

What the Hell Happened to Me?

On the Afterlife and Decay of Models

Teresa Fankhänel

1 Oliver Elser, "On the History of the Architectural Model in the 20th Century," in *The Architectural Model. Tool, Fetish, Small Utopia*, eds. Oliver Elser and Peter Cachola Schmal (Zurich: Scheidegger & Spiess, 2012), 11–22.

2 Walter Grasskamp, "Sentimentale Modelle," *Kunstforum International*, no. 2 (1980): 54–79.

3 A sample of recent case studies looking at individual historical models: Oliver Elser and Peter Cachola Schmal, eds., *The Architectural Model. Tool, Fetish, Small Utopia* (Zurich: Scheidegger & Spiess, 2012). Ralf Liptau, *Architekturen bilden: Das Modell in Entwurfsprozessen der Nachkriegsmoderne* (Bielefeld: transcript, 2019). Teresa Fankhänel, *The Architectural Models of Theodore Conrad. The 'Miniature Boom' of Mid-Century Modernism* (London: Bloomsbury, 2021). Matthew Wells, *Modelling the Metropolis. The Architectural Model in Victorian London* (Zurich: gta Verlag, 2022). David Lund, *A History of Architectural Model Making in Britain. The Unseen Masters of Scale and Vision* (London: Routledge, 2022).

4 Teresa Fankhänel, "Getting Comfortable with Loss," in: *Neue Nachbarn. Einblicke ins Archiv*, eds. Mariann Juha and Andres Lepik (Munich: Architekturmuseum der TUM, 2022).

When you google “architectural + model + destroyed,” two of the first search results are YouTube videos in which architecture students delight in stepping on or dropping their meticulously fabricated miniatures. Other acts of violence against architectural models include rolling over them with your car, lighting them on fire, submerging them in water, shooting them with a crossbow, or having them eaten by a pet. Once you begin to think about it, there are innumerable ways to lose a model.

Models are rarely created to outlast their initial utility. To students, they are an exercise; to architects, they are a design tool and a means of communicating their work; to curators they are a medium of display. After their initial utility ends, they can become mementos or trophies;¹ they can be contractual items or ideal versions of reality;² they can be prized collectibles or traveling ambassadors of a design collection.

But, more often, they become deteriorating hindrances that occupy prime office real estate. In the realm of museums and collections, models are equally a challenge. Aging materials or fragile structural conditions never meant to be preserved are as much a threat to the objects as are accidents, infestation, or the occasional deaccession long after they have entered a collection. While research in the last decades has begun to uncover model histories of the recent past—of the 20th century especially³—much remains to be studied, not least because the farther back one looks, the fewer models there are. The passage of time leads to an exponentially decreasing number of surviving specimens.

Studies on the afterlife and decay of models uncover the opposite: the many ways in which models continue to exist after their initial purposes have been fulfilled. When the dust settles, models enter their afterlife; they endure on shelves in offices, are tucked away in basements, or proudly paraded behind glass in archives or museums. Others are stored virtually on hard drives. Some models survive by accident, losing the context of their making; others may take on a new role as (material or digital) spolia. Larger models, such as model parks or cities, might become ruins themselves or survive outside the controlled spaces of archives. Each model's materiality ultimately plays a decisive role in its fate: the resilience of glue and paper presents vastly different challenges than the upkeep of a digital model.⁴ The preservation of models often includes an attempt to conserve not just material constructs or geometric shapes but sensorial and spatial insights of models past.

The contributions in this section examine the changing status of models as objects of value

and the multifaceted reasons for why models are either archived or lost, restored or destroyed, filed away, exhibited, or reused. Three papers look at groups of physical models: Stéphanie Quantin-Biancalani explores French architect Paul Andreu's series of seven spherical exhibition models, Stefanie Brünenberg and Kai Drewes study public buildings and housing projects from the former German Democratic Republic, and Christiane Fülischer assembles student models made of the Weissenhof Siedlung in Stuttgart—whose original context has dissolved and can be reestablished only through meticulous research in order to find the future potential for the remaining objects. The authors dissect how the act of reimagining an object's or a collection's utility through positioning them in a new context can become a creative force. They ask how models could be regarded as spatial resources for a lost built environment and look for ways in which the disappearance of a collection could be compensated by reimagining or reassembling its original context. Each object's materiality informs the research and ultimately foreshadows what might be lost of physical models if they were to be digitized and the viewer relegated to a digital three-dimensional version of the object on a screen. A third contribution by Daniel Cardoso Llach examines how the reconstruction of born-digital models, which are no longer accessible because of the ephemeral nature of their early digital technology, can add new insights to our understanding of the original model's programmed context. It explores digital modeling as an archeological challenge and software and its underlying design strategies themselves as models for architectural thinking at large. Here, questions of sensorial and experiential reconstruction of not just the soft- but hardware merge with technological questions of what it means to reconstruct or recreate an “original” digital work in today's programming environments.

Common to all is a desire to show how the salvage or loss of models can affect the architectural histories we build and the stories we tell about architectural design, thinking, and culture. They ask which histories are edited out and why. To move beyond established certainties of architectural historiography, cracks in physical models, the fragmented nature of records, or the loss of a model's original environment and context are no longer just occasions to be lamented. They present singular opportunities to dig deeper and uncover mechanisms of model and world making that were hitherto hidden underneath an individual model's exterior or inside the intricate processes of modeling the very concept of model making itself.



Exhibition *The Metamorphosis of the Circle*, curated by Serge Salat, Asia, 1991. [Archives d'Aéroports de Paris]

Crossing and Transformation

About Paul Andreu's Sphere
Models

Stéphanie
Quantin-Biancalani

In 2021, an ensemble of architectural models by French architect and engineer Paul Andreu (1938–2018) was donated to the Cité de l'architecture et du patrimoine in Paris. Andreu was one of the major figures of the architectural scene in the second half of the 20th century. He started his career in 1963 as an engineer at Aéroports de Paris, then a public company dedicated to the management and construction of airports. At the age of twenty-nine, he was entrusted with the design of Terminal 1 of the Roissy-Charles de Gaulle Airport (1967–1974), thus becoming a prominent expert of airport architecture on a global scale. In 2002, he left the company to open his own studio after winning the competition for the Grand National Theater in Beijing (1998–2007) and made a rich career as an independent architect, especially in Asia where he was among the few French to make a mark.

