CRAFT & ARCHITECTURE

MODULUS 22
The Architectural Review
at the University of Virginia

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Front Cover. Marco Frascari, *An Angelic View of Compasses*. 1991. Courtesy of the Artist.

Back Cover. A selection of compasses. Courtesy of Marco Frascari.

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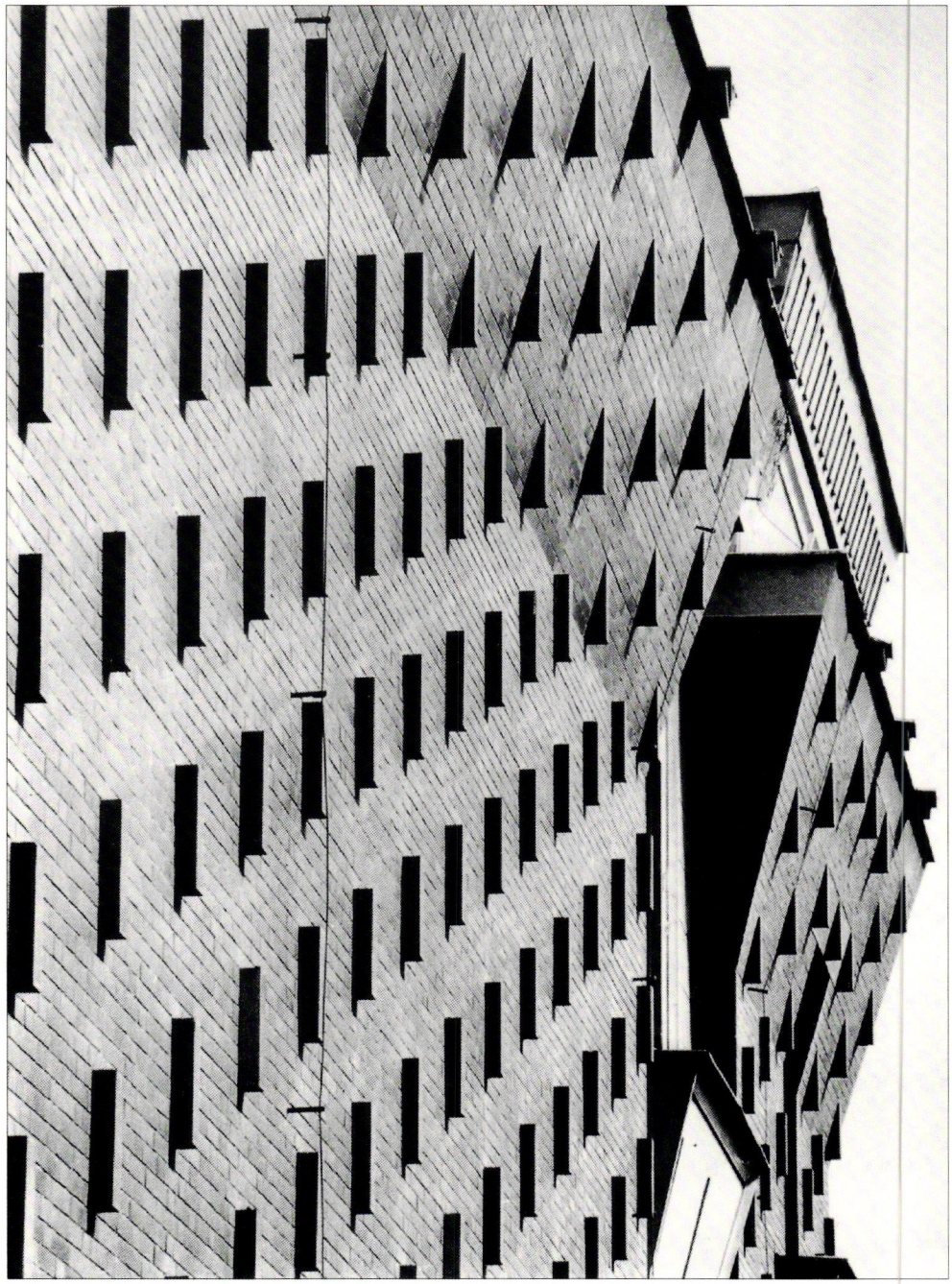
Modulus 22

The purpose of Modulus 22 *is to establish a critical approach to the making of architecture. To serve this purpose, the issue will address the relationship between craft and the art of building.*

It is essential to conceive of craft as a vital source for design rather than as a nostalgic or ephemeral end in itself. Craft is what mediates between the idea and the reality of building. Through it, man articulates the logic and cultural myths of construction—shelter, technology, permanence—and so articulates a place for himself in the world. The elaboration and necessity of material, assemblage, and structure are the stuff and test of architecture.

Modulus 22 *will examine how craft can inform and influence design. It will investigate contemporary possibilities and historical examples.*

Statement of Intent. November 1990.



Sacred Heart Church, Prague. Joze Plecnik, 1928. Photograph by François Burkhardt. Reprinted by permission of the MIT Press.

INTRODUCTION

Mason Hollier Disosway

Cum autem cotidie faciendo tritiores manus ad aedificandum perfecissent et sollertia ingenia exercendo per consuetudinem ad artes pervenissent, tum etiam industria in animis eorum adiecta perfecit, ut, qui fuerunt in his studiosiores, fabros esse se profiterentur. Cum ergo haec ita fuerint primo constituta et natura non solum sensibus ornavisset gentes quemadmodum reliquia animalia, sed etiam cogitationibus et consiliis armavisset mentes et subiecisset cetera animalia sub potestate, tunc vero et fabricationibus aedificiorum gradatim progressi ad certeras artes et disciplinas, e fera agrestique vita ad mansuetam perduxerunt humanitatem.

—Marcus Vitruvius Pollio
Dieci Libri Architecturae, II,1,vi

[As men made progress by becoming daily more expert in building, and as their ingenuity was increased by their dexterity so that from habit they attained to considerable skill, their intelligence was enlarged by their industry until the more proficient adopted the trade of carpenters. From these early beginnings, and from the fact that nature had not only endowed the human race with senses like the rest of the animals, but had also equipped their minds with the powers of thought and understanding, thus putting all other animals under their sway, they next gradually advanced from the construction of buildings to the other arts and sciences, and so passed from a rude and barbarous mode of life to civilization and refinement.[1]]

In his account of the origin of the dwelling house, Vitruvius describes two sorts of wisdom possessed by the carpenters of yore. The first, "industry," is acquired from physical experiences of building committed to memory. It involves knowledge of the necessary exigencies and form-giving capacity of material, component, assemblage, and structure; and the ability to put this knowledge into practice with facility and exactitude.

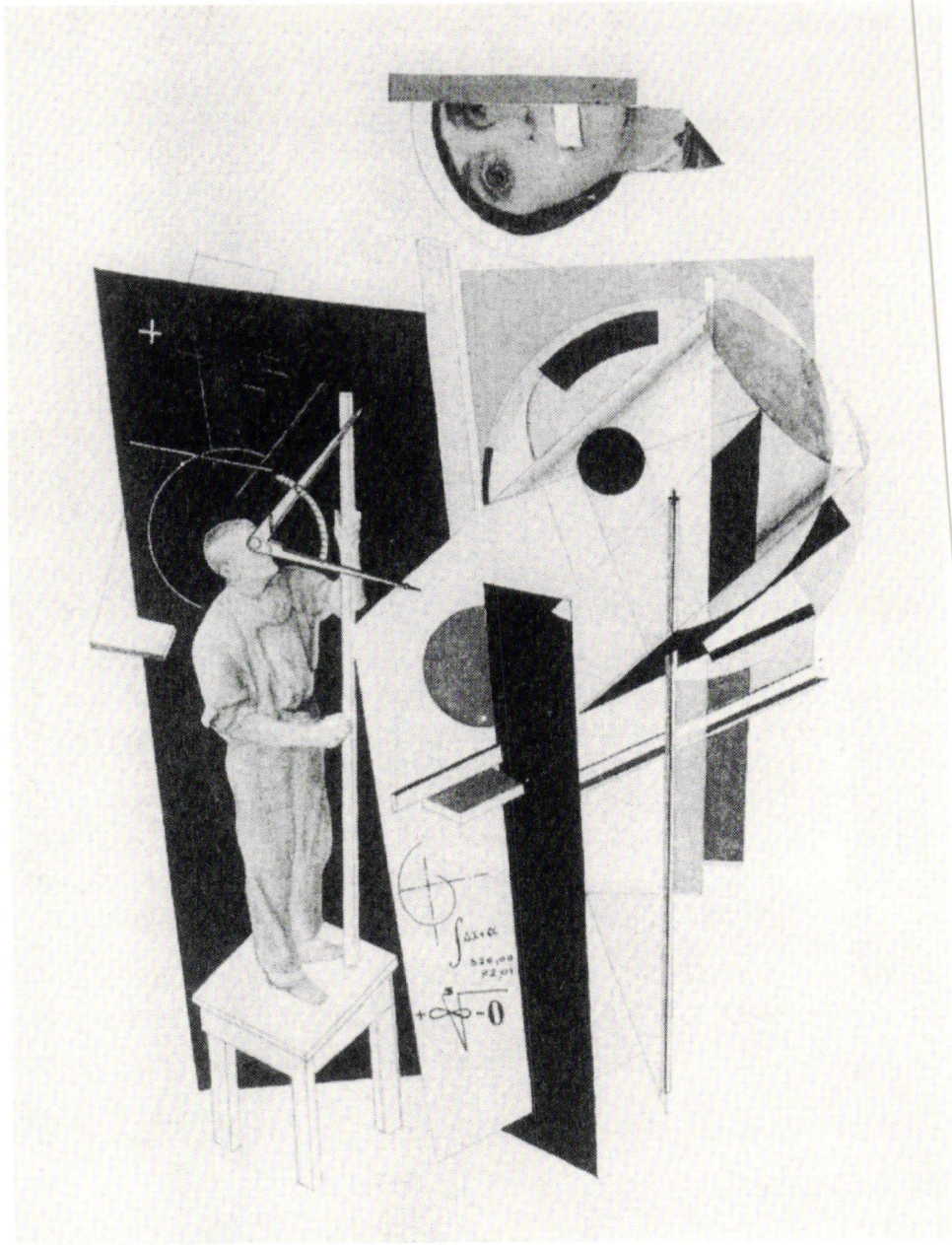
The second, "intelligence," is acquired through sustained and critical engagement of civil society. It involves knowledge of the cultural myths of construction, such as the primitive hut; and the ability to articulate and elaborate this knowledge to further man's understanding of himself as *homo faber*, he who makes.[2]

The potential symbiosis of these two uniquely human faculties is what this issue of *Modulus* is about. The articles and projects herein investigate how we might develop from the rudiments of shelter a speculative architecture that both demonstrates cultivated skill and manifests reasoned intent. Such an architecture finds an implicit source and inspiration in the craft of building.

1. Marcus Vitruvius Pollio, *The Ten Books on Architecture*, trans. Morris Hickey Morgan (New York: Dover, 1960), 40.

2. Hannah Arendt, *The Human Condition* (Chicago: The University of Chicago Press, 1958), esp. 167-74.

I should like to thank Robert Dripps, 3rd, for his support and advisal throughout the initiation and production of this issue. I should also like to acknowledge the extraordinary contributions of Alyson Steele, and to wish her luck with *24*.



Frontispiece. Tatlin at Work on the Monument of the Third International. *El Lissitzky, 1920.*

THE COMPASS AND THE CRAFTY ART OF ARCHITECTURE

Marco Frascari

The most mesmerizing image of my architectural education is a Proun, a Constructivist representation devised by the Russian architect and graphic designer El Lissitzky.[1] I saw this picture a long time ago, when I was a third year student of architecture, in the Aula del Miracolo at the monastery of the Tolentini in Venice.[2] Sergio Los, one of the assistants of Professor Carlo Scarpa, was showing slides of Russian architecture in an attempt to recruit a group of students to build a reconstruction of Vladimir Tatlin's model for the Monument of the Third International.[3]

As a modern emblem, a sublime memory device, this unusual Proun returns to my mind constantly. Every time, its visual fullness suggests new and precious meditations on the theory and practice of the craft of architecture. The Proun which struck my imagination is entitled "Tatlin at Work on the Monument of the Third International" (frontispiece). There is something extraordinary in this Proun. Tatlin himself, standing on a square stool, is tucked into the geometric composition, looking at an interpretative image of the model.[4] A compass, like a phenomenological theodolite, is coming out of one of his eyes.[5] A circle surrounds the head of the Russian architect in the fashion of a divine halo. The halo completes visually the round bar of the compass set between the two legs to hold the distance constant. This picture is not only an abstract representation of colors and geometric shapes: it has a significant symbolic dimension achieved through the use of photomontage. A representation between painting and architecture, a geometrical limbo, the power of this eidetic construction is in the incorporation of a human form within an abstract context of geometrical forms. This is neither an objective nor a subjective construct, but a sedimentation of experience formed by matter and memory. The Proun is a memory device and the representation of an intuition, a flowing of patterns.[6] These patterns are architectural images, presented in perception, which take into account the sensible qualities of architectural artifacts.

This cryptic Proun is an unstable isometric, an enigmatic expression of the power of the *mundus imaginalis*.[7] The human figure inserted into the Proun becomes a sort of holy icon, as demonstrated by the halo. The puzzling image of the compass and the circular nature of the halo are the sources for the following meditations on architectural aporias. Tatlin's compass inspires this allegorical narration of a discreet architectural theory. A circular rather than linear tale, this is a theoretical examination of the cunning nature of architecture. Unlike historical accounts or empiricist surveys, this inquiry progresses in a round fashion, as do myths.

In contemplating this unusual Proun, the first thought which comes to mind is that Tatlin's theodolite is a visual rendition of a pervasive Renaissance metaphor, i.e., Michelangelo's influential notion of the *seste dell'occhio*, the compass of the eye. The compass of the eye is a pragmatic and precise tool for measuring which can also become an instrument of theoretical reasoning, i.e., the *seste del giudizio*, the compass of judgment.[8] This visual paradigm is the basis for our understanding of eidetic processes and of our grasping of theory and cognition.

Enlarging the knowledge of Lissitzky's work, two other symbolic representations of compasses can further direct this theoretical probing toward an understanding

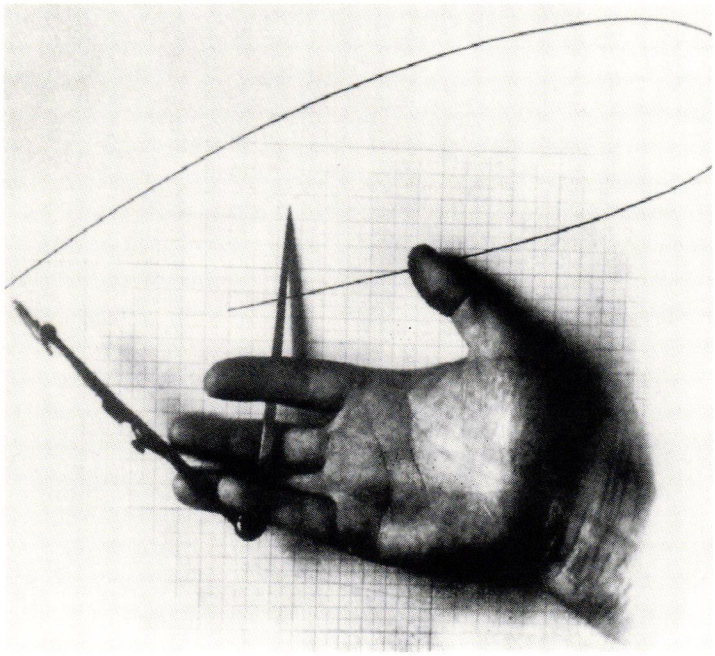


Fig. 1. Cover of the magazine Architextura Vkhutemas. *Lissitzky, 1920.*

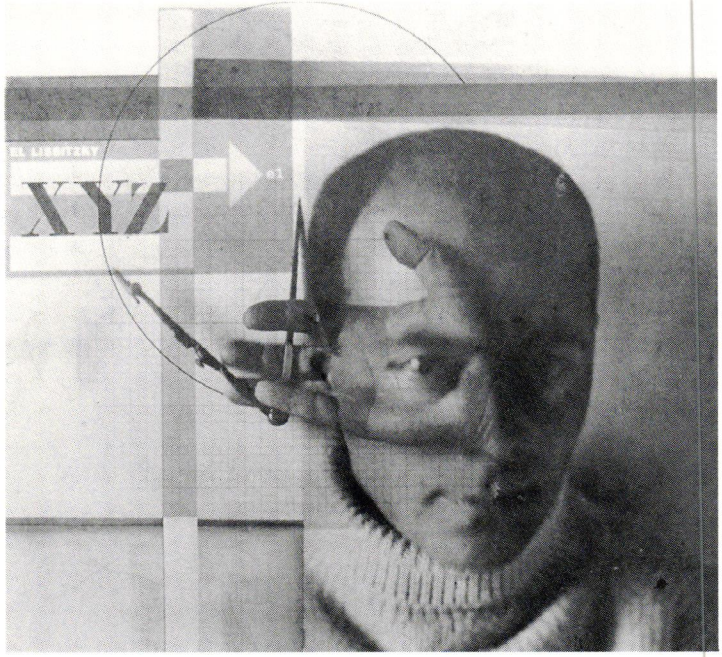


Fig. 2. The Constructor *(self portrait). Lissitzky, 1928.*

of the kinds of knowledge required by the crafty art of architecture. The first one of these two symbolic pictures was designed in 1927 and published as a cover of *Architextura Vkhutemas*, the magazine of a great Russian school of Constructivism (fig. 1). The central image is a photo of an open hand, presented vertically, resting on a flat surface. The hand holds gently an open compass, horizontally by the tops of the fingers. The visual dialogue set between the hand and the compass identifies the two realms encompassed by architectural education, the high realm of theory and the actual realm of practice. Jean-François Lyotard reads this cover illustration as a figure of thought.[9] Lyotard sees it as an emblem of tension, in which the compass has a dual symbolic presence. The compass is the tool of the navigator as well as of the architect: it is the instrument for determining the position of a ship on a map. This method of verification can be applied metaphorically to the Constructivist endeavor presented in the magazine. The open hand represents labor. This cover is a visual figure of language representing a fabrication of a meditation.[10]

The second symbolic image is a triple-exposure self-portrait composed by Lissitzky in 1928, entitled *The Constructor* (fig. 2). In this photomontage, Lissitzky employed the photo of the hand and compass already utilized for the magazine cover, but superimposed upon it a self-portrait. Both images are projected onto a background of ruled paper with other compositional elements. The hand is presented horizontally, the compass vertically. What is striking in this photographic overlay is the location of the right eye of Lissitzky. The eye is exactly at the center of the open hand. Once more, a Renaissance emblem comes to mind: the *mano oculata* (eyed-hand), a representation of crafty shrewdness and compassed prudence (fig. 3). The concept of compassed prudence is cogently presented if the allegoric representation of the "wise builder" devised by a French architect is moving toward a palm, the palm of glory, and if he is mindfully walking his compass on the ground (fig. 4).[11] The compass is intertwined with a snake, like Hermes' Caduceus.[12]

A compass can be defined as a crafty machine for graphic machinations.[13] Essentially an instrument composed of two equal legs connected by a hinge, a compass produces circles and proportional

measurements. It allows the space-translation of segments and the tracing of circles. To understand the theoretical importance of the compass, it is sufficient to think about elemental geometry, in which problems can be solved solely by use of a ruler and compass. In this branch of geometry, the problems are questions concerning graphic projections and sections. In the reality of architecture, however, a compass is a tool for solving problems of proportional construction and tectonic projection. The compass leads to the basic steps necessary to produce graphic simulations which help to overpower the uncertainty always surrounding the construction of a building. For architects, a compass is like a magic wand in the hands of a seer. It is the fundamental instrument for understanding the divinatory nature of the cunning art of architecture. Nowadays, compasses appear rarely on the drafting tables of architects. Plastic, metal, and even electronic templates have replaced the functions of compasses. However, in the far-away and foreign past, compasses had a major role in making understandable the discipline of architecture. For instance, during the Renaissance, the compass was a key instrument for folding and unfolding the measures of an anthropocentric construing of constructions.

The idea of the human measure was raised to the level of systematic thought by Nicholas of Cusa. Without a sense of measure, the activity of judgment is senseless. "A mind strives so avidly to measure things," holds the Philosopher, one of the three characters acting in Cusa's dialogue entitled *Idiota de sapientia et de mente* (*The Layman on Wisdom and the Mind*). Then the Philosopher goes on to explain that the name *mens* (mind) is derived from *mensura* (measure). The brain is a living measuring device.[14] The Layman (the Idiota), the principal character of the dialogue, supervenes the statement of the Philosopher by claiming that the mind measures reality "through itself as if it were a living compass measuring through itself."[15] The compass is both within the body and the body itself. This assertion of non-separation between mind and body generates the conclusion drawn by the Philosopher at the end of his tirade. He closes by stating that the mind works by process of assimilation, and that the analogy with the compass is a correct representation. This is because the compass is a contrivance which can be "expanded and contracted" like our mind, which learns by folding and unfolding.[16]

The same beautiful figure of thought regarding the identity between body and compass is presented by John Donne in one of his Valedictory Poems:

If they be two, they are two so
As stiffe twin compasses are two
Thy soule the fix foot, makes no show
To move, but doth, if the'other doe.

And thought it in the center sit,
Yet when the Other far doth rome,
It leanes, and hearkens after it,
And grows erect, as that comes home.

Such wilt thou be mee, who must
Like th'other foot, obliquely runne;
Thy firmnes drawes my circle just,
And makes me end where I begunne.[17]

In the *Realistic Manifesto*, four centuries later, Naum Gabo and Antoine Pevsner elaborate on the same figure of thought in

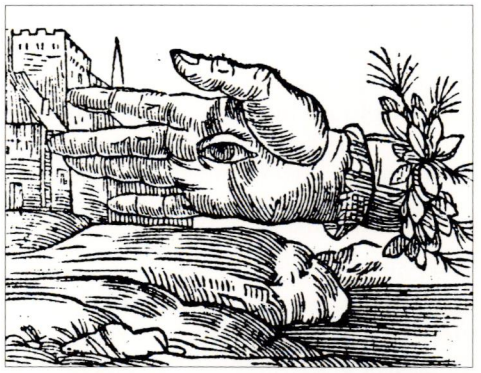


Fig. 3. Mano Oculata. *Mario Bettini, 1619.*

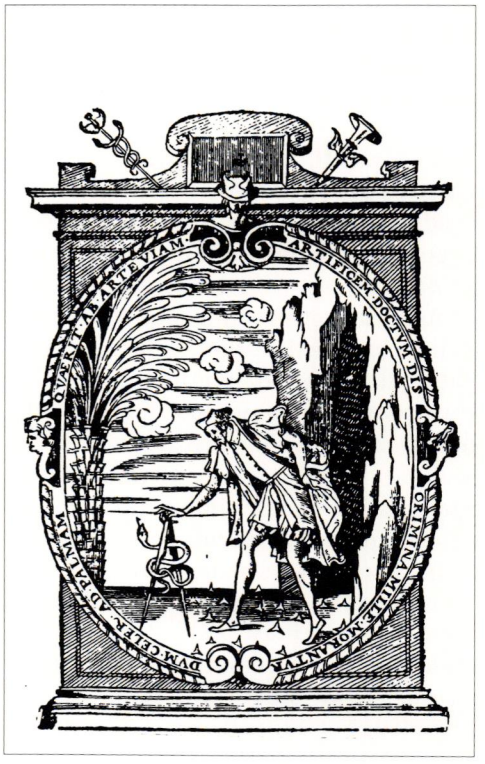


Fig. 4. The Prudent Architect. *Philibert De l'Orme, 1648.*

presenting a modern expression of the relationship existing between the bodies of the macrocosm and microcosm:

> The plumb-line in our hand, eyes precise as rulers, in a spirit as taut as a compass...we construct our work as the universe constructs its own.[18]

The compass, a persuasive mental tool, represents Cusano's taut intellectual device of the coincidence of opposites (*coincidentia oppositorum*). A demonstration of this parallelism of contraries occurs in many images of Renaissance iconography. The compass connotes the opposite personifications of theory and practice. On the frontispieces of several treatises, a compass pointed downward indicates the personification of practice, whereas a compass pointed upward is an attribute of the personification of theory.[19]

As Vitruvius (I,2,ii) demonstrates, the compass is a practical tool which, if properly used in combination with the straightedge, can give us the plans and sectional profiles of any edifice.[20] This use of the compass for constructing graphic transactions helps to reduce the incertitude dominating the reality of building, and, in the construing of tectonic acts, it reveals the nature of the intelligence involved in the making of architecture. Traditionally, there are two classes of erudition recognized within the discipline of architecture. On the one hand, there is verbal knowledge, i.e., the many statements made by architects, critics, and amateurs of architecture to explain the constructed world. On the other hand, there is visual knowledge of the many monuments built and drawn by architects and amateurs during the past centuries. These two classes do not define the real understanding of architecture, although they can open the gates to it: there is also a crafty knowledge which has been considered the cardinal virtue of architects. Without comprehension of the role of this witty fabrication, authentic work can no longer be done in the field of architectural theory.[21]

The presence and importance of this third kind of knowledge is introduced by Vitruvius in the first paragraph of the first book of his treatise. In this passage, the Roman architect traces the guidelines of a professional education by beginning with the definition of the nature of the architectural discipline. Declaring architecture to be "born of construction and theory" (*ex fabrica et ratiocinatione*),[22] Vitruvius indicates that construction is the meditated creation of buildings, and that theory is the set of demonstrations necessary to explain cunningly constructed objects (*res fabricatas sollertiae*).[23] By examining the terms used in the Vitruvian text, a map of architects' ethical values can be carefully constructed. These values or virtues of the profession are *prudentia*, *industria*, *studium*, and *ingenium*.[24] In addition, *sollertia*, a necessary intellectual procedure to erect any construction, is the cardinal virtue in both practicing and theorizing. As Vitruvius (II,1,vi) points out, *sollertia*, an efficacious crafty aptitude, has played a dominant role in the development of Roman civilization. Romans achieved the wonderful accomplishments of their arts by exercising regularly their crafty wit (*sollertia ingegno exercendo per consuetudinem ad artes pervenissent*). Good architecture is possible only when an architect is prudent as well as expert (*peritus*) and gifted with a quick and dexterous intelligence (*ingegno mobili sollertiaque*) (Vitruvius V,6,vii).[25]

In his text, Vitruvius lists many architects whose works clearly demonstrate a proper use of this third kind of intelligence. Without his musing and cunning sense (*cogitationibus et sollertia fretus*) (Vitruvius II,pref.,i), Dinocrates, an amazingly daring architect, could not make his bold proposal for designing a city to Alexander the Great. In designing the *pseudodipteros* temple, Hermogenes, a great designer of proportion, solved financially, optically, and functionally the problem of the lateral columniations of the *dipteros* temple.[26] He accomplished it by effectively using his constructive wit (*sollertiae effectus*), (Vitruvius III,3,ix). Happily (*feliciter*) concluding his treatise, in the last book, the Roman writer generates a remarkable propaganda line for the profession. In the last paragraph, Vitruvius declares that, during wars, cities can free themselves from enemies by relying on the cunning intelligence of their architects (*architectorum sollerties sunt libertae*) (Vitruvius X,16,xii).[27]

As Marcel Detienne and Jean-Pierre Vernant have explained in their book dedicated to the use of cunning intelligence in ancient Greek culture, *sollertia* is the Roman translation of what the Greeks called *metis*, an intelligence that generates crafty wonders.[28] *Metis* is a polysemic term ranging from the sphere of knowledge which can be identified under the mythological sign of Daedalus[29] to that under the sign of Hermes.[30] Under the sign of Daedalus, *metis* is slow. The *deidalia*, wonderful pieces of artwork, express the "wise thoughts" of a craftsman who slowly conceives and builds them.[31] Under the sign of Hermes, *metis* is quick. It is the gift of one "who can take in a situation at a glance" and solve problems which could not be forecast in the plotting of a project.[32] The persons

gifted with *metis* are quick-witted, and their minds are as thick as thieves.[33] In a lecture given at the University of Venice on 13 January 1976, Carlo Scarpa indicated that the intelligence necessary to an architect is just this cunning knowledge, that is "...a double mind, a triple mind, the mind of a thief...it is what I [Scarpa] call quick-wit [*arguzia*], an attentive tension to understand what is happening and what will happen." This duality of *metis* is part of the rhetorical chiasmus artfully used by Vitruvius to define architecture as a prudent profession. The practice of construction is based on reflective labor (*meditatio*), whereas theoretical demonstrations are based on craftiness (*sollertia*). On the one hand, *metis* is a particular kind of intelligence based on an informed prudence.[34] On the other hand, *metis* requires a quick mind, able to foresee the problems of artful constructions.[35] Consequently, *metis* or *sollertia* is a wily knowledge between slow formulas and quick metaphors. For instance, in his treatise, Vitruvius defines the orders by metaphoric references to female and male bodies, and by formulae that determine column proportions and intercolumnation. *Metis* is a forewarned prudence, a meditated procedure of construction enlightened by flashes of intuition.[36]

To meditate is to construct a plot, to weave a plan.[37] *Metis* has its origin in the art (*techne*) of weaving. The physical expression of *metis* is the use of a "line" which makes possible the cutting of absolutely straight beams and planks.[38] The lines and plumb-lines used by mastermasons in laying the bricks during the building of a wall are all expressions of *metis*. All the "lines" used in other crafts requiring *metis* derive from the "lines" used in a loom. The tracing on the ground at a construction site shows clearly the textile origin of construction. The plan of a future building is marked by the tracing lines (pulled between the battered boards), which together resemble a huge horizontal loom. This shows that a plan of an edifice is woven, like fishing or hunting nets.[39] The plumb-line also derives from the weights used to keep in tension the woof of the loom. Probably, this phenomenological derivation of *metis* from the *techne* of weaving explains why the majority of architects, when designing, prefer to use parallel-bars instead of more versatile drafting machines. A parallel-bar is a portable loom for weaving the lines of a plan or elevation by running a square back and forth like a shuttle.

The compass was the essential tool of any medieval architect and became the symbol of the profession. A carving at the base of a small window located beneath the main pulpit in the central nave of the Cathedral of Vienna depicts Anton Pilgran, the architect, looking out at the congregation. Master Pilgran looks very relaxed, and his right hand rests comfortably on a compass on the window sill. This association indicates his craft, as well as the important role of the compass in solving the uncertainties of building. Using this simple but effective tool to solve the many problems of stereotomy, the architects supervising the construction of a Gothic cathedral made the templates which were then used to cut the stones.[40] These templates were easily destroyed. Conceivably, they were left ouside during a heavy rain or tossed into a fire because of an apprentice's mistake. Imagine that one vault was just finished and a new one not yet started—how would one replicate the lost templates for the rib profile? It could be done by following geometric rules and using a compass which could accurately translate three-dimensional stone into two-dimensional templates and vice versa.[41] The playful precision of the geometry of the compass is the origin of accuracy in architectural crafts.

The compass is the primary tool of translation from drawing to building or from building to drawing. The drawings developed for the construction of an edifice are themselves a process of translation by which the data of an architectural project become the reality of a building. Through the act of construction, a poetic interpretation, drawings are translated into buildings: a complex intellectual procedure is embodied in this simple act of translation. The mystery of architecture is in this compass metaphor of translation. The translation of buildings into drawings and of drawings into buildings is a speculative chiasmus, which can be represented by a special kind of compass, a proportional divider, which is used for projection and analogies. This chiasmus is a project which recognizes architecture as a trade with an intellectual tradition, i.e., an infinite mirroring of translation. The act of translation, a *techne*, is the key factor for understanding the tradition of production and reproduction in the Western culture. Translation is a trade that requires a cunning intelligence, and is based on a tradition which it can also betray. Two Italian puns can relate this concept in a form easy to remember, viz *traduttore=traditore* (translator=betrayer) and *traduzione =tradizione* (translation=tradition).[42]

In the Western tradition, the architectural trade began with the Greeks, who consid-

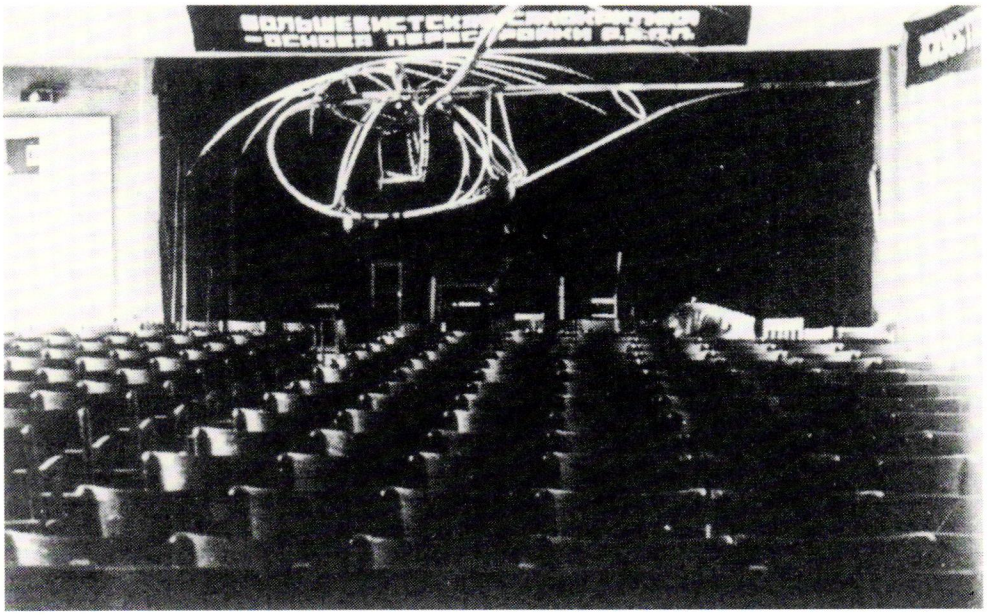


Fig. 5. Model for the Letatlin (without sheeting fabric). Vladimir Tatlin, 1932.

Fig. 6. Entry to the Quinta Biennale d'Architettura at the Corderie dell'Arsenale, Venice. Massimo Scolari, 1991.

Fig. 7. Entry to the Quinta Biennale d'Architettura at the Corderie dell'Arsenale, Venice. Massimo Scolari, 1991.

ered barbaric the languages and architecture of other populations and were therefore uninterested in translation.[43] Nevertheless, the origin of the concept of translation in architecture can be found in their concept of hermeneutics. Hermes is the god who translates for humans the hermetic language spoken by the Olympic crowd. The etymology of the name "Hermes" is uncertain, but the word belongs to a semantic family which indicates a deep insight of the unknown through analogies.[44]

In Greek mythology, *metis* is embodied in a whole series of objects: the round traps for catching deer, baskets built up in circular rings, necklaces, and coils.[45] Compasses belong to this group of wonderful and circular tools: as analogical instruments, they are prudent automata, but quick *deidalia*. The *deidalia* derive their name from Daedalus, a famous craftsman who made walking statues (*deidalia*) which had to be kept in chains so that they would not quickly run away. Daedalus led a rocambolesque life, and his epic begins and ends with homicides. The first murder is the killing of his nephew, who was also his apprentice. The young pupil is named Thalos, but is also called Kalos (cable), Perdix (a bird which flies in circles), or Circinus (compass) by Greek and Roman writers. The young apprentice invented two fantastic tools: the compass and the metal saw.[46] Out of envy, Daedalus killed Thalos-Circinus by throwing him down from the highest point of the Acropolis.[47] Although some versions of the myth say nothing about it, Daedalus was evidently also upset with his nephew because in showing the use of the legs of the compass, the pupil was giving away the secret of the walking statues: the legs of

the compass were the legs of the *deidalia*. To avoid prosecution for the murder, Daedalus fled Athens for Knossos in Crete.

In Crete, at the court of King Minos, Daedalus built a few cunning artifacts. The first one was the artificial cow within which Queen Pasiphae had an unnatural union with a white bull that the king was supposed to have sacrificed to Poseidon. Pasiphae bore the Minotaur, a human with the head and neck of a bull. Consequently, Minos had Daedalus build a second cunning artifact, a curious piece of architecture, the Labyrinth within which the King hid the monstrous evidence of the Queen's infidelity. Theseus, one of the fourteen youngsters (seven boys and seven girls) sent every nine years as food for the monster in the Labyrinth, fell in love with Ariadne, Minos's daughter. Theseus slew the Minotaur and returned from the monster's lair guided by Ariadne's thread. The quick-witted Daedalus then built a third cunning piece, a dancing floor (*choros*) for Ariadne's performances of the "crane dance," the measure of the dancing floor being the measure of the dance itself. Minos, infuriated with Daedalus, shut the mythical craftsman in the Labyrinth. Daedalus then escaped from Crete by making a fourth cunning artifact, a pair of wax and feather wings: one for himself, the other for his son Icarus. Because Icarus failed to follow his father's instructions, he drowned in the sea near Samos. Daedalus reached Sicily and there he built a thermal spa and an impregnable city.[48]

Minos did not accept his defeat and sent around a puzzle—how to pull a thread through a Nautilus shell—which could be solved only by the architect of the Labyrinth. Daedalus could not resist the challenge and sent in the solution under the name of his new patron. Minos then knew where the cunning craftsman was hiding. With the excuse of awarding the reward in person, Minos came to Sicily to take his revenge. At his arrival, he was offered a restorative bath in the new spa, and Daedalus killed him by bringing the water to boiling temperature.

