Readings/Rereadings

Rassegna 32 on *(Maquette)*, or the Physical Model

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The journal *Rassegna. Problemi di architettura dell'ambiente* (Review. Problems of the Architecture of the Environment), directed by Vittorio Gregotti and graphically edited by Pierluigi Cerri, was published from 1979 to 1999. Comprising 77 monographic numbers issued quarterly, each coordinated by influential cultural figures of the time, the periodical was developed during a historical period where the scientific, social, and professional worlds were preparing for the inexorable advent of the new millennium and the consequent phase of change on both the theoretical and practical levels. As the title implies, this editorial is a collection of considerations designed to enhance the understanding of the various architectural characters within significant macro themes.

The issue number 32 of *Rassegna*, published in December 1987, was edited by Friulian architect and professor of composition Giovanni Vragnaz. This issue focuses on the theme of the 'maquette', which is the designer's fundamental physical support for conceiving, studying, and transmitting his or her thinking. The decision to dedicate an entire issue to this topic underscores the significance attributed to this tool in the compositional and communicative processes in architecture and beyond. The analyses conducted within the volume permit the reader to gain insight into the various dimensions and potential of the model. This provides a comprehensive and stimulating overview of the subject matter, which is presented in a clear and current manner.

In accordance with the graphic design of the journal, the cover is designed to visually focus on a few clear elements (fig. 1). On the one hand, the image of the great wooden model of the competition proposal for the facade of Santa Maria del Fiore submitted by Giovanni Antonio Dosio (16th century) is eloquent and evocative. On the other hand, the concise title of the theme addressed within the pages of the periodical, (Maquette), is also noteworthy. The two graphic signs, placed deliberately in round brackets, serve to highlight the breadth and generality of the topic, which is then explored in depth within nine essays according to a historical and interdisciplinary excursus.

The curator, from an etymological perspective, favors the term 'maquette' [1] over the word 'model', which is inherently ambiguous and refers to something to be imitated. Deriving from the Latin "*macula*", meaning "small sketch, drawing, rough draft", the term would be more accurately defined as a technique of the creative process, open

Fig. 1. Cover image of Rassegna No. 32, (Maquette).

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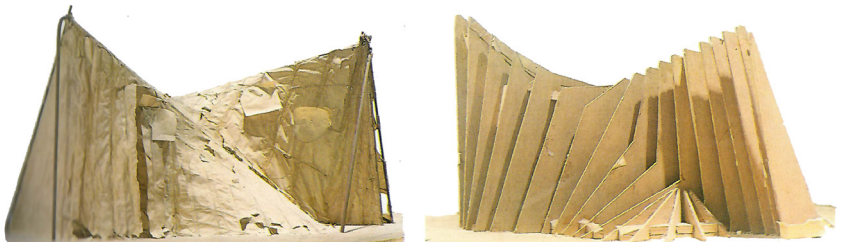

Fig. 2. Le Corbusier, two original preliminary model of the Pavillon Philips, 1958 (photo by E. Kossakowski, CCI, Paris).

and material, made up of successive modifications that can be evaluated by manual research. It serves to represent, to crystallize a thought and to anticipate a constructive reality [Vragnaz 1987, p. 5; Croset 1987, p. 45]. In the broadest sense, modeling can be considered a traditional technique of drawing. It encompasses a range of activities, from freehand sketching, which is a spontaneous and intuitive exercise in communication, to the clean tracing of an executive project. In both cases, there is an interaction between the means (drawing) and the end (project) [Maldonado 1987, p. 59]. Scale or life-size models (mock-ups) are usually constructed for the purpose of better assessing the aesthetic or functional characteristics of the reproduced objects (fig. 2). Supportive of drawing to improve the project according to Leon Battista Alberti, or its materialization for Giorgio Vasari, the maquette is regarded as the technical apparatus available to the architect to represent, plan, and construct, as well as to document, communicate, and propose potential new realities.

With this clarification, the model can be understood as a maquette in the various essays. It serves as both a drawing, prototype, or model of architecture and a resolving device for managing the construction site. Additionally, it can be used in cartography for military and defensive purposes or as an autonomous and independent work of art. In summary, *Maquette* aims to expand the field of investigation and examine the concept of the model, not only as a well-established theoretical instrument in the relationship between ideas and representation, but also as an object with multifaceted meanings and functions, as evidenced by its historical evolution within the context of various disciplinary discourses, between architecture, engineering, and visual arts in general.