One of the donated models was a mysterious sphere representing the Crater (1991–1995), a circular ascent via double escalators in an underground square in La Défense, lit by a large light well and connected to the very epicenter of the project, below the Grande Arche. This item shared many similarities with another spherical model from the collection of the FRAC Centre, which represented the central void of Terminal 1 at Roissy-Charles de Gaulle Airport, the very soul of the architecture, the symbolic beginning of the flight. The two objects had the same shape, dimensions, materials (plexiglass, plastics, metal), and concept. This comparison triggered an encounter with the former model maker, who had a photo of the original display, and research in the company archives of Aéroports de Paris.¹

History and Symbolics

This model was made during a favorable period in Paul Andreu's career, when he was expanding in Asia in the late 1980s and early 1990s. Between 1987 and 1988, he took part in and won a decisive competition: the basic design for Kansai International Airport. At a time when the Japanese construction market was closed to foreign competitors and powerfully coveted by the American industry, Andreu's victory had a strong political and economic dimension, so much so that the French Prime Minister, Jacques Chirac, wrote to the president of Aéroports de Paris to congratulate the architect.² However, Japanese authorities

1 Archives of Aéroports de Paris, 2000388-6; 2000388-7.

2 Letter from Jacques Chirac, Prime Minister, to Bernard Lathière, President of Aéroports de Paris, March 28, 1988. Archives d'ADP, 2012341-1.

later decided to launch an international competition from which Andreu was excluded. Aéroports de Paris, as design engineering office, was credited the basic design. Renzo Piano's winning project outshone Andreu's earlier design as a complex 25-million-passenger airport that was supposed to be built on a 500 hectare artificial island. In 1993, Andreu was awarded the commission for the Maritime Museum in Osaka (1993–2000), whose bold architecture had the same spatial characteristics as Terminal 1 of Roissy-Charles de Gaulle Airport and the Crater of La Défense: a long and narrow underground tunnel, running under the sea, led to the main museum gallery, a circular and high glass dome, bright and semi-transparent, where the *Naniwa Maru*, a real-size replica of a ship of the Edo period, was to be displayed. In 1991, he took part in the competition for an airport in Hiroshima; the same year, a private Japanese client also asked him to design a resort including hotel, apartments, and a golf course in Kumihama Bay, in the northeast of Kyoto.

In this very favorable context, a series of touring exhibitions on his work was organized in 1991 and 1992, mostly in Japan. Hosted by the French cultural institutes, they were on display in Osaka, Kyoto, Tokyo, Seoul, Hong Kong, Taipei, Beijing, and then back in France.³ The show was produced by Aéroports de Paris, clearly serving communication and commercial purposes. As Andreu's team was trying to conquer the Japanese market, the exhibition was supposed to be an advertisement for the company's expertise. The concept was conceived by Serge Salat, a chief engineer and a close co-worker of Paul Andreu. The show was entitled *The Metamorphosis of the Circle*, as was the exhibition catalog, one of the first monographs on Paul Andreu,⁴ which was written by Salat together with Françoise Labbé. Despite the official context, this exhibition had an unexpected conceptual meaning. The series of models was designed by Philippe Cesse, the professional model maker of Aéroports de Paris. It included four spherical models measuring 60 centimeters in diameter and one square model, each set on an aluminum structure and a green marble base. The layout designed for a 100 to 150 square-meter space also included seven scanachromes (photographic enlargements as silkscreen prints on canvas) and 22 framed montages of Andreu's architecture.

These architectural projects, including Terminal 1 of Roissy-Charles de Gaulle Airport, the Transmanche (French terminal of the Channel Tunnel), Hiroshima Airport, and the Sea Sphere, were not necessarily the most famous; some were representations of parts of a project; some were not even built. The model of the Crater was left unfinished as the model maker was unable to complete it before the opening of the show in 1991. But all of them were about transformation, passages, transitions, from earth to air, from shadow to light, from west to east. Paul Andreu's architectures always had a strong spatial symbolism, with dark underground and narrow passageways leading to high circular volumes, dramatized by the expansion of space and the choreography of light. Circles were quite often the mark of the thresholds. Aluminum structures evoked an ancient astronomical instrument, the armillary spheres, which were designed to mimic celestial spheres in order to show the movement of the sun and the stars around the Earth. Moreover, models would occupy the center of the room, and its axis commanded the hanging of the scanachromes and the montages. As presentation models, these spheres were a crystallization of Andreu's work: like alchemy they encapsulated the very essence of his architecture—transitional spaces, passages, and movement—and distilled it in a very expressive way.

3 File of the exhibition *Metamorphosis of the Circle*, 1991. Archives d'Aéroports de Paris, 2000388-6.

4 Serge Salat and Françoise Labbé, *Paul Andreu. Métamorphoses du cercle* (Paris: Electa Moniteur, 1990).

A few years later, according to an undated inventory of Aéroports de Paris' models,⁵ three spherical models were added, probably for another promotional exhibition abroad. Two identical ones represented the Kumihama Springs, whose aim was to integrate the building into the landscape. Paul Andreu attempted to "chop off" the top of the hills to rebuild them organically with architecture and blur the lines of the buildings in the shapes of the landscape. Another model showed a bird-like beacon, one of twelve blue-lit structures powered by solar energy, that would draw a circle with a 12 kilometer diameter on the coast of Kumihama. Like land art, no one would see the twelve lit beacons at one glance, but only part of them, as "the full circle would have existed only in the memory and the imagination of people."⁶ The lesson learned in Japan was first and foremost the lesson of landscape that would matter increasingly in the work of Paul Andreu during the second part of his career. Once again, the spherical shape of the models reflected the conceptual importance of these projects and symbolized the renewed connection between his architecture and earth.