To close the circle of this prudent story of parallel events—two killings, twice the solving of the labyrinth with the thread, two young men dead—it is necessary to recall that toward the end of his life, Tatlin designed the Letatlin, a one-man glider (fig. 5). The name of it derived from the combination of the Russian verb *letat* (to fly) and *Tatlin*. This Russian *deidalion* is a further clue for understanding the crafty nature of architecture and the chiasmus of translation which rules its making. Daedalus and Tatlin were craftsmen possessed of *metis*. In the Greek vision of society, as in the Russian Revolution, architects are demiurges. In other words, they are workers for the people, since architects allow *kosmos* to emerge through the making of objects. The construing of the circular myths of Daedalus and Tatlin reveals the circular technology of the crafty art of architecture, where buildings are translated into drawings and drawings are translated into buildings.

Recently, Massimo Scolari was asked to design the entry to the Biennale d'Architettura at the Corderie dell' Arsenale (the location for exhibitions by schools of architecture), and he produced a design for an unnecessary machine: a wooden glider which could not fly, but had been flying in Scolari's drawings since 1980 (fig. 6, 7).[49] This machine originated in the failures of Icarus and Simon Magus and in the silent flight of Otto Lienthal, the designer of the modern glider.[50] The wings were a translation of two building elements of the Arca built by Scolari for the Triennale five years earlier (Milan, 1986). This non-flying machine was a slow product (the design of it began eleven years earlier), which Scolari could cunningly build in time for the opening of the exhibition, since he could re-make two pieces of his Arca, (a known procedure) for two unknown wings. Aldo Rossi, an architect who is not gifted with *metis*, could not build his monumental gate in time for the opening architectural show at the Bienniale ai Giardini. Rossi's gate has been shown as an unbuilt design.[51] In Scolari's machine, the wings are like the legs of a compass open to the sky, showing the angelic nature of compasses. This Venetian image completes this meditation on the crafty nature of the art of architecture.

—Vicenza, 29 September 1991

NOTES

1. Coined by El Lissitzky, the term PROUN is the acronym of PROekty Ustanovleniya Novogo, "a project for the establishment of the new."

2. The Tolentini is the main seat of the Istituto Universitario d'Architettura di Venezia (I.U.A.V.). The Aula del Miracolo (the Classroom of the Miracle) is a crafty name given to the room where Albini taught his class on Interior Architecture. The room was furnished with all the great design chairs produced by the Italian Furniture Manufacturers during the nineteen sixties. The name is in memory of the Italian Economic Miracle, which took place at that time.

3. The monument is a steel tower consisting of two conic spirals, a huge tilted beam, and containing a glass rotating cube, pyramid, and sphere. The result is a hybrid building, a crossing of the Tower of Babel and the Eiffel Tower. The only published materials are a few pictures of the model: the front and side elevations. The plan was never published.

4. The image of Tatlin was cut out by Lissitzky from a picture showing Tatlin and a few of his collaborators during the construction of the model.

5. A theodolite is a surveying instrument for measuring horizontal angles with great precision. The Greek aspect of the name of the instrument has been a puzzle for etymologists who see in it the Greek compounds "to see-way-plain" and "to run-long." A folk origin has been suggested in a corruption of "the-0-deleted," i.e., the crossed circle of degrees representation. Probably, the word evolved from the Old French "*theodolet*," which derives from Theodolus, a Byzantine mathematician, author of a treatise on mensurations.

6. Henry Bergson, *Matter and Memory* (New York: Zone Books, 1991), 56.

7. Henry Corbin defines the *mundus imaginalis* as an *intermondo*, a space where visual imagination establishes true and real thoughts: an imaginative perception and imaginative knowledge that is an imaginative consciousness (Henry Corbin, *Mundus Imaginalis or the Imaginary and the Imaginal* [Ipswich: Golgonooza Press, 1976], 57). The prouns' axonometric space belongs to this *intermondo*, since they are the extraordinary signs of an imaginative production based on perception and knowledge. They are made of what Lissitzky calls "immaterial materiality" (Yves-Alain Bois, "From -s to 0 to +s: Axonometry, or Lissitzky Mathematical Paradigm," J. Debbaut and M. Soons, eds, *1890-1941 El Lissitzky* [Eindhoven: Municipal Van Abbemuseum, 1991], 29). In his Prouns, Lissitzky stresses the reversibility of space, making them isometric, but unstable axonometric projections based on perception and knowledge. They are made of what Lissitzky calls "immaterial materiality" (Bois, 31).

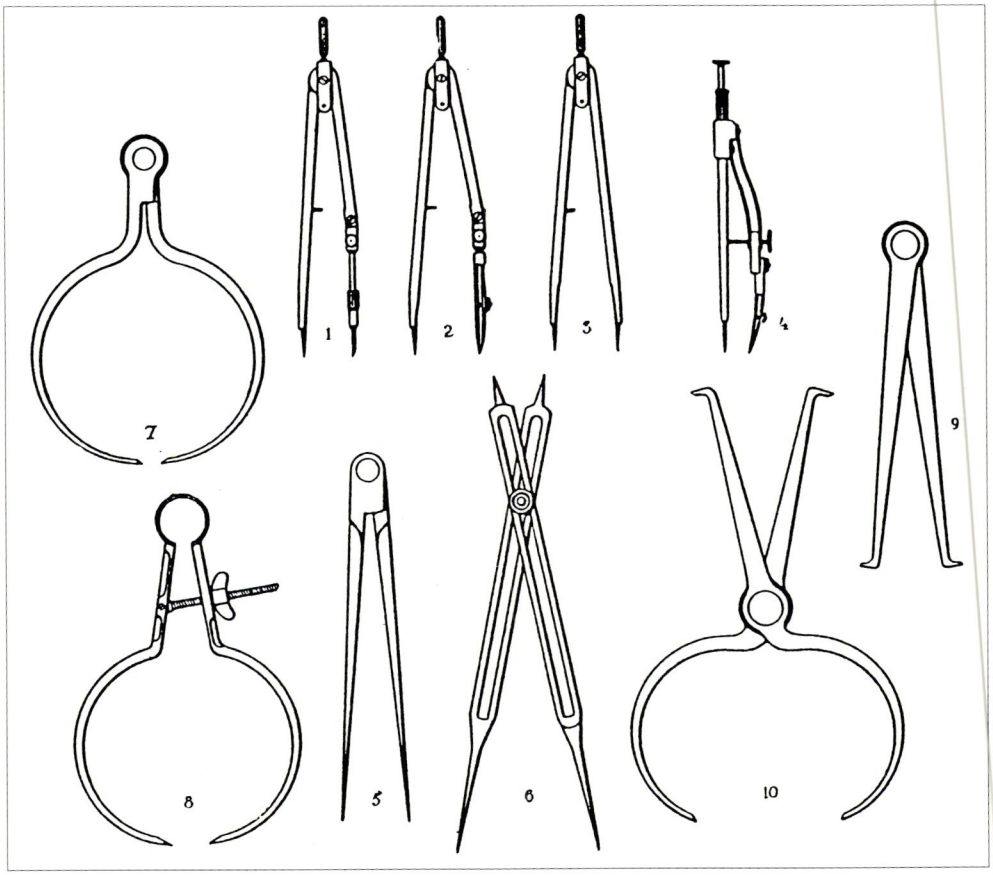


Fig. 8. A selection of compasses. The number six is a proportional divider.

8. For a discussion of the *seste*, see J. Summers, *The Language of Michelangelo* (Princeton: Princeton University Press, 1981), 101-39.

9. Jean-Francois Lyotard, *Discours, Figure* (Paris: Klinksiek, 1985), 373-4, 412.

10. Lyotard notices that in one of his writings, Lissitzky mentions Gargantua's antidotal jokes

Fig. 9. Monument to Palladio, Piazzetta Palladio, Vicenza.

Fig. 10. Detail.

(1,ch.ii). The conclusion which can be drawn is that Lissitzky's figures and the fabrication of meditations belong to the same list of antidotal jokes. See ibid., 374 note.

11. The ground around the prudent architect is covered by several war-contrivances invented by the Romans to stop both infantry and cavalry: namely, *tribola*, heavy metal balls with three acute spikes (hence the word tribulation).

12. A serpent appears also on the statue erected in 1859 by Francesco Bressan near the Basilica to honor Palladio (fig. 9,10). The great Vicentine architect is resting against a few architectural fragments. A snake coils around them and rests its head on a flute of a broken column. Palladio is an architect endowed with *prudentia*. The design of the loggia of the Basilica is a perfect demonstration of Palladio's cunning design-intelligence. The "prudent" use of the Serliana allowed for all the adjustments necessary for relating the inconsistancy of measure of the pre-existing building's Gothic arches with the constancy of measure required by the employment of the classical arch. The difference of measure is always adjusted in the trabeated parts of the Serliana. An untrained eye cannot easily detect these differences, but a compass can. Goethe, using his own body as a compass, discovered these differences in measure during his famous trip to Italy.

13. In Italian, the locution "crafty machine" can be rendered with the term *marchingegno*. Translated literally, a *marchingegno* is a *marking-machine*. A sundial is a *marchingegno*, since it marks the passing of the time; a compass is a moveable *marchingegno*, since it marks circles, arcs, or segments. A *marchingegno* also means a contraption, and, used figuratively, a ruse or stratagem.

14. Nicholas of Cusa, *The Layman on Wisdom and the Mind*, trans. M. L. Führer (Ottowa: Canada Dovehouse Editions, 1989), 87.

15. The word used by Cusano is *circinus*, which means both circle and compass (Ibid., 89, translator's note 77).

16. Ibid., 89.

17. John Donne, "A Valediction: Forbidding Mourning," *The Complete Poetry and Selected Prose of John Donne* (New York: Random House, 1952), 38-9.

18. J.E. Bolt, ed., *Russian Art of the Avant-Garde* (London: Thames and Hudson, 1988), 213.

19. See Marco Frascari, "Maidens 'Theory' and 'Practice' at the Sides of Lady Architecture," *Assemblage* 7 (1988), 35-41.

20. For a discussion of the demonstrative power and nature of the Vitruvian system of representation and the role of the compass in the architect's body pacing a building through the site, see Marco Frascari, *Monsters of Architecture* (Savage: Rowman & Littlefield, 1991), 114.

21. Knowledge of architecture does not make a person an architect, as knowledge of philosophy does not make a person a philosopher. The act of construction shows the third kind of architectural knowledge interacting with the other two. The acquaintance with verbal and built utterances is desirable, since it can help architects locate their positions in the process of constructing a proper architectural inquiry, but the work of constructing an edifice, i.e., *fabrication*, shows that something other than mere familiarity is essential.

22. As Silvio Ferri points out in his commentary to the Vitruvian text, *fabrica et ratiocinatione* is a Hellenistic polarity. This polarity can also be equated with other traditional polarities of artistic nature, viz *practica e theoria*, *ars et scientia*, and *techne/epistime* (Marcus Pollio Vitruvius, *De Architectura, Libri I-VIII*, ed. Silvio Ferri [Rome: Fratelli Pasquali, 1960], I,1,xv and 33 note.).

23. For Vitruvius, theory is an afterward, whereas construction is a preliminary meditation; see Elisa Romano, *La capanna e il tempio: Vitruvio e dell'architettura* (Palermo: Palumbo, 1989), 53.

24. Romano, 168.

25. The English word "wit" derives from the German word *witta*, meaning "the one who knows." The French word *esprit* carries the same concept (Hannes Bohringer, "Wit and Acumen," *Daidalos* 22 [Dec. 1986]: 44.). Le Corbusier is "an architect who knows." He gave a demonstration of his architectural *esprit* in the devisal of the Dom-ino System.

> The load-bearing supports of the "*ossature*" are not attached to the edges and corners of the horizontal faces as was commonly done, and as might generally be expected to be the case; instead, they are set back, thereby permitting the walls and façades to be constructed in absolute freedom and "*en n'importe quels materiaux*" ... a demonstration of *esprit*, inspiration, wit.

Werner Oechslin, "The Tough Concept of *Esprit* and Ingenious Invention," *Daidalos* 22, (Dec. 1986): 59.

26. The pride for the builder is in building with precision; and, for the owner, in monumentality. The pride for the architect (*gloria architecti*) is in devising a beautiful set of proportions *venuste proportionibus* (Vitruvius VI,8,ix).

27. *Sollertia*, above all a civic virtue (it can save cities), is the extraordinary speculation closing the circle of the Vitruvian statements on the wit of the architects.

28. Marcel Detienne and Jean-Pierre Vernant, *Cunning Intelligence in Greek Culture and Society* (Atlantic Highlands, N.J.: Humanities Press, 1978), 178-9.

29. Daedalus is the first architect in classical myth. (Francoise Frontisi-Ducroux, *Dedale: mythologie de l'artisan an Grece ancienne* [Paris: François Maspero, 1975]; and Alberto Perez-Gomez "The Myth of Daedalus," *AA Files* 10

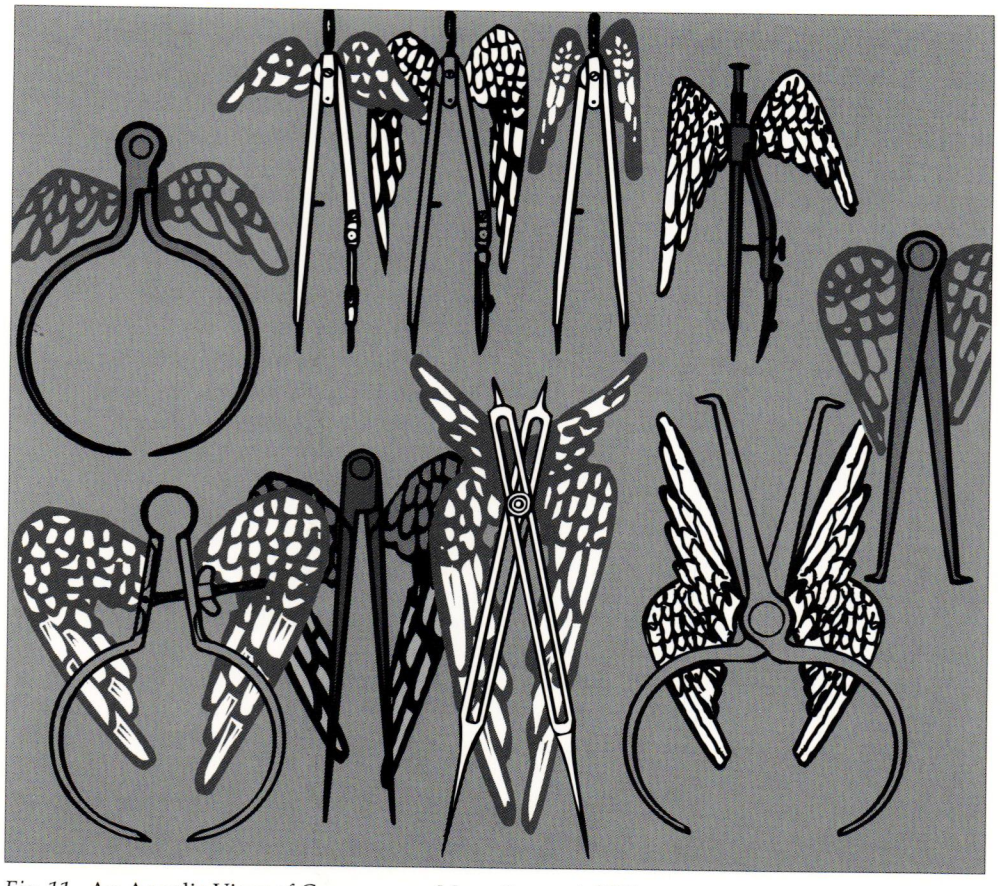


Fig. 11. An Angelic View of Compasses. *Marco Frascari, 1991.*

[Autumn 1985]: 49-52.). Socrates claimed Daedalus as his ancestor (Alcibiades 121a). See Indra Kagis McEwen, "Socrates' Ancestor," M.Arch. Thesis, McGill University (March 1991).

30. Among the Olympic crowd, Apollo and Dionysius do not possess *metis*, whereas Zeus is the most richly endowed with it. This is because Metis, the daughter of Oceanus and Aphrodite, was Zeus's pregnant wife who, just before delivering his baby, was swallowed by her Olympic husband. Consequently, Zeus delivered the baby from his head. This special baby was Athena. See H. Jeanmarie, "La naissance d'Athena et la route magique de Zeus," *Revue archeologique* (July-Sept. 1956): 12-39, and Detienne and Vernant.

31. In English, the term *deidalia* is translated as "cunningly-crafted" or "curiously wrought" (McEwen, 62). All the technological marvels described by Homer and Hesiod qualify as *thauma idesthai* (wonder-to-behold) or *deidalia*. For specific objects with the name *deidalia* and the connection with Daedalus, see note 29 and the section of the article related to the note.

32. Detienne and Vernant, 281-2.

33. Ibid., 308, 277.

34. Ibid., 11, 25, 284.

35. Ibid., 14-5, 18.

36. A clear presentation of the dual nature of *sollertia* or *metis* may be found in Italo Calvino's *Six Memos for the next Millennium* (Cambridge: Harvard University Press, 1979), 35-46. The second memo is devoted to the discussion of quickness. In this memo, Calvino discusses the Renaissance concept of *Festina Lente* (Hurry Up Slowly), and he concludes the piece with a story about a Zen draftsman who obtains from his prince two five year periods of meditation before drawing a perfect crab in one instant. For Calvino, artistic work should take account of two different measures of time. On the one hand, there is the untiring time, and, on the other hand, there is the hasty time. These are the *tempos* of the two gods who are most endowed with *metis* after Zeus, the fast Mercury-Hermes and the slow Hephaestus-Vulcan.

37. Detienne and Vernant, 237-8.

38. Ibid., 227. Also, Homer states "not strength, but *metis* is what makes the good wood cutter" (Iliad XX,III,315).

39. Detienne and Vernant, 53, n130.

40. After a detailed study of the usage of the term *deidelion* in Homer's text, Francoise Frontisi-Ducroux concludes that in its primitive Homeric usage the word meant a "cutting up" or "cutting out" (Frontisi-Ducroux, 78).

41. John James, *The Contractors of Chartres* (London: Routlege Kegan Paul, 1982).

42. For a discussion of these two puns, see Gianfranco Folena, *Volgarizare e tradurre* (Turin: Einaudi, 1991), 3-5; and Giulio Lepschy, "Traduzione," *Enciclopedia Einaudi* 14 (Turin: Einaudi, 1981), 457.

43. For a discussion of the Greek beginnings, see Richard Broxton Onians, *The Origin of European Thought about the Mind, the Soul, the World,*

Time and Fate (Cambridge: Cambridge University Press, 1951); and Bruno Snell, *The Discovery of the Mind in Greek Philosophy and Literature* (New York: Dover, 1982).

44. Folena, 6.

45. Detienne and Vernant, 306.

46. The inventions of Daedalus and Thalos are *a posteriori* representations of the discoveries done by a real craftsman, Theodore of Samos. An architect of the sixth century, B.C., Theodore was the chief architect of the Labyrinth of Lemnos; he also invented the level and the lost-wax casting technique.

47. In the many versions of the Daedalic myth, the figure of Thalos is almost negligible, but in the story, there is a parallel figure which can cast light on the origin of Daedalus's apprentice. This second Thalos is made of bronze. It is an organic-automaton, half man, half robot. It was built by Hephaestus, the divine craftsman gifted with *metis*. The bronze Thalos was given by the godly builder to Minos who put the bronze-man in charge of the security of the island of Crete.
The anatomical peculiarity of this creature was that it had only one vein which descended to the left ankle, and a membrane—a kind of cap—closed this vein at the bottom. Technologically speaking, Thalos is a mythological representation of the lost-wax technique of bronze casting. This Thalos was killed by the removal of the ankle cap. Its warm, waxy blood flowed out, leaving a cold bronze body. The connection between the bronze Thalos and the human Thalos is developed through a reptile. In a few versions of the daedalic myth, it is told that Daedalus was surprised while burying the corpse of his pupil. Asked what he was doing, Daedalus answered that he was burying a serpent. In Greek, this sentence is quite ambiguous; it can mean both the burying of a snake or a casting in bronze (Frontisi-Ducroux, 128). Probably, Palladio's and De l'Orme's snakes can be related to Daedalus's serpent, but that is another story.

48. For Daedalus's legend, see Diodorus Siculus (IV,76-80), Ovid (*Metamorphoses*, VIII,151-259), and Frontisi-Ducroux, part II.

49. In presenting his design, Scolari pointed out that the Arsenal of Venice is an amazingly daedalic place, a place of crafts and crafty arts (*Quinta Mostra Internationale di Architectura* [Milan: Electa, 1991], 40).

50. Ibid., 40. The story of the flight of Simon Magus is told in the apocryphal Acts of Peters.

> He made an attempt to fly over Rome to demonstrate his powers to Peter, who, by calling upon Christ, made him crash down...Thus, in the eyes of the Christian community, the magician came to death by his own *macchination*.

(my italics; Kurt Rudolph, *Gnosis* [New York: Harper & Row, 1987], 296).

51. *Quinta Mostra*, 46.

FIGURE CREDITS

Frontispiece. Courtesy of Erik Estorick, London.

1. Sophie Lissitzky-Küppers, ed., *El Lissitzky: Maler, Architekt, Typograf, Fotograf* (Dresden: VEB Verlag der Kunst, 1967), fig. 118.

2. Courtesy of Stedelijk van Abbemuseum, Eindhoven.

3. *Apiaria universae philosphiae mathematicae* (Venice: 1619).

4. Philibert De l'Orme, *L'Architecture* (Ridgewood, NJ: Gregg Press, 1964), III:prologue, 51.

5. John Bolt, ed., *Russian Art of the Avant-Garde* (New York: Viking, 1976), 208. Courtesy of private collector, Moscow.

6, 7. Photographs by Antonello Bellucci.

8, 11. Courtesy of author.

9, 10. Photographs by author.

Frontispiece. The Satiric Scene. *Sebastiano Serlio, 1545.*

CRAFT AND PRAXIS IN ARCADIA AND UTOPIA

William A. McClung

Extending from the slightest manipulation of nature to the most extravagant feats of engineering and design, "craft" occupies a central yet ambivalent status in the history of idealized environments. If, by definition, such environments are models of secular happiness, a praxis of improvement must be problematic, if not unwelcome. This condition is no less true for the society thought to be the product of design, Utopia, than for the one supposed to antedate design, Arcadia.

"Arcadia" and "Utopia" are literary and, to a lesser extent, architectural terms with long histories in classical, Renaissance, and post-Renaissance civilizations. In antiquity, Arcadia referred to a province in Greece of no particular importance until the late first century B. C., when the Roman poet Vergil situated his tenth pastoral eclogue there; in the Renaissance, the term was popularized as an imagined ideal landscape, a province less of Greece than of the mind. "Arcadia" gives a name to an environment in which the primary ruptures—between Man and God, Man and Nature, and Man and Man—have supposedly not occurred. Its literary history is complex, overlapping with the huge genre of the pastoral, but its constituents are familiar and stable, and have been made familiar in other arts, especially landscape painting.

"Utopia" is the contrary of "Arcadia" because it acknowledges, at least implicitly, that ruptures have occurred and are irreparable. The utopist's solution to the failure of society to produce either justice or happiness lies not in a reclaimed past, but in an invented future. Sir Thomas More coined the word with his fiction of 1516, *De Optimo Reipublicae Statu deque Nova Insula Utopia Libellus,* known in abbreviated form by the keyword that now lends its name to both the constitution and the physical fabric of an imagined state.

"Utopia" and "Arcadia" express or imply some normative relationship between craft and natural or artificial forms. On the one hand, we expect an arcadia, in its found or given setting, either to reject the crafts altogether or to subordinate them to the service and securing of immemorial, reflexive customs; yet arcadias have a history of assimilating crafts and their praxis without surrender of their claim to a pristine order of existence. On the other hand, from a utopia, which acknowledges no prior authority of place, we expect an order of craft—indeed a technology—adequate to the demands of an invented world; yet utopias have no stake in innovation beyond what it took to launch them into being. The two societies resemble each other, of course, in their claim to systems of existence and relationships insulated from the effects of time. It is in that problematic context that their crafts enjoy surprising careers.

ARCADIA

"Arcadia" means a place of natural civilization, and narratives or images of Arcadia attempt to reconcile the paradox at the core of this formula. Generally, that reconciliation takes the form of a society defined as dedicated to only those activities truly appropriate to the kind of creature a human being really is: one who rejects Faustian temptations to power over other men or over nature. Arcadia's physical fabric is simply Nature itself, modified, if at all, only by the cautious introduction of certain arts and crafts thought to be as appropriate to human residence in nature as the accessories or practices of lower

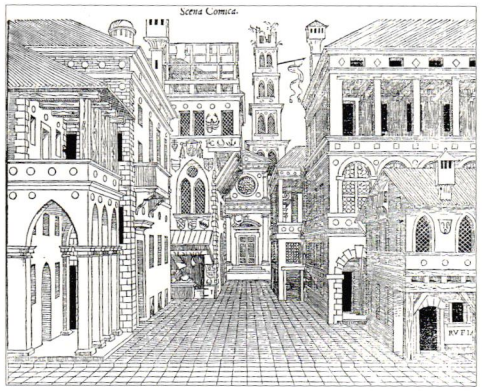


Fig. 1. The Comic Scene. *Sebastiano Serlio, 1545.*

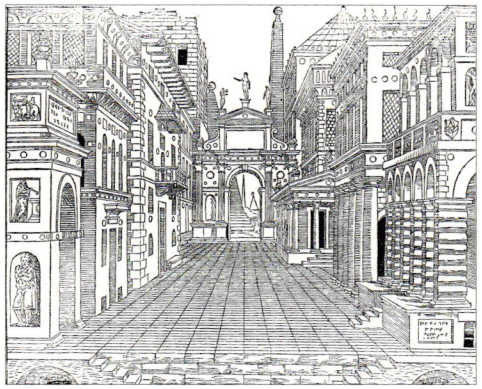


Fig. 2. The Tragic Scene. *Sebastiano Serlio, 1545.*

creatures, such as the shell of the tortoise or the structure and politics of the beehive. Among these, in Classical and Renaissance literature, are the customs of shepherds and cattle-raisers, whose occupations provide adjectives for the "natural" life, *pastoral* and *bucolic*.

Literature has been the primary vehicle for Arcadian speculation, and it has celebrated the activity of love as especially appropriate to, and nurtured by, the Arcadian environment. It was for love that generations of enthusiasts turned to the massive fictions of Jacopo Sannazaro (1457-1530) and Sir Philip Sidney (1554-86), both authors of influential prose romances called *Arcadia*. Against the complaint that they are idylls or mere dreams, arcadian literature has offered the defense that its universe of love incorporates the threats to and disappointments of that passion, including jealousy and grief. Of course, it is difficult for most modern readers to accept as replete the world of, for example, the spectacular double sestina in Sidney's *Arcadia*, whose complex verses terminate invariably at one or another of six boundaries of Arcadian experience: *mountains, valleys, forests, music, morning, evening* (fig. 3). Yet the poem's dramatization of devastating grief is the more powerful for having only those six magisterial presences as points of reference. Unlike its enframing prose narrative, full of incident and artifice (like invasions, and palaces), the double sestina rigorously restricts the arcadian environment to elementary phenomena and activities, even as its verse endows it with a rich and formalized structure of experience and expression.

The "key" to Arcadia is precisely this simultaneous reduction and elaboration of experience. By clearing the field of superfluities, the Arcadian narrator lays claim to an enriched experience of the essentials that remain. Craft, therefore, is suspect because it promotes innovation and complication. However, the Arcadias of theory and practice rarely satisfy the exacting standards of Strephon and Claius's circumscribed world. In the evolution of Arcadian programs, the ideological imperative is to reconcile introduced technology with the found environment. This reconciliation occurs in various ways and at various levels of craft, from the workmanship that is understood as an extension or realization of the innate nature of materials, to the accommodation of complex and sophisticated works of architecture.

In 1545, Sebastiano Serlio (1475-1554) published influential plates of generic comic, tragic, and satiric stage sets, after descriptions in Vitruvius's *De Architectura* (frontispiece, fig. 1, 2). These plates were actually used to illustrate Jean Martin's 1547 edition of Vitruvius, and they appeared later in other architectural texts. The satiric set, though intended in antiquity for the satyr-play, was understood in Serlio's time as appropriate for the pastoral drama. However, the prescriptions for its construction are surprising. Although it represents "all those things that bee rude and rusticall," the satiric stage is to be lavishly furnished, by Serlio's direction, with silk used to imitate flowers and foliage; various small animals fashioned from coral, pearl, and other precious and semi-precious materials; shepherds in silk and cloth-of-gold; and gilded nets for fishermen. "Never take care," he instructs, "what it shall cost . . . [for] the artificial will be

STREPHON:
Ye goat-herd gods, that love the grassy mountains
Ye nymphs that haunt the springs in pleasant valleys,
Ye satyrs joy'd with free and quiet forests,
Vouchsafe your silent ears to plaining music,
Which to my woes gives still an early morning,
And draws the dolour on till weary evening.
CLAIUS:
O Mercury, foregoer to the evening,
O heavenly huntress of the savage mountains,
O lovely star, entitled of the morning,
While that my voice doth fill these woeful valleys,
Vouchsafe your silent ears to plaining music
Which oft hath Echo tired in secret forests.
—
I that was once free-burgess of the forests,
Where shade from sun and sport I sought at evening,
I that was once esteem'd for pleasant music,
Am banish'd now among the monstrous mountains
Of huge despair, and foul affliction's valleys,
Am grown a screech-owl to myself each morning.
—
I that was once delighted every morning,
Hunting the wild inhabiters of forests:
I that was once the music of these valleys
So darken'd am, that all my day is evening;
Heart-broken so, that molehills seem high mountains,
And fill the vales with cries instead of music .
—
Long since, alas, my deadly swannish music
Hath made itself a crier of the morning:
And hath with wailing strength clim'b highest mountains.
Long since my thoughts more desert be than forests:
Long since I see my joys come to their evening,
And state thrown down to over-trodden valleys.
—
Long since the happy dwellers of these valleys
Have pray'd me leave my strange exclaiming music,
Which troubles their day's work, and joys of evening:
Long since I hate the night, more hate the morning:
Long since my thoughts chase me like beasts in forests,
And make me wish myself laid under mountains.
—
Me seems I see the high and stately mountains
Transform themselves to low dejected valleys:
Me seems I hear in these ill-changed forests,
The Nightingales do learn of Owls their music:
Me seems I feel the comfort of the morning,
Turn'd to the mortal serene of an evening.
—
Me seems I see a filthy cloudy evening,
As soon as sun begins to climb the mountains:
Me seems I feel a noisome scent, the morning
When I do smell the flowers of these valleys:
Me seems I hear, when I do hear sweet music,
The dreadful cries of murder'd men in forests.
—
I wish to fire the trees of all these forests;
I give the sun a last farewell each evening;
I curse the fiddling finders out of music:
With envy I do hate the lofty mountains;
And with despite despise the humble valleys:
I do detest night, evening, day and morning.
—
Curse to myself my prayer is, the morning;
My fire is more than can be made with forests;
My state more base than are the basest valleys:
I wish no evenings more to see, each evening;
Shamed I hate myself in sight of mountains,
And stop mine ears lest I grow mad with music.
—
For she whose parts maintain'd a perfect music,
Whose beauty shin'd more than the blushing morning,
Who much did pass in state the stately mountains,
In straightness pass'd the cedars of the forest,
Hath cast me, wretch, into eternal evening,
By taking her two suns from these dark valleys.
—
For she, with whom compar'd, the alps are valleys,
She, whose least word brings from the spheres their music,
At whose approach the sun rose in the evening,
Who, where she went, bare in her forehead morning,
Is gone, is gone, from those our spoiled forests,
Turning to deserts our best pastur'd mountains.
—
These mountains witness shall, so shall these valleys,
These forests eke, made wretched by our Music.
—
Our morning hymn is this, and song at evening.

Fig. 3. Double sestina from Arcadia. *Sir Philip Sidney, 1593.*

much more commendable the [*sic*] the naturall things themselves, [for] the more such things cost, the more they are esteemed."[1]

Serlio's pastoral setting brings together two orders of forms that have been reflexively understood as "natural": those of nature itself, both organic and inorganic, and those of crafts so allied by technique and cultural association to "nature" that they seem scarcely distinguishable from it—the rude cottages and fences that merely accommodate human beings in nature, without transforming or displacing it. Yet the materials from which both the natural and the built forms are constructed are conspicuously artful, and meant to be applauded for being so. In insisting that as much be spent on the rural as on the two urban sets, Serlio subverts the hierarchies not only of urban over rural places, but also of form over matter. His crafts bridge the gap between "natural" and "artificial" environments, and put them on the same level—an impression reinforced by the six-part gridding of the rural as well as the two urban sets. The satiric set affirms the satisfactions of primitivism, but at the level of a sophisticate, and so promotes the claims of Arcadia to be adequate to civilized expectations.

Vitruvius's prescriptions for theater sets influenced the first systematic account of landscape painting, by Giovanni Paolo Lomazzo in 1584, and through Lomazzo there is a clear line of descent to Claude Gelée, Le Lorrain (1600-82), the painter of the category called by Lomazzo "places of delight."[2] However, Claude's canvases are "arcadian" in more than their pastoral and bucolic settings: in them we find the dual process of reduction and elaboration characteristic of Arcadian fictions. His Arcadia is elaborated by the spoils of a daring raid on the world of time, history, and craft, one that liberates the arcadian sensibility from dependence on natural forms and such activities as may be inferred from them.

Claude's *Landscape with Egeria Mourning Over Numa* (l669) displays what have been called the "standard ingredients of the genre" of idealized landscape: "tall waving trees, water, distant hills, ancient buildings (intact and ruined), and a figure subject from classical mythology" (fig. 4).[3] The landscape alludes to the lake and town of Nemi and the castle of the artist's patron, Prince Lorenzo Colonna; the column in the foreground probably alludes to the prince's name as well.[4] Egeria is comforted as she laments her husband, the nearly legendary Numa Pompilius, Rome's second king, who was idealized as the governor of a small, but just and tranquil society. The anachronistic imperial architecture evokes the moral dignity and spiritual repleteness of life under his reign, while foreshadowing the Rome to come, the Rome nurtured by Numa, whose physical fabric manifests its fully realized culture.

As a component of the Arcadian landscape, architecture introduces the civilized dimensions of religion, history, even government, as well as arts beyond the scope of the shepherd's flute. Yet the canvas treats such dimensions as essences rather than as processes or systems. As essences, they don't move; as part of a larger composition, they exist in space but not in time. Although different structures may exhibit different stages of their lives—some pristine, some substantial, a few in decay—their temporal status is arrested, and the different stages are juxtaposed in space.

Time, the precondition for change, is the enemy of any ideal society. The strategy of the arcadian artist is to restate time in spatial terms, thereby incorporating the virtues of historical time into Arcadia by naturalizing elements of that world as arcadian. Craft, the agent of change, is such a virtue, and Roman architecture long claimed to be its outstanding expression. Claude severs Roman structures from their historical and urban contexts and resites them in arcadian landscapes. The time announced by the architecture in his painting is the cycle of classical civilization from genesis through maturity to decline; there is no eclipse. The pristine and ruined buildings are simultaneous and speak of a simultaneous order: the isolated column in the right foreground announces not the decay, but the antiquity of the Colonna family; the death of Numa, the cause of Egeria's grief, points to the growth of the Rome summed up in the nearby temple and basilica. Such a simultaneous order is subjectively valid because it mirrors the order the mind imposes upon phenomena at a given moment; time, spatialized in the painting, submits to the arcadian economy where all transactions return us to the point where we began.

Often romanticized as an elegiac painter whose compositions aroused nostalgia for unattainable paradises, Claude in fact worked for worldly, powerful clients in a dynamic and demanding milieu, one with strong links to seventeenth-century theater. His "ideal" world, far from being

Fig. 4. Landscape with the Nymph Egeria Mourning over Numa. *Claude Gelée (Le Lorrain), 1669.*

saturated with a sense of loss, was one, according to Marcel Roethlisberger, to which his clients aspired.[5] The Serlian sets in particular furnish analogues to Claude's compositions, which are linked to the scenographic tableaux of contemporary theater sets and, more distantly, to temporary architecture and related scenery for princely *entrées*, festivals, and other civic pageantry. Nor does an iconographic examination of his architecture justify an impression of melancholy decay: the canvases are legitimately seen as acts not of withdrawal but of engagement.[6]

If we allow for the highly conventionalized structures of seventeenth-century assumptions about both bucolic landscapes and classical Roman architecture, Claude's *Pastoral Caprice With the Arch of Constantine* (1651) offers an arcadia both replete and accessible, an imagination of timelessness endowed with the crafts of time (fig. 5). Here Claude inserts a structure of the most potent historical associations into a literal "bucolic," a landscape with cattle. By historical and literary conventions, the landscape is timeless, as is the arch, a piece of *Roma Aeterna*. Claude was fond of dropping well-known buildings into unexpected contexts, with a sleight-of-hand analogous to verbal wit; the structure is detached from the context and thread of time in which it customarily asserts its meaning. Rising as unexpectedly as the Statue of Liberty from the sands of the Planet of the Apes, the arch carries the freight of the high culture it represents. All the time it embodies, of mythologies, histories, politics, and arts, is projected upon a bucolic setting where, paradoxically, that past appears rescued, as if restored, replete and intact, to a prior order of existence with which it harmonizes, and where the passage of time can no longer affect it.