In summary, the monographs are organized by subtopics of investigation [2]. Riccardo Pacciani and Lionello Puppi address the architectural model in the Renaissance, while Jacques Guillerme and Vincent Bradel outline the role of the maquette in evidential and civil engineering. Pierre-Alain Croset and Tomás Maldonado offer theoretical and practical reflections on the historical use of the tool. Finally, Massimo Quaini and, to a certain extent, Marc Miller explain the historical evolution of the spatial and urban model, while Germano Celant describes the maquette as a leading work in the 20th-century avant-garde.

This review interprets and reorganizes the theme of the model addressed in the various essays by splitting the conceptual and historical spheres. This is done to actualize its definition almost four decades after the publishing of *Maquette*.

On the concept of model

By definition, a model is an 'object of mimesis' that reproduces the form and characteristics of a work, whether existing or ideal, in full or at a different scale, as Pierre-Alain Croset reminds in the essay *Microcosms of the Architect* [Croset 1987, p. 47]. The term can be applied to areas other than architecture and it is most used to describe the principles of construction and reproduction: the former concept detects the action of assembling and joining the parts, while the latter one identifies the model as an artifact designed to describe in a personal and interpretive way the idea of a physical space by stimulating the critical imagination of the designer (architect, engineer, or product designer) or the observer. The act of representation entails the projection and crystallization of the architect's conceptual framework with plans, elevations, and maquettes. In this manner, the project is externalized, and its form is subjected to the judgment of the senses. For Croset, the architectural maquette it's a model that has been restored to its intrinsic dimension as an object. It can interact with the author's creative process as a materialization of his intellect. Its three-dimensionality affects the observer on a sensory level, transferring to him an idea of volume and space. A study tool that is intelligible, tactile, and visual, which allows the prefigured building to be represented, explored, controlled, and transformed [Croset 1987, p. 48].

The theme of perception is also addressed in Massimo Quaini's essay, *The Lay of the Land*. Model-making

procedures document the design and practical steps that determine the form, space, and composition of an architecture. In this context, the maquette can be considered a representation that is comparable and complementary to the drawing as a subjective tool for elaborating and presenting the design idea. But compared to the drawing, the materiality of the model evokes a spatial-sensory response in the viewer. The physical maquette, through haptic, kinesthetic, and synesthetic perception, conveys the 'concreteness' of space. This is in addition to the projective and Euclidean 'abstraction' required by sight, which is considered the intellectual sense par excellence.
As stated by Quaini, the designer uses the model to both visualize the formal, structural, or functional assumptions of an idea and to present the project to external parties, including clients, performers, manufacturers, and the public. Indeed, it can be employed in two distinct ways. On the one hand, it can be used to facilitate the learning of architectural and urban design principles for those new to the field. On the other hand, it can be utilized to enhance the clarity of conventional and symbolic language with a tangible object [Quaini 1987].
In his essay *Issues of Similarity*, the artist, designer, and philosopher Tomás Maldonado elucidates the creative-constructive strategy of modeling, which is based on the concept of similarity. Maldonado posits that the manifestation of similarity, both quantitatively and qualitatively, varies across models. In fact, the degree of similarity between the original and the reproduced objects can be attributed to three distinct categories: homology (form and function), analogy (structure and function), and isomorphism (form and structure, sometimes by function).

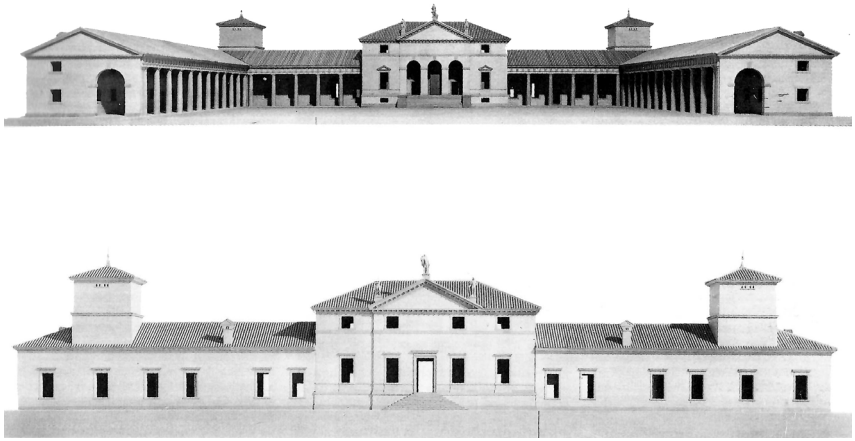

Fig. 3. Wooden model of Villa Saraceno in Finale, 1973. Centro Internazionale di Studi di Architettura A. Palladio.