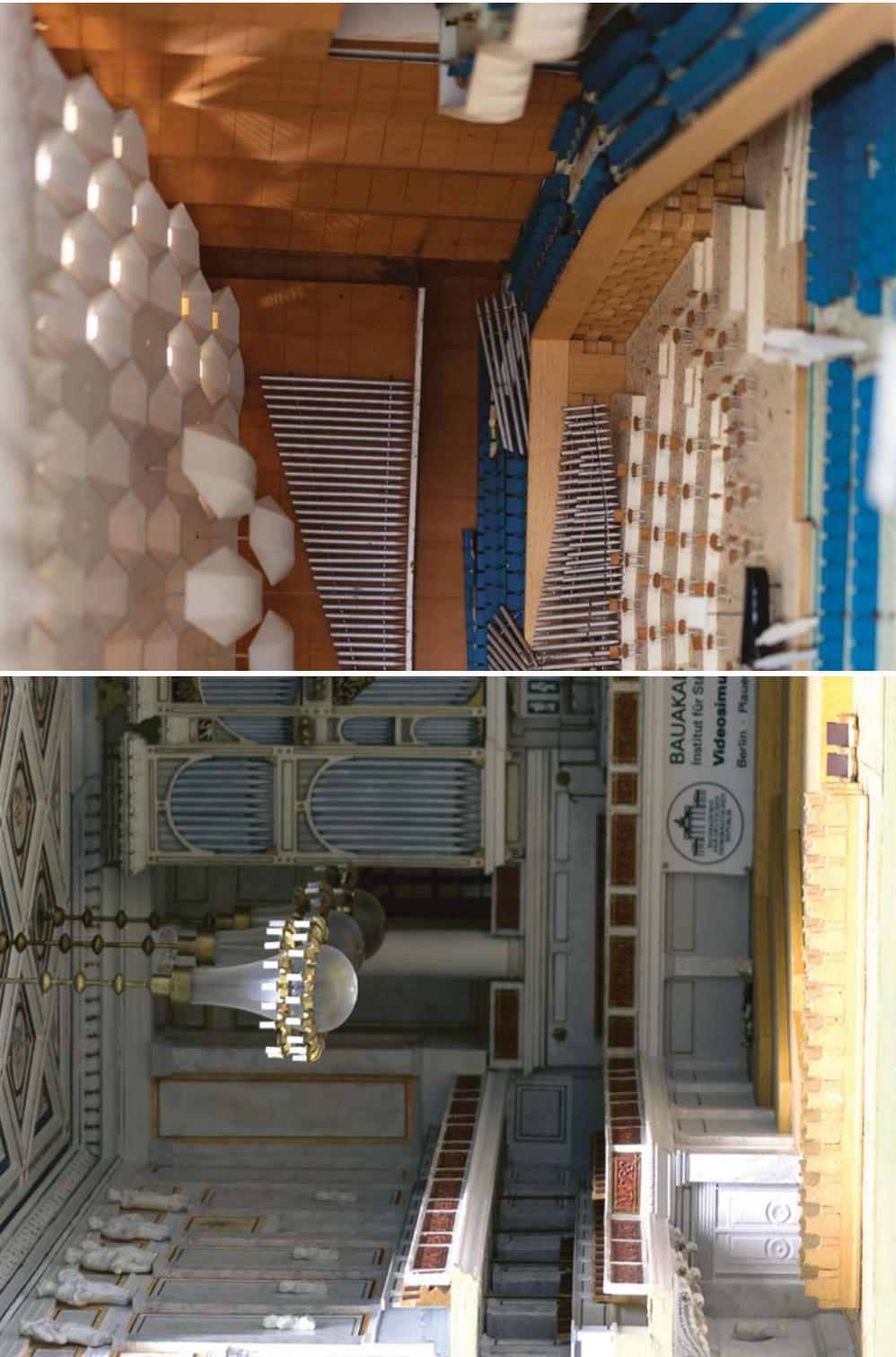
Reactivating Historical Models

In the course of their afterlife, these spherical models were modified or disappeared: they lost their metallic arches and bases, sometimes even one half of the sphere. Their history was unknown and their original meaning forgotten: they were considered individual pieces, without links between them. Research enabled to identify and locate most of them: one is in the collection of the FRAC Centre, two are held in the collection of the Musée national d'art moderne – Centre Pompidou, while one is in the collection of the Cité de l'architecture et du patrimoine. Two are part of private collections. One is known from a different and lower-quality version at the Centre Pompidou, and one is missing.

In the context of an upcoming exhibition on Paul Andreu in 2024, the goal is to reenact the connection between these models and reactivate their symbolism by means of a renewed spatial installation. The overall design, including the scanachromes and montages, has disappeared and there would be no point in rebuilding it today. The marble pedestals and the aluminum structures have also got lost. However, the 2024 show will reunite the sphere models, hang them from the ceiling, and connect them with two key installations of the show: dated from 1969 to 2018, the 69 notebooks of the architect, which motivated a thorough research on Paul Andreu's corpus of work and tell the whole genesis of his major projects, will be displayed as the backbone of the exhibition, as a story of creation. A collection of quotes, as Andreu had such a strong relationship to literature and wrote many essays as well as fiction, will create a parallel narrative about his architecture. Historical research will be developed through plans and archives in distinct side parts of the exhibition. The spatial symbolics of the spherical models does not serve a unilateral celebration of Andreu's work but a hermeneutic approach: models, sketches, and writings will give a comprehensive insight into Paul Andreu's design process, while archives will provide a contextualized and documented overview of his work in architectural history.

5 Inventory of models, model studio of PK (Architecture and Engineering Department), Aéroports de Paris, Orly, n.d. Archives d'Aéroports de Paris, 2000388-6.

6 Conference, Osaka, May 10, 1995. Collection d'architecture moderne et contemporaine, Cité de l'architecture et du patrimoine.



Two interior views of one building: on the left, the model of the rebuilt Schauspielhaus in Berlin — created for an exhibition — and on the right, an alternative design for the interior of the main hall, 1987. [IRS Erkner, Scientific Collections, E5-04 and E5-13]

How to Use Architectural Models

Connecting Archive and
Research

Stefanie Brünenberg
and Kai Drewes

1 Compare for example: *Architektur und bildende Kunst: Zum 20. Jahrestag der DDR im Bezirk Potsdam* (Potsdam, 1969).

2 For some examples see: "So wird es an der Stalinallee Ecke Bersarinstraße Ende 1955 aussehen," *Neues Deutschland*, November 12, 1954; Rei., "Neuer Omnibushof der BVG," *Neues Deutschland*, January 6, 1964; rdt, "Sowjetische Baumaschinenaussstellung in Berlin," April 24, 1959, *Ein neuer Beweis deutsch-sowjetischer Freundschaft*, 253.

3 Allgemeiner Deutscher Nachrichtendienst, "Tanzpalast aus Hirnholzklotzen, Leim und Gips," November 10, 1954, Bild 183-27387-0001, Bundesarchiv.

