture, which is not contaminated by the contingencies of its realisation and is not conditioned by the observer's choice of a privileged point of view; isometric axonometry also guarantees him the security of the relationship between the measurements that are kept constant on the three axes. "If perspective is functional to the observational conditions of the subject, axonometry is functional to the properties of the object" [Reichlin 1979, p. 87, authors' translation].
The drawing of the *Cercle de l'Ermitage* depicts an oblique axonometry in which the architecture is represented as if it were an object, a box with curved corners, without a lid, inside which the space, articulated on several levels, is contained by walls without thickness. It is a synthetic representation of the project, a mental graphic reconstruction of it, which allows Sartoris to reveal the articulation of the surfaces and volumes in the space, in close reciprocal relation: from the lower level, on the right, that houses the bar with its furnishings (counter and wall cabinet), one reaches the dance floor with its luminous circle on the floor, on the left of the drawing, via a short flight of stair, of which only the last steps are visible. The two levels are visually connected by a balcony that from the dance floor overlooks the bar. On some flat and curved surfaces, placed at opposite corners of the large room represented, articulated on two levels, Sartoris uses a corrugated sheet metal laid vertically, to accentuate the perception of free height. In the axonometric cross-section, these sheets are represented by a dense sequence of vertical lines and are coloured grey, near the bar, and turquoise around the dance floor [Morton Shand 1936, p. 183].
Sartoris's drawing continues the series of axonometric cutaways that express theories of colour, applying them to furnished interiors. Thus, for example, the orthogonal axonometry of the "Director's Office at the Bauhaus in Weimar" (1923), draft by Walter Gropius and drawn by Herbert Bayer, is a transparent cube in which the coloured furniture, carpet and lights frame the space; the axonometry of Gerrit Rietveld's "Schröder House" (1924) shows the distribution of the furnishings, in primary colours, leaving the walls transparent; the axonometric cutaway of Le Corbusier's "Maison Cook" (1926) cuts out a portion of the house, as if it were a photographic shot, telling, in the foreground, the use of colour to distinguish surfaces.

Colour gives the architecture of the *Cercle de l'Ermitage* a sculptural and plastic appearance. Abstract painting and construction combine harmoniously [Morton Shand 1936, p. 184]. For Sartoris, colour is "the fourth dimension of architecture", it is its organ, a creative and non-decorative element, which emphasises and transforms forms and planes [Sartoris 1983, p. 436]. The *Cercle de l'Ermitage* "is a chromatic work, composed of planes, a bit like a theatre set" [Frochaux 2018]. For the Epesses project, the architect uses around thirty different shades of paint [Morton Shand 1936, p. 184]. Three, according to Sartoris, are the methods of colour architecture: neoplastic, dynamic and functional [Sartoris 1983]. The first method is based on the principles of *De Stijl* and uses primary colours by integrating them into the geometry of surfaces. The dynamic method, which can be traced back to the theories of Le Corbusier, and which partly inherits Dutch Neoplasticism and French Cubism, uses primary colours on the outside and wider colour ranges on the inside, depending on the different light conditions [4]. The functional method, favoured by Sartoris, uses all colours by integrating them with the architecture, according to psychological and perceptive criteria, to accentuate the parts of the organism, arrange the furniture in a rational manner, determine the proportions, and establish the function of the parts and rooms of a building [Gavello 2019, p. 82]. Thus in the bar and dance floor of the *Cercle de l'Ermitage*, as depicted in the chromolithography, the surfaces of the same room have different colours distinguishing functions in a "juxtaposition of 'discordant' tonal values" [Morton Shand 1936, p. 184], composed in such a way that there are no overlaps or zones of contact between areas of the same shade: the floor of the bar is blue, that of the dance floor is orange, a colour that in the evening enhances "the beauty and skin tone of the women in lounges, boudoirs and dining room" [Sartoris 1983, p. 439, authors' translation]; the walls are alternately grey, turquoise or white, to broaden the perception of space, red is assigned to the bar which has a black counter [Sartoris 1990, pp. 100, 101]. The red band that turns on the curved corner of the dance floor indicates the place allocated to the large painting by Rodolphe-Théophile Bosshard. "The optical function of these elements is thus tested in the design of the Club, which is presented as a visual synthesis of

what should be the final realisation, capable of rendering, if not the actual effect, at least a concentration of it" [Versari 1997, p. 211, authors' translation].
Since the 1970s, Alberto Sartoris has produced hundreds of serigraphies based on old drawings, conceiving them as autonomous artistic forms in which the boundaries between painting and architecture are blurred. Some of these, produced between 1982 and 1995, reproduce, with colour differences, the axonometry of the bar and dance floor of the *Cercle de l'Ermitage à Epesses* and are kept in the *Archives de la construction moderne* (Acm) of the *École Polytechnique Fédérale de Lausanne EPFL, Fonds Alberto Sartoris* [5]. Realised after the circle had been heavily transformed, these polychrome serigraphies are autonomous works of art, the manifesto-images of the relationship between colour and architecture according to Sartoris, an opportunity to continue experimenting with ideal chromatic solutions on an architecture that was no longer his own, but which continued to live on through drawing. The series of serigraphies, produced by the architect several decades after the realisation of the *Cercle de l'Ermitage à Epesses*, brings back a pure dimension to his architecture, freed from its real context and deprived of its accessory elements.
In the chromolithography of the *Cercle de l'Ermitage à Epesses*, the coloured surfaces, placed on different layouts or adjacent to each other, are separated by a white line, by the absence of colour. In the serigraphies, on the other hand, the perimeter of the surfaces is distinctly separated by the compact use of colour without nuances, in a perfect interaction between shade and geometry, adhering to the lesson of *De Stijl*. In either case, the fields representing the walls without thickness also show the colour within their own skin, on the inner face of the masonry, anticipating the possibility, peculiar to digital drawing, of visualising, in shaded mode, the chromatic characteristics of a surface on both its faces. This artifice, in Sartoris's drawing, has a twofold significance: on the one hand, it allows us to show, by reversing the direction, the colour and partition of all the vertical perimeter surfaces, even where the faces of the walls, inside the structure, would not be visible to the observer; on the other hand, it reaffirms that colour is itself a construction material, it is structure. The axonometric view is, therefore, the most appropriate to represent, impartially and without any emotional involvement, all the coloured elements in space, freeing them from perceptual aspects. "These colours, projecting off the floor and walls, demolish the coherence of the usual visual pyramid: the code system that governs illusionism is broken" [Versari 1997, p. 212, authors' translation].

Notes

[1] The chromolithograph *Cercle de l'Ermitage à Epesses* is kept at the *Archives de la construction moderne – EPFL, Fonds Alberto Sartoris*, *Cote archivistique* 0172.04.0266. The folder contains several project drawings. See <https://morphe.epfl.ch/index.php/cercle-de-lermitage-a-epesses> (accessed 10 October 2022).

[2] In 1971, the *Circle* was profoundly transformed and altered. It was recently converted back into a private residence, following a project by Jean-Christophe Dunant, who preserved the spaces designed by Sartoris, restoring many original elements that had been hidden by previous transformations [Dunant 2016, p. 78].

[3] The axonometry of the studio of the "Ideal house" encloses the space in a transparent prism, traced in wire, which, like a mask, isolates the elements represented (the double-height space, the balcony, the walls, the elements of the house that overlook the studio space from the second floor, on the level below).

[4] In 1931, Le Corbusier designed a collection of solid-colour wallpapers, selecting a range of 43 shades, which, however, did not meet with interest among designers and clients, so much so that the factory stopped producing it. Sartoris often used this colour palette in his interior designs [Sartoris 1983, p. 438].

[5] See, for example, *Cercle de l'Ermitage, Epesses I*, serigraphy from 1982 (*Cote* 0172.08.0009), *Cercle de l'Ermitage, Epesses II*, serigraphy from 1995 (*Cote* 0172.08.0030, *numéro* 9b), *Cercle de l'Ermitage, Epesses III*, serigraphy from 1995 (*Cote* 0172.08.0031). <https://morpheplus.epfl.ch/fr/nos-collections/serigraphies/serigraphies-alberto-sartoris/> (accessed 10 October 2022).

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DESIGN DRAWING

Special Column

The Uselessness of Drawing

Mario Trimarchi

I do not know whether drawing is still a practice useful for design and architecture.
Certainly, it is no longer an irreplaceable practice; freehand drawing, which used to mark the beginning of the design process, can be replaced by a computer visualization, by the construction of models in paper or wire or plasticine, by very effective photomontages, or even by lists of more or less emphasized words that begin to lead us into a maze of possible alternatives, of piazzas, of alleyways, of bypasses...
I have always been fascinated by drawing as a magical practice that connects us in a simple manner with what is and what is not, with the things that exist and can be touched on the one hand, and with geometric abstractions of hopes for a somewhat different world.

Drawing is natural daily practice; a bit like breathing, doing yoga, meditating in silence, or running in the park in the morning.
It is not a pragmatic or functional tool; rather, it resembles playing the guitar, which is ostensibly useful for making music but is actually for creating beautiful thoughts, for trying to achieve the perfection of a chord, or for letting loose with the freest and most unregulated of improvisations.
Drawing is easy because it manifests itself in unimagined possibilities: in fact, drawing ultimately serves to understand things better and to bring us closer to the mystery of beauty.
I happen to draw before, during, and after the design process. I draw, with spontaneous insistence, all the little details of the products to be presented to companies, but these details come back to mind during the process of

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modeling and prototyping, and then also when the products are ready in their beautiful boxes to be displayed in stores and sold. I also continuously draw the light that hits them and shapes them and makes us see them from all possible angles as always different, and the shadows that are generated all around them, and then I start talking to those things and sometimes they talk back to me, but instead of using words I use drawing.
Drawing, then, really serves me to understand them, those things, in depth, to tiptoe into their souls and to feel them, somehow, alive.
I have been drawing and teaching for many years, and I often wonder whether drawing should be taught to students of architecture and design; to me, drawing seems useless from a strictly functional point of view, it just needs to be practiced to understand when it is capable of generating wonder.
To me, it seems important to tell students how drawing can generate, for any designer, a more sophisticated sensibility. So I tell them about the love I have always had for the practice of drawing, the music that helps me keep the right pace depending on the size of the drawing and its level of obsession, and then at the end we talk about the most important issue: when can we say that a drawing is finished?
And we never agree on that, and we've never been able to come up with a commonly shared rule.
But we did draw up a list of the infinite kinds of drawings we can make, and this list made us dizzy, due to an unsuspected broadening of horizons.
Together we discovered that drawing fascinates us precisely because it has many forms, it adapts to all people and situations while offering us multiple opportunities to understand it and to make it our own.
There is the very fast drawing, which fixes an idea that perhaps might otherwise slip away, and which possesses the seed of epiphany.
There is the very well-reasoned drawing, in which we try to make everything fit together precisely, and at times we succeed, even though that is very difficult.
There is the drawing that asks questions and the drawing that presents us with the answers.
There is the airy, unfinished drawing, which prompts us to imagine barely evoked worlds, and there is the one driven by horror vacui, which fills all the corners of the page.
There is the drawing of obsession, the one that is always repeated the same but with a few slight changes, because it wants to prove an unobjectionable thesis; there is the drawing that is done in a moment; there is the drawing full of second thoughts, erasures, and adjustments made as we go along, to achieve a perfection that will never truly be achieved.
There is the drawing in black and white, that superimposes itself on reality while slightly distorting it, capable of accompanying us into a simplified world in which all the variations of gray describe the nuances of penumbra and chiaroscuro and contrast; there is the drawing made of a single line that starts on the left and ends on the right and offers us the beauty of a naked body or a tree or a small building that changes the skyline of the hill.
In short, there is a drawing for each of us and, especially, a drawing for all hours of the morning and night, a silent drawing and one that you immediately realize had music accompanying it, and a drawing that becomes painting and a drawing that remains drawing at all costs and a drawing that is nothing but the sum of all the millions of drawings in our lives and which, in the end, as Jorge Luis Borges said, is nothing but our self-portrait.

Author

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Fig. 1. Mario Trimarchi Design, Altars offering fire to the gods.

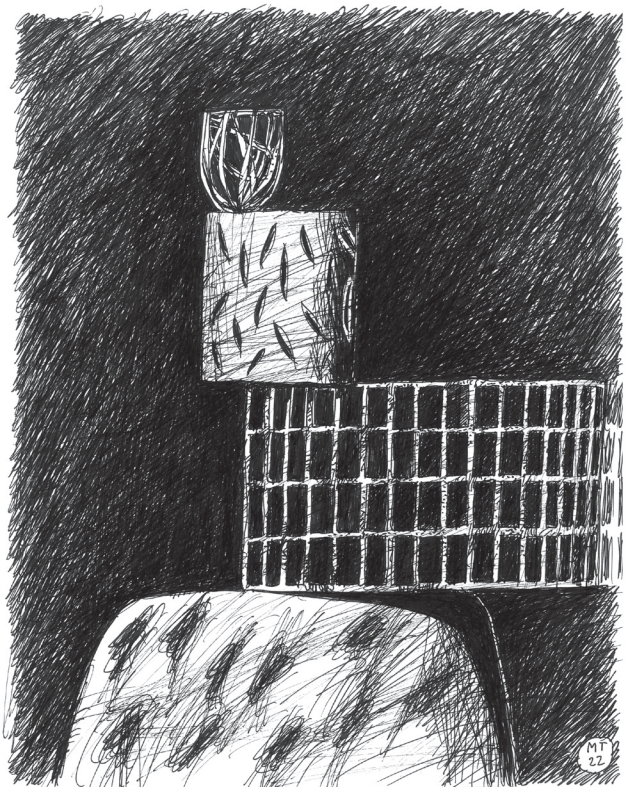

Fig. 2. Mario Trimarchi Design, Close to the edge.

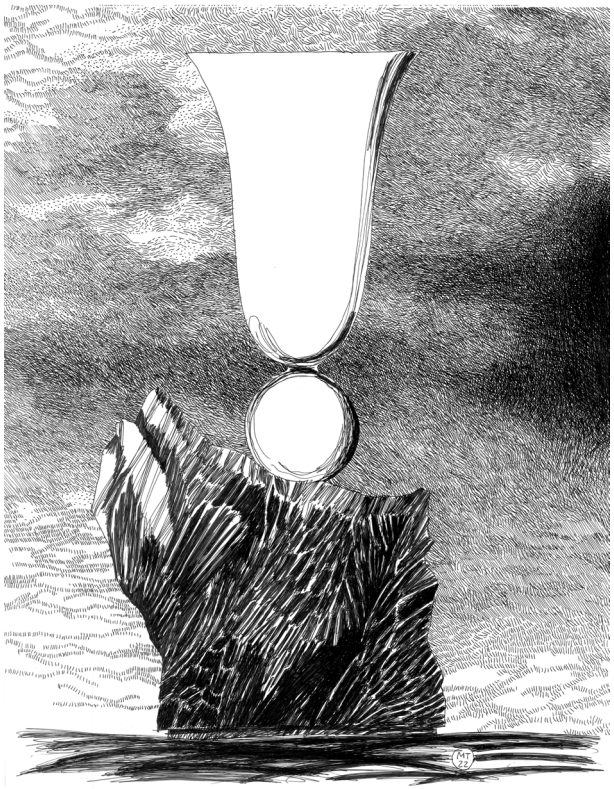

Fig. 3. Mario Trimarchi Design, Ossidiana, Alessi.

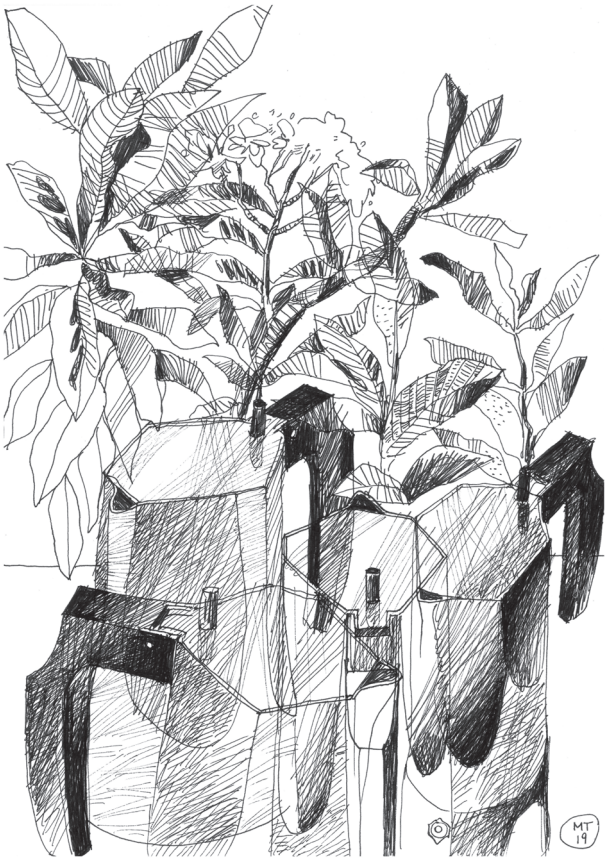

Fig. 4. Mario Trimarchi Design, Drops, Pasabahçe.

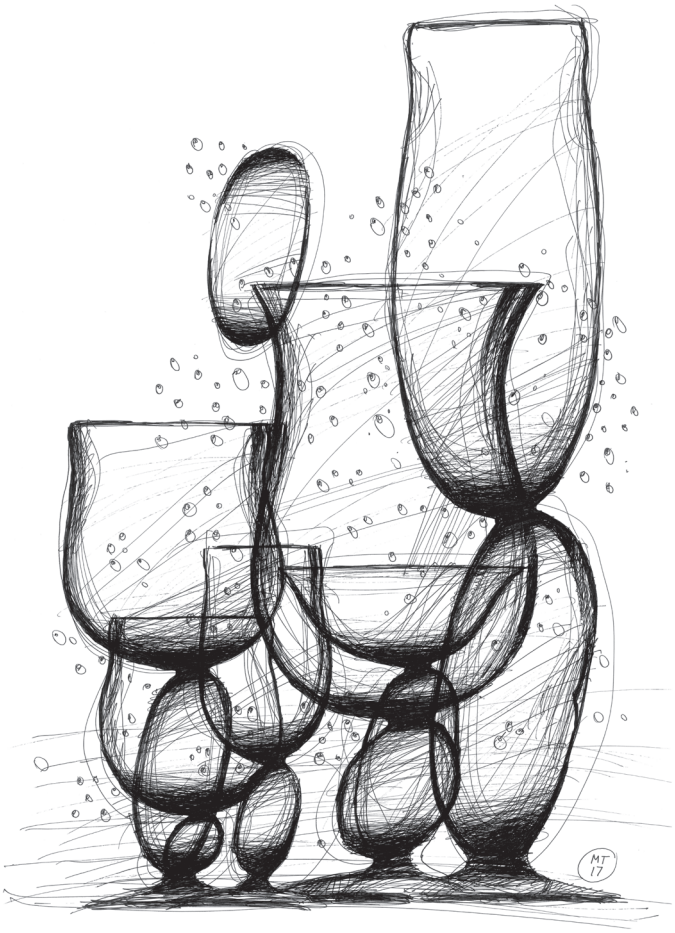

Fig. 5. Mario Trimarchi Design, Istante.

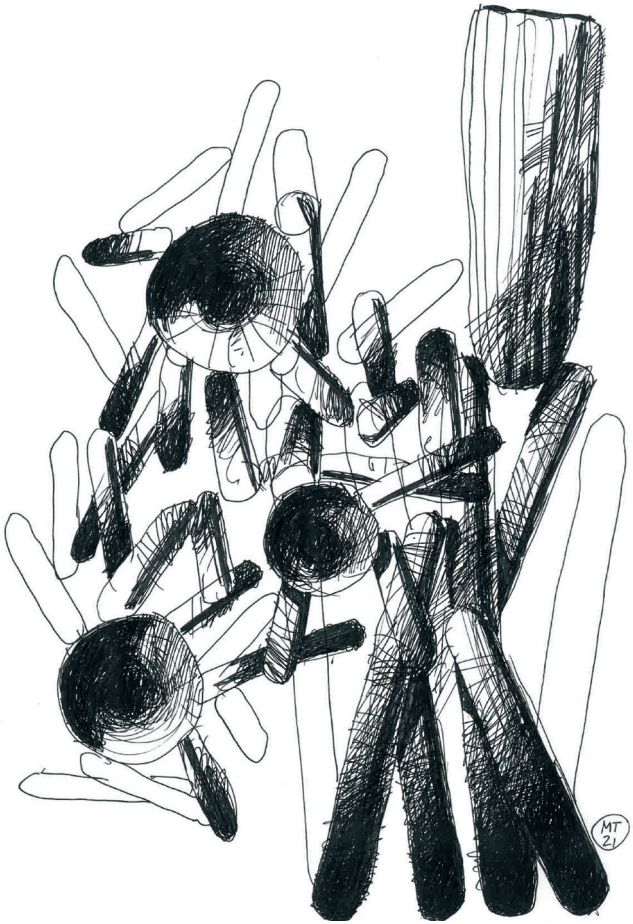

Fig. 6. Mario Trimarchi Design, Swan, Hansa.

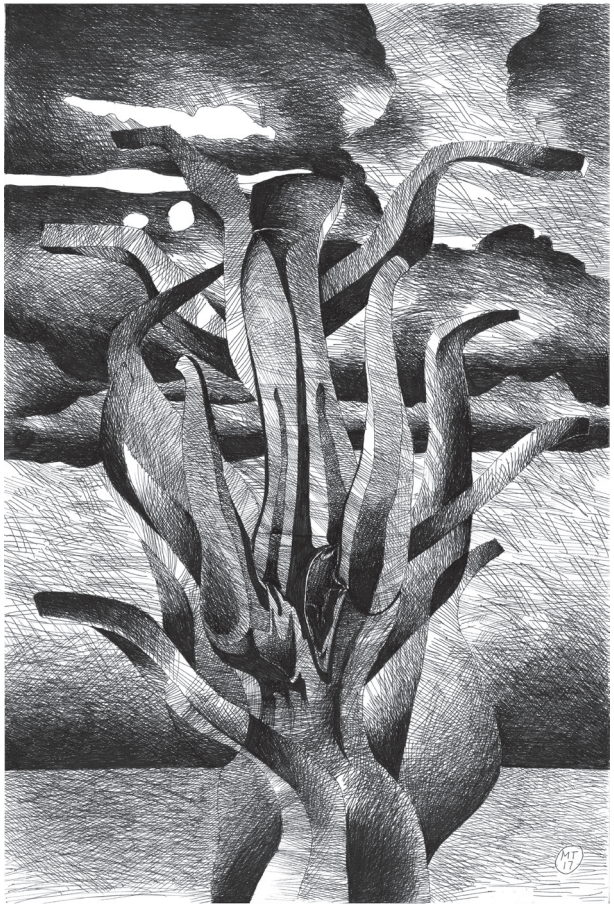

Fig. 7. Mario Trimarchi Design, Samotracia, De Castelli.

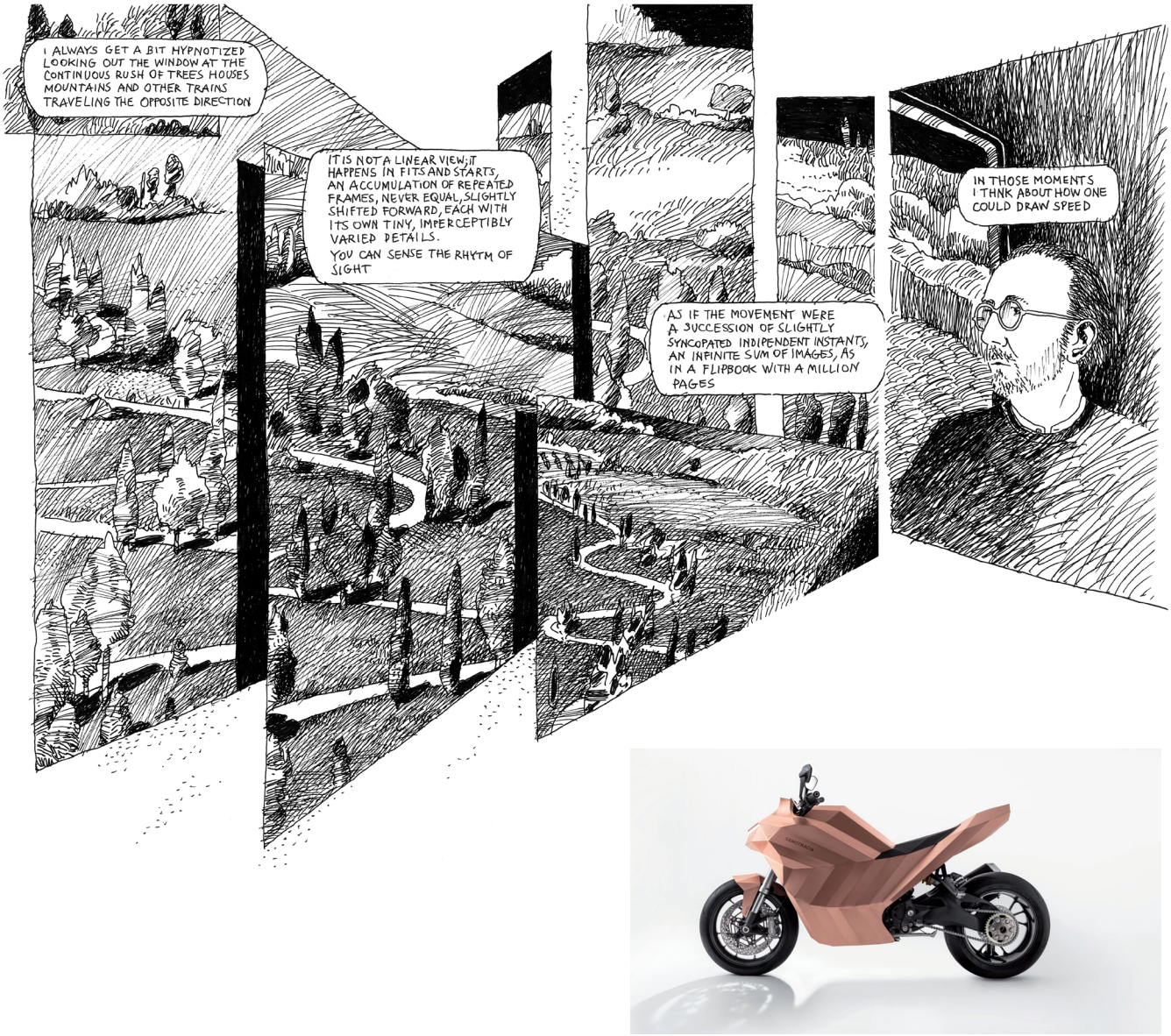

Fig. 8. Mario Trimarchi Design, Terrae motus.

Fig. 9. Mario Trimarchi Design, (Un)balanced, Pasabahçe.

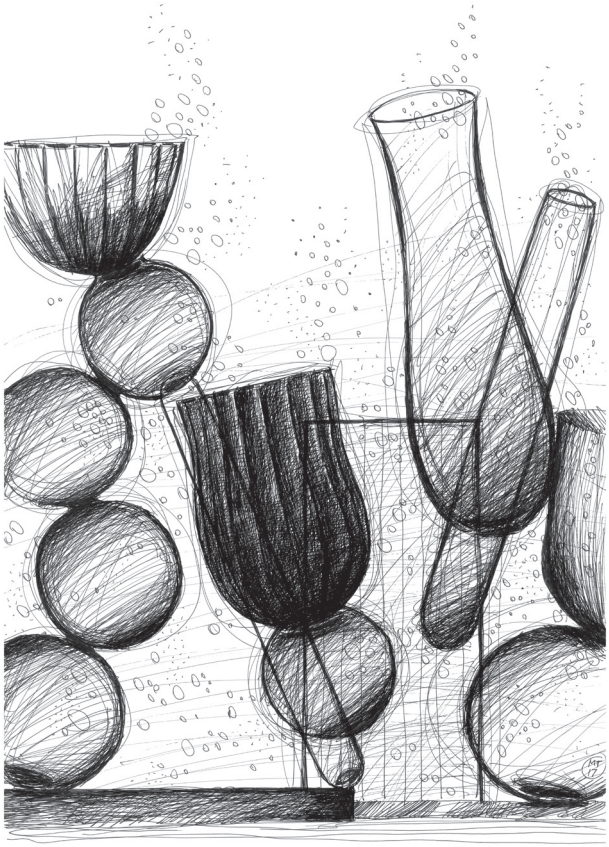

Fig. 10. Mario Trimarchi Design, Il tempo della festa, Alessi.

Masters and Practices

From Digital to Postdigital: the Dialogical Relationship between Drawing and Design

Patrizia Ranzo

Drawing, a synthetic dialogical expression that does not require words, has been profoundly transformed by the digital transition, and the same happened for design. The semantic distinction between drawing and design (understood one as a fundamental tool of representation and communication of the project, and the other as an action of sense projected onto reality through artifacts) has established itself with the emergence of new technologies and tools. Culturally this distinction, as can also be seen from the writings of the Italian masters, indicates only different phases of the project, in which the act of drawing is 'concrete thought', the moment in which the possible appears.

For Ettore Sottsass drawing was also linked to a ritual about the pleasure of the relationship with the objects, particular papers, pencils, colors, which he kept in a closet: "in that closet I keep countless pencils, even colored pencils and a box with pencils of ninety different colors […]. Then there are temperas, boxes of watercolors, brushes, inks, erasers, sharpeners, fixatives and glues of various kinds. When I open the doors of that wardrobe, an inebriating, slightly chemical, vaguely exotic smell comes out. Perhaps the desire to make drawings comes out of that closet, together with those mysterious smells or, maybe, the drawings are born from the desire to leave marks on those white papers, with those pencils, with those soft colors. I don't think there are much, much more urgent features that lead to drawing" [Sottsass 1990, p. 402].

The masters of design had a magical, ritual and complex relationship with drawing, as a privileged tool for the appearance of what 'is' not yet, as a tool for expressing and clarifying thoughts: "if one is lucky, if one manages not to

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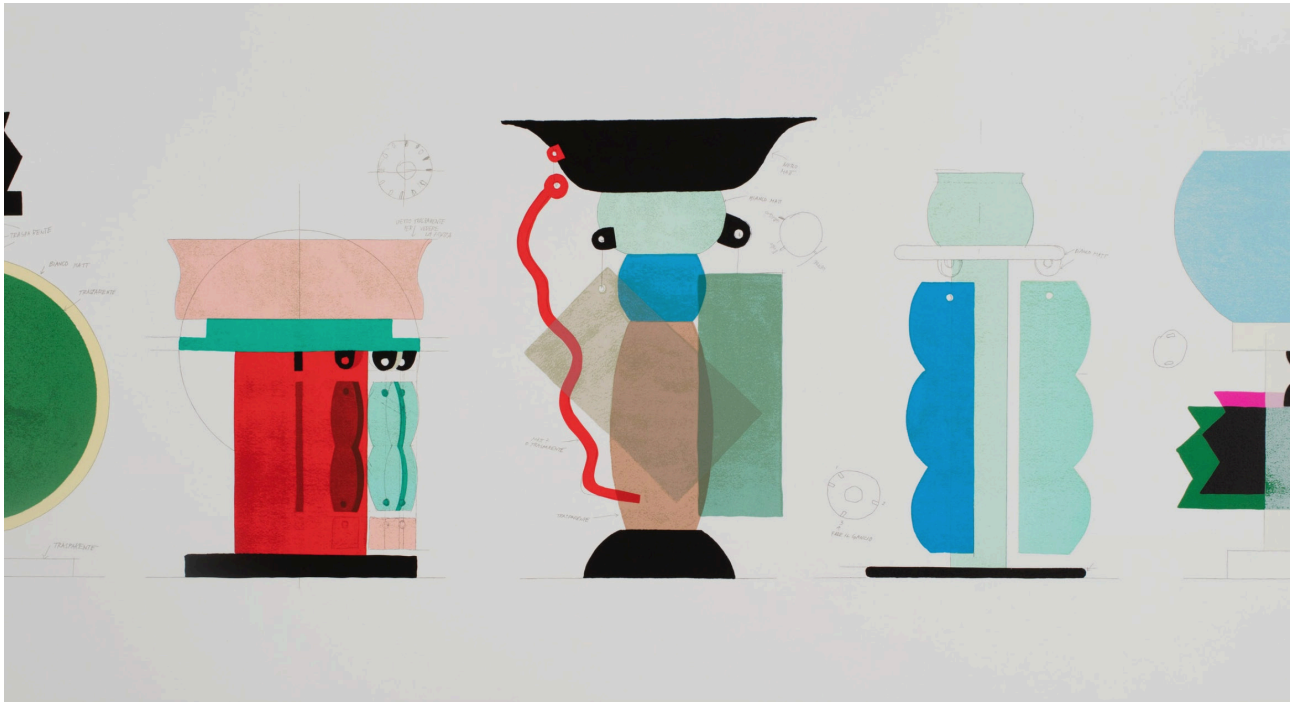
Fig. 1. Andrea Branzi, Madri, 2017.

make a mistake, if one lets oneself be guided by unknown divinities, if the moment is miraculous, then thoughts appear on paper, –as if they came out of a dark space, as if they came out of nowhere–, thoughts can be seen clearly, thoughts light up" [Sottsass 1997, p. 507].
The magical act of appearing of signs on paper is cultivated as a necessity with very ancient roots, as a dialogue between us and the universe, without the mediation of words: "our objects are in fact often thought and designed not as a simple response to objective needs, but as acts of self-identity, as the transference of a role that was once ours, and today no longer belongs to us, but which we will not give up. The objects that man loves are objects that have a soul; in the sense that they contain some sliver of mystery. This mystery is the result of an autonomy of objects with respect to man […]. It is almost a form of animism, a complex identity that enriches the relationship of use" [Branzi 1986, p. 191].
This magical aspect of drawing, where things take on substance and meaning, is actually the tool through which the imagination becomes concrete and deals with reality; it is the place where the possible forms: "the imaginary is not formed in opposition to reality as its denial or compensation; it grows among signs, from book to book, in the interstice of repetitions and commentaries" [Foucault 1998, p. 106].

The effects of the digital revolution

The digital condition, also defined as 'contemporary plankton' due to its set of fluctuating differences, determines a context, for design, in which it is not easy to identify the margins of possibility and collective meaning. We find ourselves acting in a state of continuous present, crushed by the speed of happening and the simultaneity of phenomena; design follows countless cultural, socio-technical and productive paths: that of knowledge, of hybridized knowledge, of social and cultural emergencies.
Today we can say that digital, even with not exactly positive phenomena, has been completed. Already at the end of the '90s Nicholas Negroponte was announcing the end of the digital revolution when we would have noticed the digital for its absence and not for its presence; but at that moment he did not foresee the long wave and the generative effects on the innovations that

Fig. 2. Ettore Sottsass, Vetri Memphis, lithography.



would follow. Innovations that would have also involved the sphere of bio-technological research.
The digital revolution had the effects of a seismic event, transforming the world profoundly from within, affecting interpersonal and working relationships, the material world as well as the immaterial one; finally, it changed the nature of things: "we are faced with a universe dominated by other 'things', not abstract and immaterial phenomena, but lumps of structured matter, solid presences called to interact not only with the body, but also with the mind, not only with the senses, but also with the thought" [Vitta 2015, p. 100].
Digital colonizes technological systems by continually creating new species and instantly extinguishing pre-existing products, in an energetically and technologically self-powered process perfectly described by Zygmunt Bauman: "*perpetuum mobile*: a self-sustained and self-sufficient contraption, containing everything needed to remain in continuous, ininterrupted movement, to be eternally on the move, needing no further outside boost to stay in motion, no stimulus, push or pull, no intervention of an external outside force, no input of new energy" [Bauman 2012, p. 55].
We are in a mature phase of the digital revolution in which, from the dematerialization of objects, we have arrived at the dematerialization of actions: we open the front door and pay for what we buy with the same smartphone that performs other functions.
At the same time we are wedged in a dimension of human action between immateriality and materiality, in a continuous reference; as Olga Goriunova states: "there is no point in designing a system, be a data system or a house, if it cannot pratically and actively affect things, outside of its immediate materiality" [Goriunova 2016, p. 334].
For Goriunova we produce intangible technologies to generate materiality which, in turn, will generate a new humanity and a new action.
Byung-Chul Han, one of the contemporary philosophers who wrote important contributions on the digital transition, says: "through this medium [digital, editor's note] we are re-programmed, without fully understanding this radical paradigm shift. We struggle behind the digital medium which, acting under the level of conscious decision, decisively modifies our behavior, our perception, our sensitivity, our thinking, our living together. Today we are intoxicated by the digital medium, without being able to fully evaluate the consequences of such an inebriation. This blindness and simultaneous numbness represent the crisis of our day" [Han 2015, p. 9].
The blindness to which Han mentions is undoubtedly due to the technological condition in which we are immersed, but it is also generated by the compression of time that characterizes contemporary action. There is also a technological determinism that gives the design a very strong and, in some ways, pervasive aesthetic matrix.

The techno-determinist perspective and digital humanities

The relationship between design, drawing and new technologies always produces many formal, aesthetic and content implications. The parametric approach to the project –necessary for the production with 3D printing processes based on additive and augmentative principles– has generated an induced aesthetic that homogenizes the artifacts both from a formal and design point of view: "we are witnessing a proliferation of seats, tables, bookcases and even footwear that refer, without any logical, conceptual or functional link, to the structure of bones, cells, to mathematical logics such as the Voronoi, whose tessellation resolves itself in the decomposition of a metric space given by the distances with respect to a certain discrete set of elements of space: for example, points or fractals" [Langella, Santulli 2017, p. 17].
In this case drawing coincides with the project, determined by the parametric methodology and 3D manufacturing.
A very case in point was offered by the exhibition *Out of hand. Materializing the Postdigital* (MAD, Museum of Arts and Design, MAD, New York, 16 October 2013-1 June 2014); all the installations and objects visible in the exhibition demonstrate a strong aesthetic, structural and conceptual link caused by digital technologies. This demonstrates the non-neutrality of the digital environment, which can draw our thoughts and actions through a predetermined architecture, a structure of meaning. As Floridi states: "ICTs are not just rebuilding our world: they are re-ontologizing it" [Floridi 2012, p. 13].
Also the new economy is based on the same techno-determinist model: "start-ups are tipycally based on the idea that a particular piece of technology will disrupt and reinvent some part of culture (or even nature). For example: Amazon and eBay reinvent retail, Instagram reinvents photography, You Tube and Netflix reinvent moving

Fig. 3. Schultz, Kotte, Zauner, Wilting, Eggert, Rapid Racer, 2011.

Fig. 4. Shane Kohatsu, Nike Vapor Laser Talon, 2013.

Fig. 5. Iris van Herpen, Parametric dress.

images, Facebook reinvents friendship, Airbnb reinvents hospitality, Bitcoins reinvents finance, and Google's artificial intelligence projects reinvent intelligence" [Cramer 2016, p. 125].
It would therefore seems that this techno-determinism has also profoundly changed the relationship between drawing and design, at least in the uncritical acceptance of digital technology.

A new asterism: the emergence of postdigital critical thinking

If digital, in its resemantization of the world, has reached the skin of objects, postdigital, through its own critical dimension, brings new meanings and open, collective and intelligent design visions, capable of involving people, territories and companies, starting from listening the needs expressed.
Today we talk about postdigital especially in reference to critical thinking, as a new 'asterism' opposed to the pervasiveness of digital; the need to bring man back to the center of the world's transformation processes is related to the need to design visions within which the project can assume meaning and transformative capacity in relation to emerging needs.
We are all in a condition that we can define as techno-biological-cultural coevolution, in which technologies are not only immersive, but support man through the extension of his capabilities, while replacing the experience of reality. Media and digital representations "place themselves on an equal level as compared to the real object, making the appearance a being endowed with its own truth, whose origin must be sought in the technology that produces them" [Vitta 2012, p. 53].
Within this new condition, our material culture and perception of the world profoundly change: Lev Manovich refers to contemporary material culture as "digital materialism" [Manovich 2001, p. 27], in relation to the emergence of new collaborative models of industrial design and production promoted by new technologies.

In this sense, the disappearance of the word culture indicates that the representation of cultural expressions in the concretization of the world (artifacts) is mediated by the digital through its own specific expressive languages and architectures.
In this regards David M. Berry and Michael Dieter state: "we could think of this as the emergence of a project of extend and embrace, whereby the formerly proto-scientific logics of computation envelop and transform art and design into computational media. In doing so, art becomes programmable, and design becomes a function of computation» [Berry, Dieter 2015, p. 2].
In contemporary culture the design autonomy of Italian masters, that magical dimension of drawing in which the possible makes sense, seems to be conditioned by technology. Actually the critical aspect of postdigital thinking intervenes when faced with the new condition: the universe of Italian design, in fact, is made up of 'cultural objects', as result of an intense narration in dialogue with territories, different contexts, different reasons. The socio-technical nature that characterizes a large part of international design excludes the symbolic and expressive dimension that gives the *élan vital* to the artifacts.
In the horizon of the described scenario design requires a close knowledge interaction and a strong critical dimension to orient possible futures and to curve development paths that seem pre-determined by technological trajectories.
In a universe dominated by mathematical metaphors, in which everything can be solved through a numerical container and its corresponding form, the return to the creation of value through meaning (the meaning creator of form) brings us closer to what has always characterized the various human civilizations and the related objects system.
Placing the values you believe in at the center of the project is automatically an act of human sharing and also an intention to give a real shape and direction to the future.

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The Drawing of an Intuition. Interrupted Paths in the Design Practice of Vico Magistretti

Gabriella Liva

Abstract

The essay concerns the concept design of Milanese master Vico Magistretti, focusing on a limited series of sketches belonging to unrealized projects.
Within furniture design, the analysis and study of some seat sketches, for Cassina and Alias, interrupted in the early stages of design evolution, testify how drawing is an expressive necessity of prefiguring reality and becomes a means of communicating the essence of the object even before its artifactual translation.
The 3D translation hypotheses of the 'armchair roller shutter' sketches, geometrically traceable to ribbed surfaces systems supported by tubular metal elements, aim to reconstruct a possible imaginary, tracing the continuous variations that follow on from the initial prototype and creating a logical link with the birth of other iconic objects of the designer.
The use of digital is intended to return a plausible image of the artifact from fragments and notes that, in a guise of immediacy and personal obsession, synthesize not only ambitions and intuitions, but also technical problems and shortcomings in existing products. The drawings thus become valuable tools of inquiry through which a creative project takes shape, which our technologies have a duty to redesign, reconstruct and communicate.

Keywords: Magistretti, unrealized projects, concept design, sketching, digital reconstructions.

"Design, through the iteration of ideas and models, first of all designs 'representations', that is, things that show themselves to our eyes, but end up inhabiting our minds"
[Falcinelli 2017, p. 11]

Introduction

The figure of Vico Magistretti emerged in the postwar period by virtue of the need for flexibility and lightness of furnishings that were able to adapt to changing situations and social habits [De Fusco 2002; D'Amato 2005; Dardi Pasca 2019]. Rejecting the spread of gratuitous and repetitive formalisms, within furniture design, attributable mainly to the domestic sphere [1], Magistretti demonstrates his intellectual skill in renewing the anonymous tradition [2], in making craft skills his own and in experimenting with innovative materials in a refined process of synthesis and geometric simplification that have decreed his extraordinary success with the public and critics [Ghigiotti 1992, pp. 58-67; Irace, Pasca 1999; Mondadori 2005; Koivu, Banchi 2020].
The presence of kinematics and movement constraints that blend into a simple and clean formal aesthetic are winning results and adaptable to previously ignored usage needs.
Underlying the positive outcomes of the Milanese master we find the realizing will of enlightened entrepreneurship that created the optimal conditions for still active mass

Fig. 1. Vico Magistretti Studio Museum Foundation, wall display of plastic models (photo by the author, May 18, 2021).

production. Consistently Magistretti, a two-time Compasso d'Oro award-winner nationally and internationally, maintained that: "making design means penetrating into an industrial, productive and technological reality in a real way" [Tassinari 1973, p. 47] and it was precisely the close collaboration between the Milanese designer and companies in the Lombardy region and beyond that led to an almost total concretization of his design proposals [3].
Having had access to the Magistretti Foundation and discussing with the head of the historical archive, Margherita Pellino [4], it emerged how there remained a very limited series of sketches belonging to unrealized projects (figs. 1, 2).
This verification is very significant because it suggests an extremely positive market response to Magistretti's ideas and vice versa raises a reflection on the reasons for an interrupted path for those sheets that did not have a happy realization. It surely becomes stimulating to understand the creative process that guided the master in this circumstance as well, and to attempt to construct a productive logic by highlighting strengths and weaknesses encapsulated in those abandoned sketches.
By viewing these paper documents, digitized as traces of a thought to be preserved over time, but not present in the online Archive [5], it is possible to reflect on and explore the concept design that leaves multiple avenues open in the continuation of the project evolution, allowing reflection on the one hand on the master's design process, and on the other on an attempt to actualize design products in light of the new digital technologies that CAD systems make available today.

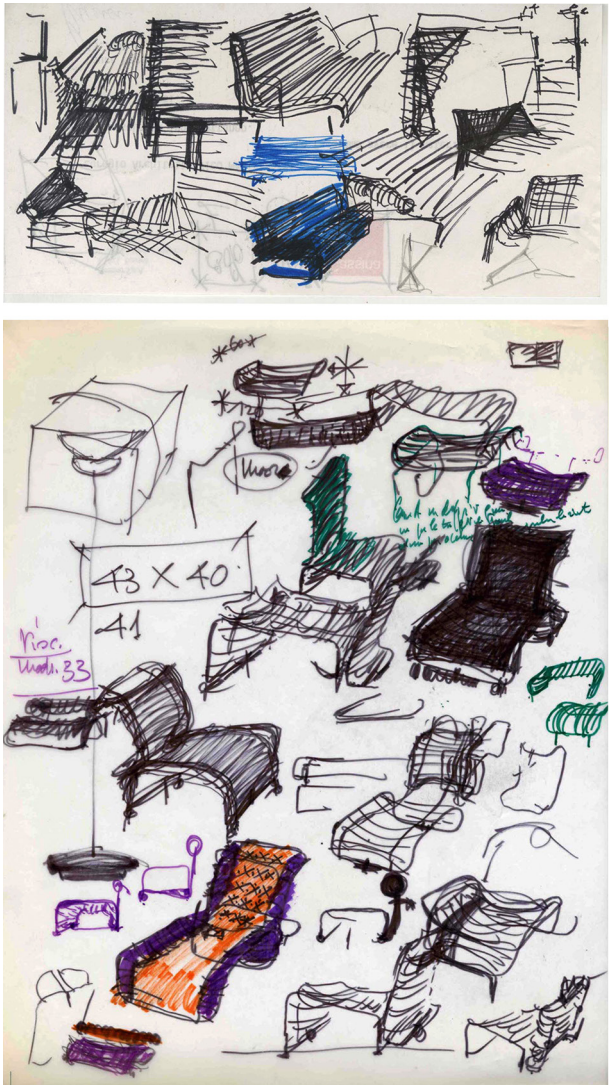
The sketch of an insight

In Magistretti's design practice, his objects, functional furnishings conceived as structural complements of the inhabited space and defined as "furniture characters" for their formal composure and ironic nonchalance [Irace, Pasca 1999], arise from a deep reflection on the conceptual value of sketching in an attempt to attribute to drawing: "since its very first formulation the task of illustrating not so much the image but the meaning, the soul […] suggesting the technical means and materials definitions necessary for an economical and correct realization of mass production" [Pasca 1991, p. 119].

At the beginning of the composition process, all the sheets examined [6], some thirty (fig. 3), pertaining to the group 'armchair roller shutter 1985' –a series of drawings on various kinds paper– present a recurring concept, borrowed in size, color and three-dimensional visualizations, sometimes accompanied by measures or brief informative writings.
In detail, the master sees in the common and well-known element 'roller shutter' a potential tool that can be reworked out of its well-established functional context, traceable to the system of window shading.
The roller shutter specifications –modularity, roll-up, adaptability– are adopted to inspire an outdoor collection of seating and related accessories, ranging from the bench, to the sofa, to the single or series chair, to the coffee table, to the sun lounger. Ideas, proofs, details follow one another in the paper sheets to hold together the supporting and carrying parts and to define in the drawing a form.
The sketch thus becomes the translation of an intuition, which often springs from every day and traditional reality, as for the celebrated *Carimate* chair, a happy interpretation of the typical popular seat in wood and straw material with the red aniline paint used for toys. The intuition is not lost in the process of forms metamorphosis, it is strongly asserted and enhanced by the colors that trace the initial black lines, correcting or marking a specific sheet area. Like his iconic objects, it is always the concept that guides the hand to quickly trace, on any support, the geometry that substance the form and thus the first images of his thought. These are drawings of meditation, of analysis, of communication where annotation, sometimes compulsive, becomes an essential graphic mediation in a project that meditates about the body and its diversified human postures.
Understanding and interpreting ambitions, mistakes and attempts encapsulated in the paper sheets, sensing the contribution that could result in the world of production, also testifies to the importance attached to geometry that punctually accompanies the master in prefiguring reality.
In the continuous marks, from which arise decisive colored fields translated into seamless surfaces, we understand how geometry is: "a little like *consecutio temporum* in Latin: it is something that makes one stand in reality, that gives meaning to reality, that provides a tool for measuring reality" [Feraboli 2011, p. 110].

Fig. 2. Foundation Paper Archive (photo by the author, May 18, 2021).

Fig. 3. Sketches 'Roller Shutter Chair' (1985). Foundation Vico Magistretti ©.



Sketches are governed by geometric proportions as an indispensable tool to control aesthetic/functional form and to establish a relationship between us and the matter around us.
Precisely the individual rods modular nature, the overall surface flexibility, the sign that struggles by alternating straight or curved, continuous or broken lines become the trace of a narrative that, beyond the lack of material experimentation within Cassina or Alias, may have an outcome in the contemporary virtual world.

Interrupted paths

Four sheets, dated June 10, 1985, present both orthogonal, axonometric and perspective views and an essential, but comprehensive, dimensioning system augmented by block letters and completion specifications. Alternating between the use of pencil, colored crayons, black stroke pen, and red or blue markers, the marks chase freely without the aid of tracing tools (fig. 4).
In addition to this composed and clearly legible sequence of drawings structured in orthogonal projections that allow for a redrawing and plausible reconstruction of the artifacts, there are numerous other drawings with predominantly red, blue, and black strokes in which the sketches overlap swirlingly, omitting measurements and mixing several elements together: chair and small table, lounger and seat, bench and armchair. All belong to an integrated system that in one sheet the designer notes as Vania Collection or Cherry Tree Garden [7] and where he marks the various pieces in alphabetical order: lounger A, table B, bench C, low table or seat D, bench E (fig. 5). These elements return obsessively in the various sketches, graphically demonstrating the aesthetic and functional reasoning for the curves and surfaces, often resorting to a single marker mark to highlight the size of the metal tubing.
Careful observation of the graphic flow of lines that intensify, overlap, and erase, alternating between the different methods of representation, allows one to follow and understand the initial formulations, the modifications, the rethinking, the exploration of forms and materials [Tassinari 1973, p. 43] that underlie the master's thinking. In the narrative sequence recognizable from one sheet to the next, it is evident how the concept remains constant,

that is, the system of rods that fit the metal structure recalling the image of the shutter. The master, however, implements a process of simplifying and emptying the volumes, abandoning the compact load-bearing portions in favor of slender tubular weaves that lend lightness to the artifacts (fig. 3). The 'shutter' system runs on tracks with reduced sections that leave an elegant graphic mark in the space, without weighing down the view.
In the formal solutions of the table, conceived in the most essential version as a support base (B), replicated in a reduced size in the small bench (E) or in the multiple table version with the seat function (D), the aesthetic form is well defined and the reasoning is limited to the possibility of inserting on the furniture D four small wheels, pinned in the sketch with the English word castor wheel, to ensure movement.
Certainly the most recurring element is the deck chair, precisely because of the problems related to its transformability that the designer wants to ensure at the seating time: the shape of the supporting metal frame, the free movement of the backrest and the footrest, both subject to a rotary motion, necessitate numerous reasonings about the connecting hinge and the possibility of inserting a wooden food rest, which would maintain horizontality, in a front or rear position, for both sides.

Fig. 4. Sketches 'Roller Shutter Chair' (1985), four drawings dated June 10, 1985; Foundation Vico Magistretti ©.

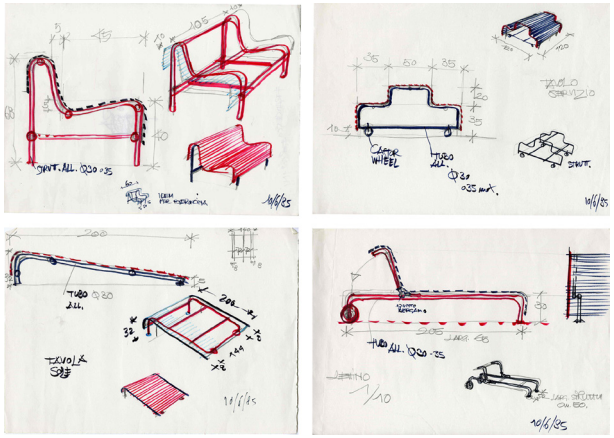
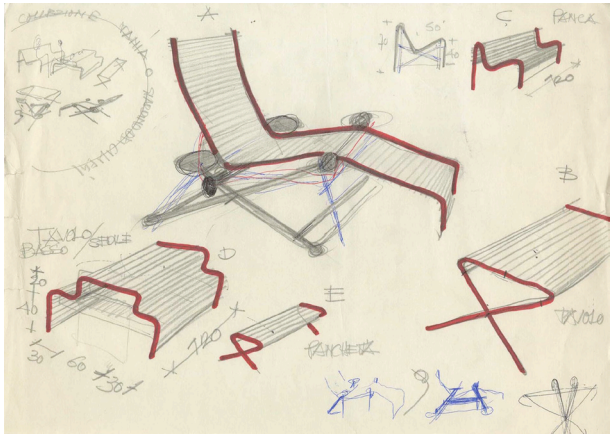


Fig. 5. Sketch collection 'Roller Shutter Chair' (1985). Foundation Vico Magistretti ©.

Fig. 6. Four variations of the deck chair: hypothesis 1 (undated), hypothesis 2 (January 16, 1982), hypothesis 3 (undated), hypothesis 4 (January 18, 1983). Foundation Vico Magistretti ©.



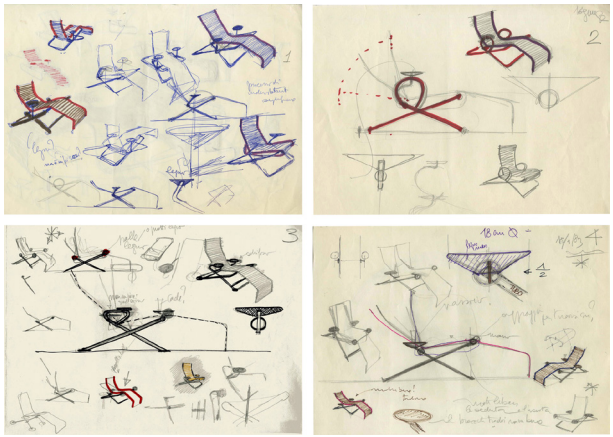
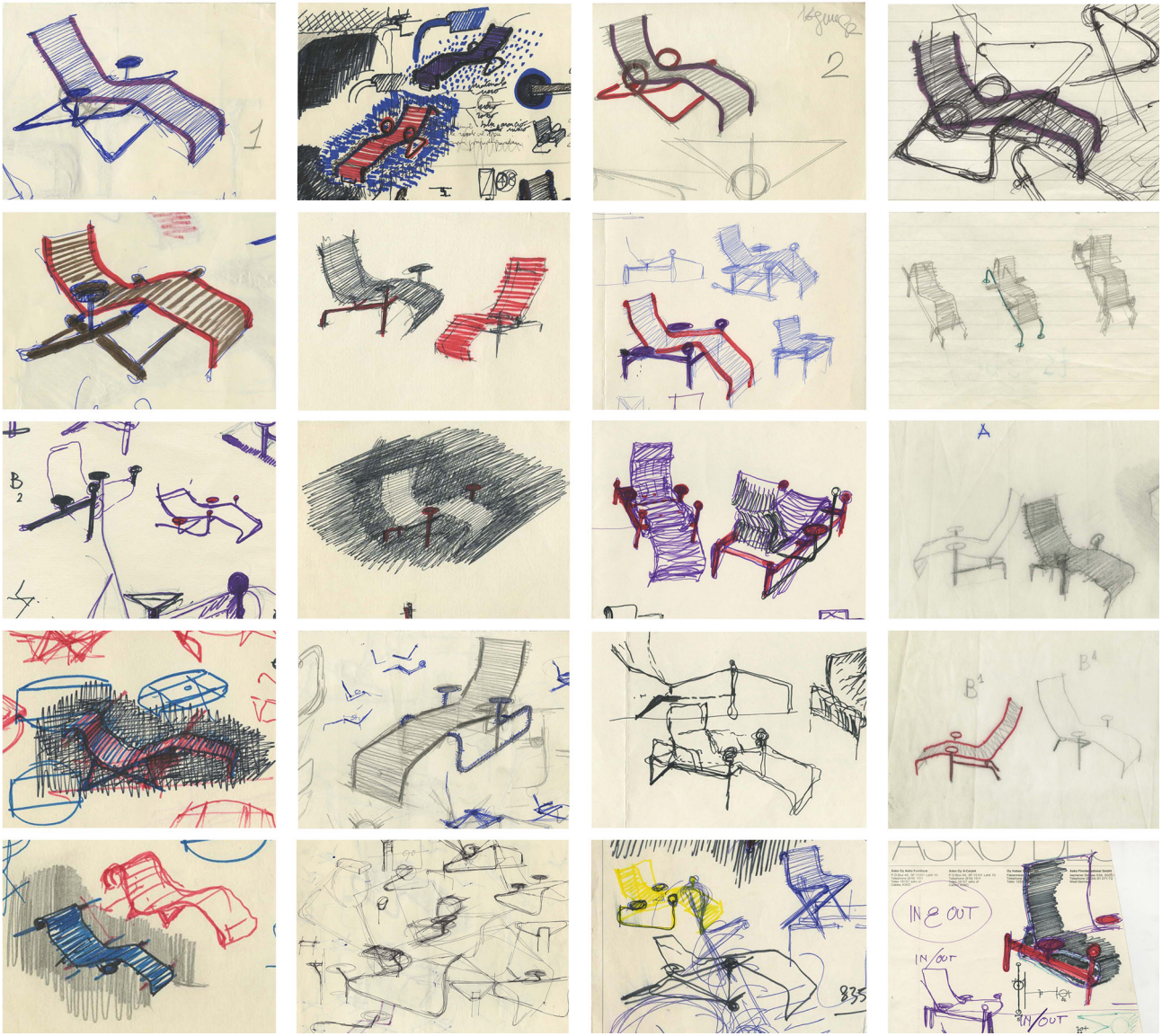


Fig. 7. Variants of the reclining seat, details. Foundation Vico Magistretti ©.



In the general sketch of the collection, the furniture is initialed A and there are 4 solutions: hypothesis sheet 1 (undated), hypothesis sheet 2 (January 16, 1982, perhaps concern an earlier solution), hypothesis sheet 3 (undated), hypothesis sheet 4 (January 18, 1983). An additional sheet is initialed April 15, 1983. Further subdivisions into A, B, B1, and C show definite variations and the beverage holder in the front position, hinted at in hypothesis 3 and 4 (figs. 6, 7). Digital analysis verified that the two elevations, contained in the third and fourth hypotheses, are superimposable, making it plausible that key elements were traced from sheet 3 to sheet 4.
Certainly, the idea that the conversation chair coexists with the resting chaise longue, in one piece of furniture, echoes the concept of the *Maralunga* transforming sofa in the 1970s. The dual function results in an abundance of sketches that go down in detail to address specific questions about the integration of different materials

Fig. 8. Sketch of the reclining seat, technical detail. Foundation Vico Magistretti ©.

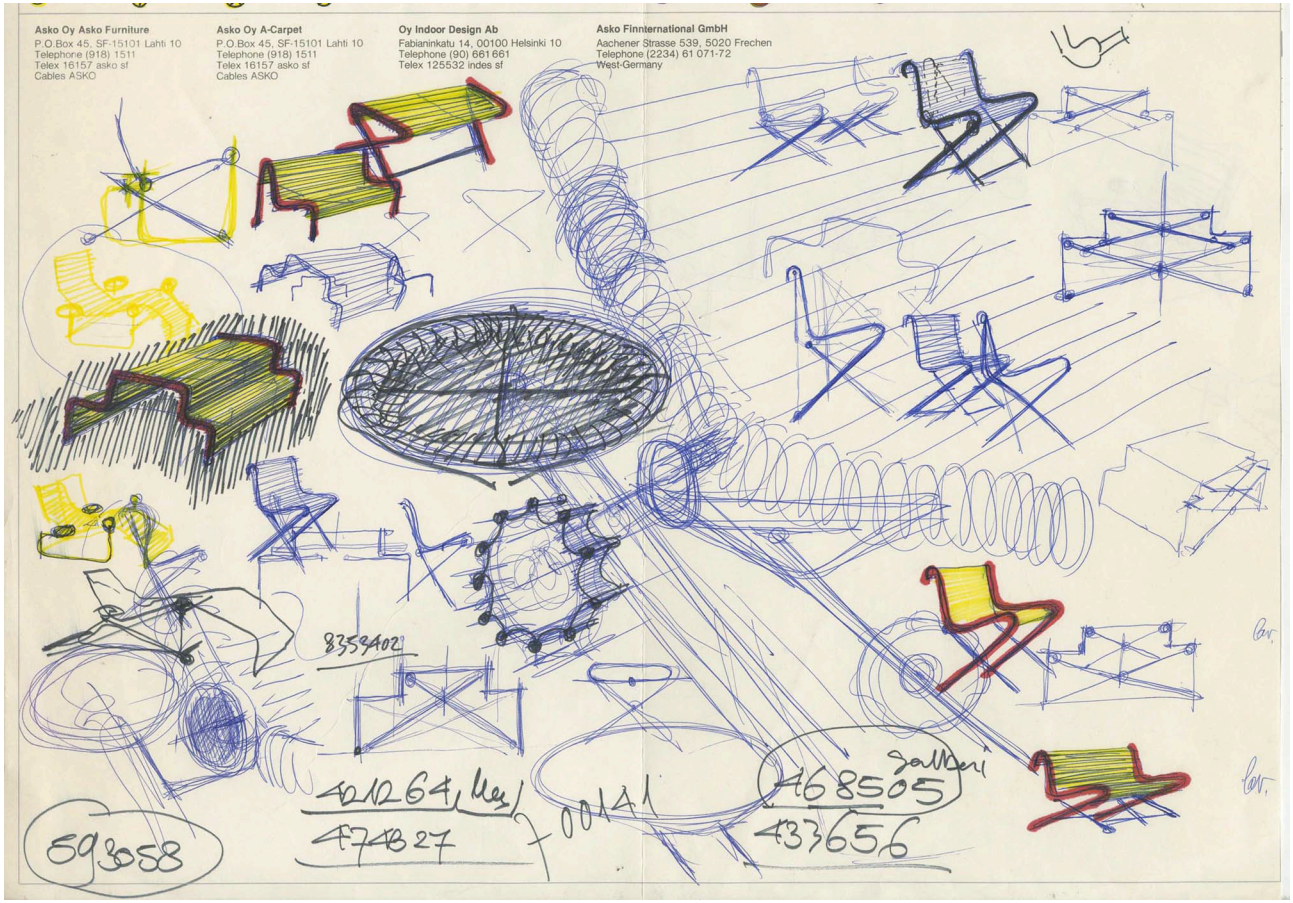
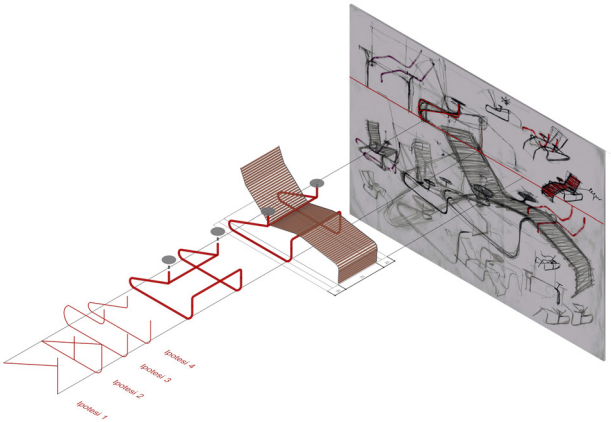


Fig. 9. 3D reconstruction of the lounger seat, hypothesis of the supporting tubulars (digital processing by the author).



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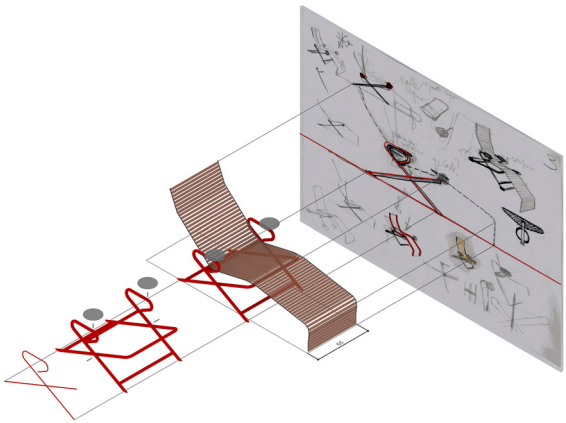

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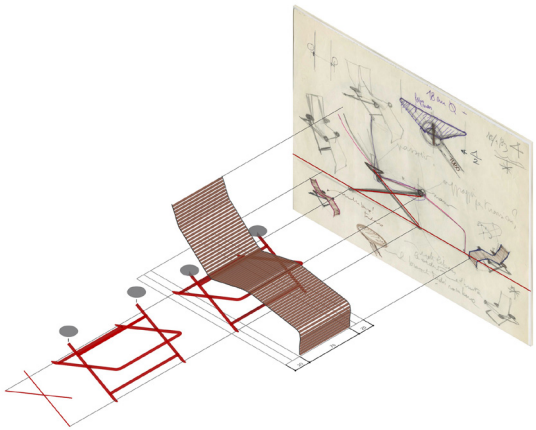

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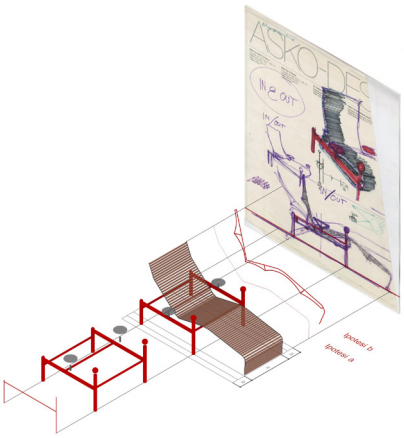


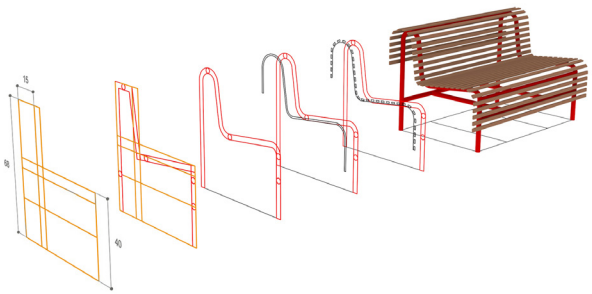
9d

elements. In the unrealized sketches, although there are no complex construction details –a lack partly justified by the adoption of industrial components related to metal carpentry– it emerges how Magistretti reasons about the problem of the various element intersection [8], the presence of hinges or joints for the versatility of his furniture. In the sheets dated 1985, on the dimensioned sketch of the crib, there appears the inscription "Giunto Bergamo" necessary for the connection of two parallel elements to be join together to ensure the movement of the backrest.
Precisely the use of assisted drawing, even before a physical prototype, allows the construction of such furniture by hypothesizing a possible joint between tubular elements so as to envisage and justify the presence of a swivel joint to connect the two parts while keeping them autonomous [9].
The issue also recurs in the reclining seat where the master hypothesizes a more visible wheel mechanism that simultaneously manages the joining of the rods and the voluntary control of the reclining backrest (fig. 8).

The digital interpretation of sketching

From the methodological point of view, the in-depth study of the material provided by the archive included, in addition to the study of the master's compositional process and the identification of consimilar cases, the 2D digital redrawing first of all of the sketches presenting measurements and elements displayed in true form, and then moving on to a reflection on each representation useful for understanding the evolutionary stages, highlighting inconsistencies or technical errors understandable in the sketching phase. Recognition of functional nodes, not always resolved effectively or blatantly incongruent with reality, but drawn in multiple versions suggesting diverse solutions to be explored further, seem to anticipate the 'algorithmic' and 'parametric' development that CAD systems make available today. These are shifting assumptions that software can quickly simulate and verify by providing the designer with additional degrees of freedom and vision (fig. 9).
The 3D translation of the sheets, which generally date to the 1980s, are geometrically traceable to systems of ridged surfaces on metal supports modeled with closed extrusion profiles that run on a directrix. The continuous design variations that evolve from the initial design are made possible by focusing on the geometry as a tool for simplification and resolution of complex forms and creating a logical link to the emergence of other iconic objects of the designer from the same period, including *Sindbad* (1981), an integrated sofa/armchair/pouf/table system, *Veranda* (1983) sofa/armchair/table [10], *Ozu* (1986) armchair.
Comparing these artifacts, we understand how the master's constant search for simplicity, comfort, flexibility is closely connected to the use of common materials according to a logic of practicality. The idea of 'throwing a blanket over a structure' (*Sindbad*) [Ferretti 1982, pp. 89-93] or sitting/laying down on a sail (*Veranda*) share an imagery that we can intuit even in the sketches belonging to unrealized projects, reflecting on the fallout of those graphic signs in relation to the production mechanisms.
The interpretation of the sketches and the verification of the ideational and functional constants make us reflect on Magistretti's own compositional methodology, and in the digital sphere, the formal decomposition of the various elements (geometric matrices, generating and directing curves, orthogonal projections, 3D model) exemplify an implicit design process by indicating a representative sequence that is also useful in today's design (fig. 10).
Certainly, in this case we do not have the final product, but the use of digital, which is not meant to detract from or replace the primordial act of design, stands precisely in continuity, in an attempt to enact a compositional continuation by returning, at least virtually, a plausible image of the collection.

Fig. 10. 3D reconstruction of a furniture piece belonging to the drawings June 10, 1985 (digital processing by the author).



Starting with geometric drawings, fragments, doodles, and notes that, in a guise of immediacy and personal urgency, summarize not only ambitions and intuitions, but also technical problems and shortcomings in existing products, CAD reconstructs the formal metamorphoses of the individual objects in the series providing a coherent overview from which to draw any conclusions about the actual abandonment of the project. In addition, digital visualization of technical details, related to the possibility of movement, makes it possible to visualize the critical points of the structure and to suggest possible alternative solutions.
For the 5 elements (A, B, C, D, E), the geometric matrices, drawn in pencil and often erased by overlapping marks, the general inclinations of the various pieces, the curved joints,

Fig. 11. Detail belonging to the sketches 'Roller Shutter Chair' (1985). Foundation Vico Magistretti ©.

the positions of the metal elements intersections, and the claddings characterized by a modular subdivision were obtained. The operation of disassembling the signs makes it possible to obtain a digital model, from the rendering of which the hierarchy of the various elements clearly emerges.
Axonometric or perspective views of the various furnishings contribute individually or in groups to reconstruct the master's thinking (figs. 11, 12).

Conclusions

In the light of these considerations, the sketches examined, far from the perfection of the final state, thus become the emblem of an interrupted, almost forgotten path but, from careful observation, they present themselves as valuable investigation tools in which drawing plays the role, as in past eras, of an irreplaceable means of reasoning [Falcinelli 2004, p. 45].

Fig. 12. 3D reconstruction of the 'Vania Collection' or 'Cherry Tree Collection' (digital processing by the author).

Drawing is the place of the project where to visualize, verify and share a repertoire of thoughts, memories, suggestions, innovations that materialize in quick and immediate images.
The 33 analyzed sheets tell an idea, record a creative cue: "show the path through which a creative project takes shape, make visible and tangible a mental landscape" [Veneziano 2009, p. 7] that our technologies have the duty to redraw, reconstruct and communicate. From the drawings emerges the essence of the object even before its artifactual translation, and the digital becomes useful to retrace the various steps, select and visualize the different hypotheses in order to build a probable imaginary that guided the master.
The analysis carried out aims to reconstruct some unrealized projects and the study of the archived material, the comparison of the graphic signs on the various sheets, the observation of repeated shapes and geometries have investigated the evolutionary process of an idea that has not lost its creative strength, despite the project variables. By combining graphic information and the different methods of representation, a coherent and functional outdoor collection has emerged thanks to digital technology.
We do not know why these sketches did not have a physical translation, we can assume dissatisfaction on the part of the designer or in a lack of interest on the part of the manufacturing companies, but it is also plausible to think that these sketches may have been useful for future [11] projects especially in the concepts of flexibility, modularity and movement that would become a hallmark and a constant in Magistretti's production.

Notes

[1] The locution "furniture design" refers to the design activity applied to the field of private, predominantly domestic.

[2] Magistretti redesigns traditional artifacts by enhancing technical and formal aspects such as the tavern chair, the English club chair, the Thonet or Mackintosh chair. From intellectual curiosity toward new materials, their application in the manufacturing sector begins.

[3] His design pieces are on permanent display at MoMA in New York, Victoria and Albert Museum in London, Die Neue Sammlung in Munich, and the Triennale Design Museum in Milan.

[4] Vico Magistretti worked in the studio on Via Conservatorio in Milan from 1946 to 2006, after inheriting it from his father, architect Pier Giulio Magistretti. In 2010, after a lengthy reorganization and enhancement of the archive, the studio became home to the Vico Magistretti Studio Museum Foundation. The enormous material preserved in the archive can be traced back to the painstaking conservation work of surveyor Franco Montella, a historical collaborator and the true interpreter and the translator into executive forms of Magistretti's concepts: <http://www.vicomagistretti.it/it/> (accessed September 10 2022).

[5] The archive, made available online in 2020, collects sketches, drawings, floor plans, project reports, patents, photographs, magazine articles, and catalogs that chronicle Vico Magistretti's entire professional life: <https://archivio.vicomagistretti.it/magistretti/> (accessed September 10 2022).

[6] The Magistretti Foundation provided the author with three unrealized designs, 'Armchair Roller Shutter' (33 images), 'Armchair Carpet' (14 images) and 'Broomstick Lamp' (7 images). The digital images concern sketches drawn on one side of the sheet or belonging to both sides (front and back).

[7] The meaning of the word Vania is not known, only later Magistretti uses the name Vanja in the bed produced for Flou (1996). As for the name 'Cherry Garden' it could refer to the material used in the furniture i.e. American cherry wood, with a compact, straight and fine grain, characterized by a dark red or reddish brown hue.

[8] In the same years Magistretti made the *Edison* table where he experimented with metal interlocks made possible by cast iron cross joints commonly used in gas lighting systems.

[9] Probably Magistretti was referring to a standardized industrial component. Currently there are modular hinges formed from components to be assembled characterized by a pin in the expanded head or mushroom version with rivet: <https://www.corisnc.it/wp-content/uploads/2017/02/Cerniere_industriali.pdf> (accessed September 10 2022).

[10] In a sheet of the 1985 roller shutter chair group 1985, there are sketches traceable to the series Veranda.

[11] The 'armchair-rolling-shutter' sketches may have contributed to the creationof the *Spigoletto* bed (1992) whose headboard is made of laths and shaped like a rolling shutter, supported at the back by two steel supports covered in leather.

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The Design-Drawing Relationship in Small Artifacts. Practices, Reflections and Dynamics of Representation for Arthouse Handles

Vincenzo Paolo Bagnato, Anna Christiana Maiorano

Abstract

Between theory and practice, this work questions the nature of the handle design, the direct metric relationship between the drawn data, the one thought and, subsequently, realized; between the imaginary data, accessible in the representation, and the real one, on the modality of use of the represented data which also significantly affects the technical-configurative procedures; on the 'real' management of planning, formal and executive contents. More specifically, the article on the one hand reconstructs the story of the relationship between drawing and design through the study of the handle artifact from the Bauhaus to the present day, identifying and observing emblematic cases (arthouse handles) intended as fundamental stages in the construction of a dialogic story between project and representation in its double aesthetic and ethical value; on the other hand, it reconstructs an infographic knowledge system oriented to the visualization of design themes linked to the handle artifact through devices which take into account the dynamics of representation of the artifacts and morphological qualities towards hybrid media and narrative forms, within the framework of a research experience based on the encounter between the discipline of design and that of drawing and on experimentation strategies implemented through the methods and codes of representative language in a continuous and lively definition of disciplinary boundaries.

Keywords: handles, design, drawing, representation, taxonomy.

Introduction

Complex artifacts, the handles are configured as an interesting and little studied field of experimentation and conceptual reflection for the design project and for its representation: in their multiple interpretations of elements of completion of the architectural construction, of furnishing objects and tools, up to their value as mechanisms for opening and closing doors and windows, the handles appear to herald an approach to representation that is always different according to the specific purpose of their design, but always in an intimate relationship with the design poetics that it underlies the form and, more generally, the aesthetics.
Generally speaking, the theme of form combined with that of geometry, representation and visualization of the artifact as well as the theory of configuration linked to the ideational principles of the project, identifies in the design of these small objects, converging in the objective of the project, the place privileged to elaborate the thought and the image that is progressively traced, until it assumes the features of concreteness and turns into matter.
From the catalogs' didactic drawings patents' executive ones, from the conceptual sketches revealing morphological and technical innovations to the metaphorical representations of renewed man-object relationships and, again, from the rigor of geometric designs organized in orthogonal projection up to the organic and fluid elaborations of 3D CAD/CAM matrix, the handles are ultimately important chapters of the twentieth century design narrative, of-

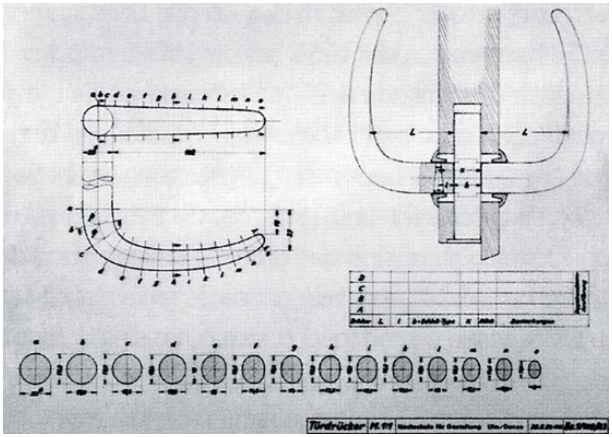
fering infinite variations in the relationship between form and representation.

The handle design: from Bauhaus to contemporary production

Around the turn of the nineteenth and the twentieth century, in the period from 1890 to 1920, the handles are characterized by an aesthetic that expresses the union of a functional condition (opening/closing mechanism) and a decorative condition, the latter in turn attributable to two prevailing categories: the first made up of animal elements (griffins, swans, lions, etc.), the second of vegetable elements (plants, fruits, etc.), respectively expression of ancient symbolic representations and new fascinations for the places of the colonies. The forms that these conditions produce, belonging in general to the Liberty language, undoubtedly express a conscious aesthetic thought, but it is with the Detscher Werkbund before and with the Bauhaus after that the design of the handle is configured for the first time as a project theme: it is not secondary that it is a handle, specifically the one designed by Walter Gropius and Adolf Meyer in 1923, the first design object to be designed in the Bauhaus and then mass-produced industrially and sold to finance the School (fig. 1).
With the Bauhaus the aesthetics of the objects therefore changes radically because all references to the naturalistic world are replaced by those of abstract art and the world of industrial machinery: the Gropius-Meyer handle, produced in brass and nickel-plated steel by the German company Loevy, was born from a prototype designed first for the Fagus workshops in Alfeld and for the Civic Theater in Jena (both designed by Gropius and Meyer respectively in 1911 and 1922), then for Georg Muche's Horn House in Weimar (1923), up to being mass-produced for use on the interior doors of the Bauhaus building in Dessau (1925). The original version consists of a square section bar that turns between the neck and the lever, then transforming itself into a cylindrical body that constitutes the handle, whose base circumference circumscribes the size of the square of the neck (its diameter is equal to the diagonal of the latter), while the parallelepiped body mutates its attachment to the rosette through another small cylindrical element of the same width as that of the handle. Later versions, starting with those used in Dessau, are larger and have a different proportion between the cylindrical and parallelepiped parts, including the base diameter which no longer coincides with the diagonal of the square but is larger. Until the mid-thirties, the Dessau handle was produced in about 20 versions in which the measurements and proportions between the constituent parts vary (lever length, cylindrical part length, cylindrical part diameter, parallelepiped part width), while maintaining the principle morphological-formal. Beyond his project, the story of the production of the Dessau handle is particularly significant insofar as it outlines an extremely dense and articulated picture of the industrial production realities that in Germany in the twenties and thirties, precisely through the large-scale production of components for architecture (and among these the handles), they make an essential contribution to the spread of the design culture of these years, reverberating and expanding the work done by schools and great masters.
However, the Dessau handle is not the only one to influence the design of these years: other handles soon

Fig. 1. W. Gropius, A. Meyer, maniglia Dessau handle in model 3174, S.A. Loevy, 1923 (source: www.catawiki.com).

became 'archetypal', including the Frankfurt by Ferdinand Kramer (1925) and the handles by Robert Mallet-Stevens, Ludwig Wittgenstein and Adolf Loos, all in their own way innovative with respect to current production, and all of which can be framed in an aesthetic trend, even if simplistically definable as 'geometric', which contrasts with the language of an organic matrix directly deriving from the Liberty, Arts & Crafts and Jugendstijl experiences.
The overcoming of this opposition of formal languages takes place after the Second World War, first with the Ulm handle (1954) by Max Bill (fig. 2) and then thanks to the Italian experience, largely dominated by the company's productions Olivari and the figure of Gio Ponti [Casciani 1992]. If the design of the handles in this period in most cases expresses the desire to definitively move away from the formal rules of the Modern Movement, it is with Gio Ponti's Cono (1954), Anello (1954) and Lama (1956) handles that it begins to tell more explicitly an unprecedented idea of modernity based on continuity with the forms of the past, on the ideal of lightness of new objects, on the reduction of morphological complexity and on the social dimension of design, specifically intended as a reduction in the degree of formal abstraction in favor of a greater 'physical-material' relationship with the user (fig. 3). This condition continued with relative continuity until the 1990s, with some interruptions that were expressed on the one hand through a series of hybridizations of the prevailing models by virtue of the advent of new materials and new production technologies (think of plastics, nylon and resins), on the other through slowdowns in the natural aesthetic-formal evolution of the consolidated types [Bearzotti 1981; Scarzella 1982]. Starting from the early Nineties, therefore, the resumption of production, driven by the implementation of the new hot forging technique instead of die casting, if on the one hand it initiates a new process of research on the aesthetic-formal level, on the other it highlights a certain mannerism in experiences which, albeit cultured and important (think of the handles by Vico Magistretti in 1992, by Angelo Mangiarotti in 1993 and by Paolo Portoghesi in 1997) are limited to reworking or revisiting the historicized models [Casciani 2010]. A few years later the new finishing technologies,



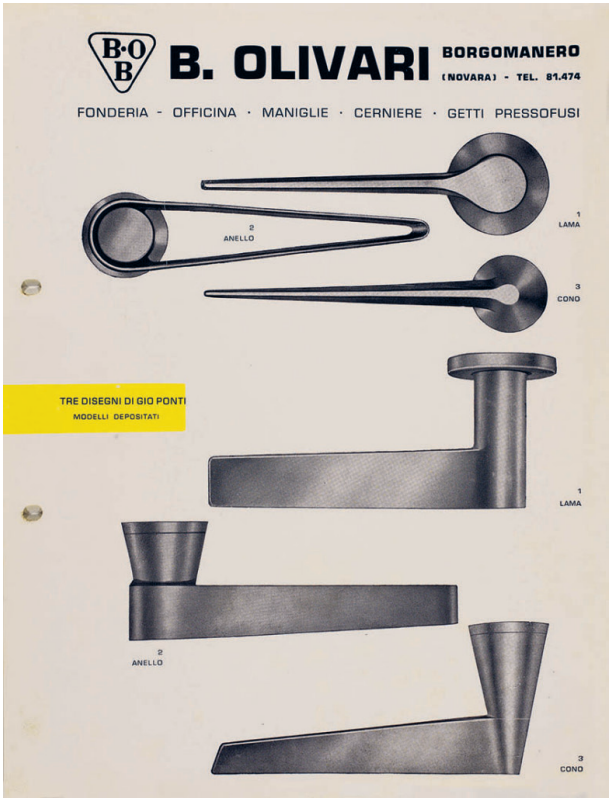


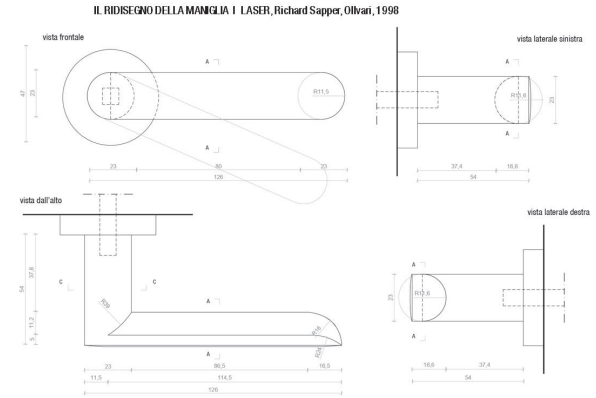
Fig. 2. M. Bill, Ulm handle in the original drawing, 1954 (source: www.griffwerk.de).

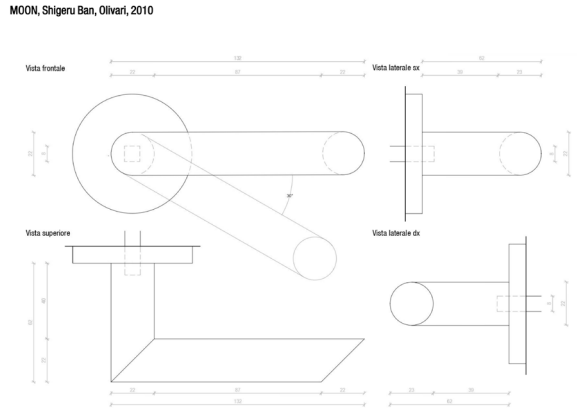
Fig. 3. G. Ponti, handle Lama, Anello e Cono handles in Olivari's original catalogue, 1956 (source: www.arredativo.it).