The author additionally notes that both 'replicative' iconic models, which reiterate a 'referent' through proportional reduction (architectural maquette), and life-size models, such as the industrial prototype, are based on the principle of similarity. In the latter case, the product may be classified as either non-functional, semi-functional, or functional, depending on the operability of the parts and the introduction of appropriate mechanical aids. Finally, there are prototypes that are nearly indistinguishable from the final product and possess the same formal, functional, structural, and operational configuration as the modeled object [Maldonado 1987, pp. 57-59].
To the 'iconic' maquettes, drawings, and prototypes (kinesthetic and approximate analogies), the corpus of models also includes 'aniconic' diagrammatic and mathematical models (abstract algebraic reductions). These are similar models, where structure and function predominate over the form. These opinions of Tomás Maldonado [Maldonado 1987, p. 60] are shared and traceable in the essay *The Rôle of the Model in the Scientific Pursuit by Jacques Guillerme* [Guillerme 1987, p. 29].
In any case, the historical evolution of model theory and practice can be observed in terms of their role and use by the designer, performer, public, or client. The tracing of a linear and clarifying path of the different conceptions on the subject is a complex operation due to the realization purposes and the evolution of various knowledge.

Historical evolution of maquette between architecture, engineering, and art
According to Tomás Maldonado, physical maquettes –whether original or contemporary interpretations– are particularly useful for documenting and publicizing the technical and theoretical progress, as well as for bringing back to their origins –through the reconstruction and completion of architectural and archaeological remains– lost or unrealized works based on iconographic

and textual sources [Maldonado 1987]. The history of architectural models has accompanied humans throughout the centuries and bears witness to the evolution of technology and the profession, although, for a period, architectural historians did not consider them to be of interest.

It is evident that the ancient Sumerian, Egyptian, Roman, and Greek architects made use of them. However, it was during the Renaissance that maquettes assumed cultural significance, particularly in the context of gaining client approval of the proposed idea and as tools for research and design delineation to be passed on to the performers and workers involved. The issue of the Italian Renaissance building site is addressed in the essays by historians Riccardo Pacciani, *Wooden Models in Renaissance Design* and Lionello Puppi, *Models by Palladio, Palladian models*. Here the authors elucidate the stages of advancement of technical knowledge and provide theoretical references, also in comparison with the building practice in the Venetian and transalpine territories.

Croset and Pacciani remind us that in first- and second-hand sources the use of model was documented from the 14th century onward, referable to the Latin root *modus* (measure), its diminutive *modŭlus*, the terms *exemplar* and, later, *designum* [Croset 1987, p. 47; Pacciani 1987, p. 7]. As evidenced by Guillerme and Maldonado, in those years the maquette played a pivotal role in the differentiation and emancipation of the architect from the medieval master builder. This shift in patron behavior can be attributed to a change in their mindset, which began in the 15th century and continued throughout the subsequent centuries. During this period, patrons became increasingly interested in viewing the final version of a commissioned work before it was completed. At the same time, new drawing techniques were being developed, including linear perspective, and sophisticated scale models were constructed to visually translate the image of the new architecture to build. In this context, the execution of the model, and thus the consequent success of the project, could be evaluated according to the ingenuity of the craftsman or the genius of the theorist [Guillerme 1987]. A qualification of architects such as Brunelleschi, Ghiberti, or Michelozzo, who had received training in goldsmithing, woodworking, carving, and other crafts. They were adept at translating large-scale architectural works into smaller, more accessible forms, facilitating comprehension even for those not directly involved in the construction process [Maldonado 1987, p. 58].