4 Perhaps the only exception was a company in Leipzig which made a model for Berlin's city. "Ein Leipziger baut Berlin auf," *Neues Deutschland*, April 18, 1985.

Architectural models provide insights into the past, into alternative spatial concepts, and into an idealized built environment. In the scientific collections of the IRS in Erkner, there are models that illustrate these three characteristics in a special way: The architectural models of the GDR show spatial situations that no longer exist today, that were never built, or that were realized differently. The illustration shows two models of designs for the stage of the rebuilt Schauspielhaus at Gendarmenmarkt in Berlin. The exhibition model was made by a model workshop of the Building Academy of the GDR. The other presents a previously unknown alternative design, which highlights the possibilities of research but also the limits of archiving.

In the GDR, models—from architectural models to scaled-down agricultural implements—generally had a great relevance. This is shown by numerous documentations of exhibitions and political events at which the "construction of the socialist state" was demonstrated with the help of models,¹ as well as by contemporary newspaper reports in which model photos were shown to strengthen the public visibility of planning projects.²

Only few original models from the GDR have survived. A major reason for this is undoubtedly that a lot of models were destroyed around 1990 in the course of the rapid dissolution of East German offices and companies. For many models, the space they took up was the reason for their loss. A large number of models was likely also disposed of during the GDR era. This may have been partly due to changes in architectural policy—for example, the replacement of socialist classicism in favor of industrial building. However, it must be assumed that many models, especially larger ones, only existed for brief periods of time because of a lack of space.

Building Architectural Models in the GDR

State-run model workshops were responsible for the construction of architectural models: In the 1950s, one such workshop is documented, which was directly subordinate to the Ministry of Construction;³ in addition, most of the district-owned planning offices likely had their own model making facilities and staff. Privately run modeling firms, on the contrary, were not envisaged in the socialist labor system.⁴ Particularly for exhibitions and research, the German Building

- 5 Bauakademie der DDR Muster- und Experimentalprojekt, Bautechnischer Erläuterungsbericht, November 30, 1981, Gesellschaftsbau, 03891, BBSR Bonn.
- 6 Personallisten, May 1990, A1_40, A1_42, IRS, Scientific Collections.
- 7 Atelier 4 Modellbau, "Historie: Biografie Hans Günter Zechert," accessed October 21, 2022, <https://web.archive.org/web/20061106063316/http://a4-modellbau.de/historie.php>; Atelier 4 Modellbau, "Modelle bis 1990," accessed October 21, 2022, <https://web.archive.org/web/20070125061910/http://a4-modellbau.de/modelle-vor-90.php>.
- 8 Klaus Rummel and Bauakademie der DDR, *Bauakademie der Deutschen Demokratischen Republik* (Berlin: Bauinformation, 1988).
- 9 Klaus Taubert and Thomas Bencard, *Mensch, Berlin, wie haste dir vaändert!* (Berlin: Verlag Junge Welt, 1986). We would like to thank Volker Mende (Freiberg University of Mining and Technology) for the kind hint and for providing reproductions of the pages in question.
- 10 Ibid., 85.
- 11 "Mit Kamera und Bildschirm durch ein Modell," *Neues Deutschland*, August 17, 1984.

Alternative Spaces: A New Version of the Schauspielhaus

- 12 Daniel Hadwiger, "Architektur als Instrument der Außenpolitik. Unterlagen zur Ausstellung 'Bauen in der DDR' in Paris 1988: Fund des Monats Nr. 11 vom März 2021," accessed October 21, 2022, <http://ddr-planungsgeschichte.de/bauausstellung-paris-1988>.
- 13 ADN, "Platz der Akademie wird restauriert," *Neues Deutschland*, May 3, 1965.
- 14 Dieter Bolduan, "Berlin erhält seinen schönsten Platz und das große Schauspielhaus wieder: Vom Neuaufbau eines weltbekannten Schinkel-Bauwerkes," *Neues Deutschland*, January 23, 1981.

Academy (Deutsche Bauakademie), as the GDR's most important research institution, operated at least one model workshop from the 1950s onwards.

By the 1980s at the latest, the Institute for Urban Planning and Architecture (Institut für Städtebau und Architektur, ISA) of the Building Academy had its own model workshop. It enjoyed a good reputation and carried out commissions for other GDR building institutions and even for clients in West Germany. In 1981/1982, a new building was planned and erected for the ISA model workshop and its model film simulation facility at Wallstraße in Berlin-Mitte.⁵ In the last years of the GDR, according to personnel lists, a total of about a dozen people were employed in this branch of the institute, including four model makers and a technical assistant.⁶ The department bore the name "Video Simulation" and was headed by architect Dr. Gerd Priese. The head of the model workshop since 1975 was Hans-Günter Zechert, a trained foundry model maker.⁷ The most important models of the workshop that still exist include a detailed model of the Zeiss Major Planetarium in Berlin, the Lubmin nuclear power plant near Greifswald, and the above-mentioned cutaway model of the Schauspielhaus.

There was hardly any public reporting on the work of the model workshop. In an official account of the Building Academy from 1988, some models photos were shown, but the workshop is not mentioned.⁸ On the other hand, an FDJ brochure from 1986, a publication geared toward East German youth, which presented the latest building projects in the capital of the GDR,⁹ not only featured photos of models from the ISA workshop but also of employees at work.¹⁰ It also pointed out the latest methods of model film simulation that were used in the workshop.¹¹ The necessary technical equipment was of high quality and correspondingly expensive—a fact that shows how highly valued the model workshop was. However, it had probably been closed down by 1990 already, and only few models could be saved.