Fig. 4. E. Mari, Stilo handle, Olivari, 2003 (source: www.olivari.it).

Fig. 5. Hybrid form: Richard Sapper, Laser handle, Olivari, 1998 (graphic elaboration by the authors).

Fig. 6. Elementary compositional actions: Shigeru Ban, Maniglia Moon, Olivari, 2010 (graphic elaboration by the authors).



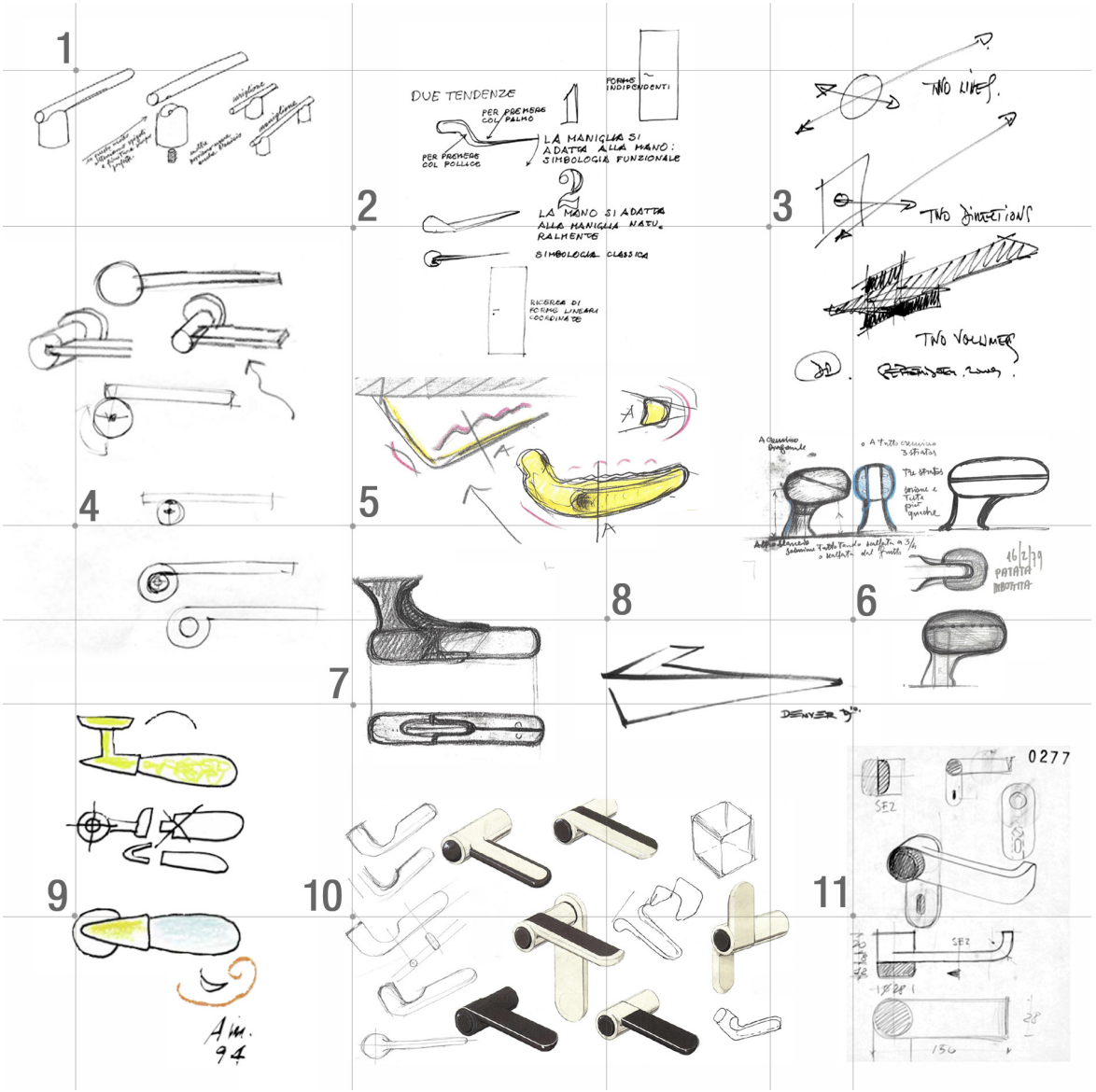


which allow greater control of knots, joints and edges (in general of all points of morphological discontinuity), open the way to greater compositional freedom by stimulating the updating of archetypal models in the direction of a renewed ethics of forms, now conceived mainly in terms of sustainability, proportional balance, dialogue with functional and productive needs, as expressed by the Stilo handles (2003) by Enzo Mari (fig. 4), Space and Time (2004-2006) by Alessandro Mendini and by the handles of Piero Lissoni, James Irvine and Shigeru Ban.
Finally, as regards contemporary production, one cannot fail to note how the trend of the latest experiments is greatly affected on the one hand by a technical research almost totally centered on the external envelope often without any dialogue with a morphological-formal dimension, on the other a new aesthetic resulting from an increasingly less tectonic control of morphology and increasingly entrusted to 3D CAD/CAM representation tools.

The design of the arthouse handle: formal categories and taxonomies

The apparent simplicity of the handle, also betrayed by its small size, actually conceals a complexity that, as we have seen, goes beyond the peremptory dichotomous antitheses between form and function, object and tool, mechanism and furnishing element, constructive detail of architecture and minimal design object and therefore, moving within the processual triad 'design-project-production', can be analyzed through a series of parameters that are, in fact, of an exquisitely compositional-formal nature [Meccacci 2012]. By eliminating the meaning of the handle as a small sculpture or jewel to be contemplated and trying not to trace the reasons for its aesthetic-formal characterizations to merely ergonomic aspects or to specious symbolic meanings, it is possible to identify a series of categories within which to frame the different experiences of the design project of arthouse handles in order to bring them back to their most intimate nature, that is that of artefacts expression on the one hand of a synthesis between a triple condition of mechanism, morphology and tool, on the other of a balance between technical, artistic and social dimensions, in the context of a constant condition of seismographs of the evolution of our material culture [Vitta 1996].

Fig. 7. The "authorial gesture" in handle study drawings: 1. E. Mari, Stilo, 2003; 2. G. Ponti, Cono, 1954; 3. D. Perrault, Living, 2010; 4. M. De Lucchi, Tool, 2011; 5. A. Mangiarotti, Como, 1947; 6. L. Cacciadominioni, Montecarlo, 1975; 7. Cacciadominioni, Saint Roman, 1975; 8. D. Libeskind, Denver, 2009; 9. A. Mendini, Aurora, 1994; 10. Van Onck Etakeda, Tokyo, 1980; 11. J. Colombo, Paracolpi Beta, 1971 (composition by the authors).



The handles always consist of three elements: the lever, the neck and the rosette. The lever (on average between 12 and 13 cm long) is the part parallel to the door plane designed to receive the grip and the subsequent pressure of the hand; the neck (about 4-5 cm long), perpendicular to the door plane, connects the latter to the lever and contains inside a pin which activates the opening / closing mechanism; the rosette (about 5 cm wide), coplanar with the door surface, is the element which hides the connection between the neck and the door itself, hiding the movement mechanism.
The design of the handle, while showing a constant tendency to remain within one of the two macro-categories of organic shape and geometric shape (which we intend to consider here in terms of "language" to avoid anachronistic readings and reductive categorizations), is expressed through the interpretation of the morphological-formal and material relationships between these three elements, producing a series of possible configurations, which can be organized into formal categories or "themes" of design reflection, as reported, without pretense of exhaustivity or completeness, in the table which follows (table 1):

Organic language	**Geometric language**
Morphologycal dimension	
Unic shape-unified shape	Shape made of recognizable parts tending to unity for mounting or combination
	Shape made of parts obtained through de-construction, separation or analytical de-composition from a unity conceptually recognizable
Fluid shape	Shape by combination of volumes
	Shape by composition of lines and planes
Dynamic shape	Static shape
	Shape obtained from the reduction of components
Plastic shape	Simple shape
Ergonomic shape-which adapt to hand	Essential shape
Naturalistic shape	Abstract shape
Technological and productive dimension	
Shape expression of mechanism and functionality	Shape by configurations of nodes and joints between elements
	Tectonic shape
Shape expression of artisanal constructive and/or productive principles	Shape expression on industrial constructive and/or productive principles
	Shape by a dialogue between materials
	Shape by the use of new materials
External dimension	
Shape by the relationship between structure and ornament/decoration	Shape by the relationship between structure and envelope
Semiotic dimension	
Shape apparently heavy	Shape apparently light
Shape as a result of re-interpretation of traditional and/or historical models (re-design)	Innovative shape expression of the potentialities of the new information and digital technologies
Shape bearer of diachronic signs	Shape bearer of sinchronic signs

Tab. 1. Themes and formal categories of the arthouse handles (elaboration by the authors).

The taxonomy set out above offers a non-exhaustive picture of the design themes and the aesthetic-figurative outcomes of the design of the handles analyzed, but in no case does it intend to close them in rigid compartments that could appear reductive with respect to the complexity of the reflections on the basis of their conception: in reality, what happens is that the models analyzed present with respect to the aforementioned categories different conditions of hybridization both in morpho-typological and aesthetic-formal terms, which places them in most cases between different categories, even apparently antithetical to each other (fig. 5). On the other hand, it may be interesting to associate this taxonomy with the system of possible compositional actions which, understood as methods of controlling the form or as strategies for achieving an aesthetic purpose (fig. 6), acquire a narrative potential with respect to the understanding of logics and reasons. at the base of the project definition processes (table 2).

Actions referred to one component element	**Actions referred to two or more component elements**
Compress	Match
Extrude	Connect
Tilt	Joint
Fold	Modulate
Rotate	Mount
Overlap	Shield
Cut	Overlap
Twist	Combine
Shift	Separate

Tab. 2. Taxonomy of compositional actions of the arthouse handles (elaboration by the authors).

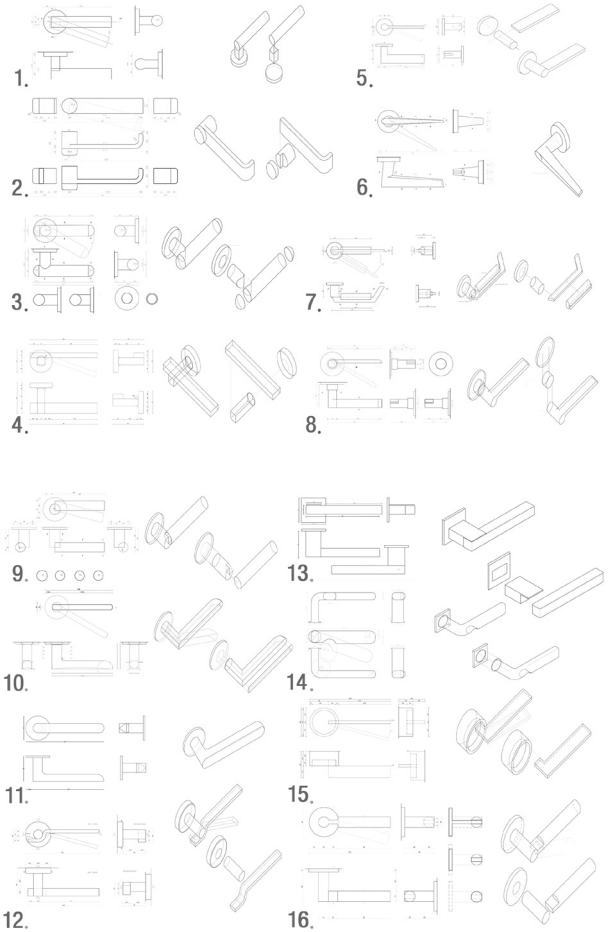
The handle in authorial drawing: expressive research and necessity of representation

"Between hand and tool, a friendship begins that will have no end. The one communicates its living warmth to the other and continuously moulds it. When it is new, the tool is not made, an agreement must be established between it and the fingers that grip it, formed of progressive appropriation, of light and coordinated gestures, of reciprocal habits and also of a certain wear and tear. Then the inert tool becomes a living thing" [Focillon 2002, p. 113]. This is how Henri Focillon in his essay In Praise of the Hand at the end of Life of Forms outlines the intimate

relationship of mutual influence between man and matter and how this relationship determines the shape of the tool and, in particular, the handle. This description seems to frame one of the themes addressed by the present research, which recognises in the drawing the privileged place where this relationship is manifested from the earliest ideational stages of the object. Through the sketch, a sort of 'textualisation' of the ideational language [Bistagnino 2009, p. 78] that has an important conformative role, the general lines of the project are traced, implicitly foreshadowing the final outcome. The ideational drawing, receptive to the many data and solicitations including the executive purposes, directly relates the mind and the hand, thought and its formalisation; a freehand sketch, still largely realised by means of traditional tools and supports, which, combining linguistic-representational codes with free individual expressiveness, represents and conforms the project, enucleating its spirit [Bistagnino 2009, pp. 80-82]. The study drawings of famous handles can be defined as 'gestural' sketches, graphic representations with strokes that are never instinctive, icàstic, describing the artefact in essential strokes and in a dry manner, without nuances.
"The operation of depicting from the tracing of an outline automatically results in a simplification, a reduction to the essential" [Anceschi 1992, p. 28]. The function of such representations was defined by Anceschi himself as 'descriptive': details become less important while the emphasis is placed on the morphological aspects of the event/object [Anceschi 1992, p. 28]. In these drawings, the absence of nuances, the 'reduction of contour lines to the essential', manifest a drawing that Roberto de Rubertis calls iconic [De Rubertis 1994, p. 15] which he contrasts with 'symbolic' drawing and which for Anceschi is constructive drawing with a fundamentally operative function [Anceschi 1992, pp. 28-37].
Gesture, gripping or pressure, profoundly linked to the handle object is celebrated in the drawing defined by the outline of the shape of the lever subjected to the stress of the hand, by the lines of force exerted on the object as vectors placed in space that connect its elements, or by the profile, now in the front view, now from above, that favours the reading of possible geometries of the material, lines, closed curves and shapes that can be traced back to those codified by mathematics.
Distinctive characteristics of the handle study drawings are a "reduction to the essence and a gradual approximation to the substance" [Anceschi 1992, p. 23], which differ ac-

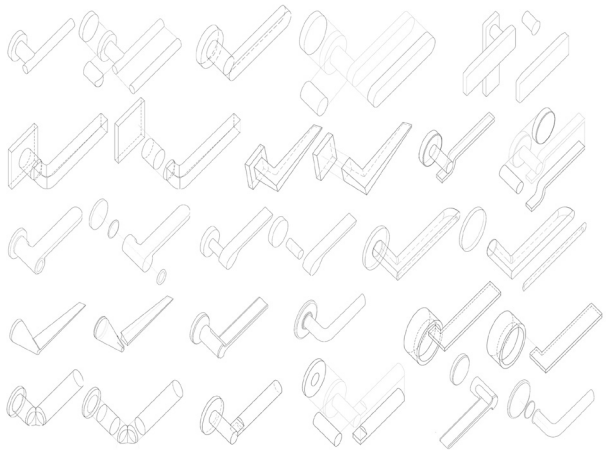
Fig. 8. Survey and graphical representation of Author handles (some examples) Device_Parallel Projections: 1. H. Kolhoff, Gottardo, 2004; 2. J. Colombo, Paracolpi Beta, 1971; GPA Monti, Boma, 1972; 4. A. Mendini, Space, 2004; 5. M. De Lucchi, Tool, 2011; 6. D. Libeskind, Nina, 2012; 7. A. Castiglioni, C-1918, 2002; 8: W. Wagenfelf, W028, 1928 (graphic elaboration by the authors).

Fig. 9. Survey and graphical representation of Author handles (some examples) Device_Parallel Projections: 9. O. Fioravanti, Boole, 2018; 10. P. Urquiola, Lucy, 2012; 11. V. van Duysen, Icona, 2018; 12. C. Boeri, Viceversa, 2015; 13. D. Perrault, Ice Cube, 2010; 14. D. Rams, DRD99, 1986; 15. M. Pisati, DND, 2022; 16. J. Pallasma, JPL16, 1991 (graphic elaboration by the authors).



cording to the expressive tension implemented by each designer, the degree of depth of the ideational process, the level of refinement of the themes addressed and the multiple representation devices used by the authors. There is little technical or construction data in these drawings, rather annotations, numbers, references to other drawings, to other objects (fig. 7).
Among the study drawings with a greater degree of detail and more advanced structural awareness are the 'visualisation drawings' [1], three-dimensional graphic models executed by hand, at the stroke, to which colour and chiaroscuro are applied, inform about the plastic component of the artefact and locate it in a more realistic expressive dimension. Sketches, conceptual and study models to life, simulations: the handle is represented and 'handled to life. Dimensional, formal, technological and constructive data are subject to direct manipulation [Bistagnino 2021, p. 30]; and this is even more true when the artefact is as small as the handle. In drawing, or what has been called the figured object [Cocchiarella 2009, p. 64], which sees the handle isolated and, in a certain way and as a result of its isolation, emphasised in form and meaning, the "management to the truth (or almost) of the design contents –formal and constructive– then determines an unexpected perceptive out-of-scale, an interesting cognitive short-circuit between the imaginary datum, accessible, precisely, in the representation, and the real datum, which in addition to renewing the modalities of fruition of the represented data, also significantly affects the technical-configurative procedures" [Bistagnino 2021, pp. 30, 31].
The design material, as a flow of data (not only material, but immaterial such as ideas, tastes, perceptions, ethical values, identities and stereotypes) is organised by the drawing, "a medium of reference in the passage, direct or reverse, between the represented form and the realised form of the object" [Cocchiarella 2009, p. 64]. Through drawing, (heterogeneous) data are selected, reordered, processed and made accessible in order to construct a language capable of dialoguing with all the actors in the process of design, construction and realisation of the work.
A language, that of design drawing, which performs, in Anceschi's words, three operations. Firstly, "it *represents*, that is, it realises an evocation, or rather, it performs the work of making visible with lines, spots, strokes what the text could make visible to the mind's eye" [Anceschi 1992, p. 171]. Secondly, it "*interprets*, in the sense that it not only simply translates into images, but […] reduces, eliminates, omits and simultaneously goes beyond the text, constructs an expansion of descriptions" [Anceschi 1992, p. 171]. Thirdly, it 'decorates', bringing out its own artefactual character. The evocative capacity of the study sketches at the hands of the many authors encountered in the research, still makes them the most complete, exhaustive and effective means of expression. And this lies above all in the aptitude of the drawing to proceed by "successive layers, which in an alternation of overall redefinition of the form on the sheet, advancing by unbalancing and balancing in an unstable equilibrium, working simultaneously over the entire field of representation, develop and define the forms of the project. Its form oscillates between recognisable iconic elements and gestures, signs, more abstract ones derived from the writing materials and the support" [Bistagnino 2021, p. 180].

Fig. 10. Survey and graphical representation of Author handles (some examples) Device_Parallel Projections _The axonometry (graphic elabotation by the authors).

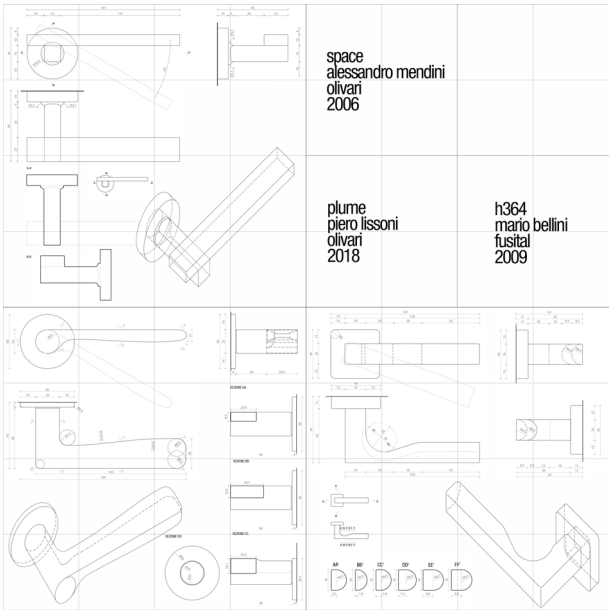


From drawing to object.
Devices of representation for the analysis of form

With a view to constructing an articulated system of knowledge to integrate the existing (and often lacking) iconographic material on the author's handles, the present study attributes to the drawing of the artefact the method

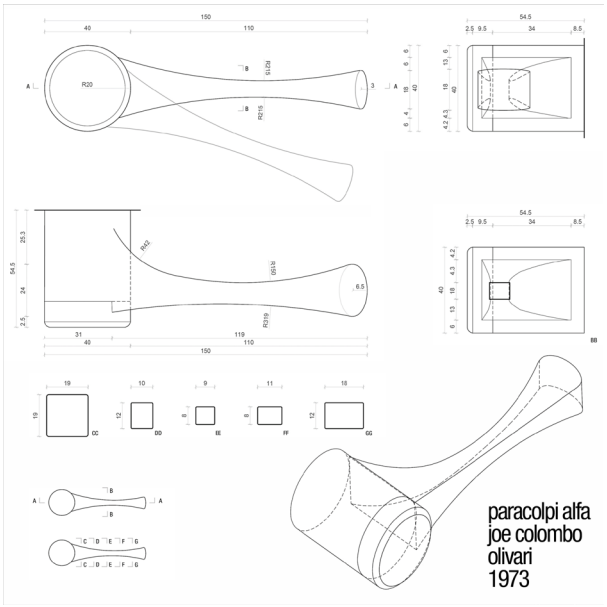
of analysing and reading the form, and to the parallel projections the descriptive space most suitable for telling them in order to organise a possible evolutionary history that better interprets the morphological, compositional and constructive characteristics together with the author's poetics.
Drawing and representing an artefact in its physical and material consistency, in its configuration as an autonomous object [Cocchiarella 2009, p. 151], together with its components, its body and its kinematics [2], is an activity no longer entrusted exclusively to the designer. Indeed, Joe Colombo predicted: "The designer will therefore no longer draw with pencil alone, but will create with the collaboration of technicians, scientists, professors and doctors and, in the fairly near future, with an electronic brain" [3]. The role of those in charge of representing the object, a system of objects or a phenomenon in general, turns out to be active, stretched in a continuous state of translation (graphic) of theories, norms, needs, facts, information and desires. It is therefore the images, in their flow of material and immaterial data, referring to objects but also to the space of living, be it real or virtual, that generate new knowledge and new desires.
It is the *imago artificialis* [4] that unveils the object, that makes its figurative form visible through a constructed image consisting of "one or more drawings, possibly supplemented by numerical, textual, photographic and material annotations and aimed at the knowledge –analysis– or prefiguration –design– of certain objects, themes, contexts" [Cocchiarella 2009, p. 197].
The analysis of the existing iconographic material allows us to visualise the handle as a product of material culture, endowed with its own design autonomy. Studying the handle not only in its materiality and functionality, as a tool or a simple machine, but as a cultural object [Pinotti, Somaini 2016, p. 38], allows a broader view on the topic addressed in order to reconstruct the whole fabric of intentions and desires that surrounds each produced image, the concrete situation in which it arose, the meanings and values, the identities and stereotypes that have been recognised in it by those who produced it and those who use it on a daily basis. The iconographic material concerning these particular objects, images that allow them to be visualised in the cultural and environmental context to which they belong, use different media and devices, sensitive to the tools and techniques of drawing production, in the gradual transition from analogue to digital. They are patent drawings, construction drawings, project drawings, dimensioned drawings. Rendering or study models in a digital environment, immersive drawings [Bistagnino 2018, p. 102]. Eidostypes and survey drawings, orthophotoplans [5] and high visual content images. Although they do not fall into the category of 'structured drawings', there are also photographs of the environment and details of the handle, photographs of prototypes and physical models produced during the conception and realisation process [6].
It is important to emphasise that in the design process, it may occur that some drawings are either placed side by side with, or completely replace, the prototype through experiences on plastic models. For example, the 'construction drawings', to which Anceschi recognises a fundamentally operative function [7], take on the role of controlling the proportions and relationships between the constituent elements. In illustrating the design methodology related to the realisation of the Gavina armchair, Achille and Pier Giacomo Castiglioni state that "a prototype was directly arrived at without drawing up any construction

Fig. 11. Survey and graphical representation of Author handles (some examples) Contemporary content (graphic elabotation by the authors).



drawings […]. For it is impossible to invent these forms by drawing countless projections on the three orthogonal planes and at the same time verify the resulting volume in relation to function as well as its infinite perspective views" [Scodeller 2018, p. 168]. In the transition from the analogue space of representation to the digital environment and through applications dedicated to the virtual construction of the artefact, this difficulty is overcome, with processes of automatic, real-time visualisation with large degrees of freedom of the existing or prefigured object.
Present in a fragmentary and never exhaustive manner in manufacturers catalogues, or in the archives of individual designers or, again, reproduced in specialist magazines and publications, the images of handles are presented in the form of structured drawings, the device of which, understood here as a "machine for seeing" [Deleuze 1980, p. 23] (and speak, reflect), identifies parallel projections as the method that best responds to the representative requirements of the object of study (figs. 8, 9).

Fig. 12. Survey and graphical representation of Author handles (some examples) Minimum analysis unit (graphic elabotazion by the authors).



In parallel projections, projective methods codified by Descriptive Geometry, orthogonal and axonometric projections, the observer, in the dual role of narrator and spectator, assumes a particular position with respect to the object of representation. In projective terms, he is placed at an infinite distance that allows access to a "vision of the world from an angelically pure or transcendental position, characterised by an a-prospective and supposedly objective perception of sensible reality" [Docci 2003, p.13].
Generally speaking, it can be stated that in "product design, articulated in many applicative realities dependent on different degrees of structural and functional complexity, there is a predilection for representative methods and models that, in addition to specifying the technical, functional and cultural specificities of this particular field of design, further reflect its conceptual and methodological originality, distinguishing it from other design fields and above all from architecture" [Bistagnino 2021, p. 42]. The graphic drawings in parallel projection show, in the technical-operational space of the design project, the peculiar character and fundamental requirement of the drawing of the artefact: exhaustiveness, precision, univocal interpretation. The final result of a profound process of comprehension, the drawing in orthogonal projection, in the frontal, top and side views, in the sections executed on a special element, or along the tracing that declares its geometric form, returns an ambivalent image of the object, suspended between the real and the virtual with a highly figurative symbolic code, capable of being read like a theorem or a mathematical formula [Pinotti, Somaini 2009, p. 58].
The language of orthogonal projection drawings is the one "that works among insiders. In the executive world of engineering design, for example, technical drawings have the prescriptive character of orders. And for those who give orders, it seems more important that they are unambiguous, rather than clear or even appealing" [Anceschi 1992, p. 70]. But it is axonometry, with its very ancient and privileged relationship with the industrial world [8], that occupies a pre-eminently technical role, functional to the primary objective of design precision (fig. 10). Like the machine, a paradigmatic object of the industrial world, consisting of mechanisms, hidden gears and automatisms.
The spatial representation, "*all-round*, makes it possible to simultaneously visualise the multiple formal, constructive and metric indications that, precisely through their co-presence in a single image, provide maximum clarity and exhaustiveness of information. The industrial object

is rationalised by the axonometric representation that conforms objective, exact plano-volumetric articulations marked by an absolute temporality, a sort of definitive 'immanence' of a fully developed and concluded idea". [Bistagnino 2021, p. 52].
The study of the iconographic material together with the visual and descriptive space that hosts it (Figs. 11, 12), introduces another aspect of the research work that defines the transition from drawing to the object in its plastic-formal reality: the graphic analysis of the artefacts. Oriented towards knowledge of the geometric peculiarities of the artefact, graphic analysis is, from a methodological point of view, a critical and operational tool that acts, through certain operations, on the object itself or its represented image.
The study of the handle relates, in this field and at this stage of research, to two fundamental analytical operations: discretizing and measuring [Rossi 2005, p. 30, 31]. In order to understand and measure an object, it is necessary to break down its physical compactness into a homogeneous system of parts, tracing it back to the collation of n components signalled by (abrupt or smooth) changes in form, transitional geometries that often correspond to changes in particular functions. Each component is then characterised by proportions that mutually connect widths, lengths and depths. The relationships between the parts establish a dynamic equilibrium capable of unfolding the reasons but also evoking the meanings of the design choices. The analysis data, through schematisations and simplifications, have the purpose of identifying the geometric matrices, the elementary volumes of the artefact and directing the drawing operations to form and structure the model built to life and in the cad environment [Rossi 2005, p. 41].
The operations underlying the formation of the model are those of solid modelling (extrusion, revolution, cutting, etc.), which describes the geometry of the object using entities such as surfaces, edges and vertices, or its topology through solid primitives among which a certain continuity can be recognised: the sphere, cylinder, prism, pyramid, cone, torus, among the smallest volumetric units that can be treated homogeneously from a mathematical and computer science perspective [Rossi 2005, p. 44-46]. The genealogy of the handle recognises the cylindrical metal bar as the elementary primitive volume. In order to transform the simple form generated by the rotation of a rectangle around its side, into complex configurations, and achieve the results expected in the product design project, Gui Bonsiepe "indicates four elementary geometric operations –translation, rotation, specular reflection, dilation– which, according to the quantity and type of their reciprocal combinations, generate linear (on one axis), flat (on two axes), spatial (on three axes) compositional articulations" [Bistagnino 2018, p. 81]. Therefore, the handle sees its complexification through operations that in the CAD environment can be described as solid and classified on the basis of the prevailing and recognised geometric characteristics.

Conclusions

From a methodological point of view, as we have seen, the study of the shape and the reading of geometric matrices is almost never an automatic operation or entrusted exclusively to the computer tool, which is delegated the task of solving the most complex issues, especially related to connection nodes, to the regions of contact, of interpenetration, of connection. It is an activity that develops through observation, the careful use of representation methods, especially moderate in a digital environment. It is precisely this processual integration which allows the analysis to be merged into an archive of drawings and models of which all the aspects that determine the design genesis of arthouse handles can be shown extensively: a map, a visual space which orders and frames the handles (re)presented through orthogonal and axonometric projections, with a representation methodology that follows the model of the table already used to define the compositional actions and develops following the narrative path in a fluid way, in order to favor and deepen the reading of the multiplicity and variety of shapes of these small design objects.

Notes

[1] See: Scodeller 2019, p. 162.

[2] On the level of morphological content, one can assume as the operative field of product design that centred on the trinomial body-components-kinematics: Cocchiarella 2009, p. 151.

[3] See: <http://www.gam-milano.com/it/mostre-ed-eventi/caro-joe-colombo/> (accessed August 8 2022).

[4] The figurative form is thus the "designed object" and manifests itself through the imago artificialis, that is, the "constructed image" that

reveals to us the "figurative object", the object that "stays" in design: Cocchiarella 2009, p. 64.

[5] The application of photogrammetry to small-scale artefacts is currently being tested.

[6] Regarding the types of drawing functional to the representation of design, see Gui Bonsiepe's listing in Bistagnino 2018, p. 84.

[7] Distances and geometry are important as the receiver of such messages must be enabled to construct or reconstruct the represented object. The receiver can, that is, act on the message, e.g. take measurements: Anceschi 1992, p. 37.

[8] This refers to the method of axonometric representation, which has a very ancient history if considered as an image, i.e. as a way of intuitively depicting a given object, and a recent history if considered as a representation, or as a codified method.

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Narrated and Imagined Objects. Luca Meda and Drawing

Rosa Chiesa, Pierfrancesco Califano

Abstract

Through the analysis of Luca Meda's work, of which some sketches from his personal archive are presented, the contribution proposes a reflection on 'design drawing', focusing on the relationship between its two natures –one more technical and the other artistic– which in some cases interpenetrate harmoniously.
The duality that was attributed to the industrial designer –a figure in the making in the 1950s– and the burden of having to harmonise 'technical possibilities' with 'possibilities of form', finds in Meda a successful synthesis in the use of manual drawing, an indispensable and effective tool both for technical design and for the poetic contextualisation of the object, almost a trait d'union between a concrete world, the one pertaining to technological aspects, and an abstract sphere, in relation to the symbolic values of objects and the emotional universe of the designer.
Starting from Luca Meda's multiple training –and bearing in mind the impact that new technological tools have on current design activity– the contribution identifies 'design drawing' as a real working methodology, still considered a foundation for the designer's training. It is presented as relevant and inescapable precisely because of its ability to integrate two forms of knowledge, the technical and the artistic, often wrongly considered antagonistic.

Keywords: imagery, art, Ulm, technical objects, sketches.

Introduction

The contribution proposes to show how the 'design drawing' –conceived with Rosselli [1957, p. 1] as "a complete and unitary fact from its birth between technical possibilities and possibilities of form"– played different roles in the analytical, imaginative and communicative phases of Luca Meda's design activity: a tool at the service of the definition of the structural and technical details of the object, but also a fundamental device for conferring poeticity to objects.
Starting from the importance that the practice of drawing has had in Meda's activity and tracing its originality back to the education received by the designer, the authors, in their conclusions, aim to broaden the reflection in the horizon of a 'cultural refoundation' based on the integration of technical and artistic knowledge as the essential basis of every design discipline.

To do so, the authors rely first of all on direct knowledge of archive sources, mostly consisting of drawings as well as study models and other materials, as well as on the fundamental support provided by the critical reading of the recent volume *Luca Meda, Architecture, Design, Drawings* [Braghieri, Carboni, Maffioletti 2021]. The conclusions are instead based on the reflections proposed by Richard Sennett in his famous *L'uomo artigiano* [Sennet 2008].

Design and imagination

An indissoluble link exists between design and imagination [1]. Both terms refer to the 'sense of possibility', i.e. the human

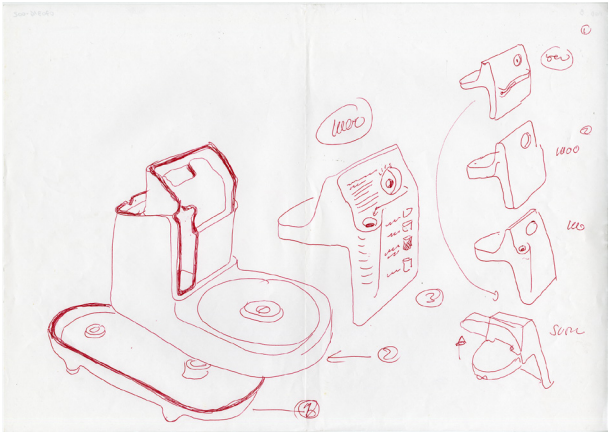

Fig. 1. Study sketch for a food processor with front controls, 1996.

faculty of figuring in factual reality a reality-other or, in the words of Paul Jedlowski, of "partially emancipating oneself from the constraints of the existing" [Jedlowski 2008, p. 238]. Michele Sinico [2016, p. 171] has accurately reflected on this connection: "imagination is precisely that throwing thought forward, into the projective, towards a future that does not yet exist as effected reality". In this dialectic, a decisive role is played by 'design drawing', which is recognised as having the task of acting as a mediation tool, a true operational-symbolic bridge, between factual reality and a reality that does not yet exist as such.
The 'design drawing' is usually recognised as having a bifid nature: on the one hand, technical drawing, relating to technological and production aspects; on the other, artistic drawing, relating to the symbolic values of objects and the emotional universe of the designer. This makes explicit a peculiar characteristic of object design: it is not an autonomous activity, it is therefore not the fruit of the 'free play' of the imagination, but is a heteronomous activity, limited by technical, economic, cultural and political factors. In short, the design imagination can be defined as the human faculty produced by the dialogue between technical imagination and sociological imagination [2]. For this reason, the 'sense of possibility' that characterises design activity, when it does not turn into idle reverie or abstract utopianism, can be described in Musil's words [2014, p. 14]: it is "an impetus, a will to build, a conscious utopianism that is not dismayed by reality but treats it as a task and an invention".

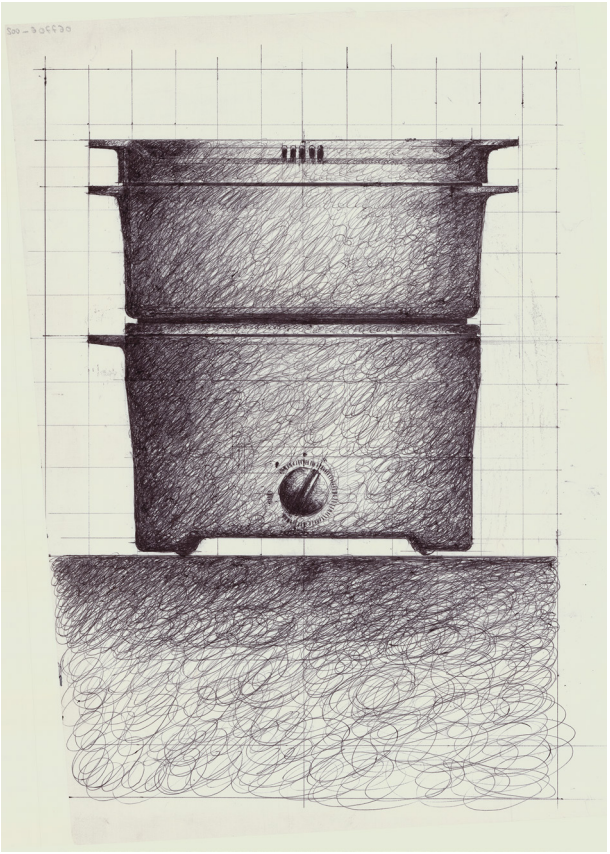

Fig. 2. Study sketch for a rice cooker, 1991.

The task of harmonising 'technical possibilities' with 'possibilities of form' finds in Luca Meda a fertile example that suggests how 'design drawing' can play the role of a mediating tool and at the same time points out how pedagogical imprinting influences the genesis or development of innate capacities.
Luca Meda's design work is essentially based on the tool of manual drawing, which assumes different functions, passing from a device for immediately fixing and translating the idea to a tool for personal investigation and conceptual elaboration, to a more traditional and useful means of technical representation capable of dialogue with other

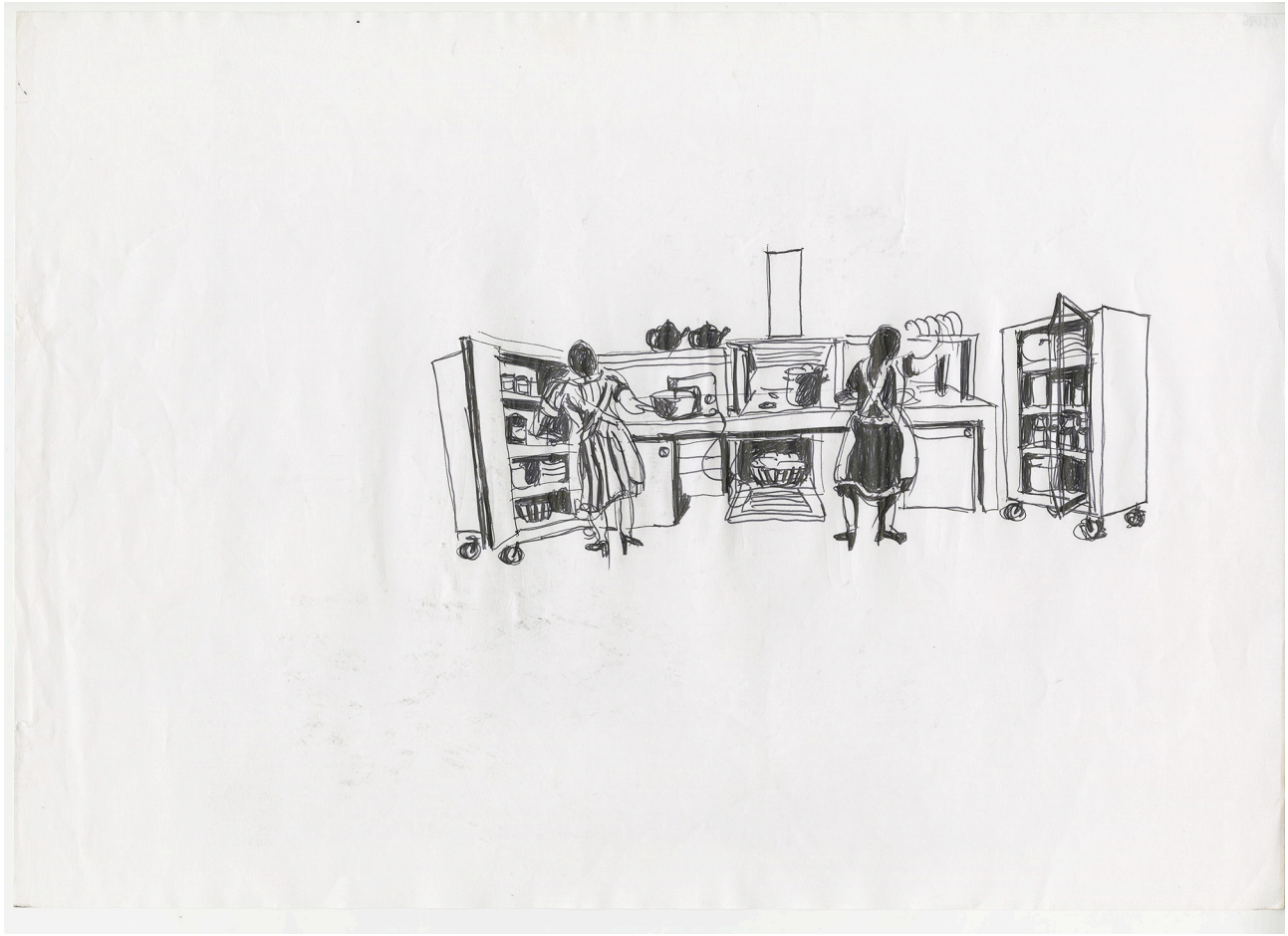

Fig. 3. Cucina Banco, 1995, drawings for the catalog.

interlocutors. Fundamental in substantiating the unprecedented three-dimensional prefigurative capacity of the internal (technological) part of certain objects, as well as essential in giving shape to the aesthetic framework and reference imagery in which Meda's objects are born and live, drawing, as a measured interpenetration of technical and formal aspects, allows us to define a true working methodology, which finds its genealogical reason in the biographical events of the author and in his multiple training, nourished by the Milanese artistic environment as well as by the brief but formative German experience in Ulm.
In Meda, the 'sense of possibility' thus finds a happy synthesis in the use of manual drawing, an indispensable and effective tool both for technical design and for the poetic contextualisation of the object, a true *trait d'union* between factual reality and possible reality.

Design and drawing

In Luca Meda's design work, drawing whether used as a device for personal investigation or in dialogue with other interlocutors, takes on a dual form, both the artistic form that contextualises/decontextualises objects within the symbolic universe, the world of affections beyond their mere use, and the technical form that privileges the form of the axonometric exploded view and axonometry to verify the feasibility and rightness of the form-content relationship.
In this regard, the drawing of the *Cuociriso* is also emblematic of how the use of the same technique (recurring in Meda) –the Bic biros on paper– lends itself to representing different languages: from the millimetric precision of the stroke for defining the components of the mechanical object (fig. 1) to a strongly expressive description that animates the object, giving it plasticity (fig. 2).
Considering Meda's assertion –"one cannot speak of industrial objects as if they belonged to the empyrean of abstract things, outside the contradictions of the economy, outside people's opinions" [Mantica 2021, p. 263]– it is natural to detect in the objects designed by Luca Meda a propensity to propose themselves as archetypes, in their evocative capacity of familiar memories imbued with domesticity (fig. 3), and in their being immersed in a sort of 'synchronicity' that from the author's subjective bearing touches the notes of a collective imagination, abstracting its essence in a fluid continuity between past and future.
Meda's 'things' [3] are thus, from time to time, transfigured through drawing, which often resorts to the expedient of the ready-made, decontextualising and recontextualising the object that becomes the undisputed protagonist of a world that oscillates between the real and the imaginary, as if it were the fruit of a dreamlike transcription (fig. 4). It is the imagination that transforms the dimensions (never deformed) of the depicted object, which, often set in natural landscapes, takes on new meanings, becoming a sort of other than itself.
It happens with technical objects –even the most rigorous– that the drawing constructs the scene used almost as an expedient to make them appear more 'human', mitigating their technicalities. Significant in this sense are the drawings of *Caffèconcerto* (fig. 5) –one of the most industrial products among those conceived by Meda [Chiesa 2005]– whose lines are softened by the organicity of the essential signs that trace an unequivocal foreshortening of a sea coastline –a recurring theme that intertwines the search for a real place with one he idealised– or various Girmi appliances (fig. 6) immersed in unreal scenarios.
In the furnishings, while not renouncing the description of mechanical details, the introduction of human figures [4] signals the 'reality test' of the design object: for example in the *Ho Chair* (fig. 6, 7) where the roundness of the female figure portrayed from behind counterpoints the hardness of the 'studs' and allows a verification of the aesthetic enjoyment of the real object, simulating the moment of its use. Through the drawing of the bodies, a 'visual synecdoche' is thus composed: in some representations of the *Vivette* armchair, the idea of comfort is conveyed not by the object itself but by the relaxed body (fig. 8), just as the female figures that populate the Girmi world (fig. 9) represent the theatre of domestic preparation, of tradition reinterpreted in a horizon made up of technological aids.
The drawing used as a device to fix and immediately translate an idea therefore uses two narrative registers, the artistic one (which includes real or imaginary figures, human or animal) where the body [5] (in its precise and proportioned definition) acts as a link bridging the gap between space and furniture, and bringing art and design closer together [6] (fig. 10) and the more technical one, the legacy of training [7] as well as the result of a talent for three-dimensional representation of objects. If in the representation of the world of furniture, the body participates more explicitly, even in the descriptions that appear purely technical, the same attention emerges, especially in the design of household appliances where the interaction component through the interface is a fundamental tool for communicating with the user and facilitating the use of devices [Chesa 2021].
Used for investigation and personal conceptual elaboration and as a traditional means of technical representation, drawing in Meda transfers in other cases the reasoning on the object, its functionality, its components, the relationships between form and content.
The accuracy of the detail depicted (fig. 11) (whether of furniture joints or mechanical parts) (fig. 12) restores control over the entire project, and the refinement in the combination of materials or colours (or non-colours) speaks of a personal sensibility developed within the framework of cultured references (fig. 13).

The pedagogical issue

Starting from Meda's professional biography [8] and rereading his iconographic production in this light, we can therefore hypothesise that drawing played a multiple and

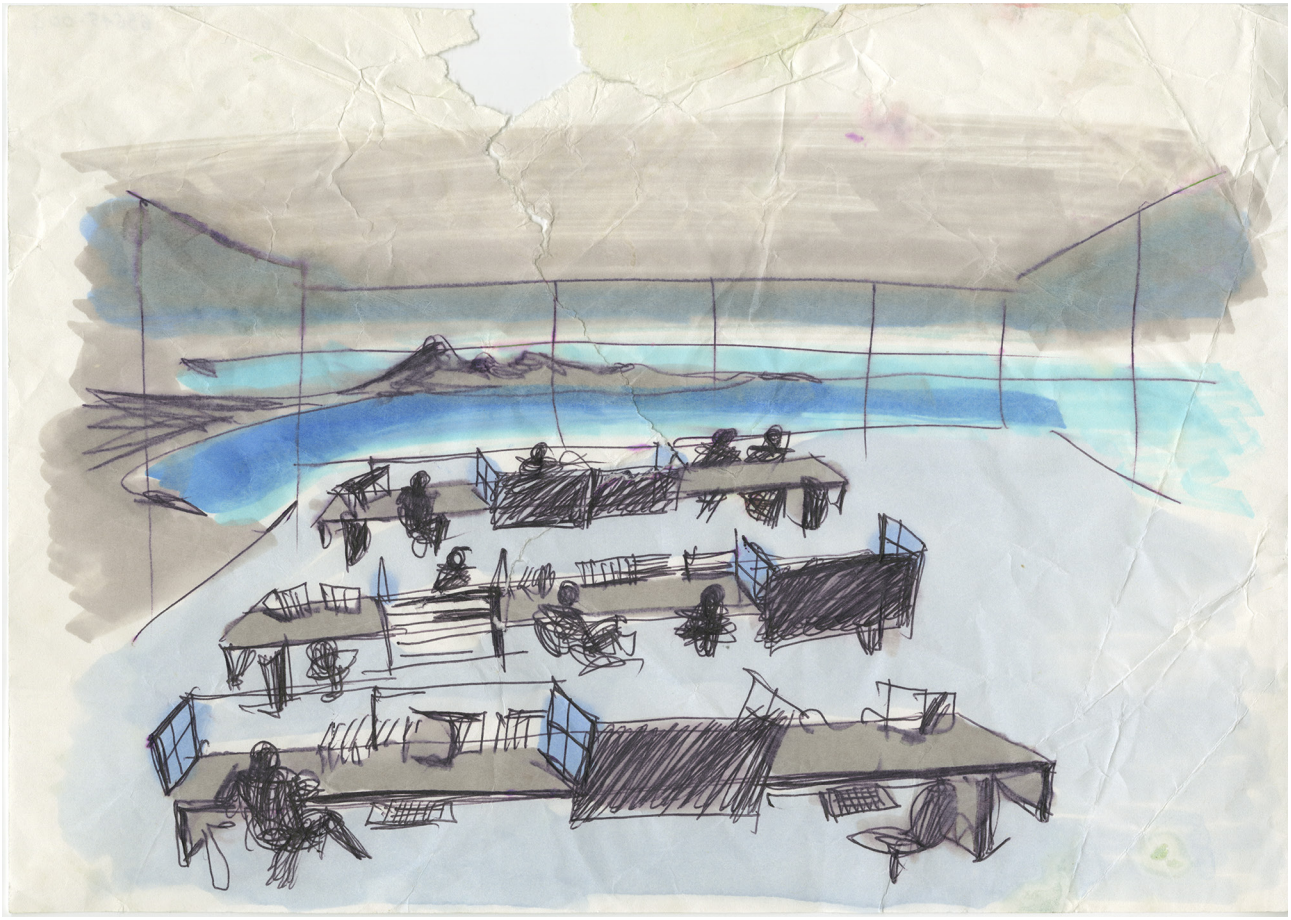

Fig. 4. Untitled, 1996, sketch.

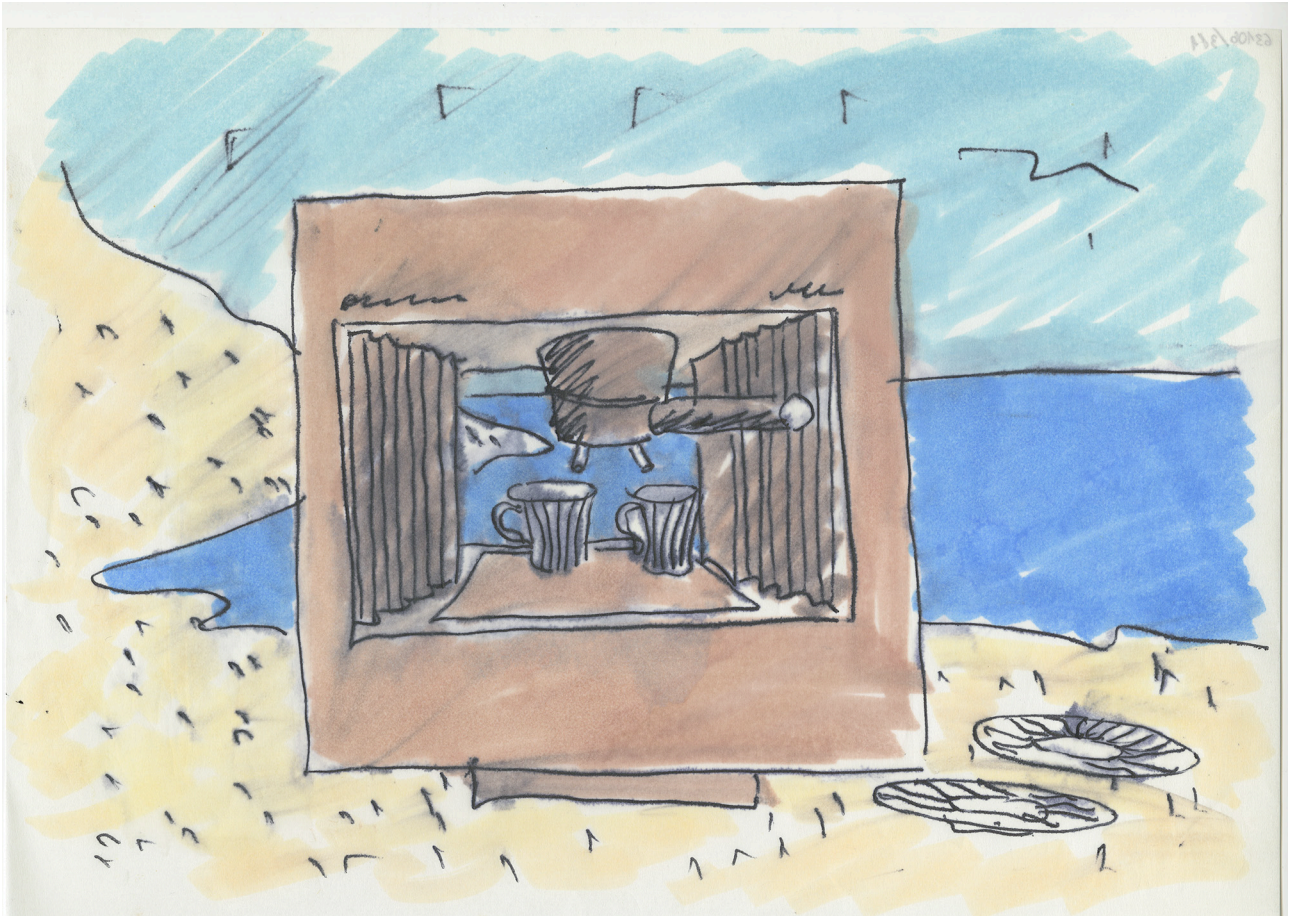

Fig. 5. Coffee machine, Caffèconcerto, 1983, study sketch.

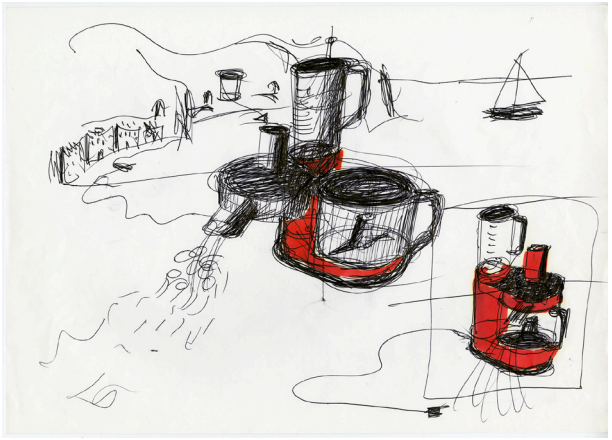

Fig. 6. Mastrogirmi kitchen robot, 1984-87, sketch.

integrated role for the author: a technical tool, always associated with a strong graphic rendering, but also a popular tool that used figurativeness learned from art, offering itself as a privileged instrument in both the conception and communication (in the broad sense) of the project (fig. 14).
As Nicola Braghieri points out, in order to fully understand Meda's ability to do this, it is necessary to refer to his training because "only by following the different and opposing experiences that marked his apprenticeship […] it is possible to grasp the nature of Luca Meda's character and spirit" [Braghieri, Carbone, Maffioletti 2021, p. 51]: "The two opposing experiences, at the Brera Academy and at the HfG in Ulm, although never completed with a diploma and punctuated by continual disobedience and disaffection, marked his way of working and his attitude towards the world: a continuous inner dialogue between the artistic impulse and interest in the mechanical secrets of form. If the Brera approach favoured a classical education, for which figurative art was the exclusive and absolute expression, the Ulm School directed its teaching and training programme towards an operational interaction of the applied arts […] with production technologies" [Braghieri, Carbone, Maffioletti 2021, pp. 44, 45].
If Meda's two educational experiences have found a fertile synthesis in 'design drawing', it seems fair to ask whether, despite the diversity of the two pedagogical approaches, common ground exists between them. If we were to follow the dominant vulgate, the Ulm School should be considered as the purest expression of rationalism in design, whose pedagogical approach categorically rejects all elements of spontaneism and intuitionism that characterise art education instead. This is a reductionist reconstruction. As is often the case in the history of such complex and significant pedagogical institutions, the history of the Ulm School is not a linear narrative. Many phases, many different educational approaches –supported by the freedom that charactercenturises private institutions– have contributed to the development of the subject curriculum that is still widely influential today.

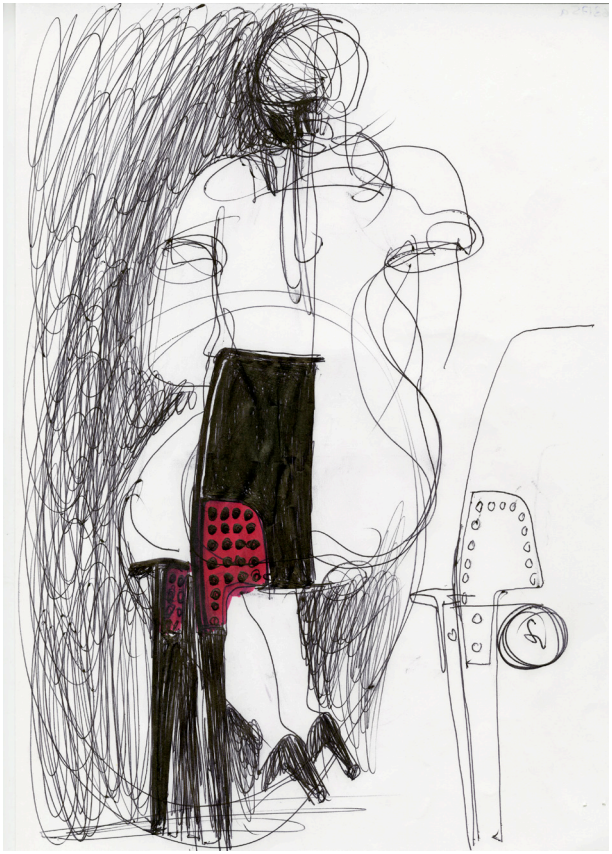

Fig. 7. Sedia Ho, 1998, study sketch.

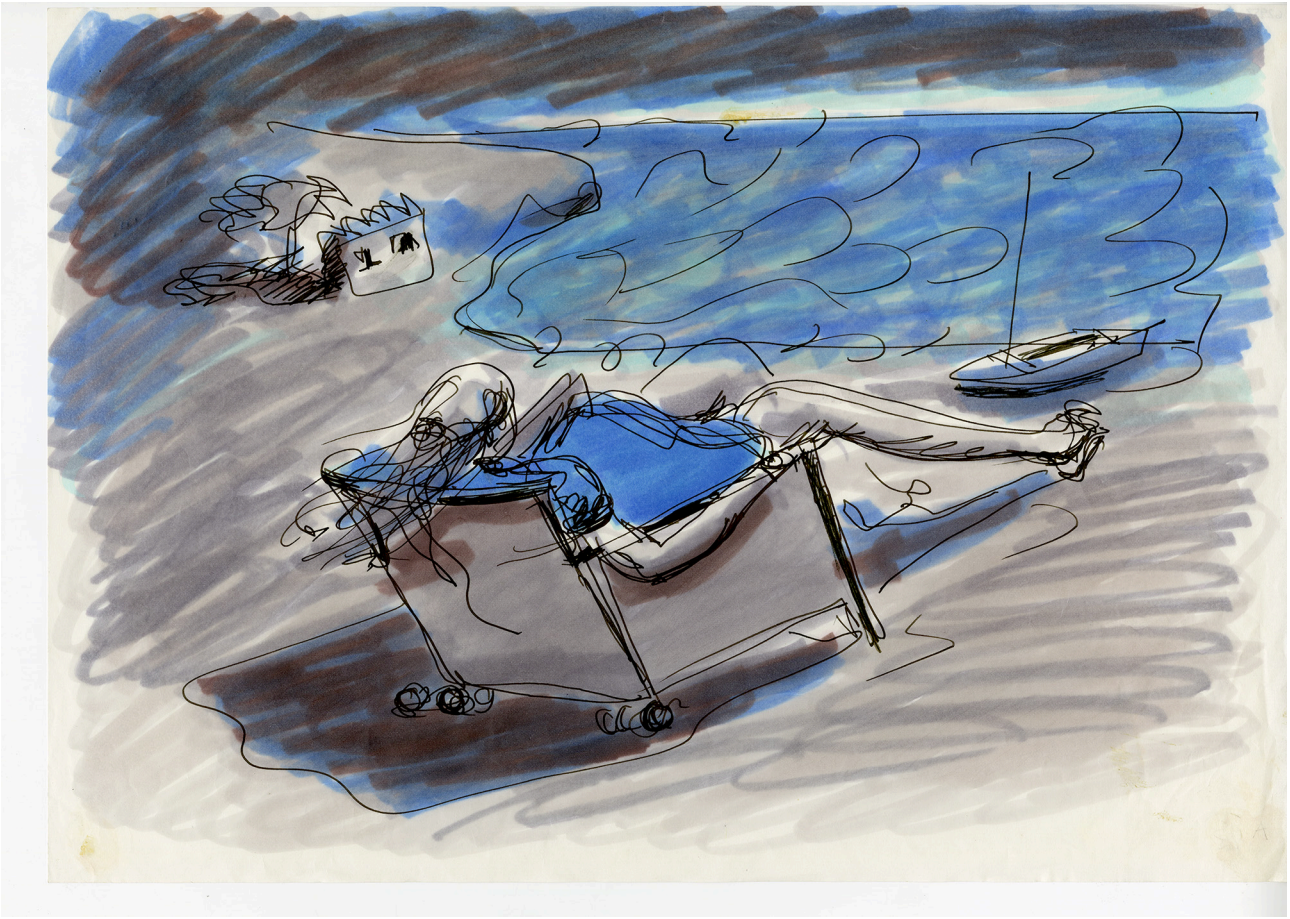

Fig. 8. Potona Vivette, 1988, sketch.

Fig. 9. Drawings for Girmi catalog, 1992.

It is certainly true that, especially through the work of Otl Aicher and Tomás Maldonado, with the Ulm School, design moved closer to the scientific disciplines and away from the realm of artistic knowledge. However, it would be a mistake not to recognise the role that art played in the formation of Ulm's designers. On closer inspection, an artistic residue remains in the *Grundlehre* (Fundamental Course), the first year of the course which –until 1961– all students had to attend before deciding on their specialisation.
The *Grundlehre* that Luca Meda attended in 1958 was a complex and layered course, which had already undergone the historic reform of Maldonado, the department head at the time. It was divided into four areas of work: *introduction to vision* (or visual introduction), *instruments of representation*, *laboratory*, *cultural integration* (History of 20th century culture, Methodology, Sociology, Mathematics, Physics, Chemistry, Theory of Science). If the laboratory hours, consisting of work in the workshops, are not taken into account, the *introduction to vision* alone occupied more than half of the lessons taught to the new students. This discipline was a development of the teaching of *basic design* proposed by Josef Albers. From Albers, it drew first and foremost its objective and didactic mode: students were given exercises on syntactic questions, which, once completed, were then subjected to collective criticism. The objective, made explicit on more than one occasion by Albers himself, remained that of training the relationship between hand and eye. The introduction to vision was thus to all intents and purposes an aesthetic education, a visual grammar, whose founding didactic principle was the need for exploration and formal experimentation. It is on this education in sensitivity and the relationship between the hand and the eye that we can recognise the common, but undoubtedly differentiated, ground between the two pedagogical experiences that formed Luca Meda and that allowed him to find in 'design drawing' a unique tool for explicating the different but dialoguing natures of objects.

Fig. 10. Untitled, s.d., sketch.

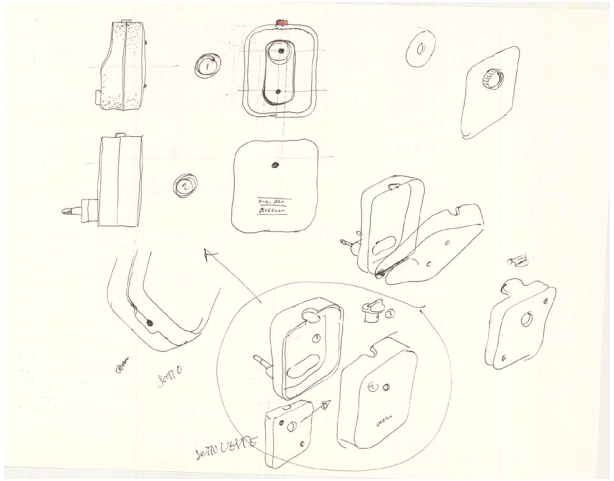

Fig. 11. Emergency light LC10, Lucetta, 1982, study sketch.

Conclusions

The felicitous visual restitution of certain projects and the ability to integrate two forms of knowledge, the technical and the artistic, often wrongly considered antagonistic, that characterises Luca Meda's design production invites reflection on the role of aesthetic education in contemporary design studies.
Luca Meda's entire design production can be considered as a repertoire of *objets à réaction poétique* [Empoli 2013], or as Meda defines it "reworking of customary forms" [Mantica 2021, p. 58], understood in a rather broad sense to embrace both traditional, everyday objects and those that belong to a collective imagination, the result of a leap of abstraction and synthetic restitution of an idea. The translation of this universe of objects through drawing is coeval with the contemporary way of designing, following an increasingly present (and not without problems) custom of designing directly in 3D, avoiding the passage of the two-dimensional description of the object. However, as has been attempted to demonstrate, Meda's ability to do this derives from a rigorous, even lacunar, aesthetic education. It is therefore legitimate to ask whether or not the elimination of an essential design phase –the two-dimensional description– unsupported by a precise aesthetic education is

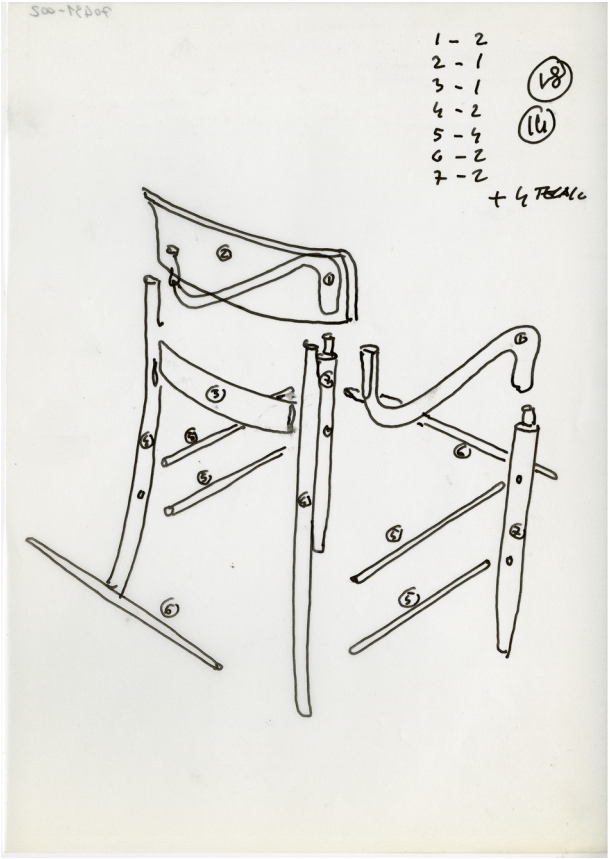

Fig. 12. Study for chair, s.d.

an achievement in the pedagogical approach of current educational models in the field of design. In other words, does the use of CAD (Computer Aided Design) systems from the earliest approaches to design disciplines bring an advantage or a disadvantage to the practice of designing objects?
Without a doubt, computer-aided design is an indispensable technique [9]. Without it, it would be impossible to design the objects of high structural complexity that populate contemporary society. According to Charles Lang, a pioneer of CAD systems, these would allow any object to be produced "more reliably and efficiently, with

Fig. 13. Tavolino Poggio, 1988, study sketch.

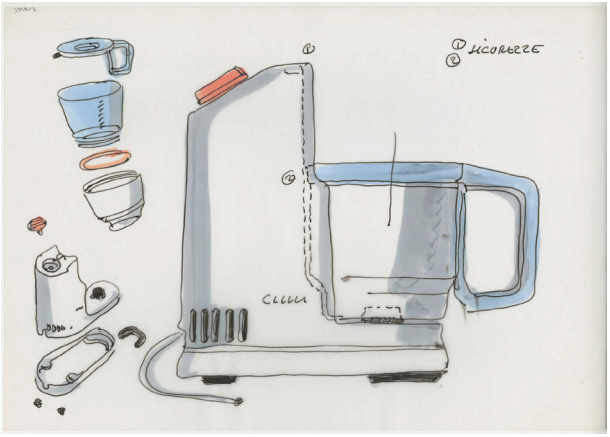

Fig. 14. Kitchen robot, 1996, study sketch.

less development time and greater functionality" [Marsh 2014, p. 39]. In addition, the most advanced software allows us to predict the behaviour of the individual components of objects and their degree of deterioration: this is why Marsh speaks of designers conquering a fourth dimension in addition to the three spatial dimensions, namely time.

Despite the great potential of CAD systems, in his famous *L'uomo artigiano*, Richard Sennett warns against their blind and fideistic use. Especially with regard to the education of the designer and the early stages of design, Sennett's concerns can be shared. The problem of using machines to design is referred to by Sennett as the 'closed system problem', which arises whenever we think of a practice as a means to a given end: "Intelligent machines offer the human being the possibility of decoupling intellectual understanding from repetitive, instruction-following, hand-held learning. This happens at the expense of human conceptual faculties" [Sennett 2008, p. 45].

By entrusting all phases of design to CAD systems, and thus renouncing the manual act of drawing, i.e. accepting a design practice divorced from corporeality, we lose the opportunity to access three peculiar characteristics of physical experience: the tactile, the relational and the incomplete. Corresponding to this threefold loss are three dangers of using CAD systems: the disconnection between simulation and reality, arising from the possibility that the simulation does not adhere perfectly to reality; the renunciation of relational intelligence, which stems from the great capacity of CAD systems to conceal or completely remove certain design difficulties; and overdetermination, i.e. the risk that an overly rigid determination of the various parts of a project does not allow for modification during the course of the project. These three dangers contribute to the risk of devolving the process of learning and refining the product from manual drawing to machines. Sennett summarises this by saying that "the abuses of CAD illustrate how, when the head and the hand become divorced, it is the head that suffers" [Sennett 2008, p. 50].

Meda's design experience and Sennett's reflection show that, even if we had perfect technological tools for designing, drawing – that is, the manual expression of an aesthetic education – would remain an indispensable tool for design pedagogy and for certain stages of design. Because if it is true that to design is to decide, it is also true that to decide is to be able to see, that is, to have a vision that is the fruit of design imagination. Drawing, in this sense, plays an indispensable mediating role.

Notes

[1] This link was investigated with acuity in Proverbio, Riccini 2016.

[2] On the relationship between technical and sociological imagination, cfr. Breton 2006, Grais 1992, Maldonado 2022, Wright Mills 1961.

[3] Reference is made here to the concept of 'things' expressed in Bodei 2009.

[4] Also worth mentioning is the use of imaginary figures such as the mad king or the 'balancing' woman. Cfr. iconography of Braghieri [Braghieri, Carbone, Maffioletti 2021, pp. 188, 189].

[5] See in particular Riccini 2015, Ciammaichella 2015.

[6] The term design is understood here in its functional sense.

[7] Reference is made here to Meda's schooling at the Ulm School but also to later collaborations with professional studios such as that of Marco Zanuso.

[8] See the biographical contribution by Nicola Braghieri [Braghieri, Carbone, Maffioletti 2021, p. 36].

[9] To learn more about the potential and use of CAD in the production of objects, cfr. Marsh [2014, pp. 37-43].

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The Shapes of Sound. Organic Geometries, Harmonic Ratios and Ethnic Design

Domenico Mediati

Abstract

The matrices that define natural shapes have organic conformations, characterized by softness and flexuosity. Such peculiarities derive from inherent functional needs and frequently manifest as polycentric curves.
The shapes of natural space have often been adopted by artists, decorators and architects over the centuries. However, there is one particular field in which man has intensively applied these organic conformations. Shapes derived from nature, from the study of harmonic ratios, and from the laws of sound propagation have been used in the production of musical instruments since ancient times. They are often the result of autochthonous traditions, closely linked to a folk culture. Materials, shapes, and colors characterize them as ethnic design objects, in which the sound function does not forgot decorum.
The paper aims to highlight the connection between organic geometry, proportional ratios and the conformation of musical instruments: emblematic examples of a folk design that spontaneously combines art and technique, innovation and tradition, listening and vision. It is a process of analysis that, through direct survey, structure-from-motion techniques, three-dimensional modeling, and the study of geometries, aims to document ethnic shapes and traditions: traces that, over the centuries, have triggered processes of innovation based on experimentation 'poor' in material but rich in creativity.

Keywords: organic geometries, proportional ratios, polycentric Curve, ethnic design, musical instruments.

Visual and sound harmonies

A widely accepted interpretation of Genesis chapter IV attributes the origins of music to two half-brothers, Jubal and Tubalcainus, sons of Lamech and descendants of Cain. The former is defined as "the father of all zither and flute players" [1], while Tubalcainus as "the father of those who work copper and iron" [2]. In essence, they represent a musician and a blacksmith, or the convergence of two vocations –one artistic and the other operative– that make possible the enchantment of musical art.
This intertwining was highlighted by Franchino Gaffurio (1451-1522), one of the most important theorists and musicians of the 15th century. At the beginning of his *Theorica musica*e, he wrote: "Josephus and the Holy Scriptures relate that Jubal of the tribe of Cain first produced refined music with the zither and organ" [3] [Gaffurio 1492 cited in Grandi 2011, p. 29]. In 1558 Gioseffo Zarlino (1517-1590) resumed this concept in his treatise *Institutioni harmoniche*: "*Percioché (come dicono Mosè, Gioseffo, et Beroso Caldeo) avanti che fusse il diluvio universale [la scienza della musica] fu al suono de' martelli trovata da Iubale della stirpe di Caino*" [Zarlino 1558]. Numerous illustrations described this event, helping to propagate a tradition that would be widely spread throughout the Middle Ages and early Renaissance (fig. 1).
The relationship between the vibrations of Tubalcainus' hammers and Jubal's musical ratios is found in the famous episode narrated by Giamblico of Chalcis (c. 250-c. 330), in a different form and with a different protagonist. In

the *Vita di Pitagora* he wrote: "while [Pythagoras] was passing in front of a blacksmith's workshop, by divine fate he heard hammers which, beating iron over the anvil, produced echoes in perfect harmonic agreement with each other, except for a single pair. In those sounds he recognized octave, fifth and fourth chords and noted that the interval between fourth and fifth was itself dissonant but nevertheless capable of filling the difference in pitch between the two. Rejoicing that with the help of a god his purpose had come to fruition, he entered the workshop and after many trials discovered that the difference in the pitch of the sounds depended on the mass of the hammers" [Giamblico 300] [4]. Pythagoras understood that with four hammers having masses in ratios of 6, 8, 9 and 12, the full range of harmonic ratios with their intervals could be reproduced.
Boethius (475-524) also narrated this episode in *De institutione musica* (c. 520). Here, he tells that Pythagoras later replaced the masses of the hammers with a monochord: an instrument in which the length of the single string was varied according to the harmonic ratios described above. Thus, lengths geometric, which were more easily measurable, replaced masses.
Beyond the actual authorship on the discovery of harmonic ratios, it is certain that Pythagoras dealt with the criteria used by the musical instrument makers of his time, focusing on the mathematical ratios behind the sounds. The relationship between Jubal and Pythagoras is obvious [5]. Both deduced the sound range and numerical ratio laws of the harmonic system from the chiming of hammers on the anvil, highlighting a close relationship between music, mathematics and geometry. However, Pythagoras went further, developing a theory of harmonic ratios that closely relates music and shape, searching for the laws that link the sound and visual arts to the harmony of nature.
Franciscus Junius stated: "I will never tire of repeating […] the well-known sentence of Pythagoras: it is absolutely certain that nature never diverges from itself. Thus, it is. Now, those numbers which have the power to give to sounds the concinnitas, which is so pleasing to the ear, are the same which can fill our eyes and souls with admirable joy. Therefore, from the very music that has made numbers the object of deep investigation, and moreover from the objects in which nature has given high evidence of itself, we shall derive all the laws of determination" [Junius 1637, III, 2, 2]. Therefore, number allows us to grasp the harmonic ratios of nature by transforming them into visible and audible form. Converting harmonic ratios into geometric ones is to seek a material and spiritual connec-

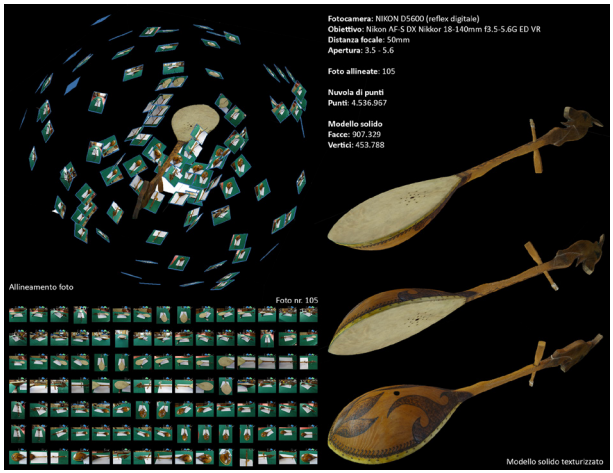
Fig. 1. From left: Jubal holding a psalter, second half of the 14th century. Vienna, Bibl. Naz., Cod. Nr. S.N. 2612, f. 25v; Jubal holding a psalter, 15th century. The Hague, Bibl. Naz., MMW, 10 B34, f. 23v; Jubal and Tubalcaino, 15th century. The Hague, Bibl. Naz., MMW, 10 C23, f. 26v.

tion between man and cosmic space. The number is the single matrix that joins the different ways of expressing this connection: "*quei medesimi numeri certo, per i quali avviene che il concento de le voci appare gratissimo ne gli orecchi de gli uomini, sono quelli stessi che empiono anco e gli occhi e lo animo di piacere meraviglioso* […] *caveremo dunque tutta la regola del finimento da musici, a chi sono perfettissimamente noti questi tali numeri: e da quelle cose oltra di questo, da le quali la natura dimostri di cosa degna et onorata*" [Alberti 1485, Book IX, chap. 6]. For Alberti, too, the link between music and shape is entrusted to a common tool for the elaboration of thought and creativity: number, that element that structures proportional relationships.
Musical instruments are the tangible sign of such a virtuous connection. They are capable of generating harmony in sound form, but they are also handiworks that reveal a free creative ambition and a deep connection with the laws of the cosmos and natural space.

From organology to ethnomusicology

The first systematic classification of musical instruments was by François-Auguste Gevaert (1828-1908) with his Traité général d'instrumentation (1863). He introduced a classification into four categories, depending on the vibrating material that makes the sound [6]. A few decades later, Victor-Charles Mahillon (1880-1922) also took up this approach. In the *Catalogue descriptif et analytique du Musée Instrumental du Conservatoire Royal de Musique de Bruxelles* (1880-1922) [7] he reintroduced Gevaert's quadripartite classification, which was to be the foundation of the classification theories still in place today [8]. However, this system of cataloguing had a narrow field of application. In fact, it was mainly used to catalog the instruments of Western classical music excluding many instruments that had, instead, a relevant importance in the development of instrumental techniques.
Toward the end of the 19th century, *comparative musicology* was born. This discipline intertwined with the coeval ethnographic studies and expanded the geographical and cultural limits of classical musicology. It was dealing with the oral musical traditions of all peoples, particularly those outside Europe. The studies of Erich Moritz von Hornbostel and Curt Sachs provided a crucial impetus for this innovative approach. In 1914, in an article entitled *Systematik der Musikinstrumente Ein Versuch* [9], the two scholars published a cataloging system that, with appropriate adaptations, is still the one widely used today for the classification of musical instruments. It is based on the way the vibration that produces sound is generated. The four first-level categories –*aerophones*, *chordophones*, *idiophones* [10], *membranophones*– branch off into further groups and subgroups allowing for constant updating and the inclusion of additional classes and subcategories [Sachs 2011, pp. 539-555] [11]. Compared to Mahillon's model it offered the advantage of greater flexibility, allowing any instrument to be included without cultural or geographic barriers. This facilitated a widening of horizons that led to the rediscovery of cultural, musical, and ethnographic traditions previously placed on the margins of official culture. Beginning in 1950, comparative musicology studies would take the name "ethnomusicology". A lexical mutation that coincided with a redefinition of research methods. Two figures, hitherto separate, became unified: that of the practitioner who collected documents in the field and that of the scholar who processed them. This led to a greater awareness of the close relationship between popular culture, local traditions, musical events, figurative traditions, and the shape and decorum of musical instruments.

Fig. 2. Lahutë, popular fidula, northern Albania. Structure-from-motion survey technique (shooting data and model processing), (survey and graphic elaboration by the author).

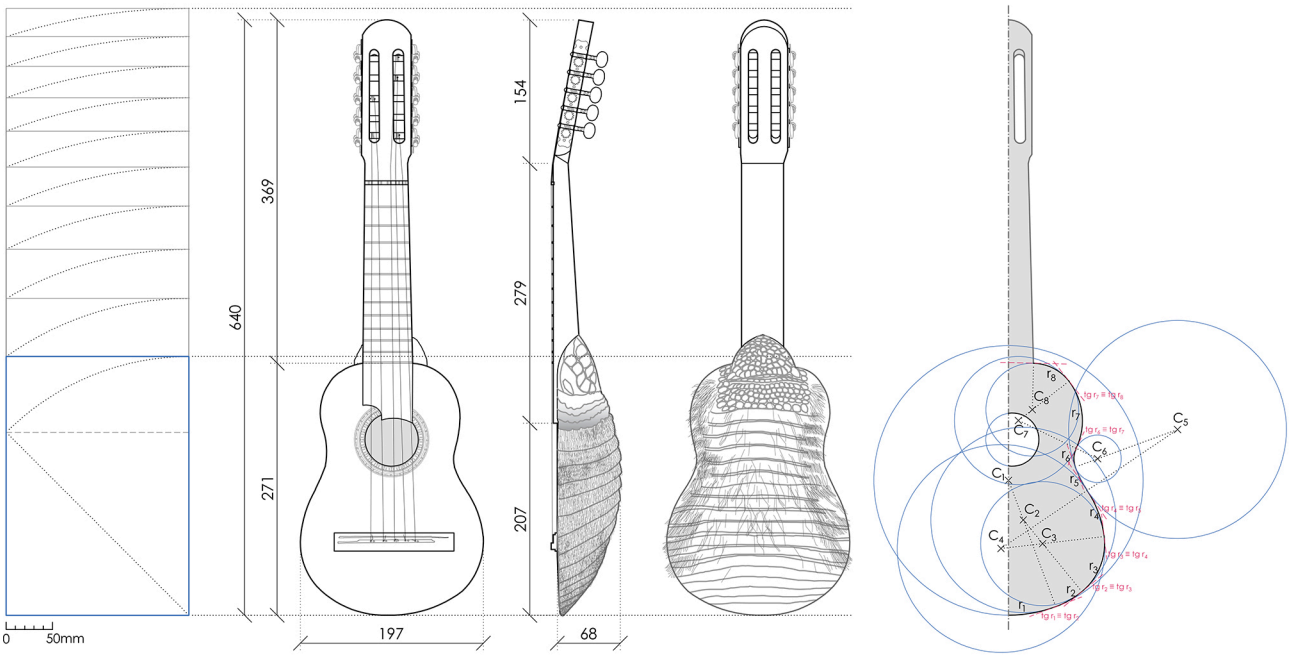


The shapes of sound

The importance of proportional ratios in sound modulation was evident from classical antiquity. The *tetrachord* expressed the consonances on which the Greek musical system was based: octave, fifth and fourth. They can be expressed by the progression 1:2:3:4. In addition to these simple intervals, the tetrachord also contains the two composite chords known to the Greeks: the octave plus fifth (1:2:3) and the two octaves (1:2:4). This discovery made people believe that they had finally found the harmonic law governing the universe, upon which would be based the symbolism and numerical mysticism that would influence human thought for the next two millennia. The tetrachord becomes materially concrete in the Greek lyre, mythologically attributed to Hermes. The length of its four strings reproduces the 1:2:3:4 progression, becoming a favored musical instrument in classical Greece.

The length of strings or the vibrating air column, the mass of idiophone bodies or the tension of membranes, respond to precise physical and proportional laws that have always allowed complex tonal variations. However, the focus on proportional ratios goes far beyond the purely sonic aspect. Precise proportional ratios are often found in the shapes of musical instruments, indicating a focus on visual as well as sonic harmony.
The graphic analyses that follow were carried out on some instruments housed at the *Museo dello Strumento Musicale di Reggio Calabria*. The surveys, initially made by direct and photographic methods, have recently been implemented with modern structure-from-motion techniques (fig. 2). Both methods have allowed for 3D models, orthogonal projections, and analyses of shapes and geometric arrays. Some of these tools were destroyed or damaged in an arson fire on November 4th, 2013, so the corresponding drawings represent the only documentation still available [12].

Fig. 3. Armadillo charango, plucked lute, Argentina. Soundbox made from the armor of an armadillo. Orthogonal projections with polycentric curve and proportional ratios (graphic elaboration by Domenico Mediati, Filippo Carmina, and Michele Casella).