In his analysis, Pacciani delineates how in some major Italian construction sites, such as the Duomo in Florence and San Petronio in Bologna, models were intended to simulate the formal and aesthetic qualities of architecture. Models of varying scale and detail, constructed from wood or different material, were useful for proposing an idea, resolving administrative and construction issues related to the site, and studying how to integrate the new building into the context or onto existing structures. The maquettes enabled the assessment of the placement of scaffolding and ribs, as well as the verification of the structures, techniques, materials, and decorations. Additionally, they facilitated the quantification of the labor required and the estimation of the costs [Pacciani 1987, pp. 10-13].

However, as documented by Pacciani and, more extensively, by Puppi, the Italian procedure was not widely implemented beyond the Alps or in the Venetian territories of the 15th and 16th centuries. In fact, to support dimensional documentation, 1:1 scale wooden outline was adopted in these places for ornamentation only [Pacciani 1987, p. 10; Puppi 1987, p. 22]. This 'rejection' of the model, as highlighted by Puppi, was a common practice among prominent architects such as Andrea Palladio and Vincenzo Scamozzi. In their cultural context, maquettes were regarded as ambiguous objects with a misleading reduction in scale. They could establish privileged, yet unreal, points of view [Puppi 1987, pp. 20, 25The Venetian Renaissance architect had an intellectual role that commenced with the conceptualization of the project and concluded with its realization, coordinating, and controlling the execution of the technical specializations involved, relying mostly on the use of drawing. There during the 15th century the notion of model was exhausted precisely in that of 'drawing in clean', or, rather, *model over disegno* and *modellum seu designum*, defined at the end of a preliminary graphic research approved by the client and accompanied by textual notes for the workers and the *protho de la fabrica* [Puppi 1987, p. 20].

Palladio's factories, which were based on classical models, became fundamental examples for the modern age. They were appreciable through the treatise *I Quattro Libri dell'Architettura* [Palladio 1570], drawings and site visits. Although physical maquettes did not form part of Palladio's design practice, there was a need to collect, compare, and visualize his works through their three-dimensional translation. This was achieved in the 1973 exhibition dedicated to the architect, which was curated by Renato Cevese and held in the Basilica Palladiana in Vicenza (fig. 3) [Cevese 1973; 1976].

Despite the divergence in methodological approach, the model witnessed

a transformation in the documentation of design hypotheses and their presentation to clients. This evolution can be observed in the case of Antonio da Sangallo the Younger and Michelangelo Buonarroti, though with markedly disparate approaches and circumstances as detailed in Pacciani's monograph [Pacciani 1987, pp. 16, 17].
The model was not only the result of a need for global and simultaneous perception of all aspects of a building; it was also the ceremonial tool and organization of space and power, with military and imperial finalization. This is in accordance with Quaini's essay. Indeed, for both strategic and collectors' reasons, numerous relief models of squares, fortresses, mountain, and coastal territories became prevalent in the 18th century as aids to understanding and controlling the territory and its pre-existences [Quaini 1987, pp. 65-68].
As Croset reminds, other types of architectural maquettes were also prevalent, particularly during the Baroque period. Scenic machines and ephemeral apparatus were designed and constructed in full scale for celebratory occasions, after which they were dismantled and destroyed. Such models were frequently integrated with perspectives and mechanical devices to simulate large-scale visual spectacles [Croset 1987, p. 50].
The models were not merely instrumental in the evolution of the research and construction of architecture. In fact, these 'objects of fiction' also entered scientific discourse to package and document major public works and infrastructure [Bradel 1987], for evidentiary purposes of engineering theories [Guillerme 1987], but also as tools for reading the territory [Quaini 1987] and documenting city development [3] [Miller 1987].
In *Three Invisible Collections for a Non-existent Museum*, Vincent Bradel examines the models constructed between the 18th and 19th centuries of public engineering works, including harbor accommodations, hydroelectric dams, road and rail systems, mines and reservoirs, lighthouses, and bridges. The varying scales of the maquettes demonstrated the soundness of the projects and facilitated the understanding of complex structures. At the same time, they fulfilled a deliberately disseminative role [Bradel 1987].
Guillerme, remaining within the field of engineering, elucidates how historically, models have been employed to exemplify the functioning of mechanisms, to study interventions of stiffening or structural lightening, and to evaluate the strength (internal and external, in terms of time and deformation) by comparative tests on homogeneous elements and materials. The initial analysis was purely qualitative, but subsequently evolved into more rigorous quantitative and numerical investigations. The "theory of the invariability of the effects" has consistently been predicated on the capacity to withstand rigorous testing of models at varying scales of reproduction. Conversely, the empirical observation of the effects on full-scale objects was conducted in construction sites. In this context, the models created by Antoni Gaudí (fig. 4), and Pier Luigi Nervi are of great interest [Guillerme 1987].
In addition, models of the territory, which did not describe its quantitative aspects –mainly offered by cartography by azimuth and planimetric projection– but also those inherent qualities of the landscape. As geographer Massimo Quaini elucidates in exhaustive detail, the landscape, comprising diverse morphological, physical-natural, and anthropic structures, also found its definition within the model. He delineates that the dichotomy between