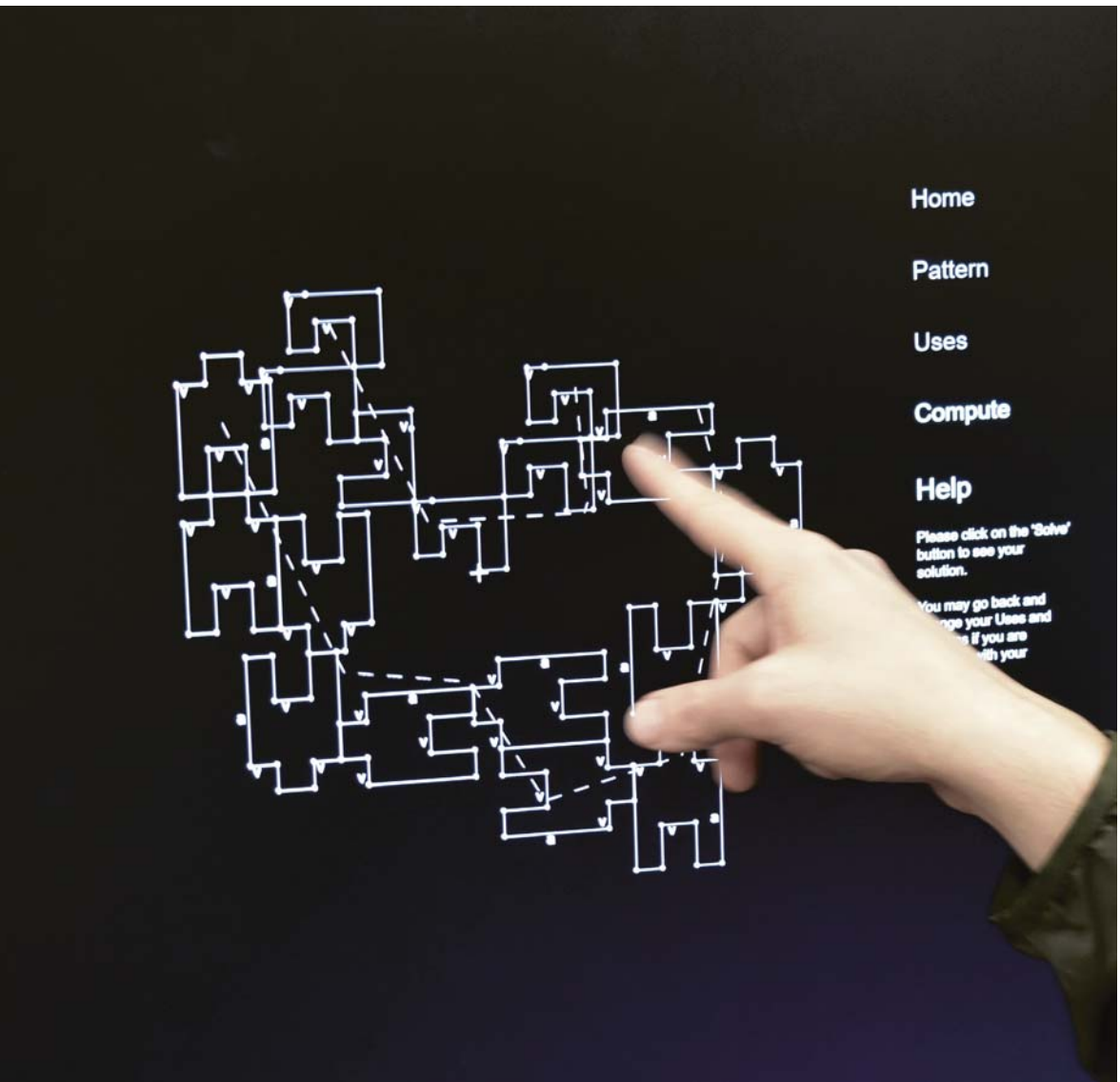
In the FDJ brochure, Hans-Günter Zechert is shown finishing the last details on a cutaway model of the Schauspielhaus in Berlin. This model can still be viewed today in the Scientific Collections of the IRS.

It was possibly created for Berlin's 750th anniversary celebrations in 1987.¹² The Schauspielhaus had been partially destroyed in the Second World War and stood ruinous in the city center for decades. It was not until 1965 that it was decided to restore the buildings.¹³ Work on the interior of the theater, as a faithful reconstruction of Schinkel's previous building, began in 1981.¹⁴ Until recently, the neo-classicist reconstruction was believed to have been without alternative. However, a chance find proves that there were indeed alternative designs for its interior. A model from the estate of architect Heinz Dübel shows what seems to have been an internal competition entry for the company Ingenieurhochbau Berlin (IHB), which is not at all reminiscent of Schinkel: wood-paneled walls and boxes set off with shaped stones, a sophisticated acoustic ceiling design, and a new interpretation of a modern organ are distantly reminiscent of Hans Scharoun's philharmonic hall at the Kulturforum in West Berlin, built in the 1960s. The model is undated, yet its existence alone is reason to conduct further research into the planning history of the Schauspielhaus: Were there other alternative designs?

Why was a decision made in favor of reconstruction? Who were the decisive stakeholders?

However, the model also shows the difficulties of preservation: It is in poor condition due to years of improper storage; parts of the interior are detached, and since there are no further clues as to the design, restoration of the model is hardly possible. Moreover, due to the size of the model's box, it is not easy to store or to make available for possible users to view. Conservation is an important task for archives, but unlike museums, they have far less experience with three-dimensional objects such as models. Of course, models pose special challenges in terms of their materiality, but the combined knowledge of archivists and researchers about the creation and transmission of models is directly relevant to their restoration. This starts with seemingly banal questions about where to reinsert individual parts that have become detached from a model. But it is also important to ask: Do we want and can we afford the potentially significant expense of restoring models? Or is the condition in which models are decades after their creation not also authentic in its own way and possibly worth preserving?

The juxtaposition of these two models of the Schauspielhaus, which are very different in several respects, is well suited to reflect on some fundamental aspects of collecting, preserving, and researching architectural models in context: For what purposes were models made, by whom, and with what means? For what reasons have very specific models survived to this day, what role did individuals play and what were their intentions? Which questions can be answered (or are even newly raised) when we take an in-depth look at architectural models? And how can we ensure that these models remain preserved and accessible in the future?



Architectural researchers have used software to model new conceptions of design. Under the advice of Charles Eastman and artificial intelligence pioneer Allen Newell, Chris Yessios developed an early software for urban design, called CISP, as part of his doctoral dissertation completed at Carnegie Mellon University in 1973. The image shows a 2019 interactive reconstruction of this system by the author, and Harshavardan Kedia. [Courtesy of the author]

Software Models Design

Daniel Cardoso Llach

Software is a vehicle through which technical knowledge, and ideas about design and its organization, travel into architecture, altering its fabric. Geometric engines developed for the aircraft industry undergird architects' modeling tools; computational modes of structuring information delineate contemporary architectural roles and sensibilities around the assemblage of ever larger building information models. The magnitude of these transfers over the last several decades has underscored the need for a critical reflection about "the digital" in architecture beyond proselytizing technologies' adoption and touting the purported advantages of a fully digitalized future. Aware of this need, recent architectural scholarship has interrogated software's intimacy with contemporary modes of architectural production and labor, as well as its importance as a domain for critical inquiry and creative intervention.