Geometric proportions and harmonic ratios

The outlines of the soundboxes of some chordophones are inscribed in well-defined dynamic rectangles. This reveals an often uncultured and unconscious attention to established formal and geometric balances. Such is the case with the armadillo *Çharango* in figure 3, which belongs to the category of plucked lutes. It is an instrument widespread in Argentina's Andean region and is derived from the *vihuela de mano*, introduced to Latin America in the 16th century during the Spanish conquest. The *Çharango* consists of a soundbox, a short arm, and five double strings. At one time, the soundbox was made from the armor of an armadillo, now no longer used because it is a protected and endangered fauna.
The specimen shown here was destroyed in the November 4th, 2013 fire. It is an instrument of complex and uncommon workmanship. It features a soundbox inscribed in a dynamic rectangle with a side ratio of 1:√2. Its polycentric conformation is drawn on a wooden plank that acts as a support for the armadillo carcass, shaped with a slight curvature to meet functional and sonic needs. The same dynamic ratio is also found in the soundbox of the *Lahutë* shown in figure 4a. It belongs to the folk fidule category and comes from northern Albania. *Lahutë*

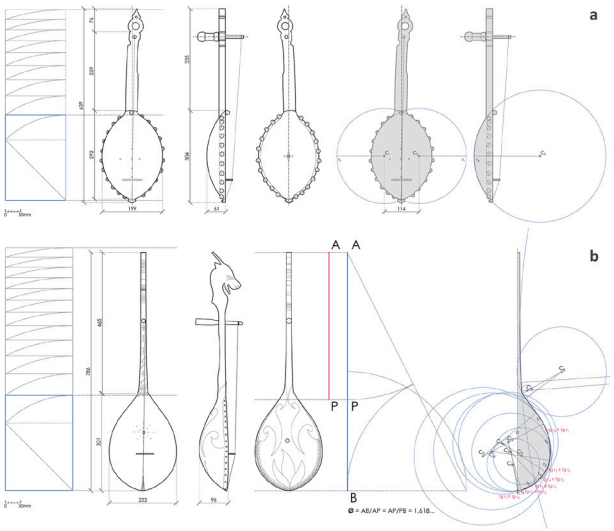
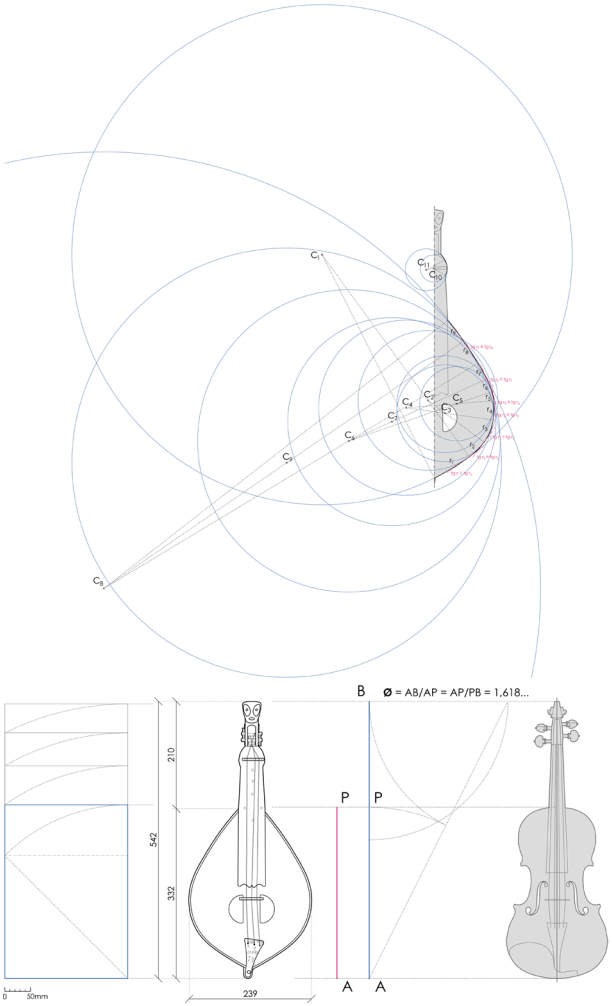


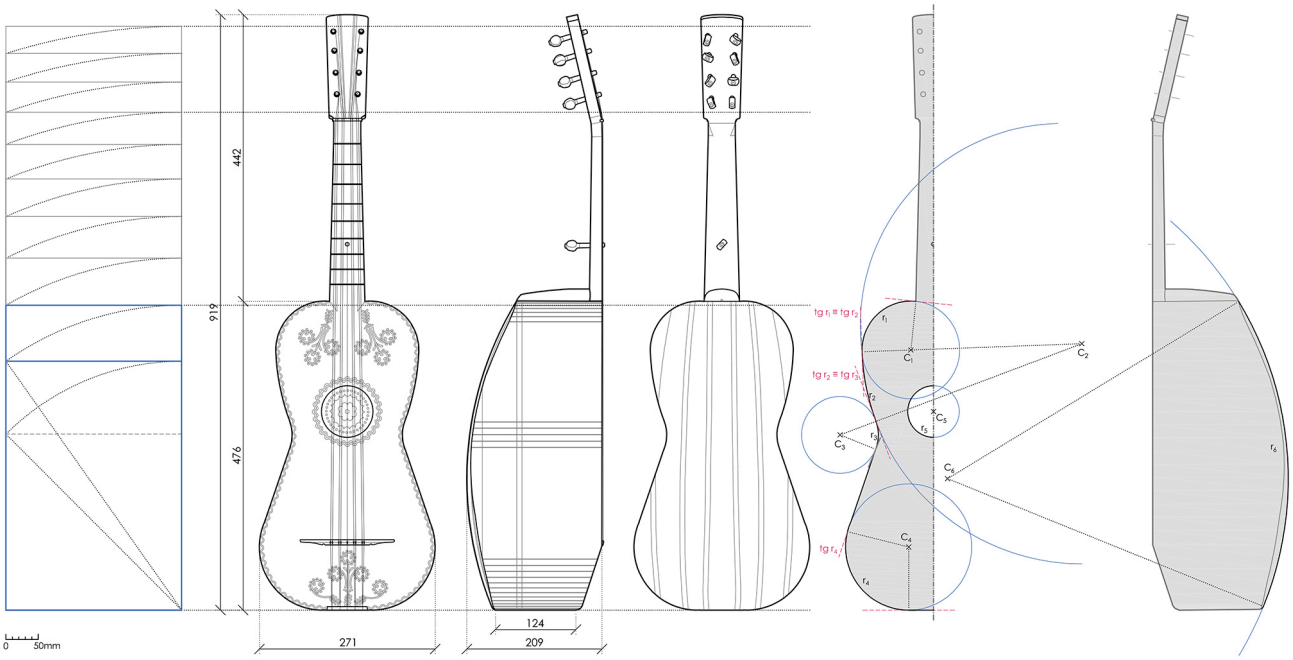
Fig. 4. Top: Lahutë, folk fidula, northern Albania (graphic elaboration Domenico Mediati and Evangelia Almaliotou). Bottom: Lahutë, folk fidula, Kosovo (fig. 4a). Below, orthogonal projections with polycentric curves and proportional ratios (graphic elaboration by Domenico Mediati, Vincenzo Romeo and Nicodemo Spatari), (fig. 4b).

Fig. 5. Crete lyre, popular fidula, Crete. Orthogonal projections with polycentric curve and proportional ratios (graphic elaboration by Domenico Mediati and Maria Montagna Barreca).



are bowed lutes, in which the body and neck are made of wood. The intersection of two circles, whose centers are about 114 mm apart, geometrically defines the frontal profile of the exemplar in figure 4a. Seen from the side it shows a slight curvature of the soundbox that will be bridge by an animal skin membrane. The single taut string is space via a conspicuous and scenic wooden key. Rubbing the string via a special bow produces the sound.
The *Lahutë* of figure 4b also has a soundbox inscribed in a dynamic rectangle with ratio 1:√2. However, its wooden structure has a more complex profile, with two polycentric curves: one with centers ranging from C_1 to C_7; a second consisting of only two circles whose centers are C_8 and C_9. The two curves are connected by a straight section. In addition, the depth of the soundbox has a more pronounced curvature than the *Lahutë* of figure 4a. The terminal shape of the deer head neck is particularly suggestive. Moreover, the total size of the instrument, the length of the neck, and the height of the soundbox set a relationship approaching a golden ratio: Ø = AB/AP = AP/PB = 1.618... The same proportion is found in the *Crete lyre* in figure 5. It is an arm lyre that, beginning in the 15th century, represents an evolution of the folk *fıdula* and can be considered a significant anticipation of the violin. Its shape differs little from medieval models and resembles that of the *ribeca* in its polycentric pyriform case with curved bottom [13]. The golden ratio between total size, case, and arm still is generally maintained in modern contemporary violins.
A more unusual proportional ratio is found in the Bisignano *chitarra battente* (figs. 6, 7). It is a typically Italian instrument, the type of which dates back to the 17th-18th centuries. It has a very voluminous soundbox with a curved bottom. A funnel-shaped parchment bellows is applied over the resonance hole and inserted into the case. Besides acting as a vibrating *membrane* it is also a choreographic decorative

Fig. 6. Chitarra battente, plucked lute – historical guitar, Bisignano, Italy. Orthogonal projections with polycentric curve and proportional ratios (graphic elaboration by Domenico Mediati and Elisa Gentile).



element that characterizes the instrument. Its soundbox has a very distinctive shape: squat when viewed from the side but very slender when viewed from the front. It is quite different from that of contemporary guitars. The ratio of the maximum width to the height of the case is very close to a dynamic 1:√3 rectangle, a proportional ratio that was common in Baroque and early classical guitars of the 18th century but is generally no longer found today.
Its volumetric conformation is more precise and defined than the chordophones previously shown in this section. It reveals a construction process based on precise schemes and models, although handcrafted. In opposition, the volumetric irregularities present on the two *Lahutë* and the *Crete Lyre* reveal an approach more related to empirical procedures and formal models handed down by tradition.

The 'organic geometries'

The curves of natural shapes respond to organic conformations, characterized by softness and flexuosity. This peculiarity reveals intrinsic functional needs and often shows itself with polycentric curves. They are characterized by the absence of cusps and points of discontinuity. The circumferential arcs that define their profile are aggregated to ensure the continuity of the curve. This characteristic is guaranteed by an essential geometric condition: at their point of contact (or point of bending of the polycentric) two adjacent arcs admit the same tangent line [14]. This allows for continuous polycentric profiles that give rise to complex shapes with an extraordinary geometric and formal quality. In fact, the organic shapes of nature have often been used by artists, decorators and architects over the centuries. One of the fields in which man has intensively applied such geometric conformations is precisely that of lutherie and, more generally, in the manufacture of musical instruments. From the earliest times, organic shapes, derived directly from natural space, the study of harmonic ratios and the laws of sound propagation, have been widely used in their production.
The most classic examples are found in the conformation of the soundboxes of stringed instruments, skillfully shaped by luthiers so as to give continuity to the surfaces. In their spatial development, polycentric curves often give rise to double-curved surfaces; sometimes shaped with extreme precision, other times achieved by more empirical craft processes.

Fig. 7. Chitarra battente, plucked lute – historical guitar, Bisignano, Italy. Views from the 3D model (graphic elaboration by Elisa Gentile).

They derive from converging needs: sonic necessities related to the reflection and propagation of sound, functional constraints depending on the posture with which the musician forks the instrument and formal choices revealing the sedimentation of figurative cultures closely linked to the instrument's land of origin. These artifacts disclose a synthesis of multiple aspects –form, history, function, tradition– that allow the creation of design objects with an amazing expressive quality. They are often the result of traditions closely linked to a folk culture. Materials, shapes, and colors characterize them as ethnic design objects in which sound function does not forgo decorum. The polycentric profile of the soundboxes helps proper sound amplification, but it is also the hallmark of many instruments. They are the result of an unconscious and 'uncultured' search for complex geometries, closely related to the shapes of nature.

In the most ancient instruments, as well as still today in primordial peoples, the soundbox is often made from remnants of natural elements: shells, animal armor, coconut rinds, emptied and dried gourds, etc. It is a spontaneous process of reuse that enhances nature's waste, senses its expressive and functional potentiality and transforms it into sound objects of high craftsmanship.

The *kora* in figure 8 is a lute harp from West Africa, Sahel area. Its soundbox consists of a gourd that has been cut, hollowed out, and covered with animal skin, usually antelope or cow skin. A wooden handle is inserted into the soundbox to which two rows of strings are anchored: 10 on one side and 11 on the other. Originally these were made of leather but nowadays they are made of nylon or harp strings are used.

The cut of the gourd results in a soundbox whose profile is similar to an elliptical shape. It is a natural element that, with appropriate workmanship, responds perfectly to harmonic

Fig. 8. Kora, lute harp, West Africa, Sahel Zone. Left: orthogonal projections. Right: photos (graphic elaboration Giacomo Giuseppe Franchini and Michelangela Vela).

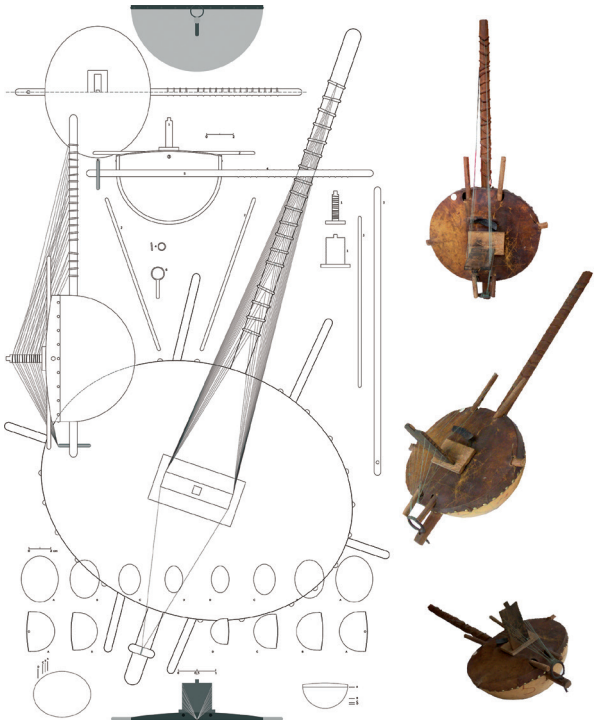
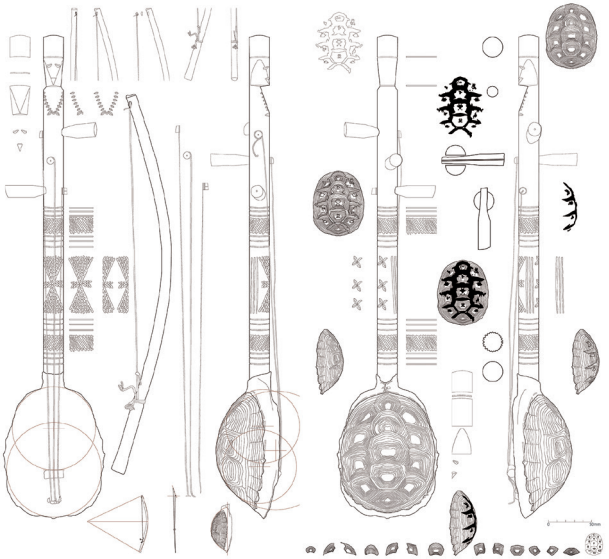


Fig. 9. African violin, folk fidula, North Africa. Soundbox made from tortoise carapace. Orthogonal projections (graphic elaboration by Caterina Candido).



needs, minimizes production processes by adapting them to autochthonous artisanal labor, and ensures an extremely interesting formal rendering.
Sometimes, animal armor is used, as already illustrated in the case of *Çharango* (fig. 3). The *African violin* specimen in figure 9 is most interesting. Its soundbox is made from the carapace of a tortoise, covered with a layer of stretched and stitched leather. A carved wooden handle, painted red with blue ends, is attached to the body. The ethnic carvings, the vivid colors of the neck and the perfect connection with the carapace make this instrument a very striking example (fig. 10).
In contrast to Western traditions in which instruments show chromatic sobriety, in instruments of African origin, color plays a key role. Its folk culture is rich in strong sensory stimuli that manifest musically in engaging rhythmic expressions. This characteristic is not exclusive to the musical field but we can also find it in craft productions. In them, predominantly geometric carvings and decorations are flanked by bright colors capable of generating strong visual stimuli: perceptual energies derived from the light intensity typical of the environmental context.
The textile tradition in Africa has an ancient history, evidenced by artifacts found throughout the continent. Turning and weaving techniques have been preserved over the centuries. *Kente* cloth, produced by the Akan ethnic group, dates back at least to the time of the Ashanti empire that took the place of the Ghana empire, which fell in the 1200s. Such fabric consists of brightly colored interwoven stripes with special symbolic meanings: royal yellow is a sign of beauty and fertility; brown represents health; and blue symbolizes peace and harmony. It is a

Fig. 10. African violin, folk fidula, North Africa. Soundbox made from tortoise carapace. Views from the 3D model (graphic elaboration by Caterina Candido).

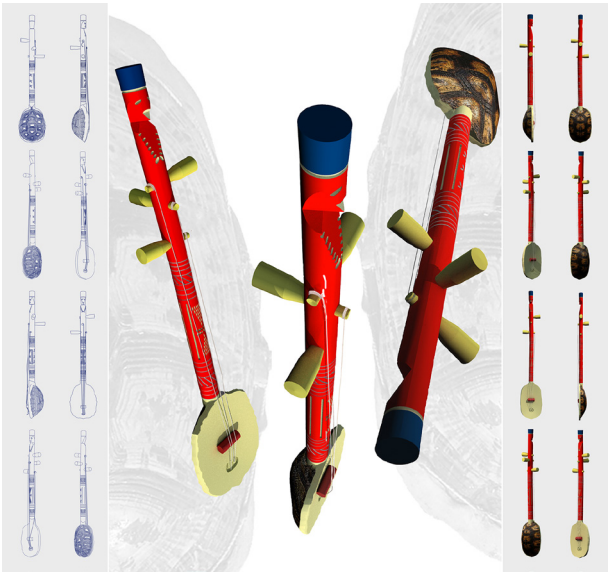


Fig. 11. Tamani, hourglass tubular drum, Mali. Orthogonal projections with polycentric curve and proportional ratios (graphic elaboration Domenico Mediati, Francesco Coscarella, and Xavier Hottot).

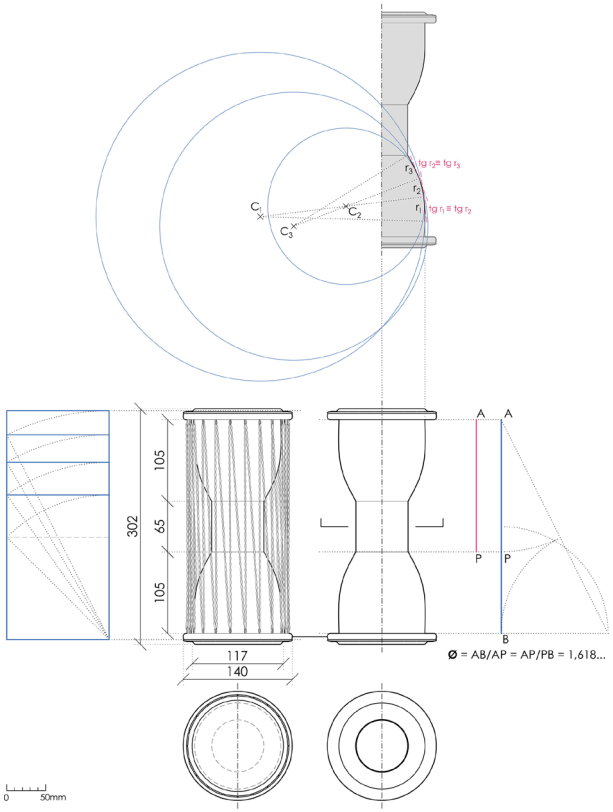


Fig. 12. Tamani, hourglass tubular drum, Mali. Left: views from the 3D model. Right: photos (graphic elaboration Francesco Coscarella and Xavier Hottot).

technique that also spread to neighboring Northwest African countries, giving rise to similar productions.
The characteristics of these fabrics –chromatic intensity and geometric decorations– are also found in some musical instruments from the area. The Tamani shown in figures 11 and 12 is a tubular hourglass drum, probably from Mali. It is also called a 'talking drum' because the sounds it produces recall the tonal qualities of some Malay languages. The Tamani has an hourglass-shaped central body made of wood, often covered with typical traditional decorations. Its profile has a polycentric curve with three arcs of C_1, C_2 and C_3 centers (fig. 11). The present exemplar has a fabric covering that recalls the textures and colors of *kente* fabric. Two membranes stretched by laces are attached to either end of the hourglass. The musician places the instrument under the armpit and through more or less arm pressure stretches or loosens the membranes while striking the instrument with a curved stick. In this way it is possible to articulate sounds according to a wide tonal range.
The instrument, which is small in size, has surprising sonic power. Its musical qualities are perfectly matched by its formal and chromatic harmony. The body of the hourglass is marked in height by three partitions according to a precise golden ratio, while the figure circumscribing the front view of the hourglass is very close to a dynamic rectangle with ratio of sides $1:\sqrt{6}$. Everything is completed: sonorous and formal harmony, proportional balance, and chromatic articulation make the *Tamani* a representative instrument of West African musical and craft traditions. It is an ethnic design object with remarkable expressive qualities that combines visual and sonorous harmony with relevant cultural significance. The *Tamani* is the instrument favored by griots, poets and singers who in West Africa take on a social-ethical role and are responsible for preserving the oral traditions of their ancestors.

Conclusion

The shapes of musical instruments reproduce the soft geometries of nature, respond to functional needs and give perceptual emphasis to objects: they are a prelude to the sonic harmony they are capable of giving off. It is the same harmony found in the growth laws of natural products, lacking rigid rational meshes but with their own intrinsic logic based on 'flexible' geometries. The polycentric curve often defines their profiles and determines a surface continuity that generates visual and sonic harmonies. Proportional ratios –dynamic rectangles and golden proportions– express a formal balance that sometimes becomes a constructive canon. Everything is the result of unaware research and shows experiences, traditions and figurative sensibilities not yet globalized which are firmly anchored in a universal knowledge that does not give up its autonomy. Number, shape, geometry and sound are faces of the same harmony that although in a common matrix find multiple forms to express themselves. It is a primordial knowledge to be preserved, evidence of a spontaneous process of popular knowledge formation. Over the centuries, it has triggered processes of innovation leading to the most sophisticated technical and formal expressions, rooted in experimentations 'poor' in material but rich in creativity.
The surveys and representations presented in the paper show overt or underlying relationships and aim to highlight proportional ratios and connections between organic geometry and the conformation of musical instruments: emblematic examples of an ethnic design that spontaneously integrates art and technique, innovation and tradition, hearing and vision. It is a process of analysis that, through survey, 3D modeling, and study of geometries aims to give shape and meaning to the sound and design of tradition.

Acknowledgements

This paper is an implementation of research carried out by the author together with Rosario Giovanni Brandolino [Brandolino, Mediati 2013]. Here, surveys with structure-from-motion techniques of some of the specimens analyzed were carried out and the topics of proportional ratios, polycentric curves and organic conformations were explored.

Notes

[1] *Genesi*, 4,21.

[2] *Genesi*, 4,22.

[3] Original text: "*musices disciplinam* […] *Iosephus ac Sacre Littere Iubalem, de stirpe Chaym, cytara et organo primum instituisse ferunt ex numeraro maleorum sonitu exquisitam*".

[4] When the mass of one hammer was twice the mass of the other (1:2) the sound produced was the octave (*diapason*); with a ratio of 2:3 the fifth (*diapente*) was obtained; with a ratio of 3:4 the sound reproduced was a fourth (*diatessaron*); with a ratio of 8:9 the tone was obtained.

[5] References to the relationship between Jubal and Pythagoras are in Book III of the Etymologiae of Isidore of Seville (560-636): "*Moyses dicit repertorem musicae artis fuisse Tubal [Jubal], qui fuit de stirpe Cain ante diluvium. Graeci vero Pythagoram dicunt huius artis invenisse primordia ex malleorum sonitu et cordarum extensione percussa*" [Isidore of Seville 1476, III, 16/1]. Transl.: "Moses says that Tubal [Jubal], of the line of Cain, invented music before the Flood. However, the Greeks say that the principles of this art were discovered by Pythagoras from the sound of hammers and strings being stretched and struck".

[6] Air column (aerophones), string (chordophones), membrane (membranophones), the body of the instrument itself (autophonics).

[7] The catalog, published between 1880 and 1922, consists of five volumes with a total of 2,300 pages. It analyzes and classifies the entire collection, consisting of 3,300 instruments, in the museum of the Royal Conservatory of Brussels.

[8] The proposed categories are as follows: vibrating string instruments (chordophones); vibrating air instruments (aerophones); vibrating membrane instruments (membranophones); self-vibrating instruments (autophones).

[9] The essay was published in the volume *Zeitschrift für Ethnologie*. In 1961, the Galpin Society Journal published a translated version in English.

[10] The term 'autophonics', present among the categories proposed by Mahillon and Gevaert, is replaced in the Hornbostel-Sachs classification with idiophonics. This choice comes from the intention to avoid misunderstandings between terms that have very similar meanings: autophonics are instruments that emit sound totally automatically (e.g., music boxes, pianolas); idiophones produce the sound vibrations with the body of the instrument itself.

[11] For a concise but exhaustive discussion of classifying methods of musical instruments, see: Oling, Wallisch 2007, pp. 29-38.

[12] Among the instruments destroyed in the 2013 fire here are: the *Armadillo Charango* from Argentina (fig. 3) and the *Chitarra battente* from Bisignano (figs. 6, 7).

[13] The ribeca is a medieval instrument of Arabic origin (***rebāb***), which arrived in Europe via Spain. Before reaching its final name, it took on the names *rebel* and *rubeba* [Modena 2010, p. 126].

[14] For an in-depth study of polycentric curves, see: Ragazzo 2011.

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Packaging Design as a Graphic Interface between Traditional Communication and New Technologies

Stefano Chiarenza, Ornella Formati

Abstract

In recent years, new information and communication technologies have had a significant impact on the design field, also involving, in a relevant way, the design and marketing processes related to product packaging. The multiple roles assumed by packaging, from functional ones to visualization ones aimed at conveying the corporate brand and persuading the buyer, have been enriched with renewed nuances and unprecedented possibilities. The latter have profoundly redefined both the relationships with the product and those with the consumer. This article explores the new ways of communicating packaging and its transition from a simple graphic-formal artefact to an articulated graphic interface. Through the narration of recent experiences that testify its transfiguration towards advanced forms of communication of products/services, the authors investigate the possibilities offered by new technologies and the founding role of drawing in this specific field of design, in which applications are increasingly characterized by multidisciplinary approaches.

Keywords: packaging, brand, communication, visualization, usability.

Introduction

The relationship between content and package has become over the years, in the context of industrial production, one of the main elements of the designer's thinking. The theme of packaging represents a design problem that places the designer in search of solutions that are not only practical but also communicative. Although it fulfils the dimension of containing or protecting, the package itself becomes on the one hand an object with specific functions of use, on the other, a communication tool. Its visual, non-verbal component therefore takes it to the field of the science of communication through images, increasing its semantic value.
In the realization of a package, therefore, various inseparable components come into play, whose boundaries often appear blurred and indistinguishable. From materials to shape, from the stereotomic conception to ergonomics, from the visual communication of the surface to the conveyance of information relating to the content, packaging appears more and more like the crossroads between creativity and innovation. In this significant meeting point, the drawing, within the design process, takes on a crucial role.
Analysing packaging in its evolution, from the narrative to the communicative function, this article intends to investigate it as a graphic interface for communication. In this capacity, new technologies make it possible to reconsider the presentation methods of the package, allowing the implementation of broader communication strategies that have a decisive impact on consumer choice. In this context, the possibilities offered by representation in the structuring of the graphic, infographic or multimedia image make it possible to convey messages capable of go-

ing far beyond the product, making communication even more important than the content itself, or, according to the suggestion of Marshall McLuhan, the medium becomes the message itself [McLuhan 1964]. Therefore, in presenting relationships and transitions between product and packaging –meaning the latter as a means of communication, now of the brand, now of the product and the meta-values related or linked to it– some theoretical-methodological assumptions are exposed that allow to identify the functions of drawing in the methodological process of packaging conception, between design and marketing.

From the story of the brand to the communication of the system/service

Packaging is a tool that allows us to get in touch with the goods and products that surround us and is an integral part of that complex system of distinctive elements designed to represent a brand. It is often a communication artefact so significant that it identifies with it. An example of this is the Coca-Cola bottle, patented in 1915 by the Root Glass Company, on the initiative of the Coca-Cola Company which proposed the challenge of developing a bottle "so distinct that you would recognize it by feel in the dark or lying broken on the ground" [1]; as well as that of Campari Soda realized in 1932 when Davide Campari asked Fortunato Depero to design a single-dose bottle, which over time became not only an icon of the Italian aperitif [Annicchiarico 2022] but the representation of the values of a company that he believed in the partnership between contemporary art and communication (fig. 1).
Packaging design is therefore an activity that requires complex skills. The designer, starting from the needs of the users and considering the market logic and the company objectives, must ensure that empathy is generated between the consumer and the package/product, that is the relationship that binds the buyer to the brand, and that establish a lasting and persistent bond between them. This sale/purchase relationship is summarized in the 1960s by Jerome McCarthy in the 4Ps of the marketing mix [McCarthy 1960]. The American professor of Marketing Management describes the logic that governs the design of a product and its introduction and persistence on the market through four variables:

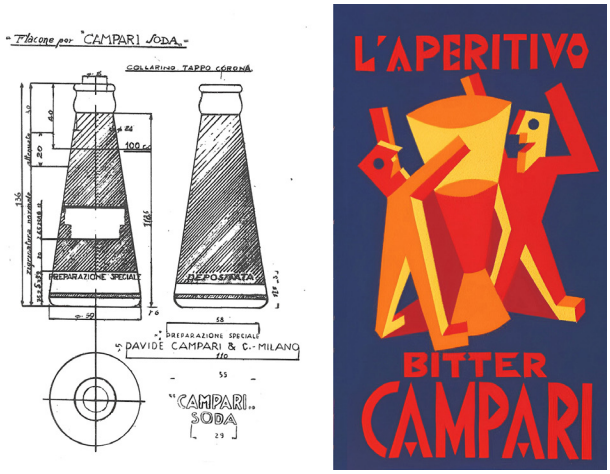

Fig. 1. Left: technical drawing for the executive production of the Campari Soda bottle, 1930s. A. Bordoni and Son glassworks. <https://www.campari.com/app/uploads/2022/03/THE-ART-JOURNAL-04-Campari-Soda-min.pdf> (accessed 9 August 2022). Right: Fortunato Depero, Bitter Campari, 1928.

- Product (the marketed good or service);
- Price (the price at which it is marketed);
- Placement (the physical or virtual place where it is marketed);
- Promotion (promotion activities designed to enhance the product).

In the early 1990s, Robert F. Lauterbon [Schultz et al. 1993], a forerunner of integrated communication, shifts the focus from a vision that favours the company to a customer-oriented one. At the 4Ps he adds the 4Cs. These, paying particular attention to the needs of the consumer and to the experiential value in the use of the product, ensure that the 4Ps evolve. Thereby:
- from Product to Consumer (to the needs of the consumer);
- from Price to Cost (at the price that the consumer expects to pay);
- from Placement to Convenience (to the most suitable form of distribution for the consumer);
- from Promotion to Communication (to communication capable of creating an empathic and emotional relationship with the customer).

In this development, new technologies play a crucial role.

They contribute to satisfying the needs of the consumer, because they can offer 'talking' devices, that is, capable of providing indications and guiding purchasing choices. The so-called enabling technologies transform the packaging from a mere container into a real communication and service vehicle. It becomes a device capable of informing and at the same time telling, creating a unique shopping experience for the user.
These technologies and 'Industry 4.0' were first mentioned in 2011 during the Hannover Fair when H. Kagermann, W.D. Lukas and W. Wahlster present a paper entitled *Industrie 4.0: Mit dem Internet der Dinge auf dem Weg zur 4. industriellen Revolution* [Kagermann et al. 2011], then released in 2013 by the German government. This document explores the strategies for facing the markets of the new millennium competitively. The indications are implemented three years later in Italy by the National Industry 4.0 Plan [MiSE 2016] which speaks of 'Enabling Technologies', or rather those interconnected devices, tools and resources, capable of managing large amounts of data and capable of assigning to products and services an added value and intelligence that allows them to analyse information and make decisions independently (fig. 2).
The packaging sector is affected by these indications both in the automatic machine production field and in the production of packaging. Digital solutions that can make production systems more performing and flexible are adopted,

Fig. 2. National Industry 4.0 Plan. The enabling technologies [MiSE 2016].

suiting the production process to new sustainable materials and changing market needs. Similarly, the labels are equipped with added performance thanks to the use of NFC (Near Field Communication), RFId (Radio Frequency Identification), QR Code (Quick Response Code) and augmented reality [2], which improve the graphic interface, making clearer and more interactive communication with the consumer. These devices intercept a shared trend in the new millennium, that of product/service personalization. "Both the most recent studies and the observation of phenomena today give us an industrial system in which the boundary between manufacturing and services is increasingly thin, so much so that it is often difficult to identify the specific sector to which a single company belongs. Industry 4.0 will only accelerate this mix, thanks above all to the Internet of Things that allows you to create smart products which can be accompanied by more and more personalized services" [Prodi et al. 2017, XI]. The English researcher Kevin Ashton, the co-founder of the Auto-ID Center at MIT, speaks of the Internet of Things (IoT), of objects equipped with sensors and technologies connected to the Internet and capable of transferring information and data between them, in a conference at Procter & Gamble in 1999. It is a revolutionary technology through which the package goes beyond the classic functions, to become an integral part of a more complex system destined to no longer convey a product but a real service.

The design of the packaging to communicate aware and responsible information

The packaging of a product fulfils a series of functions: containing and preserving the product over time, transporting the content from the place of production to the space intended for sale, communicating the brand and at the same time informing about the intrinsic qualities of the product.
In the volume *Packaging Contro.Verso*, Valeria Bucchetti, visual designer and lecturer in Industrial Design, reads "critically the communicative dimensions that are condensed in packaging to identify spaces for experimentation, search for new forms of expression and language" [Bucchetti 2007, p. 7] and she investigates the ethical and social responsibility of the designer in design choices. Four areas of reflection emerge from this survey, two of which are relevant to the discussion below.

The first, called *Just enough*, is focused on the design of labelling capable of going beyond the representation of the brand, subverting and redefining the hierarchy of information that sees the attribution of greater weight to that information often relegated to marginal spaces, such as expiration date, calories, nutritional principles. In other words, 'just enough' is reported on the packaging for the consumer to understand the actual quality of the product.
In the second, defined as *New medium*, the packaging is proposed as a vehicle and tool to spread parallel stories that go beyond the intrinsic characteristics of the product itself, as happens in *Socially Active Packaging. The Case of Antipersonnel mines*, the project that "proposes to rethink tout court the packaging of the products, making them an active part in the promotion of the social message, through the redefinition of the form even before the graphic elaboration. The goal is to raise consumer awareness on the subject of antipersonnel mines, transforming the packaging of products traditionally sold in pairs –such as gloves, socks, and shoes– through the expedient of displacement. The product packages are split into two distinct packages, held together by gauze tape. The awareness message is interrupted on the surfaces of the two packs and becomes legible only by placing them side by side" [Bucchetti 2007, pp. 57-59] (figs. 3, 4). The same theme is tackled by Ettore Ciravegna and Umberto Tolino who design the pizza carton [Ciravegna, Tolino 2012]. This becomes a 'new medium' through which to sensitize the buyer on the seriousness of domestic accidents. The experiments conducted on the subject propose a communication made up of statistics, puns and pictograms capable of involving the buyer through elements that attract his attention (figs. 5, 6). As has been argued by Pine and Gilmore [Pine, Gilmore 2010], in the New Economy it is not enough to produce goods and services, but it is necessary to ensure that the customer has an experience in the act of consumption, which builds customer loyalty and attracts in an event that becomes memorable for him. Packaging, therefore, assumes a significant role in this perspective, becoming not only a wrapper but also a medium in the shopping experience.
Enabling technologies such as augmented reality, IoT technologies, NFC tags, and QR codes allow us to design packaging capable of generating, between user and product, new ways of interaction typical of experiential marketing. The sector that is drawing the most from

Fig. 3. Socially active packaging, the case of anti-personnel mines. Shoe packaging divided into two distinct boxes. <http://www.packagingdesignarchive.org/archive/pack_details/11421> (accessed 9 August 2022).

Fig. 4. Socially active packaging, the case of antipersonnel mines. Actions performed by the consumer to access the product and concept of the project From Bucchetti [Bucchetti 2007, pp. 58, 59].

Fig. 5. Che pizza… gli incidenti domestici. Cardboard pizza packaging project. From Ciravegna [Ciravegna 2012, p. 16].

these technologies is the food sector. The labels, mediating between bureaucratic and promotional aspects, due to their small size, are not always able to tell the potential and the history of the product.
The companies of the MMR (Mass Market Retailers) are therefore equipping the packaging with augmented reality, a technology that, through a mobile device, can add digital information to an artefact of communication that helps to expand knowledge.
On this theme, as part of the research activities carried out at the Academy of Fine Arts in Naples, a work entitled LabelAR [3] was developed which allowed experimenting with new possibilities linked to the shopping experience by extending the communication skills of labels, towards new virtual and interactive reading spaces, thanks to the use of auxiliary technologies such as augmented reality. The LabelAR project borrows as a case study the NCO Consortium of Social Cooperatives, which operates on assets confiscated from the Camorra and works to redevelop these territories, proposing activities such as educational farms and food and wine tourism. The studio investigates the theme of the social responsibility of the designer who, through the project, makes choices of meaning, attributing different values to the hierarchy of information and the system of graphic signs. Since the packaging must not only tell about the product but also about the social value of the

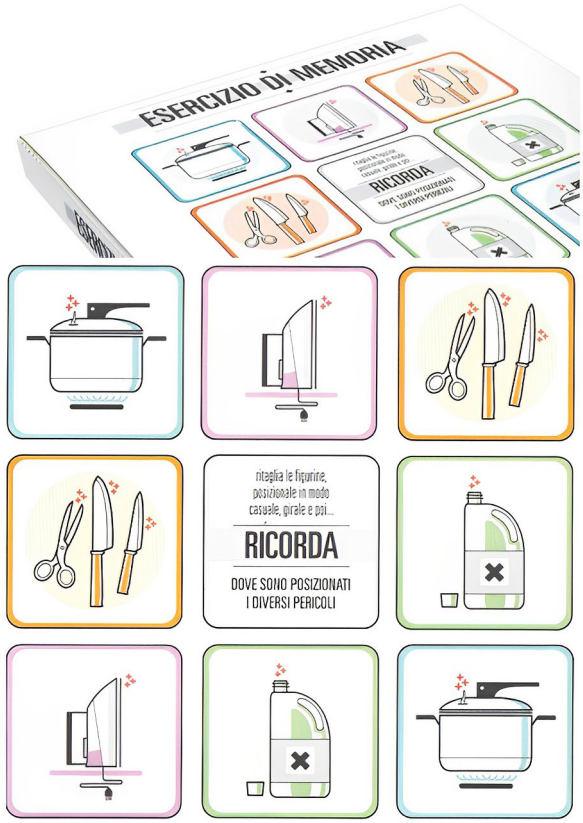

Fig. 6. Memory exercises. Project for the pizza carton that uses the memory game. From Ciravegna [Ciravegna 2012, p. 24].

company, the label on the back of the package contains a system of pictograms which, thanks to an augmented reality app, informs the consumer about how to consumption, cultivation and transformation techniques of products, origin, environmental sustainability and procedures for the disposal of the product, as well as the work of the Consortium. This 'augmented' information appears in the form of tabs on the screen of the mobile device when the latter frames the respective pictogram. To create greater empathy with the consumer, the basic indications are added to those regarding the method of

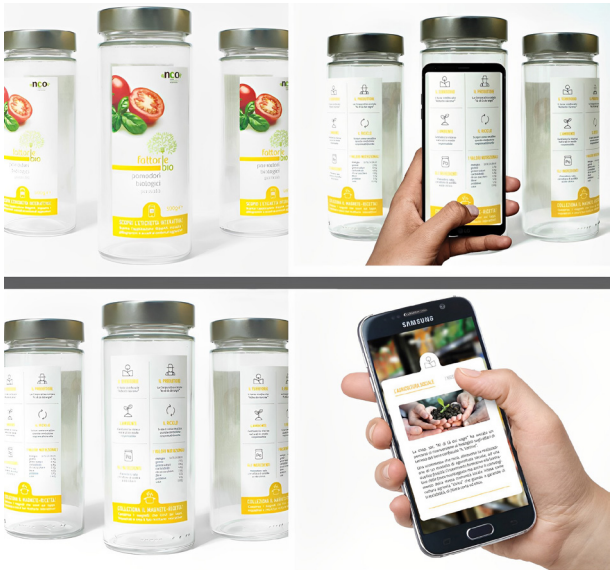

Fig. 7. LabelAR – Labels of glass jars and mobile application screen. Study relating to the Consortium of Social Cooperatives NCO. Author: M. Troiano [Troiano 2018].

Fig. 8. LabelAR – Information sheets obtained by framing the pictograms placed on the magnets. Author: M. Troiano [Troiano 2018].

preparation of the product, thanks to a recipe which can be accessed by scanning a magnet placed on the cap of the package. These magnets, acting as gadgets, become part of an ideal cookbook. The research has shown that these technologies orient communication in such a way that the customer can, according to his preferences and inclinations, search for the information that interests him most, choosing the level of detail that is most congenial to him (figs. 7, 8).Further experience in food product packaging was developed as part of the CD.PRO-CON project by the San Raffaele Roma Open University [4]. In particular, the research group has designed packaging for some products (legumes and dairy products) that the Agricultural Company Accadia Verde S.r.l. intends to place on the market. The packaging, aimed at providing the consumer with easily visible, clearly legible and possibly indelible product information, is characterized by experimentation that has combined design with new technologies. Neatec S.p.A., who participated in the research, has integrated, in the package project, an RFId tag system, a simple and cheap object but unique and difficult to duplicate, able to follow all the phases of the product's life and provide ample traceability/traceability of products and raw materials. In particular, through the use of NFC (Near-Field Communication) labels [5] applied to the product packaging, it was possible to provide the buyer in possession of a common smartphone with multiple pieces of information, ranging from the authenticity of the product to the nutritional and of the production chain, up to advice on consumption methods or recipes based on the product. A specific app puts the producer and the consumer in direct contact, who can receive automatic replies through a chatbot or by booking a telephone call with a producer operator (fig. 9).

The design of labels, using infographics and systems of iconic and conventionally shared signs such as pictograms, can provide 'custom-fit' data and information. These labelling implemented by the technology of the Internet of Things, open a new scenario that sees the packaging as part of a more complex system in which packaging becomes smart, to offer the consumer, as well as a product, a real assistance service. It is a technology that is being experimented especially in the medical field since through the connection between products it is possible to trace adherence to therapy and drug treatment.

Here are two emblematic examples that convey the proposed service, through a clear and readable user interface.
Phuture Med [6] is a case produced by the Palladio Group company created thanks to the printing of conductive inks that interact with the smartphone of the patient, the attending physician and a family member to check the correct intake of the medicine and monitor therapy (fig. 10). Water.IO [7] distributed by the Impacx company is a system that allows you to monitor water intake thanks to a bottle equipped with an 'intelligent' capsule that detects the opening and closing of the cap and the amount of water drunk. The device, thanks to a dedicated app, then sends the information to the personal device, to a platform and, if necessary, forwards the user with alerts or advice for taking the liquid.
We can note that, in this type of product, the design of the labels integrates with the design of the graphic interfaces used in the management of the service. A graphic interface, designed to ensure that the information is structured in a clear, legible and consistent way with the data shown on the label, must be associated with the design of a user experience based on the real needs and actual needs of the user, placing the user of the product at the centre of the design process.
Carlo Ratti, director of the Senseable City Lab [8], a research centre of the Massachusetts Institute of Technology, on the use of technology in reading products, raises new food for thought that goes beyond the use of devices. Ratti affirms that "technology is only a means and must serve to create relationships and exchange information that make us aware of our choices. Our task (as a designer) is to ensure that in the era of large-scale distribution, people know what they are buying. As in the old local markets" [Aliperti 2014]. These considerations shift the focus from technologies to sharing information relating to the purchased product. Carlo Ratti suggests a return to the purchasing methods of the past and hopes that in the future commercial spaces will be equipped with more immediate interfaces, without the need for personal devices to read the information on the product "the supermarket must instead offer a more intuitive, immediate experience: I put my hand close to the counter and the product tells its story. In this sense, I mean that we must first of all look to the past when it was still easy to get information on what was bought directly from producers, in local markets" [Aliperti 2014].

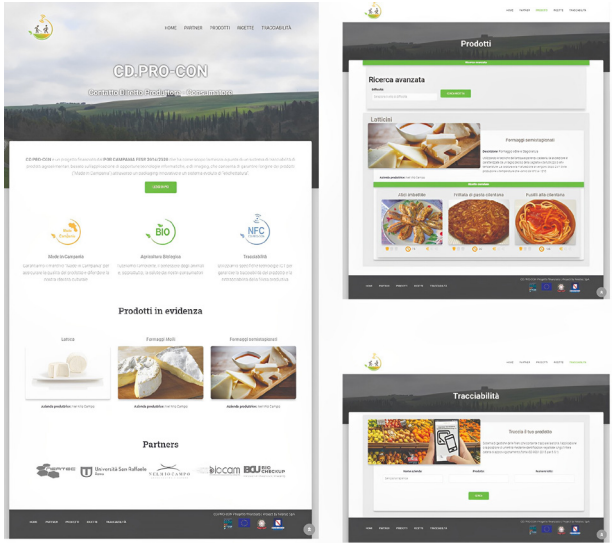

Fig. 9. CD.PRO-CON. Screenshot of the project portal with data linked to the mobile app. By Neatec S.p.A. <https://cdprocon.neatec.it/> (accessed 9 August 2022).

Drawing beyond form. Packaging as a research area between information visualization and usability

The impact of ICT on the creation of packaging has highlighted a significant design field in which the combination of form/function appears to be superseded by that of usability/interaction.
However, in the creation of such a device, usability and functionality must consider the image, as a medium for the marketing of the product and the vehicle of the brand, combining logic and aesthetics.
The role of representation in structuring graphic interfaces for the digital production of information intended for users remains crucial. As a surface for communication, the package takes on the character of material and cognitive space at once, in which form and ergonomics are re-evaluated in terms of visual fruition.
The growing diffusion of a large number of media for the visual communication of information has considerably revolutionized the field of representation by opening new research frontiers specifically related to

Fig. 10. PhutureMed, Packaging and app. Examples of application screens and the interaction of the blister with the app. By Palladio Group, 2015. <https://vimeo.com/1477309404> (accessed 9 August 2022).

visualization. As Vito Cardone observed "today's society, considered by all to be an information society, is above all a society of images. it is precisely the images that convey information, as evidenced by the fact that more than three-quarters of the information we receive reaches us visually. Of course, these are visual images in a broad sense now, no longer just graphic images. This involves a general effort of radical updating if we do not want to be swept away by scientific and technological evolution" [Cardone 2016, p. 19].

On the one hand, visualization can be read as a scientific research tool [Gillian 2012; Geroimenko et al. 2006], on the other hand, it seems to increasingly assume the role of a communication tool aimed at a wide audience of users, including non-specialized ones. The growing implementation of visual media has led to the recognition of new ways of representing, attributing scientific value to studies on visualization [Bertschi et al. 2015]. If visualization cannot be considered a new aspect in the graphic design of packaging, it can certainly be re-evaluated in light of new technologies [Johansson 2021]. The possibility of allowing the visual transmission of information, which transcends the label of the package and the product itself, through the conjugation of graphic elements and digital interfaces linked to mobile devices (such as smartphones), allows to balance attention between visual communication of the brand [9] and a series of additional information (fig. 11). The latter is dictated not only by legislative obligations, designed to guarantee the safety of the final consumer but also by the need to allow the consumer to make informed choices during the purchase phase. This implies that new technologies must be creatively integrated into the design process to affect decision-making [Shukla et al. 2022; Wang 2013].
The contribution of new technologies in this sector is certainly primary. It is possible to consider visualization as inclusive of analytical/visual thinking and communication as a sub-component of visualization itself. For this reason, the use of a correct representation of information and a precise structuring of the information visualization interfaces maintains a fundamental role.
But what are the major changes compared to traditional representation processes?
In the construction process of conventional visual communication, the message is a defined element and only the optimal presentation of the information on the surface of the envelope is required. In the new models, based on digital visualization, the message may not be completely predefined leaving the user the possibility to request and analyse information with the help of a system (generally an app) that allows him to retrieve and support his own specifications requests.
This use of the package is fundamentally based on the interaction within IT systems that allow the display of

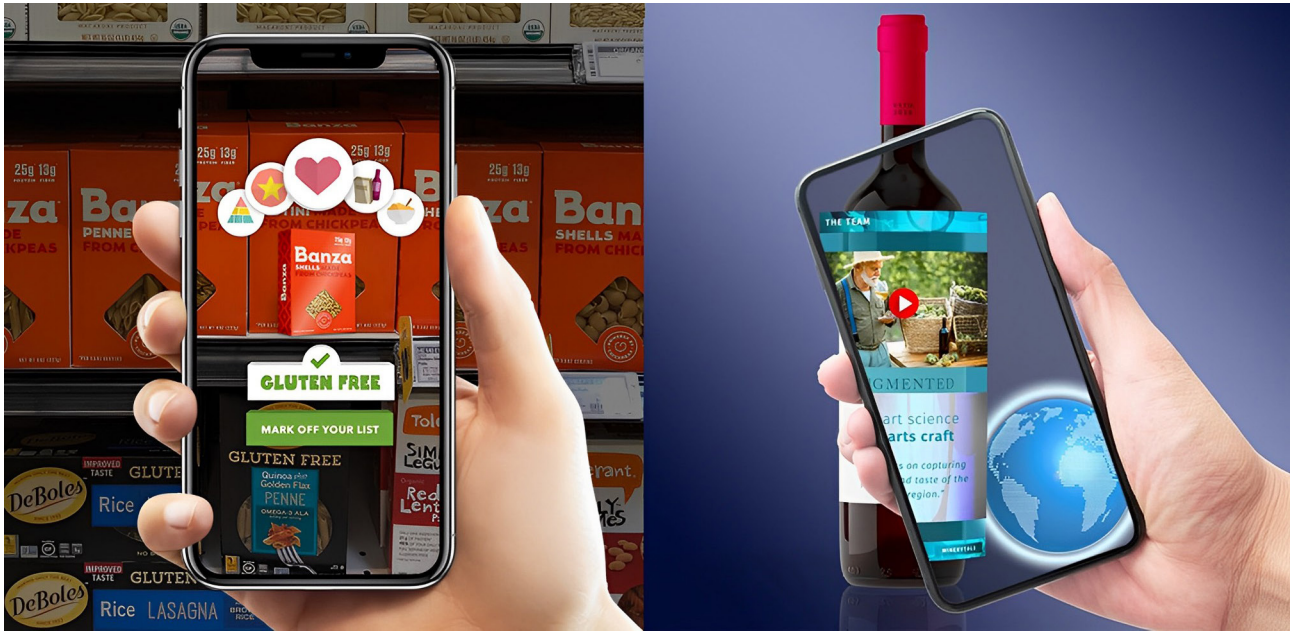

Fig. 11. Examples of visualization of product information in augmented reality. From Heller [Heller 2020].

information tailored to each type of user, with considerable advantages in terms of reading and communication times, convenience and versatility (fig. 12).
The general problem of the design of a package consists then, today, not only in the stereometric definition of a shape, in the use of graphics or geometric artefacts, images and textual information, but also in the development of graphic systems that can allow interactivity. Multimedia communication through a simple and easily accessible language must be able to allow consumers and producers to share information actively and to guide their choices attractively [10].
From a graphic point of view, this concept naturally requires new strategies. Compared to traditional systems of representation on paper, visualization through new media must take on a different role by embracing the issues related to web design, augmented reality and other multimedia techniques. Both those who define the representation and those who read it must share a new language. This, consisting of assemblies of images, videos, static and dynamic symbols, terminologies, icons etc., must be tested on all potential users.

Conclusions

Packaging design has currently reached important developments thanks to new information technologies. Together with the traditional forms of packaging, visualization is closely linked to the new digital media, embracing the problems related to the definition of new web-based representation systems and graphic interfaces. This type of digital representation involves not only designers and drafters but a variety of experts including computer scientists, designers and web designers. In fact, in addition to displaying a large amount of data, it is also necessary to carefully design the graphical user interfaces that allow

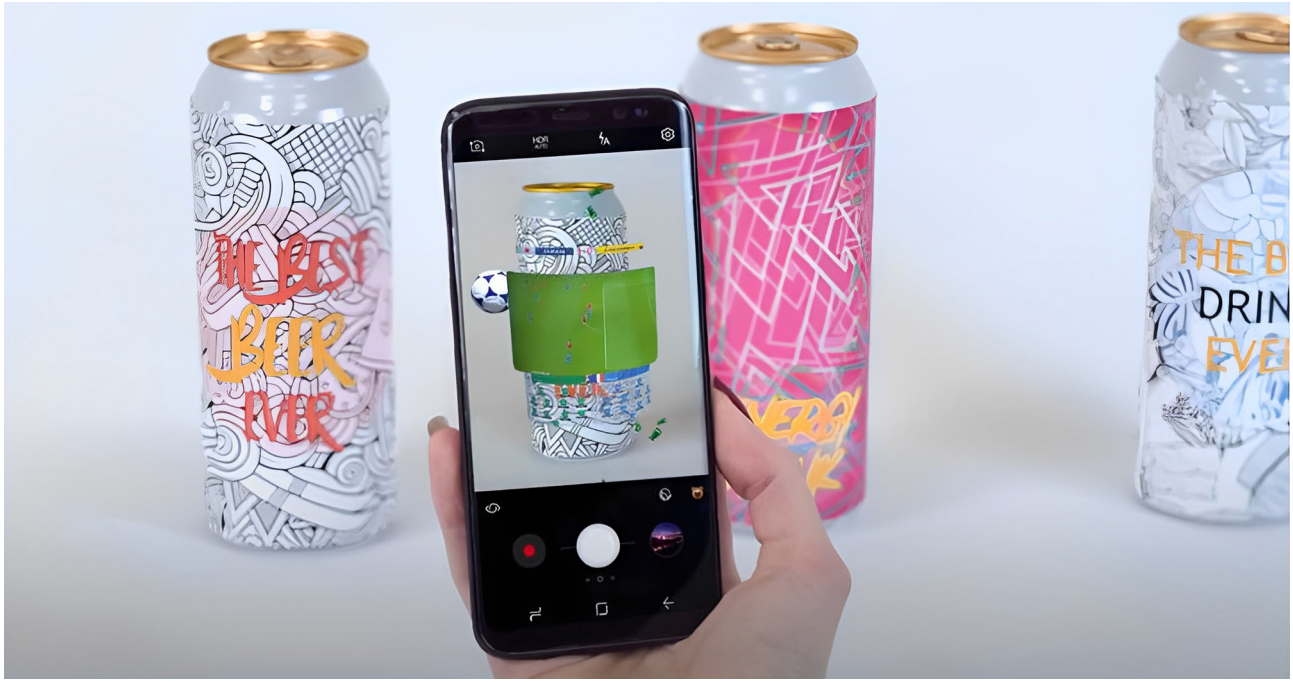

Fig. 12. Augmented Reality For Packaging. Use of AR technology in the food and beverage industry. By Skiwell Software, 2019. <https://www.youtube.com/watch?v=g4tnPETjgaw> (accessed 9 August 2022).

full interactivity and the ability to satisfy queries in real-time, on-demand or custom-made. This article, which provides a review of the current state of science on the conception of packaging as a graphical interface, identifies several open questions and fields of application of design not yet fully explored and at the same time research areas in which multidisciplinary approaches constitute elective choices.

Notes

[1] The expression takes up the creative brief of the competition that the administrators of the Coca-Cola Bottling Association launched on April 26, 1915, to some glass companies in the United States to develop a distinctive bottle for Coca-Cola. Taken from *The History of the Coca-Cola Contour Bottle The Creation of a Cultural Icon* available at the web page <https://www.coca-colacompany.com/company/history/the-history-of-the-coca-cola -contour-bottle> (accessed 9 August 2022).

[2] The introduction of AR augmented reality as a marketing tool, even regardless of packaging, has found recent and interesting applications by multinationals such as Amazon and Google, Ikea and Lego, just to name a few. The applications deployed (such as ARkit, Arcore etc.) are aimed at enhancing customer loyalty through strategies such as those 'unlock the brand' or 'try before you buy'.

[3] The cited work was developed in the context of a degree thesis on extended packaging. See M. Troiano [Troiano 2018].

[4] The CD.PRO-CON project Innovative *ICT systems and imaging for supply chain traceability, design packaging and health implications in a new agri-food company for direct contact between producer and consumer* financed by the Campania Region involved, in addition to San Raffaele

Roma Open University, also Biocam Scarl, the agricultural company Accadia Verde S.r.l., Bio Check Up S.r.l., Neatec S.p.A. Principal investigators of the project: F. Guadagni, L. Annunziato, M. Salvatore, A. Rullo. Responsible for the scientific activities related to the 'Design of new Production Processes: Packaging Design and Study of graphic communication' (OR1) S. Chiarenza.

[5] This is a specific type of RFId that is very reliable for small distances.

[6] The Palladio Group company has developed various research, conducted in collaboration with national research institutes and international companies, to support and monitor the patient during the therapeutic process. *The Phuture Med packaging* (2015) can be consulted at <https://player.vimeo.com/video/147730940?autoplay=1&loop=1&> (accessed 9 August 2022).

[7] The packging project is illustrated at the web address <https://impacx.io/water-io/> (accessed 9 August 2022).

[8] The *Senseable City Lab*, created with the aim of studying and anticipating social changes, is accessible at the address: <https://senseable.mit.edu/> (accessed 9 August 2022).

[9] This generally occurs due to precise marketing choices aimed at making the product more attractive on the market.

[10] It should also be considered that the advent of e-commerce is orienting producers towards virtual packaging strategies. The conception of packaging designed to generate sales of products for virtual stores will soon be considered, therefore, as a further challenge for the designer and those involved in representation.

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Theories and Methods

Drawing/Design: Figuration Configuration Interaction

Raimonda Riccini

> Drawing is not an autonomous reality.
> It is not: neither as an action nor as the result of an action.
> What makes drawing a heteronomous reality
> is its submission to that which is not drawing.
> [Maldonado 1967, p. 217, redactional translation]

The play on words proposed by Vanni Pasca [2010] and, not surprisingly, used as the incipit of the call of this issue of the journal *diségno*, should be taken very seriously: the relationship between drawing and design as an element for triggering a broader reflection on the two disciplines and their theoretical and practical-operational foundations. Taking this relationship seriously means not only addressing the long-standing etymological analysis of the term '*disegno*' (drawing) and its kinship with the umbrella word 'design' (and vice versa), which on many occasions has ended up mixing linguistic issues with the substance of the problems, creating, rather than a play on words, a veritable pun. But puns are often illuminating.

A blatant example of a pun carried to the limit of misunderstanding is found in the translation of a text by Tomás Maldonado, which passes from the Spanish *Diagnostico del diseño* [1967] to the Italian *Diagnosi del disegno* [1974, pp. 217-227]. As is well known, in Spanish the word that defines drawing is '*dibujo*', while the meaning of '*diseño*' is definitely 'project/plan', 'design' [Cravino, 2020-2021]. The translation of '*diseño*' with the Italian '*disegno*', which when read in the quote in the exergue makes us wince at the nonsense of the content, is symptomatic of a linguistic-cultural uncertainty [1] typical of Italy between the 1950s and 1970s. At that time, our sophisticated and, at the same time, provincial nascent design culture did not know how to express in Italian the idea, still not metabolized, of the new design activity. Design

This article was written upon invitation to frame the topic, not submitted to anonymous review, published under the editorial director's responsability.

was slowly occupying the field held until then by the artisan and proto-industrial traditions, which were currently showing themselves unable to respond adequately to the design of types of communicative artifacts, objects, machines, tools for the new social and market demands, completely foreign to the dominant Arts & Crafts tradition.
In the most historiographically widespread view, this transition has been interpreted as the question of the applied arts or the industrial arts or the minor arts [Bologna 1972], a theme long central to the thinking of aesthetics, the arts and architecture. For example, just think of the nineteenth- and twentieth-century debate, from William Morris, Henry Cole, Gottfried Semper, Alois Riegl, etc., to, in Italy, Camillo Boito's *I principi del disegno e gli stili dell'ornamento* [1887] or Alfredo Melani's *Decorazioni e industrie artistiche* [1889], to mention but a few. And then, in the first half of the twentieth century, to its crystallization around a few major figures of architects and artists who also worked as designers and theorists (in synthesis, the protagonists of the Modern Movement and of the various organizations and schools with, first and foremost, the Bauhaus).
This tradition has undoubtedly been one of the founding components of design culture, but it has ceased to exercise its exclusive function since at least the 1930s, when in Europe and the United States the process toward the autonomy of industrial design and graphic design was being initiated, and both recognized effectively as autonomous design and professional activities. An autonomy, it must be said, sought with respect to the artistic matrix as well as that of modern architecture, that is, to the two trends that have contributed to the erroneous identification of the entire history of design with that of modern design. In this tradition, the elements of prefiguration through drawing and those of design implementation of the final form of the product were considered to all intents and purposes a unitary process, semantically, stylistically and in terms of realization; not least because they referred to the same figure, not infrequently regarded as authorial. Often it was the designers themselves –who, let us remember, were in good measure artists or architects– who willingly adhered to this tradition, for the obvious reason that they had been trained in it. Moreover, in this way they felt that they could culturally qualify –or even justify– their engagement in the design activities of editorial and advertising graphics and of industrial product design, which were initially seen as standardized forms of creativity, as a commercial capitulation of 'pure' art.

I do not think there can be any doubt that the context from which design emerged conditioned in no small measure the way in which drawing has been interpreted, and continues to be interpreted, in the field of design [2]. But just as the history of design does not coincide with the history of modern design, in the same way the relationship that binds drawing to design is only partially identified with that process. Indeed, it can be said together with Giovanni Anceschi that it is precisely the gap between the two moments, between "the sphere of possibilities pre-figured –but perhaps it would be better to say pre-visioned– through drawing, and the sphere of implementation, of the final fixation of what has been pre-determined, that lies at the basis of the modern distinction between representation and design" [3]. However, the awareness that the final form of artifacts (products), whether graphic-bidimensional or three-dimensional, cannot be traced back to the linear process from conception to realization, from sketch to executive design, has been slow to gain ground. A first difficulty in explicating the elements of discontinuity in the cultural, linguistic, as well as operational sense of the relationship between drawing and design undoubtedly stems from the fact that design has struggled to construct its own epistemological framework, to develop its own methods necessary for breaking free from both the design tradition of architecture and the representational tradition of art [4].
A first timid attempt in this sense was made within the Bauhaus. It is well known that, at least at a programmatic level, Walter Gropius's project went in the direction of a synthesis of the arts in a single form, through which the proximity of artists and artisans could be made evident.
Nevertheless, he called Johannes Itten, Paul Klee and Wassily Kandinsky to teach at the school. They were all artists who, well before their arrival in Weimar, had already shown that they did not interpret this synthesis in a merely figurative or formalist sense, but rather in processual or methodological terms. The best way to understand this difference is perhaps to go to the first Italian translation of Klee's book *Das bildnerische Denken* [1959]. Faced with the difficulty of translating '*Gestaltung*' (by which the term 'design' is defined today in German), Mario Spagnol and Francesco Saba Sardi explained, "Among the proposed translations for *gestalten* and *Gestaltung* we have chosen, for many reasons, *figurare* [to form] and *figurazione* [figuration, the act of giving form]; keep in mind, however, that the German words indicate a shaping activity that is not only proper to the figurative arts, but also to nature and to any formative force"[5]. Once again we

are faced with a subtle linguistic question, which –at least in this case– leads us back to the substance of the issues. In this semantic ambiguity lies the theoretical node of design, namely the transition from "figuration" –a term that pertains to the realm of art and, therefore, to drawing– to "configuration." Although this passage is barely hinted at in artists such as Klee and Kandinsky, it was also their presence in a school of design that activated those processes and lines of tension that allow us to say today that design is above all *Gestaltung*, that is, a shaping activity that gives form to artifacts and not an activity that prefigures such artifacts (although prefiguration is now a much more articulated activity than in the past, thanks in part to the contribution of digital technologies).
It was necessary to wait until after the end of World War II for these processes to find a theoretical systematization and to be elaborated and clearly laid out in design theory and pedagogy. This was especially the case within the Hochschule für Gestaltung Ulm (Ulm School of Design) (1953-1968). It was here that the definitive break with the representational aspects in art, including abstract art, took place, in favor of principles of spatial and surface organization coming mostly from the concretist wing of the avant-garde and neo-avant-garde movements. This was made possible by the coexistence, in the School's early stages, of three central figures of Concrete Art, namely, Max Bill, Tomás Maldonado and Friedrich Vordemberge-Gildewart.
What concretism infused into design theory was the radical idea that art should in no way have references in the world of reality and that reality, rather than represented, should be configured starting from a constructive elaboration, arising solely from the cognitive-imaginative dimension of the author. This conviction had important reflections in the elaboration of a pedagogical and design methodology, as well as decisive implications in design theory [6].
Although with a very different severity depending on its protagonists, art was a topic almost banished from theoretical elaboration within the Ulm School. However, on closer inspection, an artistic residue –of a concretistic nature– lingers in the curriculum of studies itself. I am referring to the teaching called *Visuelle Einführung* (visual introduction), which constituted the most conspicuous teaching of the Basic Course in the first year that –until 1961– all students were obliged to take before choosing their specialization. The teaching consisted of drawing and painting exercises that, from their first formulation, were intended to train the hand and the eye and improve their coordination. If one takes a look at the results of these exercises, it is easy to understand the closeness between the solutions found by the students and some concrete art paintings. As Pierfrancesco Califano pointed out, "It is true that there is a certain formal continuity between concrete art and Ulm's exercises; it is also true that the visual introduction exercises are abstract, not oriented towards practical application and their focus is on the principles of configuration. However, in their didactic use, these principles are not used with an aesthetic function, but to train the student's critical capacities. The same can be said of all those branches of mathematics and geometry that are used in concrete art as well as in visual introduction: for the first they are sources of formal inspiration, for the second they serve to elaborate a rigorous methodology for the study and design of the configuration of technical objects" [Califano 2022, pp. 61, 62, translated by the author].
As can be seen, therefore, concrete art in this case is training in configuration. And with that the meaning of drawing also changes, losing its prefigurative characteristic to become a tool for indicating and visualizing technical, perceptual, manipulative and, finally, signifying configurations.
The shift from figuration to configuration is undoubtedly the moment when the reflection on design abandoned the age-old form-function question and opened the debate to new issues, such as the structural complexity of artifacts. This, especially at Ulm, led to an attention to the methods and processes of designing, rather than the form of the products. The artifact is no longer considered as an isolated creation but is thought of from a systemic logic of product planning, which takes into account economic, constructive, production and distributional, systemic factors. But moving from figuration to configuration also means paying more attention to the functional complexity of the artifacts. Here, too, aesthetic and cultural factors –which until then had dominated design discourse– even without gaining new meaning and importance, began to be joined by factors related to the use and enjoyment of products. It is no coincidence that, precisely at Ulm, a discipline such as ergonomics made its appearance for the first time in a school dedicated to design. It is a sign of a maturity, also epistemological, of the discipline. But it is also the sign of a shift in the priorities of design practice, which, precisely through the concept of configuration, led to a new awareness: design is interaction.
This insight anticipates two issues that are central in contemporary times. The first concerns the transformation of the material framework that founded the modern world: the panorama of objects has been disrupted by technologies, primarily digital technologies, that modify the way we think

about, design, make, and use artifacts (both old and new). The problem of form has lost its centrality in the world of products, many of which have disappeared, others have been combined and hybridized, and still others have been embedded in technical or biological structures. As a result, among the many shaken certainties of the 20th century, the historical form-function dualism, a veritable paradigm for design [Riccini 2015], has given way to the pre-eminence of the relationship of artifacts with users.

The second issue, which I would now like to focus on, is the centrality of the body in the drawing/design dialectic.

On another occasion [Riccini 2021], I tried to use –perhaps taking a certain risk– the metaphor of the human body as a machine for understanding one of the crucial aspects of the drawing/design relationship: the body as model and the body as agent. This is, of course, a well-known and widely used metaphor, throughout history and even more so today [7]. In his anatomical drawings, Leonardo da Vinci treats the body as a "marvelous human machine" and, in his technical drawings, treats machines as a real organisms. The body is thus likened to a fluid mechanical system, disassembled into its components and its joints, its layers, and its structures analyzed. [Galluzzi 1996]. Before becoming the Vitruvian ideal type in the celebrated drawing of 1490 conserved in the Cabinet of Drawings and Prints of the Gallerie dell'Accademia in Venice, the human body in Leonardo corresponded to a model that has "mechanical elements" at its center. If design were to look to the great Leonardo da Vinci, it would certainly be for his anatomical drawings and not for his Vitruvian ideal type. The body inscribed in fundamental geometric figures was to become a reference for design only when, more than four and a half centuries later, it took on the appearance and names of Joe and Josephine, the protagonists of the anthropometric charts devised by American designer Henry Dreyfuss [1955]. The average man as design's ideal type.

If we further explore the idea of the body as a machine, that is, an organism capable of developing "mechanical" capacities, from the earliest stages of evolution that led it to become *homo sapiens* to the present evolutionary stage, we can see how these have been intertwined with various forms of "graphical representation." More than any other scholar, it was the French ethnologist and anthropologist Marcel Mauss [1937] who taught us that the first technical object we have at our disposal is our body itself. Even before using tools, we can act in the world through "techniques of the body," that is, using our bodies as a real tool. That is why, for example, in some civilizations the tool used for sitting is not a chair, but one's legs bent in various ways under the torso; the tools for eating are not a spoon and fork, but one's hands. Therefore, by using very precise body techniques –for example, different types of swimming styles– we are able to move quite quickly through water without a boat. Therefore, it can also be said that drawing is first and foremost a "physical act that lives in a spatial dimension […] One draws with the body" [8].

Initially, the body is the drawing. Passively at first. The shadow that is cast on the ground.

Footprints on the earth. Then, handprints on cave walls, as in the extraordinary Cueva de las Manos in the archaeological region of Santa Cruz in Argentina. Here, as in many other cave paintings, even much more remote in time, there are as many as 826 handprints on the cave walls, made between 10,000 and 13,000 years ago. Depicted in different shades of yellow, ochre, brown and red, the handprints were made in two different ways: by dipping the hand in color and then pressing it against the rock surface, or by spraying colored pigment around the hand resting on the wall. The remains of bone tools used to blow the mineral inks onto the wall have also been found. These are evidently something more than the rudimentary wooden spatulas or brushes made from tufts of animal hair or plant fibers. But they are also different from the awls and stilettos used to scratch the surface of the rock walls in tracing graphic marks, illustrations of animals, human figures or hunting scenes there. Those tubes containing color, which were blown into while modulating the output of pigment, were essentially small machines, "machines" intended in the most basic sense of the word as tools that transform energy to achieve a purpose.

Then again, in the very beginning, writing was also drawing, a pictogrammatic reproduction that designed/drew reality in synthetic form: fish, birds, mountains, trees, human hands and feet, figures hinted at with essential strokes on wooden or cloth tablets, so perishable that they had to be replaced with tokens and clay tablets. And so, to trace marks on this new medium, earlier tools were abandoned and the hard calamus, (reed pen), the progenitor of all writing instruments, was increasingly used. Where this tool became popular, the graphic-pictogrammatic form of writing, so difficult and slow to realize, was abandoned in favor of sharp, abstract signs and, finally, by the alphabetic system [Leroi-Gourhan, 1982].

Thus drawing distanced itself from the body. Together with written words, it became structured in the extraordinary visual forms that our civilization has elaborated, in a reciprocal,

irregular harmonic reference. Thus Giovanni Lussu reminds us that graphics is writing and that the specificity of communication design "consists in applying, combining, modifying, forcing or generating visual codes," and of these, alphabetic writing is the most flexible and complete [Lussu 1991, cited by Falcinelli 2022, pp. 260, 261].
A further look shows that many examples have survived over time in which the body is a machine for drawing, for expressing meanings on a surface. Perhaps the first association that comes to mind is that with the painting of Jackson Pollock, the American artist who embodied the physical relationship between the body and the pictorial surface, where the whole body becomes a technical and expressive gesture for the realization of the work. The reference to Pollock's "drip paintings", which have little or nothing to do with drawing, attests to the fact that in art (and design) there are "situations in which one configures without representing" [9].
Beyond the world of art and representation, the hands or other parts of the body are used as actual drawing machines. In its evolutionary journey, the human species has honed certain manual skills that distinguish us from all other living creatures, including the control of small hand and finger movements, the so-called fine motor skills. From the earliest times, this aptitude has allowed the development of the art of embroidery, a special design technique characterized by being traced on a fabric or by means of a particular weave that constitutes the fabric itself. On the one hand the embroidered design, on the other hand the design as an expression of the mechanical work of the loom, as we are reminded by the image of Anni Albers sitting at her loom in 1937 at Black Mountain College, where she had brought the tradition of the Bauhaus Weaving Workshop, with its signature geometric designs. The needle, crochet hook and lacework bobbin, with their white or colored threads, act as small living machines whose main joint is the hand [Wilson 1999; Sennet 2008; Focillon 2014]. In pillow lace, the skill of the fingers plays a key role within a system of particular artifacts: resting on a special support, a cushion for pinning a sheet of paper with the guiding design of the embroidery to be created. Then there are the bobbins, small wooden spools with one or two heads on which the thread is wound, which must be turned and crossed with great skill and patience.
Finally, drawing and the eyes. The design and the production processes of products and artifacts may depend on extra-representational elements or on those that have only a graphic-visual resonance with drawing. In the 1950s and 1960s, Russian physiologist Alfred Yarbus conducted innovative experiments on eye movements. These observations, performed by means of a method for recording eye movements based on small suction cups attached to the surface of the eye, gave a series of reticular images as a result. These are true visual graphic representations that we cannot call drawings or representations. They refer to the observed object, of which the eye explored some parts more than others, dwelling longer on certain details. On these, the lattice-like pattern of lines become denser, producing an unusual aesthetic effect, and, at the same time, providing precise indications for subsequent steps of application. This method –oculometry or eye tracking– has many contexts of application, from medical to marketing, and is fundamental to the design of websites, interfaces, and typefaces.
The user and his or her characteristics enter into the design process, participating in the definition of communicative artifacts on a par with other design requirements (the grid, type size, arrangement of colors, etc.). The body, perception, and abilities come to determine the configuration of the objects. Thus one can now understand Maldonado's statement in the exergue, substituting "design" for "drawing": "Design is not an autonomous reality. It is not: neither as an action nor as the result of an action. What makes design a heteronomous reality is its submission to that which is not design."
Perhaps for this reason, design and drawing continue to pursue each other, like two dancers in a beautiful choreography, but are destined to never meet.

Notes

[1] This misunderstanding is all the more significant since this is a text by Tomás Maldonado, that is, an intellectual active in the world of design, of which he had proposed definitions, established genealogies and boundaries [Maldonado 1976]. The play on words, however, also triggers a series of particularly stimulating logical short-circuits and short-circuits of meaning, which allow a "*reductio ad absurdum*" especially if one reads the text by attributing to the term "disegno" its current meaning in Italian (the one that is made explicit in the title of this journal, to be clear), as is already evident from the citation in the exergue.

[2] The role that drawing has played in these traditions is not a subject within my reach and therefore I refer only to a few texts of

reference for me, which assert and clarify the centrality of drawing for architecture [Purini 2017] and for art [Griseri 1980]. If we were to indicate emblematic examples of a relationship with drawing in designers who have also turned their hand to [industrial] design, we could not avoid mentioning the names of Aldo Rossi, Ettore Sottsass, and Alberto Meda.

[3] These are the words of Giovanni Anceschi taken from the interview conducted by Enrica Bistagnino [Bistagnino 2018, p. 95].

[4] Also highly complex is the role that, albeit to a lesser extent, technical drawing, borrowed from engineering, has played for design, but [which is] all the more important today in the face of the new perspectives of digital drawing and digital design.

[5] Cited in Klee 2011, p. X.

[6] In the field of architecture, this led to the transcending of the idea of composition in favor of that of configuration. Evidence of this is the fact that, after the very early stages of the School, the Department of Architecture was called the Department of Industrial Building.

[7] We cannot ignore the fact that in today's world, the metaphor has expanded as far as to project us into the cyborg dimension, a hybrid of body and technologies, through which the human person is integrated with circuits, sensors, prostheses and so on. A hybrid that is transforming, according to some, the human into the post-human.

[8] Interview with Tomás Maldonado conducted by Enrica Bistagnino [Bistagnino 2018, p. 89].

[9] This refers again to the interview with Giovanni Anceschi conducted by Enrica Bistagnino [Bistagnino 2018, p. 93].

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Interfaces: between Drawing and Design

Francesco Bergamo

Abstract

This article explores the role of drawing in relation to design, not so much as a specific creative act, capable of informing and representing design ideas, or as a 'manifestation of the idea' per se, but rather as a dense and sedimented knowledge that is increasingly relevant for interaction design – and extensively in any design project.
Looking at examples such as video game interfaces and other everyday use artifacts, as well as theoretical reference models for the interaction design community (from Donald Norman's to Paul Dourish's, from Anthony Dunne and Fiona Raby's to Branden Hookway's, etc.), it is possible to bring out and discuss the centrality of the role of drawing in rethinking strategies of the interaction project, while considering the interface as a specific 'place' where not only the mediation between user and designed content takes place, but also that between drawing and design is activated. If windows, mirrors, and lenses can be considered as mediation devices of the visible, interfaces of digital devices can synthesize, make coexist and multiply their functioning and consequences, for example when they are meant to relate collections of data with their possible representations. Furthermore, recent discoveries in other fields, such as chemistry and biology, lead us to rethink together both drawing and design, starting from new epistemological models which extensively rely on the notion of interface.

Keywords: interfaces, design, optics, metaphors, transparency.

"It seems to me that drawings […] do not lament distance,
but reply with a single word: HERE.
And this is not arbitrary.
It has nothing to do with a conceit called Drawing.
It refers to the essential structure of the human spirit,
without which there would be no recognitionof distance!
Drawings offer hospitality to an invisible company which is with us"
(John Berger, from a letter to James Elkins, 17 February 2004)
[Berger 2005, p. 117].

Introduction: about interfaces

An interface is, literally, a (sur)face between two (or more) spaces, organisms, or other entities. The term was borrowed from chemistry, at least in its modern use; chemistry stared using it not after 1882 [1] and today often employs it as a synonym for 'interphase'. Branden Hookway [Hookway 2014] has traced its contemporary origins also back to nineteenth-century fluid dynamics, before its migration to thermodynamics, connecting its salient characteristics – such as turbulence control– to information theories and cybernetics, even in their most critical, innovative, and political-philosophical facets.
The word entered the Italian dictionary only in 1972 [2]; since then, its specific meanings, as well as its uses, have been enriched and multiplied especially in the field of information sciences, and later also involving design, art, philosophy, architecture, and human and social sciences, given the potentiality and extensibility of the notion. Moreover, the same concept of surface, or 'face', has been and still is

used profitably in the most disparate fields, so much so that tracing its genealogies and applications can be a useful indicator for measuring the major interests of certain periods and cultural fields in recent history – for example, it is interesting to compare its definitions and applications provided by Gibson [Gibson 1979], Deleuze [Deleuze 1990], Stroll [Stroll 1988] and Tripaldi [Tripaldi 2022]. Different disciplines obviously make different uses of the notion of interface, which however has common origins and genealogies and, therefore, is particularly interesting as a possible connector, or vector, to transfers knowledge and methodologies between apparently distant theoretical and applied fields. The very notion of interface is, therefore, potentially an interface per se between disciplinary fields: it is not so much a metaphor (as are the desktop, the cloud, and so on), but an actual 'face' in which interactions 'take place'.
For computer scientists, an interface is a device capable of ensuring connection and communication between two otherwise incompatible computer systems, or between a central unit and peripheral units. I will come back later in this article to its being a connection with a central unit, since a subversion of this epistemological model is precisely at the basis of some of the most interesting and innovative contemporary perspectives, involving fundamental questions for representation and for design. Those who work in Human-Computer Interaction (HCI) and Interaction Design commonly speak of 'user interface' as a "graphic mode in which a program or operating system appears on the screen and interact with the user" [3]: this definition is burdened with legacies and biases that derive in part from medium theories, which until a few years ago were mainly adaptations of modernist studies on cinema and video. First of all, it is surprising that a user interface is still defined today in the dictionary only as a 'graphic mode', without taking into account sound or haptic information and interaction modes, which are becoming more and more relevant to the scientific community and companies in the information technologies and telecommunications; and it is evident how this oversight is inherent in thinking of the interface most of all still as a screen, even more than as a window – with evident (for those involved in drawing) as well as generally neglected (by others) references to the Albertian window [4].
We can consider this aspect as the first and most obvious link between interaction design and the knowledge of drawing and science of representation, and the main purpose of this paper is to help lay the foundations for a dialogue between the two disciplines. This dialogue, based on mutual awareness, seems especially necessary today, in an era when information –which plays a dominant role in every choice for the future of the planet and of mankind– is mediated by representations taking place mainly on digital interfaces.

Interfaces and the science of drawing

Alexander Galloway notes that the interface is commonly considered a surface [5], intended as a screen through which it is possible to access a virtual world [Galloway 2012, p. 18]. However, we must be aware of the (con) fusion between medium and interface, which is due to the efforts put on the latter's transparency [6], an ambition that has 'naturalized' smart devices by establishing a forced symmetry between user and computers. This symmetry can make devices more 'usable', but it also deceives, or even annihilates [Galloway 2012, p. 30]. If the interface that works best is the one which is not noticed, which allows us to interact with the content without deviations, and which we consciously perceive only when it does not work, making us nervous, then it means that we are indulging in the illusion of an immediate – not mediated – relationship with what is on the other side of the surface, and manifests itself on the surface. It doesn't surprise that the critical approaches, closer to post-modernism, have responded to the modernist myth of transparency with writings and projects aimed at making the user 'reflect' on her own relationship with artifacts, which is to say with a 'catoptric' critique, as in the well-known cases of Bolter and Gromala [Bolter, Gromala 2003] and Dunne and Raby [Dunne, Raby 2001 and 2005].
However, it could be argued that the computer is rather a 'dioptric' medium, radically different from those that preceded it. According to Galloway, McLuhan and Kittler considered media as externalizations of human beings into objects: this is why theories of mediums often do not consider with enough attention mediation, the key point of interaction and therefore of interfaces. Even Lev Manovich [Manovich 2001], referring mainly to the web and the world of software, according to Galloway would not have realized this enough, even though his work remains relevant as far as it shows the poetic potential of digital technologies and new media, situated in the very characteristics of technology, similarly to what modernism preached.

What has been most criticized of Manovich, starting with Mark B. N. Hansen [Hansen 2004], is primarily the cinematographic foundations of his theories, as if the immobility of the cinema screen and of the spectator, situated in a room with other spectators as if she were in a Platonic cave, were also the inevitable condition of the interface between human and computer.
Attempting a possible history of interfaces, Paul Dourish, about twenty years ago, suggested the possibility of hybridizing the usual technological perspective on the history of input and output devices with a political one (how interfaces have evolved based on what was requested to designers and researchers); he focused especially on phenomenological aspects, on how interfaces were and are designed to employ different human skills and attitudes. As a result, he builds a historical classification in four phases: electrical, symbolic, textual, and graphic, starting from the first computers and arriving at the (then) new tangible and social approaches [Dourish 2001, pp. 5-23]. Computers and digital artifacts can define our being (inter)active subjects, rather than passive spectators. And the interface is the 'in between' place where users encounter representations of the data and notions they use, the threshold which is itself an environment with its own space-time structure that configures rhythms, forms and rules, according to which information passes through the elements which it connects and separates at the same time [Hookway 2014, p. 5].
If we consider Drawing as knowledge built upon a set of specific theories and practices developed over the centuries, with theoretical and applicative foundations and applications that take on increasingly relevant values in the project –also considering the technologies employed and

Fig. 1. Panoramic screenshot view of the Monument Valley game play (Ustwo Games, 2014).

those that are based on those knowledge– we can recognize numerous cases in which drawing plays fundamental roles in interface and interaction design. It has already been mentioned above the importance of optical and perspectival notions in user-centered design models, as well as in those epistemological models that aim at repositioning the user in a more conscious, broad, and complex system of relationships [7]. For example, think of what some define 'fourth person perspective', which is to say a collective – rather than impersonal– and distributed point of view, activated by the collaboration of a system of users but also by the encounter between the disembodied and all-encompassing gaze of cartography with the situated and embodied gaze of perspective, that uses the geometric and mathematical laws of human vision [Koh 2020]. It would be impossible to render this view into a two-dimensional static image, but it is becoming increasingly familiar to those who participate in the creation, or the simple use, of online content in collaborative platforms, such as those video games whose interfaces are made up of different levels: from the one that relies on the avatar's point of view to the infographic of a dynamic plan, full of otherwise inaccessible information.

The evolution of videogames over half a century provides important clues for a possible history of the relationship between digital interfaces and design. In fact, gaming is one of the leading sectors of technological development in the field of digital representation: a relevant symptom can be considered the recent acquisition of Capturing Reality, a company that had developed and marketed one of the most advanced software for photogrammetric multi-stereo matching survey integrated with laser scanner clouds, by Epic Games, a giant company in the world of gaming. The first video games often featured flat figures, closer to schematic orthogonal projections: think of *Pac-Man* in 1980 or *Super Mario Bros* in 1985. Axonometry usually provides the player with maximum control over the scene, a glance 'from above' which, however, does not renounce three-dimensionality and spatial depth, as in the case of *SimCity 2000* (1994) and some subsequent versions, while the first edition of *SimCity* (1989) made extensive use of planometric cavalier axonometries, lighter in in terms of software and hardware management since they involved a single point of view from above. In the *Call of Duty* shooter series (started in 2003), it is instead the point of view (POV) of the protagonist that dominates the screen, but at the top left of the interface it is possible to see a simplified map indicating where she is, in which direction she is moving and which presences she could meet, similarly to what happens in *Fortnite* (2017), another successful multiplayer.