The price literary arcadias have usually paid for their freedom from craft and its products is the monochromaticity of their inhabitants' lives. However heightened the arcadians' experience of love and its attendant emotions (the characteristic preoccupations of arcadians), their range has been understandably thought narrow and their perceptions—Strephon and Claius to the contrary notwithstanding—naïve or callow. Architecture, however, bestows upon Claude's arcadias the advantages of craft without the entail of time and, therefore, of dissolution. Through a combination of Arcadian vision and Roman imagery, Claude reconciles two orders of phenomena, nature and art (both "fine art" and "craft"). By epitomizing Rome in a few recognizable structures and generic building types, Claude naturalizes the Eternal City and its culture in the Vergilian landscape from which it is imagined to have sprung.

UTOPIA

Sir Thomas More's *Utopia* prescribes both a constitution and a physical fabric for a good society, and just as More coins the word, so his text supplies the model of the interdependent social and material arrangements that typify the utopian configuration at its most sophisticated. Although Utopian labor, the manifestation of egalitarianism, is driven by the highest political imperatives, its implicit role is to mediate between the claims of stability and those of process.[7] A satisfactory structuring of the "physique," so to speak, of the island—its landscape and cities—having been achieved, labor in all forms, including the crafts, seeks to sustain the structures without deforming them. The apportionment of crafts among the citizens roughly parallels the phenomenology of the nation; or, to put it another way, the praxis of their crafts is a ritualized performance in time of the nation's fundamental spatial arrangement. It is by the repetition of both their craft duties and their similarly cyclical religious and leisure activities that the Utopians neutralize the passage of time, which in this, as in other stable-state societies, forever holds the threat of change.

Utopia begins with the act, not of a god or fabulous hero, but of an engineer. The founder Utopus, we are told, ordered the original peninsula to be severed from the continent, and he dignified the task by requiring his own soldiers to work by the side of the indigenes. Thus More initiates Utopia as a secular and materialist culture, defining the population's shaping of the environment as similar to the craftsman's shaping of raw material.[8] Utopia's landscape is similarly a product of the drafting board. On the one hand, there is the countryside, exactly apportioned among fifty-four city-states like squares on a checkerboard; on the other, there are the cities themselves, the pieces positioned within the squares. Agriculture is both everybody's and nobody's business: every citizen is drafted into the fields for a single two-year stint, but the permanent rural population is negligible, as is rural civilization by consequence.

Balancing their brief tour of agricultural duty is a working life devoted, with few exceptions, to one of the five sanctioned crafts, each based on a different material: wool, linen, wood, stone, and metal. These

Fig. 5. Pastoral Caprice with the Arch of Constantine. *Claude Gelée (Le Lorrain), 1651.*

substances and their workmanship are emblematic of urbanity and material culture, and they also provide a typology of phenomena that, like the six constituents of the world of Sidney's poem, are the boundaries of licensed activity and sensuous experience of most of the Utopians. More's lack of interest in commerce is nowhere more evident than in his presentation of the five crafts not as means to an end, but rather as the secular equivalent of prayer. He scarcely mentions how the finished products are put to use; rather, by identifying the citizens' lives with their elemental properties (here, a gradation from soft to hard, rare to dense), he emphasizes how the act of labor reconciles men and the matter with which they work.

The reader of *Utopia* is constantly reminded of the imperative of balance. This condition is secured by the laws, such as those that harshly punish irregular sexual liaisons, or that thoughtfully provide for the transfer of a youth unwilling to practice his father's craft to a family headed by a man whose craft he finds congenial. Balance is also practiced on the grand scale by the depopulation of overburdened cities to replenish those decimated by plague and by the decennial exchange of homes by lot. These policies are apparently intended to promote the identification of citizens with the city, or the state, rather than with any part of it. They have the effect of devaluing or de-aestheticizing the physical fabric of Utopia, relegating it to the status of a wholly supportive mechanism, a means as opposed to an end.

More records, for example, a process of architectural development from cabins and huts, "haphazardly made with any wood to hand, with mud-plastered walls" and thatched roofs, to the present three-story uniform party-wall residential structures of "stone or cement or brick, rubble being used as filling for the empty spaces between the walls."[9] These dwellings are both inexpensive and "far from mean," balanced between utility and dignity. What will arrest the process of innovation in architecture as in lesser crafts, like garment-making (there are no "fashions" in Utopian garments) is left unstated, but the essential formula of Utopian material culture is implicit: the equivalence of objects with desire. Utopians might take as their motto the admonition from Milton's *Comus*: "that which is not good is not delicious/ To a well-governed and wise appetite."[10] A preemptive nullification of desire significantly modifies the replete material culture lauded throughout the text. Thus has the formula for utopias remained to the present day.

Utopian building praxis, described in some detail, is an index to More's grander designs for the society:

> ...the erection or repair of buildings requires the constant labor of so many men elsewhere [i.e., in Europe] because what a father has built, his extravagant heir allows gradually to fall into ruin. As a result, what might have been kept up at small cost, his successor is obliged to erect anew at great expense. Further, often even when a house has cost one man a large sum, another is so fastidious that he thinks little of it. When it is neglected and therefore becomes dilapidated, he builds a second elsewhere at no less cost. But in the land of the Utopians, where everything has its proper place and the general welfare is carefully regulated, a new home on a new site is a rare event, for not only do they promptly repair any damage, but they even take care to prevent damage ...With the minimum of labor, buildings last very long, and masons and carpenters sometimes have scarcely anything to do, except that they are set to hew out timber at home and to square and prepare stone meantime so that, if any work be required, a building may the sooner be erected.[11]

The implications of this self-renewing building culture are both ethical and phenomenal. A constant program of maintenance, which does not come near to exhausting the available labor, avoids the waste of European practices. Such a program also dispenses with both design and construction as differentiated acts. In the Utopian building trade, acts of craftsmanship cease to be temporal markers or records of "achievement." With few exceptions, there is only—and always—the same building, which is replicated on four sides of a residential block, itself replicated across the city. "The person who knows one . . . will know them all."[12]

Several technological novelties stand in high relief against the background of a text that otherwise emphasizes such replication and continuity in material culture—a text in which disruptive events, like the housing lottery that discourages attachment to particular places, confirm rather than subvert the civic order. Among the devices that get so much attention are the chick incubators, glass windows, and folding doors. These devices leave a superficial impression of a nation of ingenious craftsmen, yet each begs the question of where the ingenuity that created them is acting "now"—that is, in any time

other than the endlessly repeated ideal moment that is the real "time" of Utopia. A clue may be found in the similar rhetorical emphasis given to the use of gold to make toys, chains (for slaves), and chamberpots. More's interest is not in the originality of these memorable handicrafts, but in how they promote the state's policy of uprooting the love of money. Similarly, in the text, technological cleverness is a dead-end street terminating at the achieved social order. For example, the folding doors "give admission to anyone. As a result, nothing is private property anywhere."[13]

The practice of craft in Utopia is meaningful not because it sustains a standard of living, but because it occupies the six hours between the similarly cyclical activities of education, recreation, and sleep. Like those undertakings, the citizens' labor has no purpose beyond the maintenance of the existing level of culture. The widespread use of glass windows is an instance. Although the windows impress us as an improvement upon the England of More's day, their technology is complete and their production and installation, beyond the familiar level of maintenance, is achieved. They are a piece of a finished material culture whose virtue lies not in their innovation, but rather in their self-realization as endpoints of craft that have helped the larger fabric of the city attain an artificial parity with nature.

In the end, the utopian model resembles the arcadian, for both claim to neutralize the entropy of historical time by implementing a stable system of relationships among human beings, nature, and craft. More's cities, the real "nation" at the expense of his neutered countryside, possess both the transcendence of an invented world and the stability of a natural order of things. At the point where it becomes congruent with psychology—with the legitimate limits of desire—craft fulfills its mission: to make a world for men as authoritative as "nature" is imagined once to have been, or, for beasts, still to be.

NOTES

1. Sebastiano Serlio, *The Five Books of Architecture*, trans. A. F. Santaniello (London: 1611; reprint, New York: Arno Press, 1970), II,3,§26r.

2. See E. H. Gombrich, "The Renaissance Theory of Art and the Rise of Landscape," *Norm and Form: Studies in the Art of the Renaissance* (London: Phaidon, 1966), 120.

3. Michael Kitson, *Claude Lorrain: Landscape with the Nymph Egeria* (Newcastle upon Tyne: University of Newcastle upon Tyne, 1968), 17.

4. Ibid., p. 7.

5. Marcel Roethlisberger, "Claude Lorrain: Some New Perspectives," *Claude Lorrain 1600-1682: A Symposium*, Pamela Askew, ed., *Studies in the History of Art* 14 (1984), 57-9.

6. Cf. Helen Diane Russell, *Claude Lorrain 1600-1682* (Washington: National Gallery of Art, 1982), 55-6: "Claude's invented structures . . . are complete, and they celebrate a world that is notable for its stately grandeur and beauty. In this respect his art is not often elegiac, and it does not manifest a 'nostalgic' or 'wistful' attitude toward the historical past, although such words have frequently been used to describe it."

7. Two categories of Utopians are exempt from manual labor: the lower echelon of elected officials, and scholars (who are chosen by the authorities). However, the officials voluntarily perform it, to encourage the others. From the scholars are chosen ambassadors, priests, higher officials, and the governors. Thomas More, *Utopia*, Edward Surtz, ed. (New Haven: Yale University Press, 1964), 73.

8. For the purposes of this essay we may ignore the much discussed differences between "More's" views and those of the narrator of Book II, Raphael Hythlodaeus.

9. More, 66.

10. *John Milton: Complete Poetry and Major Prose*, Stephen Orgel and Jonathan Goldberg, eds. (New York: Oxford University Press, 1991), 63.

11. More, 73-4.

12. Ibid., 63.

13. Ibid., 65.

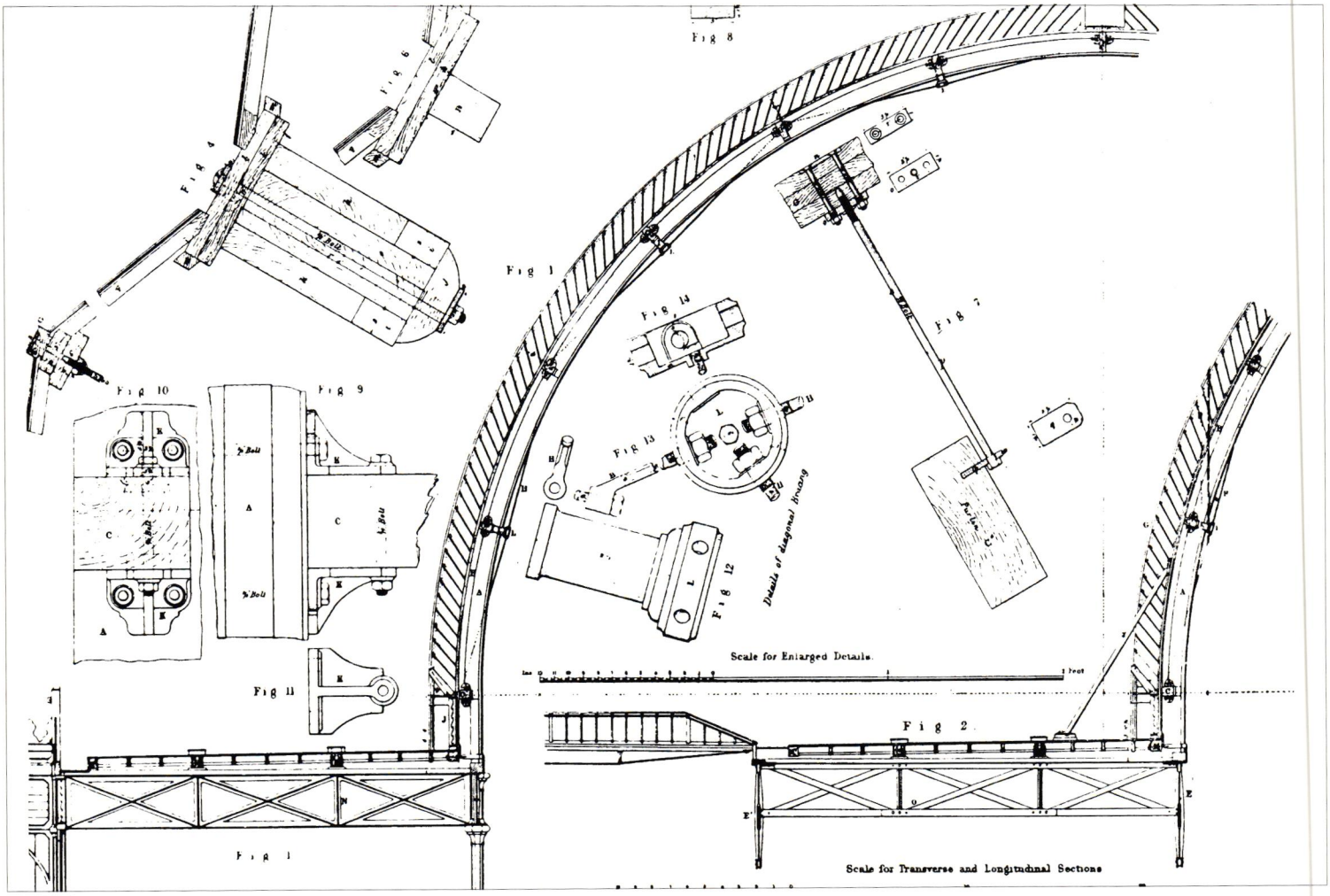
FIGURE CREDITS

Frontispiece, 1, 2. Courtesy of the Getty Center for the History of Art and the Humanities.

3. Sir Philip Sidney, *The Countess of Pembroke's Arcadia*, Maurice Evans, ed. (Harmondsworth, UK: Penguin, 1977), 413-5.

4. Courtesy of the Museo e Gallerie Nazionali di Capodimonte, Naples.

5. By kind permission of His Grace the Duke of Westminster, DK.



Frontispiece. Construction details of the Crystal Palace, London. Joseph Paxton, 1851.

THE CONSTRUCTION OF A META-PHYSICAL STRUCTURE

TRUTH AND UTILITY IN NINETEENTH CENTURY ARCHITECTURAL THEORY

Marc Angélil

> The theoretical knot that must be confronted is how to construct a history that, after having upset and shattered the apparent compactness of the real, after having shifted the ideological barriers that hide the complexity of the strategies of domination, arrives at the heart of those strategies—arrives, that is, at their modes of production.[1]
>
> —Manfredo Tafuri,
> *The Sphere and the Labyrinth*

As Tafuri suggests, the production of history is a process of artificial construction operating within ideological frameworks. History, considered a form of industry, implies the deployment of certain modes of operation, or strategies, in view of declared or hidden agendas. It further justifies its own right of existence.

Within such an understanding, this article attempts to trace the making of a specific historical program in architecture: namely, the connection between truth and utility "at the heart of those strategies" propagated by nineteenth century architectural theories at the outset of the Modern Movement.

TRACING A HISTORICAL PROGRAM

With the development of the natural sciences, the relationship between truth and utility in philosophical inquiry evolved from one of opposition to one of unity, as may be seen in Francis Bacon's assertion, "*ipsissimae res sunt veritas et utilitas*."[2] Paolo Rossi has provided the following extended translation of Bacon's statement: "things as they really are, considered not from the viewpoint of appearance, but from that of existence, not in relation to man, but in relation to the universe, offer conjointly truth and utility."[3] Bacon's concept of truth embraced not only transcendental causes, but also utilitarian matters, including use, material necessities, manufacturing, and technical exigencies. Physical reality was considered an integral part of a universal structure.

Believing in the need for a history of the technical and mechanical arts, Bacon sought to identify a connection between theory and practice, whereby the former might lead to an understanding of the latter. Bacon strongly argued for identifying the universal, and thus truthful, principles underlying real technical phenomena. This interdependence of theory and practice was supported by the propagation of empirical methods within the natural sciences, and contributed to the philosophical base of the Enlightenment.

Bacon's proposition implied a justification of the material world and belonged primarily to the sciences. Nonetheless, although it did not pertain to the appearances of things, Bacon's philosophical framework evolved to influence architectural theory. The prioritization of the concept of utility encouraged redefinition of the structure of formal expression. The search for truthful conditions underlying utilitarian matters became a guiding principle of composition, which now suggested a specific relation between form and technique. Form signified the objective reality of things as they were in their essential condition, thus including functional, as well as technical, considerations.

Traditionally, architectural form had been founded on the rules of a classical vocabulary that presumed a dichotomy between form and technique: a hierarchy in which formal concerns took precedence over technical had been the base of architectural theory. By the nineteenth century,

however, this hierarchy was challenged by the increased value assigned to the role of productive forces within society. Craftsmanship and construction gained importance as they provided a new basis for the deduction of aesthetic principles.

While this conjunction of aesthetic considerations and building construction had been anticipated during the Enlightenment by Carlo Lodolí and the Abbé Marc-Antoine Laugier, among others, the concept was further developed and brought to an unprecedented level of clarification by three architectural authors of the nineteenth century confronted with the emerging effects of the Industrial Revolution: John Ruskin in England, Eugène-Emmanuel Viollet-le-Duc in France, and Gottfried Semper in Germany. The writings of these three men addressed building construction within the general understanding of architecture as an art form. While their theories did not specifically attempt to investigate technical innovation, they did argue for a concept of form justified by an abstract notion about the processes of production. This consolidation of the concepts of beauty and utility led to a redirected search for the sublime, which led, in turn, to a new architectural aesthetic. The ideals inherent within Romanticism and the Enlightenment were synthesized in nineteenth century architectural theory, forming a structure from which the tenets of the Modern Movement could unfold.

In accordance with classical doctrine, architecture continued to be directed by the value of truth and to address the question of beauty as its primary subject. Its foundation, however, evolved toward the concept of utility as the signifier of truth. The

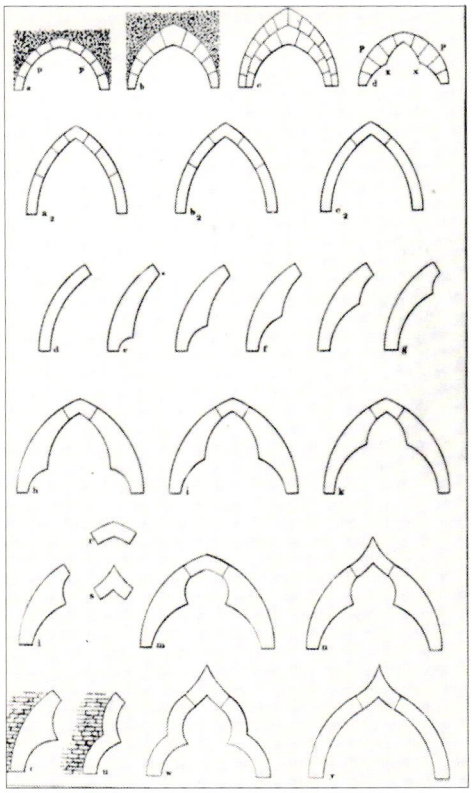


Fig. 1. Formal analysis of masonry arches in view of sensory understandings of structural principles, from The Stones of Venice. *John Ruskin, 1851.*

Fig. 2. Example of a masonry window arch for the Broletto at Como, from The Stones of Venice.

construction of such a meta-physical structure, inherently artificial in its proposition, could evolve only through the production of history—i.e., the conscious act of making it as history—which included everything from the act of writing to the firm establishment of accepted modes of operation in architectural practice.

JOHN RUSKIN: TRUTH WITHIN CRAFTSMANSHIP

John Ruskin (1819-1900) asserted the unity of truth and utility as a moral principle.[4] Without formulating a coherent architectural theory, Ruskin addressed certain ideas pertaining to the relation between formal expression and technical execution.[5] In *The Seven Lamps of Architecture* (1849), he offered an approach to architectural aesthetics based on an ethical foundation: the "lamps" of Sacrifice, Truth, Power, Beauty, Life, Memory, and Obedience.[6] It was within such a context that Ruskin understood the concept of utility; he did not conceive of architecture as pertaining exclusively to pragmatic considerations, but, instead, as transcending matters of utility.[7]

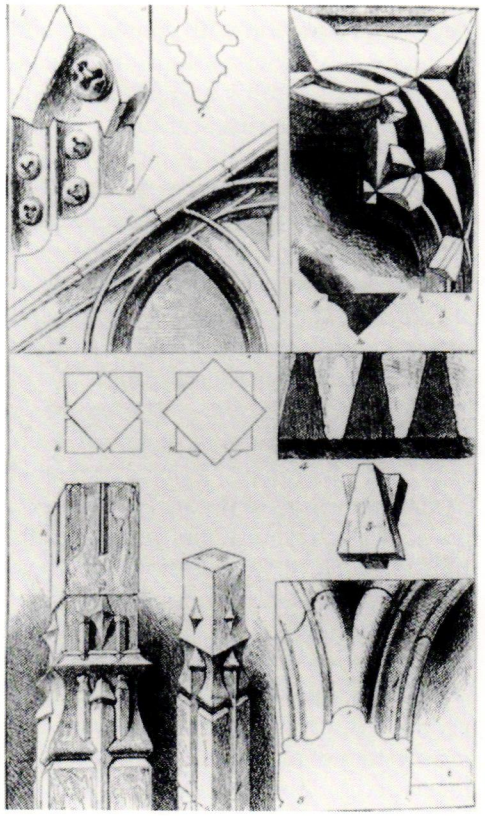


Fig. 3. Technical and formal interplay in the details of Rouen Cathedral, from The Seven Lamps of Architecture. *John Ruskin, 1849.*

Fig. 4. Artistic expression in the play of light and shade in Venetian Gothic architecture, from The Seven Lamps of Architecture.

Primarily an art theorist, Ruskin situated architecture among the other visual arts, which allowed him to elevate issues of pragmatic concern to what he believed a higher plane of understanding. Ruskin's theory of architecture proved to be founded on a conception of art based on a hierarchical structure, wherein the difference between the technical exigencies and fine art of construction constituted the difference between *Building* and *Architecture*.[8] The instrumental aspects of construction, as well as the accommodation of use, belonged to the realm of *Building*; *Architecture*, on the other hand, manifested artistic will. Ruskin wrote: "architecture concerns itself only with those characters of an edifice which are above and beyond its common use."[9] Building becomes architecture when the technical and functional considerations are resolved and the real aspects of production are taken to the level of poetic expression (fig. 1, 2).

This process by which *Architecture* transcended *Building*, Ruskin believed, was deeply rooted in the work of the craftsman, whose role in architecture corresponded to that of the artist in art. As the artist's work evoked beauty, so architecture depended on "that spirit which is given by the hand and the eye of the workman."[10] Here, Ruskin departed from the established rules of the classical tradition by emphasizing the subjective will of the maker. Construction provided a potential means of personal expression, a gesture of artistic value (fig. 3, 4).

This gesture assumed importance because the work of artists and craftsmen was thought to be guided by the search for truth. "Speaking truth," Ruskin asserted, "comes only by practice."[11] The violation of truth, which "dishonors poetry," was to be avoided. A connection was thus established between construction and architectural form. The making of architecture was to follow three principles. The first pertained to the formal consequences of the structural system: "the suggestion of a mode of structure or support, other than the true one," was considered a false assertion of real conditions. The second addressed the quality of building materials as revealed in the treatment of wall surfaces: "the painting of surfaces to represent some other material than that of which they actually consist" was to be avoided, for the nature of material was to be respected. The third concerned the operative aspect of creating form. "The use of cast or machine-made ornaments of any kind" was rejected, for truthful expression could result only from the craftsman's work.[12] Although the three deceits cited seem logically on separate planes, they nevertheless reveal a singular understanding of architectural form.

The relationship between architecture and observer implied by these principles led to Ruskin's preoccupation with finishes, hence veneer construction. The beauty

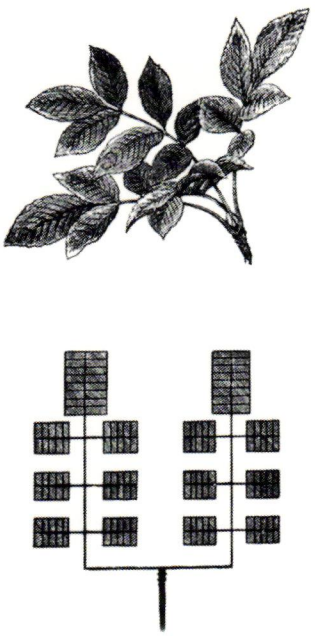


Fig. 5. Hierarchical structure within natural forms, from Lectures on Architecture and Painting. *John Ruskin, 1854.*

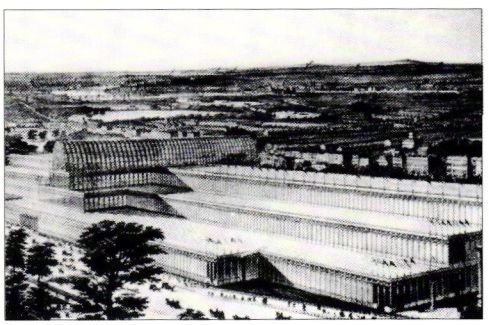


Fig. 6. The Crystal Palace, London.

within the nature of materials was to be expressed by the external layer of the building. The treatment and articulation of these surfaces was the primary task of the craftsman, whose work revealed the essential qualities of human labor. The visual accessibility of the architectural artifact was at the core of a conception that propagated an understanding of construction within the culturally accepted domain of aesthetic discourse.

Throughout his writings, Ruskin made reference to how principles could be deduced from the study of nature. An analysis of the hierarchical structures within natural forms, such as leaves and branches, could guide the artist's work (fig. 5). In "The Nature of Gothic," Ruskin contrived that as the "chemist defines his mineral by two separate kinds of character: one external, its crystalline form, hardness, lustre, etc.; the other internal, the proportions and nature of its constituent atoms," the architect considered his work in terms of *external forms* and *internal elements*.[13] The external forms were given by material conditions; the internal elements were determined by the artistic and "mental tendencies of the builders." Within his analogy, Ruskin equated the search for internal structures by the chemist and the internal (essentially intangible) motives underlying the artist's work. Both the natural laws discovered within the sciences and the expression of an artistic will applied to the revelation of fundamental truthful conditions. Such interpretation characterizes Ruskin's construction of an argument.

Ruskin's position was biased in favor of traditional craftsmanship. He regarded technical advances, new materials, and machine production with contempt, and he polemically criticized the iron and glass structures of the railway stations built in England during the mid-century.[14] Nonetheless, his position on Joseph Paxton's design for the Crystal Palace was ambivalent (fig. 6, frontispiece). He criticized the derivation of the structural framework from steel: iron could not contribute to *Architecture*, since the art of building and the laws of structure had been traditionally based on the material properties of clay, stone, and wood. "The entire or principal employment of metallic framework" was, therefore, "a departure from the first principles of the art."[15] However, the possibilities presented by the structural skeleton, glass building envelope, and prefabricated component did not elude Ruskin entirely. He recognized that new methods of production could offer an entirely different understanding of architecture: "the time is probably near when a new system of architectural laws will be developed, adapted entirely to metallic construction."[16]

While Ruskin's theories of architectural form included ideas pertaining to structure, building materials, and manufacturing processes, his propositions remained within the realm of traditional practice. He did not address the possible consequences of new construction techniques; he did not admit modern methods into his search for a new aesthetic sensibility. Nor did he attempt to address labor as a significant force within manufacturing and production. Instead, a poetic and evocative image of construction was advanced in the construction of what proved to be an influential theoretical framework.

EUGÈNE-EMMANUEL VIOLLET-LE-DUC: RATIONAL CONSTRUCTION

A different approach to architectural form based on the principles of nineteenth century technology was attempted by the French architect, restorer, and writer Eugène-Emmanuel Viollet-le-Duc (1814-79). An advocate of his age, he sought to integrate modern engineering and construction techniques into a new and expressive vocabulary of architectural forms. The unity of truth and utility, which for Ruskin belonged to the creative sensibility of the craftsman's work, was for Viollet-le-Duc a matter of rational thinking, as put forth in his two operative works: the *Dictionnaire raisonné de l'architecture française* (1854-68)[17] and the *Entretiens sur l'architecture* (two volumes: 1863, 1872).[18]

Throughout his writings, Viollet-le-Duc upheld the excellence of Gothic architecture, to which he had been exposed through the writings of Victor Hugo, the scholarly work of Arcisse de Caumont, and his own involvement in the restoration of Sainte Chappelle, Nôtre Dame in Paris, and other monuments of the French Middle Ages. Viollet-le-Duc believed that the truth of a formal style lay in the extent to which the hidden order of relationships responsible for the construction was made manifest; in the *Dictionnaire*, he even undertook to "prove" the ingenuity of Gothic construction, as may be seen in his analysis of Nôtre Dame in Dijon (fig. 7). Gothic architecture had played a significant role within French architectural theory since the sixteenth century, and the work of Philibert de l'Orme, Durand, Cordemoy, and Frézier, among others, had addressed Gothic construction in rational terms.[19] In this tradition, Viollet-le-Duc analyzed, for example, how systems of ribs formed

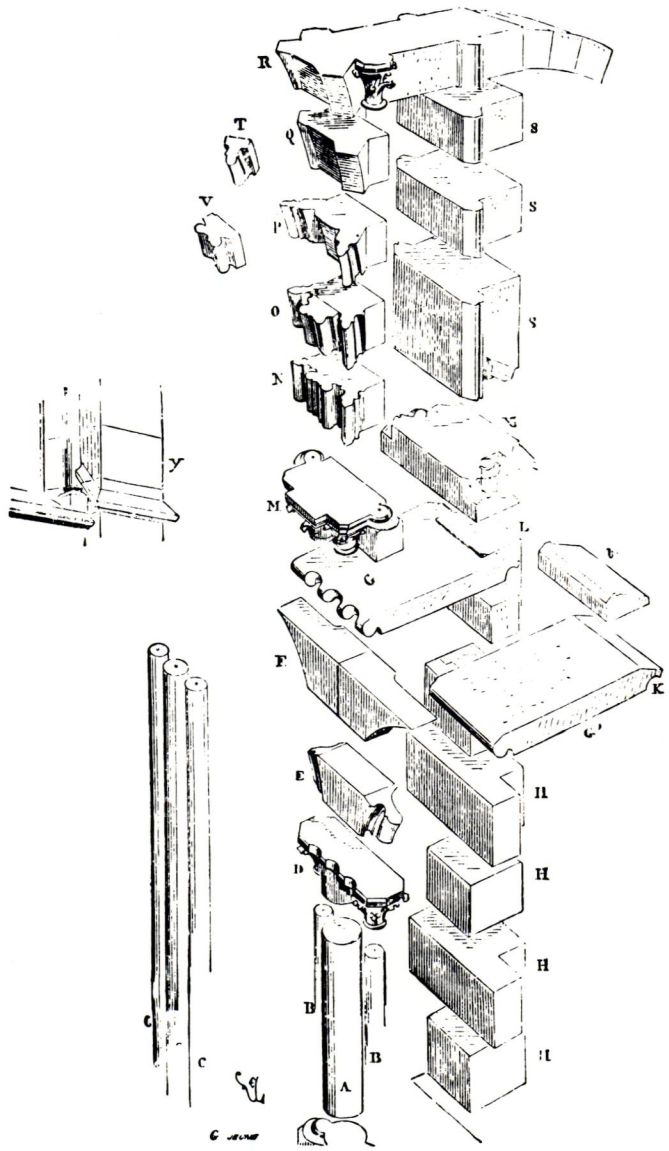


Fig. 7. Analysis of nave wall construction at Nôtre Dame, Dijon, from the Dictionnaire raisonné de l'architecture. *Eugène-Emmanuel Viollet-le-Duc, 1854.*

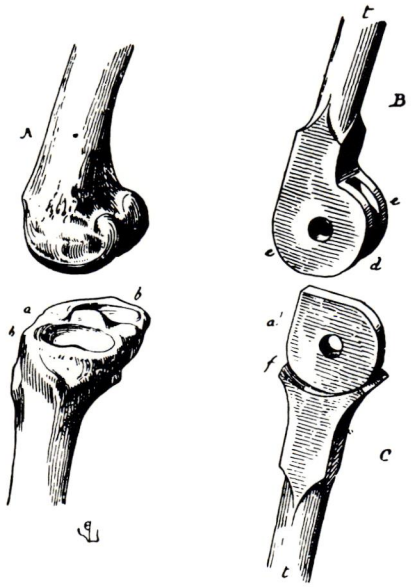


Fig. 8. Analysis of principles within natural forms as applied to structural mechanics: joints of bone structures, from Learning to Draw. *Eugène-Emmanuel Viollet-le-Duc, 1881.*

structural skeletons and how webs might be seen as infill: from such observations, basic principles of construction could be derived.

Viollet-le-Duc attempted to show that architecture was founded on a systematic, clear, and rational organization. This concept was not confined to an analysis of historical examples, but could, as suggested in the *Entretiens*, lead to a new "style." The use of "style" was significant, for the term implied not only a reference to architecture as an aesthetic discipline, but also a definition of style as "inherent in the arts of all times"—fundamental and eternal.[20] Stylistic principles, following this line of reasoning, were considered as universal and truthful as the laws of nature. As Viollet-le-Duc mentioned repeatedly, these principles could be deduced from the natural sciences, specifically anatomy and biology, and lead to a conception of a new—and essentially rational—style of architecture (fig. 8, 9).

This new architecture (*l'architecture de l'avenir*) was to take into account the materials and production methods that the development of technology had made available. New techniques required new forms. In building steamships and locomotives, naval and railroad engineers did not reproduce existing forms, but created objects and machines of unprecedented appearance or *physiognomy*.[21] Analogously, architects were encouraged to search for forms derived from the qualities of iron and its manufacturing processes.[22] Unlike Ruskin, Viollet-le-Duc recognized the possibilities resulting from industrial production and the prefabrication of parts. Building components could be entirely made in the factory or atelier and assembled on site, as at Paxton's Crystal Palace.[23] At work here was a theoretical program that stressed the necessity for architecture to adhere to technological progress. Metaphorical references to machine constructions and transportation devices—a strategy borrowed subsequently by propagators of the Modern Movement—offered the didactic means to support a theoretical proposition.

Viollet-le-Duc advocated a systematic approach to architectural construction that emphasized the interrelation between components, their assembly, and entire systems of construction. The relationship between parts constituted the essential structure of an architectural entity. The very idea of a system, as applied to architecture, implied the breaking down not only of the constructed whole into its constituent elements, but also of each of those elements into its component parts.[24] In identifying the logical principles from which the cohesion of such a system could be understood, Viollet-le-Duc followed a method of analysis rooted in scientific thinking, whose structure now formed in itself a conception of architecture. The relationship between architectonic parts in ideal and formal terms was determined by the very physical structure of building. This idea became fundamental to a new architectural aesthetic.

Viollet-le-Duc addressed the connection between the inherent structures of an object and its visible form. "Architectural construction," he wrote in the *Dictionnaire*,

> is the employment of materials according to their quality and their adaptability, with the idea of satisfying a need by the most simple and solid means, giving to the constructed

> object the appearance of durability and proper proportion, subject to certain rules imposed by the senses—reason and human instinct.[25]

Referring to reason and human instinct, Viollet-le-Duc offered a definition of construction encompassing the concepts of science and art, wherein construction was understood as both a body of knowledge, or science, and an expression of the creative will of its maker.[26] Viollet-le-Duc termed the latter *imagination*, but, significantly, went on to mention a *passive imagination* informed by reason and understanding. This passive imagination, in addition to the subjective *caprice* of the workman, directed and objectified human creativity.

Viollet-le-Duc made a distinction between *architecture* and *construction*. While architecture belonged to the realm of formal expression, construction addressed considerations of building production. "Architecture and Construction," he wrote, "must be taught, or practiced simultaneously; construction is the means, architecture is the result."[27] He criticized how the traditional approach to architecture concerned primarily formal appearances and ignored the essential logic on which the art of building was based. From this point of view, his theory of architecture was not exclusively concerned with questions of composition, but, rather, deployed the physical conditions of building production for the making of form. The resulting synthesis of form and technique constituted the base of the aesthetic program advocated by his writings.

Architecture (as opposed to construction) recalled the concept of beauty, which in itself implied the idea of truth. Viollet-le-Duc suggested that a unity of truth and utility could be achieved by giving equal value to formal and technical considerations, as the logic governing architectural forms was to be informed by the reality of construction. The laws of structural mechanics, qualities of materials, and principles of construction thus contributed to the definition of a formal order. Beauty in these terms was not considered apart from the concrete parameters of building production, but, instead, derived its meaning from the order underlying the physical creation of the architectural object.

GOTTFRIED SEMPER: FABRICATION AS STYLE

Within the German speaking part of Europe, the question of technique and its influence on form was addressed by Gottfried Semper (1803-79). Semper's most important written work, *Der Stil in den technischen und tektonischen Künsten oder praktische Ästhetik* (two volumes: 1861-3) involved the question of style within the technical arts.[28] The expression *praktische Ästhetik* ("practical aesthetic") in the title of the work indicated the valorization of the essential bond between form and technique.