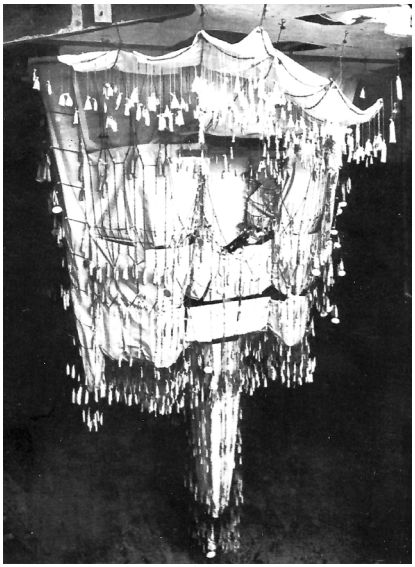

Fig. 4. Antoni Gaudí, funicolar model of the Güell colony, Barcelona, 1898 (Roberto Pane, Antoni Gaudí, Milano 1964).

quantitative and qualitative paradigms is predicated upon Ptolemaic theory, which was subsequently revived during the Renaissance and in the 17th century. It reflects the comparison between the geographical representation (quantity and extent of places, measure, and proportion of distances) composed of letters and signs, and the chorographic representation (quality of places by their similarity and true form) that uses drawings, paintings and later models or plan-relief. The advent of pictorial cartography permitted the distinction between paper and model, two terms that, in the 17th century, were used to convey the same meaning. The model map is advantageous in that it allows the user to immediately place an object in space and identify a topographic

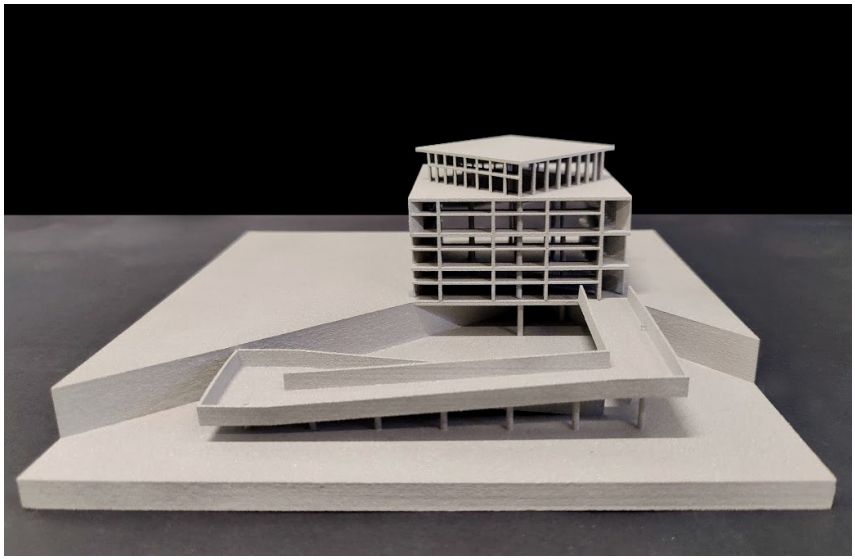

Fig. 5. Le Corbusier, the shadow tower in Chandigarh. Rapid prototyping model, laser solidified aluminum powder sintering.