A famous example of how drawing can determine the design of a GUI (Graphic User Interface) in a videogame is given by *Monument Valley* (2014) (fig. 1), where the projective properties of isometric axonometry are combined with the illusions of the Penrose triangle, the Penrose stairs and the engravings by Maurits Cornelis Escher (1898-1972).The Penrose triangle is an impossible object because angles of 60° in the 2D drawing (60°+60°+60°=180°, in the case of an equilateral triangle) are perceived as right (90°+90°+90°=270°, impossible for such a polygon), precisely because of the axonometric conventions in the representation of three-dimensional objects on flat supports. Although the fairy-tale architectures on which the princess –the protagonist of this puzzle game for mobile devices– moves seem perfectly coherent in their three-dimensionality, the isometric axonometry allows transformations of many elements, altering the configuration of the architecture with rotations and translations in ways that would be impossible in physical reality. It is precisely this method of representation that determines all the (inter)actions conceived by designers and developers.

Considering again the notion of interface in its broad meaning, in the various areas that affect interaction design, the relationship between design and drawing is even closer and deeper in the use of optical tools –both actual tools, like cameras, and metaphorical models– in common digital devices: e.g., to run augmented reality applications that need digital clones, digital twins of portions of the real world, or to handle interaction with virtual models (fig. 2), or real vehicles driven by artificial intelligences. If the metaverse promised by Mark Zuckerberg already seems disappointing today, the next big platform could be what Kevin Kelly has called *Mirroworld* [Kelly 2019], a digital clone of the real visible world necessary to make all smart devices work, a map much adherent to the territory generated by processing optical machinic information [8] captured everywhere and constantly updated: a sort of widespread and ubiquitous panopticon, where *the punctum optimum* can be placed virtually anywhere.

The aim at objectivity in representation [9] is accompanied by the impossibility of such objectivity, which underlies boundless possibilities; some of these can be found in a device as well known today for its name, thanks to a very successful television series, as well as it is little known in its

genealogy [10]: the *black mirror*. This is an optical device whose origins are very far, even though most of the information we have come from restricted contexts, especially starting from the seventeenth century (fig. 3). A black mirror can distort the visible that appears to the observer's eyes, at the same time expanding the field of vision (given its convex nature), deforming the image, blurring it and projecting the observer herself onto the reflection surface. The scarcity of literary sources [Maillet 2004, pp. 27 et seq.] contributes to the mystery of such artifacts, which could vary in shape and size and were intended just for science and magic initiates. We find them generally represented as something demonic, even as the 'bottom of the devil' [Maillet 2004, p. 47], because as early as Alhazen they were considered causes of errors, or interfaces for accessing forbidden worlds, so much so that we find them banned by the church as early as the fourteenth century. Jean Ray, in his short story Le *miroir noir* [Ray 1984, p. 316], attributes to the seventeenth-century alchemist Elias Ashmole this passage from the *Theatrum Chemicum Britannicum* (1652): "with the help of this magic stone, one can see all the persons one wishes to see, no matter what part of the world they are in, and even if they are hidden in the depths of the most inaccessible apartments, or even in caves on the bowels of the earth" [Ray 1984, p. 316]. Mirrors made of obsidian or other dark materials were already used for divination purposes by pre-Columbian civilizations [Maillet 2004, p. 53]: they were tools of catoptromancy for initiates, and it becomes so more and more especially during the seventeenth century, given the development during the Baroque of optics and its scientific and magical applications –as in the well-known cases

Fig. 2. Frame of a 2016 video promoting Magic Leap, anticipating the way the startup's platform would have work.

of direct– catoptric and dioptric anamorphoses. What is most interesting here is the power of black mirrors to disturb the observer, because of the way they distort the experience of the world mediated by vision, similarly to what technology does when it allows access to previously unthinkable possibilities, while sometimes plunging the user into uncontrollable, uncanny, or frightening conditions, like in the *Black Mirror* (2011-2019) British TV series. Access to such possibilities and conditions is always mediated by an interface or, better still, 'within' an interface, if we consider it as a place that makes the representation of a content (designed, reflected, …) happen, and 'where' the contact between our experience and that content 'takes place'.
Today, one of the most revolutionary and transdisciplinary perspectives on the notion of interface is probably that offered by Laura Tripaldi [Tripaldi 2022], a chemistry scholar who, based on recent discoveries, argues that innovative materials –and consequently design– should rely less on centralized artificial intelligences, brains that control organisms similar to human beings or to robots that belong to our science fiction imagination, modeled on us, and instead more and more on widespread, diffuse intelligences, organisms without a proper brain but capable of adaptations to the environment, perceiving it with their whole 'body' and responding accordingly, with the same 'body'.
For example, by placing oat flakes on the hotspots of a Tokyo city map and growing a specimen of *Physarum polycephalum*, a mucilaginous mold –most precisely: a protist– a team of scientists from the University of Hokkaido discovered in 2010 that the organism grew and expanded spontaneously, creating the most efficient connections, similar to those that engineers and designers had spent many years estimating for the Tokyo city's rail transport network [Tripaldi 2022, p. 44]. *Physarum polycephalum* does something similar to what "in computer science is known as morphological computation, i.e. it is able to 'think with form', modifying its body to build complex networks that would require a prohibitive amount of calculation time for ordinary computation" [Tripaldi 2022, p. 46]. Its intelligence, which redraws its configuration instant by instant, "is built into the interface: its brain, if we can call it that, is precisely its surface, the cell membrane that both separates it from the world around it and allows it to actively interact with its environment" [Tripaldi 2022, p. 54]. The most interesting robots of the future could be just *soft robots*, automatons that are 'soft' but capable of performing much more complex tasks than we can imagine.
This perspective forces us to rethink the 'representational' cognitive model on which we traditionally base our relationship with the world and with knowledge, which «implies that intelligence is to be identified with a centralised model of consciousness: the only authentic form of cognition would be one that builds a model of reality before being able to act upon that reality. On the contrary, for an organism like polycephalous slime or an intelligent synthetic material, there is no representation of reality that precedes and directs action. Instead, intelligence and action are one and the same: every signal that comes from outside determines an immediate and contemporary response to the stimulus received» [Tripaldi 2022, p. 67]. Control is therefore delocalized and widespread. Tripaldi writes: "we are used to thinking of our perceptual experience as a mirror in which we see the reflected image of an objective reality always separate from us. It is not really important whether we believe that this reflection is perfectly accurate, skewed, or faulty in some way: in any case, the perceived object does not actively participate in cognition" [Tripaldi 2022, p. 74]. This happens instead in the case of 'intelligent materials', which are therefore not simple tools or extensions, as it was for McLuhan, but, potentially, they actively participate in the hybridization with our body and our culture. In these cases, intelligence emerges mostly from relationships.

Conclusions

There are close relationships between drawing and design [11], as well as between projection and project. Like words and language, drawing is an emanation of thought and has the capability to transform the world: when it is intended as project, it acts as an intermediary between knowing and doing.
The perspective that Tripaldi develops starting from her chemical knowledge is revolutionary not only for its epistemological significance, but also because, at the same time, it opens to ways that are free from the domination of optics, which has characterized at least the last six centuries of human history: «the spider is almost completely blind and has a rather simple central nervous system, which makes it incapable of storing long-term information or constructing a mental representation of its surroundings. In spite of this, it is able to orient itself within the complex three-dimensional space it inhabits, building with its own silk perfectly symmetrical structures that are of enormous dimensions relative to

Fig. 3. Claude glass, or black mirror, in shark skin case, believed at one time to be the scrying mirror owned by John Dee (1527–1608/9), the Elizabethan magician.

its own body, something that would be very demanding even for a human individual. The way in which the spider manages to accomplish such a complex task is determined precisely by its ability to use silk to draw a geometric map of the space around it, using it as a sort of spatial memory external to its body» [Tripaldi 2022, pp. 157, 158].
We are not spiders, but human beings; we cannot give up representations, to understand and to design. Our interactions with the world are not mediated by cobwebs we weave, but can be anyway augmented by the technology we continue to develop and use (fig. 4). Research on materials and on animal and plant behaviors seem to suggest lines of research that have never happened before, not only for all the design fields, including interaction design, but also for the disciplines of drawing: how to understand, govern and use forms of intelligence which are non-representational, but which could be the last hopes remaining for a habitable planet?
As with artificial intelligences, the big problem arising is how to deal with the unrepresentable, with what we cannot represent, because it is alien or inaccessible [12]. But we can count on the same cultural tools that our fellow humans used, already thousands of years ago, while facing what was unknowable to them: on the one hand, continuing to formulate and experiment with 'models', as we are part of a scientific community; on the other hand, refining metaphors and myths, such as that of Arachne. A first step may consist in trying to observe ourselves 'in fourth person', reflected in some appropriately designed magic mirror [13], using and developing the laws of drawing.

Notes

[1] Cfr. Cramer and Fuller [Cramer, Fuller 2008, p. 149].

[2] According to Devoto-Oli Italian dictionary. In English, 'interface' has been used extensively especially since the 1960s.

[3] These definitions, here translated, come from the Devoto-Oli dictionary. They have not been changed or updated during at least the last decade.

[4] The first study to fully reveal this genealogy was probably Friedberg [Friedberg 2006].

[5] This perspective might change if the notion is considered in specific fields, such as cybernetics or systems theory.

[6] The fundamental reference book that called for the need for transparency of interfaces, with enormous success among designers, is Norman [Norman 1998]. On the pervasiveness of the notion of transparency in the contemporary era, the most famous text is probably Han [Han 2015], which synthesizes and attempts to apply some philosophical ideas coming from the twentieth century.

[7] See Bergamo [Bergamo 2013].

[8] See, e.g., Arcagni [Arcagni 2018] and Anderson [Anderson 2017].

[9] On this topic, see Daston and Galison [Daston, Galison 2007].

[10] Some years ago, Arnaud Maillet remedied this gap with the publication of his research on the Claude Glass (this name coming from seventeenth-century French painter Claude Lorrain, although there is no certain evidence that he used such devices), a dark convex mirror that we can consider as a generalization of the black mirror.

[11] On a very pragmatic level, see e.g., Buxton [Buxton 2007].

[12] See in particular Bridle [Bridle 2018] and Bergamo [Bergamo 2020].

[13] By 'magic' I intend here a transformative potential, that also belongs to the technical world. See Campagna's book on technic and magic [Campagna 2018] and Marini [Marini 2022].

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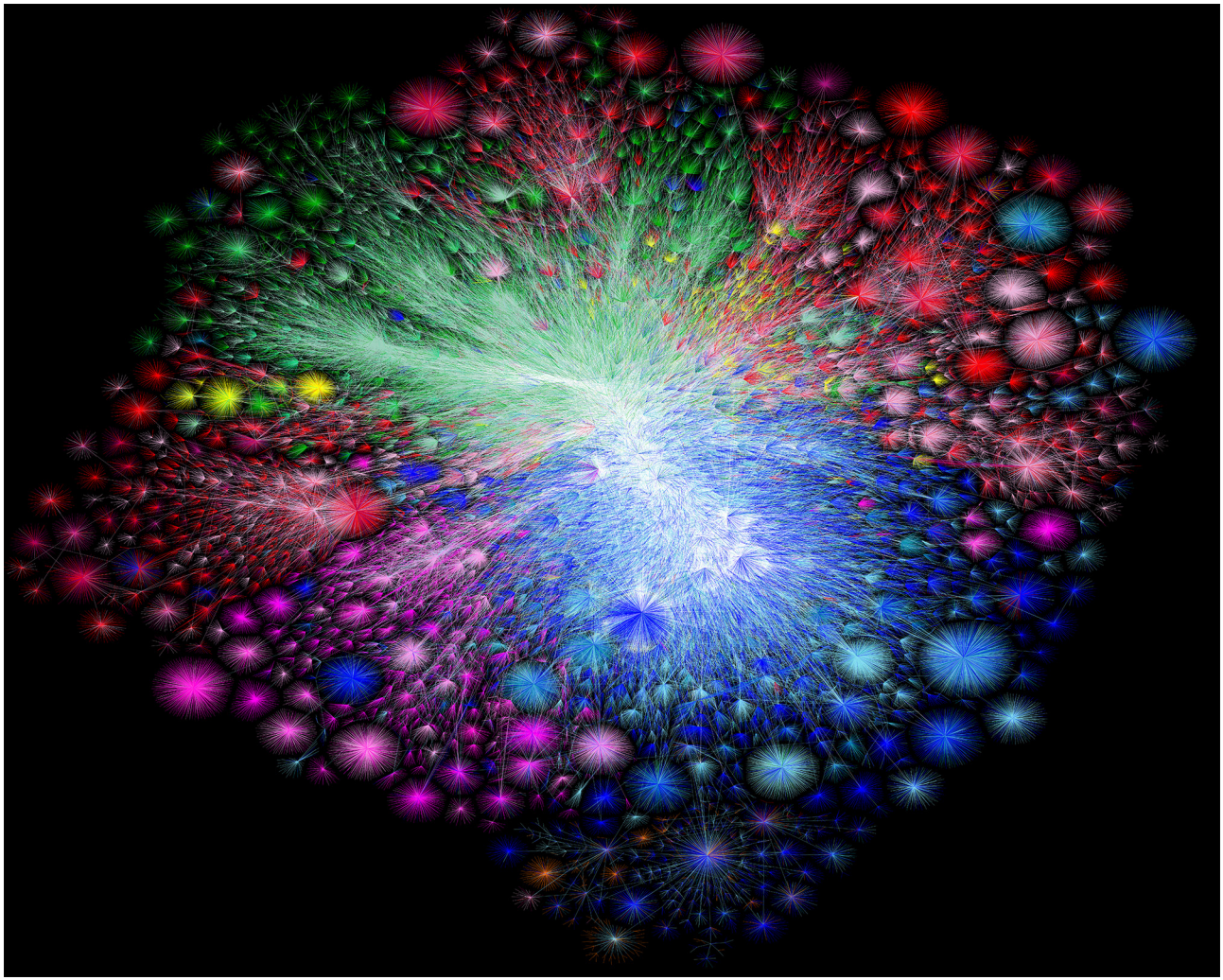
Fig. 4. Frame of a video showing the evolution of the map of the Internet from 2001 to 2021, Opte Project. The world wide web is a distributed network, a much-deployed model in today's information technologies.



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Hand Drawing and Zoomorphic Design. Nature Explored by Representation: a Discontinuous Story

Matteo Giuseppe Romanato

Abstract

The relationship between hand drawing and zoomorphic design can be traced through a non-linear genealogy, which shows different enquiries of artists, artisans and designers into the natural world. It has been precisely the idea of nature that has led the eye and the hand to seek solutions and answers to design questions from different eras. The common thread that binds these experiences, however, is always dictated by the organic forms of plants and animals, which elude the geometric knowledge of architectural representation as consolidated by Albertian Humanism. Late Florentine Mannerism captured the unpredictability of natural forms, which were being collected by naturalists at the same time, and turned them into playful grand-ducal manufactures. After that, unfortunately, some isolated attempts, such as those by Lequeu, were unable to go beyond a superficial and sculptural evocation of animality. It was with Art Nouveau that Gallé and Guimard could read natural shapes as the most suited forms for the materials and decoration of an era that desired to escape from an exhausted historicism. Carlo Mollino was far more aware of the resources that the animal body can show in its anatomical structure, and he used hand drawing in a surprisingly wide range of manners. All these experiences can finally provide a conceptual background for the challenges of recycling and upcycling design in the face of artificial nature created by man in the Anthropocene era.

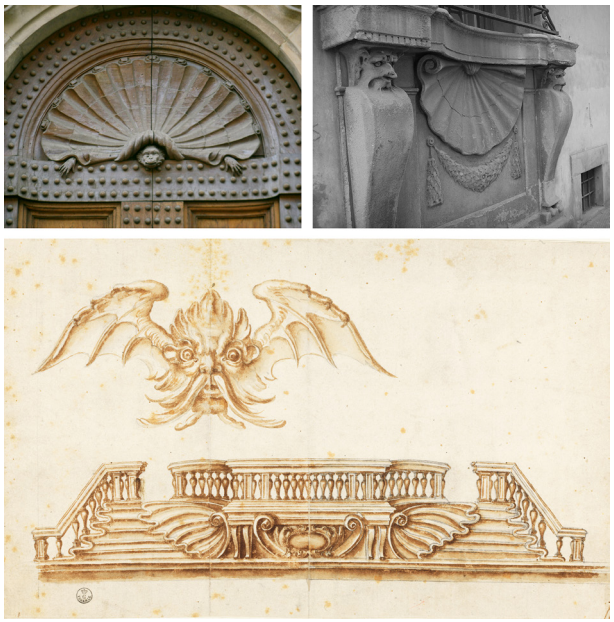
Keywords: Florentine Mannerism, Émile Gallé, Hector Guimard, Carlo Mollino, upcycling design.

Introduction: maker and nature

"I resolve on this, that certain principles, and perfections, and rules of any art or discipline shall be extracted from nature; and if we want to examine and use them, by paying attention, and taking care, we will undoubtedly make very well all what we will undertake" [Alberti in Bartoli 1804, p. 110].
From these words by Alberti, taken from *De Statua* in the famous sixteenth-century translation by Cosimo Bartoli, the confidence of the early Renaissance humanist in nature stands out as, explored with virtue and human intellect, it would not have denied teachings to sculptors and craftsmen to carry out any work. Although it has already been debunked that all the measurements made by Alberti rely on empirical observation [Aiken 1980], Panofsky's assertion [Panofsky 2010, 95] is still acceptable as he claims that Alberti and Leonardo were the first to dare to approach the living body with compass and square. Yet it must be remembered that, for Alberti, art 'does' not imitate nature from a figural point of view, but creates an analogy with the "*eidos*", after having grasped the phenomenology of its entire beauty and unveiled the causal links that regulate its harmonic development" [Panza 1994, p. 145].
Without entering into the philosophical debate on Albertian theories, it can however be stated that the idea of nature as a source of truth and beauty, supported by humanistic reflections, became part of the artists' imagination. This habit of mind ended up fuelling an almost inevitable *topos* in the mythography about the training of young painters,

who responded to an irresistible call of the innate genius through their early drawings of plants and animals [Kris, Kurz 1989]. In the above mentioned essay by Panofsky [Panofsky 2010] the author argues that the history of the representation of the human body is the mirror of the history of styles, but it can also be claimed that other living beings, such as plants and animals, have entered the repertoires of representation, although they have followed less structured paths through considerable temporal leaps.
An in-depth discussion about this issue would go beyond the purpose of the present essay; however, over the course of history, it is possible to touch upon some relevant moments that can shed some light on the complex intertwining of natural world, representation and phytomorphic or zoomorphic design. This kind of inspirations have often been deeply influenced by the configuration of cells and the development of organic tissues, these natural forms have naturally oriented representation towards alternative parameters, if compared to the established canons of architectural design. As it will be shown below, the manual sketch, traced on living bodies and on natural life, suggests different horizons of meaning with respect to the Euclidean control of the form and the perfection of Platonic solids.

Fig. 1. B. Buontalenti (1531-1608): a) Portal of the Casino Mediceo di San Marco (1570-1574), (photo by Sailko); b) Detail of the kneeling window of the Casino Mediceo di San Marco (1570-1574), (photo by Sailko); c) Drawing for the stairway of the church of Santa Trinita (1574), (Gabinetto dei Disegni e delle Stampe degli Uffizi n° 2324 A).



The drawing of mutant and amazing nature

Even at the time of Bartoli, Alberti's complex relationship with nature was replaced by anatomical investigation in artistic practice. If in the fifteenth century painters and architects debated with mathematicians and geometry scholars to study perspectives and representations of solids in space, in the sixteenth century the drawing of the human body rivalled physicists and doctors in investigating, *in corpore vili*, limbs, muscles, bones and viscera of the God's favourite creature, leaving us a corpus of extremely fascinating representations [Carlino, Ciardi, Petrioli Tofani 2009]. Since the second half of the century anatomical studies had been accompanied by the first extensive naturalistic inquiries such as those of Ulisse Aldrovandi, supported by large collections. In this way a knowledge was being formed, which would later be subject to publication in the form of books that were sometimes even unreliable from a scientific point of view, but, in any case, embellished by wonderful illustrations [Olmi, Tongiorgi Tomasi 1993], where the bizarre and the monstrous were not lacking [Aldrovandi 1642 and Caprotti 1980].
Still in the sixteenth century, almost as a consequence, artists began to experience a more fluid, reactive, hybrid relationship with a natural world pervaded not only by divine intelligence but also by magic. Hence, this new face of the universe seemed to be responsive not so much to mathematical investigation as to imagination and combinatorial curiosity. An intriguing clue already appeared in an ambiguous hint by Serlio in his Libro *Extraordinario* with a reference to a hypothetical 'bestial order' [Serlio 1551, porta XXIX]. But it is in the world of late Florentine Mannerism that perhaps the most fascinating forms of drawing can be found when goldsmiths, silversmiths, decorators, jewellers (who could be defined *ante litteram* designers) wanted to follow a completely different *mimesis* from that of Humanism.

Under Francesco I de 'Medici, a lover of alchemy, there was no longer a perfective *mimesis*, which Alberti also relied on, but rather a fluid and transformative emulation in the name of elegance, *sprezzatura* and whimsy. That new sensibility found expression above all in the work of Buontalenti who, in the Casino Mediceo di San Marco, inserted animalistic decorations in the usual sixteenth-century elements (fig. 1a) or reinvented Michelangelo's 'kneeling' window of Palazzo Medici-Riccardi, turning it into a monstrous ornament (fig. 1b). To approach a fascinating and terrifying natural world, compass and square, as Panofsky argued, were of little use; drawings had to be sketched by hand as it clearly emerges from the project for the stairway of S. Trinita (fig. 1c).

In this work, now moved to the church of Santo Stefano al Ponte, clearly Buontalenti also treasured the Laurentian vestibule but the deformation of the winding profiles declares a strong kinship with the rest of his production for the grand-ducal court. Somehow it is an experimentalism that seems even more deeply rooted in the theory of alchemical transmutation than Parmigianino's debated relationship with Hermeticism [Fagiolo Dell'Arco 1970].

In that declining Florentine world, which created his own figurative imagery [Berti 1967], Giambologna was called to make little bronze sculptures of birds with the precision of an ornithologist [Paolucci 1999] and Jacopo Ligozzi drew snakes, lizards, fishes and animals, just arrived from the New World, with almost Flemish details.

The artists, however, also tried their hand at fanciful zoo-phytomorphic experiments, so much so that Ligozzi himself invented disassembled drinking cups, in which the liquid seems to come out of a sort of cluster or perhaps a pumpkin, which, however, can also be assimilated to a tentacle with suckers (fig. 2a). Two jugs, where to mix wine, water and ice, are even more interesting (fig. 2b). Especially in the upper drawing, it seems to recognize almost a corallogenic concretions but also an allusion to the precious shells of exotic molluscs mounted in metal by silversmiths.

Despite the redundant shapes of Baroque, with all its opulence of architecture, furniture, and objects, such experimental interpretations of Mannerism would not be revived by seventeenth century artists, having to respond more to the celebratory needs of religious and state institutions than to potentially destabilizing provocations.

Although Buffon reasserts that "all the ideas that shine in the arts have their models in the productions of nature" [Buffon 1959, p. 25], even the eighteenth-century rationalist classicism confined the imaginative relationship with nature to an eccentric artist like Lequeu. In the case of the visionary French architect, the use of an *animalier* fashion was often limited to ornamentation (fig. 3a), while certain provocative and utopian buildings (fig. 3b) were more similar to inhabited sculptures (ideas already conceived by Giambologna in Pratolino or by Pirro Ligorio in Bomarzo) than to real reinterpretations of animal shapes, so much so that they could only exist in personal drawing sheets [Lequeu 1777-1825].

Fig. 2. J. Ligozzi (1547-1627): a) Drawing for glass (Gabinetto dei Disegni e delle Stampe degli Uffizi n° 97163); b) Design for two jugs to mix water, wine and ice (Gabinetto dei Disegni e delle Stampe degli Uffizi n° 97178).

Fig. 3. J.-J. Lequeu (1757-1826) : a) Porte de sortie du parc des plaisirs, de la chasse du prince [Leque 1777-1825, Figure 175]; b) Lequeu L'étable à vache tournée au midi est sur la fraîche prairie [Leque 1777-1825, Figure 174].

This can be confirmed by the traditional features of many others of his projects, but above all in the attempt to reduce even the representation of the human face to the traditional parameters of descriptive geometry [Lequeu post 1778-1779]. It is not possible to know how much Lequeu's drawings have been seen and disseminated but the fact is that his work has remained almost unknown, as much as that of Charles Ribart and his *éléphant triomphal*, until its rediscovery in the twentieth century [Kauffmann 1952].

Drawing from nature

To have a substantial change in the relationship between natural world and design, it was necessary to await *Art Nouveau*. The foundations of the new floral style were clearly stated by Émile Gallé when he argues that furniture "will have vital lines and specific details deriving from the physiological features of various species of flora and fauna, adapted to each material" [Gallé 2009, p. 84]. On the contrary, the furniture made up to then "are purely geometric laboratory combinations, and not living concepts resulting from the observation of natural organisms" [Gallé 2009, p. 93]. Implicitly, Gallé seems to counter the anthropocentrism of Humanism when he writes that Renaissance wanted to reproduce "the body of an animal that is well known to the public, the Man" also in furniture, claiming instead, for his part, that he would rather choose "in the large collection of living beings the curvature of the hippocampus or the tremors of a neuropteran's wings, as a support for a shelf" [Gallé 2009, p. 99].

Fig. 4. Atelier di Émile Gallé: a) Model for ashtray with snail, 1885; b) Model for a ceramic and glass vase, 1880; c) Model for decoration of a majolica writing desk with shells, 1889; d) Four-sided model for two vases, 1885; e) Model for a vase in the shape of a pitcher, 1882-1884; f) Wase with trout and fly, 1885-1900 (photo by Saiko). 4g. Project of a vase mounted in bronze, 1890 circa.

Furthermore, what is important to Gallé is not only the object of representation but also the connection between material and drawing. Glass and ceramics actually imply the ineffectiveness of the geometric line, which is difficult to reproduce on the object because of viscosity, processing and firing of such materials. But above all, it is the natural form that must be combined with the design of the object it should decorate. Therefore, the image of a snail, replicated along a spiral path, can adapt well to an ashtray (fig. 4a), a flight of butterflies embraces a ceramic and glass vase (fig. 4b) and an arabesque of shells lies on a majolica writing desk (fig. 4c). Furthermore, precisely in consideration of the final effect, Gallé needed to produce the atelier models in colour, which is often a hallmark in his drawings (fig. 4d).

Obviously, a good understanding of three-dimensional geometry was in any case necessary to deal with the unrolling on the plane of a decoration that needed to adhere to a jug (fig. 4e). However, his most fascinating results are those drawings that stand out as real works of art when they can render the final transparency through soft and delicate strokes (fig. 4f). On the other hand, for a different product such as a vase mounted in bronze, ordinary graphite on wove paper can immediately depict the crumpled shape of an orchid or an iris (fig. 4g).

The charm of those representations, however, must not lead us to forget that Gallé did not make personally his own pieces of art, apart from the works of his early years, but he just supervised the execution, leaving them to the hands of skilled craftsmen. Cartoons, sketches and finished drawings must therefore be attributed to an atelier of talented collaborators, designers, ceramists and glassmakers.

And Gallé always advises them: "multiply your sketches, but compare them to the living model" [Gallé 2009, p. 104].
The passion for colour and transparent materials also caught the interest of the greatest architect and interior designer of Art Nouveau France; Hector Guimard. For the decoration of Castel Béranger, Guimard drew a window carefully studied through the insertion of coloured glass pieces (fig. 5a). Thanks to the alternation of opaque and transparent surfaces, the effect suggests to the observer that he find himself inside an aquarium, a form of exhibition of the animal world that had become one of the *fin de siècle* aesthetic models [Harter 2002].
Nevertheless, Guimard achieved his most astonishing result with a study sketch for the lighting system of Paris metro stations (fig. 5b). Here his hand was truly led to follow the magmatic genesis of a living form in its natural development. It is a somewhat mysterious drawing, where biological forces seem to reflect the echoes of a dried stem, the remains of a chrysalis or even the incongruous assemblage of animal bones.
What is certain is that precisely his soft and fluid design, combined with a naturalistic colour of cast iron, was able to make the metal of the *métro* acceptable to a middle class not yet accustomed to the aesthetics of industry (Canac 2014, p. 39).
In the era of Positivism, a special attention was also paid to the scientific representation of natural organisms. *Kunstformen der Natur* (Haeckel 1904), a fairly successful book at time, shows colourful plates, especially featuring marine animals (fig. 6a), including the *Rhopilema Frida* (fig. 6b), captured by Haeckel in 1901. If Gallé, Lalique, Guimard, and Majorelle drew from nature, critically reinterpreting it, the sculptor Constant Roux created chandeliers for the new oceanographic museum of Monaco (fig. 6c) under the fascination of the jellyfish sketched by Haeckel, at the extreme limit of mimetic cast. This is perhaps a one of a kind example, but it marked a threshold beyond which it would be difficult to proceed.

Carlo Mollino, a new approach between dynamics and bodies

Among the Italian architects and designers, perhaps Carlo Mollino is one of the most difficult to label. It is possible, however, to highlight some rather evident formal references that can suggest how his work follows in the wake of those designers and draftsmen who have been shown so far. Some allusions are almost obvious such as in his text *Architettura Arte e Tecnica* [Mollino, Vadacchino 1947] where he compares the logarithmic spiral of the nautilus with the volute of the Ionic capital (fig. 7a). Although the reference to the golden ratio is no longer sustainable [Bartlett 2019], yet this simple pencil drawing testifies to his attraction towards the forms of nature, even at the cost of implicitly countering Gallé's assertion for whom "nature does not know […] the theory of the three architectural orders" [Gallé 2009, p. 112]. Mollino also pays homage to the dy-

Fig. 5. H. Guimard (1867-1942): a) Drawing of a window for Castel Béranger, 1898 (Guimard, H. (1898). Le Castel Béranger, oeuvre de Hector Guimard, planche n° 48. Paris: Librairi e Rouam) ; b) Pencil drawing for Paris metro lantern, 1901 circa (Musée d'Orsay, Inv. GP364, Parigi. Copyright: ©Musée d'Orsay, Parigi, Francia. Foto SCALA, Firenze).

Fig. 6. Discomedusae: a) Plate 8; b) Rhopilema Frida, Plate 88 (from Kunstformen der Natur, 1904); c) Constant Roux, Chandelier of the Oceanographic Museum of Monaco, Salon d'Honneur, 1908 (photo by M. Dagnino, Musée Océanographique; digital reworking M.G. Romanato).

namism of a heron's flight in a sequence almost extracted from Marey's chronophotographic gun, but drawn in pencil (fig. 7b) and, not by chance, he declares himself fascinated by the "flight path" of a bird of prey or by the "functional beauty" [Mollino, Vadacchino 1947, pp. 63, 64] of a feather. Therefore, not surprisingly, in Mollino's drawings it is possible to read a deep interest in space, explored through freehand sketching such as in some preliminary studies of dancers for the project of the Teatro Regio (fig. 7c).
It has long been known, however, that the living body is one of Mollino's sources of inspiration. On this issue, Fulvio and Napoleone Ferrari could show noteworthy comparisons with anthropomorphic and zoomorphic morphologies for many of his projects [Ferrari, Ferrari 2006, pp. 50, 51, 74, 106, 134, 162-165].
Mollino, for example, showed the features of his 1947 armchair for CADMA (fig. 8a) with a drawing in which

Fig. 7. C. Mollino (1905-1973): a) Drawing of shell and volutes of Ionic capital for Architettura. Arte e tecnica, 1947 (ACM Man2 p58 59 f123); b) Disegno per Architettura. Arte e tecnica, 1947 (ACM Man2 p66 67 f147); c) Detail of the Study sketches of dancers for the project of the Teatro Regio, 1965 (ACM P17B 402 023).

the lines seem to recall the shape of a gazelle on the run [Ferrari, Ferrari 2006, p. 126].
Among animal forms, Mollino could actually find stimuli for design with the same joyful vitality of Tuscan Mannerists. Up to now, no one seems to have recognized in the *dormeuse* for the furnishings of Minola house an intriguing resemblance with the profile of a tortoise (fig. 8b), which is clearer in the drawing than in photographs. But, above all, Mollino had a deeper interest in the anatomical and functional structure of animals. In many of his pieces of furniture a biomechanical pattern of combined forces and masses can be noticed and Mollino knew well that topic, having written on it about skiing [Mollino, 1950]. From this point of view, Mollino was profoundly different from his forerunners listed in the first part of this essay. In his eyes, those animals must have appeared as complex machines as his airplanes and cars, so much so that he claims; "Just think of how distant the fuselage of a glider is, in comparison with the heron's rib cage" [Mollino 1941, p. 4].
Thus, in the table for Minola house, it can be supposed that Mollino replicated the tense and punctiform structure of the leg of a locust, accompanying the technical drawing with a hand sketch representing the joints to support the glass tops (fig. 8c), as if they were wings. The designer's aim is therefore to appropriate balancing of masses, shapes, and frames, to be transform them into furnishings. In the 1948 office table for Reale Mutua Assicurazioni, for example, it seems to notice an analogy between the strut and trestle structural model and the anatomy of the opposing limbs of a deer. Therefore skeletal structure became a dominant theme such as in the top supports of his '*vertebrae*' table (fig. 8d), and it was replicated, not by chance, several times. The most fascinating version is perhaps the furnishings of the exhibition for the museums of the United States in 1950, where Mollino could compose almost a whale skeleton with the ribs supporting the crystal.
Yet Mollino also considered drawing a direct expression of his concepts. Having to create the movie scenography for *Femmes d'Escales* in 1945, he managed to synthesize the path of a flight of stairs with a single snake-like stroke of Indian ink on paper in an almost calligraphic style (fig. 9a). In the same way, the reconstruction of the Teatro Regio was outlined through few thick strokes to sketch out the idea of a shell-like roof supported by ribs, so much resembling a mollusc valve (fig. 9b).
His vibrant and personal mark appears almost like a signature even in small landscape sketches that try to enclose

the design idea between background and foreground. This is the case of the small drawing, almost an idyll, for the project of the Equestrian Center in Rome (fig. 9c). On the contrary, dirty strokes serve to reduce the artificial hardness that modernist architecture has always destined for banisters. Thus in the Lutrario ballroom the balustrade (fig. 9d) seems to support vine or wisteria shoots with a broken rhythm.

Yet, an essential fact in Mollino's biography should not be forgotten, and that is his clear awareness of Surrealism. Suffice to say that, in the 1930s, he was one of the few Italian architects who owned the entire collection of Minotaure [Ferrari, Ferrari 2006, p. 34].

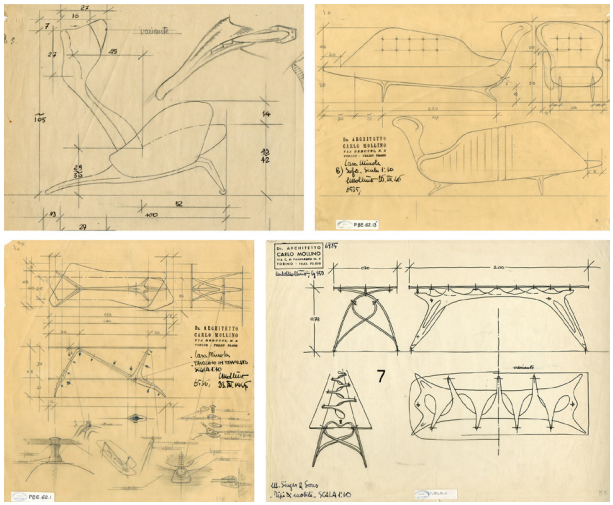
That allows us to explore, with more awareness, the relationship between photography, drawing and furniture of one of his most intriguing works; *Bedroom for a farmhouse in a paddy field*, designed for *Domus* magazine [1943]. Although it is a project from the 1940s, through a comparative analysis of images, it is possible to go back to a probable formal reference of 1935. That is the photograph *The enchanted room* (fig. 10a) staged by Mollino in the studio of Pietro Martina and rightly correlated by Federica Rovati with the cultural surrealist environment of Turin in the 1930s as well as with the previous interior arrangements of Miller and Devalle houses [Rovati 2006, pp. 66-74]. However, it is curious to note how some elements seem to be reinterpreted later in a preparatory sketch (fig. 10b) precisely for the 1943 publication. Certainly, about this project, ideal analogies with Albini's Room for a man at the VI Triennale of 1936 must be recognized [Irace 2006, p. 86], but the study sketch leads us to hypothesize a sort of morphogenesis of its composition and relate it to the 1935 shot.

Through the pencil drawing, it may be inferred that, in this sketch, the curtains reproduce the heavy curvature and consistency of the 1935 photograph and assume the angularity and thinness of mosquito nets only later in the project of 1943 (fig. 10c). Similarly, proceeding backwards, the mirror with the self-portrait of the final version can be traced back first to the picture of the sketch, in which a woman's gaze is reflected, and then to the framed canvas placed more in depth in the 1935 photograph. Starting again from this shot, it can be noticed how the oval mirror, which reflects a part of Mollino's body, leaves its function of evoking a wider space to the trapezoidal frame of the two following versions. It is also evident that the vertical black mark, strongly emphasized in the drawing as a central axis, mimes the table where a shell (not surprisingly a zoomorphic reference) and a vase are; and then disappears later in the final version. It can then be observed that the female legs in the sketch, placed more laterally than in the final solution, seem to be the evolution of the decorated sheet of paper in the photograph. Furthermore, the large unframed canvas on the left of the 1935 shot first leaves a thick pencil stroke in the intermediate phase and then is totally eliminated.

Therefore, focusing on the hand sketch, it can legitimately be argued that this is an intermediate stage between the final project and the photograph, even perhaps only at the level of an unconscious surrealism.

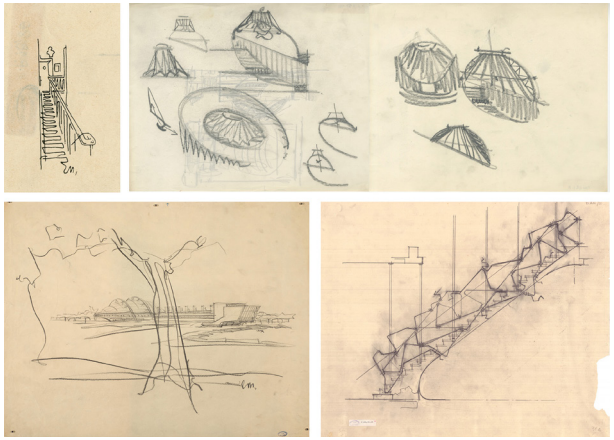
Again in the hand drawing, it is interesting to note, even more than in the final version [Forino 2001, p. 51] how an observer can feel the strange sensation of being in a cocoon, or still inside an aquarium, wrapped in falling soft drapes and no longer in the glass inlays of Guimard. And perhaps this claim is not so far from the truth when the colourful and fluid environment of Lutrario ballroom is taken into account, as it is in some way similar to the interiors of the Atelier Elvira by Endell, the so-called *Polypenrokoko* building.

Fig. 8. C. Mollino (1905-1973): a) Armchair for CADMA, 1947 (ACM P8F 69 17); b) Dormeuse for Minola house, 1944-1946 (ACM P8E 62 13); c) Small table for Minola house, 1944-1946 (ACM P8E 62 001); d) Vertebrae table for Lattes publishing houses, 1950 (ACM P8B 35 6).



Finally, in Mollino it is surprising how the strokes bundles in the sketches for the house of a sculptor in Aci Trezza of 1944 (fig. 10d) contrast with the extreme sharpness of his presentation drawings for other creations such as his *House on the hill*. For this project Mollino relied on an eclecticism that must be interpreted "in the sense of synthesis and original rethinking" [Mollino 1944, p. 8] and elaborated a building, composing a *domus* and a basilica. Yet in the highly controlled perspective view of the living room, regularly marked by vertical and horizontal grids (fig. 12e), the recovery of the seventeenth-century decoration stands out as well.
It is actually the image of an architectural *quadratura* which should have been projected in the evening onto a parabolic vault working as a Baroque 'light chamber' during the day. In this case the design of the physical space and the interchangeable image (we would call it light design today) have the same presence. After all, already in the letter accompanying his project of the *House on the hill* for *Domus* in 1942, Mollino writes that he feels at ease in an environment that is "as neutral as I could wish for: it does not disturb me, it does not rouse me to mistakes, but it leaves me free to be alone with my fantasy, let's call it my inner landscape" [Irace 2006, p. 82]. In other words, an environment that is natural, yet made of study, drawings, designs.

Fig. 9. C. Mollino (1905-1973): a) Scenography for Femmes d'Escales, 1945 (ACM P9B 86 027); b) Sketches for the roof of the Teatro Regio, 1965 (ACM PdV 42 3 (8), ACM PdV 42 3 (10)); c). Project sketch for the Equestrian Center in Rome, 1938 (ACM P1 1A 140 242); d) Drawing for the Lutrario ballroom, 1959 (ACM P9A 30 31).



Conclusions: towards a design without drawing

The fluctuating relationship between design-oriented drawing and zoomorphisms often shows results of great worth, but it assumes necessarily discontinuous outlines. However, it is possible to recognize a common thread linked to the manual drawing as the best way of grasping a universe of organic shapes which, by their nature, escape the geometric rules of exact quantitative measurement. But what can be the sense of nature that today's design must be able to find in all that? The current era is probably the most mature stage of the Anthropocene [Lewis, Maslin 2020] in which man has covered the earth with his own waste products. However, it would be defeatist to delegate the mere function of dating a future geological stratum to all that material. If the products of industry and design are today's landscape, it can be argued that this is the nature in which human beings live by now. It is a heritage created by the man himself but it is not seen as a resource yet. Since the 2000s, design has been oriented towards an approach that includes sustainability, reuse of products and low environmental footprint. The natural outcome of this trend is the need for 'recycling', but even better for 'upcycling', [Sacchi 2021, Pulvirenti 2009], which is a limited re-working of an object, at the end of its useful life, to be integrated into a new product.
A chapter on this issue and its contemporary evolution would require a further essay. However, some examples can be given to illustrate a concept that is still unfamiliar to the general public. An old suitcase with straps, for example, once placed vertically and attached to the wall, can easily become a small cabinet. After pedals and handlebars are locked, a bicycle can hold up a washbasin, towels or a laundry basket, making an equipped bathroom wall less anonymous. Old cutlery can be used to hang kitchen towels, if they are simply crooked and nailed to the wall.
In this sense it is also conceivable that design can be finally rescued from market forces and left to the imagination of individuals who can, therefore, experience a satisfactory emancipation from industrial technology and the logic of consumption.
Exhibitions have now brought to light how, in front of the challenge of global capitalism, an increasing number of people in developing countries have long since faced the problem of searching for basic resources and have been forced to make the transformation of discarded materials into a real necessity [Irace 2013].

That lesson can also be introduced into advanced countries only if design can manage to take a further conceptual step and assume the responsibility of the ecological approach. This means welcoming the suggestions from the plant or animal kingdom, so that the natural world is no longer dominated and exploited but only symbiotically lived. These phytomorphic and zoomorphic references, as it has been seen so far, have taken shape several times in the history of art and can still offer a wide range of possibilities to designers.
Trivial fragments of broken ceramics, for example, rearranged to create multicoloured paving like on a Mannerist shelly beach, would have delighted Buontalenti in his Boboli caves.
Old empty bottles, reused as luminescent bodies like jellyfishes and abyssal creatures, can easily respond to the ambitions of positivist sculpture, without replicating its banal mimetic matrix.
Damaged safety glass, with its cracks following the trajectories of internal forces, does not appear very different from insect wings with their nervures, which perhaps Gallé or even Mollino would have liked, and, once properly sealed, could be reused as a worktop.
From this point of view, the challenge to representation is perhaps equally hard. The message that can be suggested is that the rigorous norms of technical drawing based on descriptive geometry turn out to be redundant or can diminish their meaning in front of upcycling design. More precisely, the issue of upcycling design concerns the resemantization of objects, but working first of all with the disarticulation and recombination of bodies through the topological concepts of continuity, connection and convergence.
In this sense, an encouragement can come from a movement, often misunderstood in its deep reasons, that wanted to see nature no longer as a mere source of metaphors but as a fertile ground for avant-garde art experiments; and that is Arte Povera. Germano Celant, the critic who coined the term itself and was able to encompass various trends of the sixties within it, has recognized its tendency "to reduce the image to the pre-iconographic stage, a hymn to the banal and primary element" from which "a physicalisation of an idea, an idea translated into 'matter', derives" [Corbi 1969, p. 27].
It is undeniable therefore that, for upcycling design, the request to compose artefacts with recycled objects compels makers to consider these elements as ready-mades, which do not need specific projects, ruled by executive drawings, but rather a functional reformulation through hypotheses for assembly and reinvention still to be defined.

Acknowledgments and image credits

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Fig. 10. C. Mollino (1905-1973): a) The enchanted room, 1935 (ACM 4 19 003); b) Sketch for Bedroom for a farmhouse in a paddy field, 1943 (ACM P9C 92 023); c) Project for Bedroom for a farmhouse in a paddy field, 1943 (ACM P9C 92 35); d) Sketches for Mastrojanni house in Aci Trezza, 1944 (ACM P11C 149 004 e ACM P11C 149 014); e) Sketches for Mastrojanni house in Aci Trezza, 1944 (ACM P11C 148 2).

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Taxonomic Extroversions of Interior Design and Axiology of Drawing

Fabrizio Gay

Abstract

In understanding the multiple relationships between 'drawing' and 'interior design' we realize the techno-aesthetologic nature of the drawing discipline. Here we propose to do this in the light of two notions that we consider coextensive: the psychological one of 'affordance' (James Gibson) and the philosophical one of 'atmosphere' (Tonino Griffero) which –according to a particular neuropsychological definition of 'conscience' and 'feeling' (Antonio Damasio) –practically highlight the 'what', the 'almost what' and the 'not-what' can be represented for descriptive and prescriptive purposes when studying or designing –drawing– an environmental artifact. The crucial question is: 'how are atmospheres depicted?' A question that is usually considered pertinent to individual poetics, which cannot be analyzed in structural and morphological terms. Instead, starting from the observation that there are also conventional atmospheres, we propose some features of a method of analysis for these cultural categorizations, a method based on the development of the axiology of the spatial enhancement modes given by Jean-Marie Floch thirty years ago, albeit revising it in the light of more recent acquisitions in the semiotic field and according to the perspectives opened by the Deep Learning computer techniques.

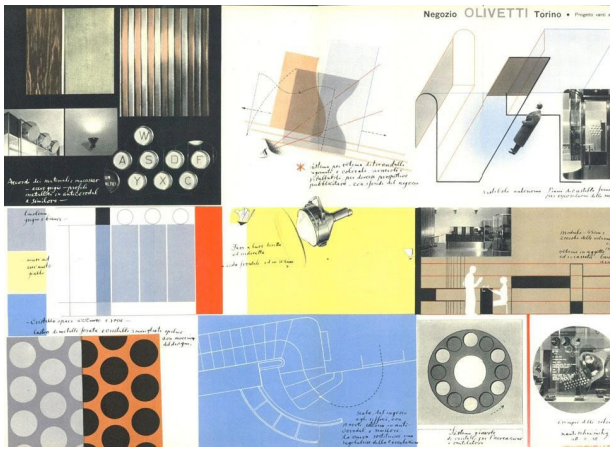
Keywords: interior design, drawing, atmospheres, affordance.

Drawing and interior design

In the last half-century, the discipline of 'drawing' in Italian universities has largely been exercised on instances dictated by architectural culture, also because the degree courses in Product, Communication and Interior design are more recent institutions in the Italian schools of architecture and engineering. These schools have gone through a thirty-year process of separation of knowledge, especially between the various fields of design and architecture. Among these separations, the one between the disciplinary areas of interior architecture –ICAR/16– and interior design –ICAR/13– seems paradoxical, at least for those that are able to remember the traditions that embodied the most famous 'made in Italy' prototype after the war. Just think of the famous figures of 'designer-architect' in the 50s-70s (for instance Franco Albini, Mario Bellini, Luigi Caccia Dominioni, Achille Castiglioni, Angelo Mangiarotti, Carlo Mollino, Luigi Moretti, Carlo Scarpa, Marco Zanuso, …) who still worked and taught as 'integral architects', that is, considering architecture as a median scale of the possible areas of design: "from the spoon to the city". Among these areas, the field of interior design exemplified the full continuity of architecture, design and drawing, showing the character of the built space as a work of art. For example, the famous Olivetti shops (figs. 1, 2) around the world were all different, but each independently conceived as an 'art gallery' where industrial design objects were displayed alongside and in the same way of sculptures, paintings, bas-reliefs, … in hyper-iconic environments, each conceived as a work of art.

On the contrary, nowadays we find ourselves wondering about the specificity of a drawing for design. If we understand drawing only as the discipline that deals with methods and practices of representation, this can be reduced to a current landscape of scattered issues related to the management of digital models –'point clouds', 'third party survey contracts', 'avatars', 'drone' flights, 'BIM' protocols etc.– along a chronicle that follows the progress of the technological tools for survey and modeling.
However, if we seriously take the derivation of the term 'design' from 'drawing' ('*disegno*', in italian) and, vice versa (that is, considering that there is no drawing without design), then by 'drawing' we indicate a design prefiguration technique that goes beyond the geometry and geomatics, which often has a 'poetic', autographic, idiolectal character, despite being scientifically founded on a '(historical) phenomenology of the depicted imagination'. In other words: drawing is the techno-aesthetologic side of design.
The academic separation of interior architecture from interior design actually mark the end of the era dominated by the aesthetic principle of the 'synthesis of the arts' and the consequent identification of drawing and design. That era had started just a century ago, in the schools of the modernist avant-gardes –from the Vchutemas to the Bauhaus– who invented 'design' to demolish the distinctions between the social domains that separated the major arts, crafts and industrial manufacturing, to open up the field to an idea of total design of the environment, to generate a sort of palingenesis of the built and inhabited space. This task was most evident precisely in the creation of 'interior environments' organically configured to express intense and radical aesthetic properties, perfectly prefigured through graphic-pictorial works often endowed with an autonomous artistic value.
It is sufficient to recall the ways in which Le Corbusier, from 1925, transposed his purist 'still lives' into "*intérieur en plan libre*", or the unfolded axonometries by El Lissitzky (fig. 3), Piet Mondrian (fig. 4) and Theo van Doesburg, the isometric ones by Walter Gropius, or the line and collage perspectives by Ludwig Mies van der Rohe, … all works that look like real 'paintings', yet born as calculated prefigurations of 'interior spaces'.
The drawing technique ensured continuity between design and architecture, opening up towards the most diverse directions of aesthetic research. It is for this historical reason that today we can still think of the discipline of drawing in general as a 'phenomenology of the design imagination' which, defining authorial 'imaginaries', was embodied in specific 'poetics'.
Drawing for interior design was perhaps the most evident context of this poietic unfolding. In fact, each author of the Olivetti spaces –Franco Albini, Gae Aulenti, BBPR, Piero Bottoni, Carlo Scarpa, Ugo Sissa, Ettore Sottsass– prefigured them with their own expressive techniques but on a common background that conceived drawing as a tool of a *Poetics of space* intended according to the homonymous and contemporary essay by Gaston Bachelard [1957]. They considered drawing from a phenomenological point of view –a phenomenology of the imagination– referable more to Henri Bergson, Maurice Merleau-Ponty and Paul Valéry, than to Edmund Husserl; even if they did it from different aesthetics: from the neo-romantic one (Scarpa linked to John Ruskin) to the more psychedelic and (pre)postmodern one (Aulenti and Sottsass).
In the same years, Louis Kahn's environmental drawings –aimed at the eternal present of the atmospheric vibration of the architectural masses– and the hyper-technological comics of Archigram and Archizoom configured opposite aesthetics, but they were all representations made to establish the stakes of a buildable space.

Fig. 1. Xanti Schawinsky, design of the Olivetti shop in Turin, 1935. Collage, 33.3 x 47 cm.



This phenomenon of drawing as a depicted distillation of an atmosphere became increasingly evident in the post-avant-gardes and along the epic of the so-called 'paper architecture' in the 70s-80s: from Aldo Rossi's theatrical 'still lives' and Arduino Cantafora's paintings, to the graphic screenplays by John Hejduk and the totemizing visions by Raimund Abraham.
In short, the history of architectural drawing could be told as a sort of extroversion of interior design, at least to the extent that the design representation tends to decant the specific ingredients of an atmosphere.
It is a multitude of cases and techniques that are almost incomparable to each other, especially for differences i) in referentiality and ii) in the social domain of the work [Gay 2020]:

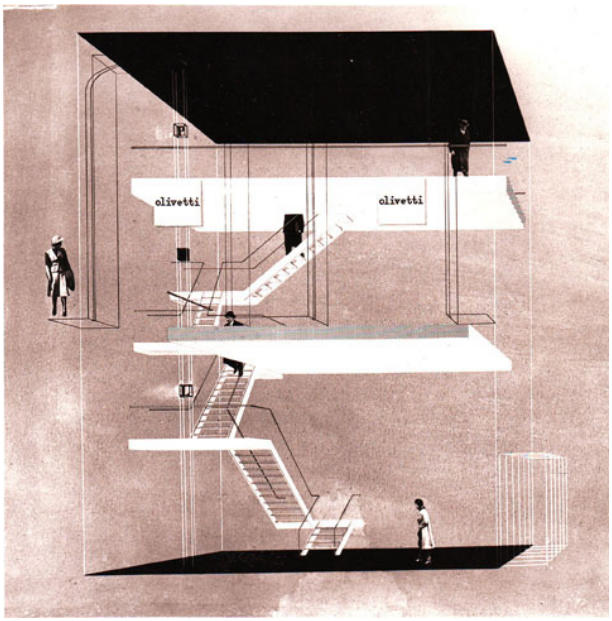
i. because they are representations in very different figurative or abstract registers: from the scenographic sketch to the photorealistic rendering, from the abstract diagram for the plastic-chromatic calculation of a spatial configuration, to the concrete samples of the mood board;
ii. because they are works included in different social domains: some are figurative art objects with autonomous value, others are valid only as heuristic works, strictly functional to the development of a given building project.

It is often difficult to discriminate in which domain a drawing is inscribed; for example, those with which Peter Zumthor configured the planimetric layout of the Baths of Vals prefiguring, in an abstract composition, the plasticity, the light, the material effects, the perceptive and mereological rhythms, similar to those later achieved in the construction. The same could be said of Steven Holl's watercolours, Renato Rizzi's bas-reliefs and countless other heterogeneous and hybrid examples. This is the case of morphological study drawings based on resonances between the stylised shape of a typical landscape and the reinvented shape of buildings (fig. 5); or the almost dreamlike ones that isolate and amplify pattern elements of the urban space (fig. 6); up to those that explore essential interior taxonomies to show how the articulation of the openings alone determines very different atmospheric cases (figs. 7-9). All these very different works can only be compared through the aesthetologic topic of the 'atmospheres', a topic that has entered the architectural culture especially through the issue of the descriptive possibilities of drawing [Holl, Pallasmaa, Perez Gomez 2008; Drozd et al. 2011].

Drawing from affordances to atmospheres

According to common sense, the 'drawing for design' is typically the sketch of an industrial object: the 'concept' of a beautiful shape to be imposed on a brute 'matter' that engineering will then tackle. Drawing brings to design that broad imaginary that we could define as a 'shell morphology'. But this morphology changes a lot if we (shrewdly) believe that form and matter (soul/body) are just two opposite points of view from which we observe the same physical and cultural reality.
Although most of the drawing techniques for design concern the descriptive adequacy of the geometry of surfaces [Gay 2019], these surfaces of objects, in reality, are frontier spaces between internal and external environments with respect to individuals –both natural and artificial– and they are very different 'things' in natural (a) and artificial (b) objects.
a) The image of the 'natural shell' [Bachelard 1957, chap.V] is the most profound and 'teleonomic' archetypal example of a body suitable for separating the two (internal/exter-

Fig. 2. Ugo Sissa, project of the Olivetti shop in Rome, 1943. Sissa Archive slide, Venice.



nal) constituent environments of each individual. It is the clearest example of form exactly modeled by the dialectic of natural forces (ontogenetic and phylogenetic), which –as Valéry said– do not distinguish geometry, physics and chemistry, and not even epigenesis from phylogenesis. In fact, we can reconstruct an objective descriptive (bio-morphometric) geometry and a phylogenesis of shape for each 'natural shell'. Phylogenetically, as Paolo Fabbri wrote [Thom 2006 p.14], "The variable balance of the relationships between predators and preys generates the outline –the skin, the shell or the armour– which would be the 'tactical' arrest of the organic extension in front of the hindering action of the beak, the tooth and the claw". This is how the most classic pages of the morphology of Goethian ancestry [Thompson 1942] explain forms as 'diagrams of forces' [Thompson 1942, p. 16], or as 'saliences' determined by 'pregnancies' [Thom 1988].
b) Even the shape of the artificial 'shells' can be conceived as a 'diagram of forces', or rather, as a 'constructive diagram' [Alexander 1967, pp. 89-97], that is, factorially and parametrically mouldable. However, the artificial shells are modeled not only by 'natural' forces (pregnancies), but also by 'cultural' instances: technological procedures, stylistic deformations, iconic stereotypes etc. They are 'construction diagrams' that evolve towards greater organic complexity, passing from the abstract to the concrete, from the 'separate' to the 'syntropic'; and they do not evolve according to a Darwinian model, but rather to a Lamarckian one, that is, transmitting to the offspring the new adaptive features acquired along technical genealogies [Simondon 1958] developed in a continuous *bricolage* or "exaptation" [Pievani, Serrelli 2011].

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.

This second meaning of design requires a qualitative leap in the definition of drawing: the passage from the abstract representation of the geometric surface of a shell to the concreteness of the environment-spaces of which that shell is a co-determined frontier. It is a qualitative leap that, first of all, concerns the cognitive limits of our imagination and depiction.
From the (phenomenological) point of view of (his) psychology of visual perception, James Gibson rightly argued that we see surfaces, but we do not see spaces: "The space outside us can be visualised, but it cannot be seen. Depth indices can only refer to a painting, a drawing, and nothing more. The third visual dimension is an erroneous application of the Cartesian concept of a three-axis coordinate system. […] Space is a myth, a ghost, a fiction of geometry" [Gibson 1999, p. 37].
According to Gibson, we perceive the surrounding environment in a completely unreflective, automatic, synaesthesic, pre-conceptual way through the 'affordances' offered to us by the real surfaces plunged in the physico-chemical pregnancies of the atmosphere. By the term 'affordance' he means what our lived body emotionally and pre-intellectually feels about its potential for interaction with the surfaces of the surrounding objects and environments; an affordance is the feeling of a potential factivity, such as 'grip', 'incorporate', 'throw', 'walk', 'climb', 'fall', 'shelter', 'sit down', 'plunge', 'ingest', 'eat', …
Particularly invoked in design theories is the notion of 'affordance of objects', often cited in functionalist theories to objectively account for the ergonomic properties of prostheses and tools: for instance the sedibility of a chair or the habitability of an interior. Designing an object is foreshadowing its affordability. But the most interesting and least studied part of the Gibsonian theory of 'affordances'

concerns, if anything, the 'environmental affordances' and those related to 'representations', i.e. those affordances which, for example, lead us to immediately perceive within the physical environment of a theatre the different and separate fictional nature of its stage portion.
Gibson's affordance is a triply objective phenomenological property because it is defined as the encounter of the objectivity of the perceiving subject's lived body with the objective morphology of the environmental body of which it is part in a given configuration of objects and subjects.
Therefore, the psycho-phenomenological notion of 'affordance' today has been completed in the aesthetological one of 'atmosphere': a topic on which a vast bibliography [1] has grown for half a century and that has gone beyond the philosophical fields of the 'new phenomenology' (Hermann Schmitz) presenting itself in other fields of study and descriptive practices –from anthropology and ethnography [Schroer, Schmitt 2020] to neuroaesthetics [Changeux 1995; Zeki 1999; Cappelletto 2012]– even in a part of the theory and critique of architecture [2], interior design and museography [Urbach 2010], built environment [3].
Although variously misunderstood and trivialized, the aesthetologic notion of 'atmosphere' has involved the whole of the design studies in a true 'atmospheric turn'. The reference to the concretely project-oriented and technical dimension started from the same aesthetological and ontological debate, especially from the formidable *Atmosferologia* by Tonino Griffero [Griffero 2010] where there is no lack of references to typical landscapes, buildings and daily interior spaces, underlining the fact that (inevitably) both architects and designers prefigure 'atmospheres'. For example, Griffero notes that "generating cues for orientation, kinetic suggestions and signals, the buildings produce a wide range of atmospheres and, as authentic staged spaces, push the perceiving subject to immerse themselves in them. Thus, the architectural atmospheres modulate the patemical timbre of the pericorporeal space of the observer, and they do it in a coherent way, since –unlike other more transitory qualities– the architectural and urban forms permanently give rise to certain atmospheres. The architectural atmosphere, even if it were intended as an 'effect' (Camillo Sitte) or 'figurability' of a city (Kevin Lynch), is therefore something that is not seen, but perceived and co-produced" [Griffero 2014, p. 24].
The integral notion of (objectual, environmental and representational) 'affordance' [Griffero 2021] links the theories of design to the aesthetologic debate on 'atmospheres', which thus shows an ontological side (what is an atmosphere?) and a pragmatic and project-oriented side (how is it prefigured and inflected?). Griffero ontologically defines 'atmosphere' that (relatively) objective spatialized and lo-

Fig. 4. P. 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.

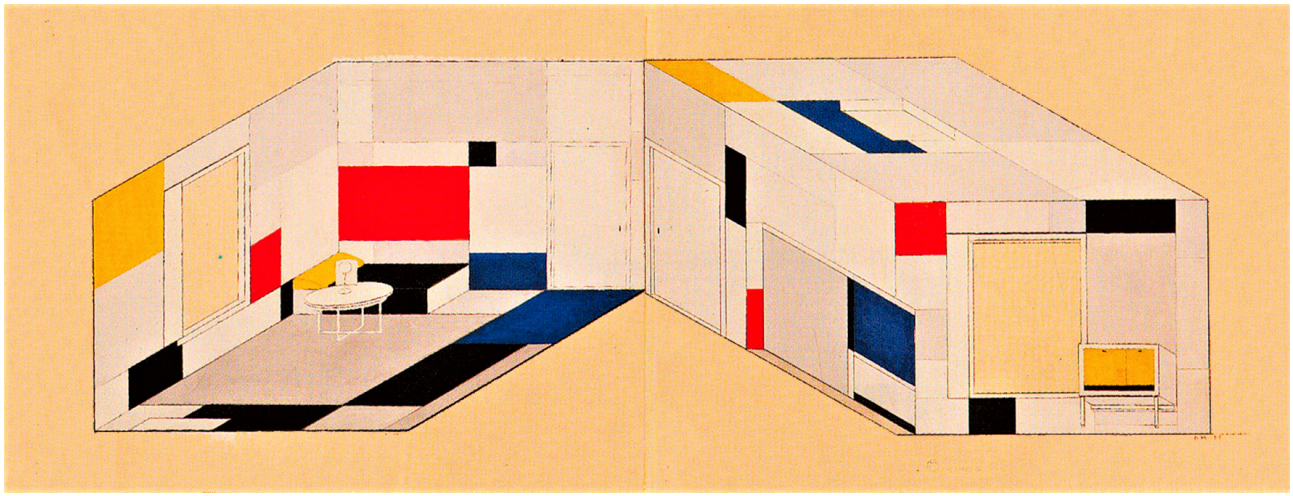


Fig. 5. F. Gay, life drawings in the Asti countryside and two pages of a study notebook, 1996. Mixed technique, 24 x 34 cm (buildings on the Monferrato hills between Asti and Casale).

calized feeling that does not lie in the perceiving subject, but inhabits the in-between woven together by the relationships between subjects and environment (physical and socio-cultural places). So, he thinks of atmospheres as: i) 'non-objects' or 'quasi-objects', ii) objective in their effects (they oppress, relax, excite, … potentially or/and actually), iii) change revising themselves over the course of the experiential duration of those who perceive them unconsciously etc. So, to what extent is the notion of 'atmosphere' a truly operable concept in design studies and through drawing? How to objectify the atmosphere if it is understood as that multiple and protean expressive quality of a localized experience, co-aroused by a multiplicity of material and immaterial factors that are epistemically incomparable with each other since their different modes of presence: realized, actualized, potential and virtual?

Calculable atmospheres

The atmospheric *prius* is a property emerging from a holistic, unrepeatable totality which does not seem to be able to be atomistically and structurally dismantled; but to what extent is it possible to describe it? Following Griffero we discover that there are also analogies between atmospheres, therefore, of conventional types, although –unlike us– he does not consider this a concept that can be analyzed in semiotic terms. The 'culturally conventional atmospheres' are inventoriable 'social objects', partly lexicalized, necessarily implicit in the distinctions between genres – literary, cinematographic, theatrical and musical– in the morphologies of interior design or landscapes, in the case studies of museography and advertising. Atmospheres as typical 'cultural objects', categorized into genres, are also, in part, calculable in their typicality, as demonstrated in traditional and more theatrical areas of interior design, especially in retail design and related marketing studies on commercial spaces.
From marketing to semiotics, the step can be short and can lead to the possibility of a factor analysis of conventional atmospheres, especially considering some current developments in artificial intelligence.
Imagine repeating today a famous marketing study on the behavior of users of the Paris metro [Floch 1990, pp. 19-47] that Jean-Marie Floch –the great semiotic exponent of the Paris School led by Algirdas Julien Greimas– made in the 1980s. The strength of Floch's analysis was a typology (a taxonomy) that indicated the four most extreme types

Fig. 6. F. Gay, two notebook pages, 1997. Mixed technique, 24 x 34 cm (Venetian ramifications).

Fig. 7. F. Gay, two notebook pages, 2000. Drawing in felt-tip pens, 16.5 x 24 cm (morphological taxonomy of openings of an interior).

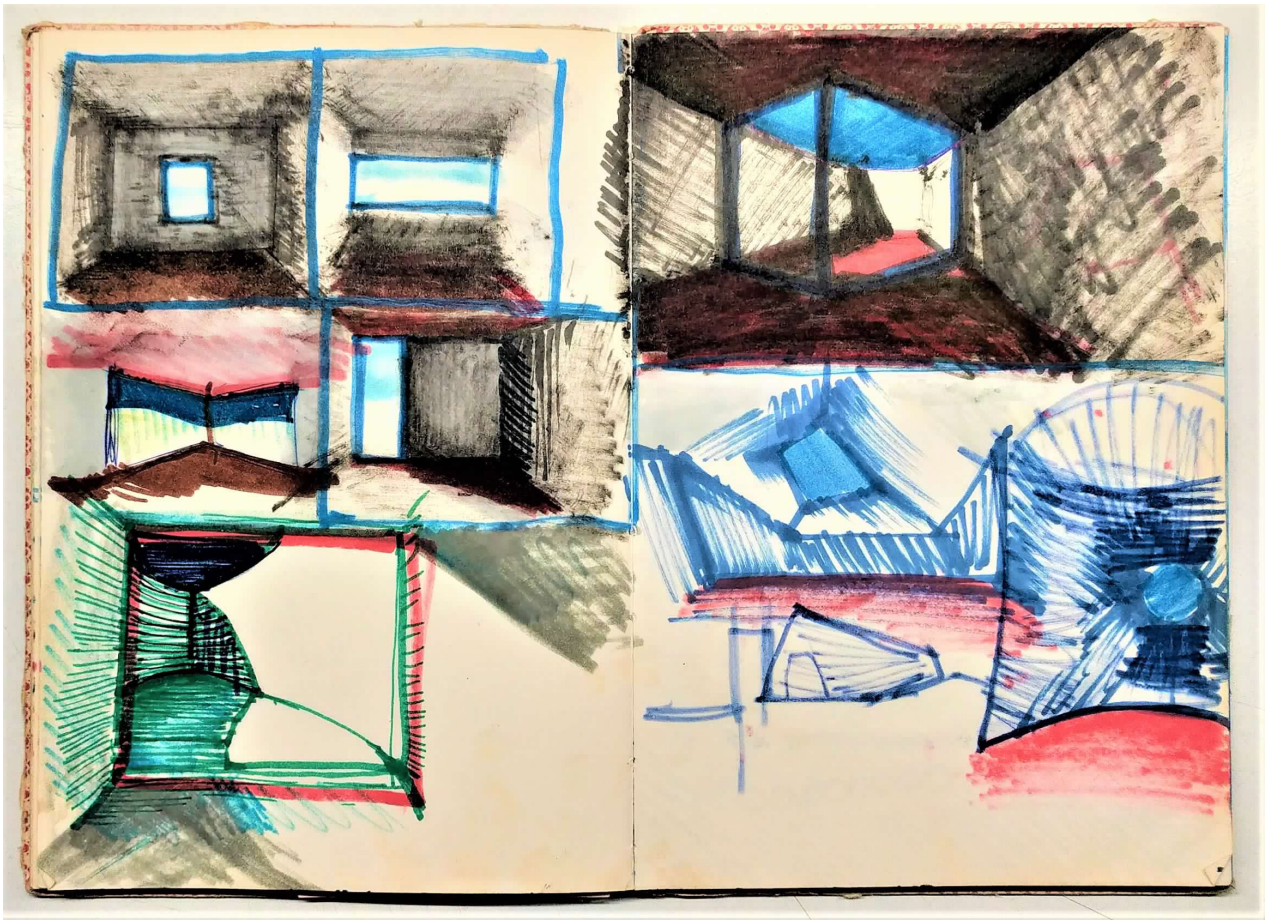
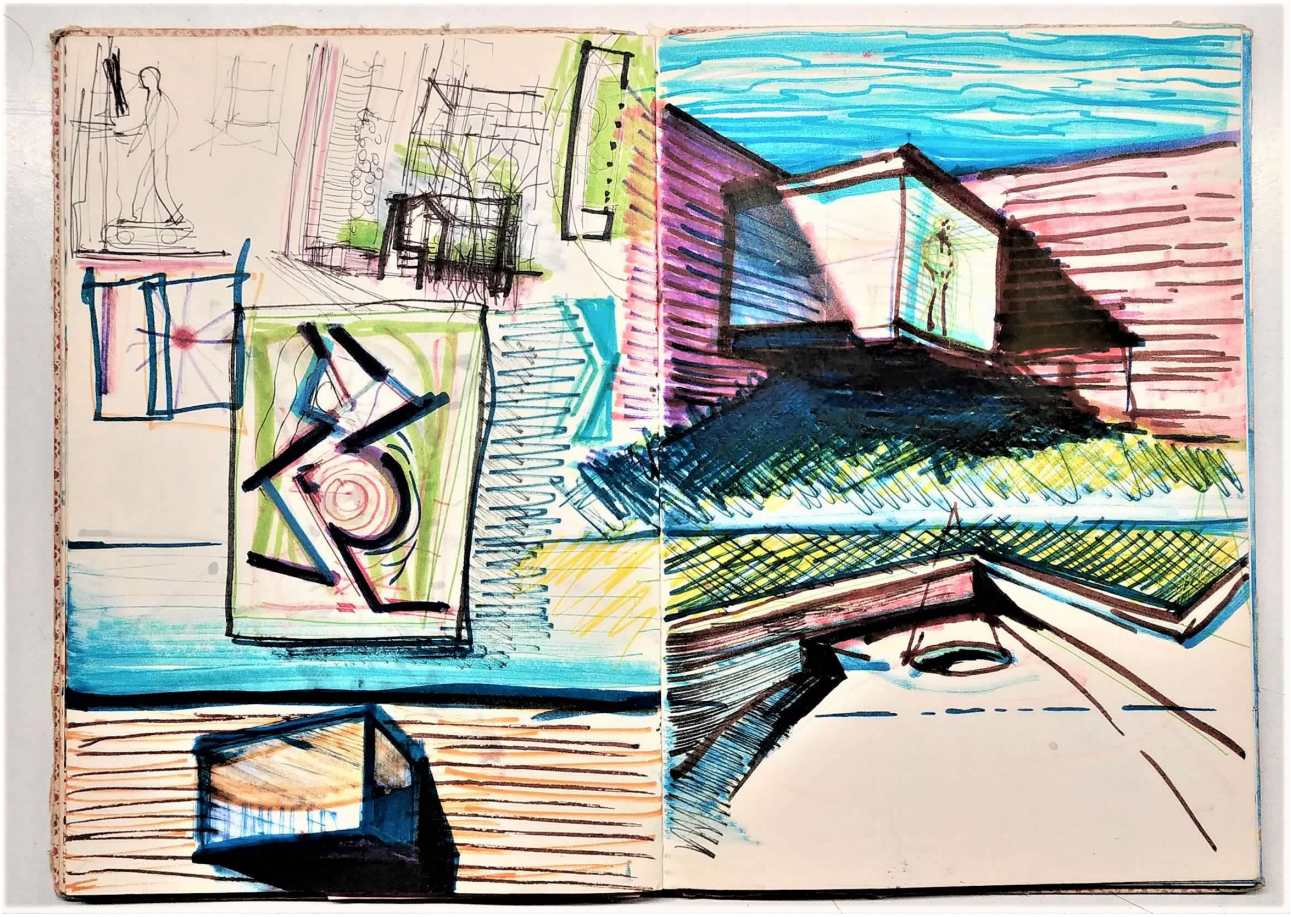


Fig. 8. F. Gay, two notebook pages, 2001. Drawing in felt-tip pens, 16. 5 x 24 cm (studies for a shower room between inside and outside).



among the possible ways of enhancing the same space and place in relation to whom and what lives in it (fig. 10). The same space was that of the complex of the metropolitan stations of the capital, but rigorously (narratologically) defined by the 'journey' intended as a unitary and 'syncretic text' (referable at the same time to different semiotic systems), structured in action programs and actorial roles.
The analysis was based on the (ethnographic) observation and recording on site of the behaviors deployed in the same place, behaviors that were directly comparable in their different ways of enhancing spatial displacement. The four extreme behavior terms that were empirically detected –'explorers, sleepwalkers, professionals and *flâneurs*'– were not intended to indicate 'social (or psychological) types', but moments and ways in which the subjects grasped the given (morphological and mereological) affordances of the place in their course of action. In other words: the labels do not try to indicate who is 'such', but how, when and where they are such.
Floch takes these four extreme 'modes' as the four terms that derive from the projection on the semiotic square (fig. 10) of the semantic category of 'continuity vs. discontinuity' of the given experienced space and fixed them as follows:

- "explorers" those who value the features of 'discontinuity' in spatial perception, appreciating the change in perceptual rhythms, but only to be able to identify, oppose and correlate places, in order to cognitively map them in relation to the rest of the urban space;
- "sleepwalkers" –as opposed to "explorers"–, those who, plunged in reading or listening, or letting themselves be carried away by the flow of the crowd, value the pure spatial 'continuity' anaesthetised in a neutral everyday life, appreciating the perceptive characteristics of a comfortable regularity and spatial fluidity;
- "professionals" those who –denying the explorer's adventurous space– knowingly minimising the path, avoiding any obstacle with a fluid path, are interested in the pure functionality of the stations, in accessibility and in their equipment, therefore in the enhancement of the term "spatial non-discontinuity";
- "*flâneurs*" those who walk in search of the unexpected, ready to treasure accidents and deviant programs, always available for interactions that multiply the potential of the journey: figures opposed to 'professionals' and who deny the space of 'sleepwalkers', concentrate on the values of 'non-continuity' of the local space.

In the course of his experience, each traveller can enhance, from time to time, different potentials and virtualities of the same objective situation. The essential thing is that in every situation it is not only the subject, but also the atmosphere that is more or less suited to "explorers, sleepwalkers, professionals and *flâneurs*", that is, more or less congenial to a given form of spatial enhancement, presenting the characteristics of a feeling that can only be amended within certain limits. Therefore, the four morphologies and mereologies that Floch gave of that same actually lived place provided the Parisian designers with precise indications for identifying the generative components of a desired atmosphere.
The semiotic approach therefore offers the methodological starting point for translating the poetics of space into a morphology. Although in structural semiotics the notion of 'atmosphere' was not used forty years ago, in the thirty years since Floch's work the structural theory of Greimassian tradition has evolved by expanding the analysis limits far beyond the notion of 'text', acquiring a 'semiotics of practices' [Fontanille 2008] based on a model of the 'generative process of the plane of expression' divided into levels (figure, sign, text, object, practice, strategy, *ethos*). In short, semiotic theory has adopted a theoretical framework that finally allows us to analyze which aspects of an object and of a practical scene connect with each other, generating an atmospheric affordance.
Finally, in addition to the possibility of better articulating the psychological notion of affordance of objects and environments, nowadays we also have new technologies of data retrieval. At the time Floch had made use of sketches and interviews, but today we could use many other digital tools for tracking the behavior of travellers, both in their physical journeys and in their consumption choices on web channels –as has been happening for some time in the tracking of our smartphones, PCs, tablets, bracelets, … through Deep Learning software–, and in the detection of people's biological parameters that are indicative of part of their emotional states.
At the same time, the rapid development of computer applications of 'pattern recognition' –through algorithms and computational models in the types of 'neural networks'– allows us 1°) to deal with digital images of any format, coming from huge data sets, and 2°) to obtain synthetic representations according to parameters referring to different classes of qualitative features.
In short, today we are in the condition of having to integrate the possibilities offered by artificial aesthetics [Manovich,

Fig. 9. F. Gay, two notebook pages, 2000. Drawing in felt-tip pens, 16.5 x 24 cm (cases of openings).

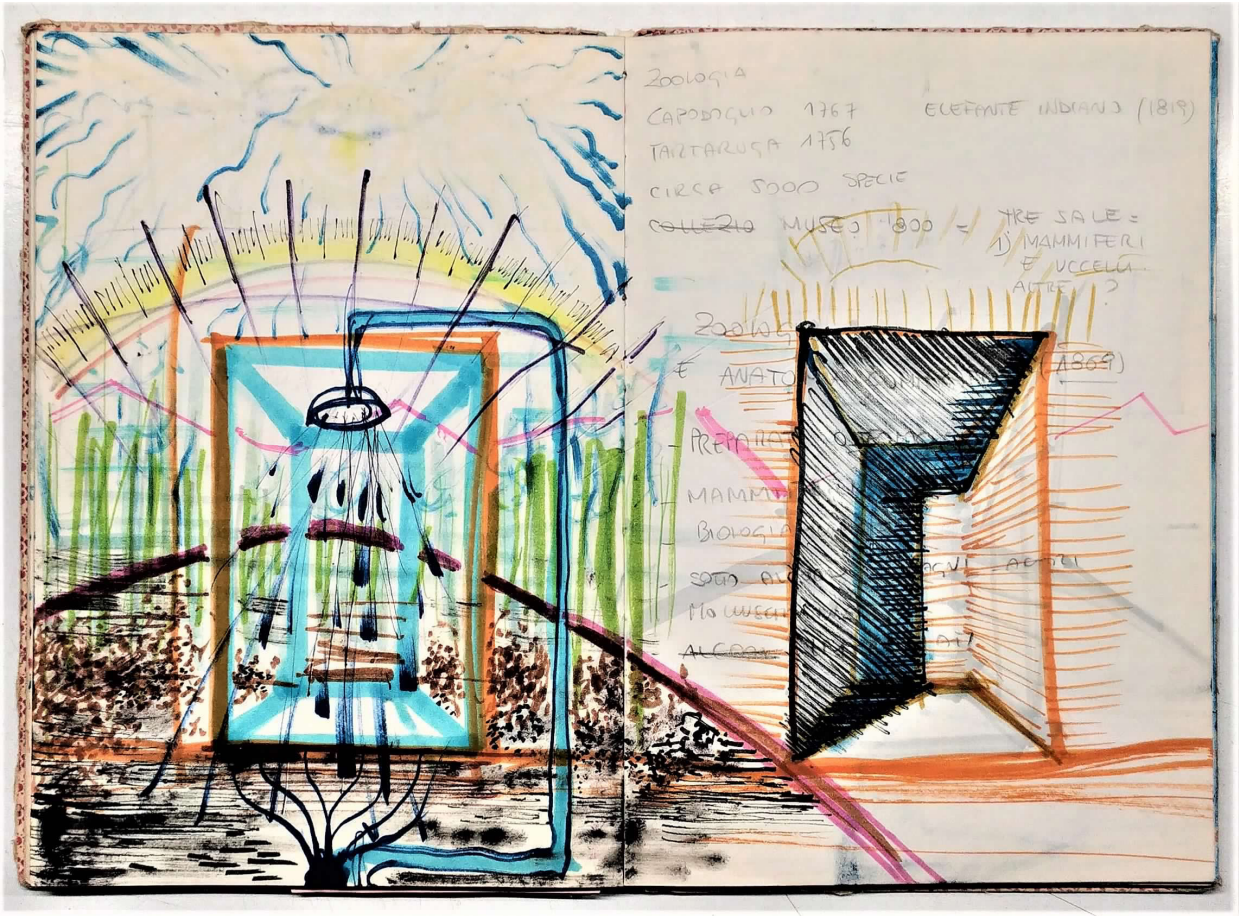
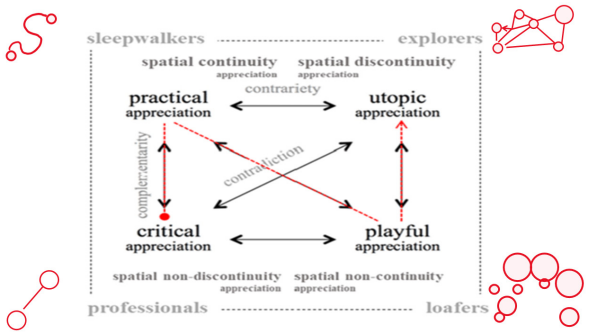
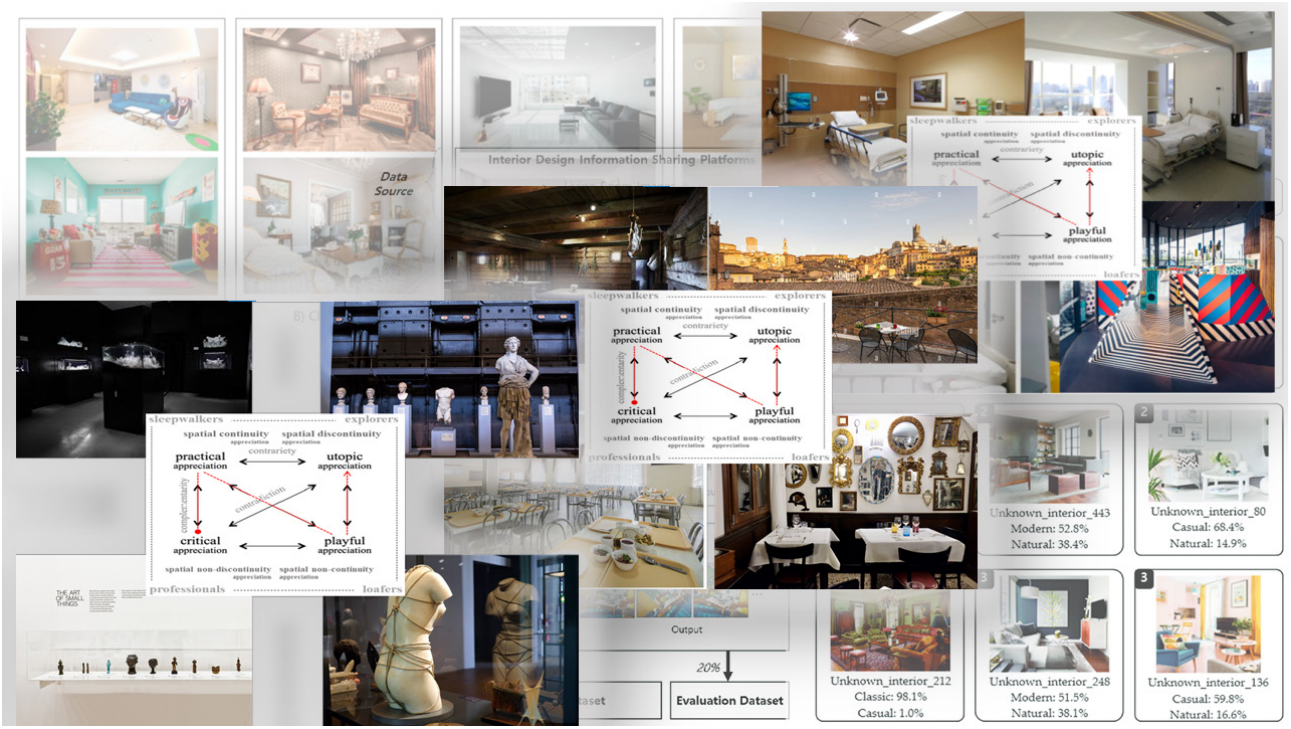


Fig. 10. The taxonomy of spatial enhancement modes used by J.-M. Floch in the analysis of the Paris metro users' behaviors: from Floch 1990.

Fig. 11. Example of modification of an interior image recognition software by introducing Floch' axiological principles.





Arielli 2022] in terms of the natural intelligence of the topic in question.
In this sense, for some years, software has been experimented [for example Kim, Lee 2020] to assist interior design by producing illustrative samples of interior design stylistic classes, or collections of images that are roughly equivalent to prototypical atmospheres, conventionally attributed to interiors or landscapes. The results still seem disappointing because their definition of 'style' is limited to a few stereotypical classes. But these experiments are interesting for the fact that they are not only given *a priori* classifications, but also *a posteriori* taxonomies, through procedures on immense lexical and iconic databases that are accessible online.
Properly developed, these systems could lend themselves to a doxastic study of the sensory categories conventionally attributed to materials, shapes, textures, colors, spatial patterns, paths, interfaces,... of interiors. The analysis could, first of all, address the plastic and iconic qualities of the interiors. On the one hand, this consists of the eidetic geometric qualities, the sensory properties of the materials, the olfactory, acoustic, haptic properties of the surface configurations, lighting, kinesthetic properties etc. On the other hand, it concerns the evocative (analogical) qualities, qualities related to the potential courses of action in practical scenes of interiors, seen as coercive constraints of the spatial articulation in facilitating practices coded as plausible or implausible.