Semper's theory was guided by the idea of the unity of truth and utility. Function, material, and technique (which belonged to the realm of utility) not only contributed to the creation of a work of art, but also defined its very meaning. Artifacts were considered the result of a creative process which took into account a series of parameters. Hence, the resulting works

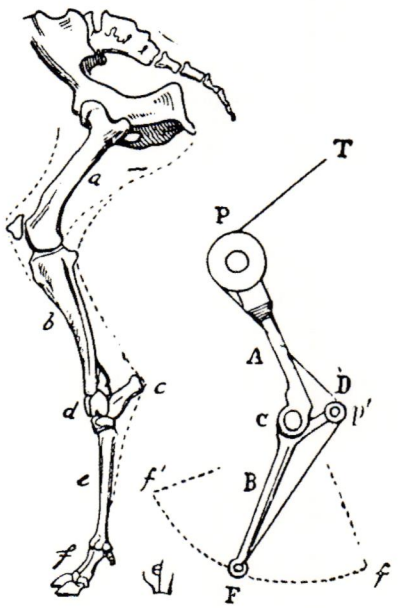


Fig. 9. Analysis of principles within natural forms as applied to structural mechanics: interaction of bones, muscles, and tendons; from Learning to Draw.

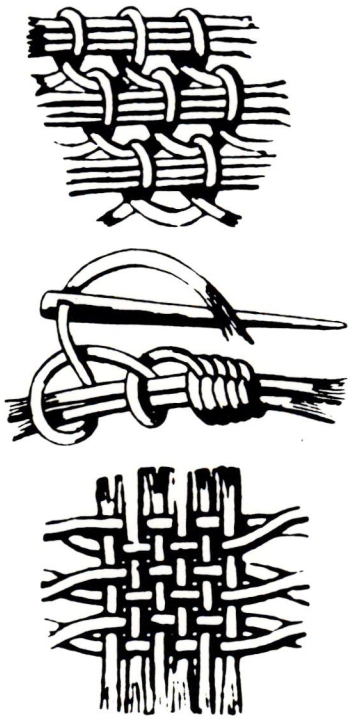


Fig. 10. Study of principles within the arts of sewing and weaving, from Der Stil. *Gottfried Semper, 1861-3.*

were a function of an unlimited number of agents, an idea summarized by Semper's formula, $Y = F(x,y,z,etc.)$.[29] Such variables included not only utilitarian factors, but also those related to the creative process, including the search for symbolic expressions and truths.[30]

Semper understood the work resulting from artistic production as an entity. Despite his use of a formula (or, perhaps, due to this fact), the artwork evolved for Semper a cosmological significance: it was "man's response to the world which is full of wonder and mysterious powers, whose laws man thinks he might understand, but whose riddle he never resolves." In order to come to terms with this "unattained completeness, man conjures into play by building a miniature universe for himself."[31] This artificial world, while conceived in reference to a larger unknowable order, was nevertheless to be comprehensible to man.

Semper proposed a structure for understanding the man-made world in his classification of the conditions under which artifacts, form, and style were generated. He identified two essential considerations in all processes of creative production. The first, necessity, governed the fabrication of objects (and thus the making of architecture). Semper saw the production of artifacts as the result of a need, whether "physically experienced or raised to a symbolic plane." The second factor, the materials and actual processes of production, determined the condition of the artifact.[32] Semper here directed his interest toward the truthful expression of function and the constructive qualities of materials, for which he used the terms *functionsgerechte* and *materialgerechte Form* (functionally and materially truthful form).[33] His understanding of building construction embraced not only traditional crafts, but also modern processes of production, as may be seen in his enthusiastic description of the properties and applications of rubber and other synthetic materials.[34] Although Semper repeatedly criticized nineteenth century industry for its speculation and division of labor, he nevertheless believed that architecture could be informed by technical advances, leading to the evolution of a new aesthetic sensitivity. Regarding the Great Exhibition of 1851, he wrote:

> may the inventions, the machines, and the speculators stir up things with all their might; they will thus prepare the mixture out of which constructive science will mold the new form.[35]

Functional and material considerations were analyzed by tracing the archetypical principles that underlay the processes of fabrication. Basic aesthetic laws, Semper asserted, originated within the fields of the practical arts and were then brought into architecture. "The industrial arts," he wrote, "are therefore the key to understanding architectural as well as artistic form and rule in general."[36] This idea was developed by Semper probably in response to what he had seen at the 1851 Exhibition, where the exhibited objects, more than Paxton's structure, had captured his interest.[37] Regarding the display of industrial products, Semper observed a decline in artistic quality resulting from a pretentious and tasteless application of machine production. He admired instead the objects of primitive civilizations, also showcased by the exhibition, because they demonstrated a high standard of artistic achievement based on a sense for materi-

als and techniques. In order to improve on the artistic value of modern industrial production, Semper argued, modern man had to consciously emulate what primitive civilizations had done instinctively: to respect "the properties of the materials and the requirement of the task."[38]

Such observations may have inspired the theoretical framework of *Der Stil*. Semper considered the origins of architecture to be found in the technical arts, which he divided into four primary branches: textiles, ceramics, carpentry, and masonry.[39] The archetypical conditions of these arts determined basic rules concerning function, material, and technical processes which could be applied to the industrial and, thus, modern arts. Herein lay the foundation of Semper's concept of a "practical aesthetics" (fig. 10).

As Laugier and other authors had done previously, Semper adopted the concept of the primitive hut to support his theoretical propositions. Through analysis of a "Caribbean Hut" featured at the 1851 Exhibition, he deduced an architectural system made up of four constructive elements: the hearth, base, roof, and walls (fig. 11).[40] Semper linked each of these elements to a separate branch of the technical arts. Weaving, belonging to the art of textiles, was the technique for making walls and partitions; ceramics, the art of molding and burning clay, was associated with the hearth; carpentry and joinery pertained to the roof and the framework of the base; masonry, or stereotomy, was historically significant, as it had replaced joinery in building substructures and was later used for making walls.[41] These correspondences between elements and crafts contributed to Semper's argument that primary building systems should be determined by the assemblage of various components.

However, despite his interest in utility, Semper was not guided by positivist interests. He stated that his position opposed modern materialism in principle. The "constructive-technical understanding of the origins of basic forms in architecture," he wrote,

> had nothing in common with the crude materialistic notion according to which the essence of architecture was nothing more than developed construction, as it were, an illustration and illumination of statics and mechanics, simply a display of material.[42]

According to Semper, form had to emancipate itself from the material aspects of architecture by transcending physical construction and entering the realm of symbolic expression.[43] An example of this process may be seen in the discussion of textile arts in *Der Stil*, which indicates Semper's interest in the use of color and pattern as meaningful decoration. Because the wall had its origin in woven materials, its function was not only that of enclosure, but also that of artistic expression. The term *Bekleidung* ("clothing") was used to identify the external covering of buildings, signifying that a building's wall was analogous to a person's clothing.[44] With the principle of *Bekleidung*, which was founded in the idea of a unitary origin for all the arts, Semper established the connection between the realms of necessity and symbolic intention.

For Semper, beauty pertained as much to the unity of truth and utility as to the

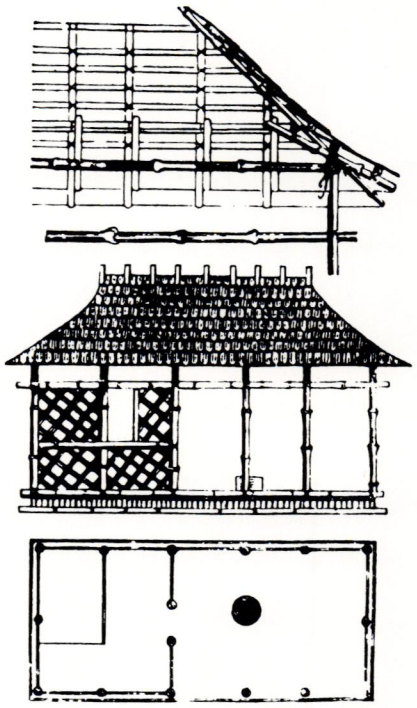


Fig. 11. Caribbean Hut, from Der Stil.

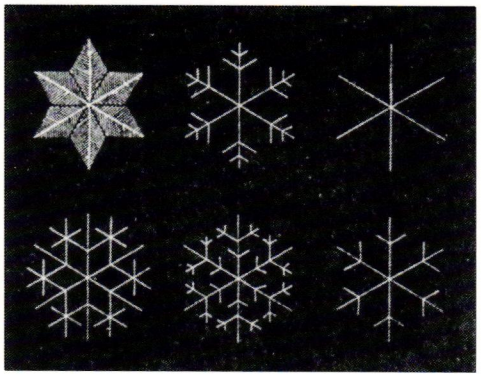


Fig. 12. Analysis of geometrical principles in snowflakes, from Der Stil.

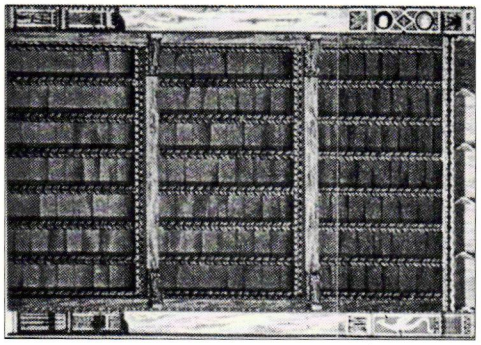


Fig. 13. Artistic expression within tectonic form: articulation and decoration of structure in ceiling construction, from Der Stil.

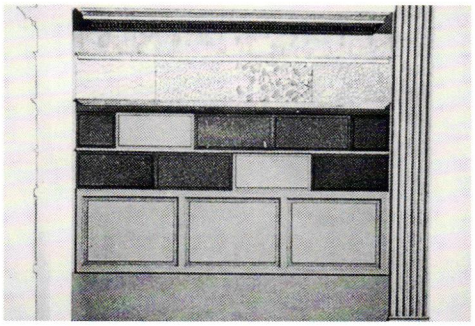


Fig. 14. Artistic expression within tectonic form: play of material and color in wall veneer construction, from Der Stil.

subjective will of the maker. Beauty was inherent within the internal structures of natural phenomena, and so Semper examined snowflakes, flowers, astronomical patterns, etc., for symmetry, proportionality, and unity of movement (fig. 12). Similarly, the beauty of man-made objects lay within their essential "structures," determined by the functions, materials, and techniques which underlay artificial production. Semper's idea of art as a system of production, defined as the truthful expression of internal "structures," coincided with an idea of beauty situated in the realm of artistic expression; beauty also pertained to the processes that revealed subjective values, truths, and ideas (fig. 13, 14). Architecture, or *Baukunst*, addressed the concept of art both as a system of production and as artistic expression; architects were to mediate between the categories of art and craft, between *Kunst* and *Kunstgewerbe*. In this mediation lay the foundation for Semper's understanding of style as the formal unity of technical parameters and personal expressions.

The concept of truth—being at the core of Semper's theoretical construction—was strongly associated with the manifestation of both objective and subjective values. His theory aimed to be all-encompassing, universal in the sense that it claimed for architecture the grounds on which science, industry, art, and the crafts could meet. This strategy allowed architecture to take a privileged center position, depicting it to be, if not of cosmological significance, a major part of the "miniature universe" of mankind.

HISTORY AS A FORM OF PRODUCTION

Despite their different conceptions of architecture, Ruskin, Viollet-le-Duc, and Semper contributed, in view of the wide proliferation of their ideologies, to the production of a historical program. Their theories strongly advocated a connection between form and technique. The truth believed to inhere within matters of function and construction offered an unprecedented foundation for the production of architectural form. The questions about utility that had occurred in the development of scientific thought became integrated into an aesthetic theory. This construction of a new aesthetic sensibility, while essentially modern, adhered to the classical tradition, insofar as both were directed by a belief in the *a priori* value of single truths.

This search for a modern base for architectural expression attempted to unite two domains: science, which arose from the thought system of the Enlightenment, and art, which was integral to the structure of Romanticism. The concept of building construction as science as well as art led to a novel understanding of the role of technology within architecture. Building technique was conceived in terms of its ontological dimension: not as the instrumental means to a specific and predetermined formal end, but as an end in and of itself. Technology in general, and architectural technology in particular, was related to man's condition of existence. Technique was inseparable from human endeavor.

The interdependence of practice and theory within architecture was most clearly revealed in the relation between technique and form. Form was based on

the truthful expression of technique as it related to material realization. This relationship evolved from the search of modern science for the underlying structures of natural phenomena. As applied to the production of artifacts, this search for truthful conditions required an understanding of laws contributing to the physical formation of the man-made world. The revelation of such laws was the object of the theoretical frameworks put forth by Ruskin, Viollet-le-Duc, and Semper.

An understanding of construction techniques thus became incorporated into nineteenth century theories of form. While traditional (and classical) theories assumed a priority of formal over technical concerns and were thus essentially representational in structure, a modern conception attempted to reconcile the means of production and the realm of visible expression. Because theory continued to address aesthetic issues, architecture was still considered a representational art that adhered to a set pattern of standards.

Theories advocating the unity of truth and utility not only contributed to a preferred mode of operation within practice, but also and more significantly reasserted architecture's epistemological structure. Thus, the production of history, in Tafuri's sense, did not shatter architecture's ideological base. Frames of reference might have been shifted, but architecture remained within the domain of stylistic considerations. Beauty continued to guide the production of architecture, and so to confirm its traditional status as a formal discipline. The construction of a modern history, intended to rejustify architecture's material base, ultimately disengaged itself from physical reality and led to the formation of a new meta-physical structure. In the name of universal truth, ideological mechanisms continued to reinforce architecture's elevated status. Despite the emphasis on a modern notion of utility, historical production continued to situate architecture within a construct dominated by aesthetic values, thus confirming its "strategies of domination."

NOTES

1. Manfredo Tafuri, *The Sphere and the Labyrinth*, trans. Pellegrino d'Acierno and Robert Connolly (Cambridge, MA: MIT Press, 1987), 10.

2. Francis Bacon, *Novum Organum* (1620), § 124.

3. See Paolo Rossi, *Philosophy, Technology, and the Arts in the Early Modern Era*, trans. Salvator Attansio (New York: Harper & Row, 1970), 160.

4. For a thorough analysis of Ruskin's life, see the biographies by Joan Evans, *John Ruskin* (Oxford: Oxford University Press, 1954); and by J. D. Rosenberg, *The Darkening Glass* (New York: 1961).

5. Graham Hough wrote that Ruskin's
> individual judgements are so capricious that to establish his real and substantial view is always a matter of shifting and collating: to quote any one passage as final lays open to the charge of being as arbitrary as Ruskin himself.

Graham Hough, *The Last Romantics* (London: 1949), quoted in Kristine Ottesen Garrigan, *Ruskin on Architecture* (Madison: The University of Wisconsin Press, 1973), xiii.

6. John Ruskin, *The Seven Lamps of Architecture* (New York: Farrar, Strauss & Giroux, 1981).

7. The connection between poetry and architecture was made by Ruskin in his early work, specifically, in the collection of papers entitled *The Poetry of Architecture*, which he had written in his youth and published under the pseudonym "Kataphusin" in J. C. Loudon's *Architectural Magazine*.

8. "It is very necessary, in the outset of all inquiry, to distinguish carefully between Architecture and Building." Ruskin, *Lamps*, 15.

9. Ibid., 15.

10. Ibid., 184.

11. Ibid., 36.

12. Ibid., 39.

13. John Ruskin, *The Stones of Venice* (London: Bellew & Higton, 1981), 118-39.

14. "Better bury gold in the embankments than put it in ornament in the stations." Ruskin, *Lamps*, 117. See also N. Pevsner, *Some Architectural Writers of the Nineteenth Century* (Oxford: Clarendon Press, 1972).

15. Ruskin, *Lamps*, 43.

16. Ibid., 44.

17. The choice of using a dictionary as the form by which to structure his writing had a didactic intention, an idea clearly expressed in the preface to the *Dictionnaire*:

> The dictionary form...seemed to meet my requirements most adequately because of the multiplicity of examples in my work. It would do justice to the complicated, but strictly logical divisions into which the compositional aspects of our medieval monuments fall, because it forces one to dissect, as it were, each building, as well as to describe the functions and applications of all the component parts.

Eugène-Emmanuel Viollet-le-Duc, *Viollet-le-Duc, Le dictonnaire d'architecture*, ed. Philippe Boudon and Philippe Deshayes (Brussels: Architecture + Recherches, 1979), 16.

18. Viollet-le-Duc, *Entretiens sur l'architecture* (Ridgewood, NJ: Gregg Press, 1965).

19. Robin Middleton, "The Abbé de Cordemoy and the Graeco-Gothic Ideal: A Prelude to Romantic Classicism," *The Journal of the Warburg and Courtauld Institute* 25-6 (1962-3).

20. See Viollet-le-Duc, *The Architectural Theory of Viollet-le-Duc*, ed. M. F. Hearn (Cambridge, MA: MIT Press, 1990), 215-30.

21. "The locomotive, for example, has a special physiognomy that all can appreciate and that renders it a distinct creation." Ibid., 220.

22. Viollet-le-Duc, *Entretiens*, 125.

23. Ibid., 336.

24. As described in a recent article by Hubert Damisch entitled "The Space Between: A Structuralist Approach to the Dictionary," Viollet-le-Duc's method discloses certain traits of structural thinking. Damisch writes that

> it is not difficult to detect the language of modern structuralism in Viollet-le-Duc's work, for the text of the *Dictionnaire* is full of references to elements and functions, systems, logic, and structural equilibrium, reasoning, deductions, reactions, and counteractions.

Hubert Damisch, "The Space Between: A Structuralist Approach to the Dictionary," *Architectural Design* 50 (#3/4, 1980), 84-9.

25. Viollet-le-Duc, *Dictionnaire*, 106. Translations from George Martin Huss, *Rational Building being a translation of the article "Construction" in the* Dictionnaire raisonné de l'architecture française *of Eugène-Emmanuel Viollet-le-Duc* (New York: Macmillan, 1895).

26. This unity of art and science was asserted in the opening sentence of Viollet-le-Duc's article "Construction" in the *Dictionnaire*:

> Construction is a science; it is also an art—that is to say, the constructor must have knowledge, experience, and a natural gift. Some are born constructors; science, which is acquired, can but develop the germs already deposited in the brain of those destined to give useful employment and permanent form to rough materials.

Viollet-le Duc, *Dictionnaire*, 105.

27. Ibid., 106.

28. Gottfried Semper, *Der Stil in den technischen und tektonischen Künsten oder praktische Ästhetik—Ein Handbuch für Techniker, Künstler, und Kunstfreunde* I-II (Mittenwald: Mäander Kunstverlag, 1977).

29. See "Entwurf eines Systems der vergleichenden Stillehre," in *Kleine Schriften*, ed. Manfred Semper and Hans Semper (Berlin: Verlag Spemann, 1884), 267.

30. G. Semper, *Der Stil* I, vii.

31. Ibid., xxi. For translation, see Joseph Rykwert, "Semper and the Conception of Style," in *Gottfried Semper, gta 18*, Schriftenreihe des Instituts für Geschichte und Theorie der Architekture, ETH, Zürich (1974/5), 73.

32. G. Semper, *Der Stil* I, 8; Rykwert, 72.

33. An early text written in 1834 already pointed to the relation between formal expression and material properties which later evolved as a guiding concept of Semper's theory. Important in this text was not the visible appearance of materials *per se*, but rather the revelation of their essential constructive qualities as, for example, disclosed by the laws of statics. See G. Semper, "Vorläufige Bemerkungen über bemalte Architektur und Plastik bei den Alten," 1834, in M. Semper and H. Semper, 219. For an analysis of "Vorläufige Bemerkungen," see Rudolf Zeitler, "Semper's *Gedanken über Baukunst und Gesellschaft in seiner ersten Schrift*: 'Vorläufige Bemerkungen über bemalte Architektur und Plastik bei den Alten,' 1834," in *Gottfried Semper, gta 18*, 18.

34. See the fascinating paragraphs on vulcanized rubber in *Der Stil*. G. Semper, *Der Stil* I, 112-9. See also Hellmut R. W. Kühne, "Über die Beziehung Sempers zum Baumaterial," in *Gottfried Semper, gta 18*, 113; and Wolfgang Herrmann, *Gottfried Semper: In Search of Architecture* (Cambridge, MA: MIT Press, 1984), 87.

35. G. Semper, *Wissenschaft, Industrie und Kunst*, in "Neue Bauhausbücher" (Mainz: 1966), 47.

36. G. Semper, "Theorie des Formeil-Schönen, Einleitung" (ms. 179). See Wolfgang Herrmann, *Gottfried Semper, Theoretischer Nachlass an der ETH Zürich, Katalog und Kommentare, gta 15* (Basel: Birkhäuser Verlag, 1974), 221.

37. Herrmann, *In Search*, 84-7.

38. G. Semper, *Der Stil* I, 124. See also Herrmann, *In Search*, 85.

39. G. Semper, *Der Stil* I, 10. Metalworking, which Semper considered to have developed from the previous arts, was later added as a fifth category.

40. This concept of the four primary elements of architecture was first mentioned by Semper in a manuscript entitled "Die vier Elemente der Baukunst" one year prior to the Great Exhibition of 1851. See also G. Semper, *Der Stil* II, 276.

41. See Rykwert, 75.

42. G. Semper, *Der Stil* I, 7. See also Herrmann, *In Search*, 121.

43. G. Semper, *Der Stil* II, 445.

44. The understanding of the building envelope as a thin layer applied to the structure of the building had already been realized in Paxton's Crystal Palace; significantly, however, this principle was developed by Otto Wagner and Adolf Loos as a guiding concept of modern architecture.

FIGURE CREDITS

Frontispiece. George Chadwick, *The Works of Sir Joseph Paxton* (London: Architectural Press, 1961), 134.

1. John Ruskin, *The Stones of Venice* I (London: Smith, Elder & Co., 1851), plate III.

2. Ibid., 129.

3. John Ruskin, *The Seven Lamps of Architecture* (New York: Farrer, Strauss & Giroux, 1988), plate IV.

4. Ibid., 137.

5. Ruskin, *Lectures on Architecture and Painting* (London: Smith, Elder & Co., 1851), plate III.

6. Patrick Beaver, *The Crystal Palace, 1851-1936: A Portrait of Victorian Enterprise* (London: Hugh Evelyn Ltd, 1970), 32-3.

7. Eugène-Emmanuel Viollet-le-Duc, *Le dictionnaire d'architecture*, ed. Philippe Boudon and Philippe Deshayes (Brussels: Architecture + Recherches, 1979), 122.

8. Viollet-le-Duc, *Learning to Draw, or the Story of a Young Designer*, trans. Virginia Champlin (New York: G. P. Putnam's Sons, 1881), 140.

9. Ibid., 143.

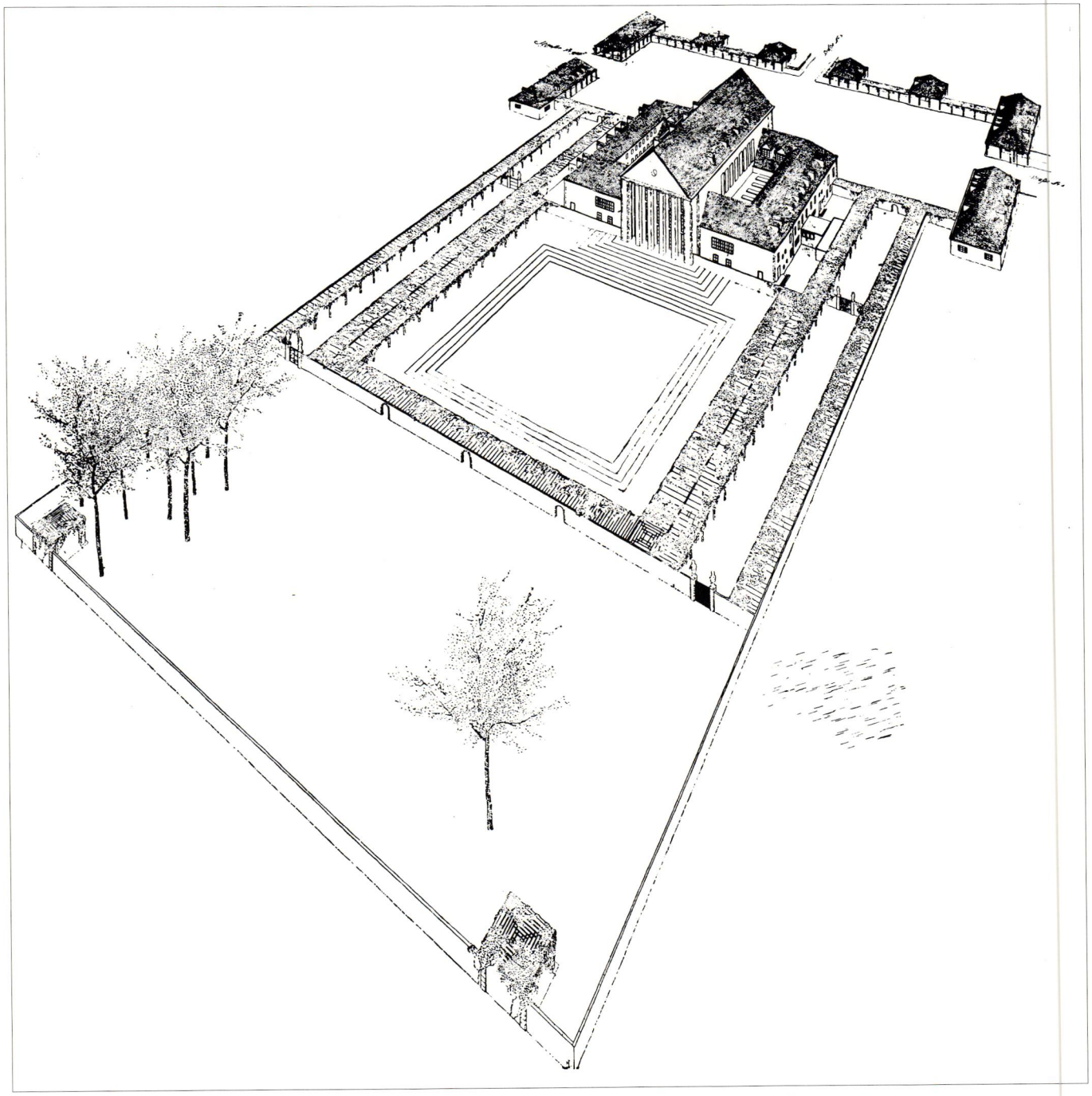
10. Gottfried Semper, *Der Stil in den Technischen und Tektonischen Künsten oder praktische Ästhetik* I (Mittenwold: Mäander Kunstverlag, 1977), 186.

11. Ibid. II, 276.

12. Ibid. I, xxv.

13. Ibid. II, plate XV.

14. Ibid. II, plate XX.



Frontispiece. Aerial perspective of the Jaques-Dalcroze Institute for Rhythmic Gymnastics, Hellerau. Heinrich Tessenow, 1910.

ELUSIVE IDEALS: MANU-FACTURE AND SMALL TOWNS

ON THE RELEVANCE OF HEINRICH TESSENOW'S CULTURAL CONCERNS TODAY

Wilfried Wang

Summa Summarum

Eine kleine Stellung, ein kleiner Orden,
(Fast wär' ich auch 'mal Hofrat geworden),
Ein bißchen Namen, ein bißchen Ehre,
Eine Tochter "geprüft," ein Sohn im Heere,
Mit sechzig 'ne Jubiläumsfeier,
Artikel im Brockhaus und im Meyer...
Altpreußischer Durchschnitt. Summa Summarum,
Es drehte sich immer um Lirum Larum,
Um Lirum Larum Löffelstiel.
Alles in allem —es war nicht viel.[1]

—Theodor Fontane, ca 1895

[A minor appointment, a minor medal,
(I was almost appointed a Court Counsel),
A little fame, a little honor,
A daughter "certified," a son in the army,
Jubilee festivities at the age of sixty,
Entries in the Brockhaus and Meyer encyclopedias...
Old Prussian average. *Summa Summarum,*
It was always about this and that,
This and that and such and such,
Altogether it wasn't much.]

Following World War II, Heinrich Tessenow (1876-1950) had but a few years to try, once more, to implement his beliefs and principles on architecture and urban design. In a profound way, these ideas were predicated on a vision of a manufacturing society, a culture that holds in high esteem the middle class, a pattern of settlements in which the small town would be seen as the most pervasive type, and therefore, ultimately, an economy that gives greater value to the real production of common necessities than to the excessive and speculative reproduction of trite and short-lived luxuries. In those years of bitter reflection on the destructive and murderous brutality of the Nazi regime, there was an inevitability of resorting to basic things. However, Tessenow was skeptical of the duration of such enforced modesty. He lamented the absence of a spiritual renewal without which the physical reconstruction would soon repeat the errors of the past; the scars of industrialization and speculative capitalism would continue to lead to "untenable conditions of life that were not caused by the war but were merely magnified by it."[2] Tessenow's position was part of a well-established line of criticism, although his combination of the ideals of manu-facture and the small town was more unusual, especially because it came from an architect and not from an economist or social theorist.[3] His renewed efforts after World War II resembled his attempts following the end of World War I, when he had another chance at returning to the first German Garden City of Hellerau near Dresden to lead the *Handwerkergemeinde* (community of craftsmen). Hellerau was conceived as a model Garden City. One of its motives was the dignified accommodation of a manufacturing population, removed from the harshness of the industrialized metropolis. It may be suggested that Tessenow sought a sound, crafts-oriented community that would guarantee the solid foundations for a wholesome architecture, which would in turn answer the needs of a modest and prudent middle class, and eschew virtuosic ornamentation, but not entirely the conscientious craftsman's flourish. Insofar as it would be the norm, this architecture would bear witness to the maintenance of middle class standards. Tessenow's ideals of manu-facture and the small town were thus part of a complete set of principles that clarified the connection between the making of an ar-

chitecture and its representation. The relation of these principles formed a comprehensive whole, as much as the manufacturing mode of life in the small towns would be organically connected to its appearance.

In relation to the larger economic developments at the beginning of and during the twentieth century, these ideals necessarily remained elusive. The bare survival of the crafts (as distinct from quasi- or would-be arts) and the small town today may be interpreted as a measure of the relative distribution of decision-making within a given society on such issues as the satisfaction of real or stimulated needs, as an index of modes and standards of life, and as a reflection of the culture within which they were to operate. Tessenow was of course aware of the impossibility of superimposing these ideals on any given group of craftsmen or on any given society, but he hoped that they might have had the power to inspire.[4] His writings suggested an inherent logic to these ideals which, nevertheless, were clearly unable to withstand a more powerful logic than the praise of norm, modesty, and essence, which had originated in England and spread to the European periphery and beyond: the autonomizing logic of capital expressed in the continuing process of industrialization. Nor could Tessenow oppose the "inorganic" appropriation by the Nazi regime of those normative forms of domesticity and settlement communality that he had proposed and which he regarded as being intimately tied to these ideals.

INDUSTRIALIZATION AND THE LOSS OF SENSITIVITY TO THE CRAFTS

Awareness of the concomitants of industrialization was expressed at an early date by those who entered the domain of factory workers in English mill towns during the first half of the nineteenth century.[5] Such awareness gave rise to disenchantment with the manner in which energy was harnessed and resources were turned into capital, objectives that ultimately led to the replacement of the known world order: towns with civic pride set in pastoral countryside, now despoiled by seemingly endless coal- and dust-covered terraced houses. This disenchantment was a powerful force behind both reactionary and reformist cultural and architectural criticism alike. Examples were the harrowing voices of Ruskin, Morris, and subsequent followers of the English Arts and Crafts (such as the German Werkbund and the Bauhaus). Late symptoms of this disenchantment could be traced to the success in the proliferation of post-World War II suburbia, on the one hand, and the reflections of the Frankfurt School, on the other.[6]

Parallel to the lamentable development in the field of settlement design, the sensitivity to crafted objects of substance was increasingly turning away from a matter of knowing cognition to one of superficial perception. The invented memory of a desired life at peace with nature and yet in command of venerated cultural achievements inevitably shut out the economic reality of converging standards of living between, for example, craftsmen and the bourgeoisie. The latter became less likely to patronize the former, more often than not being attracted to buying directly from large-scale producers, who might have been able to offer similar products at cheaper prices. Corporate culture, the ineluctable, necessary, and altogether logical consequence of the division between the application of capital from that of other resources (human/labor, crafts/skills, materials/energy), implied the disinterested and potentially ruthless regime of economy. The presence of corporate behavior in almost every sphere of production, whether formerly related to handcrafted, manu-factured objects, or even entering into the hitherto unblemished ritualistic-cultural realm ("culture industry" according to Horkheimer and Adorno), was one of the concomitants of industrialization. Craftsmanship, the proper application of techniques on an appropriate choice of materials in considered designs, was no longer understandable, but only quantifiable. The resulting loss of cognition included the eclipse of the concept of validity in terms of an object's physical, aesthetic, and operational "life-expectancy."

Against this background, Heinrich Tessenow was among the most forceful propagators of craftsmanship's continued existence as an integral part of contemporary settlement culture, in particular that of the small town. In his book *Handwerk und Kleinstadt* (*Manu-facture and the Small Town* [Berlin: 1919]), Tessenow could be said to have brought together many strands of thought and experience that had accompanied his earlier work, notably, and probably most fittingly, his contribution towards Germany's first Garden City: Hellerau near Dresden (1910-2).

What were Tessenow's arguments in favor of manu-facture and the small town,

and how were they part of the then current debate? To what extent was Hellerau successful as a Garden City for workers, craftsmen, and artists, and to what extent was it prejudiced by the very premises that it tried to replace? Was and is the necessary ordinariness in the unity of milieu and craftsmanship not an irresolvable contradiction, an unattainable virtue, given the omnipresent desire for recognition (be it on behalf of the craftsman, the craft, or the place)? Answers to these questions, as far as they can be given, may help to shed some light on the relevance of Tessenow's "elusive" ideals today.