These efforts present a welcome challenge to the discipline's long-standing distaste for recognizing its own conditions of production. In diverse forms—dissertations, monographs, exhibitions, think-pieces, and even mockumentaries—, researchers interested in these questions have started to interrogate architectural software's intellectual and institutional histories, technical lineages, gender dynamics, and geographies. They have chronicled their insertion into architectural and design cultures and their role in fostering new technical and design roles in the discipline. The image of the digital currently emerging as a result is one not merely comprised of abstract, symbolic entities, monolithic turns, or of techno-utopian visions of automated design or managerial efficiency. Instead, software has started to appear as the site of important conceptual and methodological redefinitions in the discipline, and as a sociotechnical milieu that demands the field's attention through empirically grounded, critical scrutiny. Rather than an undesirable underworld populated by technicians solely concerned with the instrumentality of design, distant from discipline's higher pursuits, software is now starting to be seen as one context where key questions about architecture and its labors are negotiated. Recent scholarship has traced, for example, formal and conceptual shifts in design resulting from the creation and adoption of software;¹ or the role women digital pioneers played challenging narratives of architecture's "digital turn" as driven by mostly heroic, male figures;² speculatively explored epistemic

1 See for example Nathalie Bredella, *The Architectural Imagination at the Digital Turn* (London, New York: Routledge, 2022); Daniel Cardoso Llach, *Builders of the Vision: Software and the Imagination of Design* (London, New York: Routledge, 2015) and "Architecture and the Structured Image: Software Simulations as Infrastructures for Building Production," in *The Active Image: Architecture and Engineering in the Age of Modeling*, eds. Sabine Ammon, Remei Capdevila-Werning (Springer: Berlin, 2017); and Theodora Vardouli and Olga Touloumi, eds. *Computer Architectures: Constructing the Common Ground* (Milton Park, Abingdon, Oxon: Routledge, 2019).

2 See for example Shelby Elizabeth Doyle, and Nick S. Senske, "SOM's Computer Group: Narratives of Women in Early Architectural Computing," in *International Journal of Architectural Computing*, August 2020, 1478077120950713. <https://doi.org/10.1177/1478077120950713>.

questions or dystopias raised by mainstream software;³ or used exhibitions to examine architectural software in new ways.⁴ These works extend, and in some cases reframe, previous architectural scholarship that valuably charted the discipline's digital excursions.⁵ And yet, the center of gravity of the part of the discipline concerned with computing still skews heavily towards techno-utopian fantasies or heroic figures.

Part of the trouble is methodological. In this book, the editors have fashioned a unique opportunity to playfully reconsider models, broadly understood, as architectural actors. How then might we make visible software not merely as an environment where architectural models are produced but itself as a model of design practice? How may we see it not simply as an "aid" but also, and primarily, as an infrastructure that models, conditions, and reorganizes architectural labor and understandings? How to approach the material and phenomenal aspects of software?

The image above is a photograph of an interactive installation that reconstructs a software system for urban planning originally developed in the early 1970s. The software, named CISP by its author, Christos Yessios, is no longer accessible, and its only remaining traces are written descriptions and line diagrams in contemporary research reports and in his doctoral dissertation.⁶ The original system was programmed in FORTRAN in an IBM 665 machine. The reconstruction, part of a broader effort to reenact architectural software, was programmed in Processing, a programming language for interactive graphics geared to artists and designers based on the modern Java programming language, and runs on a Mac Mini, a smaller and more powerful computer compared to the significantly bulkier IBM 665 originally used. Importantly, it is the system's logic—the "algorithm"—and not the details of its technical implementation that is being reconstructed. This detail matters because it is precisely there, in the algorithm, that a historical software system can most clearly be read as a theoretical model of the design process—a model of design. What is it then that this software is modeling?

Software systems model by naming elements; by defining levels of dependency between those elements; and by differentially giving control over those elements and modes to the users. Rather than giving users access to digital versions of conventional drafting tools, the system we reconstructed allowed users to create a vocabulary of geometric elements representing the outline of an urban site and the contours of building units. It further allowed users to define constraints on how the units could be configured by, for example, establishing the desired placement of doors and windows in each unit. With these elements, the system attempts to semi-autonomously create design solutions that respect the constraints, resulting in different, and sometimes surprising, urban configurations. Important to our analysis is that the system models design as the definition of basic elements and rules; and it models the designer's role as one of rule-setting, constraint-defining, and evaluating automatically generated outputs. This model of design is enacted by the software, which might be seen as a theoretical artifact first and a functional system second. After all, CISP was never implemented except as part of its author's doctoral project.

The reconstruction of CISP is one of several interactive installations I have developed with my research group at Carnegie Mellon University as part of an ongoing project combining historical research and technological prototyping in order to recreate some of the earliest

3 Ng, "OOTB," in E-Flux Architecture (blog), 2019. <https://www.e-flux.com/architecture/positions/280207/ootb/>; and "Mockumentary by Office for Uncertainty Research," dir. D.I.A.N.A., 2023, <https://www.officeofuncertaintyresearch.org/diana>.

4 Teresa Fankhänel and Andres Lepik, eds. *The Architecture Machine: The Role of Computers in Architecture* (Basel: Birkhauser, 2020); Daniel Cardoso Llach and Theodora Vardouli, eds., *Designing the Computational Image, Imagining Computational Design* (San Francisco, CA: Applied Research + Design, 2023).

5 See for example Robert Bruegmann, "The Pencil and the Electronic Sketchpad: Architectural Representation and the Computer," in *Architecture and Its Image*, Eve Blau and Ned Kaufman, eds. (Cambridge, MA: MIT Press, 1989); William J. Mitchell, *The Logic of Architecture: Design, Computation, and Cognition* (Cambridge, MA: MIT Press, 1990); Kristine K. Fallon, *The AEC Technology Survival Guide: Managing Today's Information Practice* (New York: John Wiley & Sons, 1997); Mario Carpo, *The Alphabet and the Algorithm* (Cambridge, MA: MIT Press, 2011). Antoine Picon, *Digital Culture in Architecture* (Boston, MA: Birkhauser Architecture, 2010).