Conclusions

By shifting the object of the drawing for design from the geometry of the surfaces to the aesthetology of the atmospheres, it seems that only authorial poetic answers can be given, only specific recipes for depiction or construction of ad hoc atmospheres. Here we tried to argue another thesis, a more optimistic and adventurous one, which could sound like this: in addition to indicating poetics of atmospheres, it is possible to provide specific morphologies and transform them into huge structured atlases and scattered archives of data about categorizations into genres of spaces.
In terms of Thom's semiophysics [1988], we would say that 'atmospheres' are integral saliences and that they can be partially analyzed, through the innumerable facets offered by the physical and cultural pregnancies that determine them. These innumerable possible analyses may turn out to be more or less relevant, fragmentary, doxastic, depending on which features of an atmosphere they assume among the decisive ones. In addition to their relevance, such analyses must be clear in their semantic structure and their coherence can only be defined through a clear ontology of atmospheres in its implacable vagueness.
Clear refractions of this intrinsic vagueness can be given by using clear semiotic models such as those we have exemplified by mentioning the axiology that Floch gave of the modes of spatial enhancement.
The analysis of cases and atmospherologic categories with the use of Floch's axiology (see, for instance, fig. 11) allows a study of the interior design genres by processing huge data sets with Deep Learning tools. In this case, Floch's semiotic square is transformed into a map with two orthogonal coordinates which identify the pair of initial values of each processed record and which will compose a final atlas in continuous stabilisation. Obviously, the condition prior to the functioning of the survey system of an artificial aesthetic categorization is the semantic coherence of the entire structure of the acquired and processed records.
The semiotic coherence of the analysis is the feature that also allows the integration of artificial aesthetics in the natural exercise of design. Even when the drawing is traced by hand, it is the semiotic refraction of certain atmospheric factors that guides the hand in portraying or graphically delineating an atmosphere on paper (see, for instance, figs. 5, 6), or in deciding it along a spectrum of alternatives and possible variations (see, for instance, figs. 7-10).

Notes

[1] The most up-to-date bibliography is the one produced by the Atmospheric Spaces research community, directed by Tonino Griffero. Available and downloadable online at: <www.atmosphericspaces.wordpress.com/literature/> (accessed 2022 October 29).

[2] Starting from Augoyard 1995; Wigley 1998.

[3] Suffice it to mention the vast research network *Ambiances*, and magazine published online: <www.journals.openedition.org/ambiances/> (accessed 2022 October 29).

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The Multiple 'Means' of Drawing for Design. Tests in Repurposing Industrial Products

Alessandra Meschini

Abstract

Drawing plays a specific role in forming a code of thought, which is built through progressive layering and unfolds above all in writing, whatever the instrument used. In this sense, its multiple prerogatives articulate that indispensable yet necessary language, not only to communicate a design project but also to implement that fundamental procedure of controlling the design process. From an operational point of view, this translates into the practice of using different of drawing to tell about the project.
With this in mind, this article presents some experiences in research and teaching conducted in an experimental/laboratory form on the subject of repurposing certain existing industrial products by studying their ability to accept modifications on different levels. This creative process for a renewed concept/functionality of products was conducted through two closely related phases. The first is cognitive and aimed at activating processes of true appropriation/reconstruction of the design process through graphical operations to 'recognize' the object. The second is to study appropriate transformations aimed at re-presenting the modified product according to different planes of communication or different problematic levels of in-depth examination.

Keywords: product design, drawing, transformation, cognitive models, interpretational/descriptive methods

Design: definitions, processes, objectives

Tomas Maldonado developed a definition of design, adopted at the ICSID Congress of 1961, as the act of "coordinating, integrating, and articulating all those factors that participate in the process to constitute a product", i.e. a complex action referring to factors related to the use, enjoyment, consumption, and also the manufacture of a product [Di Lucchio 2013, p. 321]. In the reality of developing a project, the notion of design is thus redefined "as a conscious activity, virtuous feedback capable of formalizing […] new products for old and new needs" [Paris 2013, p. 12].
Design always calls upon a target; the objective of meaning determines an effect of meaning for the user through a product that is presented as the answer to a question, although it may not yet be explicit. Design is therefore not merely technical practice but also a mental activity in which the question of how to act must follow the question of why (and for whom) [Zingale 2009, pp. 193-197].
Design also involves the discipline of ergonomics in both functional and perceptual/cognitive terms. Le Corbusier had already envisaged the possibility of creating *objets-membres humains*, understood as *objets-types* ergonomically 'harmonized' to humans according to dimensional standards [Le Corbusier 1925, pp. 77, 78]. Today, reference is made to anthropometry, which studies the relationship between human body measurements (static and dynamic) and the dimensions of environments and products. The path of ergonomics then evolved from the concept of anthropocentric design (User-Centred Design)

as defined by the American psychologist Donald A. Norman, according to whom the definition of a product must start from the needs and interests of the user, aiming at products that are usable and understandable, and which also offer pleasure and gratification [Norman 1995, p. 209]. The psychologist, defining the term 'conceptual model' as a mental representation (model) of the function of a product, stated that "the designer must ensure that everything in the product is consistent with the right conceptual model and exemplifies its function" [Norman 1995, p. 212].
Design, implementing an articulated system of skills and knowledge, is called to operate according to open and flexible interdisciplinary modes relying on blending and connections [Imbesi 2015, p. 43]. Thus, the intention that moves it –that is, the process that leads from the idea to the object– requires a method. In this respect, Bruno Munari wrote that "the method of design is nothing more than a series of necessary operations arranged in a logical order dictated by experience […]. Creativity does not mean improvisation without a method. The series of operations in the design method consist of objective values that become operational tools in the hands of creative designers. […] Whatever the problem is, it can be dismantled into its components. […] Having solved the small problems one at a time, they are recomposed coherently according to all the functional, material, ergonomic, structural, and formal characteristics. 'Beauty is the consequence of what is right', as a Japanese rule says" [Munari 1991a, pp. 16, 17, 42].

Drawing: descriptors, prerogatives, and modalities

We draw for various reasons: to ask and answer questions, analyse and understand, memorize and highlight, etc. In sum, its main descriptors refer to prefiguring, understanding, and communicating.
The concept of creative drawing is used in reference to a practice that constructs means of anticipating reality and its outcomes. In this case, since it involves an active operation of project ideation, verification, and control whose recursive graphical immediacy allows the idea to form through action, it is perhaps more appropriate to refer to the act of to draw [Casale, Inglese 2013, pp. 138-140].
This statement, which would seem to favour above all the idea-forming prerogative of drawing, in reality does not at all exclude the practice for cognitive/referential and analytical purposes, but rather intends to understand it again and orient it towards its deepest meaning: as another manifestation of an instrumentality appropriate for a thought participating in the goal. In fact, drawing plays the specific role of forming a code of thought which is built through progressive layering and unfolds above all in writing, that is, acting as a true language which explains concepts through signs, whatever the instrument used (analogue, digital, material).
Therefore, drawing is said to have cognitive prerogatives when it works to analyse and memorize, when it triggers a series of considerations about the graphical operation, activating methods of deconstructive/reconstructive observation, and when it activates forms of both selective and associative thinking and mental processes of discrimination/discretization that develop capabilities of both specific analysis and synthesis, describing in detail on different planes of interpretation or problematic levels of in-depth study.
Drawing can be said to be communicational when, following a critical reading, it makes specific features comprehensible or when it "transforms the imaginative complexity of the future reality into its synthetic evolution" [Casale, Inglese 2013, p. 138]. In these cases, the effectiveness of drawing with respect to communicative synthesis can be effectively explained by the fact that "The verb 'to draw' defines the activity; and in addition to deriving, like a lemma, from *signum*, sign, it is also related and akin to the verb 'to designate', to indicate precisely, to name. Hence, the act is also defined as the procedure of processing the acquired knowledge" [Bertocci 2021, p. 23]. Through drawing, it is therefore possible to build models of understanding and communication based on the fundamental conceptual operations of recognition and interpretation.
In relation to these prerogatives, drawing relies on a variety of tools and techniques.
The freehand sketch is a unique moment of preparatory observation and/or self-communication used to define an idea (whether creative or analytical) that, through a personal and intimate graphical register, allows for immediate perceptive verification; "The designer can use it as a note to remember something that he has in mind, that he has discovered, that he wants to modify […] to specify a constructive detail, an attachment between two different materials, a joint, a way of arranging the elements in a whole, an operational sequence" [Munari 1991a, p. 65]. It is a valuable notational system featuring conciseness, rapidity, density (of external and internal information), and freedom from any code; an open tool like a work in progress [Belardi 2004, pp. 42-50] (fig. 1).

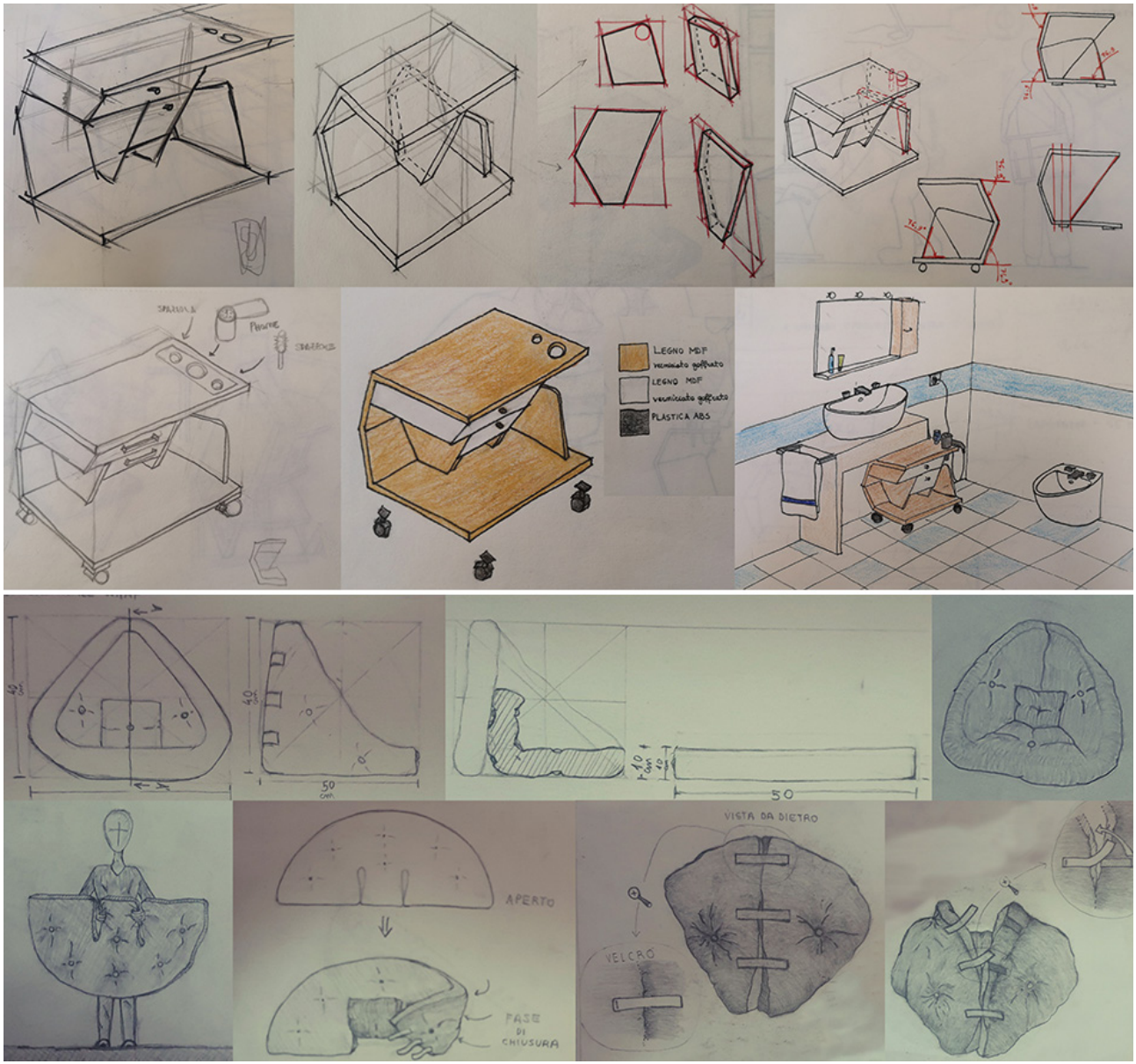
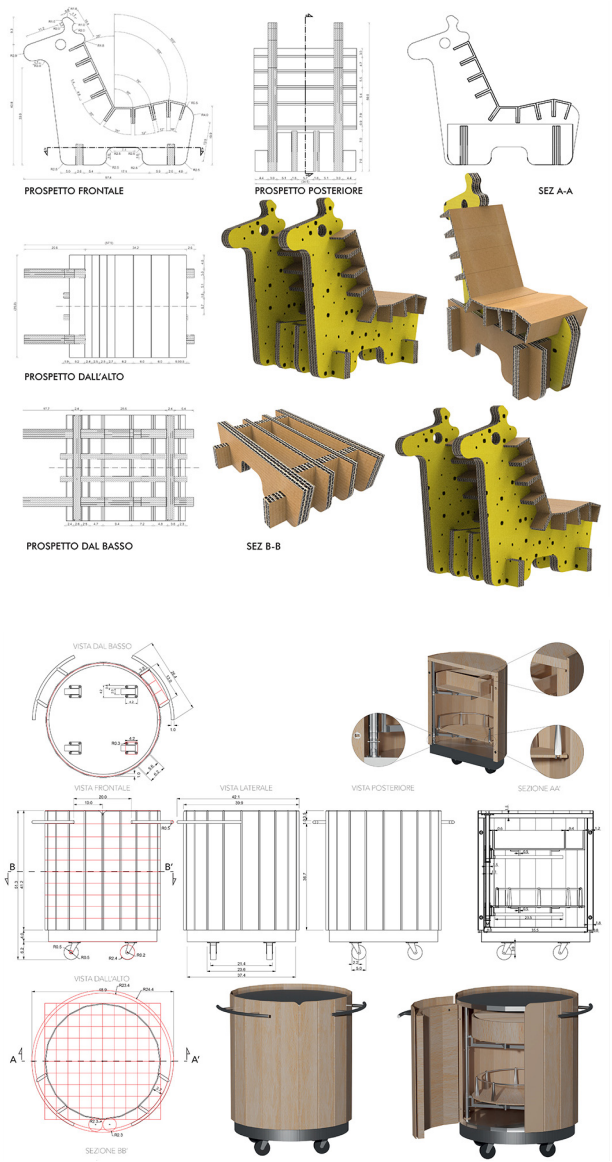


Fig. 1. Study sketches of a cabinet (students Davide Pranzetti, Ivan Rebichini) and "kids' nesting" chair (students Andrea Nicolardi, Giovanni Sasso).

Fig. 2. Technical drawings and illustrations of a "kids" chair (students Alessio Persichini, Andrea Pettorino) and cabinet (students Chiara Scaramucci, Arianna Veronesi).



At the other end, but not in the opposite sense, digital modelling tools now also play a central role in the process of prefiguration and the technical-formal control of a product. Their evolution has gone far beyond the function of simple reproduction, making them creative tools that can simulate our work in real time.
It goes without saying that in all of this, the methods of descriptive geometry play a pertinent and effective role in relation to the prerogatives of drawing, representing the complexity of what is real or imagined.
In relation to the purposes occasionally identified and with the integrated, complementary support of tools, methods, and techniques, it is therefore possible to identify two different basic approaches to drawing, one based on the rigour of measurements and a formalized language, the other operating predominantly through perceptual verisimilitude.
The technical drawings, scaled and dimensioned, can identify both the objectives of the 'geometric-metric control' of dimensions-proportions of even the smallest details and 'analytic goals' that disassemble and isolate characteristics of a product, enabling the verification of multiple aspects.
Figurative/illustrative drawings make considerable use of graphics that are more intuitive, appealing, effective, and understandable to non-experts. They may use schematic and/or plausible representational modes depending on whether they need to illustrate technological-material parts, assembly instructions, exterior/interior relationships, or offer a realistic presentation of the spatiality/three-dimensionality of an object/environment as it will be perceived (fig. 2).
Having said this, although technical and figurative drawings refer to different registers of representation and feature different communication strategies, both actually combine different levels of iconism/symbolism according to the type of information to communicate. In other words, they fuse both mimetic and notational characters in an interacting way, building knowledge through coherent acts of inclusion and exclusion [Pascolini 2006, p. 138].

Drawing and design: narrative and descriptive functions

The drawing/design relationship is a mutual and non-neutral support of one with respect to the other: "drawing while designing and designing while drawing" [Maldonado 1998, pp. 102], an interacting co-existence between the means and the end that allows a solution to be sought and identified.

Planning a design object is a complex multidisciplinary process in which drawing, through its varied systems and tools (from the most traditional to the most innovative), serves as essential support in managing the concept and information through images. Its multiple prerogatives (analytical, developmental, illustrative) articulate an indispensable yet necessary language used not only to communicate a design project, but also to implement the essential aspect of controlling the design process. From an operational point of view, this translates into different means of drawing to tell about the project.
Drawing plays a dual role here. It has a narrative function when, for example, it tells about the design concept or the function of an object in terms of both user interaction and the sequences of actions to assemble the constituent parts. On the other hand, it has a descriptive function when it expresses more specific aspects of the project (dimensions, shape, ergonomics-function, construction of the constituent parts, colours-materials, prototyping).
Therefore, since "the more aspects we know about something, the more we appreciate it and the better we can understand the reality of it" [Munari 1991b, p. 78], it is more correct to speak of 'multiple, compound' drawing because it targets different levels of detail and is necessarily addressed to different subjects (customer; production chain; advertising system; sales chain; purchaser/end user). It follows that a good designer should above all clarify to himself the different aspects of complexity so they can then be made intelligible to the different subjects with adequate graphical responses, i.e., codes of communication aimed at and suitable for the specific request expressed in each case. Hence, there is no single drawing, but rather a strategic, structured, complex, and effective combination of interconnected graphic elaborations, each with a very precise narrative/descriptive scope. The drawings are all strongly interrelated and interdependent, in mutual relation with one another according to a selective (first) and associative (later) mode of thought and operation which constitute, as a whole, that necessary multiple, structured, exhaustive representation.
In other words, when going from the conceptual to the communicational-representational plane, a good designer must know how to discern (interpret and synthesize) the characteristics of the object with reason to highlight and thus conceive drawings that are re-presentations of the object, introducing in each only those signs that are capable of isolating/emphasizing a particular characteristic.

Re-presenting/repurposing products

In the framework of the considerations mentioned above, the following presents the assumptions and results of several research and teaching experiences conducted in an experimental/laboratory form [1], on the subject of revisiting/repurposing several existing industrial products. This creative process for a renewed concept/function of products starts with a profound knowledge about them and studies the possibilities of making modifications on different levels.
As a theoretical support but also an operational outline to support both analysis and then the project, reference was made to the 'Munari method' [Munari 1991a, pp. 35-63, 102-108]. This method, which still serves as a basis for discussion today, proposes ways that are still valid for reasoning about 'what, how, why, and for whom'. Two particular experiments were conducted, differentiated by themes and thus also by the resulting specific objectives.
The chair is an object against which all major designers have measured themselves and which, in its apparent simplicity, actually also meets functional needs other than 'sitting'. With this in mind, the theme of the first experience was a kids' version of selected chairs –among which students could choose– which could be of different volumetric types: soft and conformable, rigid modular/conformable and non-conformable (solid and hollow volumes), cartoon chairs (boxy volumes created by folding or interlocking). The development of the topic was not only limited to reproportioning the object for the purposes of correct posture and thus the understanding that the objective is not achieved by a trivial scaling, but also to intervene on the characteristics of the object with small but substantial modifications specifically aimed at children. In fact, since "for a child, the object can be like a large toy" [Munari 1991a, p. 188], in this perspective, the object chair should be conceived as easy to use, fun, brightly coloured, made of light, resistant materials, easily manoeuvrable, free of hazards, and capable of stimulating the imagination [Munari 1991a, pp. 248, 252]. Moreover, since "all objects that we come into contact with are, in a certain sense, interactive, even those that appear completely passive to us" [Polillo 1993, p. 50], it is necessary to focus on the development of the object's readiness to 'interact', not only to clarify the purpose for which it is intended, but also to lead to evolution in the child's actions [Manzini 1990, p. 137].

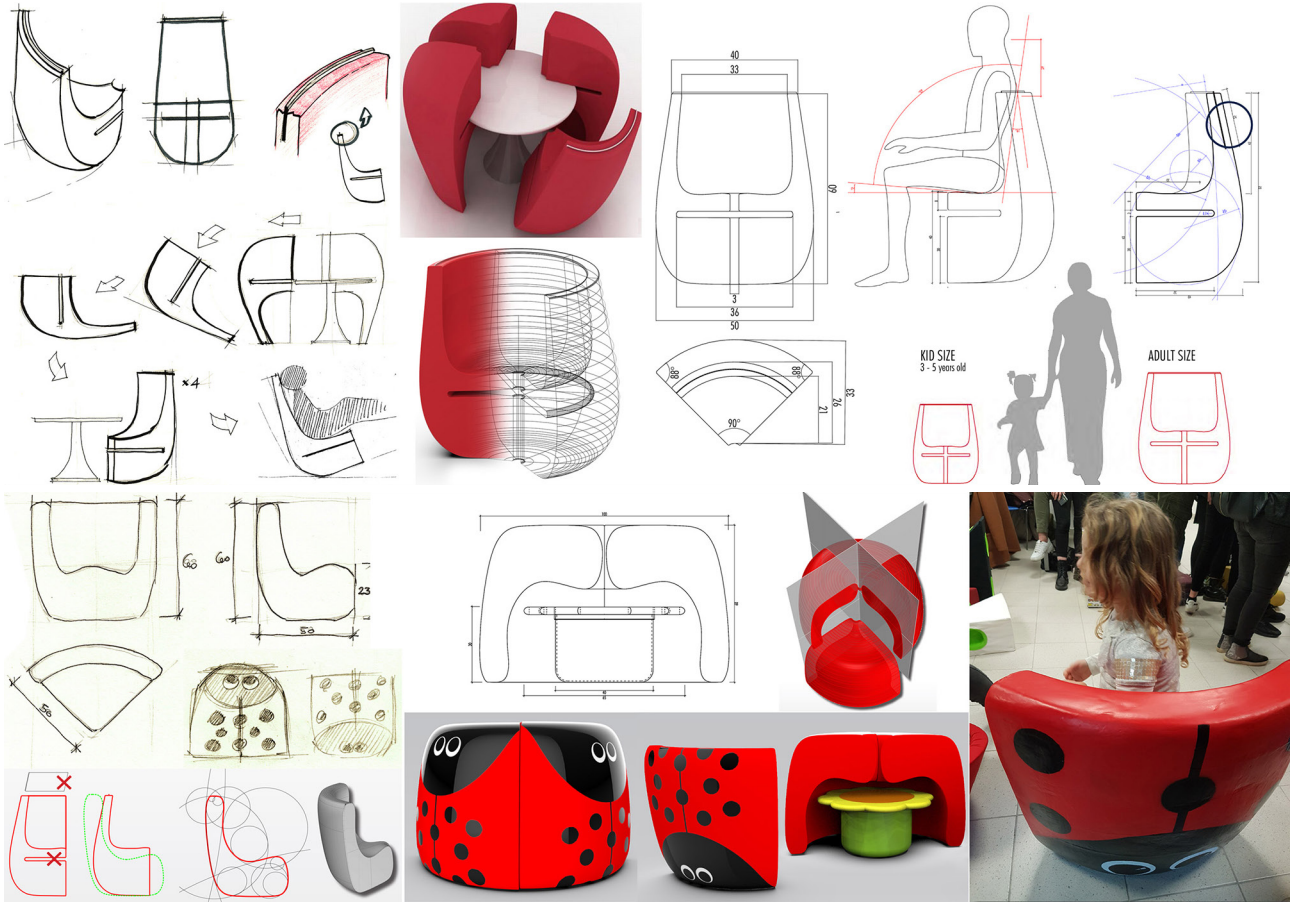


Fig. 3. Multiple drawings (from sketch to prototype) for modifications of a "kids" chair. Above: the original chair; below: the modified chair (student Laura Veccia).

Therefore, if the object has the capacity to stimulate curiosity and provide enjoyment, children are inclined to redefine their aims and behaviour towards it. The goal of the experience was thus to devise a kids' redefinition of the chair that encouraged children to discover new, different, and personal uses of the object, to interact with it in a creative and innovative way, exploring its possibilities (fig. 3).
In this sense, shape, colours, and materials are characteristics through which the object transmits and receives input. The tactile and visual sensations generated by these aspects serve as channels through which the child can glimpse/invent a playful side to the chair. For this reason, the object must be manageable and constituted formally/materially such that no harm can be done (no sharp corners or edges, abrasive or toxic materials, etc.).
In this experience, a prototype testing day was held, inviting a group of 3 to 5-year-old children. This occasion proved to be a fundamental opportunity for the students to both verify experimentally how much children do not want 'a chair to be just a chair', trying to turn it into a game (even the least 'interactive' objects), and obtain important feedback on the validity of their design choices relating to object characteristics such as weight, resistance, colours, etc. (fig. 4).
The second experience focused on small, commercially available storage furniture. This theme was addressed with a view to repurposing that adequately reinterprets the qualities and/or defects of the cabinets in relation to various small appliances to be stored in them because "by observing not only the formal characteristics, but also the material, chromatic, tactile, or other characteristics of an object, one can think of transforming it into something else" [Munari 1991a, p. 322]. This is therefore a reasoned transformation which, in order to be addressed, had to consider several factors: the overall dimensions not only of the appliance to be stored within, but also any accessories or other items related to its use; the user's actions resulting from the new functionality; and the consequent adaptability to new spaces. In this case, the transformation moved towards searching for the potential of the object, its dynamism as a variation of its potential performance, the possibilities of partial change in appearance, shape, structure, colour, hierarchy, and level of relationships between its constituent elements, as well as its capacity to be integrated with new elements. This design approach to a renewed concept of a product introduced ideas such as: creative reuse, upcycling, transformation, reinterpretation, repurposing design, and the theory of affordances [Gibson 1979] (fig. 5).

Fig. 4. Prototype testing of the "kids" chairs. Examples of children's playful interpretation of the object (photos by the author and participants).

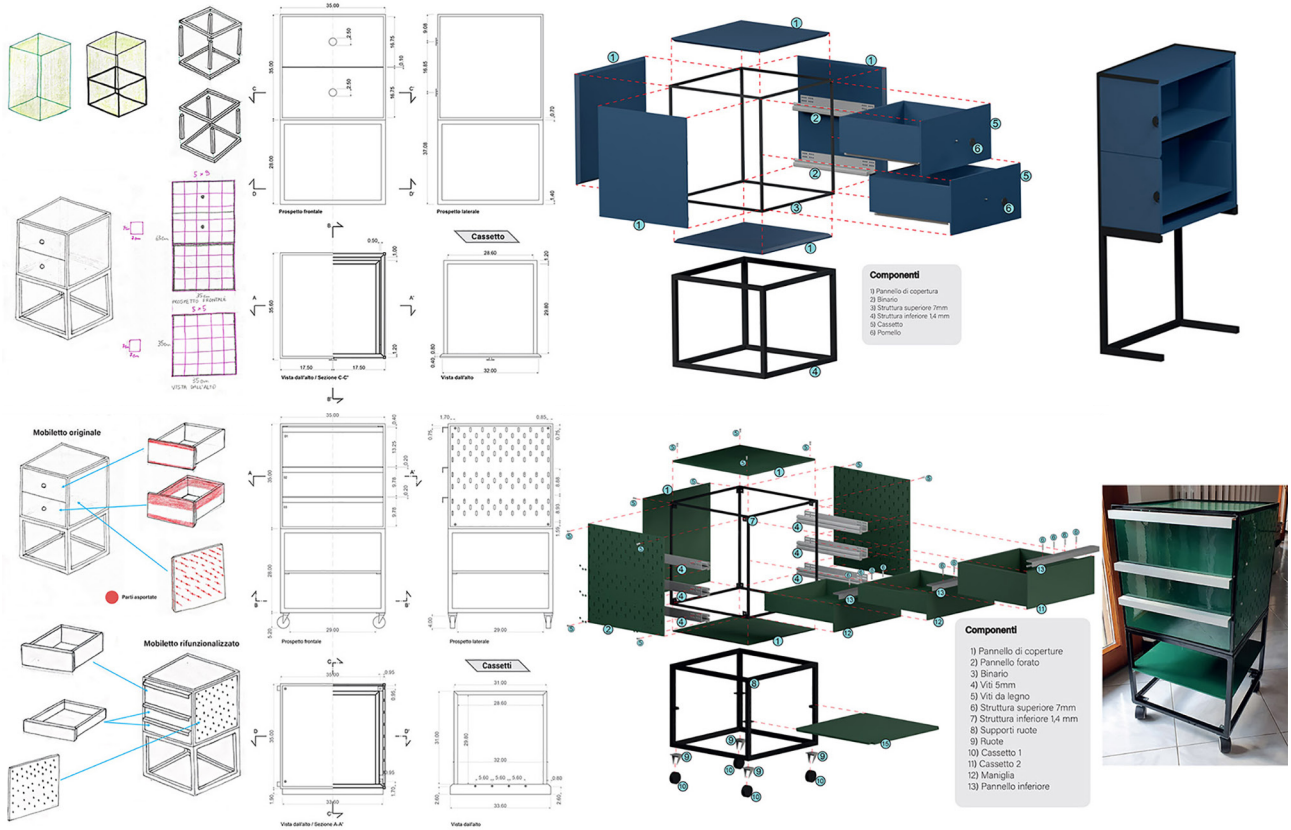


Fig. 5. Multiple drawings (from sketch to prototype) for repurposing a cabinet. Above: the original; below: the modified cabinet (students Simone Pompei, Leonardo Zazzetta).

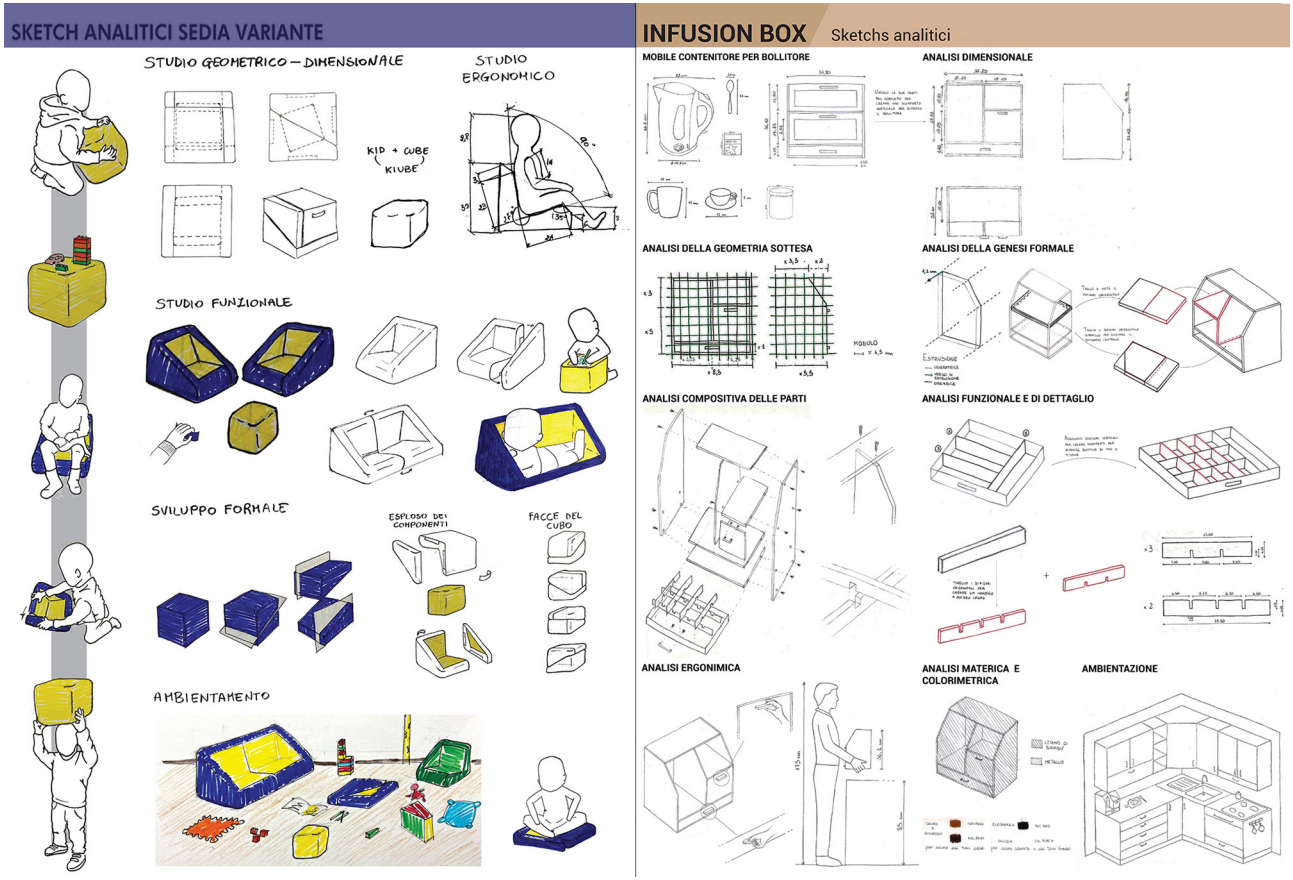
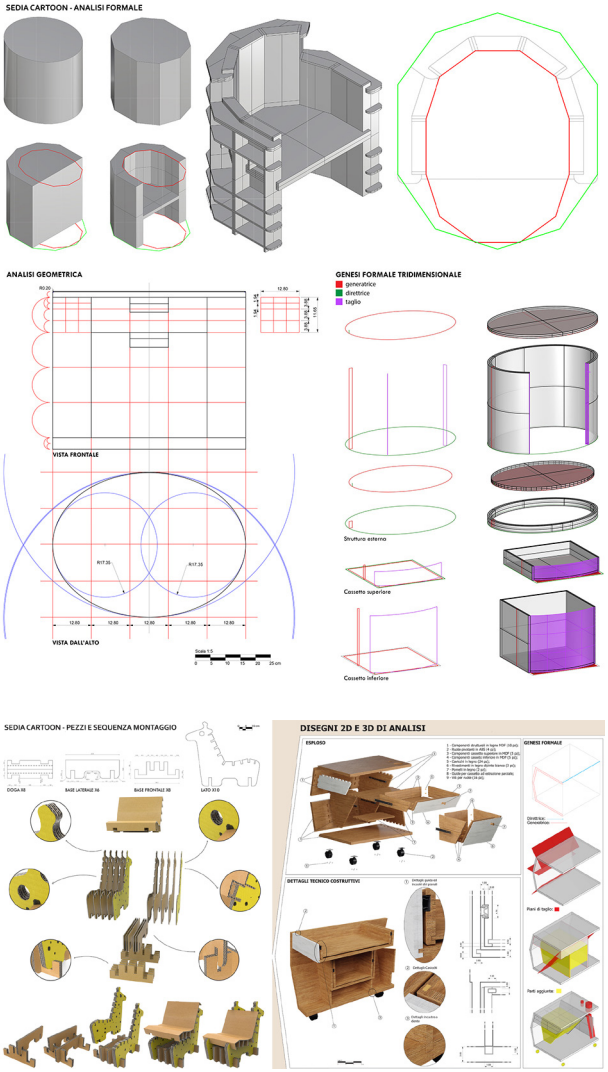


Fig. 6. Sketches of the phase to study targeted modifications. Left: a "kids" chair (students Paolo Rollo, Ventruti Erika); right: a cabinet (students Vanessa Moretti, Francesca Romano).

On a more conceptual level, this design for transformation places the treatment of objects already on the market within design for sustainability with respect to which the concept of innovation is read in terms of new functionalities and even minimal improvements. It is a conscious reflection on the culture of recovery and sustainable consumption that avoids the logic of disposability [Dal Falco 2007, pp. 80-87].
The procedure followed for both experiments was organized in two phases, which were, however, understood as parts of a single process in the sequential development of appropriate, diverse (theoretical-practical) steps, which corresponded to the same number of moments of graphical rendering.
The first phase, to understand the object, aimed to activate processes to truly appropriate/reconstruct the design process through the graphical operations of recognizing the object in its specifics.
The second phase –studying targeted modifications and creating life-size prototypes of the new version– intended to retrace the same modes of drawing, making them suitable for re-presenting the modified product according to different orders of in-depth study. The drawing-design practice was implemented following the same procedure as for the cognitive phase, that is, starting with a preliminary study of the context of the object (brand, designer, and similar products) and then experimenting with operations for its transformation/re-presentation with the introduction of an appropriate set of modifications (geometry-shape, ergonomics-conformation, construction-aggregate, material-colour, perception).
In both experiments, great importance was placed on the habit of making graphical notes in a notebook, as a form of continuous dialogue with oneself and support for the analytical/creative reasoning process, without fear of making mistakes but rather aiming to understand the means and sense to render content with a few but significant signs (fig. 6).
The shape, first of all, is the first aspect that establishes a certain programme of use for a product. Therefore, based on the principles of form theory, students were encouraged to recognize the morphological structure of the object (with reference to the three basic types of volume: solid, box, and net) as a property that is relevant for both the configuration process and shape manipulation [Cervellini 2012]. The formal genesis was analysed/studied first of all to accurately identify profiles in their true form,

Fig. 7. Geometrical-formal analysis of a "kids" chair (students Matteo Perticarà, Luca Rossetti) and cabinet (students Federico Marasca, Deborah Sorci).

Fig. 8. Axonometric exploded view and relationship between the parts/assembly of a "kids" chair (students Alessio Persichini, Andrea Pettorino) and cabinet (students Davide Pranzetti, Ivan Rebichini).



that is, the geometry of the surfaces that make up the object (basic geometric shapes, directrices and generatrices), then to correctly define the solids and their combinatorial interactions/properties, and, finally, to implement modifications through the variations identified (fig. 7). As a result, the rendering of the conformation of the object, in terms of defining all the constituent parts and their reciprocal relationships, was expressed in particular by processing the appropriate sections and exploded views accompanied by close-up 3D/2D details (joints, couplings, etc.) (fig. 8).
The ergonomic study was approached starting with the characteristics of the user group (age, anthropometric parameters, physical and perceptive abilities, possible attitudes and expectations etc.), of the activities related to use of the object (presumed needs) and the context of use, but also duly considering the cognitive and perceptive aspects of the relationship between shape and function (fig. 9). In this sense, it was important to try to understand that shape is an intrinsic component of function which includes as a design value not only the mere practicality of its use but also the aesthetic-emotional aspect of the object. Therefore, with respect to usability, the pleasantness (aesthetics) is not an excrescence but rather an intimate quality of the relationship that the object establishes and entertains with the user [Bollini 2021, pp. 844-846].
"For a designer, the problem of colour has two aspects: using the coloured material produced by industry and incorporating the colour element into the design of objects. […] There is also a functional aspect of colour tied to visual communication and psychology" [Munari 1991b, pp. 356, 357]. Therefore, when choosing modifications in this sense, the emotional dynamics that each colour or colour combination generates in relation to the particular aspects of the subject must be considered. Moreover, since each colour changes according to the underlying material, studies on colours and materials (with textures or patterns, if present) have necessarily considered not only the technical dimension but also the perceptual-sensory dimension of these aspects since they determine an important visual-tactile impact that must convey both mental/sensory and practical sensations (visual and usage comfort) (fig. 10).
The students were also asked to prepare appropriate illustrative images to create a small catalogue/brochure of the object. The eminently informational-promotional scope of such graphical products requires a particularly effective language of strong communicational synthesis to enhance

Fig. 9. Ergonomic analyses of uses for a "kids" chair (students Matteo Morganti, Kevin Usein) and cabinet (students Federico Marasca, Deborah Sorci).

Fig. 10. Colorimetric-material studies for a "kids" chair (students Matteo Morganti, Kevin Usein) and cabinet (students Federico Marasca, Deborah Sorci).

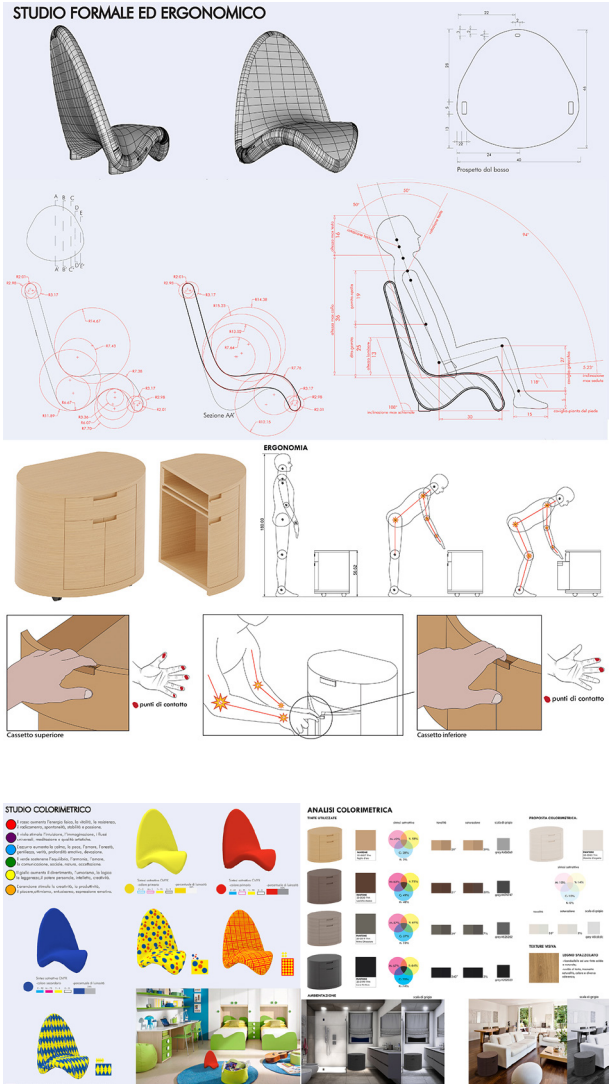


Fig. 11. Graphics for small informative-illustrative catalogues. Above: "kids" chair (students Sophia Malaguti, Milena Mercanti); below: cabinet (students Vanessa Moretti, Francesca Romano).

the object in whole or in part. Therefore, the goal was a skilful mix of synthetic black-and-white drawings designed to convey intuitive technical information and realistic illustrative images of the object setting (fig. 11).
"Modelling life (when you can) means testing the true qualities of the object, correcting any errors, and making all necessary checks before starting production" [Munari 1991a, p. 194]. For this purpose, full-scale material prototypes (of the transformed/proposed object) were produced using different materials identified according to the morphological characteristics of the object (solid, box, grid-like). The process started with a careful study and digital drawing of all the parts, systems of joint and connections, and then moved on to fabrication using laser cutting machines and 3D printers in the workshop. Direct involvement in the creation/production process, making the object with one's own hands according to the 'learning by doing' method and with the emotional component of first being able to make the object and then being able to look at it, touch it, and test it, was decisive for the learning process (fig. 12). On the other hand, the focus on 'know-how' as a qualifying element [Micelli 2011] has deep historical roots in the design culture and also fosters the acquisition of a critical capacity regarding industrial production and what the market offers [Mari 1974].

Conclusions

Drawing and constructing images, proceeding from perceptual imitation to representational thinking through visual modes/models, is the first means of approach to knowledge about the world that we use as children and then, paradoxically, often lose as we grow up.
In this sense, exercising the concrete practices of drawing, learning to manage and use this system of specific and multiple modalities, is considered to be the most appropriate method for students to discover and recognize their relevance and effectiveness, as much in the self-communication of one's own work as in highlighting and clarifying ideas and concepts for others. Employed with this understanding, drawing becomes a true language of study, reflec-

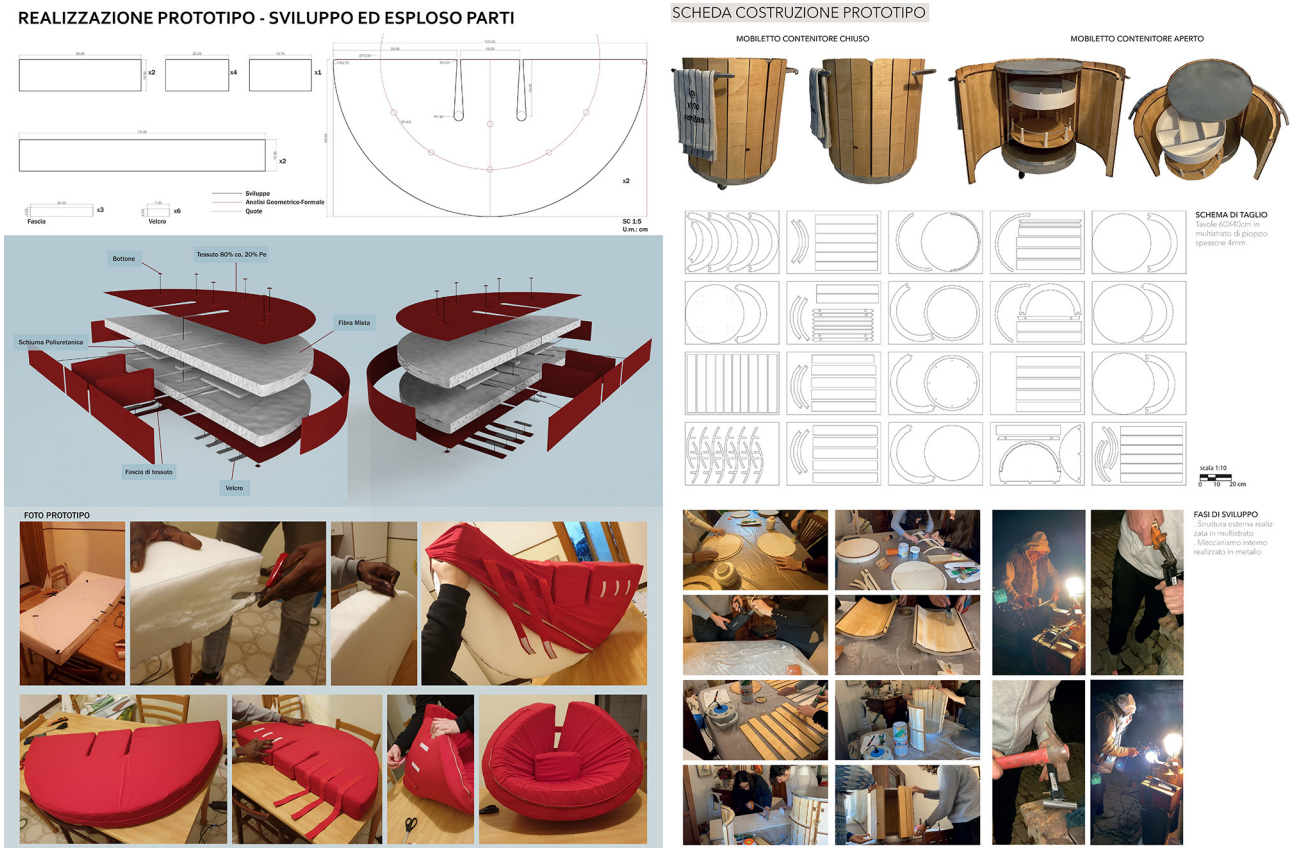


Fig. 12. Laboratory phase of making prototypes for a "kids" chair (students Andrea Nicolardi, Giovanni Sasso) and cabinet (students Chiara Scaramucci, Arianna Veronesi).

tion, investigation, and verification to understand, interpret, and bring out even hidden content, making it explicit. Not only communication, but a tool for control that highlights concepts through signs.
Therefore, from a theoretical-conceptual point of view and also concrete application, the main objective identified by the experiences presented herein was to present the acquisition of that gradual –representational– communicational process based on the correspondence between interpretational models of an object and instrumental/operational models. In other words, the aim was to build a critical awareness of drawing methods, techniques, means, and content, that is, explaining the substantial relationship between graphic elaborations (relevant, correct, and exhaustive) and their exploratory, revelatory, prefigurative, and expressive potential of all that underlies the ideation of a design product.

Notes

[1] The experiences were part of the User-Centred Design Laboratory's Representation and Modeling Techniques course in the Bachelor of Industrial and Environmental Design at the School of Architecture and Design, University of Camerino, a.y. 2019/20 and a.y. 2021/22.

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Design vs Disegno. Real vs Virtual. The Digital Twin as a Holistic Approach to Sustainability

Benedetta Terenzi

Abstract

In the Digital Era, among emerging technologies, the Digital Twin (DT) is also experiencing rapid and steady development. The DT is a virtual representation of an object or system, connected to it throughout its life cycle. It is a highly complex computerized model, an exact replica of its physical counterpart. The application possibilities of the Digital Twin in the design of products and their subsequent development are greatly increasing due in part to the possibility it offers to interpret various roles of the entire life cycle of the artifact to which it refers.
Research in this field is proceeding with the goal of getting to the point of optimizing the internal design process (from concept generation to material selection, from design verification to manufacturing, from delivery to use, and reaching end-of-life management). Based on these considerations, the article aims to highlight how DT can drive innovation in sustainable and circular economy, supporting companies, entities, and institutions to reduce costs, optimize resource use, and decrease carbon footprint. However, despite their potential, DTs have not been critically examined in sustainability paradigms and their benefit toward promoting the Sustainable Development Goals.

Keywords: digital twin, design for future, sustainable development, planet life design.

Introduction

Derived from the Latin *designare*, the term 'design' takes on the dual meaning of 'design' and 'drawing,' expressing the concept of the intention and design activity of an inventive nature [Maldonado 2013], although in common parlance it also continues to denote concrete and tangible expression: a drawing, decoration, motif, ornament, style or visual composition. Understood as design practice and subjective ability to produce aesthetic, sense and sometimes economic value in industrial products, whether they are material or communicative artifacts, physical or virtual: in the difficult task of shaping the language of modernity, design today expresses itself in very broad valences, from the real to the virtual, from products to services [Trabucco 2015]. The WDO (World Design Organization) defines design as "a strategic problem-solving process that drives innovation, builds business success, and leads to a better quality of life through innovative products, systems, services, and experiences. […] Design provides a more optimistic way of looking at the future by reframing problems as opportunities. It links innovation, technology, research, business, and customers to provide new value and competitive advantage across economic, social, and environmental spheres" [1]. And again "Design is a problem-solving activity, a creative activity, a systemic activity, and a coordinating activity" [Borja De Mozota 2003, p. 23].
In parallel, for Industrial Law the term 'design' is synonymous with graphic realization aimed at outlining the appearance of a two-dimensional product; 'model,' by

contrast, expresses the same concept in relation to a three-dimensional product [Floridia 2020].
In analyzing the relationship between design and drawing, it therefore appears interesting to investigate the relationship between 'reality' and its 'image,' between the design process and the bivalence of its final outcome that runs on two levels, the physical artifact and its digital model, focusing on the specificity of the disciplinary field of drawing, in the generation, construction and analysis of drawings, images and models, as outcomes of scalar representations of existing or designed realities.
From the ethical and cultural point of view, Baudrillard's interpretation of codes, models and signs, emphasizes the forms of organization of a new social order dominated by simulation and a paradoxical 'hyperreality' where human experience is an emulation of reality [Baudrillard 1981]. Baudrillard reinterpreted contemporary social reality by defining it as the result of a process of simulation and substitution that ends at the stage where the simulacrum stops being a copy of reality by detaching itself from it '*in toto*' [Caro et al. 2020]. Without having to consider the most glaring examples represented by social networks and the resulting culture of image fetishism, even more emblematic is the recent phenomenon of the emergence of metaverse and Non-Fungible Tokens (NFTs).
A universe, that of the virtual, which puts back at the center of the discussion the theme of the utility and ethics of Design: if we cannot and do not want to exempt ourselves from living with the hyperreal, we ask ourselves what role Design, which by definition presides over the configuration of the morphological, aesthetic, symbolic, cultural, relational, functional, technological and productive characters of artifacts, material and immaterial, can assume. Objectives of design action are to improve the quality of life of people in different contexts, present and future, and to contribute to the innovation of socio-technical systems towards models of sustainability, circularity, inclusion, and social equity. In this sense, the disciplinary scope of design shifts its horizon to include emerging fields in the strategic-organizational, digital, and social innovation fields, and is open to continuous updating in relation to the challenges of contemporary societies and new scientific-technological frontiers. In this sense, the application potentials of the visual-synesthetic and information-computational domains typical of design are explored, as well as possible innovations in applications supporting the realization process at various scales.

The Digital Twin

The term Digital Twin (DT) is increasingly used in technical discussions and common jargon, especially in connection with, but not limited to, the digitization of industrial processes. In research fields too, the term is increasingly adopted in connection with the study of complex systems by means of digital technologies. For example, in life science we speak of Digital Twin of the human body, in the field of climate change we speak of Digital Twin of planet Earth.
The Digital Twin differs from 3D reconstruction, which provides a static representation of the physical model, in that it is dynamic due to the ability to exchange data in real time with its physical homologous using Internet of Things (IoT) systems.
It was Michael Vickers who first presented a prototype of DT in 1970; it involved NASA's simultaneous use of fifteen computers to create the simulations that guided the Apollo 13 crew in the space recovery operation.
The first industry-wide software application, however, was due to Michael Grieves, who in 2002 presented the digital twin as a conceptual model for product lifecycle management (PLM) [2].
As Grieves [Grieves, Vickers 2016] states, the DT is a conceptual model that demonstrates that all information embedded in a tangible product can exist digitally.
The DT is a computer model, fed with data collected from a real system, that can concisely but faithfully represent (often through visualizations with 3D models, graphs, curves, and dashboards) the overall state of the real twin. It is an executable software model that runs on a host system. It emulates the hardware, including CPU instruction sets, memory maps, registers, and interrupts, to a sufficient level that it can be adapted to software development. On the software side, it is binary compatible with the emulated hardware, allowing users to run unmodified binary images of the entire software stack, which includes everything from low-level devices and firmware to operating systems, middleware, and, finally, the application to be developed. Simplifying, we could say that the DT is a seamless integration between the cyber space and the physical space; it is the equivalent of a real twin control center, developed inside software and running even without the controlled system.
According to Grieves' schematization [Grieves 2020] 2020], the Digital Twin is composed of three distinct ele-

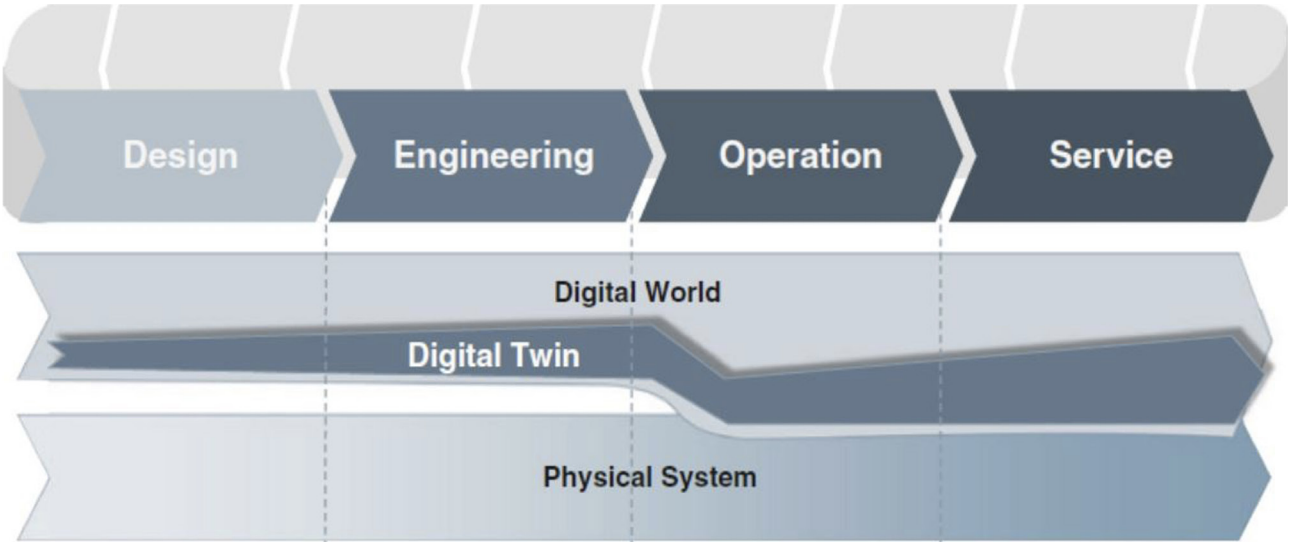

Fig. 1. Diagram of application of DT to different steps of the design process.

ments: there is the physical product that has always existed, which we can call the 'physical twin,' then there is the virtual counterpart, precisely the 'virtual twin,' and finally the third element is given by the 'two-way connection between the physical and virtual versions,' thus the data from the physical world, collected and transmitted to its digital twin.
Back in 2019, Gartner, a leader in technology research, included DT in its Top Ten Strategic Technology Trends [3], but recently, the concept of DT is taking on new meanings, expanding to a holistic digital model of a real system. It is an incredibly powerful tool because it allows not only to be in control of functions in their current state, but also to be predictive. This is made possible in large part by the computing power and data analysis available today in supercomputers or in the cloud.
The application possibilities of the virtual twin are further amplified in industry by the increasing automation of processes, where everything is managed by remote sensing systems and reconfiguration and maintenance operations must take place without human intervention, becoming one of the most promising enabling technologies for the realization of smart manufacturing and Industry 4.0 [Tao et al. 2018].

Digital Twins can provide the manufacturing sector with solutions that optimize asset performance across multiple dimensions of sustainability, safety, and profitability through adaptive models, shared data, and advanced visualization (fig. 1). Virtual twin technologies can also increase the speed of time-to-market while reducing the risk associated with complex projects [Lo 2021]. As our physical and digital worlds converge, digital twins can play a key role in helping society overcome some of its most pressing sustainability challenges with a view to ensuring a better quality of life for all [Tao et al. 2020].

Holistic approach to sustainability through the Digital Twin

Sustainability is a multifaceted, environmental, economic and social goal. The ultimate tool for achieving it is knowledge, in its various forms, above all, that of ecosystem complexity. Ecosystems have within them the great potential to preserve life, with a dynamism characterized by cyclicality and mutual subsidiarity. Unfortunately, this ecosystem subsidiarity is strongly modified in direct and

indirect ways by the anthropogenic footprint [Tartaglia et al. 2021].
Therefore, the term sustainability is increasingly associated with the term responsibility, i.e., the need to interpret in fieri social needs, security, environmental protection, and production ethics, and provide a just response to them.
The European Green Deal [4] is the action plan for making the EU economy sustainable, turning climate and environmental challenges into opportunities, and making the transition inclusive. The European Green Deal is tasked with avoiding CO_2 emissions by 2050 by promoting an economic growth model decoupled from resource use, with a specific focus on inclusiveness, which means that no person and no place should be left behind. The main points concern the efficient use of resources by moving to a clean and circular economy, include restoring biodiversity, decisively reducing emissions and pollution of soil, water and air. A range of funding instruments have also been made available to support the creation of a European climate law, which is necessary to transform theoretical and political commitment into a legal obligation and thus into effective action. Achieving this goal will require action by all sectors of the European economy, including investment in innovative and environmentally friendly cross-cutting technologies, support for industry innovation, the spread of cleaner, cheaper and healthier forms of public and private transport, and the decarbonization of the energy sector.
In this sense, the role of design appears imperative, precisely because it is oriented toward shaping complex scenarios and defining the ways in which humans interact with humans, and humans with their habitat [Terenzi 2021].
In parallel, today we move in changing patterns that need to respond rapidly to social cultural and political stimuli. Models that therefore take on the character of high flexibility and adaptability.
The fluidity of the context has exponentially broadened the operational and epistemological boundaries of design, which is no longer design of the aesthetic component of mass production but becomes design for the development of new behaviors, where objects and services are designed not only to respond to expressed needs, but also and above all to identify and anticipate latent needs in the context of sustainable development.
Anticipation is increasingly at the center of urgent contemporary debates, from climate change to the economic crisis. This aspect underscores the anticipatory

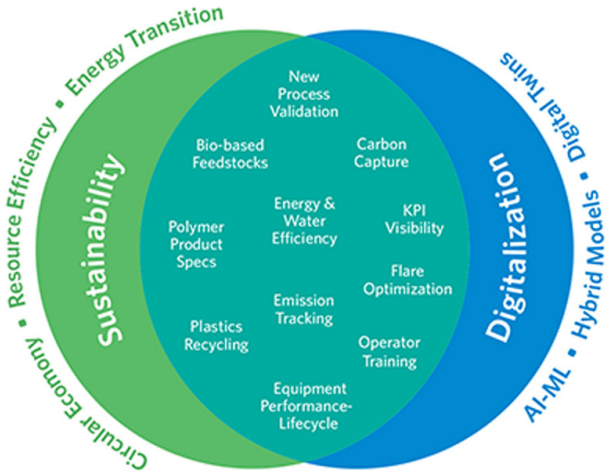

Fig. 2. The diagram shows the role of Digital Twins as an integral part of the sustainable approach. <https://www.automation.com/en-us/articles/march-2022/make-digital-twins-sustainability-program> (accessed 21 December 2022).

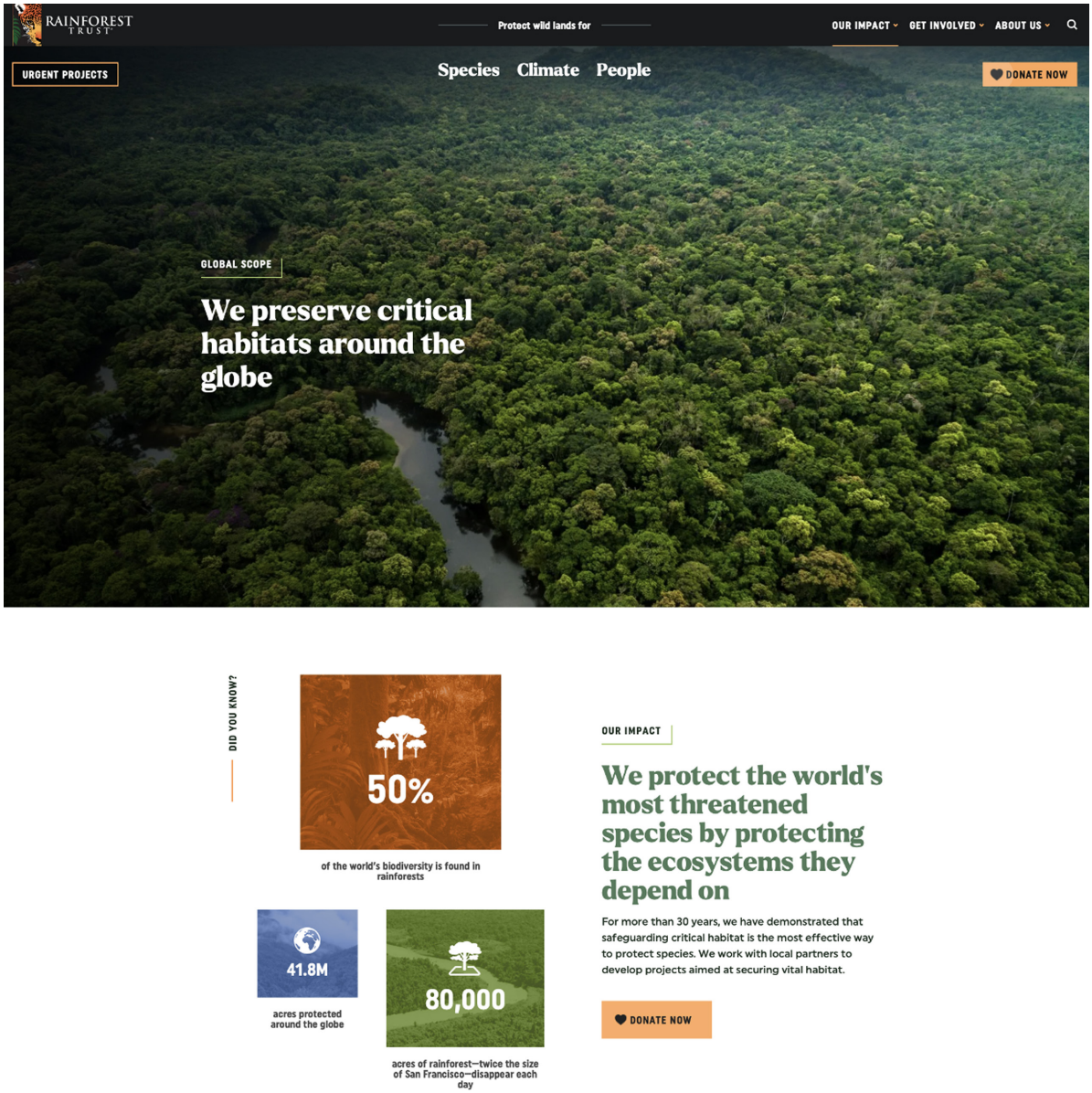

Fig. 3. Homepage of the Rainforest Trust platform.

component to which the project, now more than ever, is called upon to respond. According to Bernard Cazes, thinking ahead has always been an essential component of human nature, and anticipatory practices are coming to the forefront in political, organizational and personal life, but also in design practices [Arnaldi, Poli 2012]. If for Viktor Margolin [2017] designing in the present requires a vision of what the future could and should be, according to Bertrand de Jouvenel [2018] we have possible futures, or futuribles, while for Berger the French conception of perspective as a vision of the future refers to three aspects: - knowledge about the past and the present; - imagination; - will [Arnaldi, Poli 2012].
In this context, design action becomes the practical nexus between the past and the 'possible future,' and the material and immaterial artifacts it produces make explicit the possibility of existence at the very moment they are realized and at the same time their potentiality for what they could be. Between the concept of sustainability and the possibilities of prediction, digital transformation takes on a new role (fig. 2).
Digitization has proven to be one of the main enablers for building more sustainable economies and societies, due to its current and future potential in facilitating new patterns of consumption, production, and work, and thus, also supporting the realization of the 17 UN Sustainable Development Goals [Tzachor et al. 2022]. The growing abundance of available data can guide choices toward smarter, more informed decisions, while the growth of automation and AI can make our actions more efficient and effective.
A digital environment that copies and evolves before the physical environment, such as that of the DT, is a unique advantage from a sustainability point of view because it allows us to predict the evolutions of elaborate complex systems.
DTs can drive sustainability, basically on two different levels. On the one hand, they can be used to acquire, organize, and visualize data to provide a realistic model of the physical world. This aspect is a valuable aid aimed at understanding and quantifying what is happening, and to combine different data useful for observing the impact of decisions with respect to the processed system.
The value of the Digital Twin is that information replaces the waste of physical resources. Bits are cheaper than atoms, while bits become cheaper at an exponential rate and atoms more expensive at the rate of inflation. We

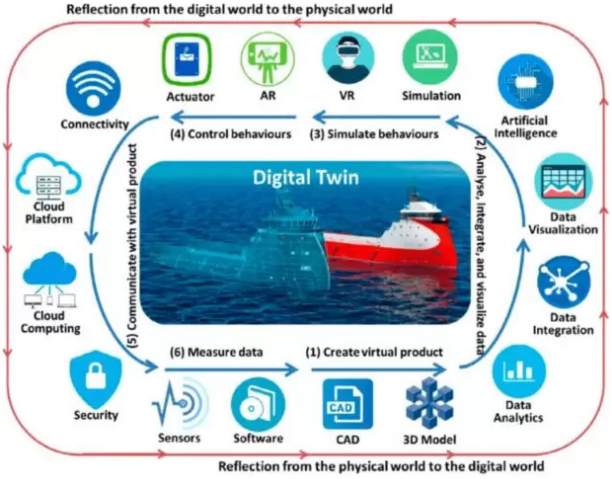

Fig. 4 ILIAD project Digital Twin of the Ocean (DTO). Cf. : <https://zeroemission.eu/ue-stanziati-17-mln-di-euro-al-progetto-iliad-per-lelaborazione-gemello-digitale-degli-oceani/> (accessed 19 December 2022).

can use the information of the Digital Twins to create, produce, operate and support products and systems more effectively and efficiently.
On the other hand, the digital model can take on the role of a predictive guide to the future, comparing possible scenarios and predicting the outcome of different alternatives before decisions are made. These potentials represent wide-ranging benefits in a variety of areas [Tao et al. 2019]. The dynamic nature of modeling lends itself to optimizing resources, processes, and systems in areas such as resource management, traffic management or logistics optimization, balancing energy networks or facilitating resilience in the face of climate change impacts. The Digital Twin model has been used by NASA for spacecraft [Glaessgen, Stargel 2012] and by the U.S. Air Force for jet fighters [Tuegel 2012].
The oil industry is exploring the use of Digital Twin for ocean production platforms [Renzi et al., 2017] while General Electric has used the term extensively, especially for power generation equipment [Castellanos 2017]. DTs have been used in the development of 85 percent of the world's electric vehicles, more than 75 percent of global wind power, enabled the world's first solar aircraft, and contributed to the development of numerous biomaterials.
The description of some practical examples helps to better understand the possibilities for sustainable development of DT.
The Rainforest Trust is a conservation organization that creates Digital Twin of rainforests in the tropics. The goal is to interpret data to allow experts to identify landscapes that need immediate protection, to prioritize species that are most threatened, and to have the immediate positive effect of biodiversity tutale for the planet's tree species. Based on the predictions, the Rainforest Trust acquires land with specific efficiency characteristics to save the most impactful acres for wildlife protection (fig. 3).
The European Digital Twin Ocean (DTO) born to support the framework of the EU Mission Restore Our Ocean and Waters by 2030 and to enable the ambition of the European Green Deal. To strengthen EU leadership in protecting the Ocean, European Commission President Ursula von der Leyen launched this important project. In this sense, the ILIAD Consortium has been awarded a €17 million grant from the European Union to develop and launch a DTO that will provide highly accurate predictions of changing data in the global seas through Artificial Intelligence (AI) algorithms. The ILIAD

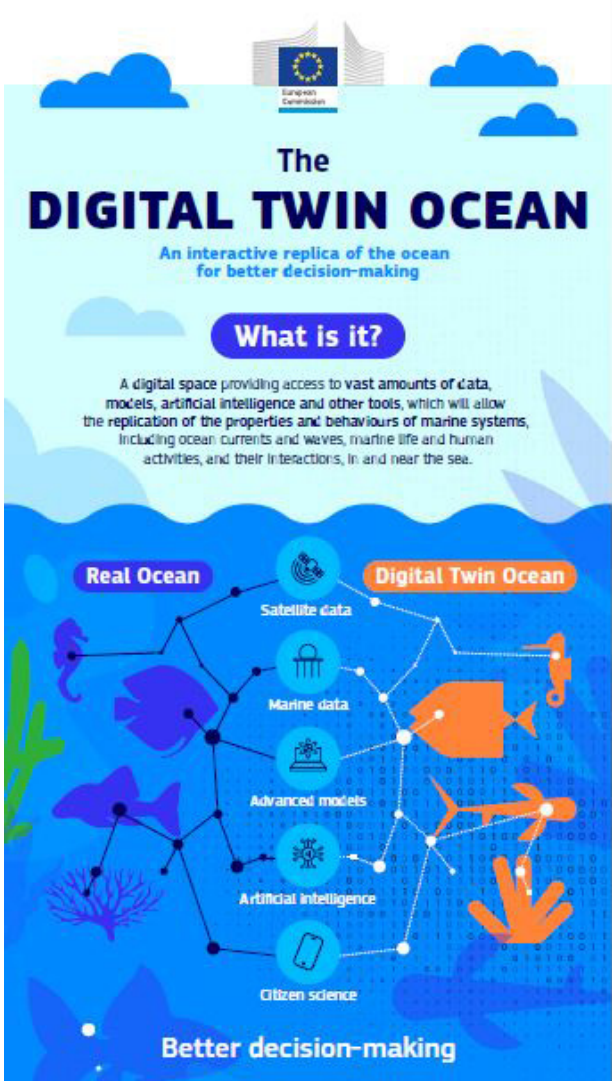

Fig. 05. Digital Twin of the Ocean, EU Missions in Horizon Europe. Cf.: <https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/restore-our-ocean-and-waters/european-digital-twin-ocean-european-dto_en> (accessed 19 December 2022).

ILIAD FIELDS OF APPLICATION OF DTs

Wind energy	Blue economy, harness ocean electricity, integrate data, models, physical ocean observatories at sea and digital technologies (HPC, AI, data analytics), a clean, productive, predicted, safe ocean.	Pollution	Pollution monitoring, mitigation, and remediation, integrate data, models, physical ocean observatories at sea and digital technologies (HPC, AI, data analytics), high resolution, near real time, stop waste entering the ocean, a clean, healthy and resilient, productive, predicted, safe ocean.
Renewable energy from the ocean: currents, waves, floating solar	Blue economy, harness ocean electricity, integrate data, models, physical ocean observatories at sea and digital technologies (HPC, AI, data analytics), a clean, productive, predicted, safe ocean.	Met ocean data: hind-, now- and forecasts	Integrate data, models, physical ocean observatories at sea and digital technologies, mapping the ocean (share and manage ocean data), understand & forecast ocean behaviour & climate change, sea level rise and extreme values in coastal environments, a predicted, safe, accessible, inspiring & engaging ocean
Fisheries and aquaculture	Farm to fork, integrate data, models, physical ocean observatories at sea and digital technologies (HPC, AI, data analytics), High resolution, near real time a clean, healthy and resilient, productive, predicted, safe ocean.	Biodiversity assessments and monitoring	Protect biodiversity, Integrate data, models, physical ocean observatories at sea and digital technologies (HPC, AI, data analytics), a clean, healthy and resilient, —predicted, safe, accessible ocean
Marine traffic and harbour safety	Marine socio-economic systems, blue economy, integrate data, models, physical ocean observatories at sea and digital technologies (HPC, AI, data analytics), a productive, predicted, safe, accessible ocean.	Insurance for marine and maritime activities	Marine socio-economic systems, blue economy, integrate data, models, physical ocean observatories at sea and digital technologies (HPC, AI, data analytics), a productive, predicted, safe, accessible ocean.

Fig. 06. ILIAD fields of application of DTs. Cf. : <https://www.ocean-twin.eu/news/article/what-is-a-digital-twin-of-the-ocean-and-what-can-it-be-used-for> (accessed 19 December 2022).

project will develop a DT containing virtual representations of the sea that will complement and extend EU Earth observation through predictive models and digital infrastructure to provide highly accurate data and predictions from climate change to marine renewables (figs. 4-6). At the One Ocean Summit in February of 2022 Ursula von der Leyen explained that a digital twin of the ocean is an opportunity for Europe to focus attention strongly on in our collective ocean resources to preserve.
To date, one of the most advanced City Digital Twins is that of the city of Zurich. In support of smart cities, the City Digital Twin is expected to be able to reflect and purposefully influence urban functions and processes to improve their implementation, operation, and management. As an important part of the city's smart strategy, Zurich's digital twin was developed to support decision-making through a digital spatial image. It enables visualization of street spaces, underground services and selected public buildings at higher levels of detail. In addition, several benefits and applications have been tested that have proven useful in the context of urban planning decision-making, such as comparing and evaluating different urban development scenarios, facilitating public participation in planning, integrating urban climate issues into development plans with simulation of the effects of environmental change, supporting the achievement of climate-neutral goals defined in the Climate-neutral and smart cities EU mission.
The city of Zurich's digital twin shows high potential for improving the city's visualization and planning and the inclusion of stakeholders with a view to improving the quality of life of its citizens (fig. 7).
Finally, we see how the difficult management of the volume of data used to make all this possible can itself be made more sustainable. Indeed, as is well known, data centers, physical spaces dedicated to the storage of computer systems that house servers, contribute significantly to CO_2 emissions. For example, every online search has an environmental cost to the planet, so much so that in processing 3.5 billion searches per day, Google accounts for about 40 percent of the Internet's carbon footprint. The mechanical movements within Computer Processing Units (CPUs) and the continuous rotation of hard drives require large amounts of electricity and thus cooling capacity. A Digital Twin of this process could identify potential alterations to reduce data duplication in storage (Dark Data) and also improve performance in centers to minimize unnecessary power consumption. In this sense, DT can reveal small but high-impact changes to data center management, which can achieve benefits of up to 70 percent energy reduction, correlated with cost savings.

Conclusions

There is no denying that science and technology are accelerating at an unprecedented speed, but it is necessary to understand today the implications of how these technological advances will directly affect all aspects of society, and how to turn them to the betterment of life on the planet.
While just a few years ago, an Internet search for the term Digital Twin would have produced a handful of results, today the same search produces more than a million results, while a DT image search produces half a million images, including applications in a wide variety of fields.
The benefits of virtual twins are numerous, and the most important is the support and acceleration these technologies can provide for the transition to a more circular economy. As organizations and our society mature digitally, the digital twin can move from describing elements of present reality, what is happening, to describing the prediction of the future and why, to proposing interventions and, potentially, giving great impetus to the ecological transition. Important support in this regard is also provided by the methods of representation used and further refined aimed at defining virtual twins, and thus their design, understood in the broadest sense as a cognitive means of formal structure, as a tool for the analysis, transmission, fruition and dissemination of existing values, tangible and intangible. And this can be applied to the entire life cycle of the asset, process, system, or organization, creating value through continuous innovation.
In the virtual twin, the real and the virtual exist as a function of each other, the intangibility of the DT goes through a reconstruction of reality, in a two-way exchange, with the goal of arriving at an evolution of the existing in a near scenario, which is defined to be manipulated with a view to forecasting the future.
An inherent peculiarity of the system, which has not yet been fully unraveled, is undoubtedly that of reading the

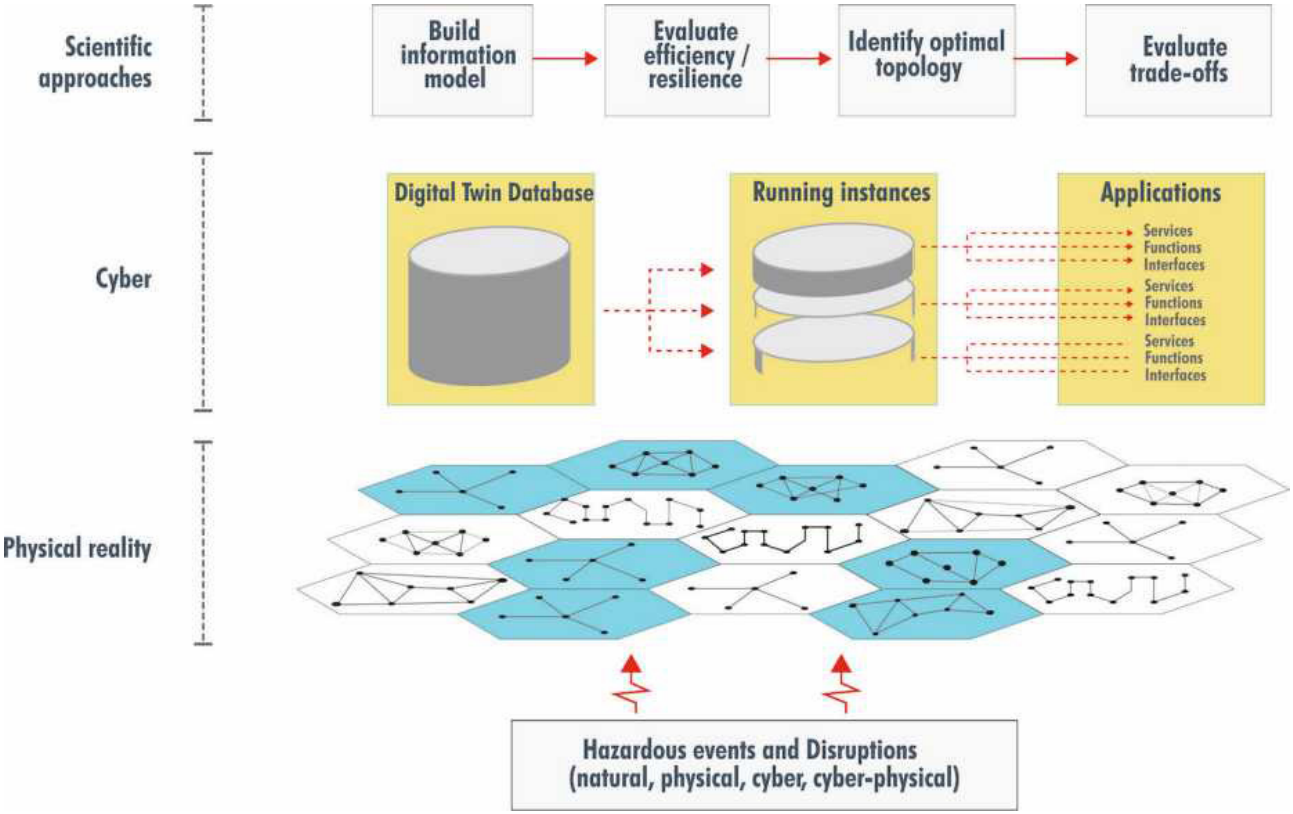

Fig. 7. Outline of the digital model of the city of Zurich. Information models together with multiphysics models highlight interdependencies within a collaborative decision support environment enabled by the Digital Twin. Cf.: <https://frs.ethz.ch/research/cyber-physical-systems/digital-twin-enabled-system-resilience.html> (accessed 19 December 2022).

potential of the virtual twin from the perspective of the possibilities it offers for decreasing CO_2 emissions, in all its potential declinations. According to analysts, the DT market will amount to as much as 35.8 billion euros in 2025, almost ten times its value six years earlier, and can lead to 7.5 Gt of CO_2 emission reduction by 2030.
To maximize its benefits, digital twins will not have to focus on individual resources, but rise to understand and operate on entire processes and contexts. Achieving the fragile balance of sustainability goals, considering people, planet, and profit equally, is a considerable challenge, but one that must be addressed, and digital technologies will be at the heart of this transition.
To do this, it is important that the ecosystem be flexible enough to adapt as it grows, considering a changing world and an expanding geographic and social reach.
On the one hand, there are undoubted advantages; on the other, there are limitations to the scope, and one of these is related to, for example, privacy. The other issue is that of individual and collective responsibility, of preventing the triumph of the container from supplanting the content, that the ubiquitous presence of symbols, fallacious and virtual narratives, assuming more and more prominence and importance at the expense of the realities they describe, ends up becoming the only interpretive tool available.
In this sense, it seems, finally, interesting to open the perspectives and draw a parallel with another virtual system that affects the transformation of the contemporary era, such as the concept of the metaverse.
Digital Twins, being digital copies in real time of a physical object, can be defined as constituent elements of the metaverse, and they see precisely in the metaverse their natural evolution, as the general connection between the digital world and the physical world that allows and exploits the possibility of switching from one reality to another and expands the possible experiences. The metaverse synthesizes the path of replacing reality, of individual and concrete value, with a new ontological conception of truth: the truth of illusion, of 'reality without reality.' In other words, while the DTs and the metaverse share the same basic logic of operation, it is equally true that while the former consist of a series of virtual instances of a physical asset, characterized by a continuous flow of real-time data that enables the use of IoT, AI and Machine Learning, to perform predictive analytics and complex simulations in real time, for the metaverse there is still no clarity of purpose on how to channel the potential of fully immersive experiences into a simulated reality, not necessarily twin to the real world.
Regarding their sustainability, in environmental terms, although there are already early studies that also indicate the likely positive effects in terms of CO_2 reduction of a progressive and massive use of the metaverse, this is yet to be verified. Replacing physical goods with virtual ones may ideally allow, for example, to reduce the environmental impact of production chains; furthermore, favoring digital events, preferring them to in-person ones, would decrease the need to travel by polluting means, and migrating social activities into virtual reality would allow for a drastic reduction in waste produced, eliminating waste. It should be noted, however, that this trend may still risk leaving a footprint on our ecosystem because it opens the way to new needs and new habits and consumption patterns, closely linked to Internet use, which would still increase demand for new related services and commodities.

Notes

[1] Cf.: <https://wdo.org/about/definition/> (accessed 19 December 2022).

[2] Cf.: <https://studylib.net/doc/15295818/plm-presentation> (accessed 19 December 2022).

[3] Cf.: <https://www.gartner.com/en/documents/3904569> (accessed 19 December 2022).

[4] Green Deal. Available online: <https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_it> (accessed 30 September 2022).