feature in the landscape. For the author, that the combination of the two views is possible for the model, albeit with certain limitations. Conversely, the representation of an object on paper, both horizontally and vertically, necessitates techniques that compromise the perspective aspect or the localization function [Quaini 1987, pp. 63-65].
Furthermore, Quaini notes that by the end of the 18th century, the absence of elevation indications was perceived as a limitation of cartography, which could be overcome only through the technical paper of contours and descriptive geometry developed by Gaspard Monge. This integration subjected relief to a rigorous geometric language, effectively stripping it of any pictorial expressiveness. In any case, the use of topographic models was gradually superseded by the production of maps. This occurred concurrently with the decline in the significance of the globe as a system for representing the entire surface of the Earth [Quaini 1987, p. 70]. To the large scale offered by models, the modern viewpoint preferred the smaller scale of the map, where the multiple information presented in abstract language was easier to read and understand.
A critical examination of the role of the model itself, as addressed by Germano Celant in *The Project Is an Object*, reveals that from the beginning of the twentieth century, the practice of maquettes was invested by an epistemological rupture produced by the historical Avantgardes. The critic posits that the model, as an autonomous research device, can disregard the mimesis of its object reality and describing an ideational process by becoming a work of art. Consider the Cubist techniques of *papier collé* and *collage*, and later the Dadaist assemblages or ready-made, which could stimulate architects' creativity with new ideas derived from everyday objects. The Russian avant-gardes (Constructivism and Suprematism, with Kazimir Malevič and Vladimir Tatlin) and Neoplasticism (with, for example, Piet Mondrian, Theo van Doesburg, Georges Vantongerloo, Jean Gorin, and many others) sought, in different ways, to find new codes that were not imitative of objective reality. This rejection of history and the present was a defining feature of both movements. Starting from the same premise, the Dadaists, on the other hand, arrived at opposite operations and outcomes by resorting to the 'disorientation' induced by the re-composition of everyday objects and remnants. In opposition to tradition and academicism, the 'degraded' maquette simultaneously acquired an autonomous, self-referential, and artistic value. This resulted in a reversal of the conventional concept of architectural modeling: from the reproduction of an existing or planned building, they proceeded to conceptualize the work based on the model's suggestions [Celant 1987, p. 79]. These works were created to criticize society, but at the same time to stimulate unpredictable senses. In addition to parodying the project, Dadaist maquettes also dealt with the secondary effect induced by the recovery of the real. The purposeless image conveyed originality in rupture and disorder, as exemplified by Marcel Duchamp.
As Celant posits, the New Avantgardes and movements between 1960s and 1980s established new values, types, and materials for the model through the formal experimentation. These include, among others, the "artist architectures" of Jean Dubuffet and Nicolas Schöffer. The maquette became confused with

the object and thus with the work. The author argued that this confusion resulted in the maquette becoming sculpture itself, or alternatively, that it remained an architecture only drawn as the premise of the construction or its demonstration. Two additional circumstances posed important questions about the establishment and mode of contemporary three-dimensional thinking. The first was the use of the model in the representation of geometric form for demonstrative purposes. The second was its employment in the form research, understood as the dislocation of matter in space through the geometric synthesis of the structural pattern.
Finally, Croset's reflection on the maquette as an object evocative of the notions of measure, norm, rhythm, mode, and limit, and from the assumed Platonic sense of 'ideal form', also fits in. A recurring paradigm in architects such as Peter Eisenman and Massimo Scolari. For them, the model manifested itself as the result of a slow and patient maturation of artistic thought and the self-expression of architecture [Croset 1987, pp. 45-52].