TESSENOW'S IDEALS: MANU-FACTURE AND THE SMALL TOWN

In his book *Handwerk und Kleinstadt*, Tessenow portrayed the seemingly unbridgeable gap between the realm of technology, with all its promises, false and actual, its Mephistophelian temptations, escapable and inextricable, and the basic field of everyday needs that still had been left wanting, a fact made all the more vivid by the events of World War I:

> While we may often decry this war, it is of little use, for we only rarely, if ever, decry its origins or the particular characteristic of the last decades wherein this war has its roots, but we would defend ourselves against it in the same way as we have always scolded our machine products as being cheap and degrading, only to continue to build new and ever larger factories.[7]

Understandably, the tone of Tessenow's writing is fatalistic and apocalyptic. Following a war of unprecedented destruction, Tessenow did not delude himself as far as its origins were concerned. The increasingly uneconomic crafts were being eclipsed by mass production techniques, the latter leading to fierce commercial competition that was to be extended to the battlefields. Tessenow thus saw craftsmen as having been cast in two disparate roles: that of the destitute and that of the artist. He considered this casting to be one further case of contemporary culture's extremism. Such extremes could be avoided in the field of manu-facture by recalling the medieval ideal of craftsmen whose "outstanding significance...consists of the fact that, in their work, they are the least one-sided, they are the individuals who bring together the most."[8] Tessenow believed that craftsmen should avoid the unbalanced pursuit of either the organizational, economical, and social dimension, or the individual, sensitive, idiosyncratic aspect of their discipline, as the former interests turn craftsmen into factory directors, and the latter turn them into obscure artists. Instead, true to the breadth of skills in bringing together disparate materials, people, and techniques, craftsmen should hold the middle ground. Tessenow regarded them as being the best members of the middle class; without their independence, health, and influence, the world would become one large battlefield.[9]

The physical displacement of craftsmen's workshops from the center of the metropolis indicated the esteem in which "industry" was held. According to Tessenow, the metropolis thrives on the opposition of extremes such as luxury and poverty, which is fueled by the presence of speculators and casual workers, visitors, and the demimonde. While the metropolis is marked by exaggeration, the village is characterized by another form of immoderateness: the concentration of property ownership and the wielding of manorial power. While certainly not denying its shortcomings, Tessenow held up the small town as the most balanced settlement type, and the most demanding of its inhabitants as far as their scruples are concerned. While the village and the metropolis either impose a naked intimacy or a cold indifference, the small town possesses a morphological structure and wholeness conducive to a more moral mode of behavior, as suggested by Tessenow's interpretation of the ability of the cathedral bells to be heard in the town's farthest corner. Tessenow's ideal of the small town may be summarized thus:

> In worldly terms, the small town is what the craftsman is in human terms, both essentially effect the same thing, that is, that they come closest to all essential things and remain furthest from all exaggerations, that they combine all opposites in the most fruitful way, that they provide us with the greatest uplift, and that they are the most likely to protect us from basest meanness.[10]

In his evaluation of the ideal settlement size, Tessenow regretfully acknowledged the logical need for both village and metropolis, to nurture and protect the small town. Yet he also suggested that the town with 20-60,000 inhabitants would accommodate the essential things, balancing surrounding small-holdings and agriculture; professional services, trades, and crafts; and material poverty and intellectual values that were ultimately to motivate production.[11] The size of the population was to a certain extent derived from

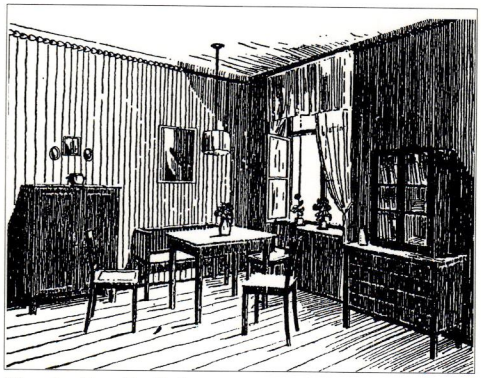


Fig. 1. Family living room with furniture by the Deutsche Werkstätten. Hermann Muthesius, 1918.

the German Garden City Society, Grünau-Berlin, that had suggested a figure of 30,000 for newly established settlements. On this latter issue, Tessenow warned that the establishment of a small town would risk the danger of excessive haste in its formation, as it would bear the hallmarks of the metropolis. Further,

> For every new establishment of a small town, there is always the danger of adhering to metropolitan standards instead of those of the simple small town; one is always dangerously tempted to primarily locate factories and factory directors and machine workers and then possibly—for reasons of an accompanying external balance—a bunch of aesthetes, instead of expressly favoring right from the beginning that which inherently contains the necessary balance: manufacture, the craftsman with his workshop.
>
> The factory director, the machine worker, the aesthete, *et al.*, are essentially metropolitan or rural in character and, in their capacity as leaders, they will inevitably seek to direct the settlement in its details, as well as in its entirely metropolitan or rural qualities, and they will thereby undermine all healthy growth of the settlement right from the beginning, they will never believe that here the craftsman has better intentions and abilities than they, they will never believe that the small town can be a world unto itself, and therefore an unhappy hybrid will result that will no longer be considered a solution to the highest tasks, at best being a nice suburb. And indeed, many of the new small towns or Garden Cities could be said to have ended in this way, not because it has to be like this today, but it necessarily has to be like this if they were led right from the beginning by one-sidedly oriented metropolitan or rural people, instead of expressly manu-facturing individuals.[12]

Some six years after Tessenow's involvement with the design of housing and communal building for the Garden City of Hellerau, these reflections may be read as an implicit criticism of everything that Hellerau had been. In addition, Tessenow's advice on the most suitable workshop size (between three and twelve craftsmen of varying seniority) and the dangers of the rate of expansion[13]—the larger size calling for management disciplines, and so forth—could also be taken as critical commentary on the Deutsche Werkstätten für Handwerkskunst Dresden und München in Hellerau, with its 500-strong workforce in the summer of 1909.[14] In fact, as the firm's history shows, it became a victim of its own success. It grew in the pre-War years, but then, in the course of a number of increases in the company's capital, it suffered the ultimate eclipse of its founder-director, Karl Schmidt, in the late 1920s.[15]

Tessenow concluded with a plea for the individual's harmonious development such that the intuitive, sensitive, and intellectual aspects would have almost equal emphases. In this connection, and subsequent to the First World War, Tessenow dismissed world peace theories as effective as the rule of law for the day-to-day control of crime.[16] Manu-facture and the small town, he argued, were inherently harmonious and of little belligerence; both would guarantee a tolerant way of life.[17]

Fig. 2. Sewing section of the Deutsche Werkstätten, Hellerau. Ca 1912.

Fig. 3. Painting and lacquering section of the Deutsche Werkstätten, Hellerau. Ca 1912.

However, the apocalyptic tone returned in the final incantations:

> We [society] wanted specialists, simple craftsmanship meant little to us. We wanted the most one-sided things, as this had the greatest external effects; the manifold seemed to us to be a hindrance. We wanted one-sided things and we wanted a lot of them, the manifold seemed to us to be too expensive. We wanted cheap things, and as a result of that, we soon did not particularly love our work, and so we were able to easily negotiate anything and the trading spirit led us along. We had been to many places where all that is dear to us had to fail, and thus we grew nervous, and the nervous-tense characteristic became general, such that in the end we lacked almost any sense of scale to help appraise people and their work. Labels and examinations and other external qualities had to replace simple and healthy cognition and sensitivity in an ever more urgent manner, and the accentuated external qualities became ever more powerful until today, when overwhelming, it sought to destroy almost everything human...[18]
>
> Perhaps it is really ludicrous to want manu-facture and the small town, or perhaps before they can flourish again, it will first have to rain something like "sulphur"; perhaps their forthcoming flower may only be possible in a splendor that we may only barely understand today, and perhaps it wants a people that has passed through hell.[19]

TESSENOW AND HELLERAU

Tessenow's path to a normative objectivity that ignored the expression of innovation while nevertheless incorporating new techniques[20] had been informed by the then recent studies by Hermann Muthesius on domestic architecture in England (fig. 1);[21] the polemics for a simple, dignified building tradition propagated by Paul Schulze-Naumburg (with whom he worked from 1904-5); and the ascetic North German Protestantism that had also influenced the bourgeois concern found in the realism of late nineteenth century German literature and painting.[22] Tessenow's apparently simple houses, especially those realized at Hellerau (see the row houses Am Schänkenberg Nos 1-5 of 1910 or the single family house of 1911 that used the patented cavity wall), were and remain part of the norm in the design of houses; today they are virtually indistinguishable from their suburban neighbors in the north of Dresden.

In the political sphere, social-liberal Friedrich Naumann wrote an essay in 1904 on art in the machine age ("Kunst im Maschinenzeitalter") suggesting that economy and quality in products would require an artistically developed society that embraced the active use of machine tools. In 1907, Muthesius, together with

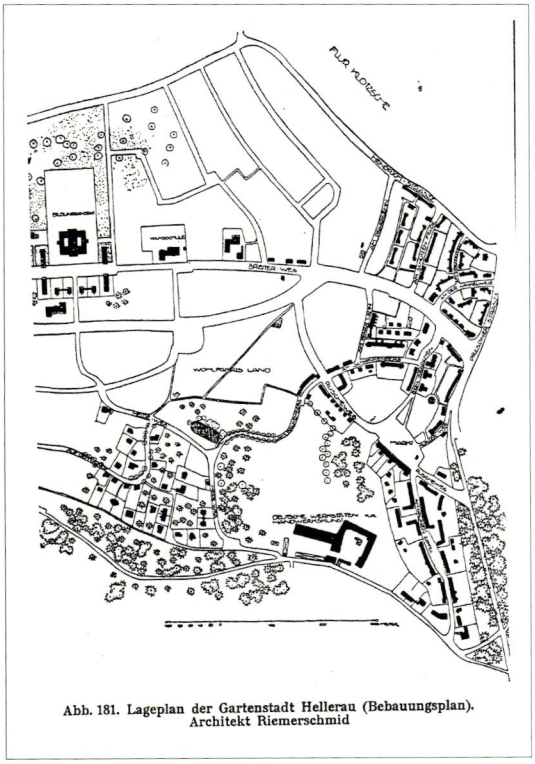


Abb. 181. Lageplan der Gartenstadt Hellerau (Bebauungsplan). Architekt Riemerschmid

Fig. 4. Proposed site plan of the "Garden City" of Hellerau. Richard Riemerschmid, 1910.

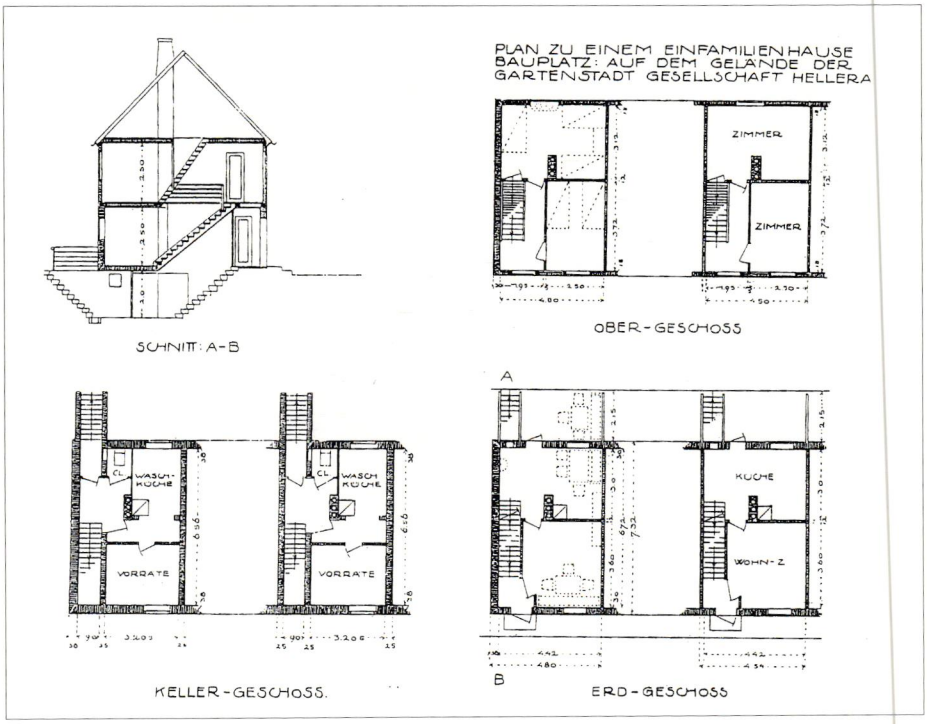
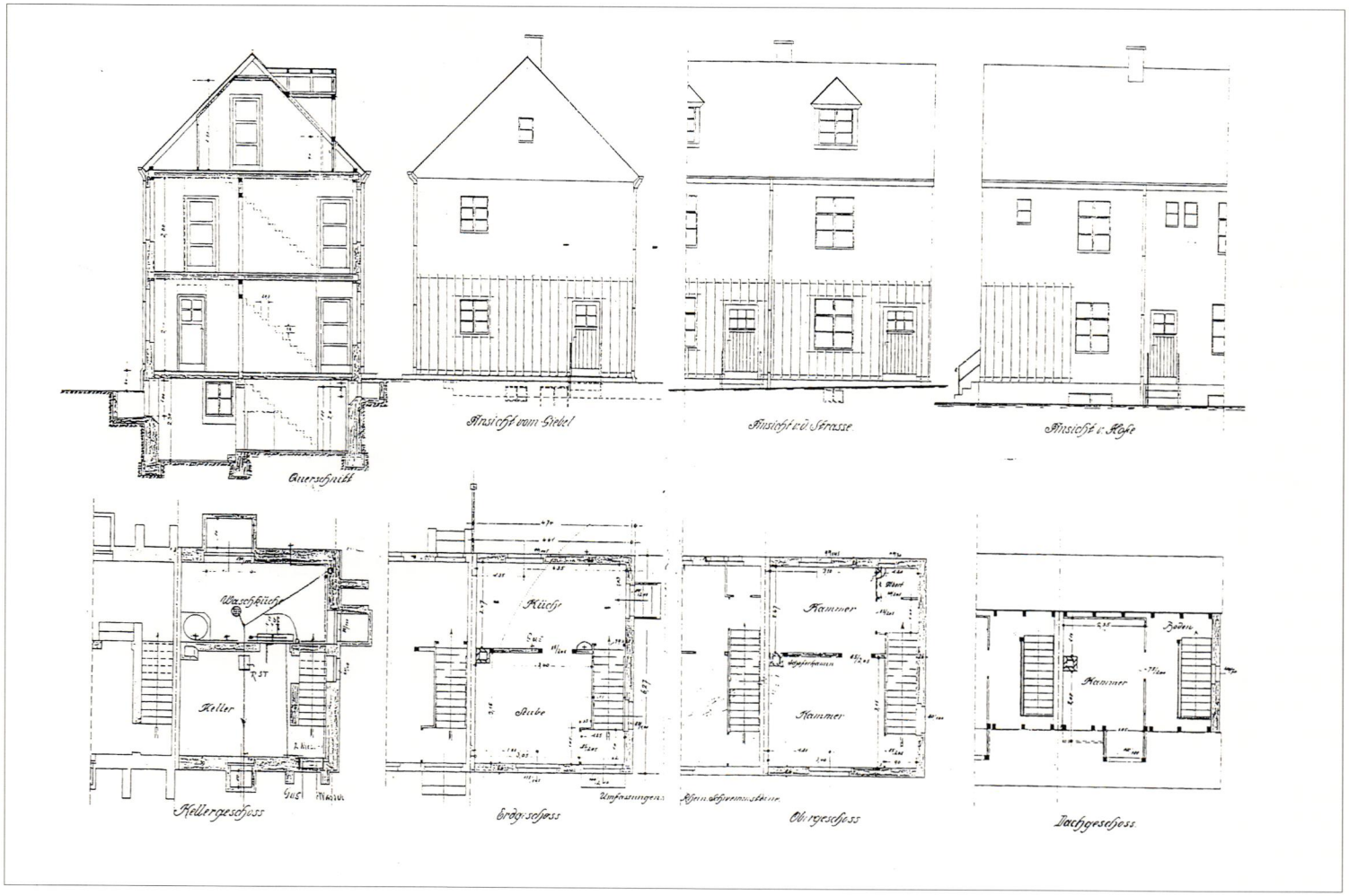


Fig. 5. Single family row houses, Hellerau. Tessenow, 1909.

Fig. 6. Single family row houses, Am Schänkenberg 38-44, Hellerau. Tessenow, 1914.


Querschnitt
Ansicht vom Giebel
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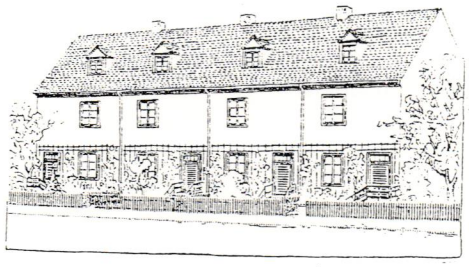


Naumann and Karl Schmidt, the director of the Deutsche Werkstätten für Handwerkskunst, formed the Deutsche Werkbund (fig. 2, 3). Until 1910, its first secretary was Wolf Dohrn, the Maecenas of Hellerau's Educational Institute for Rhythmic Gymnastics Émile Jaques-Dalcroze. Dohrn, Schmidt, and Richard Riemerschmid were the founders of the Garden City Society Hellerau (July 1908); the society acted as the freeholder of the 140-hectare plot, while a building association (whose members were principally middle class) commissioned the construction of various housing types that were stratified according to income groups and designed by Riemerschmid, Muthesius, and Tessenow (fig. 4, 5, 6). Row houses, villas, and musicians' housing, as well as communal facilities (such as a market square and, importantly, Karl Schmidt's furniture factory), were to be vetted by a team of outstanding architects including Theodor Fischer, Otto Gussmann, Adolf Hildebrandt, Fritz Schumacher, Riemerschmid, and Muthesius.

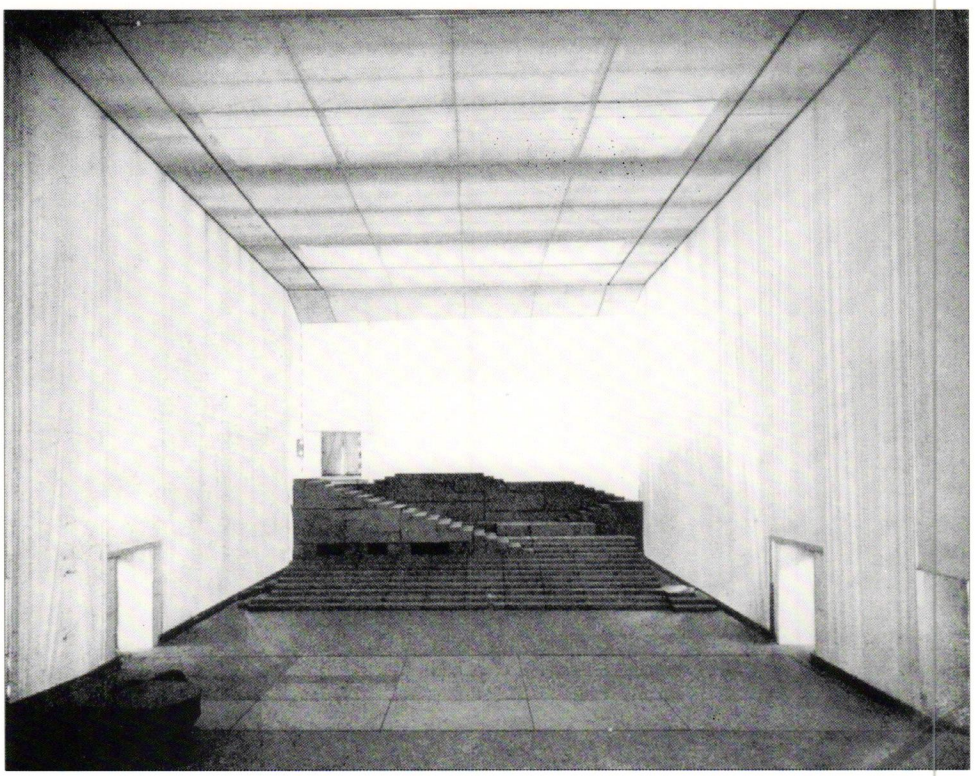


Fig. 7. View of large auditorium towards the stage, Jaques-Dalcroze Institute of Rhythmic Gymnastics. Tessenow, Alexander von Salzmann, and Adolphe Appia; 1910.

Schmidt's motivations for resiting his successful furniture workshop to Dresden's periphery were to maintain a high standard of cabinetmaking, despite the intrusion of potentially debilitating machinery; provide the best setting for the craftsmen so as to secure the continued existence and development of the company; and sustain the craftsmen's loyalty to the company.[23] A third of the 500 workers and staff moved to the 345-unit Garden City upon its completion.[24] Fewer than expected had taken to the new settlement; undoubtedly the rents were too high for some (275 to 350 marks per year, with an average worker's annual income of 1,200 marks), while others may have preferred the city. Those who did move were staff and the better qualified craftsmen, a fact that apparently met with Schmidt's approval.[25]

Schmidt had involved a number of architects, such as Henry van de Velde, Richard Riemerschmid, Bruno Paul, Josef Hoffmann, Muthesius, and Tessenow to design furniture for his company, assuring them a share of the sales.[26] Tessenow had been a free-lance collaborator of the Deutsche Werkstätten in Hellerau since 1909 when he began teaching at the Dresden Technical College under Martin Dülfer. Riemerschmid, the partner in the Garden City company, was commissioned to prepare its master plan in 1907; aside from the factory, he realized numerous houses for it. Despite Riemerschmid's initial eagerness to design the Jaques-Dalcroze Institute, after altercations between Wolf Dohrn *vis-à-vis* Schmidt and Riemerschmid, the commission was awarded to Tessenow in 1910.[27] Karl Schmidt did not consider Rhythmic Gymnastics a medium for the artistic socialization of residents,[28] while Tessenow's design was wholly acceptable to Jaques-Dalcroze, who in 1912 praised the "style of Tessenow's building as possessing the simplicity and harmony that completely matches the style of rhythmic body movements" (frontispiece, fig. 7).[29]

Fig. 8. View of large auditorium ceiling showing lighting system, Jaques-Dalcroze Institute of Rhythmic Gymnastics.

The lighting system within the rectangular auditorium of the Jaques-Dalcroze Institute for Rhythmic Gymnastics was designed by the Russian painter Alexander von Salzmann to provide a variable backlit surface using waxed white linen sheets stretched across a frame that set it off the masonry wall by one meter, and within which thousands of light bulbs were fitted (fig. 8). A dropped ceiling complemented this "luminous space."[30] Salzmann sought nothing less than a sonorous light that was able to model space according to the moods of the music drama. That eliminated stage decor altogether, merely permitting steps, planes, and veils:

> The less the props speak for themselves, the greater their eloquence will be by means of light, and their significance will be like that of a material, always of a spiritual nature. For this guarantees the artistic unity, and we do not strive for anything else.[31]

While Jaques-Dalcroze had praised the building's design for its "simplicity and harmony," seeking the collaboration of "space" in his quest for the renewal of art ("a collaboration that does not rob it [space] of any of its freedom and essence, that, however, is able to give it a new impetus, though neither irrevocably determining it, nor rendering it dependent upon art"), Salzmann and Appia's ideas on lighting and staging had profound repercussions on the design of the auditorium.[32] Tessenow had comprehended the dynamic interrelation of these reforming proposals, and, as a result, achieved credible transitions between outside and inside. The visitor approaches the Institute across the square in front of it, walks up the shallow brick steps, then passes through the giant order portico to the hallway with the seemingly massive staircase that already hints at Appia's geometric stage designs (fig. 11). Even so, Salzmann's vision of a sonorous light and Jaques-Dalcroze's appeasing notion of collaboration from the vantage point of dance belies the urge for a harmonious artistic unity, a *Gesamtkunstwerk* by many contributors. Each medium might have claimed primacy, whether it was dance, lighting, stage design, or architecture. Within the pioneering spirit—Germany's first garden city, the first Institute for Rhythmic Gymnastics, and so forth—the implicit rivalry among the pioneering media should not come as a surprise. A total work of art by a collaboration of innovators in their respective fields nevertheless presupposes a central idea, and, in the case of Hellerau, this idea appears to have served the renewal of dance in particular, and art in general, rather than the enlightenment of a particular society. Wolf Dohrn's enthusiasm for rhythmic gymnastics was not at all shared by Karl Schmidt; the Institute's development and realization took place without the involvement of Hellerau's working population.[33] For a few years, the Jaques-Dalcroze Institute for Rhythmic Gymnastics had the status of a Bayreuth of dance, attracting numerous international visitors.[34] However, this merely underlines Tessenow's

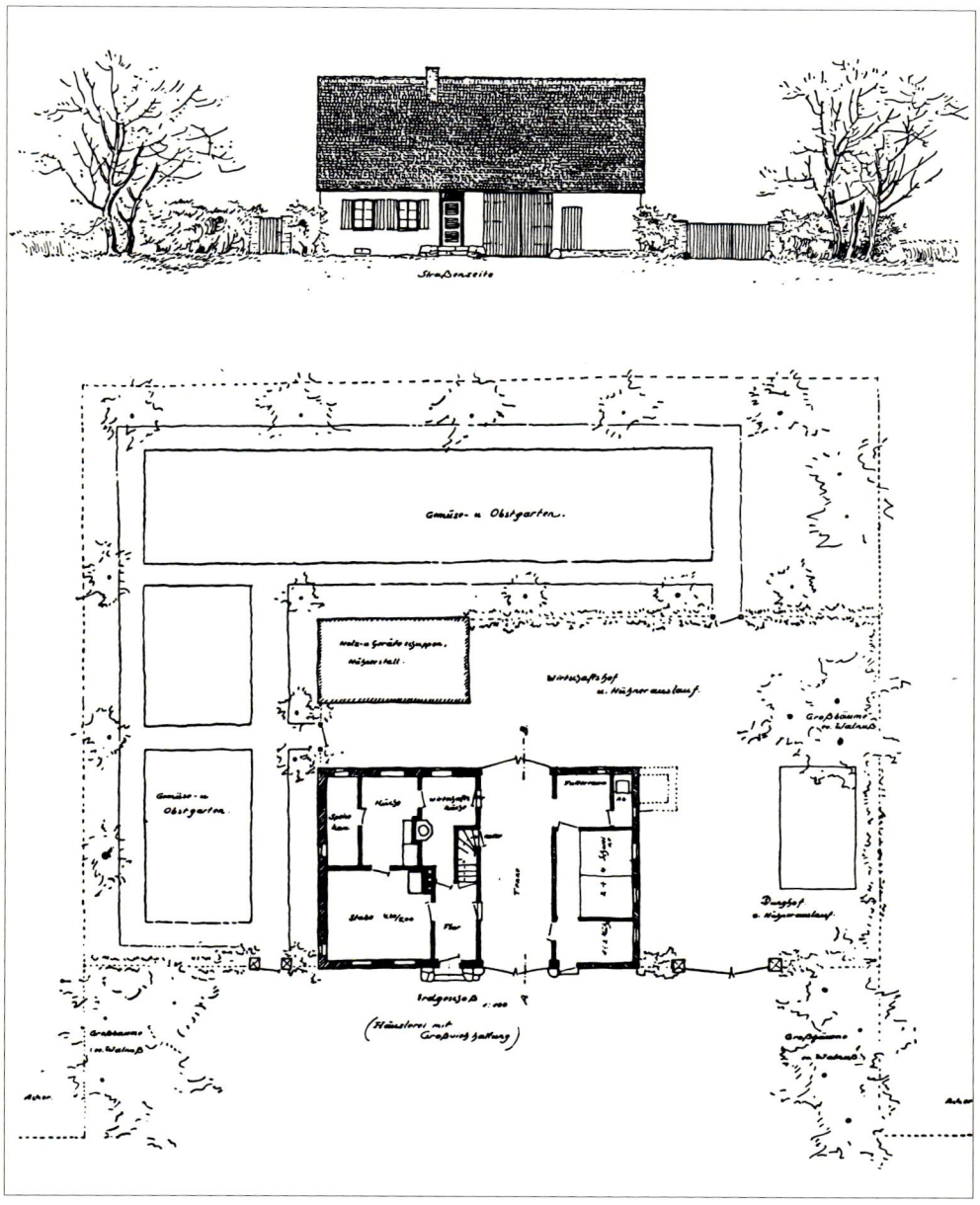


Fig. 9. House with farmyard, project in response to the Mecklenburg-Vorpommern agrarian reform. Tessenow, 1946.

sardonic remarks on the "bunch of aesthetes" that may be brought to a garden city in order to establish an "external balance." The mismatch between avant-gardists and local residents may well have been an indication to Tessenow that Hellerau was not the conventional small town with a manu-facturing base that he was seeking. Regardless of any less publicized local cultural coherence, Hellerau before World War I had an international orientation, whether this had been brought on by the enterprising circle around the Deutsche Werkstätten, the Werkbund, the noteworthy artists and architects involved, or the group around Jaques-Dalcroze and Appia.[35] Tessenow's ideal of a normal small town with the necessary range of services and crafts was perhaps laid down in its foundations; only immediately after World War I was Tessenow given a further chance in Hellerau to realize his ideals.

THE COMMUNITY OF CRAFTSMEN IN HELLERAU 1919-26

Tessenow's criticism of Hellerau's furniture factory and the Institute for Rhythmic Dance in "Craftsmanship and the Small Town" was a reference point for the group who had gathered again in the garden city: the publisher Jakob Hegner, the art critic Karl Scheffler, Harald Dohrn (Wolf Dohrn's brother), and Tessenow. As one of the founding members, Tessenow recognized the futility of artificially raising a manu-facturing sector of a society; by definition craftsmanship comes about, if at all, on its own.[36] Given the wartime privations, however, the various workshops were supplied with equipment through the sponsorship of Herta König.[37]

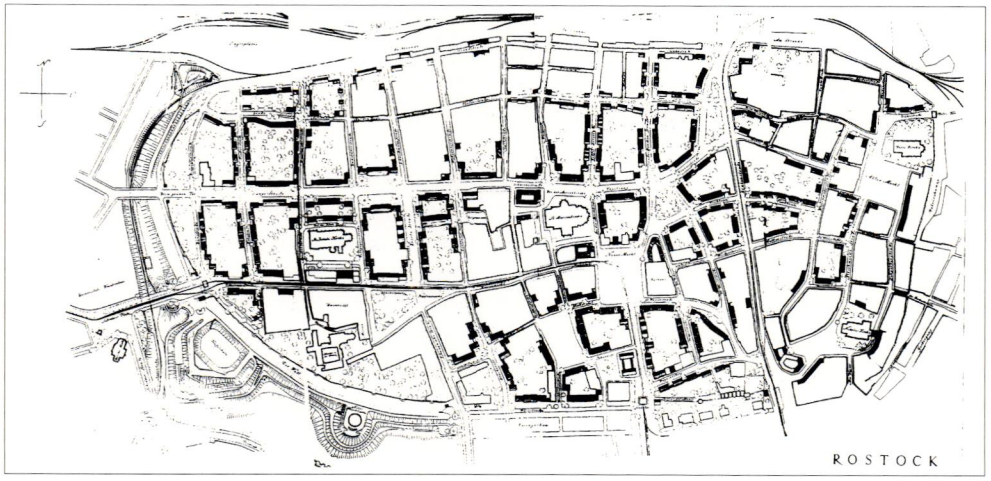


Fig. 10. Reconstruction plan for Rostock's inner city. Tessenow, 1946.

The vacant ancillary rooms of the former Jaques-Dalcroze Institute accommodated some of the workshops of cabinetmakers, a bookbinder, a letter press printer (with a hand press), a silversmith, a pottery (with a ceramics section), to be followed by a dyer, an upholsterer, a stone mason, a carpenter, and a bricklayer.[38] A tailor and shoemaker were to join these craftsmen after five years. The aim was "to produce first rate things from the least possible material to satisfy everyday needs,"[39] and "to form a world that satisfies the rich interests and rich material requirements without outside help."[40] Apprentices were drawn from colleges and secondary schools; their special interest in the curriculum at Hellerau was design courses, initially offered by Tessenow, and subsequently given by Franz Schuster.[41]

This underlines the development away from an individual's search for satisfaction in anonymous craftsmanship, to identification with the determination of form, a motive that was affirmed in the success of Walter Gropius's leadership of the Bauhaus.[42] This relative uninterest in the self-effacing aspect of well-disciplined crafts, together with Tessenow's call to Technical University Berlin in 1926, led to the dissolution of the community of craftsmen in the same year. A self-sustaining manufacture in a growing small town was an unrealistic aim, certainly at that time and place. Tessenow's own efforts at giving shape to Hellerau as a place for working and living were not rewarded. Apart from eleven one-family houses on the Pilnitzer Weg in Hellerau (1922), the housing schemes that he was able to realize were located in the neighboring Thuringia ("Am Gruneberg," "Am Gries," "Siedlung Bahnhofstraße," all in Pößneck, 1920-2, 1921-4, 1922-3).

THE INFLUENCE OF TESSENOW'S IDEAS AND ARCHITECTURE

Remarkably coherent spaces and buildings were designed and built by Tessenow from the mid-1920s until the early 1930s: the Saxonian State School at Klotzsche (1925-7), following the Jeffersonian model of the colonnaded lawn, here with an axially dominant dining room; the City Baths at the center of Berlin (1927-30); and the Memorial to the Fallen of World War I in Schinkel's Alte Wache (1930). During this time, Tessenow was at the height of a career that took on a national significance; he continued his work on the small town during the 1940s, developing settlement patterns that he was to propose in the aftermath of World War II (fig. 9, 10).

Tessenow recognized conflicting forces within contemporary life. On the one hand was the fearful comprehension of a contemporary process of civilization that embraced the division of labor with its rationalizing techniques of social stratification, industrialization, and the production of surplus containing vicious cycles of growth and decline. On the other hand was the reasoned counterproposal for a self-sufficient, non-consumerist society, to be realized in the manu-facturing small town. Tessenow realized that this inner contradiction could not be resolved by the figure of the architect. His relative failure then should not be seen as a personal one, but as one of the profession in Western society and culture. He had been aware of the impossibility of his ideas' success via their superimposition on a given society; his own trajectory is typical of an architect with unquestioned ability and thoughtfulness. Although no longer considered as central as it was in the 1920s, Hellerau was and is important as an attempt at superimposing new ways of producing furniture and constructing houses. It was, as Muthesius put it, "Germany's largest settlement" of its kind.[43] Hellerau was the most comprehensive attempt at reforming every aspect of the arts and crafts in

Germany, from dance, literature, painting, and letter press printing, to furniture manu-facture and architecture. The shadow of publicity that accompanied these attempts cast a long way ahead of all projects that had such modest, middle class, and altogether craftsman-like values.

In view of the tenuous cultural relations between the world of speculative finance and everyday production—as distinct from the most direct and often disastrous economic relations between these two—we know today that Tessenow's critique of the extremes of modern society and his resulting ideas are still relevant. A resolution presented here that takes account of ecological and socio-cultural needs would not necessarily have the grammar or meaning of his architecture; holding on to its image would be akin to preserving its shell without its intellectual rigor, and it was the latter, after all, that Tessenow rightly missed after World War II. It is only when the premise of Tessenow's critique is more ubiquitously shared that the balance between the productive versus the speculative, the civic versus the metropolitan or rural, could be redressed. A prescription of what such production might look like is futile; a distributed practice would have innumerable clients and architects, though it would be self-evident whether or not the outcome of such production could meet everyday needs using the least possible material, and remain a first-rate product.

Timothy Culvahouse

36. Tessenow, *Die Handwerker-Gemeinde in Hellerau*, in Kindt, 134. 55

37. Ibid., 133.

38. Wangerin, 36.

39. Ibid., 36.

40. Tessenow, *Handwerk-Gemeinde*, 136.

41. Wangerin, 37.

42. Gropius spoke with Tessenow in the summer of 1918 on the subject of founding craftsmen's communities, the principle underlying the various workshops of the Bauhaus. Wangerin, 37.

43. Hermann Muthesius, *Kleinhaus und Kleinsiedlung* (Munich: 1918), 365.

44. Fontane, 341.

FIGURE CREDITS

1. From Hermann Muthesisus, *Kleinhaus und Kleinsiedlung* (Munich: 1.Auflage, 1918), 77.

4. Ibid., 141.

All other figures courtesy of the Heinrich Tessenow Archiv, Kunstbibliothek, Berlin; and Deutsche Werkstätten GmbH, Dresden.

his work by Aaron Betsky.[3] In the meantime, the principal critical writings on Rogers's work at Yale are Paul Goldberger's unpublished undergraduate thesis and an essay by Susan Ryan published in *Perspecta* 18.[4]

Ryan provides an overview of Rogers's association with Yale, an account of his own training and experience and that of his staff, and a commentary that focuses on the role of narrative and reference in his work. Narrative and reference are important forms of meaning in the Yale colleges, linking them not only to general historical models, such as Cambridge and Oxford, but also to moments in the history of the University itself. For example, Wrexham Tower, a part of Rogers's Branford College, is modeled on the tower of St. Giles in Wrexham, Wales (burial site of Elihu Yale, early patron of Yale College).[5] Narrative ornament illuminates and comments upon the life and mission of the university throughout the residential colleges, as well as in Rogers's Hall of Graduate Studies (1930-2), and—with particularly lively humor—in his buildings for the Yale Law School (1931), where stylized "cops and robbers" take the place of traditional gargoyles.

Early in her essay, Ryan alludes to another level of meaning of which architecture is capable. She cites Rogers's "talent for the appropriate interpretation of traditional styles to reflect the characters of particular clients and programs."[6] Narrative content is a part of this interpretation, but the reflection of "character" involves something other than the denotation of particular symbolic elements. As we commonly use the term in reference to persons, "character" describes an overall attribute of which individual actions are "characteristic"; character is defined not by these actions, but by the broader attitude toward action which they represent.

Character guides the investigation in hand for two reasons. First, it may illuminate the relationship between material craft and architectural meaning at a broad, even ideological, level. Second, character (as contrasted with narrative reference) is more available to our typical way of apprehending architecture, which is, at best, half-aware, rather than analytical. As Walter Benjamin has pointed out,[7]

> Architecture has always represented the prototype of a work of art, the reception of which is consummated by a collectivity in a state of distraction. The laws of its reception are most instructive...Buildings are appropriated in a twofold manner: by use and by perception—or rather, by touch and sight. Such appropriation cannot be understood in terms of the attentive concentration of a tourist before a famous building. On the tactile side there is no counterpart to contemplation on the optical side. Tactile appropriation is accomplished not so much by attention as by habit. As regards architecture, habit determines to a large extent even optical reception.[8]

Daily experience reminds us of the truth of his observation, and leaves us with the problem of how architecture may convey messages—which we trust it does—without requiring our conscious attention. We might begin with the hypothesis that in the main our apprehension of a building and its meaning is based on an apprehension of the whole, rather than on a scrutiny of the parts (unless, of course, that scrutiny is a habit of our profession).

The meaning of a building apprehended as a whole necessarily depends on a collection of isolated instances of signification. Usually, however, these instances recede in importance, and the rhetorical mode that they share constitutes the effective meaning. The precarious keystones at the Palazzo del Té, for example, signify nothing in and of themselves (such as, "Pass at your own risk!"). Rather, the precariousness itself is meaningful, in that it constitutes an attitude toward the prevailing Classical paradigm. As Judith Wolin puts it in her superb introduction to architectural rhetoric, "rather than see a figure as a *thing*, we should understand it to be an *operation*, a *way of forming* material, a process of assembling elements of language, without which only literal statements would be possible."[9] A rhetorical operation alters the meaning of a particular term by overlaying that term with the meaning generated in the rhetorical operation itself.

Architectural meaning is thus not so much a matter of denotation—*x* means *y*, *gable* means *home*—as a matter of *style* (by which I mean an individual or collective way of doing things, rather than a historically specified structure or system of conventions). Style is where ideology meets craft, because it is where the material shaping of content informs the reception of that content and so constitutes ideological meaning.

In a previous analysis of Henry Hobson Richardson's Austin and Sever Halls at Harvard, I began to tie meaning in architecture to the material continuities and

Frontispiece. Portal, Trumbull College, New Haven. James Gamble Rogers, 1933.