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Languages and Devices

D^2

Enrica Bistagnino

In recent decades, especially since the 1990s, the growing of training courses in the area of design has brought about an exceptional variety of design declinations.
A sort of euphoric openness towards the most varied thematic areas, from product to service, from interiors to fashion and, of course, to communication, a discipline transversal to multiple project spaces, has favored a pulviscular articulation also in the sectors adjacent to design, such as, undoubtedly, drawing.
In this discipline, therefore, a plural and at the same time 'unitary' experimentation has been activated which has participated in 'specializing', in practice, its own procedures and in generating important, more or less direct reflection also on the theoretical-critical level.
In other words, it was not just a methodological and technical-instrumental adaptation linked to the scalar, formal, structural and functional characteristics of the different project contents, but a real expansion and hybridization of codes and languages, accompanied by a progressive growth of artifacts usable on an equally diversified repertoire of devices and through different methods.
Thus, alongside traditional printed products, the diffusion of digital products accessible on/off line has been consolidated, often in an interactive way –practicable through mobile interfaces of different formats and sizes– and shared on multiple platforms.
Thus, the semantic revolution of the languages of drawing and the extended application favored by the disciplinary nuances of design has continued to introduce new representations, often free from relationships of similarity with respect to the referent, often relating to

This article was written upon invitation to frame the topic, not submitted to anonymous review, published under the editorial director's responsability.

different domains and free from the gaze of the physical eye, as in the case of mental, mathematical and verbal representations [Mitchell 2018, p. 40].
Storytelling, data visualization, maps, photographs, Virtual Reality representations, multi-code and multi-channel works, whether static or dynamic, iconic, symbolic, indexical, rhetorical etc., are just some of the types of images that fulfill the ideational and developmental dimension of the project by expressing, in extreme synthesis, new techniques, aesthetics and semiotics.
Naturally, in relation to this renewal, which has embraced the professional sphere, as well as that of teaching and research, in the university context has matured, on the part of drawing, a widespread request for disciplinary updating.
Thus, in the recent revision of the declaration of the sector –in particular, in the last paragraph where drawing is described as a "graphic, infographic and multimedia language, applied to the design process from the formation of the idea to its executive definition" [1]– the well-known design value intrinsic to the configurational dimension of drawing was confirmed and formalized, thus expanding its role in terms of formation. In other words, in the updating of the identity and of the disciplinary perimeter, that important oversense already traceable, moreover, in the etymology of the Latin term '*designare*' [2] –which embraces, precisely, the idea of project– is further attested, as well as in the English expression 'design' [3] whose central meaning, with respect to its semantic field, is 'drawing' [Volli 2016]. On the other hand, Tomás Maldonado himself, in 2014, acknowledged that 'Drawing with a capital D' plays a primary role in the formation of the design idea. In a conversation on the relationship between drawing and design, when urged to comment on one of his thoughts on writing, in which he stated that "the logical-semantic order […], the linearity implicit in the relationship between antecedent and consequent, between premise and conclusion are felt in the practice of speaking and listening" [Maldonado 2005, p. 53], he pointed out its adaptability to representation. "This text deals specifically with writing, but the arguments developed apply in the same way to drawing. Stretching things a bit, it is possible to substitute the word 'drawing' for the word 'writing' without substantially altering the meaning of the discourse. My reasoning is adaptable to this terminological variation. This paper offers a rather precise idea of my thinking on the theme of representation" [Maldonado 2018].
Therefore, in drawing, as language producing a 'textualization' of the idea, the necessary and progressive ordering process underlying its execution induces a clarification and coordination of the numerous project variables, thus participating in a decisive way in structuring the course of elaboration and to define the contents. Recalling a famous phrase by Cennino Cennini, ancient yet always topical, "drawing with a pen […] will make you expert, skillful and capable of much drawing out of your own head" [Cennini 1437, ed. 1859, p. 9].
Again, that symbiotic relationship between drawing and designing is confirmed, a relationship which, in the vagueness of some terminologies, gathers an effective potential for meanings. This is what happens with Leon Battista Alberti's famous expression *lineamenta* that Paolo Portoghesi, in the introduction to *L'Architettura*, decided not to fix in a univocal interpretation. "By the term '*lineamenta*' Alberti means something less broad and more specific than the Italian '*disegno*' [drawing]. However, by translating '*progetto*' and '*progettare*' [plan, project, design], the meaning of the text would be altered at some point. Therefore, it was preferred to translate literally because, after a few pages, the reader would be led, by Alberti's use of the term, to restrict and specify its meaning" [Portoghesi 1989, pp. 11, 12].
In general, therefore, by skipping some steps, we can further confirm the close relationship between drawing and design that we could represent with the lexical combination: drawing by a design mindset. The verb '*disegnare*' ('to draw'), compared to the noun '*disegno*' ('drawing') in fact allows an expansion of meaning which is then offered to the interesting adverbial delimitation/expansion.
If we then think of the field of visual communication, the boundary between drawing and design is naturally even more blurred. Here, in fact, the configurative value of drawing finds, precisely in the peculiarity of the sphere of design –where the components, the methods of developing ideas and the final products refer to the same codes and the same methods of use, primarily linked to the vision– a full and immediate applicative correspondence: from conception to the product, drawing is both a communicative and an elaboration medium, or rather, a language and a metalanguage.
In this particular area of design, then, I find it interesting to recall the lexical modification which frequently sees

the expression 'drawing' replaced by the term 'image,' one of its many synonyms that is very broad in meaning and equally extensive in its applications [4].
A lexical change that seems functional, in the reference context of visual communication, to better understand that repertoire of values actually implicit in the drawing activity or consequent to it.
Image, therefore, as a virtual image *stricto sensu*, or mental image, representation of the ideational 'vision'; as an image-medium, an exploratory drawing to clarify the pre-figuration of the idea; as an image-message, or rather as a signifier; but also, forcing the reasoning a little, as an image-product, as artifact. Image being understood, naturally, as a hybrid artifact that embraces different expressive registers, interacting with each other, serving to create reciprocal semantic saturations and to coordinate various sensory elements.
However, although dealing with an inter-code scenario that can be traced back to three main categories of signs: texts, images (in the strict sense) and accessory graphic signs, with some simplifications we can state that, in terms of the gaze, the approach to the fruition of artifacts is to a large extent, and in any case in the first instance, of an exploratory type, that is specific to looking. This depends on two main factors relating respectively to the formal level and to that of the content. On the formal level, in fact, as can be seen, for example, in many works of visual poetry, in becoming writing "the word mixes again with that same real, and therefore also visual, world from which it was originally separated, through the mediation of voice" [Barbieri 2015, p. 11] and also visually conveys the message it carries. Still continuing to reflect in the context of poetry, it can be noted that writing, in particular the graphic composition of the text, is first of all a fundamental guide for reading and understanding. "A poem in hendecasyllables transcribed in full (like a novel) would be distorted in essence; for many texts the rhetorical and rhyme structures are above all things to be seen before being heard" [Falcinelli 2011, p. 271].
From the point of view of content, then, it is worth mentioning the strengthening of the visual plane brought about by the frequent use of rhetoric, which, precisely, transfers the verbal plane to the figurative one. "In yet other terms, it could be said that the performativity of the word derives from and is realized through its transformation into image." [Vercellone 2016, p. 50].
In general, therefore, in the image, even when expressed by the heterogeneous articulation of text elements and graphic components, the visual seems to absorb the textual, looking seems to dominate over reading, the simultaneity of vision seems to anticipate the temporal succession of reading.
The gaze, free from proceeding according to a linear order, thus passes from an overall exploration of the composition to a progressive deepening of the signs and levels of meaning. From plastic to figurative analysis, the image is filtered through multiple 'scans', at first faster and rougher, then slower, more circumscribed and precise, which reveal the essential relationship between the technical methodological procedures of drawing and the definition of compositive structures as well as the relationships, in the page, between the different elements that form it. In the observation, through voluntary or reflex saccadic movements, the eye, oriented towards the elements of attention, acquires that information which in the phases of fixation is systematized thus allowing access to the grammar and to the complex syntax of visual language, and ultimately understand the meaning of images.
In this way of using the visual, it will be possible to detect the central role of the perceptive and projective foundations in the formal tracing of the sign components, in the attribution of their positional and dimensional hierarchies, in the choices relating to their semantic value also in consideration of the socio-cultural context of the community for which they are intended.
If, therefore, drawing, through the adoption of methods, techniques, codes, is an active gaze in directing the idea, is its original and ordering act, the binomial Drawing-Design still seems to well represent that extreme conceptual proximity between the act of drawing and that of designing which, in some poetic creative dimensions, converge and cancel each other out in a full unity of aesthetic and technical sense.
Starting from this hypothesis, it is necessary to continue to outline –while confirming the fundamental theoretical unity– the specificities of drawing in the context of the various declinations of design and, of this variegated sphere of design, to detect, through the reading of the images, some of the more significant cultural traits, hoping, in the final analysis, to identify further data and deepen knowledge for a chronical and a history of 'Design Drawing': D^2 [Bistagnino 2010].

Notes

[1] The Declaration of the Scientific Disciplinary Sector ICAR/17, which can be consulted on the Unione Italiana Disegno website, states: "The scientific-disciplinary contents concern the representation of architecture and the environment, in its broad meaning of cognitive means of the laws that govern the formal structure, of a tool for the analysis of existing values, of an expressive act and of visual communication of the design idea to different scaled dimensions. They include the descriptive geometric foundations of computer design and modelling, their theories and methods, also in their historical development; survey as an instrument of knowledge of the architectural, environmental and urban reality, its direct and instrumental methodologies, its procedures and techniques, including digital ones, of metric, morphological and thematic restitution; drawing as a graphic, infographic and multimedia language, applied to the design process from the formation of the idea to its executive definition". <https://www.unioneitalianadisegno.it/wp/sample-page/> (accessed on 7 December 2022).

[2] *Designare* –composed of the prefix '*de*', indicating completion of an action, and '*signare*' from *signum*, sign– therefore indicating in a specific way, destining, assigning, representing imagined or existing things.

[3] The verb 'to design', derived from the Latin '*designare*', contains like the Italian '*disegnare*' a similar ambivalence of meaning.

[4] I am thinking, for example, of the term 'image' in its ordinarily accepted meaning as a set of signs used to depict an absent object; I am thinking of the projective image, therefore linked to geometric methods for the representation of reality and of the elaborative imagination; or again, I think of the image as an icon, symbol or index, therefore a medium to represent the referent according to different levels of figuration or abstraction that bring into play aspects relating to the visual code, and much more.

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Notes on Morphology of Typefaces

Luciano Perondi, Roberto Arista

Abstract

Designing a typeface implies the search for a visual coherence between a series of shapes with different structures. This coherence is the effect of different interdependent factors that can be described and measured.
The purpose of this analysis is to provide a detailed description of some of the main independent variables of the design of a typeface and their interactions. We will then present a study of the shape relationships between the glyphs of a typeface, we will identify some of the design variables of a typeface, we will give a description of these relations and use all these notions as a design and teaching tool. This approach is inspired by the work of Donald Knuth and therefore has its roots in digital typeface design and can lead to a parametric approach to drawing.
Isolating the independent variables allows us to control the design choices and potentially to experimentally verify their effects. A detailed description also allows us to control through the study of functions the interpolations between shapes – a widespread practice since the 1990s to draw intermediate variants of typefaces. In this manuscript we will consider the shape of the glyphs intended as silhouettes, even if described by the outlines; therefore we will consider the impact of the perceptual interaction between black and white on the basic design variables. From an educational point of view, elaborating and verifying the effects of a variable and checking an interpolation, in addition to providing specific knowledge for the typography field, can be placed among the configuration exercises in the context of basic design. This method has been used at some courses of design in some Italian universities.

Keywords: typeface design, parametric typography, font classification.

Introduction

The design of a typeface presents a complex interaction between geometric aspects and perceptual aspects.
Attempts at a geometric systematization of the design of the font have been made in various eras. A notable example in typography is the work of the commission led by Jaugeon for the *Romain du Roi* in the 17th century [Kinross, 2005, pp. 24-27].
Two more recent systematizations are particularly accomplished: the one described by Noordzij in *The Stroke* [Noordzij 2005] and that of Donald Knuth [Knuth, 1979], which led to *Metafont* (font definition language and rendering system).
In both cases these are analyses formulated in a relatively isolated way from the world of contemporary design, but both have had a very strong impact on the design of the typefaces.
Knuth had an impact from a more technical point of view, with the introduction of parametric curves, for Noordzij from a more aesthetic point of view, with the explosion of "broad nib" typefaces in the 1990s Dutch graphic design.
Although both Knuth and Noordzij had a strong impact on the project, they developed their models in relative isolation from their contemporary designers.
Donald Knuth in particular is one of the most important computer scientists, and was introduced to the world of typeface design mainly from a collaborative relationship with Hermann Zapf and only later with Charles Bigelow [McCarthy 2020].

For this paper the important aspects of these two models are related to the identification of parameters or design variables that allow generation of a wide combinatorial of shapes. Both identify calligraphy in the generating principle of forms and both models are based on the concept that the shapes of the letters can be generated by a calligraphic process in which a shape runs along a path and defines the shape of the letters. As fascinating as this hypothesis is, the drawing of a glyph is a silhouette only vaguely attributable to an essential, but distant calligraphic origin.
In fact, the traditional punch cutting method has shaped the Latin alphabet since the fifteenth century, progressively moving the shapes away from their calligraphic origin. This detachment was completed during the nineteenth century, when the process of engraving wood types made for advertising purposes was added.
The shapes of the letters, although indebted to a calligraphic tradition, emerge from a process of reworking the shapes with different techniques and therefore have assumed proportions and shapes specific to press and punch cutting. An example is the evolution of the shape of the serifs, which has mixed calligraphic elements with elements related to stone carving and punchcutting.
Furthermore, although a "calligraphic" approach to typeface design re-emerged during the twentieth century, the spread of font editors based on parametric cubic splines that define the outlines, sanctioned the fact that the design of a typeface was emancipated from its calligraphic origin.
A more recent model is the one proposed by Riccardo Olocco [Olocco 2019] for the analysis of historical typefaces; this model has been adapted and used in the design of revival typefaces again by Olocco with Michele Patanè [Olocco, Patanè 2022]. The effectiveness and interest of this approach are linked to the fact that the typefaces are considered for their silhouette on the page, rather than on their abstraction or idealization.
The systematic study of variables in typefaces is related to the fact that a typeface is a coherent system: a core of relatively few formal choices has a decisive impact on the design of almost any glyph. If the bow of the *b* joins to the stem at a certain height, with a certain thickness and at a certain angle, this will have consequences not only in *q*, *d*, *p*, but also in *n*, *m* etc. and on *6* and *9* or on *G*, although the shapes are not exactly the same in all glyphs [fig. 1].
This close connection between glyphs is what makes the Latin script very homogeneous and compact in its appearance. At the same time it makes it difficult to discern on

Fig. 1. The figure shows some recurring details in typefaces (graphic elaboration by the author).

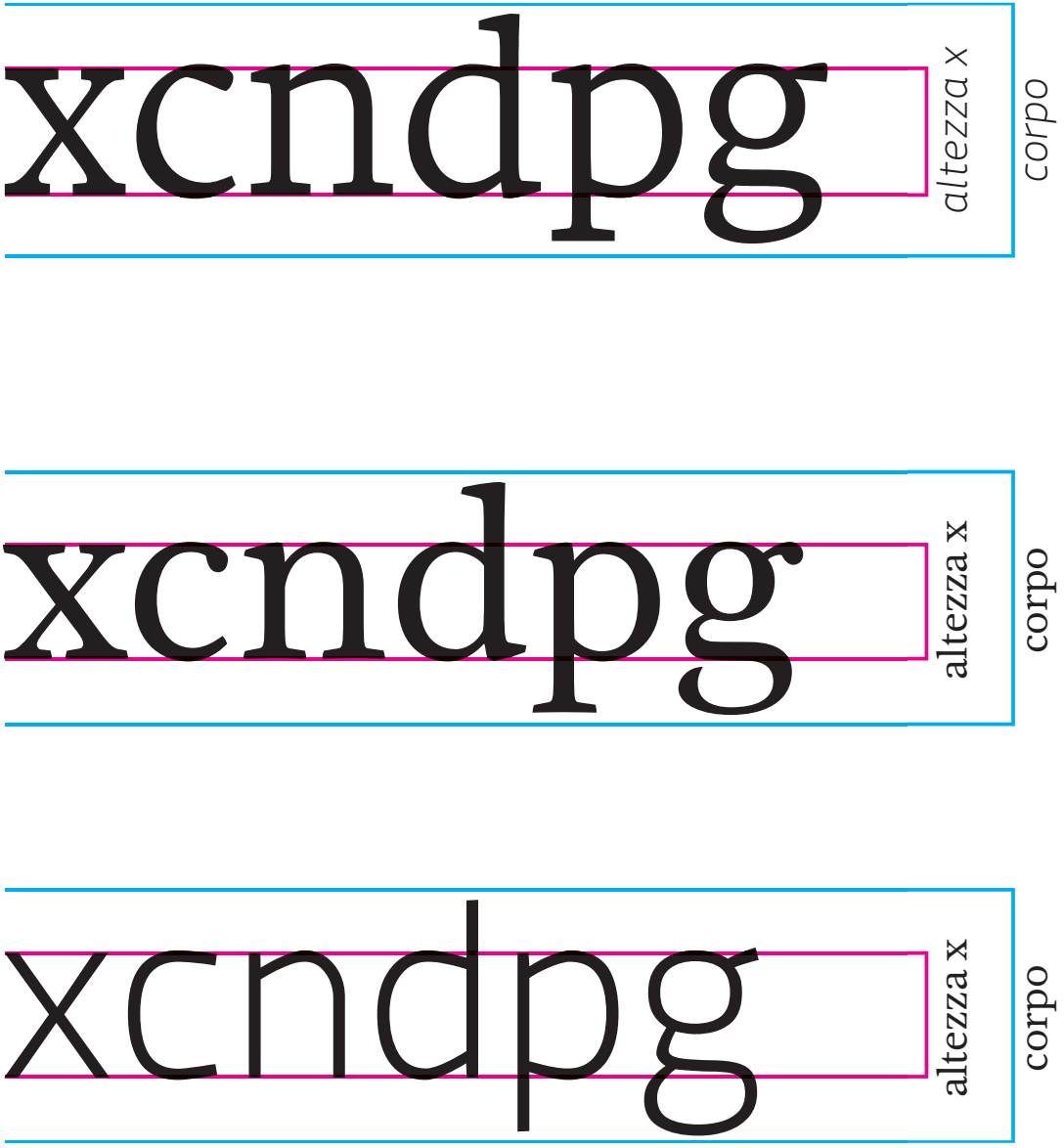


Fig. 2. The figure shows the relationship between x height and body in a typeface (graphic elaboration by the author).

Fig. 3. The figure shows the list of the variables described by the authors at this moment (graphic elaboration by the author).

which parts of a glyph it is acceptable to introduce formal "acceptable" inventions and within what limits.

Method

In the present analysis we have specifically taken into consideration Roman lowercase text typefaces, as the variables are different in relation to each writing style (see for example italics, formal scripts).
The taxonomy of the variables is the result of a research, carried out mainly by the authors at the Isia in Urbino and used in an educational key [Perondi, Arista, D'Ellena 2012] and research [Perondi et al. 2017].
This research had its starting point in the typeface design course by Giovanni Lussu at the Politecnico di Milano in the years 2006 and 2007 and from the discussions that emerged from the people involved in the course at the time (Michele Patanè, Giorgio Caviglia, Paolo Mazzetti).
The description of the variables is focused in particular on the measurement of the proportions of the letters, which allows us to study the interaction between the variables in the existing typefaces and the possible parametric generation of new typefaces. In this article, we will focus in particular on the general definitions and the problem of irregularity in digital typefaces.
All the measurements have been traced back to ratios, since the very functioning of a digital font is based on the scalability of elements in constant proportions [Southall 1991, pp. 93-98; Southall 2005, pp. 169-171].
The *x*-height is considered more representative of the body to indicate the apparent dimensions of a typeface [Law & Bigelow, 2011] and thus has been taken as a fundamental measure to which the others are compared, to the point that now even the legislation refers to that [Regulation (EU) No 1169/2011].
Basing the measurement on the *x*-height alone does not allow an optimal normalization of the apparent size of the typeface, as it is also influenced by other variables such as the expansion [Wallace et al. 2022, pp. 12-14], despite this, the height of the *x* is a better descriptor of the apparent size of a typeface than the size of the body.
As for the choice of the letter *x* to measure the font size, in order to carry out the measurement, we identified "representative" letters for each variable.
It would be possible to obtain measures for each single glyph and balance them according to the occurrence in a language, considering that the variables are systematic in a given typeface, but they are not necessarily applicable to all letters. For example, the degree of expansion is not applicable to letters such as *l* or *i*.
This operation is quite complex, and it would not be justified if the measurement of representative letters was a good predictor of the forms of the whole typeface [fig. 2].
We have distinguished the independent variables from the dependent ones. The independent variables which are the choices that are made in the design process, the dependent variables that are –in the most common conditions– the necessary consequences of the design choices. In fact, there is the possibility of untying the dependent variables and developing original proportions, but the result can lead to bizarre typefaces, hardly considered suitable for the composition of running texts.
Over time, rules and fashions have developed which are nothing more than the reiteration of combinations of variables or the introduction of new variables, gradually accepted.

Outline of independent variable descriptions

Definition
It is a description of the criteria adopted for measuring the proportions of the letters. All values are ratios, so they are independent of the physical size at which a typeface is rendered.
Cases
We mean a discussion on the measurements and on the critical issues in the measurements.
Nominal Value
We mean the arbitrary reference value for measurement of the variable. This value is an ideal starting point in which the interaction with the other variables is arbitrarily set equal to zero.
Examples
We mean the presentation of specific Examples whose measurements are known in detail.

The variables

We have identified 10 groups of variables grouped by type, each of which collects a series of variables. Each variable can be measured and potentially collect a set of attributes (tags) referring to the variable itself [fig. 3].

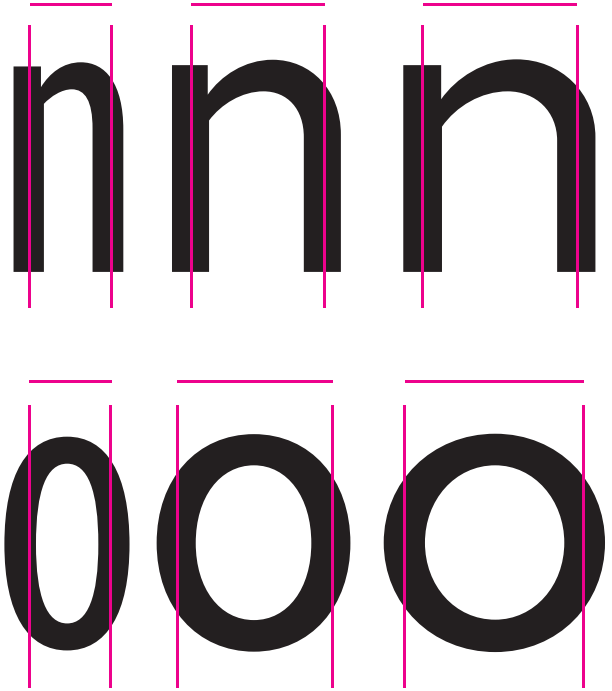


Fig. 4. The figure shows the average expansion of lowercase letters (graphic elaboration by the author).

Vertical Sizes – *Dimensioni verticali*
Horizontal Sizes – *Dimensioni orizzontali*
Weight – *Peso*
Squaring/Axis – *Squadratura/asse*
Path – *Ductus*
Joint – *Innesti*
Aperture – *Apertura*
Endings – *Terminazioni*
Serifs – *Grazie*
Irregularities – *Irregolarità*

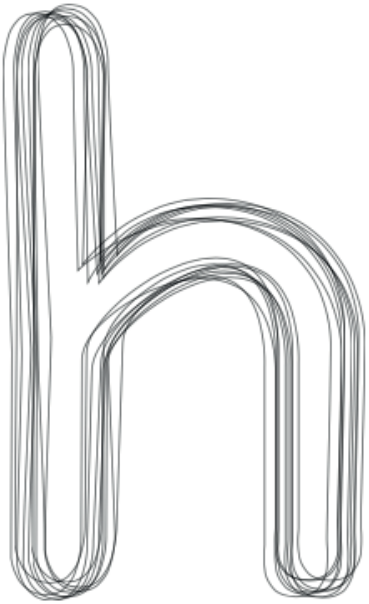
Here are some of the definitions we produced.

Vertical Sizes – x-height/body ratio – Rapporto x-height/corpo
Definition
We define the *x*-height/body ratio as the ratio between the distance between the bottom and the top side of the glyph *x* and the top side of the same glyph and the font body size.
Cases
The value returns the size of the lowercase in relation to the body.
The value of this variable is approximately between 0.4 and 0.52, i.e. the size of the lower case can be just under or about half the body. This is too wide an interval to see a correlation between the body size of a font and its *x*-height.
Sans serif fonts tend to have a higher value than serifs, with a large number of exceptions.
This value could show a correlation with the length of the ascenders and descenders.
Nominal Value
In our description all variables are ratios and most of them are expressed just as relations between a physical measure and the measure of the *x*-height. For this reason, we did not consider it necessary to define a nominal reference value.
Examples
The values of *Times* and *Arial* are 0.447 and 0.519 respectively. This means that if body size is equal, the apparent size of the lowercase letters of the two fonts is quite different.

Horizontal Sizes – Lowercase average expansion - Espansione media delle minuscole
Definition
We define expansion of a glyph as the ratio between the maximum distance on the *x* axis between the midpoints

Fig. 5. The figure shows the n-o expansion ratio (graphic elaboration by the author).

of the vertical strokes of a glyph with two vertical strokes (*n*, *h*, *o*, *p*, *q* etc.) and the *x*-height.
We define the lowercase average expansion of a typeface as the arithmetic mean of the expansion of the glyphs *n* and *o*.
Cases
The choice of midpoints is due to the attempt to represent the widths of the "skeletons" of the letters, excluding thicknesses as much as possible.
We have chosen as the reference value for the expansion of a typeface the average between the expansion of the letter *n* (Unicode: 006E) and the expansion of the letter *o* (Unicode: 006F) because, while the ratio between expansions of the letters *n* and *o* vary according to the style of the typeface, their average has much lower fluctuations (apparently independent of the style) and generally oscillates around the value of 0.75 ± 0.05, both for sans and for serifs.
With the commercial spread of super-families of typefaces, the expansion was introduced as a variable capable of differentiating different cuts available within the same coherent type family. An example of this is Adrian Frutiger's *Univers*, published in 1957.
The expansion can only be measured on letters that have only two vertical strokes (the presence of a single or of a third stroke drastically affects the expansion of a glyph). We think this measurement is sufficient to provide a precise idea of the height-to-width ratios of lowercase letters. In the case of open letters, such as the lowercase *c* (Unicode: 0063), the expansion is strongly influenced by the Aperture (in particular by the "degree of aperture") and therefore is a variable dependent both on overall 'expansion' and on the aforementioned set of variables Aperture.
Nominal Value
The nominal value of the expansion was set at 0.75, a value around which the typefaces are considered 'roman' (this value is in most of the fonts between 0.70 and 0.82), i.e. neither condensed nor extended, stand. Some fonts of more compact proportions, such as *Proforma* (serif) and *Officina* (sans), are not called "condensed", but have lower expansion values than the common "romans".
Examples
Gill Sans (*o*=0.86, *n*=0.64, med=0.76), *Frutiger* (*o*=0.82, *n*=0.7, med=0.76), *Garamond Premier Pro* (*o*=0.85, *n*=0.68, med=0.76), *Bodoni Twelve* (*o*=0.78, *n*=0.63, med=0.7), *Adobe Caslon* (*o*=0.82, *n*=0.6, med=0.76) [fig. 4].



```
#RANDOM VIBRAZIONE, SPOSTAMENTO ASTA VERTI
rnd_vbr_67_78h=random.uniform(-20,10)
#RANDOM VIBRAZIONE, SPOSTAMENTO ASTA VERTI
rnd_vbr_67_78hy=random.uniform(-30,0)
#RANDOM VIBRAZIONE, SPOSTAMENTO asta destr
1,2,3,4,13,14)
rnd_vbr_123_413_14h=random.uniform(-30,0)
#RANDOM VIBRAZIONE, SPOSTAMENTO BASE ASTA
(9,10,11)
rnd_vbr_910_11h=random.uniform(-10,10)
#spostamtento verticale della curva punti
rnd_vbr_34_13h=random.uniform(-25,0)
#spostamtento verticale dell'innesto punti
rnd_vbr_45_13h=random.uniform(-20,0)
```

Fig. 6. Some examples of irregularity of the letters in a project by two students of Isia Urbino (graphic elaboration by Mauro Tosarelli and Beatrice Bianchet).

n-o expansions ratio (Lower case proportions) – Rapporto di espansione n-o (Proporzioni del minuscolo)
Definition
We define the expansion ratio *n-o* as the quotient of the division of the degrees of expansion of *n* (Unicode: 006E) and *o* (Unicode: 006F). From this ratio we hypothesize it is possible to derive the expansion ratios of the single letters of the Latin lowercase.
Cases
Our hypothesis is that this ratio is fundamental to define the style of a typeface.
Usually a "roman" typeface commonly considered to have a "humanistic" structure has values between 0.7 and 0.8, a "roman" typeface with a "modern" or "grotesque" structure generally has higher values (between 0.8 and 0.9), although there are exceptions.
The n/o ratio is strongly influenced by the "degree of squaring" and the "expansion".
A correlation seems to emerge between these values. In particular the typefaces with "humanistic" structure, but with a high "degree of squaring", have relatively high values for this variable (this means that *n* and *o* degree of expansion is similar).
Nominal Value
The nominal value of the lowercase *o* (Unicode: 006F) was set to 0.79, while that of the lowercase *n* (Unicode: 006E) to 0.65, therefore the *n-o* ratio is set at 0.82.
Examples
Gill Sans (*n/o* = 0.74), *Frutiger* (*n/o* = 0.85), *Adobe Garamond Premier Pro* (*n/o* = 0.7), *Sabon* (*n/o* = 0.76), *Didot* (*n/o* = 0.88), *Fedra Serif* (*n/o* = 0.92) [fig. 5].
Irregularities
Digital fonts may have irregularities in their design (in their outlines or skeleton, for example). This solution can be adopted to reduce the effect of excessive precision and regularity given by the digital medium.
The degree of irregularity generally has two measures: the maximum span between two extreme measures and the distribution of the single measures (a good indicator could be the kurtosis index).
The degree of irregularity can be applied to some of the variables already described and is a deviation from homogeneous values; therefore, these variables cannot be approximated by measuring them on a single letter.
We have introduced this group of variables, despite the reduced use in typography, since a certain amount of irregularity is intrinsically produced in press (in particular in letterpress), and this can be considered a form of "machine memory".
This kind irregularity is easily tolerated by readers and some digital drawings have introduced a certain degree of irregularity. Beyond the irregularities related to printing, it is therefore possible to speak of "regular inconsistencies" typical of a typographic design, considering the combinatorial possibilities offered by digital.
We consider in particular two cases: the *Beowolf* by Letterror [Perondi 2016], in which the possibility of pseudorandomly arranging the positioning of the points was exploited; the second is the *Adobe Garamond Premier Pro* by Slimbach for Adobe in 2005, to which the author has given shapes that are more adherent to the irregularities present in the original models of Garamond and Granjon than the design of the 1989 *Adobe Garamond* that he himself executed, which is instead a modernized version, with perfectly regular curves and strokes.
These "regularities in inconsistency" therefore come not only to imitate printing or handwriting, but also to create controlled inconsistency effects even in contexts where a perfectly defined rendering of the original design would be possible.
In a context where the curves are necessarily quadratic (TTF) or cubic (Postscript), the degree of irregularity depends on the position of the control points of the curves with respect to an orthogonal and strongly coherent "neutral" position.
The degree of irregularity can also be controlled thanks to the fluctuation of the points in the same letter, since it is possible to have fonts that automatically and pseudorandomly use different variants for each typed character [fig. 6].

Weight Irregularity – Irregularity of stroke thicknesses – Irregolarità degli spessori
We present for illustrative purposes and for synthesis only one variable of the group Irregularities.
Definition
We define the thicknesses of a typeface as irregular, if the thickness of the straight vertical strokes of *l*, *n*, *p*, *q*, *i*, *b*, *q*, *h*, *d*, *f*, *j*, *k*, *u* is not constant.
We define the 'degree of irregularity of the thicknesses' as the maximum deviation value between two thicknesses of the vertical rod within the character.
We define "variance of thicknesses" as the value of the variance $\sigma 2$ with respect to the mean value.
We define "kurtosis of the irregularity of thickness" as the value of the distance from a normal distribution of the irregularities ($\gamma 2$).

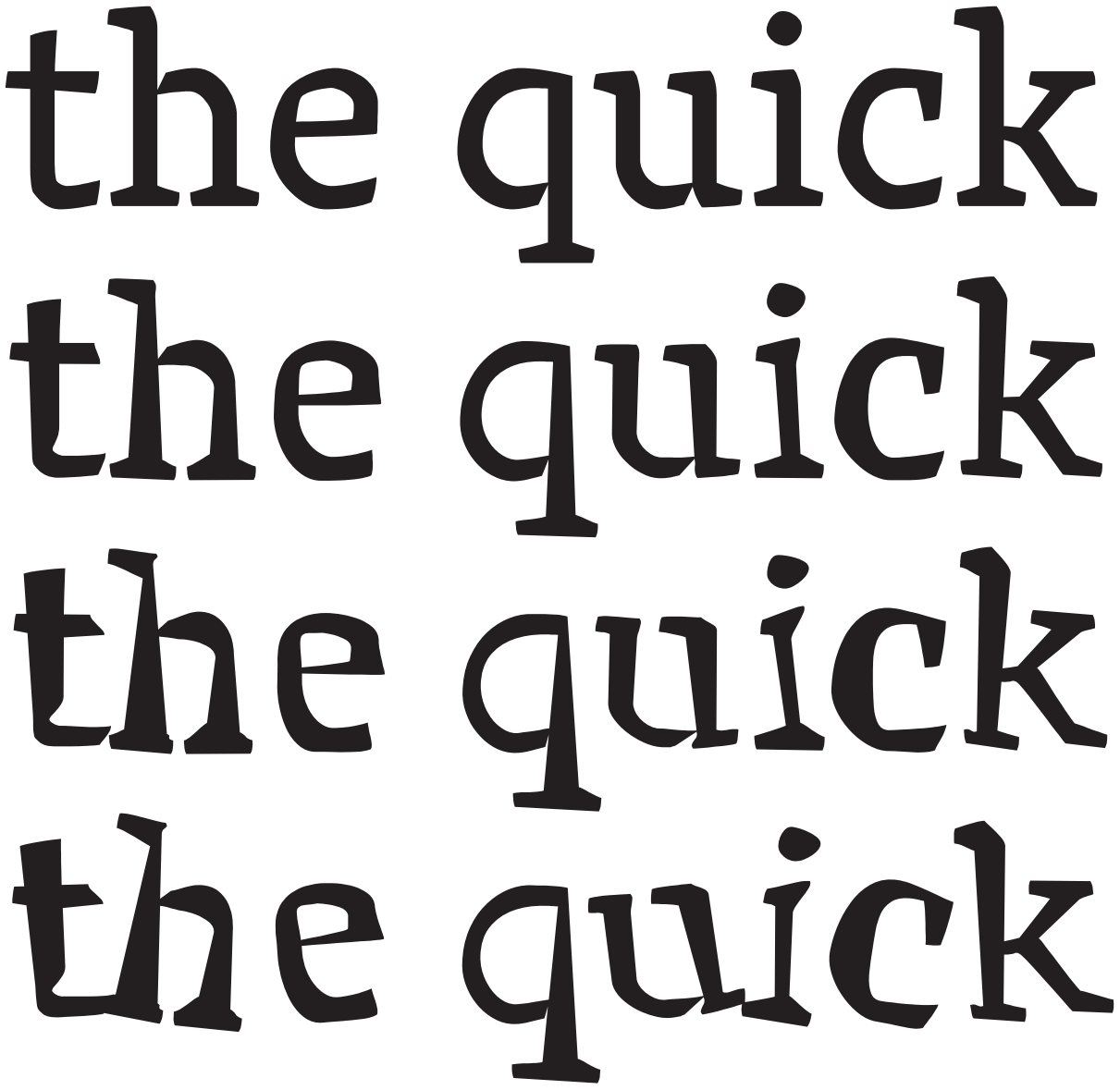


Fig. 7. The figure illustrates the irregularity of the thicknesses (graphic elaboration by the author).

Cases
The irregularity of the thicknesses can only be measured on vertical straight sections: the other elements (curves, heels, horizontal sections, etc.) have irregularities depending on the specificity shape.
As an alternative to the variance, the standard deviation σ can be used, which makes the idea of the amplitude of the dispersion of values more intuitive.
Nominal Value
The nominal value of the degree of irregularity, the variance and the kurtosis are equal to zero and indicate the case in which the design adheres to an ideal orthogonal and perfectly regular model. In some cases this model is given and the degree of irregularity is controllable and easily measurable, because it is obtained through algorithms (see for example *Beowolf* by Letterror, *Arlt Lanzallamas* by Alejandro Lo Celso, *Valnera* by Riccardo De Franceschi).
Examples
Valnera Regular (maximum weight irregularity=0,15) [fig. 7].

Discussion

The systematization of the variables allows a description of the typefaces useful for different purposes, first of all it allows us to describe the typefaces and insert them in a classification by attributes and not by facets, which would allow easier identification and choice in a catalogue of fonts. This systematic description can favour the development of automation and presumably Machine Learning processes. Since it is based on the outline drawing it is limited in the developments regarding the overall drawing of a typeface, but it is well suited to the curve editing software most in use today (*Glyphs*, *Fontlab*, *Robofont*). Since it is also derived from the analysis of existing typefaces, it should be less affected by a particular imprint linked to a design approach by a particular designer.
This description investigates specific variables related to the design of the typeface by individuating them with precision, a path followed by a line of research on reading [Beier, Oderkerk 2022]. This approach aims to reduce the problem of internal validity [Schulz 2016] in the experiments on reading and allows us to treat the problem of equalization of the typeface size in a more precise way [Wallace et al. 2022].
This description provide s a useful summary for students to understand the aspects related to the design of a typeface, in particular for a more informed use and choice of the typefaces themselves.
The description can provide more precise measurement criteria in the regulatory environment (for example in relation to medical packaging, road signs or food packaging).
The problems of this description are related to the reductionist nature of the model, which makes it difficult to deal with some more complex issues to be described such as the inclination of the axis [Bringhurst, 2004, pp. 12, 13], areas in which a mathematically more complex approach would be required, such as the one proposed based on Fourier transforms [Boschin, 2021], although it is not considered an adequate model of the human visual system [Majaj et al. 2002].
Furthermore, this type of approach led to the development of *Prototypo* (www.prototypo.io), which however was not commercially successful and was discontinued as a development. Such a detailed approach to the font can be useful in the design field, as demonstrated by the success of parametric tools on the market in 2022, but probably the market is not yet ready for such complexity in the choice of a font. It is possible that an ever greater growth in computer skills among graphic designers and a greater diffusion of variable fonts could push in this direction, but at present this model appears far from the practices of choosing and using typefaces.

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In this article paragraphs *Introduction*, *Method* and *Discussion* were written by Luciano Perondi, while the paragraphs *Outline of independent variable descriptions* and *The variables* were written together by Roberto Arista and Luciano Perondi.

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The Situationist Times. Drawing and Design of Situlogy

Simone Rossi

Abstract

The essay explores the editorial project The Situationist Times, *a magazine published between 1962 and 1967 by Jacqueline de Jong, to investigate situlogy, a kind of situationist topology. In particular, the analysis aims to delve into the role of drawing and the design strategies employed to communicate this new discipline, conceived by Asger Jorn, and treated from the third to the fifth issue. Indeed, the advent of situlogy entails a radical transformation in both linguistic and compositional terms. The double pages become the setting for a labyrinthine interweaving of topological figures such as the spiral, the knot, and the ring. Encyclopedic iconographic collections allow for a morphological study that connects heterogeneous times, cultures, and disciplines. Adept at never taking a peremptory position, de Jong's situlogical exploration is marked by openness and horizontality and invites the reader to active interpretation. In its extensive use of imagery, drawing sustains a propaedeutic and operative function: it introduces the theme and mediates between the photographic and textual documents, managing to combine mathematical patterns and decorative motifs of cultural-historical value. Finally, together with the recurrent use of manuscript text, it enables the project to preserve a confidential dimension and, likewise, to reveal the ultimate meaning of situlogy, understanding forms from their inherent potential for metamorphosis.*

Keywords: The Situationist Times, *Jacqueline de Jong, Asger Jorn, situlogy, topology*

Introduction

In 1964, on the occasion of the launch of the fifth issue of the magazine *The Situationist Times* (1962-1967, hereafter *TST*) at Galerie Gammel in Copenhagen, Jacqueline de Jong (1939), the artist, editor, and graphic designer behind the project, provides a concise overview framing the trajectories covered by *TST* in its first two years of publication, in a brief welcome address. De Jong reveals some of the project's pivotal points, such as the role of topology and the significance of situlogy, the magazine's polyphonic and anti-sectarian vocation, and the artistic, political, and imaginative influence exerted by situationism and pataphysics [Prestsæter 2019, pp. 189-191]. Toward the end of the reading, after presenting all the heterogeneous contributions of the issue, with insights from architects, mathematicians, poets, historians, scholars, and artists, de Jong reports, more as mere technical data, another element worthy of attention, namely the presence of nearly eight hundred illustrations, of which about seven hundred and twenty are numbered, in the last issue of the magazine alone.

This note, seemingly devoid of resonance, is nevertheless indicative of an ambitious editorial line that privileges, through an expanded use of images, the visualization of knowledge in the extension of space rather than a vertical, verbose, closed hermeneutic. This choice is implemented with the help of a wide assortment of representational forms –such as drawing, freehand tracing, and photography– a symptomatic preference of a research that is as

focused on images as on the techniques that enable them, whereby the clash between elements occurs on several combined levels, for a fragmented and composite collage. The penchant for the visual as a tool of knowledge seems to be related to the use of topology as an object of exploration. This is used by de Jong "superficially", filling the space of double pages with examples of invariant forms in metamorphosis. Topological inquiry seems to respond to the desire to reorient situationist thinking toward a renewed study of the situation, its constitutive notion.
TST addresses topology by extracting it from its mathematical context and using it to activate a comparative discourse that embraces different fields of culture, from art to literature, from history to architecture. De Jong's topological inexperience ensures that the journal never comes to adopt a peremptory or ideological position, and stands as a space open to accommodate different, often even contradictory opinions, drawing an incoherent and ambiguous horizon; such that it does not provide easy definitions or systemic understandings, but nonetheless capable of generating productive comparisons and assigning maximum freedom of movement to the equally illiterate reader.
The extensive use of photographic reproductions and drawings should therefore be understood as part of a larger project of studying and applying topology, or rather, situlogy, a kind of situationist topology, which de Jong explores together with the reader through the pages of *TST*, since the third issue. Guiding de Jong toward situlogy is Asger Jorn, Danish artist and thinker, avant-garde spirit, former founding member of the art collective CoBrA (1948-1951), the International Movement for an Imaginist Bauhaus (1955-1957) and the Situationist International (1957-1972, hereafter SI), of which he was a member until 1961. Jorn, even before he distanced himself from SI, manifested his interest in topology, a "plastic geometry" that circumvents Euclidean binary and definitory logic, introducing instead a "geometry of variables, playful and differential" [Jorn 1960]. Defined as "the transformative morphology of the unique", situlogy accompanied Jorn's artistic projects and theoretical reflections throughout the 1960s and finds fertile ground for introductory investigation in *TST*. This essay aims to examine more in detail the techniques through which situlogy gains space within *The Situationist Times*. The research conducted so far has had the merit of illuminating the context, genesis, and language of the magazine, the distancing from Debord's "official" situationism, the playful, labyrinthine, and subversive use assigned to topology, and Jorn's influence on the project [Kurczynski 2011; Pollet 2011; Prestsæter 2019; Wark 2008, 2011]. Precisely in order to grasp from different angles the multiple philosophical and cultural reverberations that flow freely in *TST*, the essay intends to continue the recently initiated work of reactualization and to focus more specifically on the communicative strategies and the role of drawing in the iconographic galleries dedicated to topology, that allow de Jong to develop, in a continuous interplay, a mobile and relational thinking through images.
In recent years, *TST* has witnessed an unprecedented expansion of academic, critical and museum interest. Yale University's Beinecke Rare Book & Manuscript Library acquired de Jong's entire archive in 2011, containing the magazine's original materials, maquettes, and correspondences. A year later, on the occasion of the magazine's 50th founding anniversary, the New York curatorial platform and exhibition space Boo-Hooray dedicated a major exhibition to the project and published facsimiles of all issues [1]. More recently, researcher Ellef Prestsæter has developed a tripartite project, *These are Situationist Times* [2019], which includes an exhibition, a digitization project and a critical anthology [2]. These and other opportunities for discussion [3] have made the contemporaneity of the project even more evident. It proves relevant for the profound epistemological value devoted to topology, which today is reflected, for example, in sociological studies that address culture in topological terms [Lury et al. 2012]; and equally it proves generative for the daring graphic, typographic and linguistic contaminations, for the strenuous defense of a design-it-yourself culture, defined by de Jong as "amateur professionalism", and for the extreme freedom of expression invoked in the name of a fundamental interrelation between fields of knowledge.

Spaces of empowerment

The first issue of *TST* was printed in Rotoprint in May 1962 in Hengelo, the Netherlands, de Jong's hometown. Nevertheless, the idea of publishing an English-language Situationist magazine had been born two years earlier, during the fourth SI conference, held in September 1960 in London. De Jong proposed creating an "international"

Fig. 1. J. de Jong (Ed.), The Situationist Times, 5, back cover, 1967.

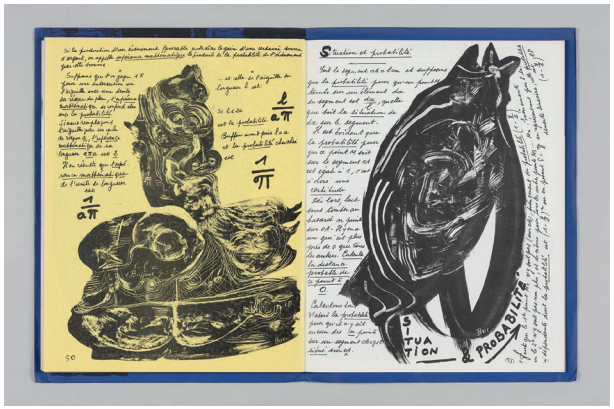


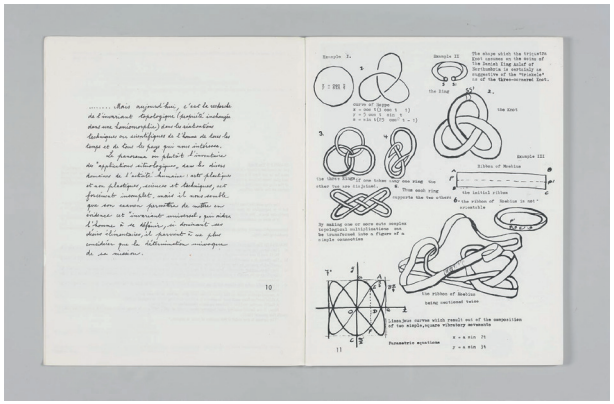
Fig. 2. J. de Jong, Critique on the Political Practice of Détournement. In J. de Jong, N. Arnaud (Eds.), The Situationist Times, 1, pp. 42, 43, 1962.

Fig. 3. M. Bucaille, Situation & Probabilité. In J. de Jong, N. Arnaud (Eds.), The Situationist Times, 2, pp. 50, 51, 1962.

version to go along with the two existing journals, *Internationale situationniste* (1958-1969), produced by the French division, and *SPUR* (1960-62), produced by the German core. The journal was supposed to translate and transmit the ideas of the SI –particularly those of the French branch of the movement– into English, taken as the new European *lingua franca*. But the purpose is soon shattered: between 1961 and 1962 the German section is expelled, their magazine is accused of pornography and blasphemy by the Bavarian authorities, and the Scandinavian branch of the movement splits, led by Jørgen Nash, Asger Jorn's brother, who founds a situationist utopian Bauhaus and journal, called *Drakabygget* (dragon's den), on a farm in southern Sweden. De Jong, sympathetically aligned with the German cause, close to the playful and experimental instances promoted by Nash, and deeply disappointed by the institutional and anti-artistic hardening of IS, chooses to use *TST* as a platform to voice her disappointment, as a space for emancipation to reaffirm the original potential of situationism as a radical and anti-organizational avant-garde, founded on the strategies of "*détournement*, derive, and modification" [Prestsæter 2019, p. 16].

The first and second issues, co-edited with Noël Arnaud, a surrealist and pataphysician with already significant editorial experience [4], openly sided with the *SPUR* group in frank polemic with IS. The magazine was immediately disavowed by IS and took a circuitous and independent path that transformed as de Jong and Jorn's interests and economic fortunes evolved. Both graphically and linguistically, *TST* distanced itself from the serious, austere, and compartmentalized *Internationale situationniste* and drew on a wide range of references [5], making the most of the typographic and graphic experiences acquired by de Jong during her formative years at the Stedelijk Museum in Amsterdam, under the supervision of designer and curator Willem Sandberg (1897-1984).

"The lettering is from *The Times* and everything else was composed with characters in wood. Sandberg had influenced me in terms of the usage of wooden characters. As for the Celtic pattern, that was Jornian, of course. I stole it from *Drakabygget*, Jørgen Nash's journal. […] The Celtic knot is a reference to Jorn's theory of triolectics. We were both opposed to dialectics and triolectics was our alternative" [Prestsæter 2019, p. 29]. As is also evident from this reconstruction by de Jong, Jorn's role is central to the project. His contribution appears even



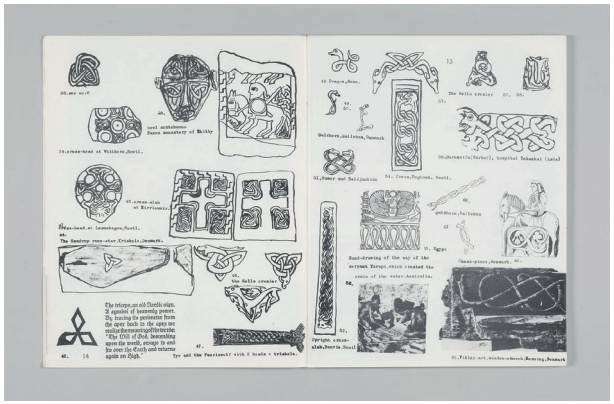


Fig. 4. J. de Jong (Ed.), The Situationist Times, 3, pp. 10, 11, 1963.

Fig. 5. J. de Jong (Ed.), The Situationist Times, 3, pp. 14, 15, 1963.

more significant from the third issue, when the journal chooses to devote itself entirely to situlogy, with three thematic issues.

Jorn approaches topology to overcome the limitations of Euclidean geometry, which appears inadequate to understand an increasingly chaotic world and to take into account the observer's point of view. His analysis goes as far as to problematize the paradigms of Aristotelian binary logic, proposing a new tripartite logic, to which he gives the name of triolectics [Rossi 2022]. Topology allows him "the introduction of disorder and temporality into geometric thought" [Kurczynski 2011, p. 160] and soon attempts to relate it to the situationist cause. He thus suggests recovering the studies of Henri Poincaré, the father of modern algebraic topology, who speaks of it in terms of "analysis situs", which can be immediately linked to the fundamental question of (situ)ation and the labyrinth, a true situationist obsession [Burleigh 2018]. Situlogy allows Jorn to move beyond general topology, toward a "visual morphology" apt to understand cultural forms from their transformation and to reread phenomena starting from a single form in constant motion that unfolds homeomorphically in infinite variations. Indeed, the double pages of *TST* become an encyclopedic display case where multiple eras and civilizations are brought into dialogue through the juxtaposition of works of art, scientific models, ritual objects, and topological patterns, such as the knot, the ring, and the spiral.

Many of the images that de Jong xeroxes, cuts out, or traces by hand come from the photographic archive of the Scandinavian Institute of Comparative Vandalism (hereafter SICV), which Jorn has been developing since '61 together with French photographer Gérard Franceschi –and partly with de Jong herself– with the aim of documenting and comparing figurative and decorative motifs of the Nordic tradition with those of Romanesque and Gothic history. The counter-archive to the dominant history of Western art that SICV develops finds in *TST* a privileged space of application. Here it is enriched by numerous heterodox artistic and mathematical interventions –such as the dozen contributions by mathematician, surrealist, and pataphysician Max Bucaille– that invite a constant remixing of the elements at play. It is a constant action of rewriting and disorientation that de Jong operates in the first person and likewise urges the reader to do, as is evident from the back cover of the third and fifth issues, which reads "any reproduction, deformation,

modification, derivation and transformation of *The Situationist Times* is permitted" (fig. 1). De Jong's topological wanderings provide a comparative arena in which the reader is not only invited to move unguided through the redundancy of the proposed connections but is also stimulated to make their own use of the materials provided by the magazine. The result is a project in which the relationships do not cease to encourage new interlacements and combinations.
Before dwelling more specifically on the communicative and design techniques used to present the topological derives of *TST*, it is worth mentioning that the project is divided into three salient phases: the first, comprising the first two issues, is still fully imbued with situationist matter –see the narrative drift of the cyclist Polydore Bouffioux that runs through the entire second issue– and linked to the political and ideological events that followed the splits of 1961 and 1962. From the third to the fifth issue, the narrative is characterized by a comparative approach, in which a myriad of images combines to form an exploratory panoramic study of situlogy. The themes of the third and fourth issues are interlacing and labyrinth respectively, while the fifth focuses on rings and chains. The third phase, encapsulated in the sixth and final published issue, is notable for its use of lithography and welcomes thirty-two contributions from as many artists. Each double page hosts a color print, placed on the right side. The topographical research disappears, or rather, is suspended; in fact, de Jong would like to resume it through an issue on the wheel, of which no materials are available, and one on the pinball machine, of which a sketched mock-up exists instead [Prestsæter 2019, pp. 261-336], but unfortunately she will not be able to release any further issues, stopping at the sixth, printed in Paris in December 1967.

Strategies of narrative

The aesthetics developed by *TST* within its situlogical explorations absorbs and rearticulates some instances peculiar to the Situationist avant-garde, such as détournement and psychogeography, anticipating some strategies typical of postmodernism, such as the appropriation of pre-existing materials and the overcoming of the logic of copyright, bringing critical attention back to the reader's activity. It also recovers the art of assemblage and collage

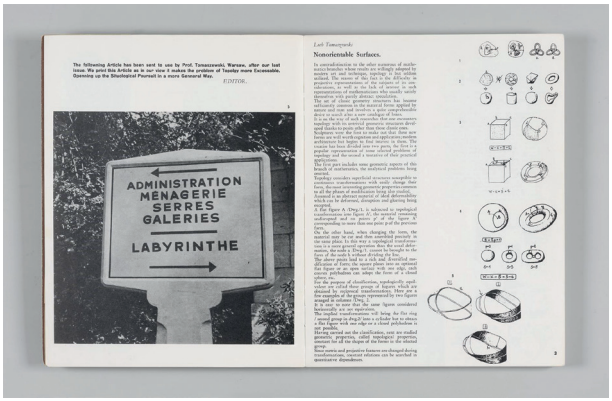
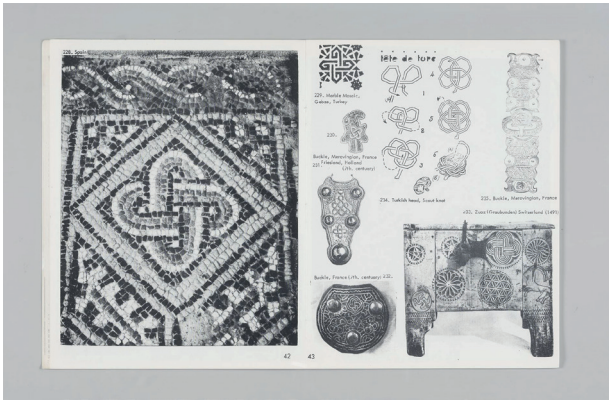


Fig. 6. L. Tomaszewski, Nonorientable Surfaces. In J. de Jong (Ed.), The Situationist Times, 4, pp. 2, 3, 1963.

Fig. 7. J. de Jong (Ed.), The Situationist Times, 5, pp. 152, 153, 1967.

of the early twentieth-century avant-gardes, particularly the playful and subversive use of Dada and Surrealism.
The first two issues see the alternation of several types of paper and colors, such as red, blue, and yellow, and playful situationist experiments often take over – prominent among them are manuscript contributions by de Jong and Bucaille, titled respectively *Critique on the Political Practice of Détournement* (fig. 2) and *Situation and Probability* (fig. 3). A series of opaque montages of images to decipher, juxtapositions with an ironic but critical edge, also begin to appear in the second issue. Yet the use of drawing is still limited and merges with a still preponderant use of text; it remains tied to situationist psychogeography exercises and some geometric patterns. The writing is photocopied from other sources or handwritten; the rhythm is discontinuous but varied.
In the topological issues, on the other hand, black and white printing prevails, the intervention of color is minimized, and drawing becomes the protagonist. Decorative motifs, geometric patterns, topological forms, hieroglyphics, graffiti: the drawing is photographed, cut out from other volumes, xeroxed, even traced by hand and begins to fill the double pages seamlessly. It is mainly de Jong who uses tracing and freehand drawing. The choice seems on the one hand related to technological impediments and on the other indicative of a 'raft' approach to publishing that does not sympathize with the growing (ab)use of mechanical and industrial reproduction and division. Indeed, de Jong's role in the project is horizontal. She is omnipresent throughout the processes of the magazine's editing, crossing graphic, typographic and editorial skills. Her figure moves ubiquitously between directing and producing, with tasks of both coordination and supervision, as well as practical and manual enactment. Moreover, unlike what was originally assumed, de Jong chooses to publish the texts she receives directly in the language in which they are written. It is thus that the internationality of *TST* is no longer configured by the exclusive use of English, but by the combination of many European languages, such as German, French, Italian, and Danish. Where English recurs, the language is crippled and approaches a simplified English purged of many linguistic niceties [6].
From the third issue, then, the layout of the journal undergoes a substantial metamorphosis. Entire issues become patterns of situlogical applications. The text recedes, until it becomes mere caption, and the image



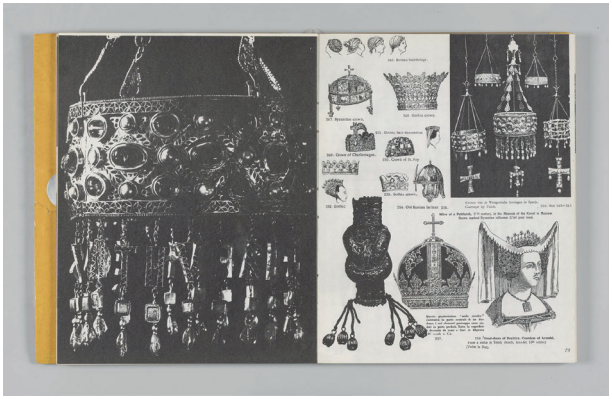


Fig. 8. J. de Jong (Ed.), The Situationist Times, 3, pp. 42, 43, 1963.
Fig. 9. J. de Jong (Ed.), The Situationist Times, 5, pp. 78, 79, 1967.

becomes the protagonist. De Jong intervenes personally, not only tracing a myriad of topological forms by hand, but also collecting many of the photographs directly from volumes in consultation at the National Library in Paris and at SICV. One bold aspect, antithetical to the spirit in which modernist design approaches mathematical rule [Falcinelli 2022, pp. XLIX-LV], is that the entire layout of the magazine seems sustained by a playful and subversive impulse. The situationist use of topology, mathematics of metamorphoses, under an apparent scientificity actually conceals an ambiguous practice that "far from being a guarantor of order, becomes an agent of confusion, an instrument of subversion" [Pollet 2011, p. 106].

It is significant to note that within the situlogical discourse the different techniques of representation alternate and intertwine with each other respecting certain rhythms and balances. Take for example the incipits of the first two issues devoted to the theme. The first begins by illustrating a series of topological interlacements and non-orientable surfaces, such as the Möbius strip (figs. 4, 5). Before photographic reproduction takes over, about sixty drawings, mostly freehand, introduce the subject. The same happens in the second issue, devoted to the theme of the labyrinth. The issue opens with a praise of topology by Polish architect and theorist Lech Tomaszewski and an essay on the topology of the labyrinth by Italian artist Piero Simondo. Sequences of images flow by, most of them freely made by hand (fig. 6). This technique thus seems to possess an initiatory and propaedeutic function. Bearer of information, it allows for tracing, erasing, and editing. It belongs to a draft dimension, where the imprinted mark retains a transitory, ephemeral, undefinable character, which acquires value only when framed in an overall cartography where each element means by the relationships, similarities, and dissonances it is able to activate on the atlas.

De Jong approaches situlogy by opting for a technique that is scientifically among the least rigorous. Yet this preference allows her to design directly on the page, without frames or borders, achieving a diaristic intimacy that, together with the widespread use of handwriting, makes the entire project extremely confidential. Namely, the entrance of topology takes place by privileging a figurative and experiential form of learning at the expense of a purely verbal and mnemonic one. Direct and impulsive application, sometimes with childish traits, is preferred to documentary, objective, ethnographic photography, or mathematical formula.

In the last issue devoted to topology, however, tracing immediately gives way to Jorn's triolectics patterns. In this last topological excursion, the use of the image reaches its greatest expansion (fig. 7). Drawings and illustrations are employed mostly unframed, with transparent backgrounds, and seem to form a kind of bridge between the textual and the photographic, both of which are instead usually placed within geometric and modular frames. Their role appears as liberating as balancing. Exploratory on the one hand, especially when made by hand, mediating on the other, both in compositional and topological terms, when photocopied from other volumes. Drawing simultaneously abstracts and reifies what photography and text document, managing to link mathematical patterns to ornamental motifs of cultural-historical value. Its use provides the page with the breathing space that the black ink absorption of photographic reproduction subtracts. It is also able, as a whole, to convey to the entire investigation that plastic and metamorphic potential proper to topological form that text is unable to stimulate instead.

The single drawing is most often reserved a small space on the page, while the single photographic reproduction comes to occupy up to an entire side (figs. 8, 9). This play of scale, in which multiple small drawings occupy space and are juxtaposed with much larger photographs, is another dominant recurrence throughout the situlogical issues of *TST*. But the choice does not seem to respond to a hierarchy of values. Both techniques flow freely respecting an invisible metric that juxtaposes full and empty spaces, black and white. Drawing facilitates the functioning of photography and vice versa. Their continual exchange of positions and interlocks does not allow the reader to recognize a pattern and thus produces a solicitation that finds no rest. Protagonists of an assemblage that aims to repeat itself through ever-changing forms, they succeed each other in an enigmatic alternation that disassembles and reassembles knots, interlacements, and chains. The interplay of combinations occurs without any overlap between the images. Exploited to their full extent, the double pages turn into a visual atlas that simultaneously arranges and disarticulates. The reader, disoriented by so much whirling and multilingual flow, is thrown at least one lifeline: each content is numbered, described, and finally indexed.

Conclusions

TST emerges as a project with multiple layers of interpretation, never abandoning a playful and transformative disposition, emphasizing the boundaries between the serious and the facetious. Far from attempting to fix situlogy in an arid and ideological framework, de Jong succeeds in the not easy task of presenting it always in motion, never over-interpreting it and preserving the transformative potential that fuels it. The fluctuation between tracing, drawing, illustration, photography, and text –the latter often opening and closing the issues, as if to guard within it an otherwise unrestrained flow– weaves superficial but tangled threads. The intricate weave that *TST* unfolds overturns the epistemological and normative value of mathematics, now revealing a chaotic and problematic world, and invites the reader to enter the situlogical labyrinth without orientation, with the goal no longer to escape from it but to welcome its constant transformation.
The essay seeks to highlight certain procedural and compositional recurrences, paying attention to the use and potential significance of certain representational techniques in the economy of the project. The analysis hypothesizes that the use of drawing, primarily by hand, is indicative of a design practice that to the documentary verification integrates an artistic-expressive exuberance capable of contextually generating an international magazine with an encyclopedic vocation and a research notebook with a confidential and amateurish tone.
Instead, the continuous alternation of drawing and photography seems to respond, rather than to an aesthetic need, to a spatial and dialogical balance. Where photography excels in number and size, drawing carves out a mediating space between the abstraction of topological form and its cultural-historical application.
De Jong is skilled in not saturating ultra-specialized and easily soporific topics, diversifying viewpoints, and thus ensuring a fertile heterogeneity of new combinations and perspectives. Situlogy does not find easy definitions and resolving interpretations; it subverts certain lines and fixed plans and introduces unpredictability and disorientation, both compositionally and epistemologically. To the reader the explicit task of metabolizing and metamorphosing a discipline that, in part, they will personally invent.

Notes

[1] The facsimiles published by Boo-Hooray are immediately disapproved by de Jong, who considers them, in several key respects, not adhering to the originals. She calls the facsimiles "Errata", <https://www.jacquelinedejong.com/internationale-situationniste/> (accessed 20 December 2022).

[2] The exhibition, curated by Ellef Prestsæter in collaboration with Torpedo and Jacqueline de Jong and titled *Jacqueline De Jong & The Situationist Times: Same Player Shoots Again!*, was on view at Torpedo/PUB, Oslo, 2018; Konsthall Malmö, 2019; Museum Jorn, Silkeborg, Denmark, 2019; Treize, Paris, 2020. The digital project, developed in parallel, makes available the scans of all the issues of the magazine, via Monoskop <https://monoskop.org/Situationist_Times>, and a video commentary featuring de Jong herself, via the Scandinavian Institute of Computational Vandalism <https://vandal.ist/thesituationisttimes/>.

[3] Among the many opportunities for discussion worth mentioning are the symposium organized on January 28, 2017 at Kunsthall Oslo, titled *These are Situationist Times: A Symposium on Topology, Culture and Politics*, <https://kunsthalloslo.no/?p=4443>, and the exhibition *Pinball Wizard: The Work and Life of Jacqueline de Jong* held at the Stedelijk Museum in Amsterdam in 2019, which ended with the launch event of the volume *These are Situationist Times!* edited by Ellef Prestsæter.

[4] A hospital administrator by profession, Arnaud was editor of important avant-garde magazines, including that of the surrealist group La Main à plume (1941-1945) and, together with Jorn, of *Le Surréalisme révolutionnaire* (1948). Arnaud was also a member of the post-Dadaist group "Les Réverbères", satrap of the College of Pataphysics, a member of the avant-garde movement CoBrA and president of the literary group OuLiPo.

[5] In several interviews [Prestsæter 2019, pp. 31, 133; Sherlock 2017] de Jong acknowledges the influence of other journals such as *i10* (1927-29) published by the anarchist Arthur Lehning, and *Potlatch* (1954-57), a journal of the Lettrist International.

[6] Wark uses the term "netlish" to refer to a transnational English, shamelessly used as a second language that traces the writer's native language [Wark 2011, p. 116]. Prestsæter speaks instead of International Art English [Prestsæter 2019, p. 10].

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Typeface Drawing and Design. Aesthetics and Readability

Daniele Colistra

Abstract

Since the invention of printing, typefaces simulate the appearance of two writing procedures closely linked to manual skills: the uppercase of stone inscriptions and the lowercase of humanistic calligraphy. Typography was born with an 'original sin', which numerous treatise writers take care to legitimize through rigorous geometric constructions to support the graphic design of each letter. From the Renaissance to the twentieth century, the evolution of styles and printing techniques is slow, and even the figurative avant-gardes have proceeded in small steps: typographic design is a conservative art, it prefers to emulate or refine previous experiences rather than innovate. In the sixties of the twentieth century, photocomposition dematerializes the techniques of engraving and casting, inducing some designers to experiment with shapes that are easily adaptable to the row-column system. Twenty years later, the PostScript revolution and the spread of vector software based on spline curves bring drawing fonts closer to manual skills. By hybridizing tradition and experimentation, font design opens to the countless possibilities offered by new media.

Keywords: font, calligraphy, typography, readability, dysgraphia.

Introduction

Phonetic writing is a conventional way of fixing signs that encode sounds on a medium; the sounds, in turn, refer to concepts elaborated by the mind. Over time, handwriting has developed techniques based on rigorous procedures but with the approximations inherent in gestures and extemporaneousness. Printing, on the other hand, is based on the sequential arrangement of predefined signs (characters) whose shape is engraved in the metal according to a meticulous design.
Each writing must be legible; but being characterized by a form, it also has a figurative value and is always, inevitably, an image. These two aspects have favored the development of two opposing positions [Jury 2007, pp. 14, 70]. The first refers to a pragmatic and instrumental vision of writing; the second considers typography an art endowed with a value that goes beyond legibility and, therefore, can express a precise aesthetic. Both positions are further divided internally between supporters of a design that refers to the tradition of Renaissance typography, in turn derived from humanistic calligraphy, and the followers of a radical renewal, capable of overcoming the sound-sign binomial and prefiguring –always through the control of the drawing– new alphabets.

Power to the hands: stonecutters and scribes

At the base of the design of typefaces there is manual writing, which in the West is based on alphabets

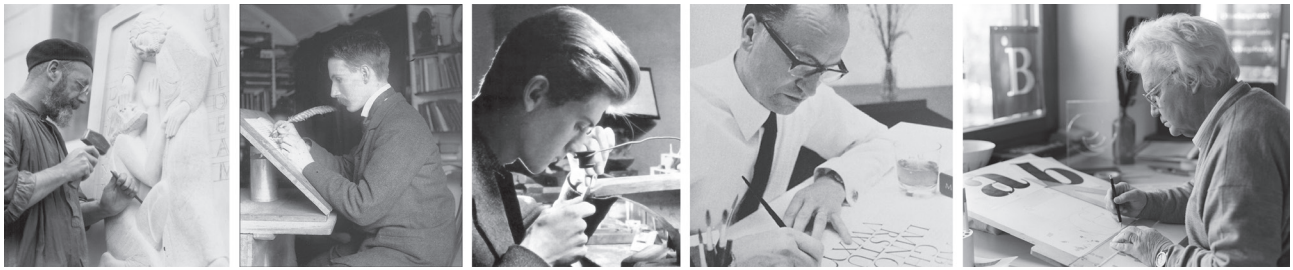


Fig. 1. Hand drawing tools for characters: chisel (Eric Gill), quill (Edward Johnston), burin (Matthew Carter), brush (Hermann Zapf), pencil (Adrian Frutiger).

that can be traced back to two families: 'archigraphies' and 'calligraphies' [Polano, Vetta 2002, p. 19]. The first group includes writings obtained by subtracting matter from a hard surface by means of a rigid instrument; the graphic result is the uppercase alphabet, which has evolved very slowly as it is linked to durable supports and exposed to view for a long time. Calligraphies, on the other hand, are obtained quickly, in an additive way, by depositing a pigment with a soft instrument on a light support; they correspond to lowercase characters. The uppercase, typical of stone inscriptions, has very differently shaped and clearly separated letters. The lowercase is typical of smaller scripts, has rounded letters and connected to each other to allow a more fluid tracing. Furthermore, the lowercase letters are very similar to each other and, to be more easily recognized, they are equipped with additional graphics (the ascending and descending strokes). Seven centuries after the invention of mechanical printing, handwriting –with its many techniques– is constantly practiced by both traditionalists and artists who are more sensitive to the charm of modernity (fig. 1).

Movable type printing was born around 1450 and favored the standardization of writing styles in use at the dawn of the Renaissance. Gutenberg's 42-line Bible punches were engraved according to one of the four calligraphic styles practiced in Germany in the 15th century, called Textur [1] Letterpress printing spread rapidly throughout Europe; at the end of the 15th century, the great printing schools had already established their own aesthetic standards. Typeface designers, rather than develop an original sign system suited to the fledgling technology, strive to reproduce handwriting. Over time, and with great opposition, the Italian school will succeed in imposing the Latin alphabet, an original reinterpretation of the style used in classical antiquity [2]. The press, therefore, was born thanks to a formal compromise; it hybridizes archigraphy and calligraphy, allowing a series of opposites to coexist (hard and soft, addition and subtraction, uppercase and lowercase, hand and machine) [3]. Despite the rapid spread of typography, calligraphy continues to be practiced profitably by writing professionals for at least another three centuries [4].

Ethics of emulation

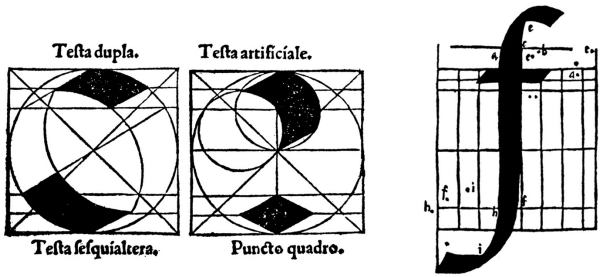
The close relationship between typeface design and handwriting has at least three reasons. The first is linked to communication: imitating an existing writing allows easier reading and more effective understanding. The second is ethics: recognizing the value of a centuries-old tradition. The third is economic: to prevent innovation from failing, with the inevitable economic consequences (which happened to Gutenberg himself, who was forced to sell the presses and almost all the printing material to creditors as early as 1455).

The uppercase Latin alphabet, as we have seen, has separate characters; they are based on the development and variation of three primary forms: the square, the circle, and the triangle. The circle is the static figure par excellence, an expression of maximum balance. The square is a versatile figure; it can express static equilibrium, dynamic equilibrium, or imbalance, depending on whether its axes are in the horizontal/vertical direction, inclined at 45° or generally oriented. The triangle denies the simultaneous presence of horizontality and vertical-

ity and therefore always expresses dynamism (fig. 2). But even the lay scribes made use of rigorous geometries. Especially from the thirteenth century, with the establishment of the first universities, the art of writing ceases to be the exclusive patrimony of the religious and the treatises on calligraphic technique spread, rich in illustrations relating to the ways to move the hand correctly and trace the letters geometrically (fig. 3). The clear separation of characters also adopted from lowercase in round humanistic calligraphy can be considered an anticipation of movable type.
Almost all the typographers of the past have reworked pre-existing designs, perfecting them, and sometimes adapting them to geometric constructions that refer to symbolic, esoteric, and religious values. In 1509 Luca Pacioli draws an uppercase alphabet, defined by himself *Alfabeto Dignissimo Antico,* inscribed in the square and based on the golden section (fig. 4); he will use it, among other things, for the titles and drop caps of *De Divina Proportione*.
Pacioli's contribution to typography is not limited to the use of harmonic proportions. He reduces the ratio between the thickness of the temples and their height to 1/9, giving a greater balance compared to the stone inscriptions of the Augustan period (based on the ratio of 1/10) and the more widespread calligraphic styles (which reached up to 1/12) [Spera 2001, p. 37].
The use of underlying geometries is not a prerogative of Humanism. Hermann Zapf, for example, also draws many of his alphabets according to the golden ratio. Its most famous font, Optima (1958), is inspired by the stone inscriptions of the Italian Renaissance, and yet refuses any cataloging. It is a sans-serif but looks like a serif, and this effect is achieved by carefully reducing the thickness of the temples (fig. 5). Zapf is also an excellent calligrapher [5]; to the Calabrian Giovanni Battista Palatino (known as 'the calligrapher of calligraphers' and author of the most successful writing treatise of the Renaissance, *Libro nuovo d'imparare a scrivere*), he dedicates an elegant font called, precisely, Palatine (1948).

An ancient dilemma: aesthetics or functionality?

The contrast between aesthetics and functionality in a printed text is as old as typography. Readability and form often coexist, but 'illegible' is not inexorably linked



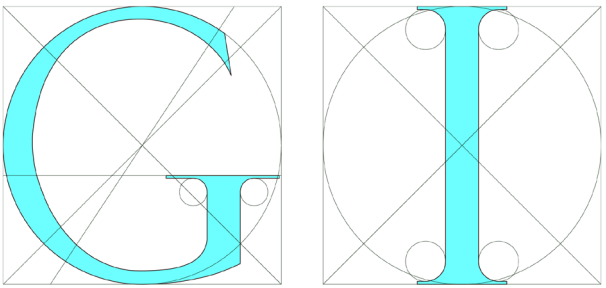


Fig. 2. Futura Bold typeface and elementary geometric shapes (graphic elaboration by the author).

Fig. 3. Left: Sigismondo Fanti, Effecti de penna nella costruzione di lettere. Venezia, 1514. Right: Ferdinando Ruano, Sette alphabeti di varie lettere, formati con ragion geometrica. Roma, 1554.

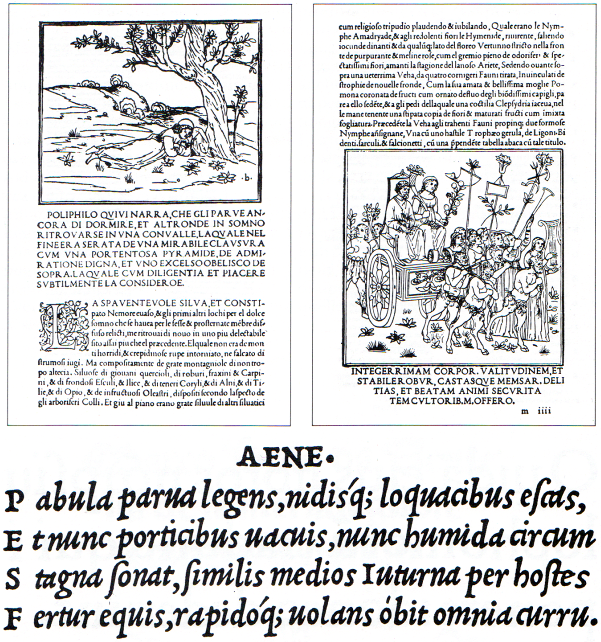
Fig. 4. Geometric constructions of 'G' and 'I' in Alfabeto Dignissimo Antico by Luca Pacioli (graphic elaboration by the author).

Fig. 5. Optima typeface superimposed on a grid that highlights the refined optical corrections (graphic elaboration by the author).

to ‘ugly’, nor ’legible’ to ‘beautiful’. For example, the editions of Aldo Manuzio, published at the beginning of the sixteenth century in Venice with cursive typefaces designed by Francesco Griffo were hardly legible (even for readers of the time), but formally flawless and effective from a ‘corporate’ point of view; the compactness of the text and the presence of numerous ligatures allowed a considerable saving of space, cheaper editions, and an extraordinary commercial success (fig. 6).
John Baskerville, in the eighteenth century, is the first to argue that typefaces design and page composition can guarantee aesthetic quality to the book, regardless of the illustrations. But books are printed for reading. On this issue, designers are often uncompromising, like Stanley Morison, author of Times New Romain (1931), according to whom the purpose of typography is essentially utilitarian, and only accidentally aesthetic. Pleasure of the eyes is rarely the reader’s primary concern; for this reason, any typographical arrangement that stands between the reader and the author is to be considered wrong [Lussu 1990, p. 76]. Beatrice Warde, head of marketing for the British Monotype Corporation, has a similar opinion: type well used is invisible as a type, just as the perfect talking voice is the unnoticed vehicle for the transmission of an idea. The more the reader focuses on letter design or layout, the worse the typography [Warde 1955, p. 13]. On the same position Lázló Moholy-Nagy, who in 1925 wrote: “Typography is a communication tool, it must be clear communication in the most effective form […]. The legibility of communication must never undergo the paradigms of a priori aesthetics. Characters should never be forced into predetermined forms” [Polano, Vetta 2002, p. 111].
To achieve the ‘invisibility’ evoked by Warde, the most effective tool is geometric control, guided by a rigorous design. If calligraphy tends to connect and tie letters, typography –as artificial writing– crystallizes the forms derived from handwriting into figures which, even from the etymological point of view, suggest the notion of ‘type’.

Egalitarian geometries: the grid

In 1620, Louis XIII established a private printing house in the Louvre, which Richelieu placed under the control of the state in 1640, calling it Imprimerie Royale. On the initiative of Louis XVI, in 1692 the French Academy



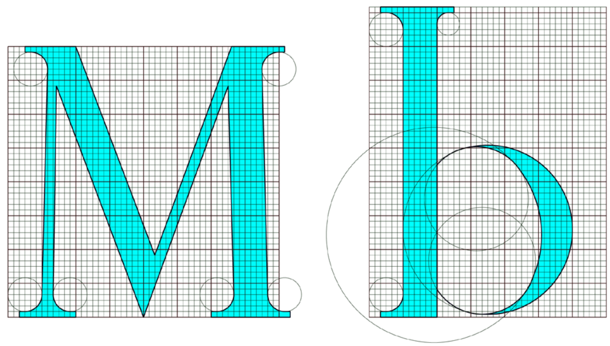


Fig. 6. Pages from Hypnerotomachia Poliphili, printed in Venice in 1499 by Aldo Manuzio and detail of the font designed by Francesco Griffo.

Fig. 7. Roman du Roi, geometric construction on a grid of the letters ‘M’ and ‘b’ (graphic elaboration by the author).

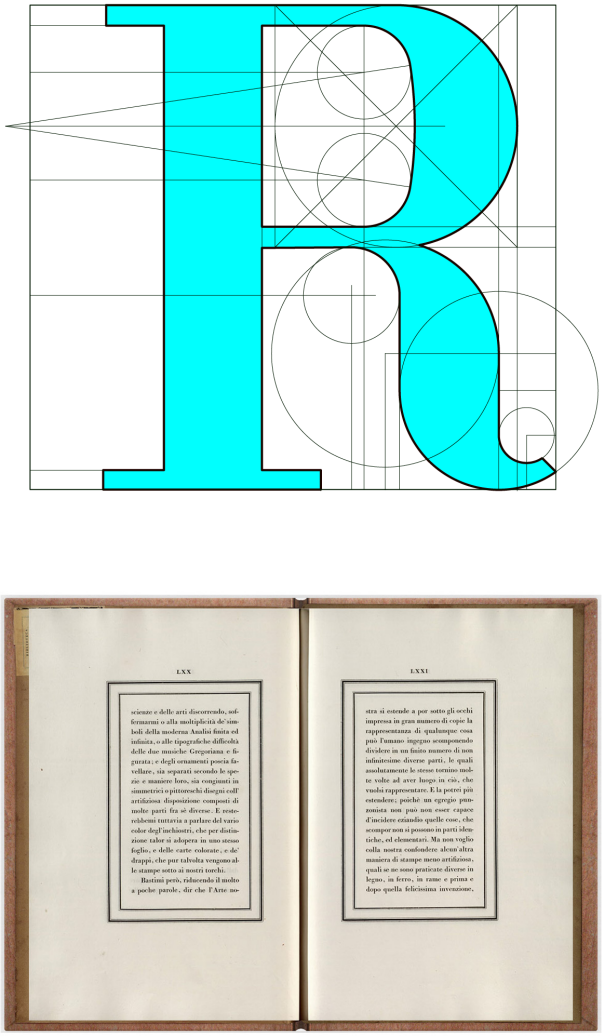


Fig. 8. Side-by-side pages of the Bodoni Manual and geometric construction of the 'R' in Bodoni font (graphic elaboration by the author).

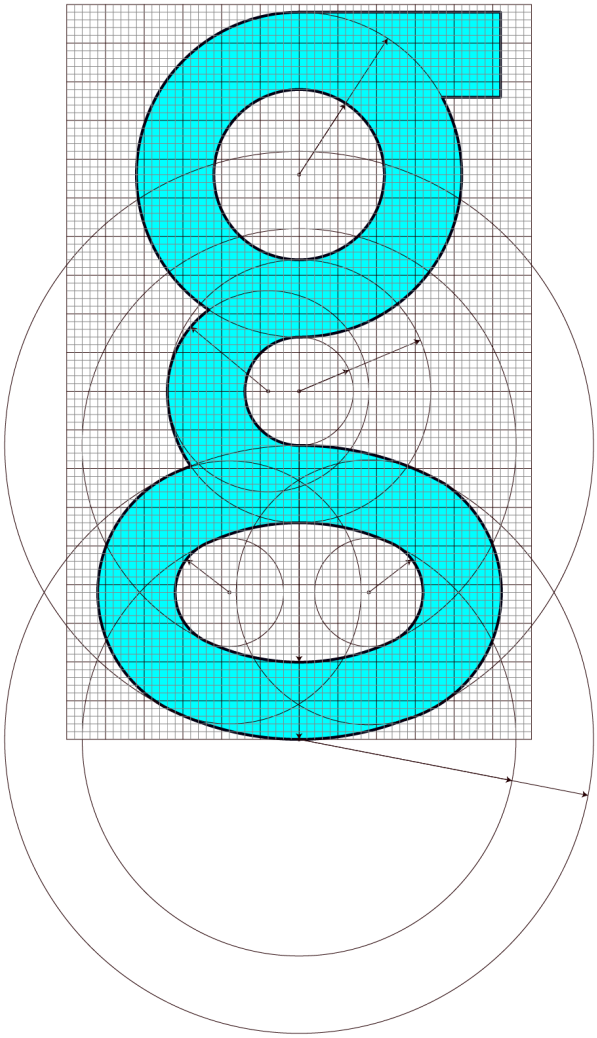


Fig. 9. Geometric construction of the letter 'g' of Eric Gill's LNER (graphic elaboration by the author).

of Sciences appointed a commission for the study of a new typeface for the exclusive use of the Imprimerie, to be designed according to scientific principles. The commission is chaired by mathematician Nicolas Jaugeon, who suggests using a square matrix of 2304 units (48 rows by 48 columns). Philippe Grandjean thus engraves Romain du Roi, the first font built on a homogeneous grid (fig. 7).
Romain du Roi is a 'Cartesian' typeface, destined to influence typography for many decades. In the wake of the eighteenth-century French school, based on an obsessive attention to detail, the figure of Giovambattista Bodoni emerges; he made the Reale Stamperia di Parma famous and in 1790 opened a private foundry in the same city. Bodoni has skills as a draftsman, engraver, caster, typographer, publisher, and bookseller, but his fame is mainly linked to the elegance of the layouts and the typefaces he conceived, perfectly corresponding to the neoclassical ideals of balance, sobriety, and purity of the sign (fig. 8). Bodoni [6] is a modern Romain, based on the Baskerville transitional. The proportions are classic, the geometry rigorous; serifs are reduced to a completely flat and horizontal line: a refinement once unthinkable, finally allowed by the evolution of punching, casting, and printing procedures. Despite the careful design, Bodonians suffer from a problem called 'dazzle', that is, poor readability in small bodies or in case of excessive width of the text column; to get the right emphasis, Bodonians need ample white space and generous line spacing. In his *Manuale Tipografico*, printed posthumously in 1818, Bodoni suggests the canons that typefaces must respect: clarity, good taste, grace, regularity. For the first time, printed products acquire value regardless of legibility, thanks also to the refined composition and quality of the print, paper, and binding.
Two hundred years after Grandjean, Eric Gill –eponym of the famous Gill Sans (1926)– also adopts the grid (in this case, graph paper) as a support for the drawing, relying on geometric constructions often based on arcs of circumference, as in the LNER (1928), designed for the London & North Eastern Railway (fig. 9). Gill is a multifaceted and controversial artist; he humbly referred to himself as a 'stone carver' and was considered an amateur printer by many colleagues. His positions are often controversial and contradictory. On one occasion he states that "lettering is a precise art, and strictly subject to tradition" [cfr. Polano, Vetta

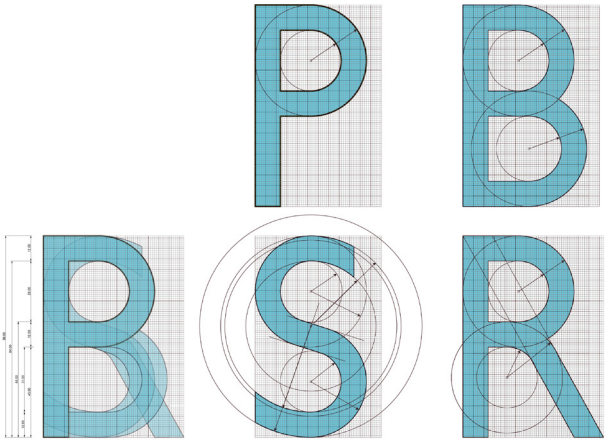


Fig. 10. Geometric construction of the letters 'B', 'P', 'S', 'R' of Gill Sans (graphic elaboration by the author).

2002, p. 162]; on the other he considers it "an entirely outworn, decayed and corrupt convention whose chief and most conspicuous character is its monumental witness to the conservatorism, laziness and irrationality of men and women" [Gill 1936, p. 121]. Tireless artist and attentive to details, he has been able to transform elementary geometries into elegant shapes. Gill Sans is a sans-serif with the typical style of serifs: the 'g' has the classic double eye, the 'R' is characterized by a characteristic foot, the 'p' italic has an unusual continuation of the curved line. The design is based on the utmost economy, does not concede anything to the formalisms of traditional typography and lacks the optical devices useful to ensure better readability (fig. 10). Gill is also unsurpassed in the design of serifs, such as Perpetua (1925) and Johanna (1931), whose shapes reveal his familiarity with the typical graphics of the chisel.