6 Christos Yessios, "Syntactic Structures and Procedures for Computable Site Planning" (Dissertation, Carnegie Mellon University, 1973).

CAD systems. A premise of the project is that while oral, archival, and other documentary sources provide invaluable insight into these technologies, they say very little about their gestural and sensual aspects, or about their specific modes of operation. Part of engaging with software as a primary material is to understand how it behaves visually, gesturally, and interactively, and this requires that we expand our methodological repertoire. As described above, software reconstructions offer access to historical software systems which are no longer accessible because of technological limitations—for example, many historical systems can't be emulated because they depend on hardware platforms that no longer exist. In addition, it can help approximate ergonomic and gestural particularities of historical systems that are no longer part of modern computing systems.⁷

- 7 See Daniel Cardoso Llach, "Reconstructing 'Sketchpad' and the 'Coons Patch': Toward an Archaeology of CAD," *Leonardo* 51, no. 4 (2018): 429–430; Daniel Cardoso Llach and Scott Donaldson, "An Experimental Archaeology of CAD: Using Software Reconstruction to Explore Early Computer-Aided Design Technologies," in *CAAD Futures 2019: Hello, Culture* (New York: Springer, 2019); and Daniel Cardoso-Llach, Eric Kaltman, Emek Erdolu, and Zachary Furste, "An Archive of Interfaces: Exploring the Potential of Emulation for Software Research, Pedagogy, and Design," in *Proceedings of the ACM on Human-Computer Interaction* 5 (CSCW2): 294:1–294:22 (2021). <https://doi.org/10.1145/3476035>.

These reconstructions make different theorizations of design evident. Using archival materials and technology prototyping, they enliven distinct understandings of design. Software systems are thus rendered in their fundamental ambivalence—at the same time as visual artifacts, modeling techniques, and signifiers for specific ways of imagining designing and building. At times, they show how software models an understanding of design founded on the geometric plasticity of computational descriptions; sometimes, on the possibility of physically realizing these descriptions via numerically-controlled manufacturing methods; sometimes, as the structured, hierarchical composition of artifacts as interlinked informational units. Reconstructing historical software thus offers a path towards performative accounts of these architectural technologies, their histories, and their contexts.

From here it is worth pondering what other overlaps and tensions we might productively identify between architectural and software theories. If software indeed models design, perhaps architects have been looking for architectural theory in all the wrong places.



Model Project Weissenhof Estate, scale 1:500, 1991. [Universität Stuttgart, Digitale Sammlungen der Universitätsbibliothek, <https://digibus.ub.uni-stuttgart.de>]

Same, and Yet Different

Eleven Realities of the
Weissenhof Estate

Christiane Fülcher

The model collection of the Department of Architecture and Urban Planning at the University of Stuttgart comprises around 300 models, which were created exclusively in the context of teaching and mostly produced by students for exhibitions in collaboration between the Institute for Architectural History and the department's model workshop from 1980 to 2015. The collection contains a great number of highly appreciated models of architectural icons that were shown in exhibitions like "Soviet Avant-garde," "Neues Bauen International," or featuring Erich Mendelsohn, Alexander Melnikov, and others. This occupation with the Modern Movement followed the example of Jürgen Joedicke, founder of the Institut für Grundlagen moderner Architektur (Institute for Principles of Modern Architecture) in 1967. Correspondingly, the internationally renowned building exhibition of the German Werkbund on the Killesberg in Stuttgart in 1927—also referred to as Weissenhof Estate—was the subject of student projects on several occasions. The culmination was an exhibition on the houses by Ludwig Mies van der Rohe, Le Corbusier, Mart Stam, Walter Gropius, and others in 1985, commissioned by the Institut für Auslandsbeziehungen (Institute for Foreign Relations), which toured the world for decades as cultural ambassador. The single houses on a scale of 1:50 and the model of the site on a scale of 1:200 are still the most requested items of the whole collection.

Outside the Box

An exception to these sophisticated objects is a student project created in the summer term of 1991, which was never meant to be presented to a greater public. Under the supervision of the model workshop's master, Martin Hechinger, 27 participants created site models of the Weissenhof Estate at a scale of 1:500.¹ All models had the same dimensions, the same outlines, and showed the same group of buildings. In each case, the section of the terrain was chosen as if the model could be immediately inserted into a larger environment, as in competitions, but here, it was the defined outline of the settlement area and the surrounding streets. This is where the similarities of all models end. Each model was made of a different material and different formulations of terrain, buildings, and greenery. Not only traditional modeling materials like plaster, Plasticine, cardboard, and

¹ Correspondence Christiane Fülcher with Martin Hechinger in 2022 and 2023.

wood or those popular since the 1960s such as aluminum and acrylic glass were used. Less established components like newspapers, lead, or cake were also employed. Eleven models of this assemblage showing the same object have survived the last 30 years, spread across different places. Seven models were kept safe yet dusty in numerous display cabinets and cupboards at the building of the architecture department. Four others were pinned to the wall in the dean's office and highly cherished. Hidden from the university's public, they blended inconspicuously into the built-in inventory. Being manufactured a decade before cutting and laser plotters arrived in model workshops, all eleven models impress with their manual craftsmanship.

Transition Processes

Creating a model is a design process. In transferring the two-dimensional idea of point, line, and area into three-dimensional rod, board, and volume, the choice of modeling material forms the individual model's character. The special features of a material and its natural or artificial coloration cause a distinct perception. Ideally, the material selection underlines the initial design idea, but it can also evoke contrary associations. Like a test track, the eleven objects celebrate the individual interplay of colors, textures, shadows, and lushness. The project's main theme of visualizing the same architectural complex in eleven material variations contradicts a fundamental position that institute director Wolfgang Knoll and his staff member Martin Hechinger phrased in their publication *Architektur-Modelle. Anregungen zu ihrem Bau* (*Architectural Models. Proposals for Their Construction*), published in 2006. In making the distinction between building reality and model reality, they state that the underlying architectural idea influences the decision to choose a certain material. Accordingly, there is only one appropriate solution for the material choice to highlight the existing project in line with the architect's intentions. To emphasize this statement, the authors present the models of the Weissenhof Estate by showing only one monochromatic example.² Classified as an urban concept model, its basic idea was related to a preliminary draft and should meet the requirements of changeability and variability.³ This assumption is the opposite of presenting a model of an estate that has already existed for eighty years. Models do not only activate seeing as the sensory stimulus. The perception of a model and its intrinsic idea occurs through tactility, movement, and finally through the viewer's experience connoted with the individual material, depending on its cultural ties. Turning around the system of one single solution for building reality and model reality, the manner of material and priority setting changes the recognition of the Werkbund exhibition. Consequently, variations of materials and model realities associate—maybe unwittingly—variations of building realities just as several realities of the Weissenhof Estate.