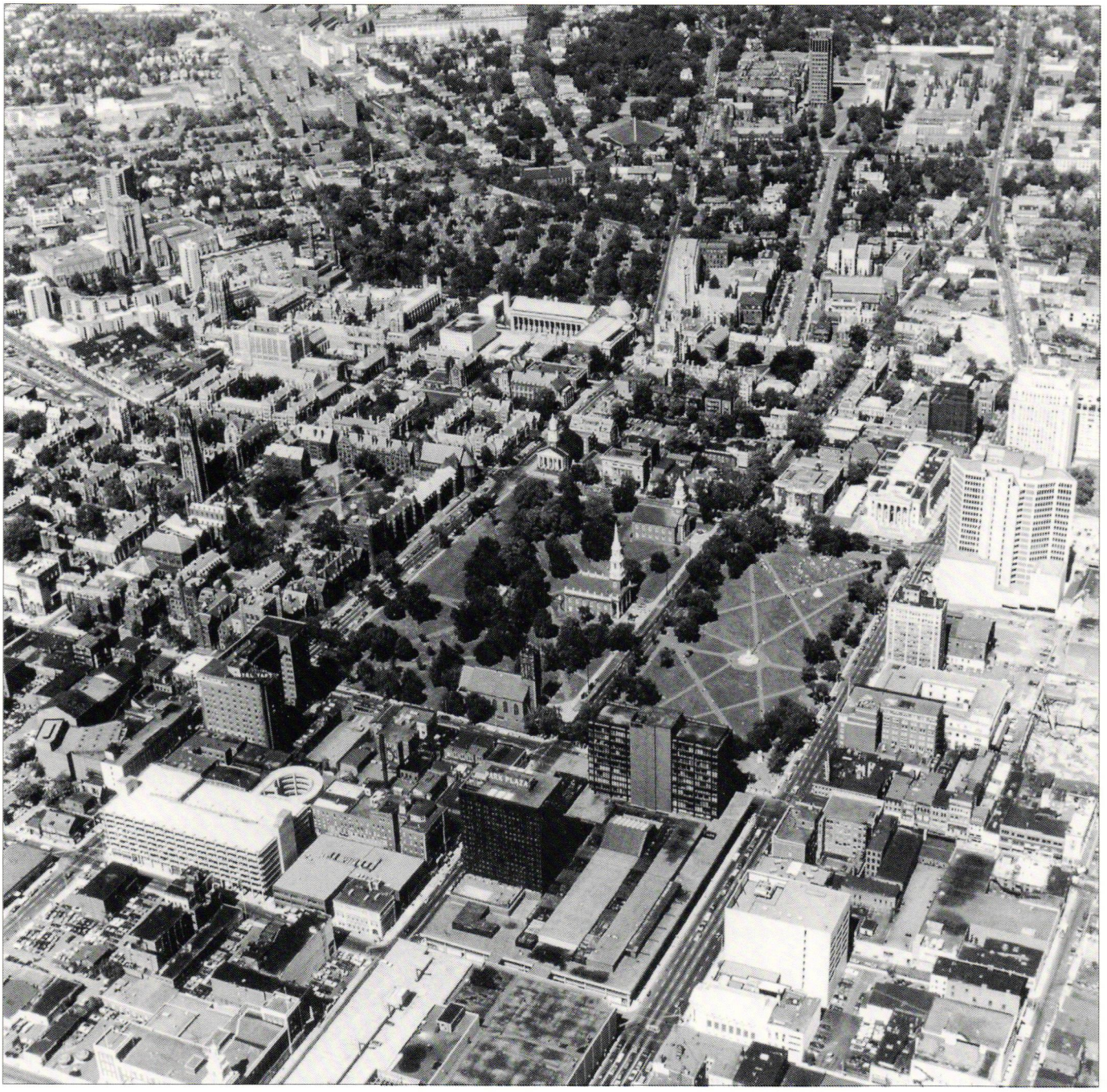


Fig. 1. Aerial view of Yale central campus, New Haven.

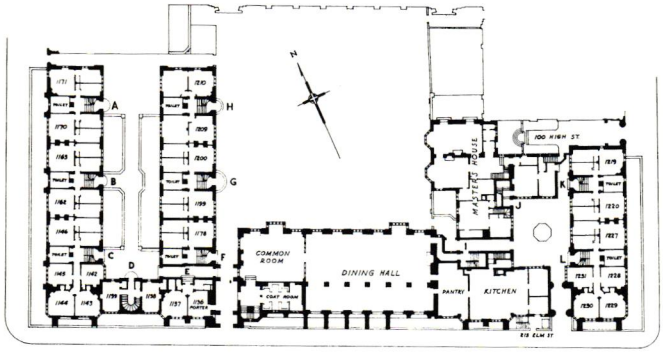


Fig. 2. Plan of first floor, Trumbull College.

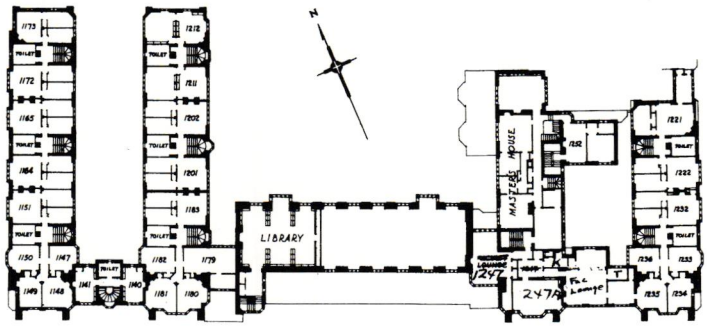


Fig. 3. Plan of second floor, Trumbull College.

discontinuities of building.[10] I described how both connection and distinction are inevitable and necessary functions of architecture. As designers, we connect architectural elements not only to meet structural necessity, but also to establish comprehensible realms of habitation; we distinguish architectural elements as figures so that we may speak in and through building. Our discipline's material constitution both requires and facilitates such a simultaneity: *requires* insofar as ours is an art of joinery, and, however well we join things, at least some of the joints will show; *facilitates* because any two materials may be similar in some properties, while at the same time dissimilar in others. In the essay on Richardson, I stopped short of attributing specific meaning to Austin and Sever Halls, save the rudimentary denomination of the parts themselves: this bank of windows a library, that turret a stair.

James Gamble Rogers's Trumbull College at Yale University affords an opportunity to consider how material craft contributes to the construction of a *specific* structure of meaning, one that is fully ideological in nature. This structure of meaning is not simply represented. It could not, in fact, be represented simply, or clearly, or legibly, because it is through a calculated *illegibility* that the ideology of this privileged, academic society is conveyed. The ideological meaning of Trumbull College is constructed through *a discrepancy between a particular body of content as such*—in this case, the social organization of the college—and *that content as revealed* to the uninitiated passerby. Masterfully, Rogers and his principal design assistant, John Donald Tuttle, constructed material continuities and discontinuities that simultaneously identify and obscure the social organization of the college.[11]

THE ORDER OF THE RESIDENTIAL COLLEGES

Yale's campus is generally thought a showplace of late modern architecture: Paul Rudolph's controversial Art and Architecture Building; Louis Kahn's first and last major building projects, the Yale Art Gallery and the Center for British Art; and important buildings by Marcel Breuer, Eero Saarinen, Philip Johnson, and Gordon Bunshaft. After seeing these buildings, the typical architectural sight-seer in New Haven would likely turn to the postmodern work of Robert Venturi, Peter Millard, and Frank Gehry. I, however, would prefer to stroll among Rogers's collegiate Gothic courtyards, to ponder their sophisticated craftsmanship and the subtle significance of their formal and material composition, which, in my view, far outshine much of the more recent work, Kahn's Center for British Art and Peter Millard's Whitney Avenue Fire Station excepted.

The core of the Yale campus (the area adjacent to the New Haven Green and extending west to Park Street and north to the Grove Street Cemetery) is decidedly

Fig. 4. Masters' entryway, Trumbull College.

urban (fig. 1). Begun in 1717 as a single building facing New Haven Green, the campus was expanded in the latter half of the eighteenth century to form a rank of eight buildings facing the Green and centered in the block that is now the "Old Campus." Of those eight buildings, known as the Brick Row, only one, Connecticut Hall (1750), remains, and it is surrounded by a perimeter block begun shortly after the Civil War. This development has transformed the original outward-facing campus into an introverted quadrangle, still adjacent to, but now aloof from, the city's civic focus, the Green.

After the close of the First World War, Yale embarked on a major campus expansion that included the establishment of residential colleges. For these colleges, the model of the enclosed courtyard, prefigured by the Old Campus, but consciously reminiscent of the great British universities, prevailed. Ten residential colleges were erected between 1920 and 1940; James Gamble Rogers was the architect for eight of these.[12] Every Yale undergraduate is a member of one of the residential colleges, and a substantial majority reside "in college." The colleges are not curricular units (the academic departments—English, mathematics, and so on—are independent of the colleges), but they are more than mere dormitories. Each one comprises a dining hall, library, common rooms, master's house, suites for visiting scholars, and, in some cases, a theater and chapel as well.

Rogers realized that continuity of the physical fabric—the framework against which we move, within which we ourselves figure, and against which we figure our thoughts—is especially important for an institution like the Yale residential college, which is intended to provide students with a complete, if microcosmic, world. He struck a careful balance between the necessity for continuity within the community and the need for identity of that community's many parts (fig. 2, 3). The six colleges surrounding the Old Campus (Jonathan Edwards, Branford, Saybrook, Trumbull, Berkeley, and Calhoun, the last by John Russell Pope) share a similar vocabulary of collegiate Gothic forms and materials. The colleges form a continuous street edge, and each is organized around an internalized series of paved or grassed courtyards. Several entryways open onto each courtyard; each entryway leads to a stair rising through several floors of paired residential suites; and each suite typically contains two bedrooms, most with two beds.

Within this configuration, there is thus a nesting of smaller elements within larger ones, whereby each element has its own identity at the immediate scale, while becoming part of a greater context at the next. This nesting of residential units reflects the ethos of the residential college, promoting individual accomplishment within a structured community. Beginning with Rogers's treatment of the wall surface around one of the entryways leading off of Trumbull's main courtyard, I will demonstrate how this ethos is represented, albeit obliquely and with qualifications, in the material composition of the college.

MATERIALITY AND REPRESENTATION IN TRUMBULL COLLEGE

The exterior walls of Trumbull College facing the main courtyard are made of seam-face Massachusetts granite (fig. 4). Ohio sandstone, more readily carved than the granite, is used around openings and in ornamental moldings.[13] The two materials have similar unit sizes, for they are similarly obtained, transported, and put into place. They differ, however, in color. The granite is a medium gray, mottled with oxide of iron, while the sandstone is a consistent, lighter gray. The less homogeneous granite accepts fine surfacing less readily.

Nevertheless, the two materials have more in common than, for example, brick and stone. John Russell Pope's use of these two materials in Calhoun College, just down Elm Street from Trumbull, affords a useful comparison. At the smallest scale, Pope moderates the meeting of brick and stone by roughening the edges of the stone at the joints where it meets the brick, a tremendously subtle modulation (fig. 5). Otherwise, each stone figure stands out sharply from the brick ground. Moreover, whenever Pope makes a figure—such as the boss on either side of a door opening—the stone in which it is carved is always just big enough to contain the figure (fig. 6). The extreme horizontal and vertical extensions of the figure determine the dimensions of the block. The block that contains the figure does not also constitute a part of the ground; the distinction between figure and ground is always sharp and firm.

Rogers, on the other hand, elaborately moderates the distinction between figure and ground. He sets up a sharp distinction between the functional roles of the two stones he uses: granite comprises the ground, and sandstone the figures on that ground. The distinction, however, is not absolute. The clearest example occurs where the horizontal sandstone molding meets the doorway surround (fig. 7). When it is running free of the doorway, the molding is identified by material as a figure: sandstone set against the otherwise uninterrupted field of granite. When the molding meets the doorway surround, however, one block of sandstone is simultaneously part of the doorway toothing and the ground across which the molding passes. At this point, a single sandstone block comprises both the ground for the figure and the figure itself; moreover, the flat portion of the block, which is the ground for the molding, is also a part of the figure of the doorway surround. By contrast, the edge of a similar molding in Calhoun College always occurs at the joint between blocks and, where possible, between materials (fig. 8).

Consciously or otherwise, Rogers has recognized that because sandstone and granite share some properties, but are distinguished from one another by others, each can assume the role of either figure or ground at any given point. Having a figure and ground is a necessity of cultural representation in the material world: the overlaying of the discontinuity of discourse with the continuity of existence.

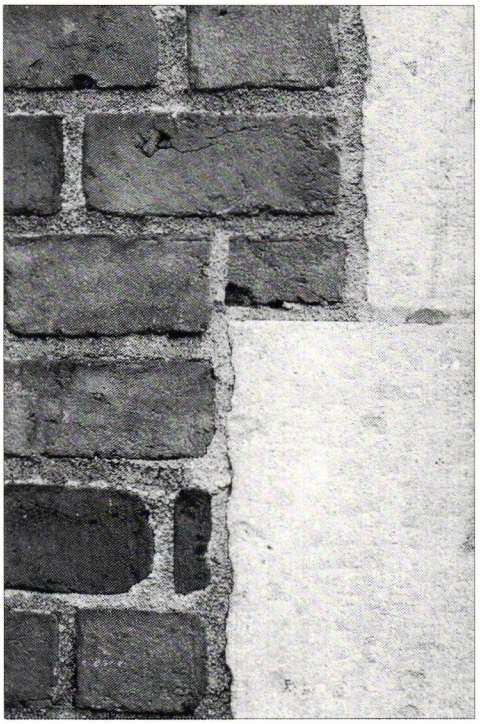


Fig. 5. Detail of portal, Calhoun College, New Haven. John Russell Pope, 1932.

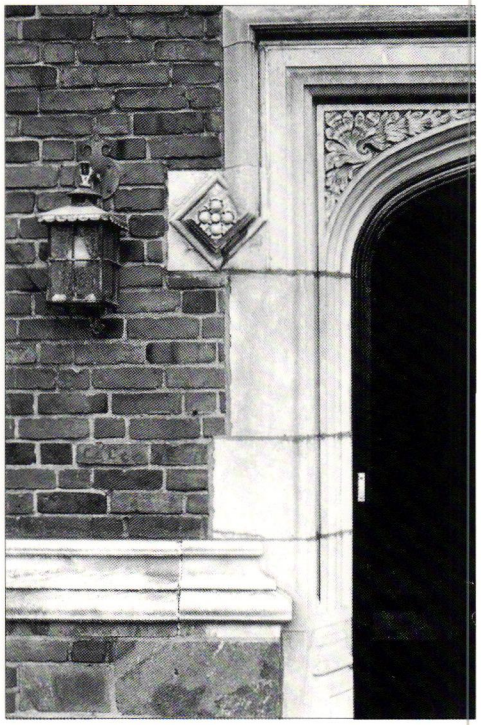


Fig. 6. Detail of portal, Calhoun College.

Fig. 7, 8. Details of Trumbull and Calhoun Colleges.

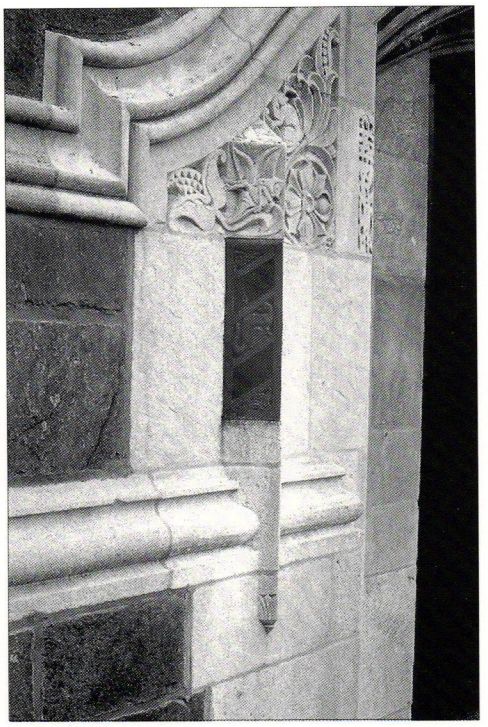


Fig. 9. Detail, Trumbull College.

The entry splits the wall's sealed symmetrical composition to offer admission not only literally, but also formally. Not until the visitor has actually entered the volume of the dining hall does she realize that it takes up only two thirds of its apparent container, and that the other third is divided both laterally and in section to accommodate the college library and common room. The external form does not reflect this subdivision because the particularities of the college's organization neither need nor should be known by the outsider. Similarly, the limestone surround of the entry into the main courtyard turns the corner to connect the residential wing with the wing of the dining hall, common room, and library. Here, the visitor need only distinguish the primary passage from a secondary one leading to a smaller courtyard. The differentiation of internal spaces can yet remain obscured (frontispiece).

However, neither role is limited to a particular material by its nature; rather, the nature of any material can accommodate both roles.

Rogers consistently casts his materials in similarly complex roles, balancing the demands of continuity and distinction through a number of subtle devices. Among them are the bronze light fixtures of the doorways, which lend their profiles to the adjacent stone (frontispiece); and the moderated symmetry of the entryway surrounds, which shift the figural emphasis from the surround to the opening itself (fig. 9).

No mere formal flourishes, these complexities are directed toward the gradual or, perhaps, reluctant revelation of the college to the progressively initiated visitor. An example at a larger scale is the main entry to the college, off Elm Street (fig. 10). The Elm Street façade quite literally turns its side to the casual passerby. Its overall symmetry is centered not around the entry, but, instead, around the side elevation of the chapel-like volume that contains the college dining hall. The first time visitor to the college need know only one thing about the college before entering it: the location of the entry itself. That entry, just to the left of the central volume, is the only substantial figural differentiation in an otherwise hermetic wall.

CONCLUSION: MATERIALITY, IDEOLOGY, AND STYLE

In all of these instances, figure and ground overlap. Figures are nested within one another, and establish a hierarchy of differentiations within the whole, both in the material composition and in the social organization of the college. These two hierarchies—the material and the social—correspond, but only loosely; their correspondence is obscured by each of the subtle slippages that establish the parallel in the first place. The social structure of the college is legible in its figural composition, but only to a qualified degree. The casual passerby understands from the manifest continuity of the whole that the college is a realm from which she is ex-

cluded. At the largest scale, in the volume of the dining hall, she can read the organization of the college as a community—but that is all. The nested hierarchies of the college remain a mystery, revealed only to initiates, and then only in stages. The official visitor learns that the entryways lead to various administrative offices (dean, master) and to common spaces such as the library or dining hall. Only residents, parents, and guests discover the hierarchy of rooms and suites. Sometimes, physical access precedes representation as the means to understanding; other times, the opposite occurs. In every case, however, the degree of legibility—or, perhaps, more pointedly, the degree of illegibility—manifests the ethos of the neo-Gothic college at Yale: that knowledge is not given transparently, writ on the face of nature in a play of simple denotation, but is rather a product of initiation into a discourse.

The figural logic of the building correspondingly represents ideology, not directly in *what* is said, but, instead, indirectly in *how* it is said. It is a matter of style, as well as of content. At this level, it is not individual correspondences that are important—*this* stands for *that*—but, rather, the mode of correspondence: exact or inexact, clear or obscure. Meaning in architecture is thus not to be merely understood by way of a theory of signs and their substitution; it must also comprise a theory of style as understood in the everyday sense of manner of presentation—straightforward or coy, cool or engaging—as well as in the standard art historical sense—Gothic, neo-Classical, and so on.

For our purposes, the typical symbolic figures of a style (such as gargoyles or acanthus leaves) are not so important as the devices afforded by that style for the connection and distinction of elements. The Classical requirements of symmetry and hierarchy, for example, tend to demand a more direct correspondence between spatial units and their representation than that demanded by the Gothic.[14]

As these speculations suggest, stylistic appropriateness depends not only on symbolic associations (which are, after all, changeable: the Yale of the Protestant Divines is now unequivocally secular), but also on the expression of connections between building elements.

If we can think of style in this way—as a set of terms for negotiating continuities and discontinuities in building—and if we can thereby understand craft in a necessary and determinant relation to style, we should find the rift between the phenomenal and cultural understandings of architecture beginning to close. We should also find that materiality and ideology are inseparably linked in the rhetorical operations of style, and not only in buildings as sophisticated as Trumbull College. Perhaps we might find, in fact, the new realism that Michael Stanton calls us to seek, but with this difference: the synthesis of hard materiality and lyric aspiration would be not quite impossible.

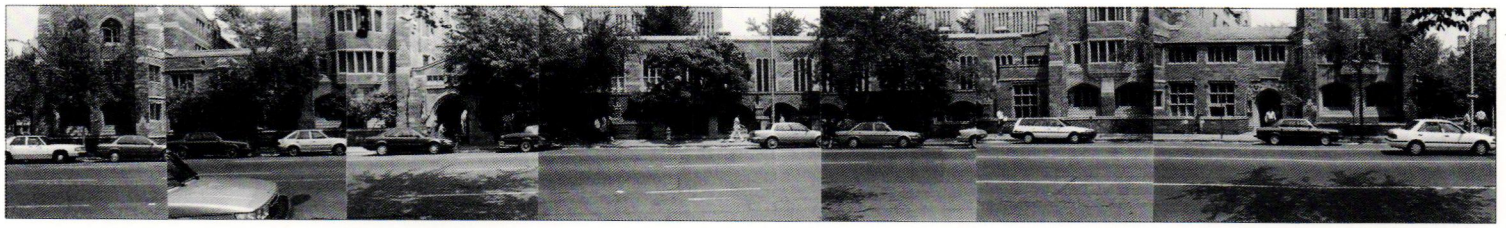


Fig. 10. Elm Street elevation of Trumbull College. The entry (left of center) disrupts the overall symmetry of the façade. To its right are located the library, common room, and dining hall.

NOTES

1. Michael Stanton, "Hedged Bets: Practical and Theoretical Equivocation during the Reagan Years," *Modulus* 21 (1991), 103-11.

2. Ibid., 109-11.

3. Aaron Betsky, *James Gamble Rogers and the Architecture of Pragmatism* (Cambridge, MA: Architectural History Foundation/MIT Press, forthcoming fall 1993).

4. Susan Ryan, "The Architecture of James Gamble Rogers at Yale University," *Perspecta* 18 (1982), 23-42.

5. Paul Goldberger, "Romantic Pragmatism: the Work of James Gamble Rogers at Yale University," unpublished senior essay, Yale University (1972). For additional historical information on the Yale colleges, see *Buildings and Grounds of Yale University* (New York: University Printing Service, n.d.); Elizabeth Mills Brown, *New Haven: A Guide to Architecture and Urban Design* (New Haven: Yale University Press, 1976); Richard C. Carroll, ed., *The Residential Colleges at Yale University* (New Haven: 1977); Robert D. French, The Memorial Quadrangle (New Haven: Yale University Press, 1929); and "The Yale Residential Colleges," *Yale Alumni Weekly* xliii (#13, Dec. 1933).

6. Ryan, 24.

7. Walter Benjamin, "The Work of Art in the Age of Mechanical Reproduction," in *Illuminations*, ed. Hannah Arendt, trans. Harry Zohn (New York: Schocken, 1969), 217-52.

8. Ibid., 239-40.

9. Judith Wolin, "The Rhetorical Question," *VIA* 8 (1986), 28.

10. Timothy Culvahouse, "Figuration and Continuity in the Work of H. H. Richardson," *Perspecta* 24 (1988), 25-36.

11. Ryan, 37.

12. The colleges designed by Rogers (and their dates) are Berkeley (1934); Branford (1921); Davenport (1933); Timothy Dwight (1935); Jonathan Edwards (1932); Pierson (1933); Saybrook (1921); and Trumbull (1933). Calhoun College, by John Russell Pope, was completed in 1932; Silliman College, the last of the original ten, was completed by Eggers & Higgins in 1940. Morse and Stiles Colleges, by Eero Saarinen, were built in 1960-2 and bring the current total to twelve.

13. Donald Baerman, professor of building technology at the Yale School of Architecture, is my source for the types of stone used at the colleges. The identification that I give here is not nearly so subtle as that which Professor Baerman can provide; his knowledge extends beyond general types to particular quarrries and, in fact, to particular areas within each quarry.

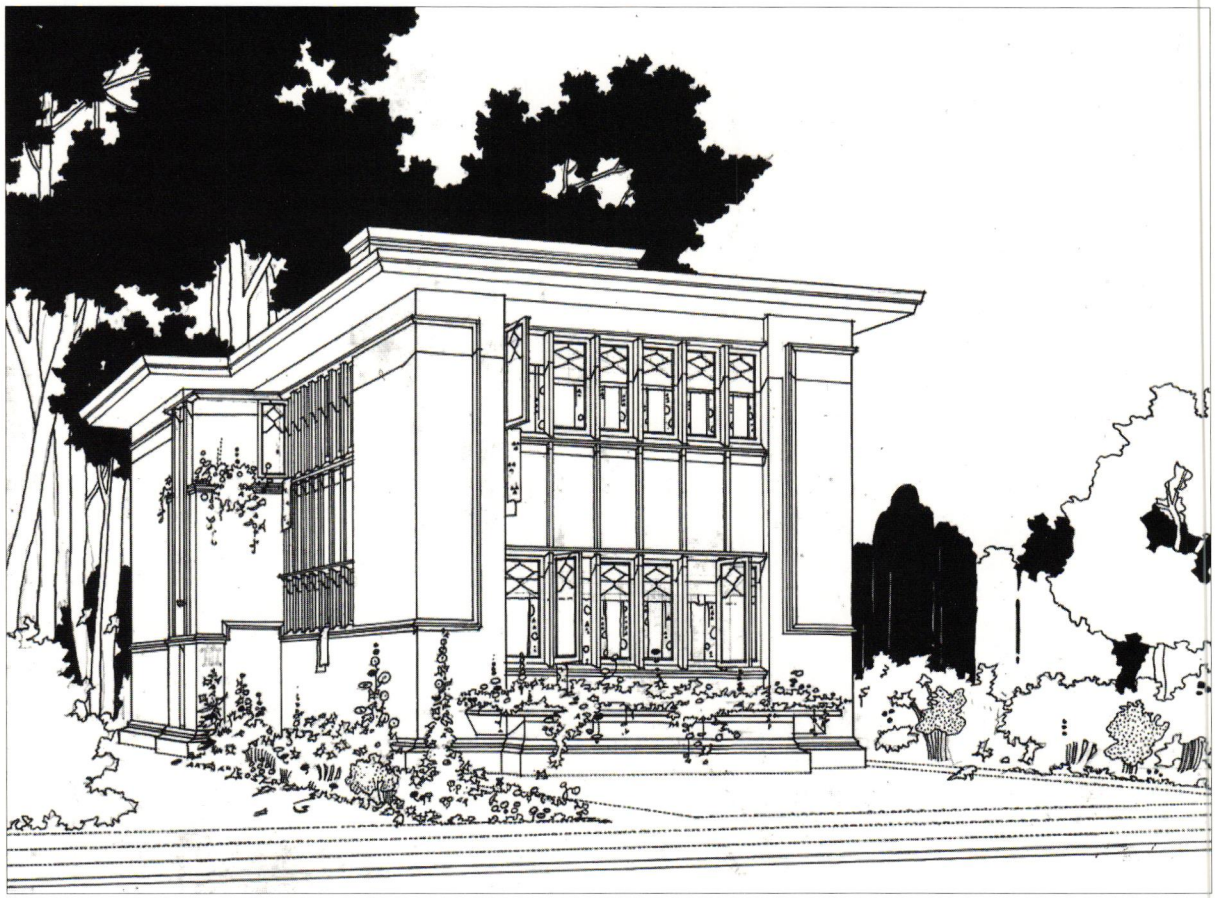
14. It might, however, be reasonable to ask to what extent the necessity for contrivances in plan drove an architect like Hawksmoor toward a highly mannered classicism, or what, precisely, is the relationship between planning necessities and stylistic development in Butterfield's All Saints Margaret Street.

FIGURE CREDITS

1. Courtesy of the New Haven Colony Historical Society.

2, 3. Courtesy of the Yale University Library Archives, New Haven.

All other photographs by author.



Frontispiece. American System Built House (ASBH) with flat roof. Frank Lloyd Wright, 1917.

FRANK LLOYD WRIGHT: EXPERIMENTS IN THE ART OF BUILDING

Kenneth Martin Kao

> Always the desire to get some system of building construction as a basis for architecture was my objective—my hope. There never was, there is no architecture otherwise, I believe.[1]

Today's American architects are increasingly disengaged from innovative work in building assembly and the construction process. This situation has resulted partly from their limited technological training, as well as from the increasing costs of experimentation and malpractice liability. As architects participate less in pioneering research and the development of building technology, they are less likely to be perceived as master builders—as being expert in the building process. Unlike many architects, who limit themselves to working as "artists" or "design stylists," Frank Lloyd Wright pursued the tradition of the architect as a master builder who synthesized and reinterpreted both the vernacular and state-of-the-art technology.

Wright is most often lauded as an artistic innovator of building design. Yet pragmatic issues, such as methods of standardization, simplification, and serialization, informed Wright's investigations of the concepts and constructs of building. Indeed, Wright's famous statement that architecture is "the art of building" may be interpreted to implicate technology in the architect's conception and construction of built forms. Not only was Wright extraordinarily creative and inventive in design, he was also surprisingly systematic and persistent in modifying conventional building details, reinterpreting material applications, and generating prototypical building components and systems. Paradoxically romantic and pragmatic, Wright's approach to architecture embraced both experimentation and customization in "design pull" and "kit-of-parts" systems. These explorations demanded an extraordinary commitment of resources from Wright, who practiced architecture as a cause, rather than as a profitable profession. He viewed himself as a master builder who explored the art of building within the context of a professional practice. A study of Wright's pivotal domestic projects can help us reassess this idealization of the architect as a master builder, as well as the architect's relationship to research and development in building technologies.

Traditionally, the single-family house type's relatively small scale, low cost, short construction schedule, and direct client-to-architect relationship have favored a fast cycle of experimentation. Such commissions enabled Wright to establish and develop a practice, and represent his most profound and prolific form of design exploration. During his sixty-six years of practice, Wright designed over 630 houses, of which more than 320 were constructed. He used these houses to test ideas and building systems, which, if successful, he would later apply to larger projects, such as the Johnson Wax Administration Building. In these houses, Wright had the opportunity to initiate incremental technological and design innovations, which evolved from previous advances or failures and served as a platform for further experimentation.

Within this continuum of design development lie Wright's breakthroughs and subsequent elaborations. Wright's investigations included exploration of the balloon frame; systematization of the design and production of pre-cut houses; innovation of radiant floor heating, laminated roof framing, and the sandwich panel parti-

tion; and the invention of a reinforced concrete block assembly. It was Wright's design and production strategies in his early works, such as the Prairie houses (Willits house, 1902-3) and the Ready-cut houses (American System Built Houses, 1911-7), however, that structured important lessons that sponsored subsequent design developments.

As early as 1900, Wright perceived his architectural works as "experiments."[2] This perception continued throughout his career. "I always explain that I am an 'experimenting architect.' And I am not ashamed of the fact because I know it is inevitable and should be."[3] Here, Wright was inspired by myths of the American pioneer spirit: the romanticism of the Western frontier and prairie landscape; the notions of Yankee ingenuity and the experimenting tinkerer; the Emersonian concept of the transcendent spirituality of invention; and John Dewey's pragmatism and progressive education laboratory.[4] In fact, Dewey's ideas on "learning-by-doing," "laboratory school," and "continuum of inquiry" informed Wright's pedagogy, experimentation, and practice. Wright often portrayed himself as "the hardy pioneer who takes his architectural life in hand and fares boldly forth in quest of his ideal,"[5] and further popularized this heroic role.[6] In such a spirit, he sought to pioneer a new architecture, a modern tradition in the American vernacular.

THE ARTS AND CRAFTS OF THE MACHINE

Wright attempted to combine the values of handicraft and the application of industrial technology in the production of architecture. As one of the charter members of the Chicago Arts and Crafts Society, he embraced its 1899 constitution ("...to consider the relation of the machine to the working man...[and to] foster the idea of a regional architecture for the American Midwest..."), along with its pleas for reform through elimination, simplicity, respect for materials, and inspiration derived from nature.[7] Wright exhorted artists to master the use of machines as tools for artistic creation, to grasp technological advances, and to avoid enslavement by the machine. He adopted such Arts and Crafts ideals as the honest expression of materials; inspiration from nature as design model; respect for fine craft and workmanship; and the unity of design from buildings, to furniture, to graphic art.[8] In contrast to Gustave Stickley's United Craftsmen workshop or Elbert Hubbard's Roycrofters, Wright envisioned a society in which manufacturers and artists could educate one another in the use of modern tools and experiment with artistic works.[9]

By 1900, Wright sought to infuse his formal and spatial designs with poetic and pragmatic interpretations of materials and methods. He wrote:

> ...the architect will know the capacities of modern methods, processes, and machines and become their master. He will sense the significance to his art of the new materials that are his, of which steel is but one.[10]

For Wright, instruction in technological and design innovations constituted an essential component of the architect's education. He believed that mastery of the medium of construction for artistic and poetic expression evolved from sustained effort, rather than from isolated investigations. Without this mastery, architectural designs would become stylistic and formalistic exercises lacking authenticity and validity. Accordingly, Wright encouraged architects to focus on a limited palette of materials while deepening their imaginative efforts, rather than to broaden their selection of materials while working superficially with them.[11]

> The first study of importance in this connection is of course, the nature of materials...To know intimately the nature of wood, paper, glass, sheet metal, terra cotta, cement, steel, cast iron, wrought iron, concrete, is essential to know how to use the tools available to make use of those materials, sensibly or artfully.[12]

Building materials constituted a part of nature awaiting transformation by master artists, whose creative imaginations would discover the dormant nature of each material and "awaken it to life."[13] Wright believed that the fusion of nature and technology required the artist-architect to impress his individual imagination upon all available resources and techniques. So informed by the sensibilities of nature and technology, the artist-architect would be able to grasp the essence and poetic potential of materials. In short, architecture became nature transformed by human intuition and craft.

Between 1900 and 1902, two lectures delivered by Wright emphasized architecture as the art of building and gave an increasingly prominent role to new machines and materials. These two lectures, entitled "The Art and Craft of the Machine" (1901), and "The Modern Home as a Work of Art" (1902), coincided with the

beginning of Wright's work on the Prairie houses, so marking a significant point of synthesis in Wright's *oeuvre*. This interest in new materials and processes complemented his earlier discourse on the art and poetry of architecture, and the emphasis on experimentation within the art of building remained throughout his career.[14]

Wright perceived limitless potential in the combination of old and new materials, machines, and fabrication processes. Although he understood the physical properties of materials and machines, it was his intuitive perception and analogical grasp of their fundamental qualities that sponsored his search for a new architecture appropriate for the Machine Age. Wright continuously asserted the primacy of artistic over technical issues in architectural design. He stressed the fundamental necessity for the architect not only to master the materials and machines for building, but also to address inventively both the pragmatic and poetic aspects of construction. In this way, Wright worked in the tradition of the master builder.

Wright advocated that machines be used artistically, as modern tools for artists. He believed that:

> ...in the Machine lies the only future of art and craft—as I believe, a glorious future; that the Machine is in fact, the metamorphosis of ancient art and craft.[15]

Wright viewed the machine as both simplifier and emancipator, but used the word "machine" to describe more than a new artistic medium. While considering the mechanized tools employed for cutting, galvanizing, printing, etc., to be "machines," he also used the term to refer to new production processes for glass, steel, and concrete. He further perceived the totality of a building constructed of modern materials as a mechanized system of machine-fabricated parts—as a machine itself, exemplified by the skyscraper, a recently emergent building type. Indeed, Wright expanded the scale of the machine metaphorically to represent the man-made environment of the metropolis, such as the city of Chicago.

Throughout his writings and lectures, Wright outlined the discord he perceived between form, materials, and building methods in revisionist architectural styles. He decried manufactured copies of the handcrafted forms of the past, reproduced in greater quantity and with greater efficiency, believing instead that the machine should be used to search for new forms more appropriate to the means and materials of the newly industrializing society. Modern machinery, he expected, would lead to the obsolescence of old forms. Thus, the machine was the means to emancipate "human expression" and "the creative mind," to reveal the beauty inherent in the nature of the materials.

> The Machine...has placed in the artist's hands the means of idealizing the true nature of wood harmoniously with man's spiritual and material needs, without waste, within reach of all.[16]
>
> I advocated the machine as an artist's tool, and the machine of course means prefabrication; means reproduction; means standardization; and to accept it as an artist's tool, inevitable necessity.[17]

Wright perceived that the nature of the machine (and of mass production) was "the principle of organic growth working the Will of Life through the Medium of Man."[18]

Wright singled out "standardization" as "the most basic element in civilization, to a degree it is civilization itself."[19] The machine was to be the primary tool of this standardization principle. Wright posited that standardization, when freed from the potentially dominating qualities of exact reproduction, could embody an unlimited potential for the individualization and customization of built forms through modern mechanization. Accordingly, the structure of modern industry presented new and exciting challenges to designers and builders.