Purism and compromises

Composition based on elementary geometry is one of the basic principles of modernism, whose exponents challenge tradition even in the field of typography. Piet Zwart argues that "if the old typography was contemplative, imitative, decorative and individual, the new one must be actively effective, plastically expressive, elementally functional and collective" [Baroni, Vitta 2003, p. 108].
The Bauhaus printing school was established in 1925 under the leadership of Herbert Bayer and, later, Joost Schmidt. They, together with Moholy-Nagy, have developed numerous projects according to the principles of geometric abstraction advocated by the school. Die Neue Typographie, published in 1928 by Jan Tschichold and adopted as a textbook at the Bauhaus, highlights the layout based on dynamic symmetry, the use of grids, the relationship between full and empty spaces, the insertion of graphic elements (fillets, bars etc.). According to Tschichold, who in the same year designed a rigorous version of Universal Alphabet (fig. 11, top), the essence of the new typography is clarity. This contrasts it with the old typography, whose goal was beauty and whose clarity did not reach the level that modern society needs. Furthermore, "the new typography differs from the old in that its primary objective is to devel-

Fig. 11. Universal Alphabet by Jan Tschichold (1928), by Herbert Bayer (1925) and by Josef Albers (1926); preliminary version of Paul Renner's Futura (1924).

op its visible form independently of the functions of the text" [Tschichold 1995, p. 67]. Later, the artist will abandon these radical positions and will devote himself almost exclusively to compositions inspired by tradition and the design of serif typefaces.
The adoption of a geometric and 'universal' system of writing is central to the Bauhaus. Universal Alphabet, designed by Bayer in 1925 is based on a square matrix, with geometries derived mainly on arcs of circumference: "a mono-alphabet tending to the Platonic idea of writing […]; an essential, reduced writing based on elementary geometry. Each letter is constructed in a rational way, on a square grid, with vertical and horizontal segments and with circular arcs and uniform width" [Russo 2019, p. 37] (fig. 11, bottom left). Bayer's alphabet has no capital letters, to ensure greater simplicity and readability: an even more radical choice for Germany at the time, still faithful to the Gothic characters and the use of capital letters for all nouns in the text.
Josef Albers designed his version of Universal Alphabet in 1926, relying on square, triangle, and quarter circle (fig. 11, bottom center); he also designs the capitals, but the results are questionable from the point of view of legibility. Even Albers, like Tschichold, in the 1960s will question design entirely based on the use of elementary geometric shapes and will firmly support the superiority of Romain typefaces.
The choice to consider the alphabet exclusively from a geometric point of view, regardless of the typographic tradition and its complex system of rules and details, can produce unsuccessful results; readability is partly linked to habit, and if an innovation is not supported by widespread dissemination, it is difficult for it to be successful. The design of a typeface, in addition to the overall geometry, involves additional elements such as the management of spaces, attachments, ligaments and glyphs, the harmony of all the combinations between the letters; issues that traditional calligraphy and typography had long since resolved and which modernists have often avoided addressing.
Paul Renner was not part of the Bauhaus, although he was strongly influenced by it. The first, radical versions of his Futura are affected by the same problems as the works of Bayer and Albers (fig. 11, bottom right). The compromise, and the consequent success, come thanks to the designers of the Bauer Type Foundry in Frankfurt; in 1927 they engrave a specimen that hybridizes the rules of classical typography with the pure geometries suggested by its creator. The enormous commercial success of which Futura and its numerous imitators (such as Avantgarde and Century Gothic) still enjoy today, demonstrates the fact that the best figurative results, especially in a sector full of rules such as typography, almost always derive from the mediation between innovation and tradition [7].

Experiments and dysgraphies. Back to calligraphy?

The digital revolution and the coding of the PostScript language (1985) have allowed the digital redesign of all characters engraved in the past, as well as countless experiments. When foundries and metal characters finally leave the scene, the English term 'font', derived from the medieval French '*fonte*' (which means 'fused'), spreads in Italy. The ancient and heavy typography limited the realization of graphic ideas; thanks to the perfect correspondence between the image on

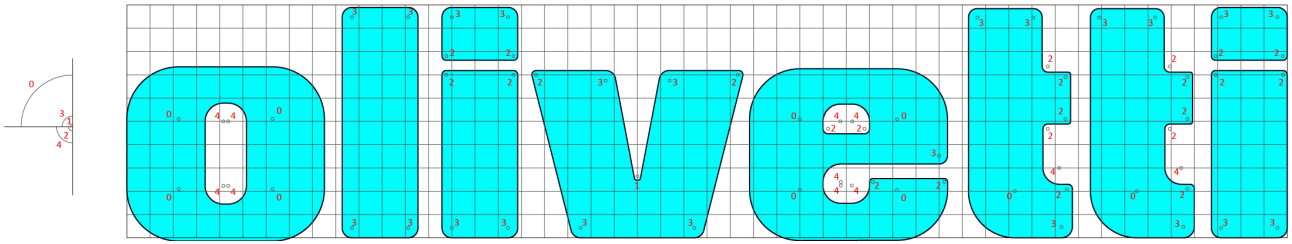


Fig. 12. Graphic construction of the Olivetti logotype (graphic elaboration by the author).

Fig. 13 Left: cover of New Alphabet [Crouwel 1967]. Right: the basic form on which New Alphabet is based and the five variables that allow modifications (graphic elaboration by the author).

Fig. 14. Digital disgraphies applied to form; to proportions (on Gill Sans); to kern and interlining (su Gill Sans) (graphic elaboration by the author).

the monitor and the print, condensed in the acronym WYSIWYG (What You See Is What You Get), the possibilities offered by software and technology develop more rapidly than graphic research. The first electronic fonts are based on a grid of points, the most common of which is the 5 x 9 point grid. In the 1960s, almost all designers tried their hand at drawing characters in pixel cages, sometimes reinterpreting traditional forms, other times concentrating on experimentation and neglecting aspects related to legibility. All the graphics of the following two decades are influenced by these researches, such as the Olivetti logo designed in 1970 by Walter Ballmer (fig. 12). Wim Crouwel's New Alphabet (1967) is also based on a 5 x 9 point matrix, but the rigidity of this configuration is only apparent. The shape of each character derives from five variables which, interacting with each other, allow for countless variations [8]. Each letter is marked with a five-digit code, corresponding to the value of the same number of variables that define its shape (fig. 13). It is a meta-design principle, which develops the one conceived by Adrian Frutiger with the 21 declinations of Univers (1957). A further feature of New Alphabet is that it rejects the hypothesis that the reader's attention is focused on the areas of the lowercase letters that contain the most distinctive features, namely the upper and right sides.
Experimentation must always deal with legibility. It has been shown that lowercase letters are 13% more legible than uppercase [Tinker, Paterson 1928; 1939] and in general we rely more on intuition rather than actual reading because we tend to perceive not so much single characters, but the whole word or even the whole sentence. At the beginning of the last century, ophthalmological studies have verified that an average reader perceives 10 letters at a time in a time ranging between 1/4 and 1/3 of a second, with a pause of 1/40 of a second. The eye stops three times on each line, and always in the same points [Javal 1905].
The new media have questioned some of the rules of typography; culture and visual sensitivity have changed, and with them the notion of legibility. The software that allows you to design fonts and format texts are accessible to anyone [Carter 2000, pp. 24-57]. Digital typography returns to approach the manual skills of engraving and calligraphy: a light manual skill, favored by the elasticity of digital paths. And just like handwriting, typography can be affected by disorders and dysgra-

phies (fig. 14). Erik Spiekermann argues that the loss of humanity and warmth, which were once guaranteed by the fusion of characters, must be compensated by the design of deliberately defective fonts [Garfield 2010, p. 192]. Adrian Frutiger does not have the same faith in dysgraphies: "readers remember the outlines of syllables and words, as if they were a skeletal form; the details that determine the typographic styles are perceived as 'resonances' that do not disturb the reading process if the general design respects the basic rules" [Frutiger 1996, p. 168].
The software saves us the trouble of drawing the letters, engraving them, punching them, melting them, composing them; it is not so much the artisan dimension of the craft that disappears, but a conception of design which, before producing visually verifiable results, requires consequential and controlled actions. The alphabets should be radically rethought; it is no longer necessary to draw the letters as separate entities because they could finally be linked into groups of phonemes. But typography, as Alan Fletcher likes to repeat, is a straitjacket imposed on the alphabet, and its conservatism always tends to reappear. The research on forms is incessant, we need to express ourselves in new ways; nevertheless "typefaces design always remains linked to the great tradition of calligraphy" [Zapf 1954, p. 3] and it seems impossible to design new fonts that differ from the shapes of the past: their quality continues to depend on the level of imagination and feeling we put into reinterpreting tradition.

Notes

[1] In addition to Textur, Rundgotisch, Schwabacher and Fraktur were widespread in Germany. Textur is characterized by letters in straight lines and sharp edges that make the printed page resemble, when viewed from a certain distance, the warp and weft of a fabric.

[2] The Italian typographic school adopts as a reference the humanistic writing, soft and rounded, derived from the Carolingian minuscule (also called 'Roman' or 'Antiqua'). Poggio Bracciolini and Niccolò Niccoli formalize the '*round humanistic minuscule*' (which they themselves defined as "*littera antiqua*"), supporting the correspondence with that used in the classical era. In it, the letters are detached from each other, the lines well-spaced, the composition sober and elegant. The humanistic minuscule spread rapidly throughout Europe, except for the countries of the German area, which continued to prefer Gothic until the 1940s.

[3] The typographic glossary is also linked to manual skills and anthropomorphism. Just to limit ourselves to the typeface, the terms in use are *occhio*/eye/*œil*, *braccio*/arm, *corpo*/body/*corps*, *spalla*/shoulder, *orecchia*/ear/*boucle*, *collo*/neck, *gamba*/leg, *piede*/foot/*pied*, *coda*/tail/*queue*.

[4] The stonecutters use only capital letters and take into high consideration the aesthetics and the rules of composition of the text. Merchants and bankers, animated by essentially practical and autograph purposes, practice inhomogeneous and careless styles. The copyist monks apply the writing techniques used in the monastery they belong to. The scribes develop a style of cursive calligraphy called cancelleresca, similar to the humanistic one but more compressed and inclined to the right. The cancelleresca was born in Italy and spread throughout Europe; even today, the term that universally denotes cursive writing is italic.

[5] Zapf writes: "Anyone who is fascinated by the art of typography will never experience boredom, for their entire life. The practice of calligraphy offers us the opportunity to express the many aspects of human emotion. […] Although a large part of my time is engaged in the complicated and rigorous work of designing alphabets for electronic composition, my love is still the cut-off nib; there is always a drop of our heart in the ink we use" [Lussu 1990, p. 85].

[6] Bodoni is not a single font, but a family of typefaces with slightly different versions from each other.

[7] This is also confirmed by Helvetica, probably the most used font in the second half of the twentieth century, designed by Max Miedinger in 1957. Despite the rigorous geometry and the absence of serifs, it represents a return to tradition hybridized with modern style. It is a neutral typefont, based on the 1896 redesign of Akzidenz-Grotesk but with the introduction of measured formalisms, such as the curled leg of the ? '*R*'.

[8] The basic form on which the 5 variables act is shown in figure 13. They are: *a.* variable number of vertical units (odd progression); *b.* variable number of lines per vertical unit (200 to the cm); *c.* variable number of horizontal units (odd progression, at least: *x*-heights + 4); *d.* variable number of lines per horizontal unit (200 to the cm); *e.* variable number of the *x*-height (odd progression).

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Augmented Visual Models of Scientific Zoological Collections. A User Experience at the MUSA University Museum

Pierpaolo D'Agostino, Giuseppe Antuono, Pedro Vindrola

Abstract

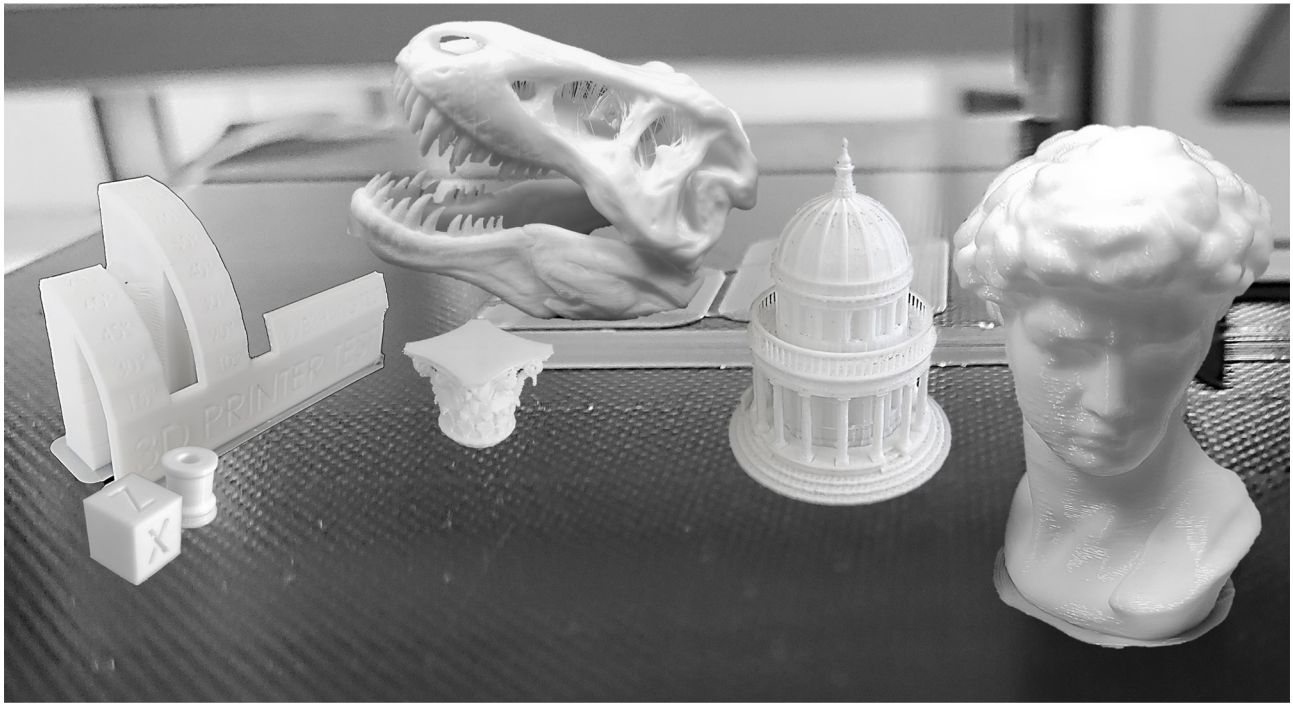
The present work wants to configure itself as a paradigmatic contribution proposing a methodological approach for an augmented fruition of museums and their exhibits. Currently heritage, museums and the way of experiencing them are undergoing a paradigm shift, due to all the digitalization era, where it has to overcome this transition and take advantage of it, capitalizing on what these new technologies have to offer.
An augmented fruition experience of a study case is proposed, where the augmented component is configured by combining state-of-the-art techniques with traditional ones. Where rapid prototyping, different survey techniques and augmented reality in fusion with the standard ways of showcasing objects are used, in the museum center of agricultural sciences (MUSA) of the University of Naples Federico II in Portici. The augmented fruition for all heritage of the museum is the outcome of a three-way relation made between the new technologies and the two key concepts: preservation and divulgation. Where the technologies offer ways to develop strategies, more efficiently, for divulgation and preservation; and the second two facilitate a field of application for pushing the limit of these technologies further and further.

Keywords: scientific collections, cultural heritage, extended realities, rapid prototyping, virtual fruition model.

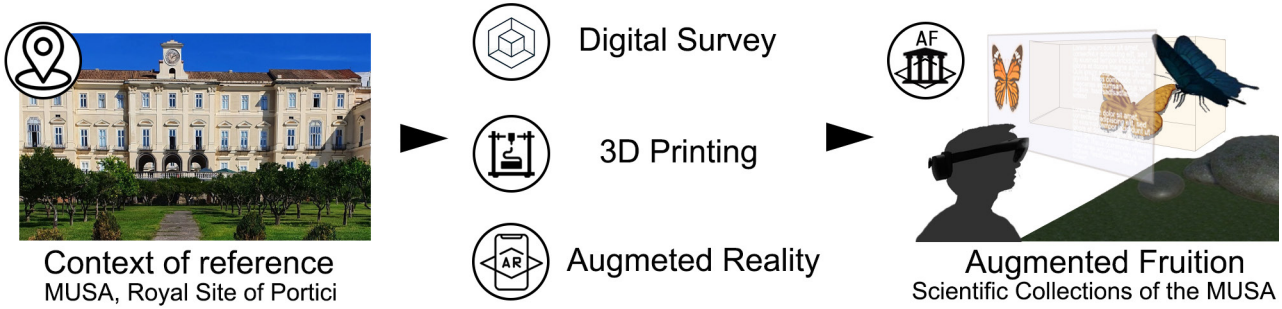
Introduction

Drawing and design –as tool a of representation– have been in the past the main tool for the manifestation of ideas; today, in the 21st century, the discipline of representation is in the situation of having , with flexibility and adaptation, todeal with rapid technological changes, reinventing and experimenting with new digital environments of communication and fruition.
Communication, as a disciplinary field, since the World Wide Web advent [Huhtamo 2010, pp. 121-135], that led to the rapid growth of web applications in the 1990s [Hooper-Greenhill 2003, pp. 1-40; Oppitz, Tomsu 2018, pp. 201-227], has undergone a migration from the analog to the digital realm, developing new languages (hypermedia, augmented reality, virtual content) that finds fertile ground in the cultural heritage sector, with particular reference to the Digital Transformation of art and museums [Bertacchini, Morando 2013, p. 62; Bolognesi,Aiello 2020, pp. 83-90], enabling innovative modes of fruition [D'Agostino, Antuono, Elefante 2022, pp. 399-407]. The museum and art sector had to assimilate with struggle these new technologies [Parry 2010, pp. 1-8] and this sector "re-formulation process" [Cameron 2010, pp. 80-95] continues, since they are, in many situations, already the main channel of access to information about cultural heritage; new forms of democratization of culture have been made possible by the revolution set in motion by the World Wide Web which, representing a rupture from the past,

Fig. 1. In-house prototypes for experiments between real and virtual elements of museum heritage (authors' elaboration).



has changed not only the creation and distribution of information but, also multiplied the opportunities for exchange, accessibility and participation of the user; who is called to interact in pervasive and cross-media digital environments.
Currently, heritage, museums and the way they are experienced are undergoing a paradigm shift, due to the whole era of digitization, which must overcome this transition and leverage it, capitalizing on what these new technologies have to offer. In this perspective, moreover, after an initial establishment of digital surveying techniques, such as laser scanning and photogrammetry, recent years have witnessed a paradigm shift in digital fruition, with the reconstruction of material prototypes (fig. 1) and increasingly related to words such as metaverse, Extended-Realities (xR), etc., which are beginning to appear in the glossary of an audience –not only in 'native' digital sciences– increasingly more at ease with the technologies, as well as feeling familiar with these neologisms [Sherman, Craig 2018; Huggett 2020, pp. 1-15; Allam 2022, pp. 771-801].
Now with the global situation related to the pandemic [Cicerchia, Solima 2020, pp. 1-27], information and communication technologies for augmented reality (AR) and virtual reality (VR), have enabled the user to simultaneously interact with the real and virtual environment, enhancing experiences and conveying the content of the cultural product in order to facilitate connection, especially to remote access [Kang, Yang 2020, pp. 139-161], and have a deeper understanding of it. Hence, the push today is toward greater complementarity of visual design technologies for digital innovation of museum



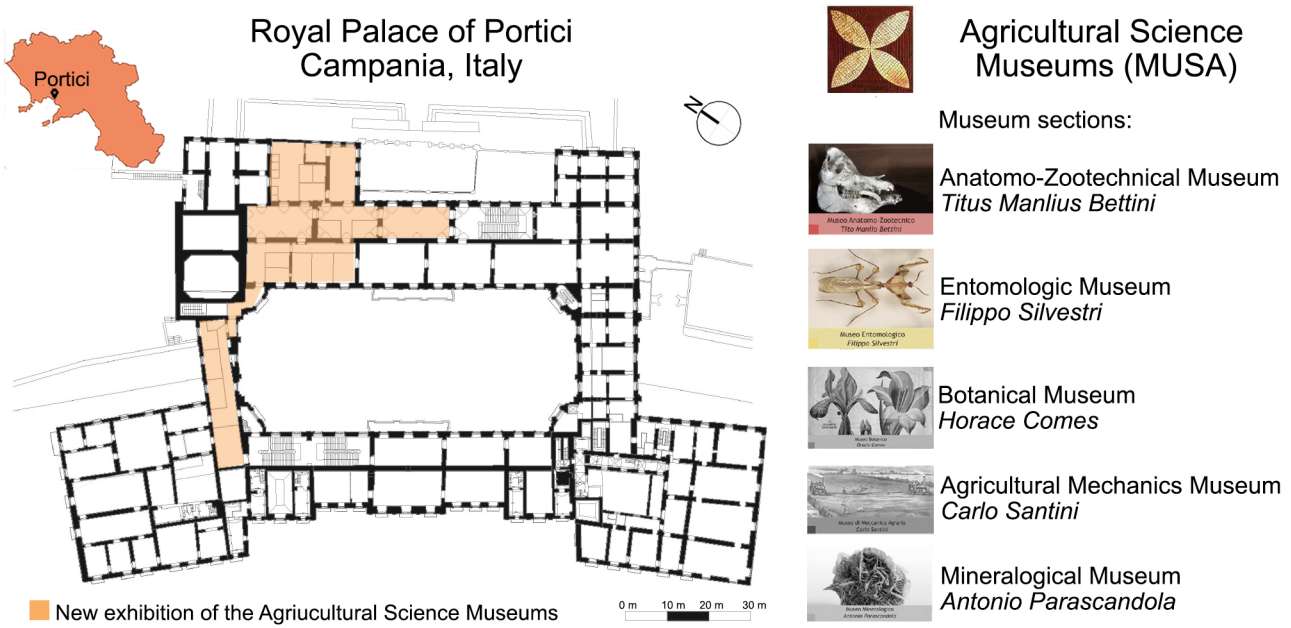


Fig. 2. Methodological workflow: from the context of MUSA in the Royal Site of Portici to artifact augmented-fruition of the scientific collections (authors' elaboration).

Fig. 3. Framing of the site: the whole exhibition area of MUSA's scientific collections on the main floor of the Royal Site of Portici (authors' elaboration).

knowledge pathways, in line with the new International Council of Museums (ICOM) definition of a museum, which focuses specifically on "providing diverse experiences for education, enjoyment, reflection and knowledge sharing." The goal is to be able to make artworks 'express' works of art in innovative ways, through devices and interfaces, while also aiming to integrate tactile modes of interaction with multisensory experiences into communication [Neumüller et al. 2014, pp. 119-134; Khunti 2018, pp. 1-12].
To this end, the present contribution, in discernment of new digital languages (fig. 2), proposes an organic method of informative correlation in the virtual fruition of artifacts in a museum space, experimenting –in particular– in the Museum Center Museums of Agricultural Sciences (MUSA), combining, from data acquisition through digital sensing technologies, to augmented fruition techniques and rapid prototyping in accordance with the standard ways of exhibiting collections, in the recently restored rooms on the main floor of the Palace of Portici (fig. 3).

From real to virtual and back. A method exemplification

In line with the three criteria for efficient cultural dissemination (quality, quantity, and accessibility of content), the basis of *audience development strategies* –understood as a useful tool for understanding the opportunities arising from digital media with the goal of enhancing the lived experience of the public, by proposing new and appropriate ways so Cultural Heritage can be enjoyed and fruited by the community [Ippoliti, Albisinni 2016, p. E6] –and *audience engagement*– consecutive in creating a context of interaction, participation, and experience that leads to engagement, audience satisfaction, and all this to the construction of a sense of identity [Ippoliti, Albisinni 2016, p. E4]–, this proposal describes a pilot of XR technologies in integration with rapid prototyping for the preservation and dissemination of the numerous exhibits of the significant heritage of scientific collections, regarding the entomology and zoology sections of the MUSA in the Palace of Portici.
The opportunity to set up and open to the public the new exhibition spaces on the main floor by the end of the year 2022, as well as the recognized fragility and high-risk condition in the exhibition of artifacts, allowed to define a framework of activities to implement the virtual in the real space of the museum site, in line with the demands of the National Recovery and Resilience Plan (PNRR) –implementing tangible and intangible infrastructure of the historical and artistic heritage through digital investments–, with the goals of Agenda 2030 –in improving accessibility to information as well as the quality of education through information and communication technologies– and with what has been stated internationally with the UNESCO Recommendation from 2015 [UNESCO 2015] – which promotes the protection of cultural heritage. Thus, to enable easier and more immediate sharing of content, thanks to the digitization of collections and consequently better preservation of heritage, and thereby reach a wider and more diverse audience a new exhibition paradigm was tested. The experimentation was carried out by using the transparent screens of a Liquid Crystal Display (LCD) to conform a digital showcase in the integration of AR devices. The objective is to implement a visitor's fruitive experience with the environment and scientific collections, to enhance and implement the interaction between information content and the material-virtual container, intensifying the integral experience of the museum object, through multiple senses, in the reflection on the product-space-use relationship for the future use of the museum halls, which are undergoing restoration work.
The exhibits examined in this research refer to different types of animal and multiscale species, preserved today in inaccessible places because they are subject to the risk of environmental deterioration; the size of the objects, their different types and, above all, their belonging to different disciplinary fields determined a particular complexity of investigation that has seen the experimentation and evaluation of different techniques of digital data detection and integration, useful for reconstructing their related geometric-material models in the augmented reality information component.
Therefore, the methodological workflow applied to the experimental site (figs. 2, 3) included the stages of:
- Digital survey of the museum artifacts and integration of the acquired data of the museum space;
- Digitization and modelling of the museum holdings;
- Rapid prototyping with production testing of museum artifacts;
- Creation of a digital display case and fruition in AR.

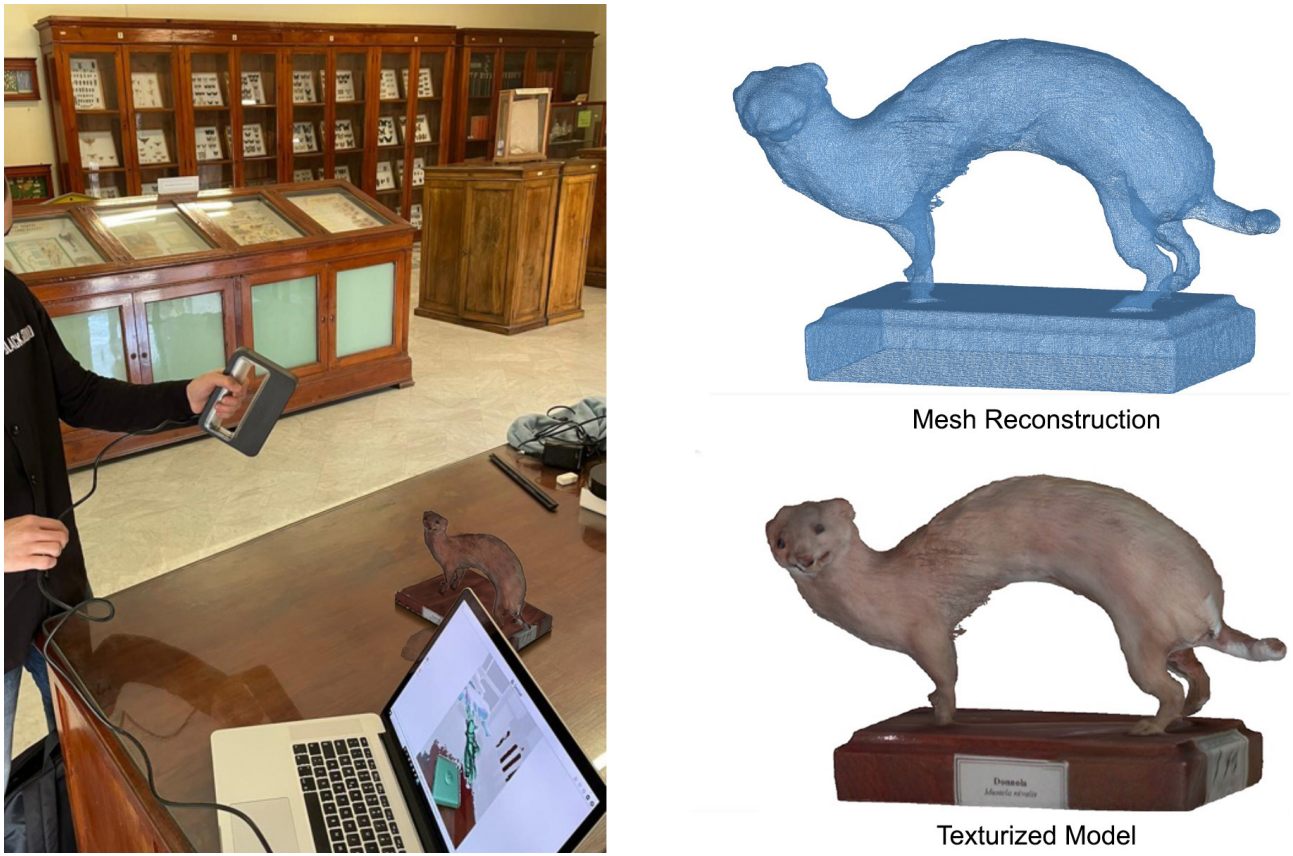


Fig. 4. Survey stages of the Systems-Sense 2 3D laser triangulator scanner and the digital reconstruction of the mammal Mustela nivalis of the family Mustelidae, part of MUSA's zoological collection (authors' elaboration).

The stages enclose and conclude with the fulfillment of the goal of achieving augmented fruition of the collections within the museum space.

From survey to prototype of scientific collection exhibits

In recent years, foundations, museums, and in general all institutions, which are committed to enhancing the value of historical collections and preserving their value beyond the destructive action of time, have realized the potential of using digitalization approaches. Because make it possible to archive and reproduce the geometric characteristics of historical works, without compromising the integrity of the collections, describing new paths of virtual visitation and allow the visualization and re-imagining of historical spaces and objects that would generally be left to the imagination of visitors [Empler 2018, p. 13.10].
In line with new developments, for the study and acquisition of 3D models of the Museum of Agricultural Sciences architectural and collecting heritage, various digital survey methodologies were used to describe the museum room spaces and to reproduce the various objects, with different sizes and typologies, useful for testing the feasibility of the techniques for the proposed objectives.
The first macrophase involved the digital laser scanner survey of the different rooms of the new museum rooms on the main floor of the Reggia, using a Leica BLK 360, returning an integrated model useful for the space-conform reading of the access and passage paths, as well as the relationships with the natural lighting systems.
In a second macrophase, the findings were acquired at two different times, using two different digital sensing techniques. The first one involved acquisition based on triangulation scanning system. Specifically, a 3D Systems-Sense 2 was used, equipped with two cameras, one for image acquisition, the other equipped with a depth sensor, which, based on geometric triangulation criteria, allow the reconstruction of an unstructured point cloud model in real time. The result is a detailed model in texture reproducibility –was also tested for the other types of artifacts taken from the museum– described by a surface of polygons, in the *Mesh Re-*

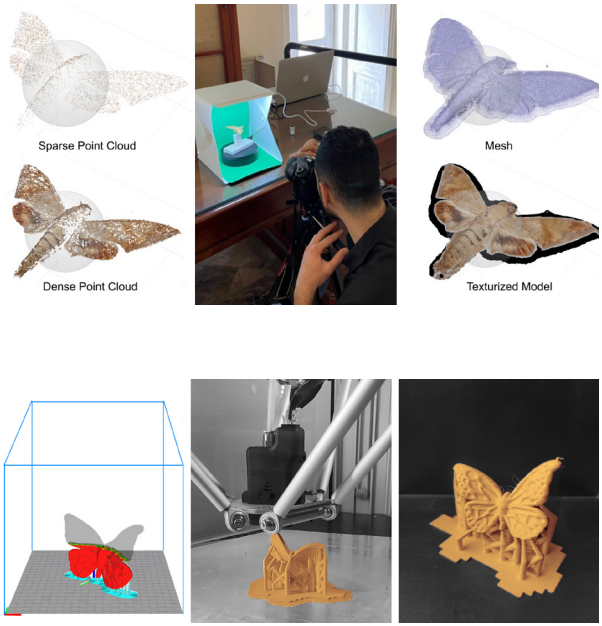
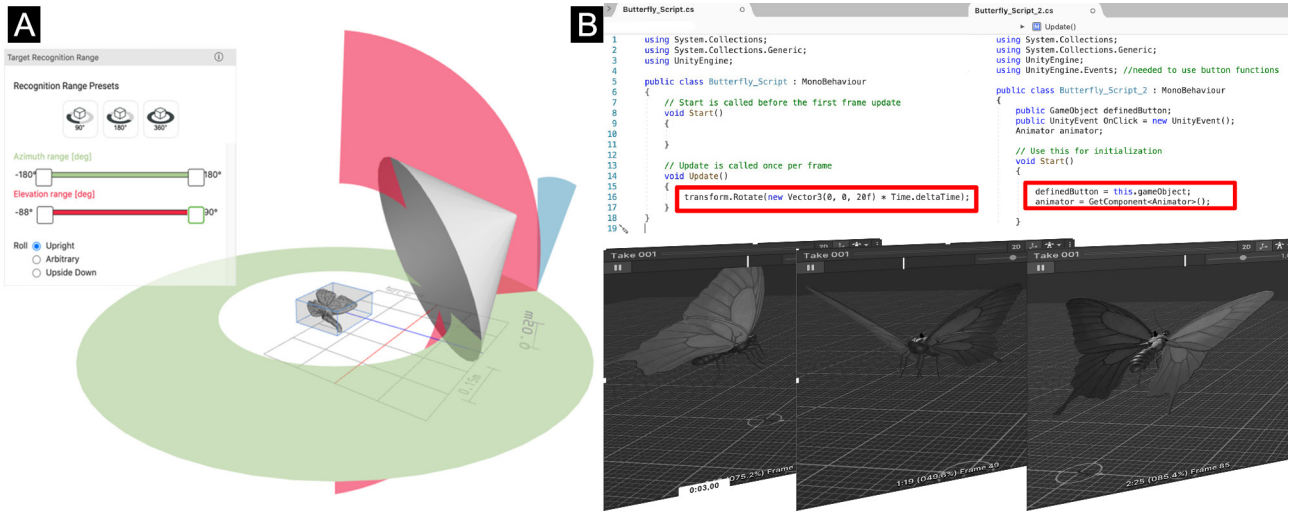


Fig. 5. Photogrammetric survey and digital reconstruction of an insect of the order Lepidoptera, part of MUSA's entomological collection (authors' elaboration).

Fig. 6. Lepidoptera prototyping process. From left to right: model setting and printing parameters; prototyping with Delta WASP 4070 type printer; one of the outcomes of the printing steps (authors' elaboration).

Fig. 7. Building the digital fruition model in AR mode: A) definition phase of the model Target; B) definition of the script in C# in Visual Studio for iterating and animating the model frames (authors' elaboration).



construction stage, textured through photogrammetric image mapping. Despite the execution of an image calibration procedure, the final model was found to have low fidelity, with just an approximation of geometric shapes compared to the small scale of the object, characterized by a reflective material (fig. 4).
Therefore, to meet the requirement for the survey of small artifacts and overcome the difficulties encountered –in the need for accuracy of the fundamental data for their digital reconstruction– digital photogrammetry, which is based on Structure from motion (SfM) techniques, was used, allowing the free form of bodies to be restored [Liva 2021, p. 12]. In particular, a Nikon Corporation D90, with an AF-S Nikkor 50mm lens and light box size of 25x25x25 cm on a swivel base, and XP Pen Deco 02 graphics tablet was used for masking the acquired images, yielding a focus on the object with increased point acquisition (fig. 5).
For this purpose the software, open source, FormWare was used, which allowed the mesh to be repaired in .stl format for the next stage of model preparation and definition of rapid prototyping parameters in Ultimaker Cura (fig. 6). These included validating the mesh, identifying any missing parts and closing the surface in *Mesh Tools,* defining in *Cylindric Custom Support* the supports to the model for the post-production phase, or again verifying the parameters of correct positioning and adhesion of the object on the printing plane in *Auto-Orientation*.
After this phase was completed, the prototypes were printed through a Cartesian-type Anycubic I3 Mega S and a delta-type Wasp 4070 Pro in PLA bioplastic material (fig. 6). Also was tested the outcomes with respect to the achievement of the objective and the definition of the parameters that determine, for example, the retraction that is used to regulate the length of the same of the wire to avoid problems of stringing –as well as avoiding a warping problem related to adherence to the plate– and monitoring the printing temperature, aiming to avoid the problem, still present with this type of prototyping technology, of under-extrusion. Despite the performance of the Wasp 4070 Pro, which is indeed more oriented to the prototyping of medium-format models, the Anycubic I3 Mega S maintains high defining capabilities of a base model with lower economic commitment; ergo, this last was replicated also with the

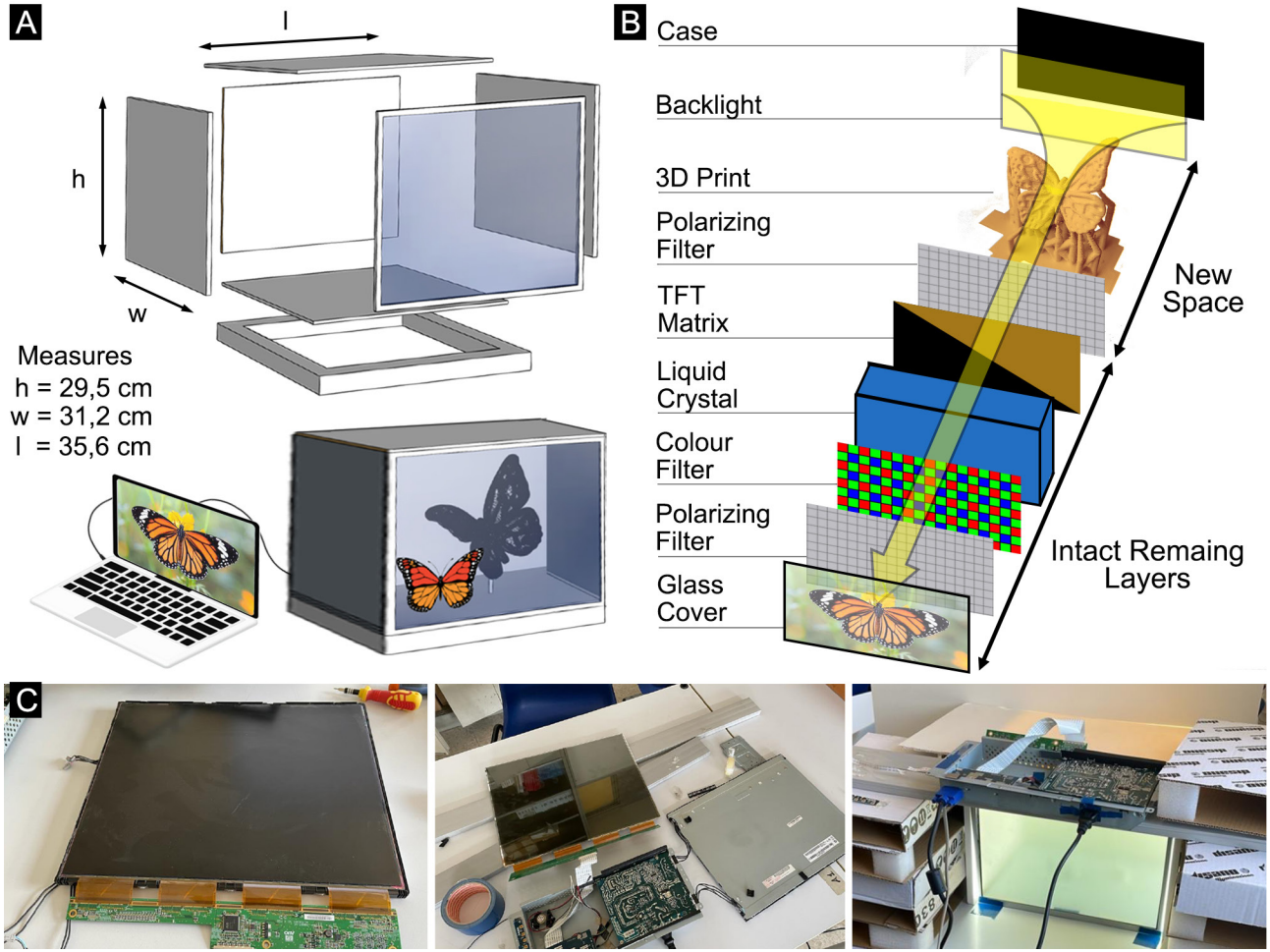
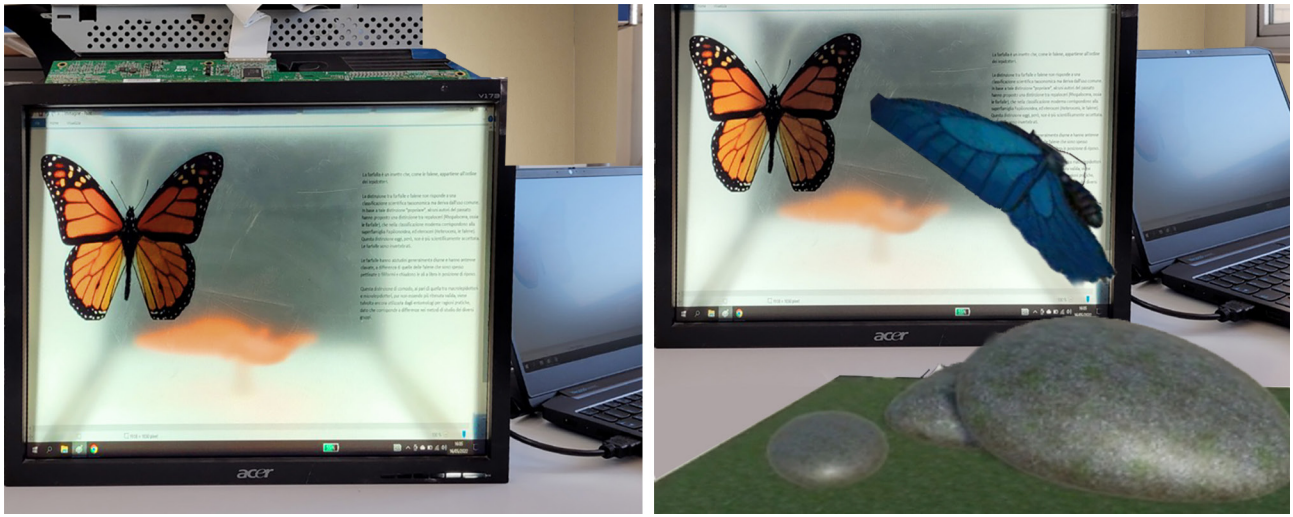


Fig. 8. Prototype development of multimedia display case with 4:3 LCD screen: A) drawing of the prototype; B) operation diagram; C) engineering stages (authors' elaboration).

Fig. 9. From left to right, prototype of the digital display case for information fruition and frame of the AR application (authors' elaboration).



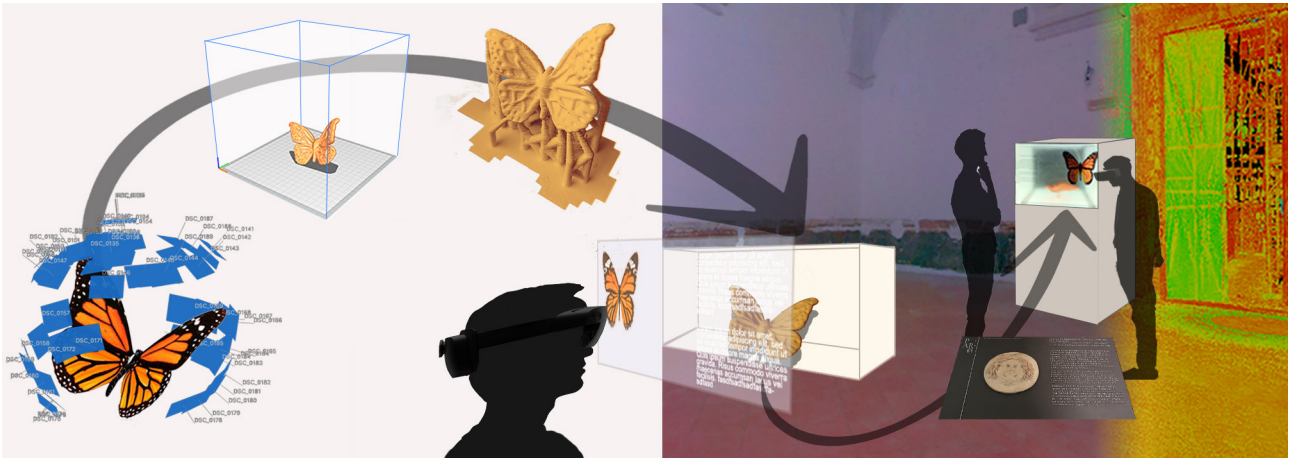
other elements of the MUSA's archive, for the preservation of authentic exhibits and, yet, more focus toward the possibility of a greater tactile performance of the model, which allows a more verisimilitude interactive experience with its reproduction [Ballarin, Balletti, Vernier 2018, pp. 55-62], as a rethinking of the visit path, by breaking down the barriers that ensured its preservation and integrating virtual information through augmented fruition technologies. The horizon that 3D printing of elements made interactive, eventually scalable, opens up allows in fruition not only informative sharing for the visually impaired, but also proposes a way to diversify edutainement, adding the sense of touch to the museum experience [Sdegno 2018, pp. 256-271].

Fruition of augmented visual models in a digital showcase

In accordance with the goals of expanding the informational experience to different categories of users of MUSA's scientific collections, the experimentation developed a digital prototype of integration between real and virtual [Papa, Antuono, Cerbone 2020, pp. 41-50], with the creation of a display case that, by expanding the traditional museum information systems (panels, audioguides, professional guides), allows the user to interact with the physic reproduction in scale of haptic models [Wilson et al. 2018, pp. 445-465]. In addition, it allows the user to deepen the digital resources of the associated digital objects in an immersive and augmented experience, useful for the preservation and dissemination of the collection heritage in the spaces of the museum's halls.
Therefore, from the digitization of the exhibits of the scientific collections, that can be loaded into the asset of the Unity multiplatform videogame engine, an AR application was developed, which synthesizes in the virtual scene the information associated with each element/exhibit. The project was configured for the Android operating system, using a predefined Unity template for 3D apps (fig. 7). Specifically, for the creation of the scene, AR graph-visual interaction modes were set up to recognize images and target models and, thus, enable interactivity with the real model in both the basic functions of motion tracking, i.e., understanding and

monitoring its position with respect to the world (identifying key points in the real environment and keeping track of how they move over time), and environmental understanding, to detect the size and position of the space and support augmented enjoyment, evaluating the current lighting conditions of the environment, optimizing the rendering of 3D objects. Hence, in structuring the digital content to support a museum fruition, the potential of a number of platforms were exploited, integrated inside Unity interface, capable of making the visitor interact with the prototype object displayed via device. In particular, Vuforia Engine, for the development of the augmented reality app and image target tracking of the virtual content in overlay with the dedicated museum space in direct dialogue with Unity. In addition, Visual Studio, for the creation of animation models associated with the model target, through the definition of a script in C# language, managed in model target generator that allows the model target tracking and the reconversion of 3D models in the online database Vuforia Developer Portal, which means recognizing, via device, the material prototype and launching the associated digital content.
To create the image targets, a number of photographs of the exhibits of the species chosen for experimentation were selected, subsequently uploaded to the Vuforia developer portal in order to make the image recognizable by the devices and imported into Unity. The next step was to associate the information content to be shown to users, with an image or video of the exhibit composition, as well as a brief description with shared scientific data related to the naturalistic collection.
At the same time, the virtual model of the artifact was finalized in the model target generator, which was then converted into the Vuforia Engine dataset, by defining the parameters of: model up vector, to establish the position and direction of the object; model units, to size the object and validate the correspondence between digital and physical object; complexity, to assess the degree of detail of the polygonal surface describing the digital model for easy enjoyment in mobile devices in real time (cell phones or AR viewers); model type, to typify the model as 3D Scan, i.e., created from photogrammetric textures; motion hint, to manage the type of object motion, in dynamic mode, during the recognition phase with AR device; Guide Views, as a support for object recognition and creation of different of views, either in overlaying the digital model to the physical model outline, or in 360° overview view for better immersive experience.

Fig. 10. Toward the design proposal: from the final fruition scheme to the set-up (authors' elaboration).



At this point it was possible to associate immersive digital content with the target model, pre-loaded in Unity, which involved interactions and animations of the object, structured and animated according to the creation of a specific script in C# language in Visual Studio. For the specific case under consideration of a volatile species, this allowed the object to fly and rotate to appreciate its structure and color. The latter feature, in particular, would not be appreciable from the physical model alone without the texture (fig. 8).
In fact, user involvement requires the integration of effective tools of cultural fruition, thought, in the specific case, in the integration of new modes of information fruition [Empler 2018, p. 13.10] and in the iteration of the real and the virtual model, through the realization of a digital vitrine where to display the surveyed object, connected in an augmented reality experience, also usable in a traditional way on a transparent screen [Bimber, Encarnação, Schmalstieg 2003, pp. 87-95]. Specifically, for the creation of the display case, the components of an Acer LCD monitor were reassembled into the digital showcase, structured to fit the material prototype into a 'new space' between the different layers of the LCD and the backlight (fig. 8). The showcase was sized and designed to be equipped with a new backlighting system, by means of 5 LEDs of 40W and 3600 LM, to achieve uniform brightness and perfect visibility of the digital content on the screen, which acts as a front glass protecting the exhibited object (fig. 9). The screen was then connected to an external computer for sharing content, and AR app tracking systems was adapted for the display case and the printed object. This resulted in a prototype that, in the integration of the digital reconstruction and integration phases between real and virtual [D'Acunto 2012, pp. 273-278], is placed in the museum environment with reference to natural lighting conditions so that they do not interfere with the proper digital enjoyment of the content (fig. 10).

Conclusions and future developments

The goal, to digitize and model the holdings of the scientific collections –in agreement with MUSA for the new museum display of the entomological and zoological sector– has been achieved by highlighting the support of new technologies that, if critically integrated, can expand the knowledge of artifacts in the interconnection between real and virtual, responding positively to the content-container question on which the museum idea is based. It should be emphasized that the work done so far is intended to be a highly experimental process; in consideration especially for future developments that are moving toward the integration of showcase touch [Yang, Wang 2009, p. 75132U], it is not a point of arrival but a starting point for further experimentation that can delve into certain issues such as the lack of authenticity of the asset that differs from the original in materials, colors, textures and the most minute details. Hence, this contribution represents a first step for the recovery of the material model in the medium of rapid prototyping and integration with augmented fruition, addressed to a popular and research use guaranteeing the protection of delicate, fragile and of great scientific value collections that need, therefore, to be safeguarded thanks to the application of new information and communication technologies.

Credits

The contribution is the result of the joint research work of the authors, with the operational support of Dr. Eng. Carlo Segretario, as part of the activities of the RemLab (Laboratory of Surveying and Modeling), of the Department of Civil, Building and Environmental Engineering of the University Federico II of Naples, with the availability of MUSA in the figure of Prof. Stefano Mazzoleni, Director of the Museum Center, for the activities of acquisition of scientific collections. In particular, P. D'Agostino authored the paragraph *Introduction* and *From real to virtual and back. A method exemplification*; P. Vindrola is the author of the paragraph *From survey to prototype of scientific collection exhibits*; G. Antuono is the author of the paragraph *Fruition of augmented visual models in a digital showcase*; finally, *Conclusions and future developments* are shared by the authors.

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From Showing to Connecting. The Design of Exhibitions (*Object Notes* #1)

Edoardo Ferrari

Abstract

The paper aims to focus within the history of exhibitions some experiences that are fundamental in describing the relationship between graphic design and exhibition practice. Through a selection of cases that have highlighted the qualities, disparities, and characterizing attributes of the exhibition system through design, the paper aims to read the project as a scenario of a production activity. The reading of some internal exhibitions in the 1980s and 1990s now become an opportunity to reflect on the relational system intrinsic to display practices. Starting from the reading and analysis of the editorial objects produced on the occasion of the exhibitions, the contribution attempts to show a relationship between the curator's work, the graphic project carried out, the professional figures involved and the result obtained.
The cases identified find in Germano Celant's curatorial practice a focus on the graphic qualities of the exhibition activities he imagined. This practice makes it possible to emphasize within the paper the theme of exhibition design as an instrument of connection. And, at the same time it emphasizes the disciplines involved in collective exhibitions to narrate the device-exhibition and the production qualities of the imagined systems.

Keywords: exhibitions, curating, display, graphic design, project

I.

"Vignelli Associates' basic design belief is that 'design is one'. We believe in discipline as the pursuit of structural integrity, appropriateness as the search for the specific, and ambiguity as a plurality meaning" [Vignelli Associates 1990, p. 1].
This definition of how the studio founded by Lella and Massimo Vignelli in 1971 works opens the book *design: Vignelli* (1990). The design of the Vignelli Associates studio is not only embodied in specific design applications but it universally encompasses work done on the scale of corporate identity, packaging, transportation graphics, architectural graphics, book, magazine and newspaper design, poster design, interior design, furniture design and product design [1]. The text by curator and critic Germano Celant included in this volume celebrates these skills, emphasising a unique coherence and linearity in the production of his work. He speaks of this through a plural *Vignellis* that identifies a quality of shared thought capable of designing a process that renounces subjectivity to yield to the 'system' characterised by forms, volumes, colors and materials.
When this text came out in the volume –with its square format, the red colour identifying Vignelli's corporate identity programme, and with the title printed in white in Our Bodoni [2] on the cover and spine– dedicated to the designer's design, profound interactions between the curator and the graphic design studio profile had already been ensured. Indeed, in 1985

when Celant curated *The European Iceberg. Creativity in Germany and Italy Today* at the Art Gallery of Ontario in Toronto from 8 February to 7 April, Massimo Vignelli was present in two ways. The graphic treatment of the exhibition and the volume is defined by a return of six typographic choices and five colors. The catalogue, published by the Italian publishing house Nuove Edizioni Gabriele Mazzotta in Milan, presents a series of vertical bands that, unrolling and repeating themselves throughout the spread cover, draw the two flags: green, white and red for Italy, black, red and yellow for Germany. Here, Vignelli's rules defined by the recommended use of six fonts such as Garamond, Bodoni, Century Expanded, Futura, Times Roman and Helvetica [3] seem to shatter against the identity of the state on display. The typographic choices do not fully celebrate the states except in a few cases. The six repetitions of the title are composed in Futura, Century and Fette Fraktur within the bands of the German flag, in Helvetica, Bauer Bodoni and Egyptienne for the Italian flag (fig. 1) [4].
The drawing of identity is not Vignelli's only contribution to *The European Iceberg*, in fact in addition to the sections *Architecture*, *Art*, *Cinema & Film*, *Design*, *Fashion & Mode*, *Photography* and *Theater* there was also *Graphic Design* in the exhibition. Giovanni Anceschi's text-manifesto *Graphic Axes*, placed at the opening of the author's section, unfolds in seven points the trajectory of the graphic trends included in the geographical bisector between Italy and Germany (emphasising the passage from Switzerland) [Anceschi, 1985, p. 262]. Anceschi's essay defines the connotations of the father of the creative explosion of Italian graphic art to Antonio Boggeri, Similarly, he declares numerous figures who intertwined graphic, pictorial, typographic and drawing qualities within their work. For Italy he reports Aldo Manuzio, Alberto Griffo, Pier Luigi Cerri, Luigi Veronesi, A.G. Fronzoni, Albe Steiner, Franco Grignani, Italo Lupi, the naturalised Bob Noorda, Bruno Munari and Enzo Mari. On the German side, only a few names are mentioned, the two exhibited designers Michael Klar, Karl Heinz Krug together with Peter Behrens. Significantly present are the names of artists and designer from outside these two countries such as the Austrian Herbert Bayer and the Swiss Josef Müller-Brockmann, Max Huber and Xanti Schawinsky. Along with the text, thumbnail images of the projects displayed by Lupi, Vignelli, Cerri and Fronzoni exhibit a production quality typical of graphic design in connection with art, design, architecture, information, and exhibition's practice. The text in the catalog also celebrates the qualities of the exhibition design produced by Vignelli, in fact he writes (or explains): "One of the most brilliant participants here was Massimo Vignelli, who worked out a modular system of lights – and it caused a sensation. Vignelli, together with another 'Nordic', this time the Dutchman Bob Noorda, founded Unimark, the great international studio, which took on many graduates of Ulm, for instance an industrial designer like Frank Hess" [Anceschi 1985, p. 264].
The layout is designed by wooden panels arranged within the space that not only section off the various rooms but also present part of the paper materials produced: if on the vertical surface of the panel we find the posters selected for display, catalogs and publications find space on small shelves inserted perpendicular to the panels. Along with these we also find platforms and parallelepipeds to define the exhibition language conceived by Vignelli. Cerri exhibited in the section dedicated to graphics the identity designed for the XXXVII Biennale di Venezia in 1976, Fronzoni the poster for Fontana at the Galleria La Polena in 1966, Vignelli a series of publications designed from 1963 to 1980 while Lupi some posters among which it is possible to recognise the 'T' designed in collaboration with Alberto Marangoni for the XVI Triennale di Milano. Regarding the differences between exhibition and publication, it is important to underline that in the catalogue each discipline presented is present in text and photographic format, while in the exhibition we do not find the materials of the *Fashion & Mode*, *Theater* and *Cinema & Film* sections [5].
On display in the exhibition we find Pier Luigi Cerri's work for *Identité italienne. L'art en Italie depuis 1959*, the exhibition curated by Celant at the Centre Georges Pompidou in Paris from 25 June to 7 September 1981. The long timeline designed for the exhibition – which controls the catalogue by means of the recurring, placed above each page and underlined by a black thread– generates an editorial volume that, with its 648 pages, does not explicitly present files dedicated to the 18 selected artists but a long chronology of political, historical, cultural and artistic events in Italy from 1959 to 1980. The identity devised by Cerri is

Fig. 1. Front cover of the catalogue. [Celant 1985].

Fig. 2. Front cover of the catalogue. [Celant 1981].

defined by a photograph of the celestial map where we find the insertion of a grid subdivides space and the stars together with stylization of a cube, the upside-down Italian peninsula, marble faces and other Italic characters (fig. 2) [Celant 1981]. The layout, also designed by Cerri with Vittorio Gregotti, had envisaged a concentricity deriving from a honeycomb pattern that made each space monographic, giving it to a single artist. In the concretization of the editorial volume, however, these islands are split by the will to respect a constraint defined by time, thus drawing a sequence of pages deriving from a long continuation of Italian history [Messina 2015].
This case helps us to understand how studying the design of the exhibitions within these years not only exposes knowledge about the exhibition space, but also describes a professional and design figure interested in the design of a relationship between image, text, space and audience. The elements intended to keep track of the work thus become an extension of a physical and experiential manifestation that transposes into the visual identity the task of surviving, through the scenarios produced, over time. At the same time, the relationships between curator, architect, and designer –the latter to be understood as graphic designer and professional figure responsible for the exhibition and publishing format– produce countless points of contact that validate an awareness in the design of the project on different scales. Starting with Celant and his interactions with the other professional figures presents a vast territory of conscious actions that allow their own quality of action to emerge within a history of exhibitions.

II.

The Italian Metamorphosis, 1943-1968 is the title of the exhibition organised by Germano Celant at the Contemporary Art Museum in the Solomon R. Guggenheim Museum in New York from 8 October 1994 to 22 January 1995. Here the name of Massimo Vignelli as graphic designer returns again, declared in the third line on the flap of the hardback catalogue's dust jacket after the name of the organiser and Umberto Eco for the preface. In this work Celant figures as organiser and curator of the Art section together with Andrea Branzi for Design, Gian Piero Brunetta for Cinema, Maurizio Fagiolo dell'Arco for The Literature of Art, Vittorio Gregotti for Architecture, Luigi Settembrini for Fashion, Pandora Tabatabai Asbaghi for Artists' Crafts and Italo Zanner for Photography [Celant 1994]. The exhibition design consecrates the name of Gae Aulenti together with architect Vittoria Massa and costume designer Giovanna Buzzi. The architecture and art magazine *Anfione e Zeto* dedicated issue 11 to Aulenti's exhibition design for the three spaces where the exhibition was directed: New York, in Paris at the Musée National d'Art Moderne at the Centre Georges Pompidou and in Milan at the Galleria della Triennale. Aulenti's contribution through words, technical drawings and photographs of the exhibition spaces made it possible to include the rules and problems she faced in the magazine.
"The first requirement was to break the continuum of the spiral, which makes everything analogous. The only way to do this was to throw these rooms into space, towards the invisible center of the museum. But it was not easy: the slopes made it necessary to use plinths. Insurance prevented us from displaying some works in the void, as we wanted" [Aulenti 1995a, p. 17].
Aulenti's drawings published in the magazine still hold together the idea that the works could be hung in the void, in those acute angles she designed that divided part of the space into segments: from the heart of the museum one could see, from bottom to top, the angles converging in the centre of the room, extensions of the rooms that indicated their presence in the exhibition space. While the works were exhibited in the conformity defined by the museum space, Aulenti in the design of the exhibition space "recalling the responsibility of the geometry of the building with eccentric signs to the evidence of its form" [Aulenti 1995b, p. 16] devoted herself to defining the presence of the four rooms to the visitor. Thus trying to be more generous towards the rhythms and sequences that the content of the exhibition required.
Instead, Vignelli's visual identity for the exhibition was completely absorbed by the space. In fact, the photos documenting the exhibition only display small captions next to the works and the title of the exhibition, written in Futura, on the base of the spiral climb designed by architect Frank Lloyd Wright. Instead, the editorial of the catalogue in relation to the exhibition space was

totally controlled by Vignelli's rules. The 760-page volume presents a sequence of pages dedicated to Italian creativity in the twenty-five years that, from the fall of the fascist regime to the movements of '68, defined a transformation in culture. The cover with its white background houses eleven overlapping, semi-transparent images representative of the arts on display. The inside of the volume, on the other hand, holds together the textual and photographic contents produced through a graphic design defined by four columns and wide margins (fig. 3). Each of the eight sections opens with a double black page, inhabited by a large white typography that turns out to be the beginning of the essay that will run through the following pages until it runs out. Vignelli in his design gives space to exploratory texts in which the curators of the sections together with other authors define possible answers as to why it is possible to talk about the Italian metamorphosis of those years.
Related to exhibition practices two names mentioned individually within this essay find form of collaboration within the *XVI Triennale di Milano*: while Italo Lupi is the creator of the Triennale's identity from 1979 to 1982 together with Alberto Marangoni, Gae Aulenti results in Giunta's responsibility until his resignation in March 1980 for the section *The arrangement of design*. The identity designed is represented by a three-dimensional T in which it is possible to see in its false axonometry the presence of five rooms, each of a different color and dedicated to the disciplines on show, which are the subtitle of this exhibition event: City, Architecture, Design, Fashion, Audiovisual. The graphic design is thus adapted to different formats such as posters, guidebooks and three-dimensional signage structures.
"Thus it was proposed –but already close to the first opening, the challenge of December 1979–, the construction of a 'Triennale Image Coordination Centre' that would in fact take on the role of art direction: an innovation in line with the hypothesis of change that attempted to replace the great Triennale exhibition with a continuum of events, and a monolithic Board with more and more coordinated presences. Thus, unlike previous editions where the graphic image of the current Triennale was determined by a single creative contribution, designed and applied with a certain rigidity, standardized therefore for all communication materials –a choice that was undoubtedly justified by the monothematic nature of the events and their transitory nature in time– this 16th edition commissioned two graphic designers –Italo Lupi and Alberto Marangoni– to communicate visually, and with the utmost poignancy, the different way of being and operating of this administration" [Pansera 1982, pp. 20, 21].
It is important to remember how this design can find space within this reconstruction for the qualities imagined and designed together with the visual identity. Likewise, the designed communication finds, through different graphic solutions, valid forms and applications to always represent the five disciplines together [6].

III.

Among the outcomes of the collaboration between the curatorial figure of Germano Celant and the design qualities of Pier Luigi Cerri is also found in the joint planning of the first Florence Biennale entitled *Il Tempo e la Moda* in 1996. The Biennale di Firenze project sees Celant, Luigi Settembrini and Ingrid Sischy as artistic directors together with a series of curators involved in following the seven sections in the first edition. So is Cerri for the graphic consultancy carried out, both for the Biennale and for its first event in *Il Tempo e la Moda*. We also find Gae Aulenti's name again as Vice-President of the Florence Biennale and, together with Vittoria Massa, as the person in charge of the Visitors installation, a section curated by Settembrini with Franca Sozzani.
Under Cerri's direction, the graphic design of the catalogue was entrusted to Marcello Francone, the only name to appear as graphic designer in the English volume *Art/Fashion* (1997) for the transmigration of the art and fashion section by Celant, Sischy and Tabatabai Asbaghi to the Guggenheim Museum SoHo in New York from 12 March to 8 June 1997. The volumes are headed by the full outline of a 'B', written in Futura and pierced by the white symbol of the Florentine Lily. Next to this 'B' there is the year '96 (Fig.4). The general catalog distributed in Italian holds together in its 684 pages texts, interviews, photographs and images related to the espsote works and the relationships between art and fashion [Monti 2017, pp. 253-257].While the introductory texts find the names of the three

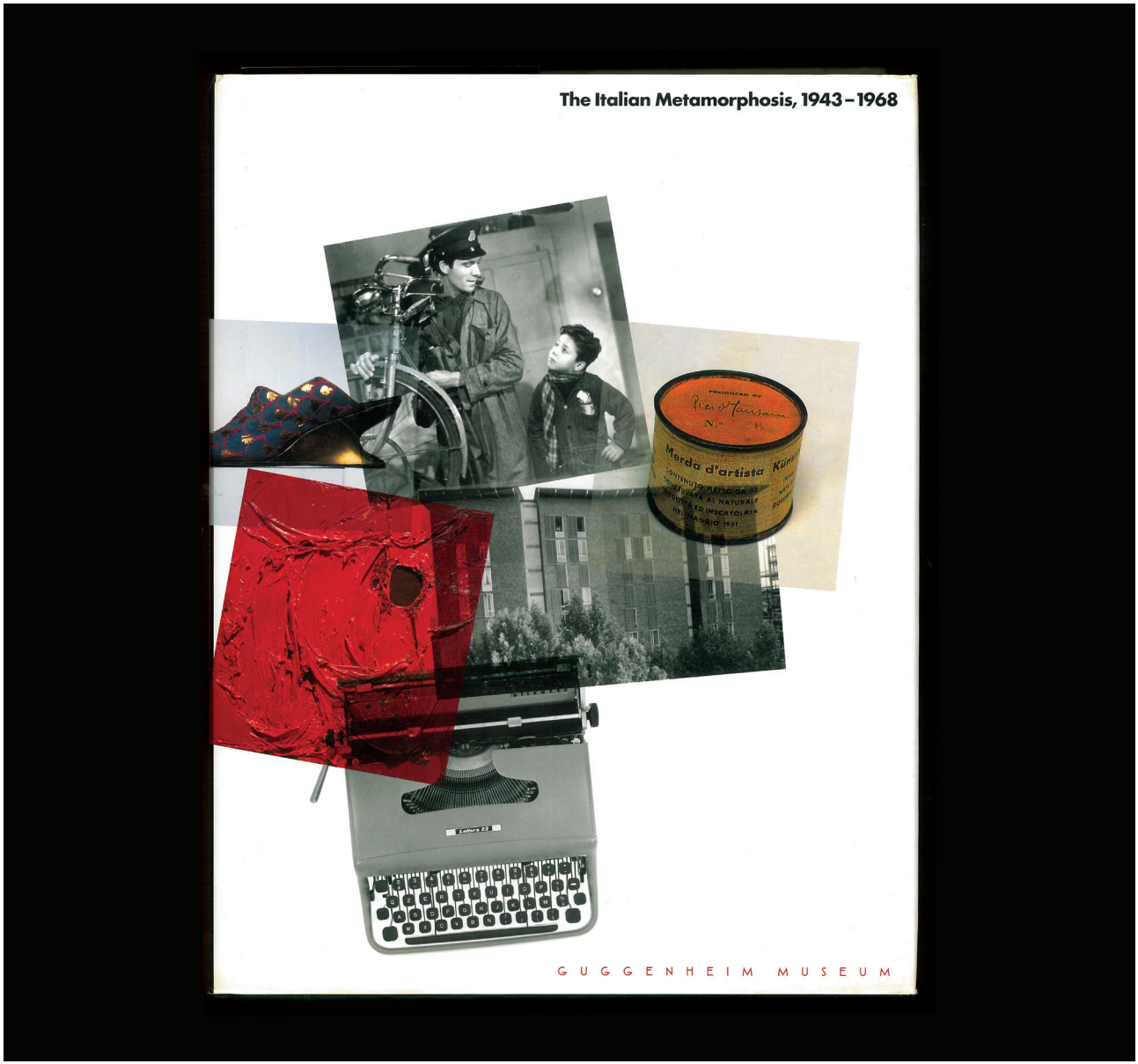

Fig. 3. Front cover of the catalogue. [Celant 1994].

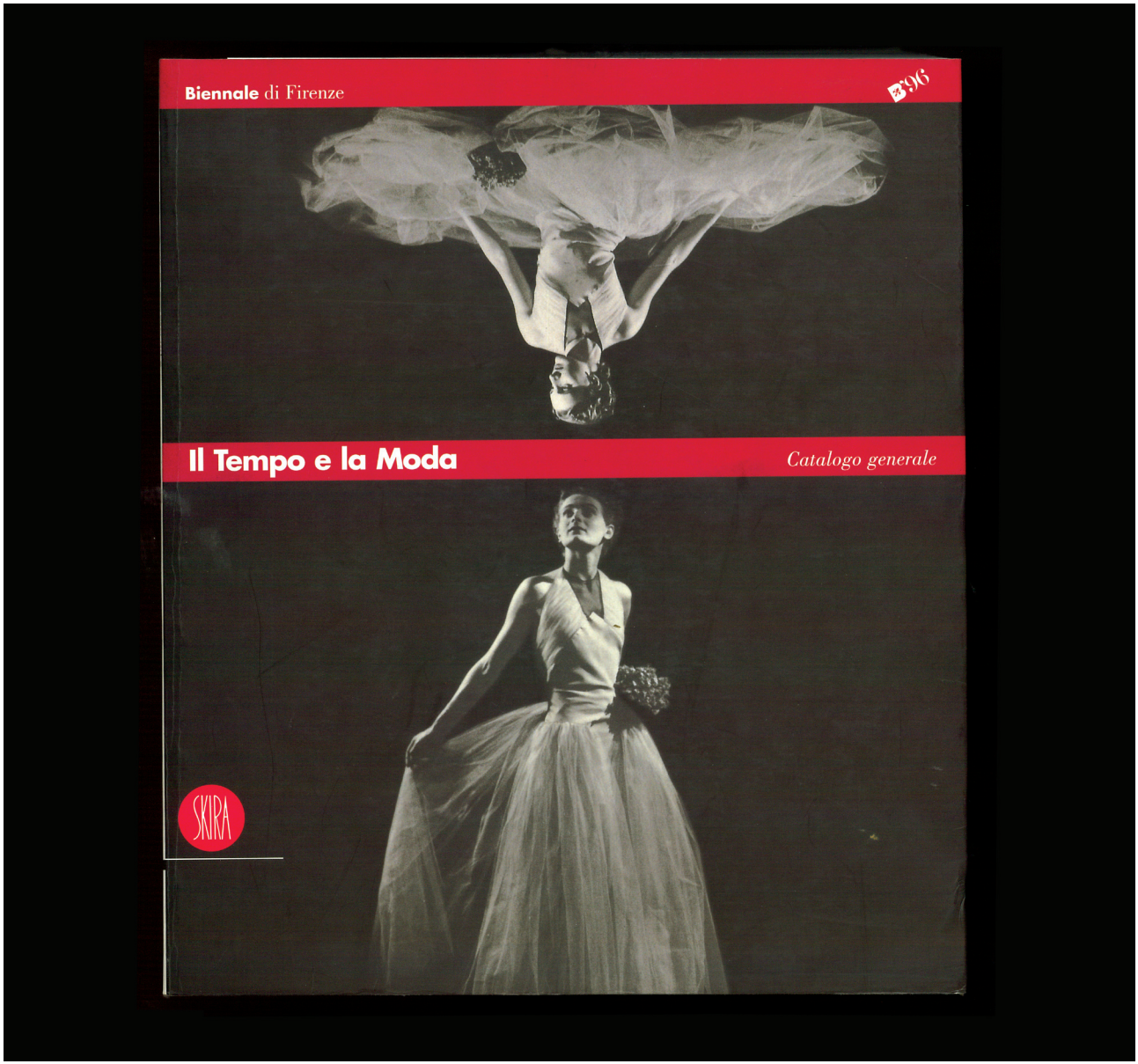

Fig. 2. Front cover of the catalogue. [Celant 1981].

converging curators as authors, the first essay signed by Celant is entitled *Il giardino della Moda e delle Arti: la Biennale di Firenze*. It is written through an incursion of questions posed by the different voices involved in the project, the first of which is Aulenti's own: "What is the reason for this Florence Biennale, dedicated to the subject of fashion, and what is the philosophy of this project?" [Celant 1996, p. 13]. Celant uses the modality of conversation and questioning as an action to try to describe the work he did; in fact, the text that runs for ten pages ends with the opening, double-page spread of the *Art/Fashion* section he co-curated.
The transcription of a conversation –and thus of the mode of mutual exchange– is not only used by Celant in the first pages, but we also find it between Sozzani and Aulenti as the opening text for the Visitors section. In fact, in the latter, the dates of the beginning (December 11, 1995) and closing (September 21, 1996) hint at the time in uale the exchange occurred produced the forms of the exhibition project. The text is entitled Gae Aulenti - Franca Sozzani: how a project is born and seems to celebrate the quality of human relationships within the design. This emphasizes the outcome of a working method that implies the design of a collaboration between space, time, authors and roles, works and dimensions that seems to recall a series of experiences within the production of exhibition making [Aulenti, Sozzani 1996, pp. 389-393].
The work outlined in this essay is here, with *Il Tempo e la Moda*, condensed by a need for continuous dialogue between the different systems, especially in the definition of active collaboration between all the figures involved. The projects mentioned not only interrogate the modes of exhibition making, but explore the intrinsic relationships of experiences, many times only declared by names in colophons and official documents. In this, the analysis and documentation of the editorial formats of the exhibitions draws a rich panorama of information useful for tracing fundamental experiences in the intertwined culture of the disciplines.
"As natural as the parallel and connection between the exhibition and the publication formats may appear, given the traditional involvement of graphic designers in the making of exhibition catalogues and books as well as their more recent direct engagement in writing, editing and publishing, the link between editorial and curatorial work to some extent raises the question of the specificity of the exhibition as a medium and format of communication, and how it is used in this sense by graphic designers" [Camuffo, Dalla Mura 2014, p. 24].
Giorgio Camuffo and Maddalena Dalla Mura in *Graphic Design, Exhibiting, Curating* (2014) highlights the value produced by the outcome of the graphic designer as a medium of a communication that, in the book or exhibition format, generates a platform for mediation, production and circulation. In this, the proposed research has taken shape precisely through the study and analysis of the mediums produced, these voluminous, independent, complex publishing bodies that no longer fall under the technical connotation of the word catalogue. Instead of holding together only the information in the exhibition, they become publications in their own right, real study tools that oscillate between the wills of showing and explaining.
Tracing how exhibition design is an integral part of a research work defined by several professionals emphasizes how the cases shown in this mapping are only one part of a larger system. While *The European Iceberg. Creativity in Germany and Italy Today* (1985) makes explicit the figure of the graphic designer as an actor in an artistic scene, *Identité italienne. L'art en Italie depuis depuis 1959* (1981) keeps track of a work declared in two different ways by the same design figure: in the physical space the exhibition inhabits the Centre Pompidou in nuclei of activity, while the catalogue exposes an inclusive temporal narrative that is extraneous to the monolithic artistic presence on display. The case of the *XVI Triennale di Milano* (1979-1982) makes it possible to present the first work activated by the institution towards the project of visual identity, while *Il Tempo e la Moda* (1996) seems to synthesise, within the experiences faced, an interest in the theme of the relationship as an act of production. Similarly, the sum of the actions realised generates a new surface: a place of encounter and confrontation where certain relationships are confirmed through the analysis of an experience. And it is precisely the term collaboration that identifies the outcome that, between professionalism and production, manages to converge within different formats the interest in defining a form of communication, dentifying which forces and which applied languages have been able to generate the qualities inherent in exhibition-making practices [7].

Notes

[1] The list of these applications of graphic design and of a methodology aimed at defining rules [Vignelli 2010], is stated in the index of the volume *design: Vignelli* (1990), which assigns each section a personal definition along with a selection of projects with as many captions aimed at explaining the work carried out.

[2] The Our Bodoni typeface family was commissioned by Bert Di Pamphilis, former president of the World Typeface Center (WTC) in New York and designed by Tom Carnase under the direction of Massimo Vignelli in 1989. The typeface became a sort of Vignelli trademark and is still widely used in corporate and editorial graphics.

[3] "In order to draw attention to that issue I made an exhibition showing work that we had done over many years by using only four typefaces: Garamond, Bodoni, Century Expanded, and Helvetica. The aim of the exhibition was to show that a large variety of printed matter could be done with an economy of type with great results. In other words, is not the type but what you do with it that counts. The accent was on structure rather than type. […] Besides those already mentioned, I can add Optima, Futura, Univers (the most advanced design of the century since it comes in 59 variations of the same face), Caslon, Baskerville, and a few other modern cuts. As you can see my list is pretty basic but the great advantage is that it can assure better results. It is also true that in recent years the work of some talented type designers has produced some remarkable results to offset the lack of purpose and quality of most of the other typefaces" [Vignelli 2010, p. 54].

[4] Vignelli's choice draws an operation that attempts to celebrate the qualities of the foundries and typographic design of Germany and Italy. At the same time for Germany we find the Century Expanded (America) together with the German Futura and Fette Fraktur. Instead with the Italian Bodoni in the Bauer Bodoni version are Helvetica in Condensed Bold (Switzerland) and Egyptienne in Condensed Bold (Holland).

[5] In fact, there is no reference to the works in these sections in the catalogue in the chapter *Catalogue of the Exhibition and List of Illustrations*, pp. 321-333.

[6] <https://triennale.org/archivi-triennale/16> (accessed 14 July 2022)

[7] This paper is the first action of a series entitled *Object Notes* with the aim of investigating and contextualising the work of the graphic designer within different disciplines. The narrative displayed in *From showing to connecting. The design of exhibitions* consists of numbered acts. This makes it possible to keep track of the possibility of the continuation of this intervention aimed at defining different modes of production within the practice of the designer.

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RUBRICS

Readings/Rereadings

Readings/Rereadings

La speranza progettuale. Ambiente e società by Tomás Maldonado. A Rereading

Fabio Quici

Written by Maldonado in 1969, *La speranza progettuale* was begun with the intention of formulating a systematic book on the […] state of methodological research in the field of environmental design and planning. An endeavor, however, that appeared almost immediately unfeasible to its author due to the crisis of the very idea of design that pervaded the society of those years. Indeed, the years of youth protests are those in which Maldonado's work should be contextualized, hence the change of perspective proposed in his reflections with which he sought to distance himself from a prevailing nihilistic vision of the future. It is in this way that the writing of the essay, from the first idea of systematic discussion, became an opportunity for the intellectual Maldonado to take a stand in response to a contestation that he found arid, in that it lacked any formulation of rational alternatives. A stance that was felt to be urgent and necessary because "the true exercise of critical consciousness is always inseparable from the will to search for a coherent and articulate planning alternative to the convulsion of our times" [p. 16] [1] – as the author wrote in the foreword to the first edition of 1970.

This alternative was already being identified in those years in a new form of

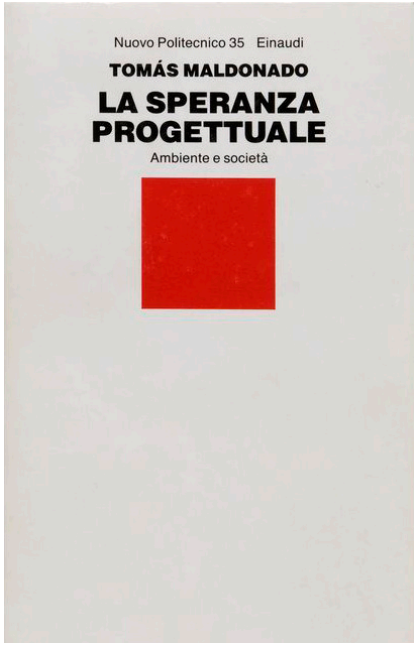

Fig. 1. Cover of the first edition. Einaudi, "Nuovo Politecnico Einaudi" series, 1970.

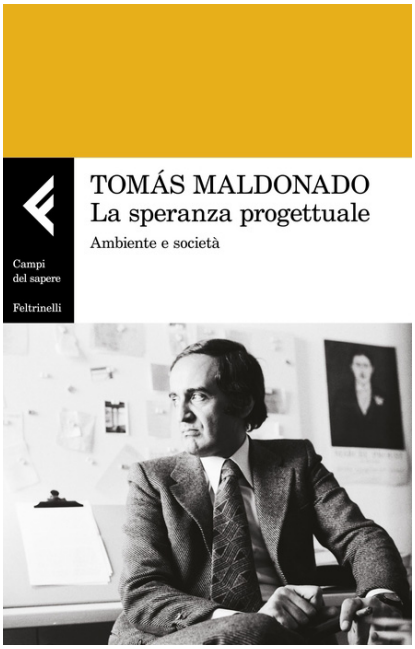

Fig. 2. Cover of the most recent edition. Feltrinelli, "Campi del Sapere" series, 2022.

https://doi.org/10.26375/disegno.11.2022.24

Fig. 3. Tomás Maldonado while teaching at the Hochschule für Gestaltung in Ulm.

planning for addressing the environment, a natural environment compromised by that 'human ecological subsystem' [2] capable of provoking "substantial –that is, irreversible– disturbances in the equilibrium of other subsystems" [p. 35]. According to Maldonado, it is not just a matter of saving the natural environment but of saving the human environment as well, that is, our own existence undermined by an alienation resulting from the labored efforts we make to 'live, coexist and survive' in the physical and sociocultural surroundings we ourselves have created and with which we continue to interfere without caring about the consequences.

When one considers that it was precisely in 1969 that the first environmental movements came into being –in the wake of environmental disasters such as the Union Oil spill off the coast of California– prompting the first Earth Day in the United States held on April 22, 1970, one can understand how Maldonado's reflections come across as historically circumstantial yet are still today relevant and at times prophetic.

In his reflections –which at times take on the tone of social criticism– those 'time bombs' going off today were already being recognized in the environmental situation of those years. Maldonado saw an ongoing state of 'explosive congestion' of people and, proportionally, also "of objects, resources, infrastructures, equipment, processes, messages, cognitions, etc." [p. 87]. A state of things and people that threatened to turn into a 'catastrophe of the gravest consequences' in the span of a very short time. A threat felt as "real, current, everywhere verifiable" [p. 87], but above all unavoidable, if society were to continue to develop in its 'chaotic spontaneity', with no plan that would take

into account in advance the possible consequences of choices and actions.
The threat that was being envisaged by ecological scholars, and felt by Maldonado, was that of an 'irreversible disruption of ecological balance' due to an uncontrolled proliferation of discards, residues and dross. An increase in the 'population of waste', 'pollutants' and 'artificial erosion factors' that would have marked the destiny "of every form of human life on the face of the earth perhaps as early as the second half of the next century" [p. 87]. The huge island of plastic debris in the Pacific – known as the Great Pacific Garbage Patch (GPGP)– was probably beginning to take shape in those years, only to be spotted for the first time in 1997.
It should be mentioned that this importance of the design act in the preservation of human existence, within an environmental ecosystem threatened by human activity itself, had already been the central theme of a collection of writings by Richard J. Neutra published in a first edition in 1954 by Oxford University Press (New York) and later in a second edition, precisely in 1969 [3]. Although the title of Maldonado's book seems to echo Neutra's *Survival through Design*, the latter never appears among the many citations present in *La speranza progettuale*. Whether this is the result of an oversight or a deliberate omission is unknown.
Faced with the bleak outlook described in the essay, which he shared with the environmentalist and anti-militarist youth of the 1960s, Maldonado did not feel, however, that he could also share their nihilist response of total rejection of all 'concrete projections'. Such a rejection would have entailed, in fact, a renunciation of the fulfillment of our very being, "of our doing and our desiring" [p. 41] since it is precisely through concrete projections that is, 'what we are, do and want to do' – that we shape the human environment itself.
His hopes were thus directed toward a revolution conducted through a kind of designing able to bring together 'technological imagination' and 'sociological imagination'. That is to say, 'technological courage' and 'social and political courage'. Designing "that seeks to open up a horizon of action that is articulated, coherent and socially responsible for the human environment and its destiny" [p. 84]. Designing guided by innovative yet responsible behavior, understood as an 'act of management' aiming "to keep the risk under control and measure its consequences" [p. 106].
It seems evident how, in Maldonado's words, this warning was addressed not only to civil society –with a view to ecological preservation– but also to the political representatives that in those years were responsible for the disastrous initiative of the Vietnam War, a phantom that appears time and again throughout the essay and in the subsequent revisions that followed in its reprints. The Vietnam War is evoked by calling into question one of its main proponents within the J. F. Kennedy administration, that is, Robert McNamara, Secretary of Defense, who in the name of rationality used mathematical models and quantitative methods of operations research to conduct his disastrous international policy.
Maldonado here finds a way to criticize those who think they find infallibility in supposedly scientific methods, in the most 'exhaustive and extensive quantitative surveys of data', warning us against those who make rationality prevail over broader goals and values.
When the California government thought of turning to 'systems engineers' borrowed from aerospace research to solve the problems of traffic and air pollution caused by automobiles, their models identified commuting employees alone as the crux of the problem, proposing a radical solution: that of moving workers away from their 'collective workplaces' and having them work at their homes, each transformed into a kind of 'home office', equipped with technological devices useful for remotely performing all those tasks that involved 'information processing and management'. It is here that Maldonado's work becomes topical once again, at a time in history when, in light of our experience with the isolation caused by the Covid-19 pandemic, the idea of fostering remote work and teaching has come back into vogue and at times even in enthusiastic tones. In his essay, Maldonado calls this solution a 'sociological aberration' because it is the bearer of a deurbanization that brings with it a far more serious problem, that of the desocialization of humans, that of a society that would be emptied of 'any tangible concreteness'. Providing a portrait of a living condition in which we have no difficulty recognizing ourselves today, Maldonado wrote in the footnote: "The worker […] is condemned to suffocating isolation. It is an isolation '*en famille*', this is true, but it is still isolation. His real relationships with other men are reduced to a minimum. The television screen, which used to exist only as a function of entertainment, now appears, as monitor, as a function of work. The world of others is no longer at arm's length, but now only within reach of the television screen" [p. 115]. And though in times still far removed from the spread of Internet and social media, Maldonado seems to warn us, "Mass man, we all know, is manipulable; but isolated man is ever more so" [p. 115],

opening with this warning what would become one of his contemporary concerns, the manipulation of the virtually connected masses, addressed in *Critica della ragione informatica* (1997).
In professing his rejection of that 'nihilism in design' seen as the outcome of the encounter between cultural nihilism and political nihilism, Maldonado, in the field of urban planning, found in Robert Venturi and Denis Scott Brown, with their study of Las Vegas –published first as an article in *Architectural Forum* (March 1968) and only later in book form (1972)– his scapegoats. While, on the one hand, he who was to become the editor of *Casabella* from 1977 to 1981 shared with Vittorio Gregotti the idea of the need for a desire preceding the design act, on the other hand, he also found unacceptable Robert Venturi's 'exercises in conformist gymnastics', where it seemed that an analysis of the existing did not lead to a reforming action. Sharing with Kenneth Frampton (with whom he had been in close contact during his teaching days at Princeton University) a politicized, Marxist position inspired by the writings of Herbert Marcuse (*Eros and Civilization*, 1955), Maldonado believed he saw in Venturi and Scott Brown *naïve* apologists for a commercial aesthetics resulting from the capitalist social system. Not showing, in this case, enough foresight as to recognize in *Learning from Las Vegas* the innovative charge that would be at the origin of contemporary architectural theory, Maldonado only saw an approach derived from the art of reading the exclusively visual aspects of the city. A gratuitous exaltation of the visual ambiguity in which arbitrariness stood as an alternative to utopia and seemed to reject any efficient action within the framework of that 'praxiology', borrowed from Tadeusz Kotarbinsky [4], that Maldonado hoped to associate with the design act.
In the foreword to the 1992 edition, the author acknowledged the change that had occurred in the social, political and cultural context from that which had originally accompanied his reflections and the waning of the urgency to defend design and planning. On the other hand, he still considered the environmental problem, in which he continued to see 'the issue of all issues', as central to our society. What Maldonado still seems to want to say today to the young environmentalist generation is that environmentalist awareness alone is not enough, just as, alone, that contestation for its own sake that has always sought to oppose servility toward the 'system' without realizing the impossibility of eluding any system, is not enough.