2 Wolfgang Knoll and Martin Hechinger, *Architektur-Modelle. Anregungen zu ihrem Bau* (Munich: Deutsche Verlags-Anstalt 2006, 2nd edition), 17.

3 Ibid., 10, 13.

A Set of Realities

The monochromatic example shown in the book was made of Eaplast, an easily moldable and kneadable modeling compound that hardens in contact with air.

Following its additive nature, baseplate, buildings, and trees merge into one homogenous mass. The only difference between trees and buildings is their size and the form contrast of

square and round shapes. Streets, pedestrian paths, and plot boundaries are slightly pressed into the smooth surface. The warm white Plasticine shapes the hillside of the Killesberg, the buildings and trees growing out of it as a single unit. Scratches, grooves, fingerprints, and cracks evoke its unfinished appearance of a concept model. However, the seemingly conventional Plasticine is connected to the Modern Movement as a common modeling material in the 1920s and one of the first concept models for the Werkbund Estate by Ludwig Mies van der Rohe in 1925.

Another model in the university's collection boasts greater perfection with its cubes cast in plaster, while the terrain is formed from elevated aluminum sheets and the trees from rectangular, matte acrylic sticks. The production technique of the plaster cubes is elaborate, and this is probably the reason why these plaster houses were only on display once. The so-called white modern is also conveyed in a model using polystyrene for the terrain and houses. By working with thin strips, the building structures achieve a finer level of detail. Nonetheless, the use of round acrylic sticks for the trees seems necessary to contrast with the houses. Polystyrene is THE modeling material of the 1980s and 1990s and the most used material in the Stuttgart collection. Its stability and durability make it ideal for exhibition models that are frequently transported.

For the appearance, it makes a great difference whether a model is manufactured by hand only or machines are used. Thus, the wooden model of the Weissenhof Estate allows a first insight into the possibilities of processing materials by using three different kinds of wood to distinguish between terrain, nature, and building volumes. The base plate consists of thin, hand-crafted balsa sheets that contrast with the prefabricated beech spheres for the trees and the very hard, reddish-brown pearwood sawn to create the building cubes. The latter allows the addition of details like the roof garden and the brise soleil at Le Corbusier's duplex house in the front. Obviously, this ought to be the focus of the observer, so the receding surroundings emphasize them. But the use of wood creates a traditional impression that is connected to the history of the Weissenhof Estate, too. To promote the wood industry in the early 1930s, Richard Döcker planned a second building exhibition on the Killesberg. After the Nazis seized power in 1933, Paul Schmitthenner took over the project to realize the so-called Kochenhof Estate according to long-established craftsmanship techniques. This connotation concerns two other models with wooden building structures that compete with their metal environment. In one case it is rusted steel, in the other black-colored lead. However, even the soft construction material lead tells the history of the Weissenhof Estate. In the monochromatic lead model, the method of reduction is taken to the extreme. The material properties of formability and duration are employed on one single layer shaping the landscape and the outer walls of the houses. There are neither roofs, correct heights nor trees, the edges are rounded, sometimes dented. In a way, the model design corresponds with the toxic nature of lead—the black oxidized surface in combination with the display of the building outlines involuntarily recalls the destruction and loss of ten houses in World War II.

A real contrast in its characteristics, but also a transformation of the material properties into a design theme, can be seen in the fourth monochromatic model made of acrylic glass. The crystal-clear layers shaping the terrain are elevated by transparent acrylic sticks, whereas the houses—formed as opaque shimmering volumes—

4 When architectural theorist Julius Posener called the building exhibition a fraud in a letter to Jürgen Joedicke in May 1980, he referred to the overestimation of the importance of the Stuttgart sanctum, but the formalism debate and the ICOMOS critique of the 1990s were already resonating. Universitätsarchiv Stuttgart and Wüstenrot Stiftung, eds., *Jürgen Joedicke, 1925 bis 2015. Notes from the Archive* (Stuttgart 2020), 104–108.

stand out. The sanded surface corresponds with the necessity of working with a circular saw and its raw cut. Overall, the technological, polished appearance is punctuated by a lack of trees. The unaged acrylic model can be seen as synonymous with perfection and the conservation of the modern. In the early 1980s, the Weissenhof Estate had been refurbished and the surfaces were removed from the shell.⁴

In contrast to all others, the last three models seem to be indecisive, almost inconsistent. Due to the mixture of more than two materials, they appear homely, like model railway houses. But more than the abstract ones, these picturesque models are an attempt to approximate the existing contrast of the natural environment, of terrain and trees, and the hard edges of the buildings. Layers of newspaper or plaster blur the contours, and the streets and plots are set off by color. The trees made of sponge, white soaked paper, or steel wool reflect their grown structure and contrast with the buildings made of wood or Efaplast painted in white or gray, recalling a bon mot of one of Stuttgart's postwar professors, Günther Wilhelm: "Just take a cheeky gray."⁵ While all models appear like a kaleidoscope of different identities of the Weissenhof Estate, these final models come closest to its current state of various conditions and conflicting interests: partly lost, partly modified or reconstructed, partly preserved in its original appearance, and extended by previously overlooked houses, the former building exhibition functions as an icon, a place to live in, a museum, and an important tourist attraction at the same time.

5 Kerstin Renz, "Nehmen Sie doch ein freches Grau. Günther Wilhelm und die 'Stuttgarter Schule' in den Nachkriegsjahren," in *Architekturschulen. Programm, Pragmatik, Propaganda*, eds. Kerstin Renz and Klaus Jan Philipp (Tübingen and Berlin: Wasmuth Verlag, 2012), 53–65. Translation by the author.