Despite his enthusiasm for machinery (and the consequent trend toward simplification and standardization), Wright viewed mass production and automation with suspicion, rejecting the economic rationale for the development of mechanistic systems of production. While he sought standardization and customization through the greater production capability of the machine, he denounced profit-motivated mass production, which strove for greater efficiency, elimination of waste, and greater volume at a lower price. Wright's idealistic view of technology and its applications in industry contrasted with the market-driven concerns of profiteers. His faith that advances in modern technology would result in novel building materials led him to forecast an unlimited fabrication capacity and pioneer optimistically the use of previously untapped materials. It was this enthusiastic faith that encouraged Wright to develop architecture beyond conventional construction.

THE WARD WILLITS HOUSE: A REINTERPRETATION OF THE AMERICAN BALLOON FRAME TRADITION

Like the pattern book and balloon frame, Wright's Prairie houses have been assessed as a major contribution to the development of an authentic American architecture, as well as to the formulation of modern architecture.[20] In these early works, which were built mainly with conventional techology, Wright expanded the spatial continuity, openness, and formal plasticity of the Stick and Shingle style houses of the mid- to late nineteenth century (fig. 1). He progressively applied his idea of the machine as an artistic tool, while retaining the fundamental ideals of the Arts and Crafts Movement, adapting the simplicity of Japanese aesthetics, and absorbing the Transcendentalists' regard for "organic" nature.[21] These issues informed Wright's refinement of the balloon frame, as well as his manipulation of vernacular building materials.

Wright summarized his design strategy for the Prairie Houses into nine points, abridged below:

> First—To reduce the number of necessary parts of the house and the separate rooms to a minimum, and make all come together as enclosed space...
> Second—To associate the building as a whole with its site by extension and emphasis of the planes parallel to the ground...
> Third—To eliminate the room as a box and the house as another by making all walls enclosed screens—the ceilings and floors and enclosing screens to flow into each other as one large enclosure of space, with minor subdivisions only...
> Fourth—To get the unwholesome basement up out of the ground, entirely above it, as a pedestal for the living portion of the home...
> Fifth—To harmonize all necessary openings to "outside" or to "inside" with good human proportions and make them occur naturally...
> Sixth—To eliminate combinations of different materials in favor of monomaterial so far as possible; to use no ornament that did not come out of the nature of materials...
> Seventh—To incorporate all heating, lighting, plumbing so that these systems became constituent parts of the building itself. These service features became architectural...
> Eighth—To incorporate as organic architecture—so far as possible—furnishings, making them all one with the building and designing them in simple terms for machine work...
> Ninth—Eliminate the decorator...[22]

The hip-roofed Prairie House composition, for example, developed from some of Wright's elevation sketches of the barn for Henry N. Cooper in La Grange, Illinois (1890). These sketches hinted at what were to be characteristic elements of the Prairie Houses: a base, wood-trimmed low wall, window frieze band, and horizontally expansive hip roofs running parallel to the entry. These sketches were indicative of Wright's design process, which was informed by a long-term reformulation and transformation of a limited series of vernacular building components, plan types, and details.

Wright conceived of house design in terms of a "grammar," with a "vocabulary" of architectural elements. These elements were organized in component types whose variables sustained Wright's continued experimentation.[23] As Charles White, Jr, wrote:

> His tendency of the last two years has been to simplify and reduce to the "lowest elements" his designs. His grammar, which he may be said to have invented, is such as he used in Winslow house, consisting of a base, a straight piece of wall up to the second-story window sills, a frieze from this front to the roof, and a cornice with a wide overhang.[24]

Wright viewed the Ward Willits house of 1902 as "the first great Prairie house."[25] As Scully has asserted, it not only illustrated Wright's assimilation of American domestic architectural technology and philosophy, but also demonstrated an important methodology of experimentation. The Willits house incorporated the American vernacular balloon frame, innovative wood crafts detailing, and the Prairie house kit-of-parts described above. In the Willits house, Wright continued his investigation of the spatial, formal, and construction elements of single-family house design, refining its "grammar" in material and methods.[26]

UNIT SYSTEM

Although Wright often gave lectures concerning the application of a three-dimensional planning grid in the Prairie house designs, its rigorous use was not evident at the Willits house. The precise dimensions at the partitions and window openings did not strictly conform to a unifying compositional grid, nor did they correspond to the conventional balloon frame

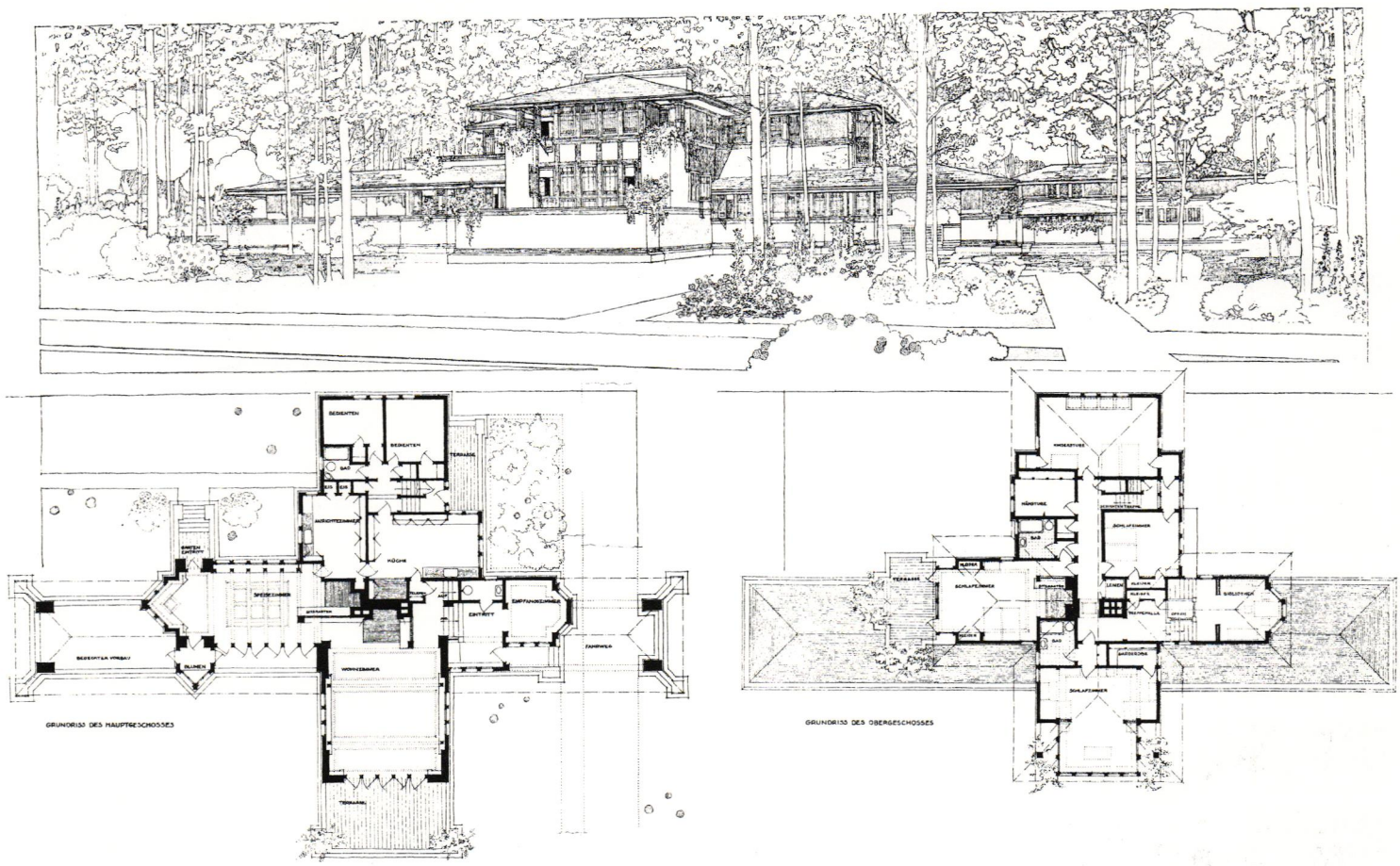
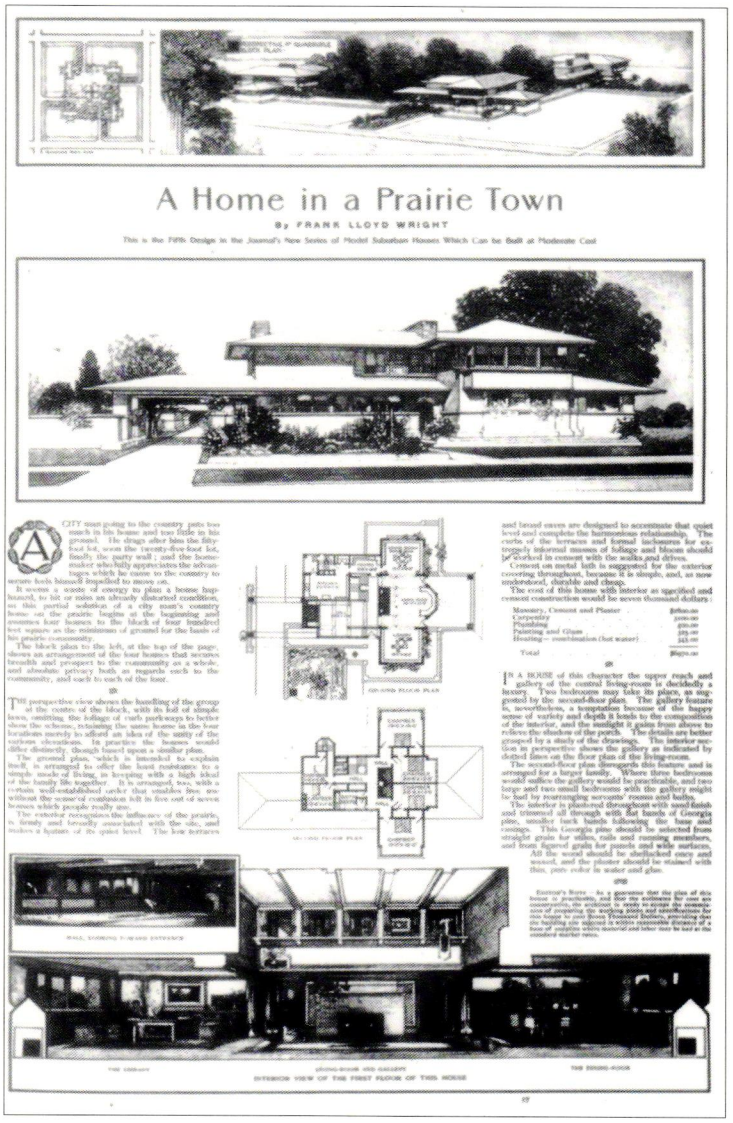


Fig. 1. Ward Willits house, Highland Park, Illinois. Wright, 1902.



A Home in a Prairie Town

By FRANK LLOYD WRIGHT

This is the Fifth Design in the Journal's New Series of Model Suburban Houses Which Can be Built at Moderate Cost

Fig. 2. "A Home in a Prairie Town," from Ladies' Home Journal. *Wright, 1901.*

A Small House with "Lots of Room in It"

By Frank Lloyd Wright

NINTH DESIGN IN THE JOURNAL'S NEW SERIES OF MODEL SUBURBAN HOUSES AT MODERATE COST

Fig. 3. "A Small House with Lots of Room in It," from Ladies' Home Journal. *Wright, 1901.*

member spacing of 16-inch multiples on center.[27] For example, the typical Willits house window opening was 32 inches wide, with a 7-inch wide centerpost. The resulting window module of 39 inches on center did not correspond to the conventional balloon frame's 32-inch stud-spacing, thus eschewing the economies inherent in modularity. Furthermore, this window module was inconsistent, for it increased by as much as 2 inches in the dining room and other places. One can therefore infer that Wright designed the Willits house with a general sense of planning, using localized units and grid-based composition, rather than a single, systemic module.

At the Willits house, Wright's utilization of a "unit system" as a design tool was not yet pervasive or technologically significant.[28] The "tartan grid" later outlined by MacCormac remained primarily a formal compositional discipline.[29] Nonetheless, during the same period, Wright began to experiment with a more rigorous planning grid for wooden cottages, whose structural economy (like that of the Cooper Barn) foreshadowed his later simplification of house construction. In these exposed timber structures, the windows fit within 3- to 4-foot modules, while partitions were located precisely along gridlines.

One year after the completion of the Willits house, Wright's assistant Charles White, Jr, observed the pivotal role of the unit system of design for both plan configuration and the massing and elevational articulations.[30] The logic and "self-generative" potential of this "modular assembly" facilitated and disciplined the translation of Wright's concept sketches into construction documents. Wright's application of production standardization enhanced an integration of design elements, which was generally missing in compositions of elements from the pattern book's myriad kits-of-parts.

PLAN TYPES

The Prairie houses evolved through the development of generative plan types and a kit-of-parts. By modifying a limited number of plan configurations, Wright generated new designs, not only to meet the differing functional needs of clients, but also to permit formal exploration. These plan types (including the cruciform plan of the Willits house, the rectangular box, the linear scheme, the "L" plan, and the "T" plan) reflected Wright's classical discipline, as well as the Shingle Style's freedom of spatial and surface articulation.[31]

Regardless of type, however, Wright's plans were typically organized around a central fireplace and in two zones, one "open," with the living and dining spaces, the other more enclosed, with the kitchen, utility, stairs, and entry. The bedrooms were located on the floor above. The increased openness between traditionally partitioned spaces required economical long-span structures. To meet this demand, Wright used steel to create openings with dimensions beyond the capacity of the conventional balloon frame.

Wright designed the Winslow house (1893), Devin house (1896), River Forest Club (1898), Ross house (1902), Metzger house (1902), and Willits house all with a cruciform shape and two-zoned plan. In using this plan type, Wright consciously sacrificed economy and efficiency for openness and light. As he wrote in 1901 regarding "A Home in a Prairie Town,"

> The plan disregards somewhat the economical limit in compact planning to take advantage of light, air and prospect, the enjoyable things one goes to the suburbs to secure. With modern systems of heating a distinct freedom in arrangement, denied to earlier builders, is made not only possible, but may be made comfortable with modest outlay.[32]

This repetitive modification of plan type rendered the production process more economical and efficient. It also allowed for a readily developed level of design resolution and production competence, which made possible more time-consuming experiments.

Wright's floor plans were diagrams of space upon which he could manipulate and generate different forms, namely, components from his repertoire of interchangeable building elements. For example, he once wrote about a quadruple block composition of identically planned houses, "in practice the houses would differ distinctly, though based on a similar plan."[33] In the Willits house, he worked from the plan of the "House with Lots of Room in It," enlarging the dining room terrace, adding servants' quarters to the kitchen area, and elaborating the pinwheel plan into a stronger cruciform composition (fig. 2). He provided this variation, however, with the sleek, horizontally accentuated hip-roofed structure of "A Home in a Prairie Town" (fig. 3).

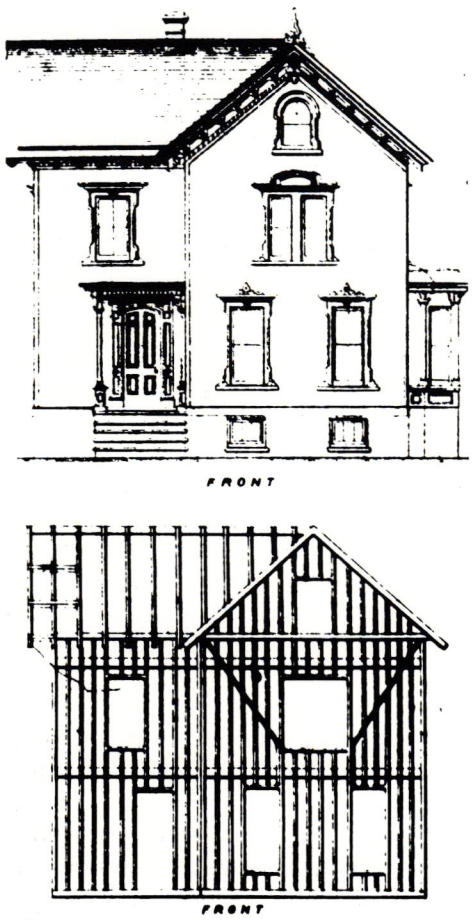


Fig. 4, 5. The balloon frame and its cladding. A. J. Bicknell, 1873.

BALLOON FRAME

To achieve interpenetration of interior and exterior spaces in the Willits house, Wright modified the balloon frame configuration of the walls and roofs. The conventional balloon frame structure is typified by a volume framed by planes of studs, joists, and rafters spaced 16 or 24 inches on center. It relies on a braced, solid corner to achieve lateral stability. At openings, the headers transfer the loads to the doubled-up studs at the jambs (fig. 4, 5). For rigidity, diaphragm action develops from planes of vertical stud partitions or horizontal floor joists. This structural system typically results in either a large rectilinear envelope subdivided into compartments by interior partitions, or an aggregate of numerous boxes. The prevalent use of the conventional balloon frame is directly attributable to its obvious material efficiency, economy, and flexibility; ease of transport and handling during construction; and standardization of member sizes and types. For Wright, as for others, the versatility of a system of small wooden members lent itself to great design differentiation and articulation.

At the Willits house, Wright utilized a conventional framing design, but replaced the typically massive corner brace with a single post and recessed the adjacent walls to hollow out a void where one would expect great mass (fig. 6). To further dramatize the unusually broad cantilevered roof, the front window screen wall was aligned with the roof eaves, so emphasizing the independence of the walls from the roof volumes. Wright accentuated the cantilever of the Willits house roof with a flat dark brown stain on the wood corner post and window framing elements. The dark finishes contrasted sharply with the light-colored, stuccoed building mass below, so minimizing the materiality of the framed structure on the second floor. Thus, by varying the configuration of the balloon frame, changing the corner structure, and dramatically differentiating the exterior finishes, Wright innovatively achieved a heightened level of formal and spatial articulation. Despite these manipulations, however, the true simplicity of the Willits house framing becomes apparent when compared to the stock designs by Comstock or Bicknell (fig. 4, 5).

Wright further departed from the conventional balloon frame by incorporating steel.[34] In much of his early work, he used steel beams, tensile rods, and flitch plates to obtain spatial openness and horizontality.[35] Nonetheless, he typically concealed steel girders and hangers, adhering to his analogy of steel as sinew and bones, covered by muscles and skin. (One of the exceptions is his Oak Park Studio, where he chose to celebrate the tensile steel structures, while concealing the seemingly expedient hybrid structural solution of simple, long-span steel girders and trusses.) For the Willits house living room, Wright articulated the two steel beams with wood trim, intimating the existence of a load-bearing structure, while concealing the steel beams themselves, that is, he ornamented a structural logic, while retaining the unity of the wood and plaster interior finishes. Wright continued to employ concealed, long-spanning steel beams in such structures as the broad, cantilevered roof and brick balcony of the Robie house. By incorporating steel, Wright expanded the formal and spatial potential of the conventional balloon frame.

Fig. 6. Construction photograph of the Willits house balloon frame.

Seeking economical and simple building processes, Wright occasionally made on-site changes to his designs as they were specified by construction documents. At the Willits house, for example, the roof of the dining room veranda was to have been supported by a "beam trussed with rod," but, later, a simpler solution was adopted: a rolled steel beam was substituted to support the wooden roof joist framing.[36] The steel was fully concealed from view, unarticulated, and covered by a coat of plaster. In another instance, Wright specified that the floor over the living room be hung from the roof truss via two iron rods. Construction drawings indicated that the rods were to be hidden within the framed partitions on the second floor stud work. Probably for economy and ease of construction, a pair of steel beams spanning the living room ceiling was substituted.[37]

CLADDING AND FINISHES

The ideals of spatial plasticity and continuity informed Wright's integration of disparate architectural components, among them, walls, columns, piers, windows, planters, railings, and skylights. Wright's detailing afforded a surface continuity characteristic of the Shingle style, but reinterpreted in stucco or plaster on wood lath, with a wide variety of finishes. The diversity of surface articulation extended to such details as the profiles of the wood banding, plaster, brick, and mortar (fig. 7).[38]

Wright's elevations generally consisted of three horizontally banded subdivisions: base, wall, and frieze. This tripartism was established through the systematic application of trims, which, in the later Prairie houses, evolved from a horizontal discipline to a less rigid pictorial composition. The trims of the Willits house, however, exemplified the most direct and pervasive application used by Wright: flat wood trim of a simple rectilinear section nailed onto blocking strips set into the stucco and plaster walls. The trims were systematically applied on the walls' base, wainscot, picture rail, and ceiling; mounted to join the jambs, sills, and heads of openings; and extended to cap the garden walls. To integrate these trims, Wright designed a set of profiles that could be adapted to differing detailing conditions, shown in the sections at the wall, window sill, and parapet. These details consisted of a top sill cap with two horizontal banding strips below. Adapting to various architectural components, the two horizontal strips and the front profile of the top sill cap remained constant, while the width of the top sill cap extended from the shallow wall trim to form a window sill, or to create the garden wall parapet cap. Within this system, the wood profiles could be adapted to different houses.

The Willits house also exemplified Wright's expansive interpretation of the wall's formal potential. On the exterior, the wall was at once house enclosure, garden boundary, veranda parapet, extension of the roof-bearing piers, and support for the planter-urns. On the interior, it was a wainscot, serving buffet, book shelf, and container for heating elements. While transformed to accommodate disparate functions, the wall surface provided continuity from element to element. This strategy remained one of Wright's most inventive design themes.

Wright's systematic experimentation with cladding facilitated his simultaneous production of numerous houses, each with

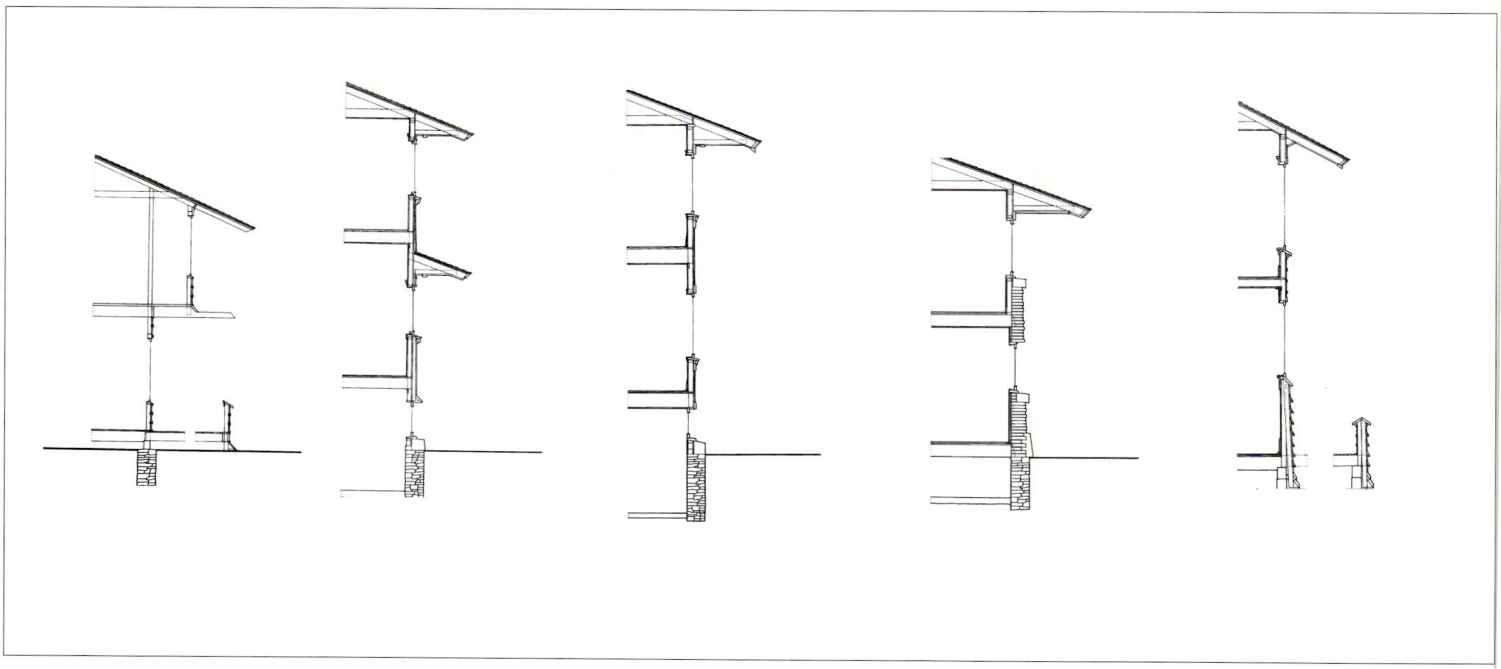


Fig. 7. Comparative wall sections of the E. H. Pitkin Summer Lodge, Sapper Island, Canada (1900); F. B. Henderson Residence, Elmhurst, Illinois (1901); Ward Willits House; Arthur Heurtley Residence, Oak Park, Illinois (1902); and Frederick B. Jones Residence, Lake Delavan, Wisconsin (1901).

characteristic details. The extent of this experimentation is evident in the balloon frame houses he designed while working on the Willits house. By changing the trim and siding profiles and reconfiguring the elemental sections of the cladding, Wright was able to design numerous wood sidings, many expressive of horizontality, between 1900 and 1902 (fig. 7, 8).

WINDOWS

Between 1893 and 1902, Wright used four types of window wall in his house designs: a flush-mounted window within the basic balloon-framed wall, without a roof overhang; a window set deeply in a wall shaded by a broad overhanging roof; a window set behind a planter sill; and, last, a wall that introduced a balcony between the parapet or planter and the window wall behind. The increased layering and variety of exterior wall depths allowed Wright to expand his repertoire of wall components.

Wright's window designs, like those for cladding, exhibited a high degree of systematization and customization. Instead of selecting standard details from patent books or prefabricated units from catalogues, Wright designed his own window types, reducing individual window components to the essential. He then customized them for each house, altering and elaborating size, leading patterns, glass types, sash, glazing bead, and trim detailing.[39] Drawing from a basic set of details, Wright could simplify and ornament windows for houses and cottages in different price ranges.

In the Willits house, the functional weathering components of the window were retained by Wright, while the number of decorative trims was reduced from nine to three (fig. 9). Compared to the conventional window details illustrated by Comstock, Wright reduced the number of window trim elements from seven to six (later, in the Jones cottages, he further reduced it to four).[40] At the Pitkin summer cottage, Wright eliminated the interior finish trims for the windows; only two pieces were used for the sill, leaving a sill and a window stop. These changes allowed for ease of manufacture and efficiency of installation, thus demonstrating the practi-

cal application of Wright's theories of modern craft production.

Conceiving of glass as a filter of light, whether natural or artifical, Wright typically unified and integrated designs for windows, skylights, and electrically lit ceiling screens. Wright's propensity to experiment led him to collaborate with the master glaziers Giannini and Hilgart, and the results of their efforts exploited the full range of available glass colors and types: opalescent, opaque, colored, and clear, set within screens of zinc or copper leading or framing of two to three varying widths. Geometrical patterns played on the effects of light, screened vistas, and filtered spatial perceptions between the interior and exterior.

In developing window designs, Wright concentrated on changing the composition of glass and the profiles of members, achieving novel effects with glazing materials, and varying window-to-wall configurations. He attempted to explore the expressive and compositional potential of the window, while simplifying its detailing. His work contrasted sharply with the technically-oriented investigations by contemporaneous window inventors, who were prolific in developing and patenting functional window components.

HEARTH

In the Willits house, a central "pinwheel" fireplace directed the spatial flow of the first floor, defining and extending entry, living, and dining spaces. Here, Wright transformed a basic type, the introverted inglenook of seventeenth and eighteenth century wood-framed houses, from "the enclosed core, to the half-open core, to the liberated core—an island that coordinates spaces around it."[41] Pragmatically, Wright's fireplace integrated modern systems of heating, cooking, and ventilation in a central service shaft; symbolically, it remained the heart of the house.

The fireplace brickwork typified Wright's use of details to recall the horizontality of the prairie. Roman bricks were rendered continuous by the use of similarly colored lime mortar for the vertical joints, while white mortar bed joints underscored each coursing.[42] The conventional mantelpiece was replaced by a concealed steel angle.[43] The broad chimney mass contained separate flues for the fireplaces, heating units, and kitchen exhausts. Surprisingly, it split into two sections on the second floor to allow a corridor to pass through: a sky-lit void penetrated the center of the core and illuminated the floor above the dark and protected hearth. This unexpected contrast of solid and void was further elaborated at the Robie house six years later.

INTERIOR FINISHES

Wright's interest in expressing the nature of materials was most clearly manifested in his wood finishes. Inside the Willits house, stains revealed the grain and quality of Georgia Pine, and sand, rather than paint, determined the plaster's color. Color was "of" the material, not "on" a film that concealed the material behind it. However, this desire to reveal the quality of the material, characteristic of the Arts and Crafts movement, applied only to visible surfaces, which often concealed actual structure behind them.

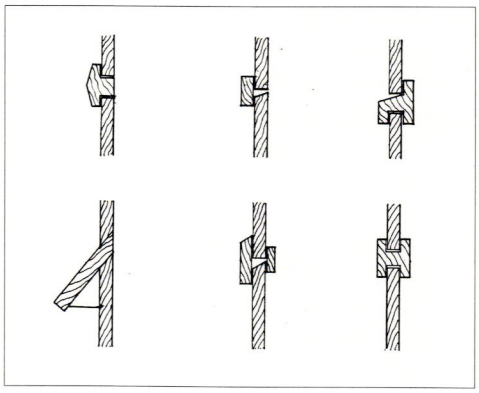


Fig. 8. Wood siding details of six Wright projects. Clockwise from top left: Wilder Stables (1901) (vertical board and batten), Gerts Double Cottage (1902), G. W. Spencer House (1902), Pitkin Summer Lodge, ibid., and Jones Residence.

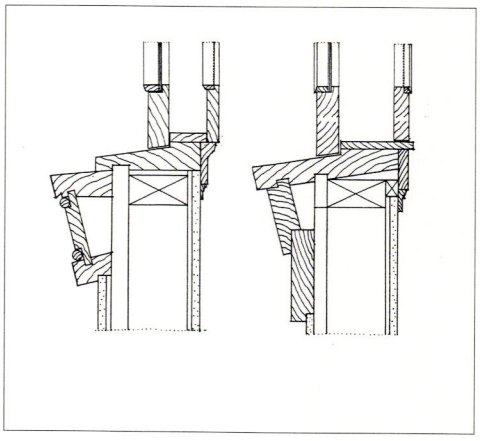


Fig. 9. Window sill details of the Thomas house, Oak Park (1901), and the Willits house. Note the simplification of profile, and reduction of members required to construct the frame.

While wood trim was essential to express a "revolutionary sense of the plastic whole," Wright also justified it as necessary to conceal poor workmanship.[44]

> It was necessary with the field resources at hand at that time to conceal much. Machinery versus the union had already demoralized the workmen. The Machine resources were so little understood that extensive drawings had to be made merely to show the "mill-man" what to leave off. But the trim had become only a single, flat, narrow, horizontal wood band running around the room.[45]

Wright developed a system of machined wood detailing, with an adaptable kit of trims. Instead of heavily detailed, carved forms, he selected plain rectilinear bands and edge trims that expressed the simplicity and standardization of machine fabrication. Wright articulated plaster surfaces with wooden bases, picture rails, sills, wainscots, and ceiling bands. A base consisted of a rectilinear board, at the bottom of which was added a carpet strip. An upper transitional trim of routed profile intersected and continued the linear articulation of the vertical or horizontal wainscot panel to which it was joined. On the top rail, a smaller rectilinear band had another edge trim below, and a picture rail cap on top. Typically, the trim of the living floor was higher in profile, and, in certain instances, the primary band had two or more additional edge trims on top. On the upper floors, the wood bands were simplified in profile, diminished in size, and, occasionally, eliminated. With a limited set of trims, great versatility of expression was readily achieved.

CLIMATE CONTROL SYSTEMS

A further example of Wright's inventive transformation of functional elements through application of the "art of the machine" may be found in climate control systems, to which he attributed the freed manipulation of interior space and exterior form. In 1901, he wrote:

> With modern systems of heating a distinct freedom in arrangement, denied to earlier builders is made not only possible, but may be made comfortable with modest outlay.[46]

Ten years later, in the Wasmuth Portfolio preface, Wright elaborated upon the implications of improved heating technology to "modern opportunity" in spatial articulation. The systems that Wright utilized in the Willits house (and in his other Prairie houses) were not novel inventions; what distinguished Wright's work was holistic design incorporating mechanical and electrical systems.[47]

Consistent with previous works, the Willits house integrated the structure, enclosure, garden wall, planter, glazing, ventilation, and built-in furniture with the heating, plumbing, lighting, and electrical systems. Hot water heating elements were concealed behind bookshelves or hidden within the cavities of stud walls, and the system was augmented by indirect radiant heating tubes below the dining room and entry floors.[48] Although this strategy of concealing the mechanical systems within framing or millwork was well practiced in Adler and Sullivan's commercial and institutional designs, Wright refined it by applying it to residential projects.

The lighting design at the Willits house included art glass panels above the entry hall and dining room, which were illuminated by incandescent lamps and via skylight, respectively. Throughout the Willits house, lighting fixtures were transformed into ornament that heightened spatial definition. Instead of his patented Luxfer Prisms, Wright incorporated conventional glass globe sconces and bare bulbs within a system of interior wood screens and trims. The sconces were mounted on the wooden posts as both functional and decorative elements. Similar to the lights that Wright helped to design while working on Adler and Sullivan's Auditorium, these fixtures were seen as "features of the plaster ornamentation."[49]

FURNITURE

At the Willits house, as in many of his subsequent commissions, Wright extended his services to include the design of table settings, murals, sculptures, floral arrangements, and landscaping. Motivated by a desire for unity of artistic expression (the ideal of the *gesamtkunstwerk*), Wright created built-in and free-standing furniture (such as chairs, tables, bookshelves, and serving buffets) that echoed the house design. Each piece was characterized by simplicity in joinery, with wood slat screens and plain rectilinear wood members. The subtle flaring of flat chair legs and backs imparted a gracefulness that was lacking in the Mission Style furniture popular at the time.

Wright's investigation of the kit-of-parts in his early Prairie houses, evident in the building components of the Willits house, served as a framework for subsequent

experimentation. Between 1900 and 1910, Wright and his collaborators at Oak Park produced over 140 new and remodeled houses, of which more than 80 were executed. These individually commissioned houses, functioned, in essence, as prototypes for the American System Built Houses to follow.

THE AMERICAN SYSTEM BUILT HOUSE: TOWARDS STANDARDIZATION, MASS DESIGN, PRODUCTION, AND MARKETING

The American System Built Houses (ASBH) constitute one of Wright's most intensive efforts to adapt his customized Prairie houses to a moderate-cost mass market in America (frontispiece). He conceived of the ASBH as a vernacular development in house design that responded to an increasingly industrialized society. In these projects, he attempted to establish a system of design—as well as a system of building houses—that would fully employ the machine and modern organization. Wright remarked:

> The American system-built house is not a ready-cut house, but a house built by an organization systematized in such a way that the result is guaranteed the fellow that buys the house. I want to deliver beautiful houses to people at a certain price, key in pocket. If I have made progress in the art of architecture, I want to be able to offer this to the people intact.[50]

Wright's moderate-cost housing agenda in design development began years before the ASBH, as shown by such previously published prototypes as "A Home in a Prairie Town," "A Small House with Lots of Room in It," and "A Fireproof House for $5000." Wright's interest in designing speculative, moderate-cost houses was further evident in "Three Typical Houses for a Real Estate Subdivision from E.C. Waller," and in six houses built by Sherman Booth similar to the concurrently executed ASBH. The ASBH was thus a continuation of Wright's previous investigations in speculative small- and moderate-size homes.[51]

The ASBH formalized a design methodology that Wright had already begun to utilize in his office production. Like the Prairie house, it was organized as a standardized kit-of-parts (documented in over 980 sheets of sketches and drawings) that allowed for customization and variation.[52] In this way, Wright continued the type of experimentation illustrated by the Willits house, while increasing the standardization and systematization of the unit system, plan types, and kit-of-parts. He believed that "this effort [the ASBH] is the logical conclusion of my studies and my architectural practice."[53]

Based on the extensive collection of drawings in the Frank Lloyd Wright Archives, this case study focuses on Wright's strategy and techniques for developing a moderate-cost American house with the potential for large-scale production. Wright aspired to capitalize on modern economic and technological means in order to realize affordable houses with infinite design variations, based on limited and standardized house and component designs.[54]

The ASBH project was sponsored by Arthur L. Richards (1877-1955), who had engaged Wright's services for the design of the Geneva Inn in Wisconsin (1911).[55] He again hired Wright for the Madison Hotel (1911) and the Richards Company Office Building project (1913). When the ASBH project began, Richards joined Wright in his ongoing campaign for moderate-cost houses, contributing financing and expertise in building, development, management, and marketing, so complementing Wright's creativity.[56]

Wright and Richards agreed to collaborate exclusively with each other on "Standardized System Built Buildings."[57] Richards contracted Wright to design buildings; to provide "complete plans, specifications, designs, details, and perspectives;" to "inspect and study housing and building conditions and requirements" as designated by Richards; and to patent and copyright the plans designated by Richards under United States laws.[58] Wright was to be compensated in three $250 installments every three months, along with weekly royalty payments, and royalties based on "gross business" activities in graduated percentages ranging from 1% to 3.5%. Furthermore, Richards promised Wright stock ownership, along with a director position. By June of 1917, due to the absence of royalty payments, Wright nullified this agreement.