The contemporary relevance of the physical model

A reexamination of *Maquette*, conducted nearly four decades after its publication, reveals that its conceptual and theoretical content remains as pertinent as ever, as well as its historical delineation of the use of models. Despite its sporadic use in the late 1900s and a stated apprehension about the proliferation of new digital modes of representation, the model has remained a fundamental element in the design, management, and documentation of a work. Indeed, physical models remain a valuable teaching and learning tool in architectural and engineering education. They are also an important research tool, facilitating the dissemination of historical and figurative outcomes. The capacity of physical models to convey psychological and perceptual information is a significant factor in their continued use.
To date, the term 'maquette' can be understood as both a tangible and an intangible artifact that responds to the conceptual dichotomy between the 'real' and the 'digital'. This distinction necessitates the actualization of the definition of the term 'model'. The construction, structure, and investigation of architectural designs can be facilitated by the use of digital modeling, surveying, and visualization tools that simulate architectural elements and spaces. These tools enhance the qualities of the designs through the incorporation of realism and proportion. The three-dimensional model is still the product of a creative, semantic, and geometrically defining act. It is the result of assembly and fitting operations offered by the increasingly popular solid, mesh, NURBS, BIM, and parametric modeling techniques, which grant continuous manipulation and sharing of content. On occasion, these maquettes can replicate real objects of various sizes that can be obtained through advanced acquisition practices, including 3D scanning, laser scanning, and photogrammetry. These techniques are useful in detecting and providing a highly accurate reading of the state of art for documentation purposes. Finally, digital models can be converted into virtual/immersive or augmented reality, or they can be used to produce physical artifacts through rapid prototyping.
In the current era of digitization, virtual models permit the designer to enter and navigate ideal architectural and spatial configurations, which are represented in life-size and replicate the visual sensations of the real world through real-time rendering. Nevertheless, the simulation of finishes does not permit direct tactile feedback with the materiality of surfaces. Similarly, the lighting conveys a mediated impression of reality, despite the geolocation of the maquette. The presence of a screen between the visitor and the model also affects the conditioning of digital, virtual, and augmented models.
Consequently, spatial and formal research aimed at creating environments with architectural qualities that involve the complete involvement of the senses continues to find the physical model to be the most effective tool, capable of bringing the reproduced work closer to the real thing, albeit on a smaller scale. A possibility offered once again by physical 'handmade' maquettes, creative results of the artist and real works of art, or by the production of models through 3D printing (fig. 5), which, depending on the technology and materials used, can translate digital models into physical ones, thus allowing even hypersensitive people access to the concrete, tactile and material content of the reproduced objects.
We therefore answer the question posed by Tomás Maldonado within the pages of the editorial about the possible future of iconic and aniconic modeling because of the contemporary computer science revolution [Maldonado 1987, p. 61]. This reflection addresses the implications of digital technologies and their simulation of reality and dematerialization of form. The author subsequently expands upon these themes in the book *Reale e virtuale* [Maldonado 1992].
Computer graphics and digital image processing facilitate the performance of numerous functions that were previously the exclusive domain of traditional modeling techniques. This enables the creation of a multitude

of potential applications. Consider the paradigm shift in the construction industry brought about by Building Information Modeling (BIM). This innovative approach not only facilitates collaborative and integrated design but also optimizes information gathering and management of the entire job order, including the construction and maintenance of the building. A hyper-structured model suitable for clearly defining quantitative aspects and identifying possible conflicts in implementation in advance, but somehow depriving the work of the qualitative aspect due to its excessive objectivity.
The advent of digital modeling and advanced simulation techniques has given rise to new professions, including the BIM specialist, coordinator, and manager, as well as the 3D artist. This last one combines technical expertise with personal creativity, as evidenced by the unique nature of architectural models.
As anticipated, digital maquettes, or computer-generated models, have become a prevalent feature in the realm of project and content dissemination. The advantage of these numerical and parametric models is that they contain and implement both geometric and nongeometric content that can be manipulated and managed in a single system organized at multiple reading levels. This provides the same performance as iconic and diagrammatic models. The visual arts, semiotics, psychology of perception, industrial production, robotics, as well as technical and scientific research are all engaged in a process of self-reflection and measurement against the operational field of virtuality, which encompasses both positive outcomes and possible risks [Maldonado 1992].
In 1987, there was a concern that the use of digital tools, which were not yet commonplace at the time, would render professionals unprepared. Additionally, there was a debate about the role of professional creativity in the new modeling dimension. The current situation is analogous to that described above. The question is whether our intellectual, creative, and sensory abilities can be replicated and replaced by the increasingly popular artificial intelligence programs that are advancing hypotheses increasingly ambitious in these fields. This could potentially deprive us of our uniqueness.

Notes

[1] From the Treccani dictionary: "Sketch, draft; in particular, model or reproduction in reduced size of a sculpture, monument, construction, mobile structure (ship, airplane, automobile, etc.); in the graphic arts, sketch of a poster, advertisement, book cover, and the like".

[2] The English translation of the monographs appear starting the on page 123 in the copies distributed abroad.

[3] Such as the *Robert Moses' Model*, the Panorama of New York City realized for the 1964-1965 New York World's Fair described by Marc Miller. The urban model, which covers an area of 836 square meters, was updated in later years with the addition of new buildings to ensure that the image of the entire metropolis always remained current.

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