Notes

[1] All citations refer (with page references) to the most recent edition of the essay (Feltrinelli, 'Campi del Sapere' series, 2022), which fully reproduces is updated version published in 1992 in the series 'Piccola Biblioteca Einaudi'. The essay was already published in Italian when it first came out in the 'Nuovo Politecnico Einaudi' series in 1970. In 1971 a new updated edition came out with more extensive notes with which Maldonado intended to fill some gaps he had found in the first edition.

[2] Single quotation marks are used in this text to report expressions and terminologies used by Maldonado himself.

[3] Richard J. Neutra, *Survival Through Design*, Oxford University Press, New York 1953, 1969. The first Italian edition dates back to 1956 (Edizioni di Comunità).

[4] Praxiology as a "general theory of efficient action" is taken up by Maldonado from the essay by T. Kotarbiński, *Praxiology - An Introduction to the Sciences of Efficient Action*, Pergamon Press, Oxford 1965 (original title *Traktat o dobrej robocie*, 1955; 3rd ed. 1965).

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Reviews

Reviews

Valeria Rotili, Stefania Ventra, Francesco Moschini (a cura di)

Il Putto reggifestone di Raffaello. Studi, indagini, restauro

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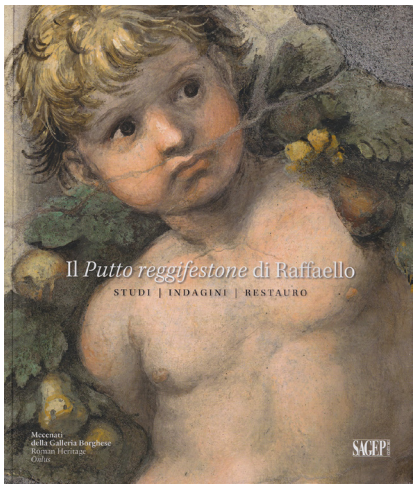

The goal of this short review is to bring to the attention of anyone interested in the material interpretation of artworks a recent publication illustrating the results of an undeniably important research that has re-assigned the paternity of a fragment of a fresco portraying a putto to the painter Rafaello Sanzio. Although the research has produced sensational results, its true appeal lies in its methodology, involving a group of scholars and the techniques and instruments they employed.
Several features of the study –three in particular– are undoubtedly worthy of note: 1. the multidisciplinary approach; 2. the rapidity of the research, from its ideation to the publication of the results; 3. a lack of any desire to influence the results one way or the other.
Although multidisciplinary projects have long been held in high regard in the field of research, they are not always satisfactorily pursued. In this case the project deserves to be examined more in detail because it is not only the foundation stone of the methodology, but also the element that allowed the scholars to achieve their key results in such an amazingly short space of time –a feature that that is anything but secondary. The rapid implementation of a project is very often deplored as a burden detrimental to real in-depth research; instead in this instance it is synonymous with synergy, exchange, and ability to organize and collaborate. The study focused on precise issues, but clearly there was no way of knowing the ensuing results in advance. This is the third strong point of the research: the lack of any desire to influence the results. It is apparent in the lucid repositioning of the terms of the issues that prompted this new study of the artwork and in the simplicity with which the group exploited former studies so that they could examine them armed with new up-to-date theoretical and practical equipment and tools.
It's uncommon for a research project not to be influenced by the envisaged results, or maintain an open mind *vis-à-vis* the direction of the study in terms of gathering more knowledge and data. In this case the results could have been incredible (and they were), but they could also have confirmed the less attractive hypotheses, equally useful as regards the research, but much less appealing regarding dissemination. In short, the research involved providing a fresh start to an issue weighed down by extensive discussions and the involvement of 'excellent' scholars; the goal was to verify whether or not the re-interpretation of an artwork that used all the tools that current research should –and possibly, 'must'– trust, was able to solve the thorny issue of who designed the fragment of a wall painted fresco belonging to the Accademia di San Luca since the late 19th century,

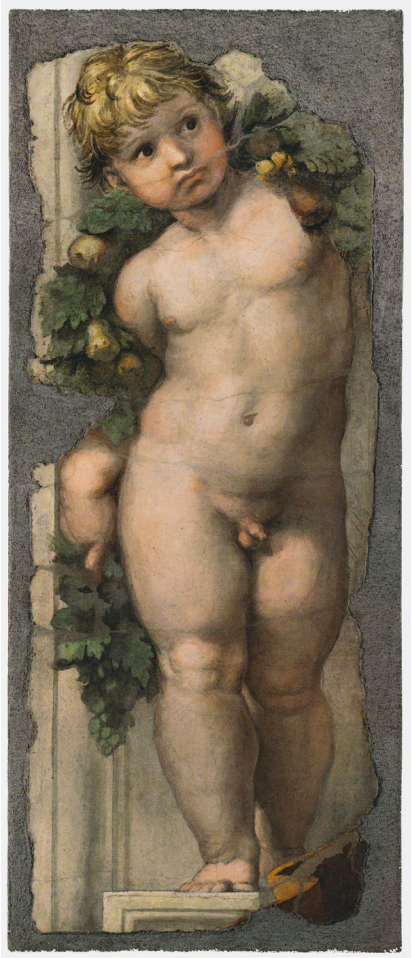

Fig. 1. Raffaello Sanzio, Putto carrying a festoon, 1513, fresco. Rome, Accademia Nazionale di San Luca.

and since then carefully and sometimes critically scrutinised (fig. 1).
Instead another factor, that was anything but secondary, played a key role in the successful outcome of the study, i.e., the involvement of a very broad-minded sponsor who made it possible to exploit the incredible potential of innovative ideas, tools, and technologies [1].
The initial idea that sparked the implementation of the project emerged during an exhibition, more specifically during the preparation of the exhibition entitled *Rafael. The Academia di San Luca and the myth of the Urbinate* [2] curated by Valeria Rotili, Stefania Ventra and Francesco Moschini. It was then that the three scholars came up with the idea for the research, so well documented in this book.
The work in question is the figure of a putto frescoed on plaster. As mentioned earlier, the long-standing *querelle* regarding the attribution of this artwork began when it became part of the collection of the institute in Rome thanks to Jean-Baptiste Wicar (1762-1834), a painter and above all a collector who had chosen and purchased it in Bologna, and then bequeathed it to the Accademia, convinced as he was that it had been painted by Rafael [3].
The fragment with the figure of a putto measures approximately 41.6 × 108 cm [4] and was obviously part of a much bigger composition. The putto is almost identical to another putto painted on a pilaster in the Church of St. Augustine in Rome; this latter putto is depicted in the top left-hand corner of the frescoed portrait of the prophet Isaiah located above the niche housing a sculpture by Jacopo Sansovino. The date when the fresco was painted in the Church of St. Augustine is pretty precise –1513 ca.– and the fresco is indisputably attributed to Rafael.
So, we are dealing here with two putti: the *Putto carrying a festoon* in San Luca and the so-called *Putto of Isaiah*. These two putti triggered an impassioned but erratic debate between those who believed that the fragment in San Luca should be considered a copy (painted later and by someone else) of the one in St. Augustine, and those who attributed both putti to Rafael who is said to have painted an initial version of *Isaiah*, which he soon destroyed, leaving only the surviving fragment currently housed in the Accademia di San Luca. The research shows that the two figures seem to have identical details, are equal in size, and appear in the same pose, so much so that some scholars theorize that the same cartoon was used for both [Violini 2022]. This is not so obvious if one bears in mind that the *Putto carrying a festoon* is painted on a double-curved surface [see the geometric confirmation in Fasolo et al. 2022] (fig. 2) while the Isaiah is depicted on a flat surface.
The history of the *querelle* regarding its attribution began with Wicar's opinion of the artwork; it continued when the issue resurfaced in 1960 after two contributions (with contrasting positions) were published by Luigi Salerno and Pico Cellini in the same issue of *Bollettino d'Arte* [Salerno 1960; Cellini 1960]. This *querelle* alone would justify reading the book we are reviewing, because it illustrates the involvement and input by important collectors, art historians, conservators and restorers. This series of the more prevailing opinions is both fascinating and captivating: apart from Salerno and Cellini, other scholars involved are Adolfo Venturi, Vincenzo Golzio,

Italo Faldi, and still others [Venturi 1920; Golzio 1939; Faldi 1974; cfr. Ventra 2022].
The idea that prompted the research illustrated in this book was to once again consider the artwork as the key issue, because only by basing the research on a direct 'operational' comparison between the two is it possible to achieve new data and knowledge and, perhaps, say something definitive about its paternity.
The artwork has regrettably suffered the ravages of time and interventions that were not always successful. Apart from the issue of its attribution, it was important to give the work back its technical and expressive clarity and transparency. So the project not only studied documents and reports written over the centuries, it combined them with new material reviews and interpretations. The latter were possible thanks to advanced cleaning, restoration and conservation technologies as well as newly-acquired morphological, geometric and chromatic data regarding the deformed fresco.
Many professionals were involved and the synergy they generated succeeded in providing diverse contributions, but they all focus on the same idea: to base the study on the work itself.
The work group included: art historians and curators (Rotili and Ventra, plus another participant, Silvia Ginzburg who wrote an important contribution outlining, amongst other things, the genesis of the putto's figure and pose [Ginzburg 2022]; restorers (read the splendid interpretation of the artwork by Paolo Violini [Violini 2022] and the interesting technical contribution by Claudio Falcucci [Falcucci 2022]; architectural historians (with the important input by Francesco Moschini, National Academic of San

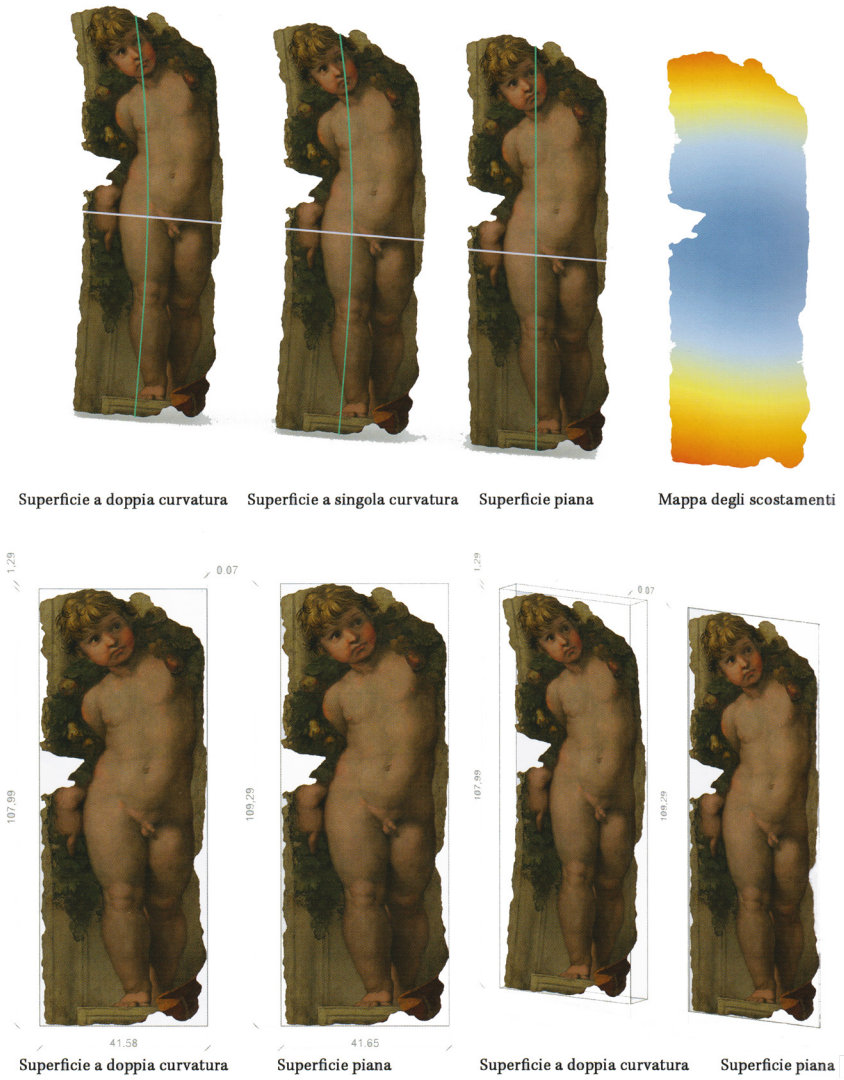

Fig. 2. Raffaello Sanzio, Putto carrying a festoon, 1513, fresco. Rome, Accademia Nazionale di San Luca. Phases of the plane development of the double-curved surface [Fasolo et al 2022, fig. 17, p. 116].

Luca and its General Secretary from 2011 to 2020); experts in the fields of survey, documentation, and geometric analysis of architecture and cultural heritage (Leonardo Baglioni, Matteo Flavio Mancini, and Sofia Menconero who were members of the group coordinated by Marco Fasolo).
The members' contribution –that perhaps focuses more in detail on the specific interests of the journal *diségno* and the Unione Italiana per il Disegno (UID), the scientific association that decided to launch the journal– is part of the interesting essay entitled *Geometric studies on the Putto carrying a festoon: surveys and analyses* [Fasolo et al. 2022]. The essay is itself an exemplary, well-performed and superbly shared research, proving that a well-planned, integrated and absolutely non-invasive survey, combined with a careful analysis of the morphology and color data, should currently be considered (along with the options provided by a skilled use of restitution and interpretation models [5]) as a powerful tool to analyze, preserve and enhance cultural heritage. The contribution focuses on how a careful interpretation of the morphology of the study object can reveal, or at least, provide scientific data supporting certain aspects and hypotheses formulated based on tools used in other investigative fields; it also indicates how to examine cultural heritage using non-contact technologies by creating copies that can be used to make comparisons based on surface size, superimpositions, juxtapositions, and the matching of vulnerable or physically distant works.
In concluding this review it is possible to state the following: research sometimes opens doors that were previously shut. This is what happened here thanks to the 'fortunate' result of this study that has enriched the catalogue of the works of an artist with an undisputed personality and undeniable international renown. This will undoubtedly benefit the whole country and add an important page to the book of the history of art. But what is particularly unusual and interesting, especially for those involved in research, is that the scientific communication –not only of the results, but also the methodological, technical and instrumental process that was adopted– is also 'enthralling': this book represents one of those rare cases when readers will perceive the enjoyment and enthusiasm that appears to have gripped the very different professionals and experts working in so many fields.
All we need to understand now is whether, by chance, part of this success should also be attributed to Rafael, because we should not ignore the fact that it is the *Putto carrying a festoon*, rather than the *Putto of Isaiah*, –in my very questionable opinion– that once again moves us today.

Laura Carlevaris

Notes

[1] The study, restoration of the art work, and the publication were sponsored by the Associazione Mecenati della Galleria Borghese - Roman Heritage Onlus that promotes culture and art by supporting the Galleria Borghese and the Monuments, Excavations and Historical Gardens of Rome. It was founded in 2013 to promote, protect and enhance historical and artistic assets of the Galleria Borghese: since 2017 the Association has broadened its objectives to include the city of Rome, performing and supporting 'study activities, scientific and documentary research of crucial cultural importance' involving 'recovery and restoration projects with a commitment to make private entities aware of their responsibilities and involve them in a modern logic of cooperation with the public': <https://www.mecenatigalleriaborghese.it/> (accessed 24 October 2022).

[2] The exhibition was held in Rome from 22nd October 2020 to the 5th March 2021 at the Museo Accademia Nazionale di San Luca in Palazzo Carpegna. The year 2020 marked the 50th anniversary of the death of Rafael who was born in Urbino in 1483 and died in Rome on the 6th April, 1520.

[3] In the book Valeri Rotili [Rotili 2022] extensively discusses the figure of Jean-Baptiste Wicar, his clever intuition, and his crucial role in the story of the fragment of the fresco in San Luca.

[4] The fragment has a double curvature that creates depth on the surface: the measurements cited here are those of the theoretical envelope box, with a depth of roughly 8.2 cm. As regards the morphology and geometric characteristics of the artwork, see: Ginzburg 2022, pp. 36, 37; Fasolo et al. 2022.

[5] Today many contributions support the idea of a Model of reality which can generate and be expressed by a wide range of different models, from graphic models to the models behind digital representations, maquettes and holographic models,…: see, for example, Migliari 2004; Migliari 2012.

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Reviews

Pedro M. Cabezos Bernal, Pablo Rodríguez Navarro, Teresa Gil Piqueras, Juan Cisneros Vivó, Cristian Gil Gil

Captura fotográfica gigapíxel de obras de arte

edUPV

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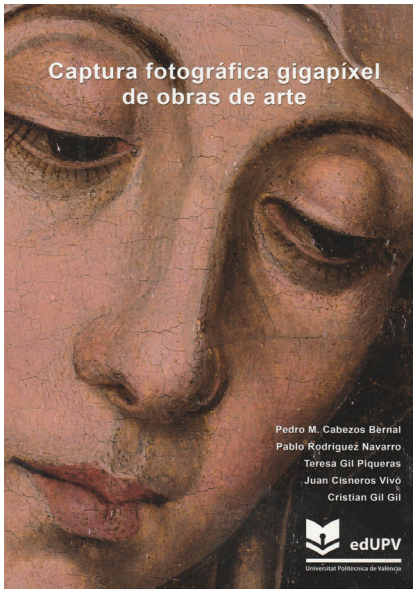

The book *Captura fotográfica gigapíxel de obras de arte* by Pedro Cabezos Bernal, Pablo Rodríguez Navarro, Teresa Gil Piqueras, Juan Cisneros Vivó, and Cristian Gil Gil, published in 2022 and edited by edUPV, deals with the acquisition and processing of highly informative photographic images, called precisely gigapixels. This is an innovative technique that is gaining popularity in several international museums as a means of documenting, analyzing, and disseminating pictorial artistic heritage through very high resolution photographs. The research work in this case aimed to use different methods of photographic capture to document some important works of the Museo de Bellas Artes de Valencia and other works belonging to the Diputación de Valencia, the Fondo de arte of the Universitat Politècnica de València, as well as some early works of the Valencian painter Leopoldo García Ramón. The use of this technology makes it possible to appreciate details of a painting that the mere vision of the painting would not make one grasp: in fact, it allows, by means of a screen, to enormously enlarge the image thus being able to detect details useful to art scholars such as chiaroscuro effects, the use of color, the use of brushstrokes, and light reflections, so as to make such details appreciable even by non-art experts, in order to experience an almost immersive observation of the painting, which allows one to delve into the painting to grasp its most minute details.

The research work presented moves from the awareness that the new digital technologies represent a very effective tool not only for the results that can be obtained in the scientific field, but also for the space that these results can have in the museum and popularization field, since the images obtained are accessible to a wide audience through the web. In fact, it is enough to frame a QR code to have an image on one's smartphone that can be enlarged to capture the smallest details of the work.
There are already many museums that have taken advantage of this new technique thanks to the collaboration of Google and its high-resolution digital capture system of pictorial works, called *Arts & Culture*. However, very few are specialized in this type of digital image capture because of the technical difficulties related to the means required and the physical problems encountered during capture, such as light diffraction and image sharpness. These are in fact systems that involve the use of a pan head that keeps the position of the optical center of the camera lens fixed while the camera rotates on itself to capture individual frames that will eventually make up the final image. Since all points are in focus only when the camera's sensor is parallel to the painting, whereas when the camera is turned, as the angle between the sensor and the camera itself increases, the focus of the images decreases, the method turns out to be suitable for sampling especially small/

medium-sized works of art, since as the size of the work increases, there are drawbacks caused by the fixed position of the panning head, which does not allow for satisfactory image resolution.
For this reason, the research work of the group of authors aimed to develop a system and methodology that would allow the capture of even large works of art while avoiding problems related to image quality and color accuracy. This method consists of capturing images by moving the camera in a parallel or oblique manner, thus allowing for perfectly sharp images at all times and solving in this way one of the issues related to the use of the panoramic head. As for the problem of reflected light, which also changes as the shooting point changes, causing differences in exposure and reflections, this is solved by using an artificial light source that moves along with the camera. At this point it is possible to compose the mosaic of photos using stitching software that, through the use of certain algorithms, combines photographs even with different viewpoints.
In order to choose the best method of image acquisition and to correctly proportion the scale of the gigapixel image, it is of paramount importance to know the exact size of the painting and the desired pixel density, which is between 600 and 1000 ppp, thus being able to determine the necessary distance in which to place the camera and the number of frames that are needed, taking into consideration that between adjacent photographs there must be a minimum overlap of 30% using stitching software. At this point it is possible to choose between the different types of image capture: single viewpoint, multiple parallel viewpoint, and multiple oblique viewpoint. In the first case, a panning head is used that allows the camera to rotate, which remains fixed at one point without moving; in the second, the movement of the camera always remains parallel to the painting while the optical axis of the lens is perpendicular to the painting; in the third, in fact a variation of the previous one, the camera can move and, if necessary, even tilt.
Once the images have been acquired, it is necessary to edit them with the help of a color chart to balance the whites appropriately to the lighting conditions of the scene, eliminating any color predominance. After color balancing, the exposure of the acquired images is checked and they are saved in 16-bit color TIF format to ensure the highest quality of gigapixel image composition.
The result of this research work is the documentation of twenty-three works of art, each of which can be viewed digitally from one's device by framing a QR code or following the indicated link [1]. These works represent part of the holdings held at the Museo de Bellas Artes de Valencia, the Diputación de Valencia, and the Fondo de Arte de la UPV, plus an urban artwork has been documented. The book also presents quite detailed information about the work and the author, supplemented by the Web encyclopedia of the Museo del Prado and that of the Museo de Bellas Artes in Valencia.
An explanatory example of the result obtained is a work by master Francisco de Goya, *Retrato de Joaquina Candado* [2]. It is a painting of considerable size, 168 x 112.6 cm, depicting a female figure sitting on the trunk of a tree with her gaze turned toward the viewer. The very high level of detail in the photograph makes it possible to appreciate different aspects of the painting, from those of a purely expressive nature to those of a more technical nature, although in the final rendering for the purpose of perceiving the work the two aspects go hand in hand. By enlarging the image one can more truthfully notice the expression of the female figure, as well as the presence of certain elements, such as the dog and some details of her clothing, but at the same time one can observe the different treatment the painter gives to the background surfaces to the fabric of the dress and to the complexion of the subject, using more controlled and meticulous brushstrokes for the woman's face so as to give a greater intensity to the gaze, and more casual and quick brushstrokes, laden with color for some details such as the dog and the shoes, to communicate a certain vividness and rapidity, typical of Goya.
A second interesting example is the work *Figuras de casacas jugando en el jardín* [3] by Joaquín Sorolla. Again, the work has considerable dimensions, 173.4 x 135.5 cm, in a more frivolous and festive autumnal setting, rich in light and color. Indeed, these are precisely the hallmarks of Sorolla's painting, which thanks to gigapixel photography we can experience at a very high degree of detail. By enlarging the image we can see how a vigorous and fresh, albeit indefinite, brushstroke, together with the predominant chromatics of the work that revolve around yellows, ochres, greens and oranges with contrasting blue tips, give the entire work an autumnal spirit accentuated precisely by the rapid brushstrokes that make up the leaves of the trees, together with a joyful and fresh charge given by the treatment of light.
The last aspect to be considered is surely that of the disclosure of the high achievements of this research. Indeed, this is a work with incredible potential in both scientific and museum settings. However, if in research circles the interest on the part of experts is un-

doubted, in museum circles one has to wonder if perhaps the possibility of observing a painting at such a degree of detail from one's own device does not disincentivize attendance at the exhibition spaces where these works are displayed. Indeed, if it is possible to observe a work in greater detail from one's own home one has to wonder what might make a visitor still prefer to visit the museum. Well, although these photographs allow a perception of the work of the highest quality, in any case they do not convey the same feeling as if one were physically in front of a painting, in a space set up especially for him and for other paintings or works of a different nature. Probably an interesting application would be a blending of the two experiences, the physical one together with the digital one, so that the visitor can experience both and enjoy at the same time the fascination of being face-to-face with the work, getting as close as possible, and the thrill of taking an extra step beyond the allowed limit to delve inside the work and feel infinitely small compared to its size.

Camilla Ceretelli

Notes

[1] The catalog of acquired works can be found at <https://gpix.webs.upv.es/index.php/obras/> (accessed 23 September 2022).

[2] The painting *Retrato de Joaquina Candado* by Francisco de Goya can be found at the link <https://gpix.webs.upv.es/gpix/583.html> (accessed 23 September 2022).

[3] The painting *Figuras de casacas jugando en el jardín* by Joaquín Sorolla can be found at the link <https://gpix.webs.upv.es/gpix/132-2004.html> (accessed 23 September 2022).

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Reviews

Graziano Mario Valenti

Di segno e Modello. Esplorazioni sulla forma libera fra disegno analogico e digitale

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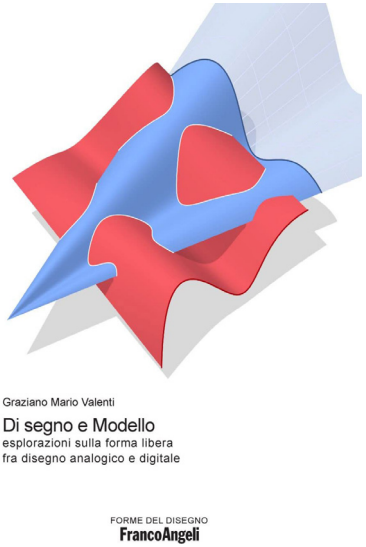

Graziano Mario Valenti's book, entitled *Di segno e Modello. Esplorazioni sulla forma libera fra disegno analogico e digitale*, is undoubtedly an explicit example of experiences in research and didactics of representation. There is an air of experimentation in all the chapters of which the book is composed, since no unambiguous solutions are given to the many questions raised-an imperative present in the practice of every researcher-but at the same time an attempt is made to convey in the teaching experience-with the direct involvement of the students –the vocation to reflect on what is being done, beyond the simple technical application of established strategies of cognitive inquiry, so as to seek solutions that vary from time to time. The student, therefore, wears the clothes-often uncomfortable –of the careful experimenter who asks questions that, before him, few have asked.

The book proposes to reflect on a particular kind of drawing: one that the author calls 'useless' because it is produced without any figurative idea in mind, by freely running the hand with the pencil across the paper. The term –let it be said– may seem unbecoming, since every devotee of the discipline knows that every drawing has its own utility, especially if produced by hands that have been trained to transfer onto paper a thought aimed at knowledge: to put it in terms of what we might liken to what was expressed in a well-known essay by Massimo Scolari, in which he observed that "in free drawing the skein of thought with its dislocations and accidentalities extracts from the line the hard form" [Scolari 1982, p. 82]. The author then questions what might lie behind this 'free' or 'spontaneous' drawing when probed through the advanced tools of a digital representation. Here then is that behind an abstract series of decomposed traces, Valenti identifies complex geometries, probed with the attentive eyes of one who knows geometric projections – parallel or central depending on the interpretation the user assigns to the free form– so as to detect morphologies of an extraordinary complexity, which allow the subject's interpretive abilities to emerge and at the same time also his own level of maturation as far as knowledge of descriptive geometry, solid modeling, and figuration with advanced algorithms of digital illumination are concerned.

Valenti seems to amplify to the nth degree the well-established principle that every architectural drawing is, in fact by its very nature, a projection. When, in fact, we are about to make any sketch, having in mind a real or imaginary object, we perform a projection operation: be it orthogonal, axonometric or perspective. In the case of the author's proposal this assumption is also associated with any sign produced in the absence of authorial intention. From this assumption, the research phase is initiated whereby the form reveals

a content, often unexpected, that can lead the spontaneous gesture back to a freeform, such that the underlying figurative equation is satisfied.
The book could not fail to begin with a reflection on traditional drawing in the first chapter entitled *Sul Segno e sul Modello* (On Sign and Pattern) [pp. 23-38]: here the conceptual sphere is sounded out, also through the analysis of Italo Calvino's well-known text in the second of the *American Lessons* [Calvino 1988], the one on *Rapidity*, which is taken as a reference, also in the light of the reflections conducted by Riccardo Migliari around the so-called Crab Theorem [Migliari 2004]. The account of the drawing of a crab, produced with extreme rapidity, but following a very slow reflexive investigation, allows us to investigate apparently controversial concepts, such as precisely quickness, meditation, awareness, with a careful reasoning about the concepts of Drawing and Model as expressed by Migliari in the cited book.
In the second chapter, titled *Dal Segno al Modello* (From Sign to Model) [pp. 39-86], the main core of the author's reflection manifests itself. 'Free drawing' comes to be analyzed from the projective perspective provided by the discipline of descriptive geometry. There takes place that leap-what we have defined to the nth degree-that transforms expressive freedom into a digital model congruent with the initial form. It is, perhaps, the most innovative, experimental contribution –and as such not yet subjected to the rigid rules provided by established procedures– that expands toward unexpected, and often unforeseen, results of what a 'useless' drawing may imply. That is, behind each sign lies a bounding box that encapsulates in stereometric form a distracted and disorganized gesture, giving the user a three-dimensional geometry. How to realize the shape within a modeling software interface is made explicit in the next chapter –*Teoria per la rappresentazione del modello geometrico digitale* (Theory for Representing the Digital Geometric Model) [pp. 87-102]– where elementary and advanced graphical primitives enable the user to solve the equation required by the system. From two-dimensional curvilines, we move on to the more reckless splines, which record daring complexities with stretching operations in digital space, through a timely analysis of the main algorithms that the history of numerical computation has made available to us over time.
The further evolution cannot but be foreseen in the subsequent *Costruzione e controllo del modello geometrico digitale* (Construction and Control of the Digital Geometric Model) [pp. 103-132] in which the fulfillment of morphological synthesis takes place: the choice of lines, surfaces-whether NURBS, translation, revolution, rototranslation, interpolation or SubD-of solids, and the related development that allows the geometric genesis of the final form, comes to be explicated in a rigorous manner. Extreme synthesis cannot fail to be the reduction in parametric form of the procedure – see the chapter *Modelli per la rappresentazione generativa* (Models for Generative Representation) [pp. 133-146]– so as to bind to dynamic procedures the final choice on the concluding morphology which, as such, is susceptible to continuous movements, such as to register an extreme operational flexibility that now characterizes all manipulations available within the digital universe.
The next two chapters, *Modelli per la rappresentazione della luce* (Models for the Representation of Light) [pp. 147-158] and *Esplorazioni della forma libera* (Explorations of Free Form) [pp. 159-206], authored respectively by Cristian Farinella and Michela Ceracchi, are in fact a useful appendix to the understanding of the entire expository record: on the one hand, in fact, we have some reflections on the figurative modalities of a virtual scene in the light of pragmatic considerations on the choice of the set to be subjected to illumination. On the other a specific case study comes to be proposed so as to allow an immediate practical evaluation of the theoretical input provided by the author in the preceding pages. An abstract drawing, devoid of any formal intention, comes to be traced by the author to a freeform of singular complexity, so much so that –in the eyes of the observer– it seems difficult to trace the former back to the latter. The extreme investigation could only associate the form with a physical prototype conducted with the techniques of rapid prototyping –in particular FDM filament printers are indicated as the technology used– proposing images of physical models of the complex geometry obtained, although it seems to us that these are actually rendering images, also due to the fact that the filament mentioned is an opaque material and in this case shiny dots are visible on the surfaces that are difficult to ascribe to the material described (unless a subsequent treatment with special paints, which, however, is not mentioned). By the way, this type of objects would rather require the use of printers using resin solidification stereolithography, which would undoubtedly succeed in solving the problem of making models of great formal complexity, also through the optimal management of supports that, as we know, are guaranteed to be better quality of processing, compared to FDM printers.

In addition to the rich bibliography, the volume closes with a chapter devoted to *Considerazioni e sviluppi* (Considerations and Developments) [pp. 207-210], in which the author articulates the synthesis by relying on the use of certain keywords to convey conclusions. In this way, terms such as 'expression', 'prototyping', 'process', 'light' and 'knowledge' summarize the *intentio auctoris* of the volume, indirectly referring back to what might be some subsequent developments in research activity, including in the transmission and dissemination of knowledge outside academia.
We also point out the two prefaces, by Andrea Casale –who pauses to reflect *ab origine* on the semantics of free drawing, including in the declination of child drawing studied by Georges-Henri Luquet– and that of Edoardo Dotto –who reflects on the relationship between the various connotations of drawing, analog and digital, in light of the outcomes produced in the volume.
Finally, it must be acknowledged that Graziano Valenti's book stands out for its originality. His working method, in fact, does not seem to have direct references in the scientific literature, perhaps also due to the fact that, although the method is rigorous from the point of view of the tools used, the procedures that allow one to arrive at the result depend very much on the subject who practices the operations. Considering a 'free drawing' as an axonometric projection or a perspective certainly influences the final result, so that anyone who approaches such an experiment will –in fact– produce a dissimilar work. The digital twin that is obtained in this case, in fact, has a very high margin of flexibility, which conveys at one and the same time the level of refinement reached by the one who stands in front of such an operational approach and, at the same time, also the knowledge gained by the same in the vast and varied field of digital modeling.

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Reviews

Enrico Cicalò, Valeria Menchetelli, Michele Valentino (a cura di)

Linguaggi Grafici. MAPPE

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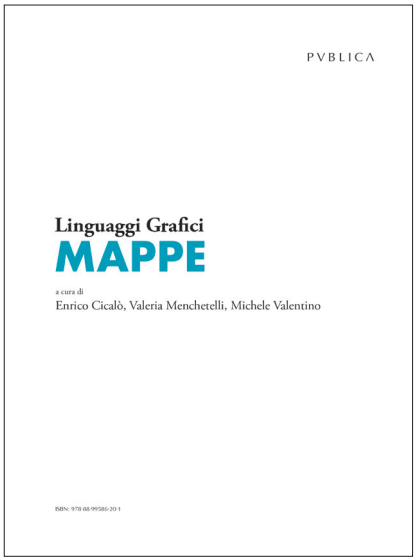

The collective volume *Mappe* (*Maps*), the second in the *Linguaggi Grafici* (Graphic Languages) series, is proposed as a space for reflection on maps, considered among the most widely used graphic devices with transversal and different purposes, with the intention of exploring their various typologies, functions, uses, modes of expression and symbolic languages while investigating their potentialities, roles, areas of application and research perspectives.
Mapping is, in fact, the act of representing complex realities, phenomena or systems through a drawing based on a code aimed at graphically mediating the correspondence between reality – whether perceived, planned, measured or imagined– and its representation.
In its wealth and variety of facets, the topic dealt with is well-framed in the opening essay by the three editors, who already in the title *I linguaggi grafici delle mappe: ragioni, funzioni, evoluzioni* e *definizioni* (The graphic languages of maps: reasons, functions, evolutions and definitions) well express the meaning and contents of the volume: "a collection of viewpoints on the world of maps, a diversified mosaic of approaches that document their historical-cognitive value, that analyzes them as graphic artifacts, employs them as a method of inquiry into the past and the present, or interprets them as privileged views oriented toward future planning. A mosaic that in turn constitutes a mapping of the many uses and roles that maps play in different fields of knowledge" [p. 17].

The volume brings together 61 essays, many of them having multiple authors and coming from various disciplinary fields, even those not directly related to the area of Drawing; subdivided into 11 sections, they touch on themes ranging from the reading of the map as a cartographic image intended for the study of the territory and its transformations, but also as a medium for the interpretation of complex phenomena, implemented through the analysis and visualization of data, up to the map in the sense of artistic experimentation, with even metaphorical meaning, thanks to interdisciplinary research supported by recourse to the mapping of scenarios and to their representation.
Fundamental to understanding this topic is the map's ability to recognize its own constitutive reasons in the act of transcription, that is, the encoding of information in a language other than the source language, and specifically in a graphic language, in perfect adherence with the definition of representation; emerging forcefully in these reflections is the theme, always very topical, of the relationship between signifier and signified, in the construction of a graphic code based on the selection of signs, as the map never establishes a relationship of exact correspondence with reality, but of similarity under a specific interpretative key, influenced by the author's culture and the context (geographical, chronological etc.) in which and for which it is developed.

The map, as a visual device that makes use of different graphic languages, can, moreover, assume a multiplicity of functions. Among these, there is certainly the need to orient oneself in a place: medieval pictorial allegories, portolan charts, road maps, illustrated atlases from the Renaissance, cartographies and urban representations of various typologies and representative categories, are only a few of the solutions produced for this purpose; in the volume, these are dealt with in several of the categories corresponding to the thematic sections that the contributions are divided into.
Given the complex reality of the world's manifestations, a further task entrusted to maps is surely that of analysis; the use of this device has determined its application in various fields of knowledge ranging from medicine to graphic representation, from sociology to geography.
Of great interest and consistency is the study of the evolutions that maps have undergone over time, and numerous references can be found in this thematic vein: suffice it to think of, for example, the *itineraria picta* (illustrated or depicted road maps), the *Tabula Peutingeriana* (Peutinger Table), and the *mappa mundi* (world maps).
The evolutions of cartography have outlined a path that seems to be articulated precisely along the two previously identified parallel tracks: on the one hand, the map as an image of the world, that is, as a transcription, as objective as possible, of reality; on the other hand, the map as a symbolic representation of the world, that is, as a synthesis of the complex of values which constitute it through the map's own representative autonomy.
While traditional cartography pertains to the first context by remaining predominantly anchored in the geographical discipline, relating to the second context are the results of all those forms of mapping that go beyond geography to offer themselves as points of observation and interpretation of interdisciplinary studies, assuming a decisive role in the evolution of critical thought, starting from artistic discourse.
The numerous articles that structure and enrich the volume, organized, as mentioned earlier, in thematic sections (categories), are positioned in the table of contents so that they can be read (in the editors' intentions) not only as individual presentations of research, but also in a linear reading that runs through and relates them in a consequential manner; a reading favored precisely by the order of the articles, which makes this edited volume not a mere collection of texts, but a collective volume with a monographic slant, potentially readable from beginning to end as a unitary work.
The categories, being precisely such, are purely an expedient used to give an order; this expedient does not intend to confine the contributions within rigid containers, but to help in the structuring of precisely that unified reading path, starting with *Sguardi* (Views), a category that includes studies on mapping and data visualizations and the relationship between tradition and innovation, and then moving on to *Geometrie* (Geometries), a category that takes up, by analyzing them, several cornerstones: de' Barbari's *View of Venice*, ideal cities, the city of God, and celestial maps. All of these maps being suspended between opposite and complementary dimensions: the scientific and the artistic.
And then the category of *Rotte* (Routes), which analyzes and studies portolans and nautical charts; that of *Confini* (Borders), which reflects on *cabrei* (cadasters), private land registries, notarial maps; that of *Strati* (Layers), which analyzes the link between knowledge and representation that emerges in another cornerstone map such as Giambattista Nolli's *Map of Rome* and, more generally, in thematic maps.
Then again, the mapping of the *Reti* (Networks), in which we find as precursors the *Itineraria picta* and the *Peutinger Table*, but also maps for subways and studies on the structuring of new codes for infrastructure maps.
The category devoted to *Significati* (Meanings) is highly articulated. It explores maps that convey the thinking of artists, sculptors, illustrators, designers and graphic designers, thanks to maps which become exploratory tools that enrich the image of the world with further meanings, up to real graphic abstractions; almost an evolution of this section is *Informazioni* (Information), aimed at exploring the data flow produced by the network and its need for adequate forms of representation to support the critical understanding of the complex reality of the world. In this category emerges the peculiar need for a solid graphic-visual literacy specific to infographic maps, supplementing narrative and graphic devices capable of increasing awareness of the content to be conveyed, also through conceptual and mental maps such as visual organizers useful for representing knowledge.
Decidedly peculiar is the category *Corpi* (Bodies), in which, through anthropomorphic geographic maps, the relationship between body and territory is explored as a figurative metaphor, going so far as to investigate the extraordinary potential of medical imaging as a precise mapping of the different parts of the body in its innermost, hidden parts.
Finally, the categories *Tecnologie* (Technologies) and *Media* include contri-

butions that start from innovations in the technological sphere and from the stimuli to reinterpret, through experimental forms of mapping, the different aspects of reality, of both material and immaterial territories (implementable 2D and 3D information archives; multidimensional, multi-temporal 3D GIS etc.) which, by delineating digital maps as multilayer tools of analysis and understanding, choose GIS as a tool of synoptic overlay of architectural, urban and territorial elements, as well as landscape conditions, also through reactive and interactive mapping, up to investigating the use of maps in videogames and the relationship of maps with different communication and narrative media.

At the end of the long review of the meanings and functions that maps can assume, a new definition of the concept of map itself comes to the fore, which places, between representation and documentation typical of cartography, the extended and transdisciplinary interpretation referring to all those contexts of application in which the map becomes a tool for managing the complexity of a phenomenon, whether historical, anthropological or cultural.

Obviously, a definition of the map cannot be given in the absence of graphic language, which must be selected in an appropriate manner, coherently with the specific purpose for which the map itself is made.

For this reason, the editors propose a definition that makes it possible to classify the map by distinguishing it from other forms of representation: "the map is a form of visual communication resulting from the reading of complex subjects and their subsequent disposition capable of producing an overall view, in which graphic languages are used according to a specific interpretative key" [p. 32].

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Events

Events

UID PhD Summer School
Around Palladio / Attorno a Palladio. Nuove metodologie di disegno per l'architettura

Elisabetta Caterina Giovannini

The Polytechnic Department of Engineering and Architecture and the Science and Technology Pole of the University of Udine organized from June 13 to 17, 2022, the second PhD Summer School of the *Unione Italiana per il Disegno* entitled *Around Palladio / Attorno a Palladio. Nuove metodologie di disegno per l'architettura*. The Summer School [1], dedicated to advanced PhD training in the disciplines of representation, allowed PhD students to have a direct experience with respect to advanced tools and methods for the analysis, documentation, visualization and dissemination of architectural and cultural heritage. The initiative was held in continuity with the first edition, which took place from September 24 to 28, 2018, at the National Archaeological Museum of Aquileia and the University of Trieste's Gorizia Pole on the topic of *Cultural Heritage Survey and Inclusive Representation for Museum Accessibility / Rilievo dei beni culturali e rappresentazione inclusiva per l'accessibilità museale*.

The Summer School was inaugurated by an Open Conference entitled *Around Palladio / Attorno a Palladio. Architectural Drawing Between History and New Technologies of Representation / Il disegno di architettura tra storia e nuove tecnologie di rappresentazione* (fig. 1), held at palazzo Garzolini di Toppo Wassermann, home of the University of Udine Graduate School. The interdisciplinary conference featured international speakers who addressed the topic of architectural drawing in the sixteenth-century context, both for architectural history and disciplines of representation.

After institutional greetings, the President of the *Unione Italiana per il Disegno*, Francesca Fatta opened the first day's proceedings by bringing greetings from the scientific community and emphasizing the success of the initiative in involving 11 universities, with the presence of their respective young doctoral students. Alberto Sdegno (University of Udine), coordinator of the initiative, after the presentation of the event, passed the floor to Donata Battilotti (University of Udine), moderator of the *History of Architecture* section, to introduce the *Lectio Magistralis* by Howard Burns, President of the Scientific Council of the Andrea Palladio International Center for Architectural Studies and professor emeritus of History of Architecture at the Scuola Normale Superiore in Pisa, entitled *Palladio: drawing as metamorphosis; the built as an alternative project / Palladio: il disegno come metamorfosi; il costruito come progetto alternativo*. Burns addressed the relationship between drawing conventions and the built project, recalling that Palladio's drawings often leave free design interpretation. The representation of architecture thus becomes a multi-layered system where different transformations and metamorphoses of the same project can be read.

Sabine Frommel, Directeur d'Études Histoire de l'art de la Renaissance at the École Pratique des Hautes Études - Sorbonne (PSL), presented the paper *Leonardo's Architectural Drawings: assimilation and hybridization of models / Disegni architettonici di Leonardo: assimilazione e ibridazione di modelli*. The paper analyzed the architectural language in Leonardo's graphic production recognizing how the historical context and the Italian Renaissance influenced his design process.

Vitale Zanchettin, head of the Superintendence of Architectural Heritage of the Vatican Museums, addressed the topic of graphic analysis of architectural drawings with the contribution *The Perspective of the School of Athens. The rediscovery of method in a 'forgotten' drawing / La prospettiva della Scuola di Atene. Il ritrovamento del metodo in un disegno 'dimenticato'*. The talk made reference to the preparatory cartoon for Raphael's *School of Athens*, in which it is possible to observe the role of the architect in moving from the practical need to draw a large perspective to a geometric problem of creating the background of the scene in the foreground of the painting.

The first day of studies concluded with a visit curated by professor Donata Battilotti to the palazzo Antonini-Maseri, designed by Andrea Palladio in the mid-16th

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Fig. 1. Flyer of the event.

century, formerly home to the Banca d'Italia and now the Rectorate of the University of Udine.

The second day addressed the themes of architectural representation and its new languages. The session *Representation* was moderated by Alberto Sdegno and began with the talk by Mario Docci, professor emeritus of Sapienza University of Rome, *Drawings, Surveys, Plans and Proportions in the Work of Andrea Palladio / Disegni, rilevamenti, progetti e proporzioni nell'opera di Andrea Palladio*: a critical reading of survey drawings, preparatory sketches and plans edited by Palladio.

Marco Gaiani (University of Bologna), presented the paper entitled *Andrea Palladio Seen, Analyzed, Communicated and Narrated Digitally / Andrea Palladio visto, analizzato, comunicato e narrato digitalmente*, illustrating the outcomes of different researches that introduced digital tools to see, analyze, communicate and narrate Palladio and, in particular, the experiments he conducted: *Palladio Digitale*, the digital edition of *The Four Books of Architecture* and *Andrea Palladio 3D geo database*.

Cristiano Tessari (University of Udine) addressed the topic of *Palladio's Antiquity / L'Antico di Palladio* by highlighting how the master, through his graphic work, modified evidence from antiquity and his own work to validate his theories.

Pedro Manuel Cabezos Bernal (Universitat Politècnica de València), spoke instead about *Gigapixel Photography for the documentation of paintings / Fotografia gigapixel per la documentazione dei dipinti* and how this innovative technology is increasingly being used by museum institutions for the analysis and dissemination of cultural heritage by making it accessible to a wide and heterogeneous audience.

Giuseppe Amoruso (Politecnico di Milano) with his talk entitled *Palladio's Teatro Olimpico. Digital Experience at the Borders of Classical Theater / Il Teatro Olimpico di Palladio. Esperienza digitale ai confini del teatro classico*, he expounded the analysis conducted for the *frons scaenae*, *proscenium*, and *cavea* for the purpose of three-dimensional restitution from the digital acquisition of the Teatro Olimpico in Vicenza, Italy, designed by Palladio and built by his son Silla after 1580.

Orietta Lanzarini (University of Udine) addressed the topic of *The Antiquarian culture. Representation and Interpretation / La cultura antiquaria. Rappresentazione e interpretazione* in which drawing becomes a tool for designing and sharing ideas.

Finally, Alberto Sdegno presented a contribution entitled *Virtual Models of Palladian Architecture / Modelli virtuali di architetture palladiane* in which he described the genesis and advanced representation of some Palladian palaces, villas and bridges.

The participants and academics of the PhD Summer School continued their work with the application session at The Advanced 3D LAB at LAB Village, recently started at the University of Udine, thanks in part to funding from the Friuli Venezia-Giulia Region.

The workshop, as highlighted by the event's subtitle, *New Drawing Methodologies for Architecture / Nuove metodologie di disegno per l'Architettura* was divided into three thematic seminars that covered the most innovative technologies for representing architecture: 3D capture, rapid prototyping tools and methods, and virtual, immersive and augmented reality applications.

During the first day, as part of the seminar on *Innovative Technologies for Architecture / Tecnologie innovative per l'Architettura*, doctoral students were able to experience the workflow from digital capture to 3D printing. Various 3D prototypes printed with different tools and materials were described. Elisabetta Caterina Giovannini delivered a lecture entitled *The Communication and Enhancement of Cultural Heritage through the Use of Open and Web-based*

Fig. 2. Panoramic photo with participants of the UID PhD Summer School 2022.

Solutions / La comunicazione e valorizzazione del Patrimonio Culturale mediante l'utilizzo di soluzioni open e web-based.
Within the seminar *Virtual and Augmented Reality for Architecture / Realtà virtuale e realtà aumentata per l'architettura*, several case studies were examined: *Augmenting Painting: perspective restorations of paintings and applications in augmented reality / Augmenting Painting: restituzioni prospettiche di dipinti e applicazioni in realtà aumentata* (Silvia Masserano, Veronica Riavis), Zaha Hadid's Vitra Fire Station in immersive reality (Mattia Comelli), to which were added other case studies including real time navigation within Le Corbusier's Esprit Nouveau pavilion. Pedro Manuel Cabezos Bernal illustrated the workflow required for the creation of spherical panoramas (fig. 2) and their use in the field of Cultural Heritage for the creation of virtual tours. Silvia Masserano's talk on *The architectural perspectives of the canvases of Paolo Caliari, known as Veronese / Le prospettive architettoniche dei teleri di Paolo Caliari, detto il Veronese*, concluded the day.
The seminar *Virtual Reality Applications to Digital Models/ Applicazioni di Realtà Virtuale a Modelli Digitali* featured an introductory lecture by Giuseppe Amoruso on creating BIMx hyper-models for museum exhibit design. Veronica Riavis presented a paper entitled *Tactile representations of architecture and painting: geometric reconstruction of the church of Sant'Ignazio in Gorizia and perspective restitution of the wall fresco / Rappresentazioni tattili di architettura e pittura: ricostruzione geometrica della chiesa di Sant'Ignazio a Gorizia e restituzione prospettica dell'affresco parietale*. Several case studies were subsequently illustrated: Frank Lloyd Wright's Waterfall House in virtual reality (Simone Veneziano) and the interactive Gorizia castle. The doctoral students were thus able to experiment with different advanced interaction techniques using immersive systems such as *HTC Vive* and *Oculus Quest 2*.
Particular attention has therefore been paid to the digitization processes affecting cultural heritage today, which increasingly refer to the broader concept of digital transition. Virtual, immersive and augmented reality are thus tools to which the discipline of representation turns its attention with a cultural gaze and a scientific dissemination perspective.

Notes

[1] The Summer School was promoted and funded by the *Unione Italiana per il Disegno* (UID) with additional financial/organizational support from CISM - International Centre for Mechanical Sciences. The initiative had the logistical support of the Polytechnic Department of Engineering and Architecture of the University of Udine and was sponsored by the Order of Architects, Planners, Landscape Architects and Conservators of the Province of Udine with an economic contribution from the company Techno Serramenti. The event was held as part of the initiative *UID - Survey and Representation Days - Specialist Seminars in the Disciplines of Drawing for PhD Students*.

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Events

BAL – Beyond All Limits 2022

Alice Palmieri

The evocative venue of the Monumental Complex Real Belvedere of San Leucio in Caserta hosted, from the 11th to the 13th of May, the international conference *Beyond All Limits* promoted by the Department of Architecture and Industrial Design of the University 'Luigi Vanvitelli'. Two prestigious foreign partner universities were involved, namely the Faculty of Architecture of Cankaya University in Ankara and the Department of Architecture and Engineering of the University of Strathclyde in Glasgow.
Held in a hybrid mode, the conference allowed for a large number of remote participations by academics and researchers, mainly from foreign universities, underlining the significant international footprint that the conference, now in its second edition (the first was held in Ankara in 2019) has been pursuing since its inception.
The central theme of the conference, which ran through all the interventions in various ways, can be summed up in the word 'sustainability', in its broadest sense and thus in its many possible declinations and implementations in the fields of architecture, design, planning and technology. The subject of the interesting reflections that emerged from the conference was the concept of sustainability, starting from the well-established themes of the green economy, the use of ecological resources and the production of environmentally friendly materials, and then inserted into the current international debate according to a multidisciplinary approach, proposed by the interpretation of the *New European Bauhaus*. The issues raised by the NEB project, originated with many ambitious goals, including rethinking contemporary lifestyles in search of 'beauty' and redefining possible strategies for living the future in an inclusive and sustainable manner, thus found their way into the 18 parallel sessions. In each of these, more than 110 presentations from 9 different countries were illustrated, in which participants proposed visions, approaches and strategies that aim to address today's wide-ranging challenges (not only environmental). There were many speeches that addressed some of the key points of the NEB project, including social issues such as accessibility, both physical and cultural, aimed at involving all categories of users; inclusion, understood as valuing diversity, the uniqueness of each person and the equality of all; and of course, sustainability, reiterating the now indispensable ecological approach to production and consumption. A horizon of reflection therefore, based on the ambition to create a new European Bauhaus, understood as a space of co-creation in which architects, artists, students, engineers and designers work together. The parallel sessions thus gave substance to this transdisciplinary criterion, which invites us to recognize the multiplicity of dimensions of reality and which, in the context of the conference, contributed multiple insights thanks to the variety of viewpoints shared.
In fact, numerous disciplinary sectors were involved in a broad overview and a critical and multidisciplinary reading of the proposed themes. And precisely for this reason, the event benefited from the patronage, first and foremost, of the European Commission and the Ministry of Ecological Transition, which was joined by the Italian University Conference of Design (CUID) with the speech by Francesca Tosi, and many important scientific societies, including the Italian Society of Design (SID) with the presentation by Raimonda Riccini and the UID, thanks to the participation of President Francesca Fatta in the introductory session. In particular, Francesca Fatta's lecture immediately highlighted how it is necessary to go beyond the limits of one's own field in a vision of the project that is transdisciplinary, or rather, that aims to transcend regulatory and academic boundaries in favor of an articulated and complex vision of the project, which is what holds together

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the spheres of architecture and design and which, in the case of the disciplines of representation, defines a project path that takes shape in drawing, image-making and visual communication.
The succession of plenary and parallel sessions was coordinated by the Conference Chairs, Claudio Gambardella (University of Campania 'Luigi Vanvitelli'), Pieter De Wilde (University of Strathclyde) and Timuçin Harputlugil (Çankaya University), who first introduced the two distinguished Keynote Speakers: Ezio Manzini, designer and Honorary Professor at the Politecnico di Milano, and Patrizia Ranzo, architect, designer and Full Professor of Industrial Design at the University of Campania 'Luigi Vanvitelli'.
Design in/for complexity was the title of Professor Manzini's talk, which questioned the anthropocentric approach of designers, who perhaps underestimated the radical interdependencies that bind humanity to other earthly beings. Sustainability was translated in his speech into an approach that embraces the perspective according to which our actions are considered as part of a system, going beyond the idea of production in favor of the idea of generation, reorienting design towards the Earth and no longer only towards man. In Manzini's analysis, if design is to be considered as a process of sense-making, then the 'post-anthropocentric' approach could imagine actions capable of generating values beyond the human perspective and not as reactions against nature, but rather as inter-actions, with a view to building a common world that is truly shared by all living beings on Earth.
Patrizia Ranzo also proposed a reflection on the role of design, whose vision as a device for the production of reality would be simply reductive without starting from a speculative and critical

Fig. 1. Flyer of the event.

capacity; therefore, considering this approach, design is increasingly configured as an experimental and open laboratory, a place for the narration of technology in accessible forms, where each object becomes the start-up of the next. In her talk *Perpetuum mobile. Identity and value landscapes of contemporary design*, she turned her gaze to the digital and the need to design visions through which the project can take on meaning and transformative capacity in relation to emerging needs. Consequently, design workshops are imagined as places to explore the territories of what is possible with respect to social evolutions, 'beyond' technology, in which the true innovation to be sought is an innovation of meanings, requiring a critical and dialogic mind and attitude capable of producing visions within which it is truly possible to inhabit the world anew.

The speeches of the two Keynote Speakers clearly defined the trajectories of the conference, which, with its choice of the title *Beyond all limits*, invited us to open our eyes and minds beyond schemes, beyond obstacles, beyond a thought that has already been perpetuated and that perhaps has not always been successful. Significant, in this sense, was the willingness of the organizers, particularly Claudio Gambardella, to involve young researchers with the freedom to express visionary ideas, but who were able to offer suggestions and key concepts for a sustainable vision of the future.

Special attention was paid to the universe of fashion and its complex relationship with sustainability. A round table, open to PhD students and under-30s, was dedicated to this topic, with a particularly innovative approach, which aimed, even more emphatically, to offer a contemporary look at the issues addressed in the conference. Participants produced videos, lasting a maximum of 5 minutes, on the theme *The Future of Sustainable Fashion*. This initiative, thanks to the scientific coordination of Professor Aguinaldo dos Santos (University of Paraná UFPR, Brazil), aimed to involve young researchers in a dynamic communicative mode, through which they could present a personal point of view, result of their individual research, through an expressive vehicle of great potential. The short films were presented during the May 12th Day and the roundtable, which followed the screenings, included a cross-questioning phase, in which each participant presented issues or reflections on the videos, in a perspective of open and constructive discussion. The proposed narratives provided points of view related to the origins of different countries and cultures (in addition to Italy, contributions to the roundtable also came from Hungary and Brazil) putting on the table topics related to the value system underlying consumption and production in the fashion industry, the goal of reducing environmental impact through the use of sustainable materials, and upcycling and slow fashion strategies, which aim to subvert many current dynamics.

In conclusion, the days held in the beautiful setting of San Leucio, witnessed the significant contribution of illustrious exponents in the fields of architecture, design, engineering and urban planning, thanks to whom a comparison between different generations was made possible. The numerous participations of young people, PhD students and researchers, with solid roots and an eye to the future, put forward multiple points of view, for a vision of a sustainable world, in a theoretical, practical and ethical dimension, which truly aspires to go 'beyond all limits'.

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Events

The Third Edition of the International Summer School and Academy *After the Damages*

Fabiana Raco

Now in its third edition, the *After the Damages* Advanced Training Summer School project on risk management and the impacts on the existing built heritage resulting from natural or man-made disasters consolidates both the didactic results and the interest and participation of national and international partners in the Academy's activities.
The areas of investigation and comparison, also on an international scale, have concerned, among other things, the effects of climate change on the conservation of cultural heritage. This has been done starting from an interdisciplinary and integrated approach to the issues related to emergency management, safety, and reconstruction following catastrophic events of a different nature.
The Academy *After the Damages* is coordinated by the Department of Architecture of the University of Ferrara –through the Departmental Centre for the Development of Integrated Automatic Procedures for the Restoration of Monuments (DIAPReM), the Industrial Research Laboratory TekneHub of the Technopole of Ferrara, and the Laboratory for Architectural Restoration LaboRA, the Research Laboratory for Building Maintenance and Management and Environment LEM– and it is organized in partnership with the Department of Engineering and Architecture of the University of Parma and the 'Enzo Ferrari' Department of Engineering of the University of Modena and Reggio Emilia.
The scientific committee, which is made up of representatives of Emilia-Romagna 2012 Earthquake Reconstruction Agency, the Ministry of Culture MiC, the Central Institute for the Digitization of Cultural Heritage, the Department of Civil Protection of the Presidency of the Council of Ministers, the Technopole Big Data and Clust-ER BUILD belonging to the High Technology Network of Emilia-Romagna, the General Directorate for Cultural Heritage Security of the Ministry of Culture, the Superintendency of Archaeology, Fine Arts and Landscape for the provinces of Parma and Piacenza, the Superintendency of Archaeology, Fine Arts and Landscape for the metropolitan city of Bologna and the provinces of Modena, Reggio Emilia and Ferrara, and other organizations, worked with the project's various actions, training and exchange, and in-depth analysis on specific topics, in the year 2022.
The Scientific Committee works in synergy with the International Faculty of scholars and experts from Armenia, Brazil, France, China, Ecuador, Mexico, Spain, Italy, Poland, Turkey, India Slovenia, and the Faroe Islands to update the strategic training areas.
Through Spring Focus, Talks, seminars, and an edition of the *After the Damages International Award*, the exchange and discussion activities amongst the network of partners and stakeholders that had already started in 2021 continued in 2022.
The first edition of the *After the Damages International Award 2021* results were presented and discussed on a study day in February. The winning and listed projects addressed the cross-disciplinary problem of resilient communities in smaller centers in addition to developing design and technology solutions devoted to special forms of cultural assets, such as places of worship in Italy and Nepal.
The areas of investigation related to risk management were addressed with reference to the development of protocols and good practices for the digital document in March as part of the Days of Restoration and Cultural Heritage organized in collaboration with the Department of Architecture of the University of Ferrara, the TekneHub Laboratory, the DIAPReM research center, Clust-ER BUILD, Futuro in Ricerca Consortium, and LABORA, Architectural Restoration Laboratory.
In April, specialists from CEPT University Ahmedabad, ICOMOS New Zea-

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Fig. 1. Ten years after the 2012 Emilia-Romagna earthquake. After the Damages Summer School poster of the events organized on the tenth anniversary.

land National Scientific Committee on Energy and Sustainability and Climate Change (NCES+CC), Instituto Federal de Minas Gerais-Campus Ouro Preto, Brazil, and Faculdade de Arquitetura e Urbanismo, Universidade de São Paulo, ICOMOS Brazil and ICOMOS National Scientific Committee CIPA-HD Cultural Heritage Documentation discussed the new challenges posed by climate change to the conservation of Cultural Heritage.

The Summer School's third edition, which occurred from July 5 to July 19, 2022, built on the previous iteration's participation and outcomes by showcasing the topics' growing interest as well as the efficiency of the course's design and teaching. Since participants can access the teaching materials in the form of audio-video support even after individual seminars have concluded, the *After the Damages* Higher Education project is proposed in the form of integrated synchronous and asynchronous distance learning after the pandemic event. To achieve the mentioned results, the didactics are carried out using exclusive digital platforms that enable the simultaneous participation of all participants, the recording of audiovisual content, and simultaneous translation into many languages, including English and Portuguese, for the 2022 edition.

The third edition involved 75 participants, professionals, researchers, scholars and public administration employees, experts in the disciplines of architecture, engineering, cultural heritage, archaeology, economics, humanities and 56 lecturers, from a total of 19 countries on 4 continents.

The 2022 edition of the Summer School lasted two weeks amounting to 104 hours divided as follows: 42 hours dedicated to lectures; 26 hours to seminars/workshops; 24 hours for individual work and the final workshop; 12 hours of virtual thematic visits of selected case studies.

Of the various topics covered in lectures and seminars, the central role played by the disciplines of representation, surveying, documentation, modeling and digital visualization, also integrated with key enabling technologies such as sensors, IoT and automation in both national and international contexts to support complex decision-making and intervention processes involving the architectural, urban and territorial scale and communities, is highlighted for the third edition as well.

The most noteworthy example of the use of integrated digital methodologies and technologies to recreate cultural heritage is the site of knowledge and digital documentation of Notre-Dame that professor Livio De Luca presented. Additionally, with reference to the

three editions of the Summer School, an integrated approach to intervention aimed at improving the technological and constructive fragility of artifacts as well as social fragility is a topic of interest for participants from various disciplinary, technical, and humanistic fields.
The discussion and debate surrounding the sharing of exemplary case studies, also in reference to the scenario of war following the pandemic crisis, were other characteristics of the 2022 edition of the advanced training course.
The case studies of the Totsuka area in Tokyo, the cities of Cairo, Warsaw after the Second World War, Mosul in Iraq, Istanbul and Nepal enabled a thorough examination of the issue of resilience in relation to man-made catastrophic catastrophes.
A debate was also dedicated to case studies of the 2012 Emilia-Romagna crater area. The size of the damaged built heritage and cultural heritage made it necessary to reconsider the traditional protocols for surveying and quantifying damage, as well as the tools for integrating, sharing, and implementing information over time.
Finally, by means of virtual tours involving all the actors in the process, planners, public administrations, those responsible for the procedures and disbursement of funding, and territorial associations, the participants were able to explore the restoration sites of the town hall in Concordia near Modena, the Borgatti Theatre in Cento, places of worship in the crater area, and a school in Pieve di Cento.

Fig. 2. Some pictures of case studies of the 2012 Emilia-Romagna earthquake crater area analyzed during the course. Photocredit After the Damages.

The last workshop activity, which involved the 75 participants divided into 12 groups and directed by as many tutors among experts and lecturers of the third edition, marked the completion of the postgraduate training experience. The topics discussed and suggested by the participants included the use of methods and tools for risk analysis, mitigation, and management, tools, and strategies to raise public awareness of issues related to the effects of catastrophic events on the existing heritage, the opportunities, and limitations of applying particular technologies to improve the resilience of the built heritage, documentation, surveying, and digital mapping.
A whole dossier in the upcoming issue of the journal *Paesaggio Urbano* is devoted to the results of the instructional activities and the final workshop.

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Eventi

UID2022. *DIALOGUES. Visions and Visuality* 43rd International Conference of Representation Disciplines Teachers

Maria Elisabetta Ruggiero

1992-2022: after thirty years, the UID annual Conference of returns to Genoa, the "Lerici Conference" –as it was defined– returns home, but in a different house: from the usual appointment in the splendid setting of La Spezia Riviera, to the headquarters of the Architecture and Design department in the town center, attended on the occasion of the celebrations organized by Genoa for the 500th anniversary of the discovery of America following the voyage of Columbus.
This is the reasoning starting point to identify themes and objectives of the meeting, from the deeply changed relationship of the University with the host context and from the dialogue that today's University is gradually establishing with society in a deeper and deeper and more incisive way. Another, terrible, element, has influenced the debate on the titling and the contents of the meeting: the very recent pandemic that has forced us to take note of our fragility as individuals and communities, of the precariousness of what we consider as consolidated and permanent and of the fundamental role that the interpersonal relationship plays in the balance and serenity of the life of each of us. It will therefore be a question of dialogue. Or, more precisely, of dialogues, because by transferring the observations made in the disciplinary field it is immediately evident how the visuality *sub specie* imagine –to any definition, purpose, realization mode– is in effect a form of non-verbal language and therefore deals with the dialogue with the interlocutor.
The Methods, techniques, methodologies are facets of the same issue and lead to reasoning precisely on possible partners. The disciplines that most intervene in the debate that involves all-round representation, are undoubtedly those related to Science and Technology, History, Semiotics and from here began the construction work of the 43rd International Conference of Representation Disciplines Teachers, Congress of the Unione Italiana per il Disegno.
About 250 participants, numerous Spanish colleagues, with whom an intense and fruitful collaboration has been active for many years, over 100 interventions of the 9 parallel sessions, 3 main focuses each opened by a conference in plenary session, speakers Michela Spagnuolo, Claudio Strinati and Mauro Bubbico, respectively for the focuses *Experimenting* (signs and sciences), *Witnessing* (signs and history) and *Communicating* (signs and semiotics). A very dense program, perhaps too much, but it was difficult to cut some contributions that had received a positive double revision and the great, generous effort made by the moderators also allowed to make many promising young people known to the Scientific Community.
The "new Genoa", effectively introduced at the opening of the works by the pro-rector to the third mission, Fabrizio Benente, was then the leitmotif that guided the choice of the places of the *convivium*: the Teatro della Tosse, home to experiments, avant-gardes and the continuous contribution of Lele Luzzati, together staging of a *pièce* preview of the programming of the interdepartmental University center Palazzo Falcone; the two state museums of Palazzo Reale and Palazzo Spinola di Pellicceria and villa Pallavicini in Pegli, on Saturday afternoon, for those who wished and had time for a visit; the special opening for the Congress participants of palazzo Pallavicini, a renovated venue open to the public of part of the private residence of Prince Pallavicini; villa Balbi allo Zerbino, for the social dinner, during which a special mention was given to Annamaria Parodi. Days of celebration, for the Genoese ICAR/17, but also for the entire scientific community of the Polytechnic School –as underlined by Rector Federico Delfino, Dean Giorgio Roth and DAD (Dipartimento Architettura e Design) Director Niccolò Casiddu in their opening greetings–, community able to discuss internally and internationally and to disseminate research and new cues for thought, of transdisciplinary interest.
At the end of the Conference, the usual annual report on the activities of the Association, carried out by president Francesca Fatta and the presentation of the final balance and forecast, edited by treasurer

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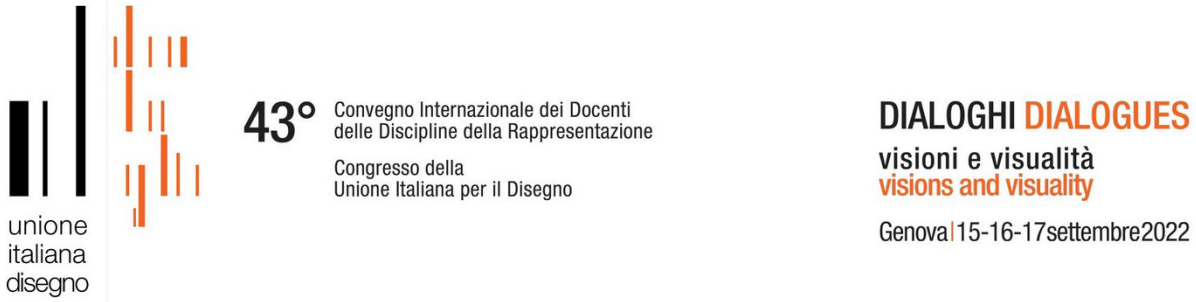

Fig. 1. Banner of the event.

Ornella Zerlenga, with the delivery of the gold plaques to Rossella Salerno and Mario Trimarchi, who also intervened with an interesting and personal speech on his relationship with drawing, illustrated by beautiful autograph images.
At the opening and closing of the works, the "Vito Cardone" UID Giovani Award was then assigned to the DERIVELAB project (coordinator Claudio Patanè, Università degli Studi Mediterranea di Reggio Calabria) and the "Gaspare de Fiore" plaques to dr. Francesca Gasperuzzo (IUAV University of Venice, supervisor: prof. Agostino De Rosa, co-supervisor: prof. Gundula Rakowitz, tutor: arch. Luigi Pavan, with the doctoral thesis entitled *Mostruose Architetture: le obliquazioni di Juan Caramuel De Lobkowitz*), and to dr. Anna Lisa Pecora (Naples, Federico II, tutor: prof. Alessandra Pagliano, co-tutor: arch. Erminia Attaianese, external consultant: dr. Giovanni Minucci, with the doctoral thesis entitled *Lo spazio rappresentato per il disturbo dello spettro autistico - ASD*). Mention to dr. Claudio Patanè (Università degli Studi Mediterranea di Reggio Calabria; tutor: prof. Francesca Fatta; co-tutor: prof. Juan José Fernández Martìn, with the doctoral thesis entitled *Architetture parlanti nel paesaggio fortificato calabrese. Il Codice Romano Carratelli. Progetto e Costruzione di un itinerario terracqueo*) and to dr. Sofia Menconero (Sapienza University of Rome, tutors: prof. Laura Carnevali, prof. Marco Fasolo, prof. Leonardo Baglioni, with the doctoral thesis entitled *Tra immagine e immaginazione: analisi e interpretazione dello spazio u-topico. La serie delle Carceri piranesiane*).
On the occasion of Genoa meeting, the Architecture and Design Department unanimously decided to dedicate the exhibition space, traditionally called "Cisternone", to Gaspare de Fiore, with the motivation of his fundamental innovative approach to the discipline of Drawing, which Genoa then developed into the lines of teaching and research related to boating, landscape and design, University of Genoa's training offer still available today. The space was inaugurated by Sereno Innocenti, with a symbolic "ribbon cutting", transformed into a nice puzzle designed by him and with the participation of Angelo and Valeria de Fiore: the last read a beautiful thought of his son Nicolò, dedicated to his grandfather.
From the point of view of the contributions, the three themes of *Experimenting*, *Witnessing* and *Communicating* have been interpreted in a personal way and characterized by research directions that, although heterogeneous, clearly refer to a methodological structuring that is always evident and, from a certain point of view, common, that is representation as a method of investigation, analysis, and proposition. The more consolidated themes of survey and historical investigation have been flanked by those of communication where the two previous themes often merge to become substance and vector of knowledge and sharing. The theme of communication therefore appears today to be an element of unification of several disciplinary aspects, where the theme of conservation and dissemination of artistic, architectural and landscape heritage assumes a prevalent role.
Certainly, the research addressed not only provides a picture of the disciplinary state of art but may offer insights for further studies and reflections.
The UID 2022 edition was characterized by days of a rediscovered presence without pandemic limitations, and that opened the joyful expectation of the 2023 appointment, in Palermo. Thanks again from Genoa, then, and see you in Palermo!

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Events

REAACH-ID 2022 Symposium

Marco Vitali

The REAACH-ID (*Representation for Enhancement and management through Augmented reality and Artificial intelligence: Cultural Heritage and Innovative Design*) symposium is now in its third edition, which was held, again this year, in webinar mode, on the days (October 11-12, 2022) organized by the promoting committee composed by Andrea Giordano of the University of Padua, Michele Russo of Sapienza University of Rome and Roberta Spallone of the Politecnico di Torino.

The symposium, which comes under the aegis of the Representation Challenges, re-proposes the combination of Augmented Reality (AR) and Artificial Intelligence (AI) by exploring its new frontiers, which are constantly being updated.

The purpose of the second Symposium (2021), triggered by the debate developed during REAACH-ID 2020, was to go beyond the census of the research carried out by Representation scholars in Italy, exploring the new boundaries that, after just one year, AR and AI were marking in the fields of Cultural Heritage and Innovative Design on the scene of international studies. This goal was fully achieved, and we could say surpassed, thanks to the response and participation of scholars in the 2022 edition of the symposium. They not only confirmed their interest and commitment in this area of research but also demonstrated, with a wide range of proposals and through the involvement of new scholars, the relevance of this event, which contributes to nurturing and stimulating research in this area of knowledge.

The relationship between Augmented Reality and Artificial Intelligence, strengthened by the increasing number of trans-disciplinary applications, solicits deep reflections in research fields related to the disciplines of Representation, a convergence place of theoretical and applied research traditionally related to architecture, the city, and the territory. In fact, the symposium proposed to the attention of scholars an exchange of ideas, experiences, and a discussion of research priorities and objectives, declined on the themes of Augmented Reality and Artificial Intelligence as tools for the analysis and knowledge of the environment around us, for architectural, environmental or infrastructural design and monitoring, and for the enhancement and communication of Cultural Heritage.

Based on these cultural directions, two different topics were identified, orienting contributions on: "AI/AR for space recognition and valorization", within Feature Recognition, Image Segmentation, Data Libraries, Marker/Markerless tracking, Interaction, and Immersive Experiences; "AI/AR for design, monitoring, and management" includes research and experiences on Point Clouds, Semantics and Ontologies, Element Classification, Hierarchical Structures, Sensors, and Archiving.

Following the institutional greetings of Francesca Fatta, president of UID, there was the opening address given by the members of the promoting committee, in which it was recalled how the research proposed for the two-day symposium would be, after the seminar, discussed by the members of the International Scientific Committee and the Reviewers Committee, who would provide guidelines, stimuli for ongoing research, as well as suggestions, requests for clarification and in-depth analysis concerning those already completed, a review process aimed at the production of the extended papers for publication in volume, expected in February 2023.

For this reason, and as the cutting-edge topics addressed require, the outcomes gathered in these two

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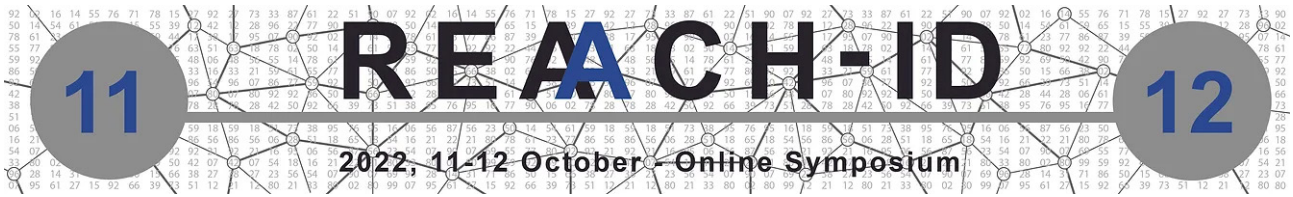

Fig. 1. Locandina dell'evento.

days of study turn out to be as up-to-date as possible, in complete adherence with the issues listed in the Final Report *Study on quality in 3D digitization of tangible cultural heritage: mapping parameters, formats, standards, benchmarks, methodologies, and guidelines* [1] funded by the European Community Commission Directorate-General of Communications Networks, Content & Technology. That report, published in April 2022, is the outcome of the research carried out by the consortium formed by the Cyprus University of Technology (CUT) and a group of experts, a 360-degree exploration of heritage digitization, including the concepts of complexity and quality, with a focus on standards and formats, but without neglecting to broaden the look at 3D digitization technologies and the world of Architecture, Engineering & Construction (AEC). In the last section of the report, devoted to the *Forecast Impact of Future Technological Advance*s, individual points of attention in convergence with the REAACH-ID Symposium topics are, among others, Extended Reality (AR, VR, MR), Metaverse, 5G and the Continued Advancement of Mobile Technologies, BIM, HBIM, HHBIM, and Digital Twins, Artificial Intelligence/Machine Learning, Blockchain Technologies.

The analysis of the keywords chosen by the authors to represent the content of their research brings out the expected interest in digital technologies, primarily AR and AI, and their relations with Methodologies of Digital Acquisition (Photogrammetry and UAV Photogrammetry), Interpretive and Informational Visualization (BIM, H-BIM, 3D Modeling, VPL, Digital Fabrication, Mapping), Visual Communication (VR, Immersive Environment, Interactive Representation, and Hologram). In addition, several application areas emerge (Cultural Heritage, Museum, Education, Archaeology, Street Art, Urban, Built Heritage, Virtual Museum) and AI-related Practices (Machine Learning and Semantic Segmentation). Still, other terms seem likely to foreshadow new representation challenges, opening up new research and application fields.

The two-day symposium consisted of seven sessions (a total of 29 papers and 109 authors) and three invited presentations by keynote speakers: Laura Vigo (Musée des Beaux-Arts de Montréal), with a presentation entitled *Subverting Museum's Untouchability through Digital?*, Arnadi Murtyoso (ETH Zürich), with the talk *Semantically enriched architectural photogrammetry using deep learning methods*, and Francesco Fassi (Department of Architecture, Construction Engineering and the Built Environment, Politecnico di Milano), who presented the speech *MR techniques for on-site fruition of 3D survey. The case of Milan Cathedral*. Twenty video presentations (40 authors) completed the scope of contributions.

Lastly, it is important to mention how this edition of the conference also records a significant evolution of REAACH-ID Symposium which, during this year, promoted the founding, with some members of the Scientific Committee and emerging scholars in the different sessions of the Symposium, the REAACH Association (REpresentation Advances And Challenges APS, Social Promotion Association).

The association aims to organize conferences and seminars, publications, as well as workshops and training activities devoted to fostering the exchange of knowledge and multidisciplinary research related to the advances and challenges on which the Disciplines of Representation are engaged in the present day [2].

We can say that also for this edition, we have witnessed a rich meeting, full of stimuli and challenges for the continuation of research in very rapid evolution, which will find new space for discussion in the next edition of the symposium, which will take place 10-11 October 2023.

Notes

[1] EU Study VIGIE-2020/654. <https://digital-strategy.ec.europa.eu/en/library/study-quality-3d-digitisation-tangible-cultural-heritage> (accessed 9 December 2022).

[2] <https://www.reaach.eu/> (accessed 9 December 2022).

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The UID Library

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2022

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UID Awards 2022

UID Awards 2022

Special mention to Annamaria Parodi

The special mention to Annamaria Parodi aims to recognize and reward the fundamental role played for the development of the discipline of Drawing and for the progressive definition of disciplinary aspects.
In the years of collaboration with Gaspare de Fiore at the Department of Sciences for Architecture in Genoa she was an indispensable promoter of the activation of the University Diploma in Industrial Design, then evolved into a Degree Course; she was responsible for the CampusOne project and also responsible for masters and research conventions, able to combine the relationship between the 'new' and the 'tradition' with attention and constancy.
In the scientific field, she has worked on the issues of representation at different scales and in different fields; since 1993 she developed an integrated survey methodology for the analysis of the built and, at the same time, dealt with the issues of perception and visual communication, up to teaching and research on graphics.
UID Targa d'Argento in 1996, she is now awarded by the UID with the special mention for her merits of recognized excellence in the promotion and development of Drawing discipline.
Genoa is grateful to her and thanks her particularly for the contribution to its University.

Golden award to Mario Trimarchi

The UID 2022 Golden award to Mario Trimarchi intends to reward those who, starting from the solid foundations of Drawing, has been able to combine and integrate them with a visual and product design, becoming a professional and a teacher of the highest level.
Born in Messina, he graduated in Architecture with Franco Purini, with whom he collaborates; he is a successful designer, who expresses himself through a poetic language, based on aesthetic values and believes in the project as a tool to spread poetry in the world of things.
His work ranges in different fields, from the study of communication, to design, to architecture; the *fil rouge* of the project is always the rappresentation, understood as an expression of thought, which leads to a personal project, unique and therefore not trivial.
As for didactics, he is a professor capable of transmitting notions with passion and involvement, establishing an active and participatory relationship with students.
His contribution to Drawing is continuous and intimate, so much so that he recently exhibited his drawings in two solo exhibitions, in Paris and Barcelona.
The figure of Mario Trimarchi undoubtedly ranks as an excellence in the world of visual communication translating ideas into signs and signs into projects, in a continuous and profitable research.

Golden award to Rossella Salerno

The UID 2022 Golden award to Rossella Salerno intends to reward a scholar of the disciplines of Drawing understood as a conceptual expression and theoretical vector for the reading of architecture and its project.
The research and teaching activities focused on the increasingly massive use of digital techniques, addressing both the technical aspect and the critical and inclusive one, for the analysis of new balances among material and immaterial dimensions of representation.
In her University she has promoted and favored the important issues of communication, image, information sharing, connected with new digital technologies.
Within the Scientific Society, she competently coordinated and shared the three seminars on research from 2019 to 2022, and shared two important documents: the 'vademecum' for reviewers and the new declaratory of the Scientific Disciplinary Sector, unanimously approved by the Assembly respectively in 2019 and 2021.
Finally, my personal thanks go to her for her supporting role as vice president of the UID, from 2019 to today.

Silver awards "Gaspare De Fiore"

Francesca Gasperuzzo. Mostruose Architetture: le obliquazioni di Juan Caramuel De Lobkowitz; supervisor: professor Agostino De Rosa; co-supervisor: professor Gundula Rakowitz; tutor: architect Luigi Pavan
For excellently investigating, through the analytical methods of representation, the oblique design system described by the Madrid monk Caramuel de Lobkowitz in *Architectura civil recta y obliqua* published in Vigevano in 1678. The rigorous methodological structure of the thesis, rich with relevant iconographic apparatus and autograph representations, concludes with a clear analysis of the project for the historic center of Vigevano in which Caramuel establishes precise projective rules analyzed by Francesca Gasperuzzo with great scientific awareness. The relevance of the bibliography and the richness of the accompanying apparatus demonstrate how the research was carried out with extreme methodological rigor that it is hoped will be a harbinger of subsequent developments.

Anna Lisa Pecora, Lo spazio rappresentato per il disturbo dello spettro autistico (ASD), tutor: professor Alessandra Pagliano; co-tutor: architect Erminia Attaianese; external consultant: doctor Giovanni Minucci
For choosing to investigate a profoundly interdisciplinary topic, with a solid and structured methodological basis, with a precise investigation of the state of the art and a valid project verification, remaining anchored in the epistemological bearing of the discipline of Drawing in its interests in the perceptological and technological-digital fields and opening, in fact, a broadly developable research field.