To protect the venture from being copied by competitors, Wright was contractually obligated to patent all of the ASBH plans, elevations, sections, and details. Richards agreed to compensate Wright for the cost of the applications, in exchange for the sole privilege to build the designs in the U. S., as well as overseas, if Wright chose to patent them abroad. Although "Patent Applied For" appeared on all the working drawings, patents were never granted by the United States patent office.

Fig. 10. Cover of Building Materials and Ready-Made Houses *catalogue. Lyman Bridges, 1870.*

Like the houses offered by such companies as Sears or Montgomery Ward, the ASBH drew upon the American tradition of ready-made houses and the stock kit-of-parts offered by the pattern books (fig. 10). However, the ASBH offered designs by "America's most prominent architect" at economical prices. Richards's prospectus marketed the houses with descriptions of notable qualities, such as

> ...straight lines, spacious surfaces, every feature clean and direct; the pleasant casement windows; simple exterior moldings; the ever present flower boxes...superior ventilation...folding screens...cross light and ventilation... The framing is the most rigid possible.[59]

Richards and Wright intended to show potential customers a multitude of plan types, design variations, and details, all ready for construction. Specifications, sample doors, windows, walls, and appurtenance systems would be exhibited to potential buyers, minimizing consumer uncertainty.

ASBH advertisements highlighted guaranteed prices between $4,000 and $10,000. Unlike the terms for many of Wright's custom-designed Prairie houses, those of the ASBH promised to pay any cost overruns and to refund savings. The Richards Company emulated Sears's financing plan for mail-order houses, subdividing the payments into monthly installments comparable to the prospective buyers' rents.[60] These arrangements offered working class and farm families the means for home ownership.

Wright left sales and marketing tasks to Richards, who awarded the ASBH advertising contract to the Taylor-Critchfield-Clague Company of Chicago, the country's leading agency. Richards's goal was to develop a national network of promotional and sales fanchises for the ASBH. The materials (including lumber, flooring, mill work, electric fixtures, plaster, hardware, trim, and art glass) would be supplied to dealers by the Richards Company at manufacturers' list prices.[61] Subcontracts for masonry and cement, plumbing, heating, plastering, wiring, painting, roofing, rough hardware, carpenter labor, and incidentals, along with the dealers' profit, were not included in the guaranteed prices. For these services, dealers were required to make a number of competitive sub-contract agreements with local contractors and suppliers.

Wright's ASBH, along with their often referenced American Ready-cut houses, were clearly part of a well established tradition of American manufacture. The ASBH employed production and marketing ideas commonly found in American industry. By 1911, such ideas for simplification, systematization, standardization, prefabrication, mass production, distribution, marketing, and sales were well publicized heroic achievements. This societal response to commercial ingenuity was exemplified by the mythologizing of Eli Whitney, the "father of mass production," and of Henry Ford, the "first major user of true mass production."[62]

The ASBH competed against conventionally designed and constructed houses, precut mail-order houses, and prefabricated houses by offering designs by a world-renowned architect at a lower, guaranteed cost. In design, the ASBH retained a basement for storage, laundry, and me-

chanical services; eschewed the conventional "decorated box" concept; eliminated unnecessary handiwork, elaborate detailing, and "wasted" attic spaces; increased the efficiency of spatial utilization; and included Wright's famous qualities of space. In construction, the ASBH promised to eliminate the uncertainties of material quality and building schedule.

MODULAR DESIGN

The structural planning grid of the ASBH was adapted from those of the Prairie cottages. An important design variation was the increase in stud spacing from 16 to 24 inches on center. In both design and construction, this 2-foot square grid was first laid out as a matrix for the location of stud walls (fig. 11). As noted by Edgar Kaufmann, Jr, Wright typically used the grid to harmonize proportions and rhythms without imposition.[63] In the ASBH, the grid unified spatial composition and constructional logic. At the same time, the house plans were conventionally dimensioned, with running dimensions noted on the drawings. In the ASBH, Wright set up the system upon which the Usonian concrete house grids later capitalized, simplifying the dimensioning and construction process.

Within the 2-foot grid of the ASBH, room partitions were located on center lines, except at exterior corners. The dimensions of these corners were informed by several factors, including the thicknesses of the partitions themselves and the requirement of nailing surfaces to secure the wood sheathing for interior plaster or exterior stucco. In order to express the 2-foot module on the exterior, the corner stud spacing was reduced by the width of a partition. The exterior wall surfaces were thus aligned with grid lines, while interior partitions were centered on them.

Due to the nature of balloon framing, the stud members' horizontal spacing was determined by design and structural requirements, while the vertical module remained flexible, varying according to the dictates of window sills, headers, and accent trim heights. Significantly, the traditional relationship between window assembly and wood framed rough openings was altered in the ASBH. Conventional windows were designed as units to be inserted between vertical studs, with headers and doubled-up studs at each jamb to transfer the loads down to the ground. Instead of conceiving of windows as punched openings in a wall plane, Wright configured the windows as operable or vision panels set within the continuous screen of a 2-foot stud framing system. This strategy minimized cutting and simplified the design through modulation, which emphasized the ASBH's rhythmic proportions.

HOUSE MODELS

Wright systematically modified and reused the earlier, individually commissioned Prairie house designs. He developed 138 ASBH type designations, of which approximately 50 were documented in drawings (frontispiece, fig. 12). The designations were not systematically encoded, except for the three digit numbers, wherein the last number denoted the roof type. For example, F-110 designated a basic plan configuration. The "1" at the end of F-111 indicated that plan type con-

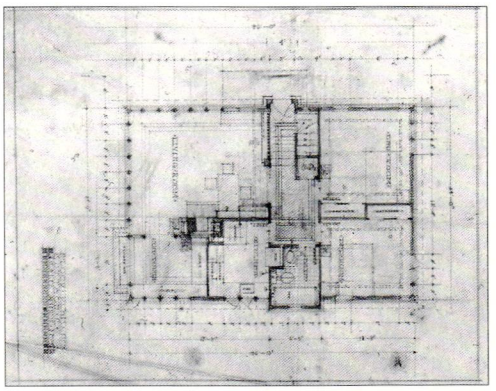


Fig. 11. ASBH design process sketch.

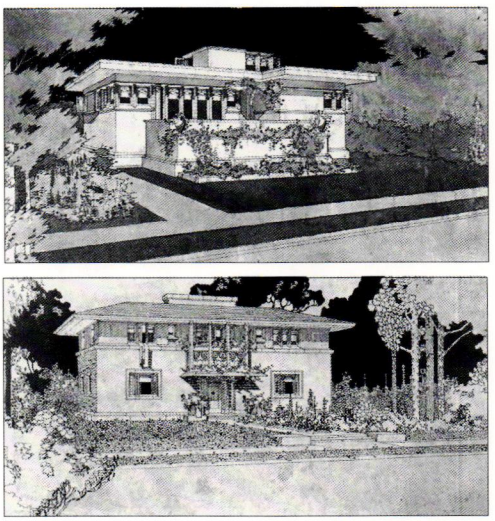


Fig. 12. Views of ASBH with flat and hip roofs.

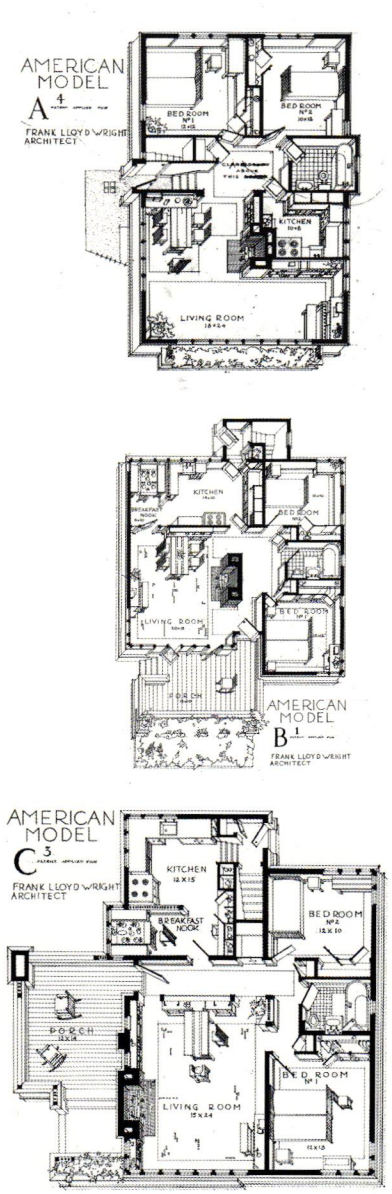


Fig. 13. Axonometric plans of ASBH models A, B, and C.

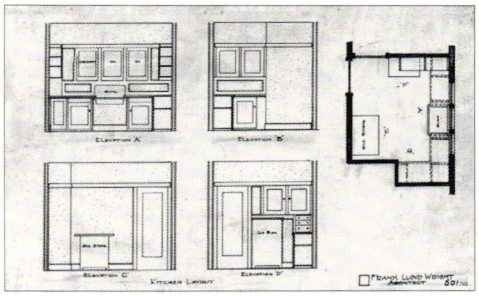
figured with a flat roof; the "2" in F-112 a gable roof; and the "3" in F-113 a hip roof. While this numerical classification was well-ordered, the alphabetical prefix was adopted for the sake of convenience. As noted by McArthur, a similar systematized roof configuration had been proposed earlier for three typical houses designed by Wright for a real estate subdivision of E.C. Waller (1909).[64]

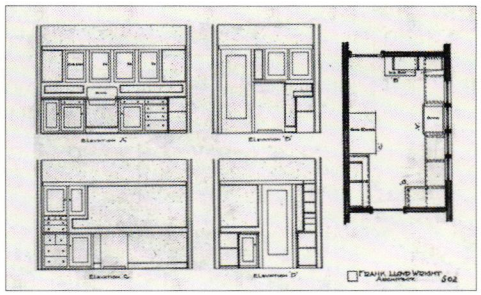
The 138 ASBH models shared common design "parts." Like the earlier Prairie houses, each ASBH was planned with two complementary zones, public and private. In the former, circulation flowed between the living, dining, and kitchen areas, unobstructed by traditional room enclosure and separation; in the latter, by contrast, prototypical box-like units contained the bedrooms and baths, and were aggregated in "J" or "L" configurations (fig. 13). Design variations of a plan type were tallied on a sheet which listed the attributes of each model. Prominent in these listings were the overall dimensions; number of levels; number and type of rooms; roof forms; and use of terraces, porches, or planters. For the sake of versatility, some of the ASBH designs could be developed as a single-level house, or expanded with a second level of bedrooms and a roof garden. The simplification of the customized Prairie house designs is most evident in a series of perspective renderings of the different house models, which reference previous commissions such as the Winslow house, the Willits house, and "A Fireproof House for $5,000." Looking at these drawings, it is clear that Wright based his type variations on concepts of interchangeability and variability.

ROOM TYPES

A series of standard room types and space-defining elements was central to Wright's systematization of house design. Standardization of both spatial modules and building components facilitated the design process, documentation, prefabrication, and mass production. While the bedrooms, bathrooms, breakfast alcove, fireplace, and built-in dining set were the most standardized spatial units, the kitchen, dining, and living areas could be adapted in size and shape to fit into different house models. Consequently, Wright could easily adjust an ASBH model to suit a customer's particular needs. Each spatial module was fully documented on one drawing sheet. The designs synthesized spatial modules from a large selection of differentiated types, and integrated these elements into a specific, individualized plan. Because of the use of a 2-foot module, most ASBH houses contained rooms with set dimensions of 6, 8, 10, 12, 14, 18, 20, or 24 feet, and only an occasional odd-numbered size.

Most of the ASBH were designed with two or three bedrooms of standardized sizes: 10 x 10 or 10 x 12 feet for single beds, and 12 x 12 or 12 x 14 feet for double beds. Each bedroom had windows in two adjoining exterior walls, an interior wall with hall doors and built-in closets, and a blank wall for the placement of bed headboards. The bedrooms were clustered together in close proximity to the bathroom, which was also standardized. The typical bathroom measured 6 x 8 feet; the bathtub, lavatory, and toilet were located along the long wall, thus consolidating plumbing, minimizing pipe lengths, and facilitating installation and repair. In most bathrooms, a small window provided ventilation, and





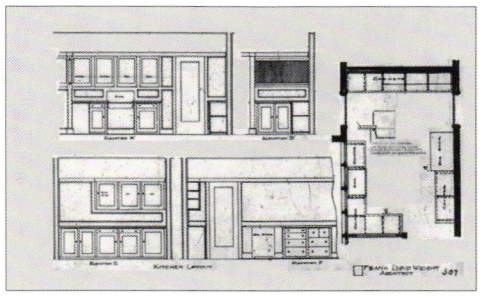


Fig. 14, 15, 16. ASBH kitchen layouts.

closets behind the two longer walls insulated the adjacent bedrooms from noise.[65]

The available kitchen layouts varied in size and counter configuration. Most utilized an "L" or "U" shaped counter, with a linear strip of counter and an ice box opposite (fig. 14, 15, 16). Each of these designs was illustrated on a sheet containing a plan and four interior elevations, with references to standardized cabinet and appliance connection details. The dining alcove common to most house types measured 6 x 8 feet (the same size as the bathroom), and accommodated a breakfast table, two benches, and an end chair. Although its 6-foot width remained fixed, the dining alcove's length could be adjusted to extend beyond the 10-foot depth of the adjoining kitchen, from which it was separated by a wood screen partition.

Whenever possible, Wright allocated a corner window for the dining alcove (model B1), which, at times, was pulled out from the house to increase the glazed area and its volume (model C3). The dining area itself consisted of a long rectangular table with four or five seats. Its short end abutted a wall of cabinets for plates, silverware, or books. This standard unit defined the space for eating in the midst of a fluid living area, and set the backdrop for the celebration of dining. Its design was antithetical to the formal dining rooms of the Prairie houses, and its openness foreshadowed the composition of the Usonian houses.

In the ASBH, Wright's "destruction of the box," was applied to the living, dining, and entry spaces, informing the location of the partitions, fireplace, and built-in furniture. The kitchen, baths, and bedrooms, however, were accommodated in a series of enclosed boxes of standardized dimensions. The windows and doors of these rooms were usually located at corners, where they provided access, admitted light, and allowed for extended diagonal vistas. In the type B1 plan, this motivation is evident in all four major spaces.

Despite this repertoire of open corners, Wright provided massive piers for the street elevations of models A4, D1, E3, J400, and J900. The massing of these models appeared symmetrical, box-like, and tightly clustered (with banks of windows buttressed by stucco wall panels or bracketed by solid corners), but their interior spaces betrayed their exterior articulation. For example, an interior partition might intersect the bank of windows at an intermediate mullion and create a single-sided corner window in the interior. From the exterior, however, the row of windows would appear to continue uninterrupted.

Wright's conceptualization of the ASBH as spatial units standardized for design composition precursed his 1932 proposition for an "assembled house," in which he entertained the idea that the standardized design could be further pre-assembled in the factory, transported, then installed on site.[66] He singled out the bathroom and kitchen for pre-finishing, with all of the appliances factory-installed, needing only to be attached to existing water and electrical lines. The bedrooms and living rooms contained standardized arrangements of furnishings, the result of Wright's speculation about an aggregate system of house design, based on pre-designed, prefabricated house units.

STANDARDIZATION AND SIMPLIFICATION: THE KIT-OF-PARTS

Typically, the ASBH was constructed as a balloon frame on a concrete or concrete block basement foundation, clad with stucco and wood trim, and finished on the interior with plaster and wood trim. Wood

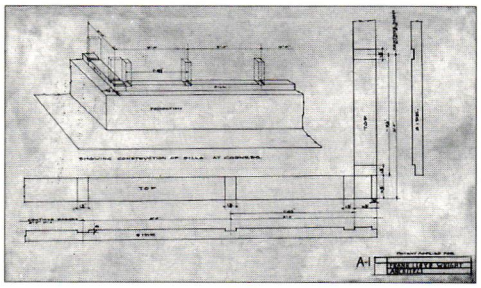


Fig. 17. ASBH standardized balloon frame detail: the pre-notched sole plate.

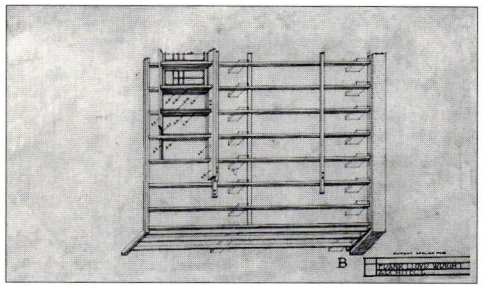


Fig. 19. ASBH standardized balloon frame detail: windows and framing.

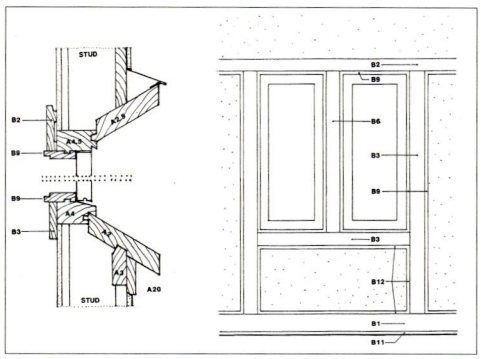
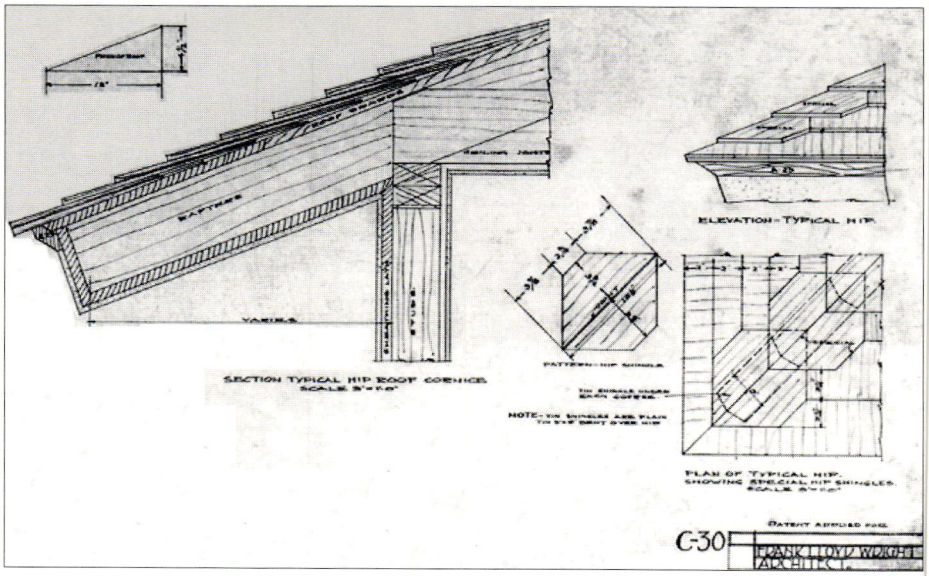


Fig. 20. ASBH encoded wooden assemblies and glazing types.



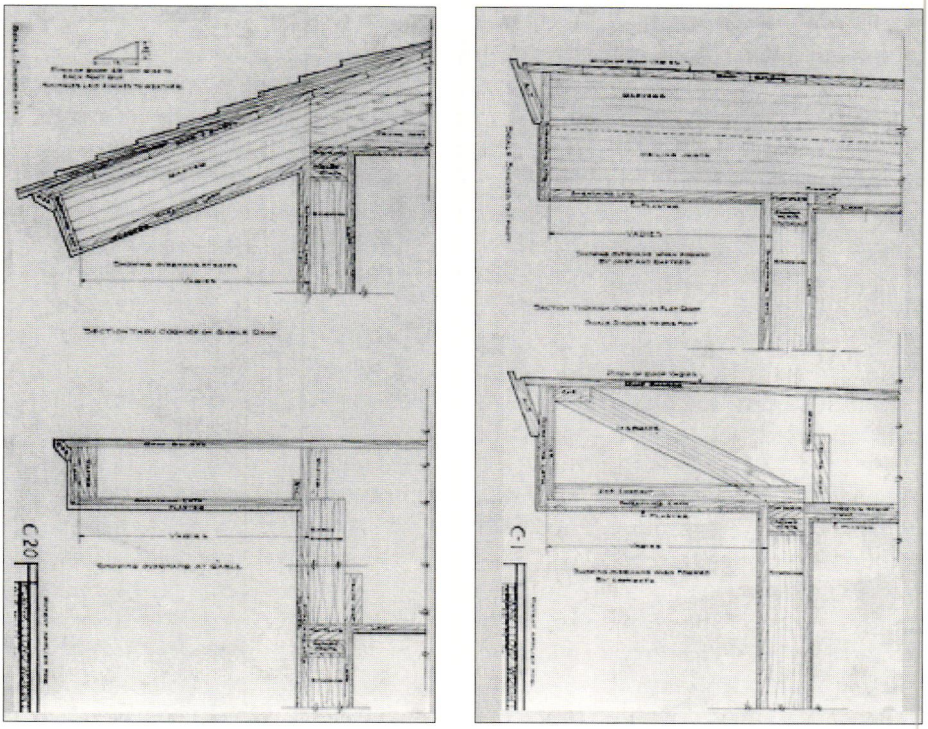


Fig. 18. ASBH standardized roof details.

trellises, garden walls, and planters were added later.[67] The erection of the 2-foot spaced studs was facilitated by the prenotched sole plate (fig. 17). Exceptions to this rule included the eccentric corner stud configuration described earlier, and the notch detail on the sills. The latter accentuated the already labor-intensive joinery by deviating from the norm, but was later simplified by the elimination of the routed, notched sill/stud connection.

In the rough framing of the doors, Wright incorporated a simple—but surprisingly inventive—variation of conventional stud configuration. He rotated the stud orientation 90 degrees at the jamb, thereby reducing the nominal stud width at the partition from 4 to 2 inches. This contrast in partition width increased the apparent mass of the wall, but decreased the depth of the door frame itself. This manipulation of standard stud wall detailing foreshadowed the similarly oriented 2-inch thick wooden core of the Usonian sandwich wall.[68] As in many other instances, Wright's fascination with the details involved in the art of building becomes apparent when one looks at his unconventional use of ordinary building materials and components.

ROOF

Flexibility and interchangeability were the main goals of Wright's roof design strategy. Wright often conceived plans without designating roof form. In his elevation sketches and perspective renderings, he would interchange flat, gable, and hip roofs on the house massing beneath. The client determined which roof form would be chosen, although the flat roof proved to be the most adaptable to varied plan configurations. In addition to these roof types, Wright included two wood trusses in his kit-of-parts. The trusses replaced the steel supports used for long spans or cantilevered roofs in the earlier Prairie houses, and were framed with two wood studs and top and bottom truss cords, sandwiching a single member web with diagonal struts.

Standardized eave details corresponding to the three roof types were simplified to an angled trim at the top edge of the projecting eave, over the stucco soffit and walls (fig. 18). The upper and lower eave conditions were documented on each drawing with illustrations of the lookouts, as well as the ends of the roof joists. Thus, sectional details could easily be pulled from the general detail file, submitted with their appropriate roof type, and assembled as part of the construction documents. This strategy was conceived for efficiency of documentation and execution. Wright's Prairie houses, with their evolving kit-of-parts, made up a progression; each house was but one iteration in a process of design experimentation. On the other hand, in the ASBH, the potential for systematized variation of component details was explored in an even more rigorous and inclusive manner.

This systematization was most evident in the eave details of the flat roofs, which varied in trim profile and, consequently, expression. Wright illustrated several configurations: one, an upturned stucco eave fascia, capped with an angled wood trim; a second, an upturned eave capped at the end by two converging fascia boards meeting at a sharp edge; a third, further simplified, a single sloped fascia board which capped the roofing at its top edge and met the stucco soffit with its lower edge.

CASEMENT WINDOWS

One of the ASBH's most significant innovations may be found in the design of windows and framing. Wright greatly simplified the framing of the rough window opening by eliminating the wooden headers, sills, doubled-up jambs, and cutting of the studs. Each window was designed to fit between studs spaced 2 feet on center, allowing for an uninterrupted transmission of loads from the roof, past the windows, to the sill plates (fig. 19). Within this structure, each window type had a standardized width, with variations in height and glass patterns. To facilitate design and fabrication, the exterior and interior trims were codified with standard profiles and details.

Wright reduced the number of parts necessary for component assembly by simplifying the casing and trim at the header to four elements (more elaborate designs typically required at least six). The sloped jamb, head, and sill profiles accentuated the depth of the window unit, reducing the perceptible thickness of the stud framing. The sills continued the line of the horizontal wood trim on the stucco wall planes, reinforcing the overall planar articulation. The top header trim angled upward, increasing the window opening, while flashing protected it from precipitation.

For ease of detailing, documentation, precutting, fabrication, and on-site assembly, Wright encoded each window component (fig. 20). Exterior members were

designated the A series: A1, the sloped trim; A2, the window sill; A3, the trim under the sill. The interior trims were designated the B series: B1, the base; B2, the head trim; and B3, the vertical and horizontal window trim. Each of the referenced members was then described in greater dimensional and specification detail on a standard sheet that accompanied the project. Wright's implementation of such a system demonstrates his vision of standardization as part of the "craft of the machine."

Wright also aimed for acute simplification and standardization in glazing. Seven art glass patterns of the same width were created to fit within varying heights of the standard 2-foot module.[69] The number of glazing bars was dramatically reduced from the earlier Prairie houses (such as the Willits house), whose more elaborate windows might include over 200 glazing bars each.[70] Although the windows and doors were based on a fixed dimension, variations of the etched patterns and zinc bar compositions were potentially limitless. Much of the individuality that Wright emphasized as a critical element of artistically designed houses was accentuated within such a standardized framework.

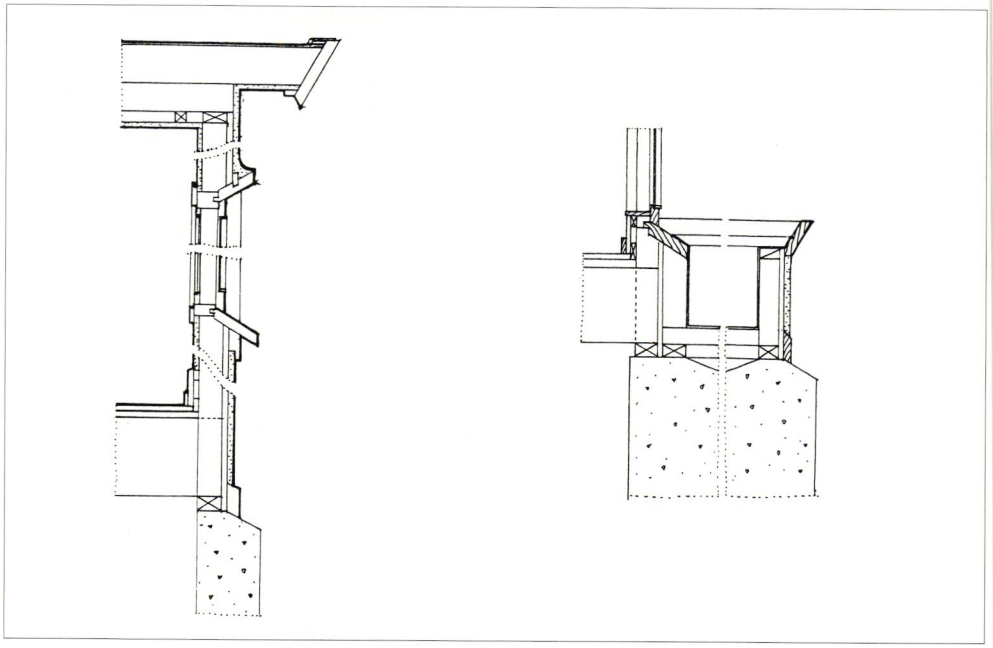


Fig. 21. ASBH typical planter detail.

FINISHES AND TRIM

The ASBH offered "Beautiful Elastica Stucco" in fifty colors. Clear cypress no. 1, "the wood eternal," was specified for all exterior woodwork. Interior finishes included oak floors (maple in the kitchen) and selected birch trims.[71] Wright specified a two-coat plaster finish on wood laths of tongue-and-groove sheathing boards with routed grooves for stucco. In ease of installation, these sheathing boards were as much of an improvement on conventional ones as the newer lath products advertised in 1916. A stucco board variation of Wright's was the Bishopric Stucco or Plaster Board, which integrated dovetailed keys of creosoted wood lath with stucco and was backed by asphalt mastic over heavy fiber-board. These configurations were touted as weather- and waterproof.[72] The application of these units was still far more labor-intensive than that of the plaster boards offered by Sears, which could be nailed on in 4 x 8-foot panels, tapped, and sanded to a smooth finish.[73]

The ASBH fireplaces were equipped with plain cast stone lintels and constructed of pressed bricks with Wright's typical horizontally expressive mortar joints. The fireplace's location was exceptional within the standard modular plan. The open hearth defined the surrounding spaces, anchoring the juncture of the living and dining areas, while screening them from the circulation zone. For economy, the Prairie house inglenooks were deleted.

Because the spatial configuration of the ASBH was drastically simplified, Wright's modular built-in furniture gained importance. The coordinated set of Frank Lloyd Wright furniture included kitchen and dining cabinets, breakfast and dining tables, bookshelves, closet accessories, and radiator screens. Wright facilitated the use of these pieces in various combinations for different house models with independently documented fixed dimensions and configurations.

Standard lighting fixtures, consisting of bare bulbs on tin cube bases, were surface-mounted on walls or hung from ceilings.

The art glass lanterns characteristic of the Prairie house were eliminated, along with the elaborate wood brackets that had integrated them with the interior trims.

Wood trellises were detailed by Wright to appear a continuation of the horizontal wall trim, linking different window types by extending the lines of the headers. Sometimes a wood trellis was cantilevered to shade and sponsor the growth of vegetation over entrances and porches (fig. 21). Similarly, exterior walls extended from the house volume; enclosed porches or terraces; and functioned as garden walls, planters, or stair railings. This approach necessitated not only the detailing of discrete parts, but also and more importantly their creative combination in order to reduce the need for customized components. Innovative design was accomplished through the repetitive—but inventive—use of predetermined architectural elements. By altering the relationships between these elements, Wright codified the synthesis begun in the design of the Prairie houses: he systematized it into a kit-of-parts.

CONSTRUCTION

Initial variations of the ASBH were constructed in 1915 at the Ravine Bluffs Development commissioned by Sherman Booth. Ravine Bluffs was located in a suburban subdivision north of Chicago and consisted of six houses of unmistakably similar massing. The series used three designs proposed for the Waller housing development, outfitted with flat, hip, and gable roofs. A two-story center block echoed the massing of the ASBH, and its detailing was sympathetic to the ASBH kit-of-parts. These similarities are not surprising, since they reflect Wright's method of infusing various commissions with his unique combination of design themes.

In 1917, ten units of housing based on three ASBH model types were built at the Richards Company Burnham Street development in Milwaukee.[74] Their construction was supervised by Russell Barr Williamson, who prepared a large number of the ASBH drawings and also managed the office when Wright began to spend most of his time in Tokyo working on the Imperial Hotel. Wright's absence during the ASBH construction phase was consistent with the houses' design intentions as reflected in the construction documents. Unlike earlier custom-designed projects, these houses were to be constructed with a minimum of on-site refinement and so would not require Wright's personal attention.

These houses were built as demonstration models, which had great promotional value for Richards's 1917 marketing campaign. The flats were publicized in the *Milwaukee Journal*, which reported:

> The apartment building, both in design and construction, will represent a radical departure from the old-fashioned flats...The standardizing of the houses does not go toward making them look alike at all, for with the same materials we can build houses that look entirely different both inside and out.[75]

To broaden the sales territory, the Richards Company opened a branch office at 7 West Madison Street in the Chicago Savings Bank Building and began advertising in late February of that year. Richards's marketing concentrated on the Chicago area, with advertisements running simultaneouly in the *Examiner* and *Sunday Tribune* listing nine local dealerships. While Richards's American Home Building company campaigned in a substantial number of territories surrounding the city, other dealerships offered their services in Gary, Indiana, and Champaign, Illinois.

Richards wrote to Wright of the continued efforts to bring the set of ASBH documents to "100 percent completion." Paradoxically, Wright condemned the "plan factory" that he had helped create for its insistence upon quantity at the expense of quality. He lamented that it was "the product of a raw commercial state, perhaps a necessary evil to be passed through as we pass through the dark before the day."[76] Nonetheless, speaking of their efforts to standardize and systematize the production of architecture, Richards proudly assessed the ASBH:

> It is my belief that our SYSTEM will make it possible for us to have our plans, working drawings, and specifications in such shape that they will make Dan Burnham's and Holabird & Roche's plan factory look like novices in comparison with ours.[77]

The ASBH embodied Wright's efforts to emulate previous successes in industry and manufacture through standardization, prefabrication, mass quantity, and sales techniques utilizing guarantees and promises of economy-of-sale.

CONCLUSION

Wright developed the art of building through extensive investigation, adaptation, and modification of vernacular and newly available building materials and methods. His adaptation of conventional balloon frame wood technology exemplified the means by which he systematized aspects of fabrication and construction and streamlined his own design practice to develop a methodology which could sustain experimentation and innovation. The systematized details for the ASBH precipitated Wright's development of a standard detail sheet to accompany his later Usonian house designs. Furthermore, they shortened the design development and contractual drawing stages of production, enabling the wide application of standard details consistent with intended compositional strategies. By standardizing component parts and detailed drawings, they also supported customization and experimentation in design, based on a kit-of-parts.

Frank Lloyd Wright's synthesis of architectural designs into component and compositional types enabled him to craft prototypical building elements, sponsor their translation into design permutations, and expedite their development into production types. His positivistic strategy towards innovation using vernacular materials and development of building technologies was sustained in his early practice at Oak Park through voluminous residential commissions. Instead of radical experimentation within the context of a single large-scale project, repetitive house commissions facilitated Wright's incremental approach to design innovation, distributing exploration, expenditure, and liability over a large spectrum of practice. For architects today, Wright's strategy offers an attainable model for design innovation within the realm of professional work.

NOTES

1. Frank Lloyd Wright, *An Autobiography* (New York: Duell, Sloan & Pearce, 1943), 224.

2. Wright, "The Architect," *The Brickbuilder* 9 (#6, June 1900): 24.

3. Wright, *Autobiography*, 9. Wright propagated the perception that his experimentative spirit began in the early days of his childhood: Wright and his boyhood friend Robie had a "real passion for invention," perpetually experimenting in their play. Wright, *Autobiography*, 35.

4. Dewey began a professorial appointment at the University of Chicago one year after Wright began his private practice in Oak Park. Dewey served as a trustee at the Hull House, where Wright became one of the members of the Chicago Arts and Crafts Society (1899). Although the extent of their personal contact remains undocumented, their involvement with the Hull House would have provided opportunities for acquaintance. Addams attributed to Dewey many Hull House programs, such as the lectures on the history of craft (Jane Addams, *Twenty Years at Hull House* [New York: New American Library, 1981], 172). Wright's aunts Jane and Nell were sympathetic to the progressive teachings of Dewey, and incorporated them into their work at the Hillside School.

5. Wright, "The Architect," 127.

6. Ayn Rand, *The Fountainhead* (Philadelphia: Blackiston, 1943); and John Dos Passos, *The Big Money* (Boston: Houghton Mifflin, 1933).

7. H. Allen Brooks, "Chicago Architecture: Its Debt to the Arts and Crafts," *Journal of the Society of Architectural Historians* 30 (#4, December 1971): 312-6.

8. In this progressive view of machines and crafts, Wright echoed ideas voiced by Oscar Lovell Triggs, who founded the Industrial Arts League of Chicago. Triggs, the literary critic and biographer of Walt Whitman,

> was dedicated to the idea that the more sophisticated the machine became, the more essential it was to have intelligently designed work for it to produce, and thus there was an ever increasing need to train skilled craftsmen to initiate and execute designs for machine production.

Ibid., 313. See also Oscar Lovell Triggs, *Chapters in the History of the Arts and Crafts Movement* (Chicago: 1902), 193.

9. Even so, Wright's ideal vision diverged from the reality of his own practice in Oak Park. The studio was conventionally operated, devoid of a socially progressive agenda, and had no profit-sharing among the assistants and apprentices. Despite these conditions, talented and enthusiastic young assistants were attracted to the office, primarily by the novelty of Wright's designs.

10. H. Allen Brooks, ed., *Writings on Wright* (Cambridge, MA: MIT Press, 1981), 128.

11. Wright, "In the Cause of Architecture III. The Meaning of Materials—Stone," *Architectural Record* 63 (April 1928): 172.

12. Wright, "In the Cause of Architecture: Standardization, the Soul of the Machine," *Architectural Record* 61 (June 1927): 136.

13. Wright, "In the Cause of Architecture V. The Meaning of Materials—the Kiln," *Architectural Record* 63 (June 1928): 193.

14. Wright, "The Art and Craft of the Machine" Hull House Lecture, 20 March 1901; "The New Larkin Administration Building," *Larkin Idea* VI (November 1906); "In the Cause of Architecture," *Architectural Record* 23 (March 1908): 155-221; *Ausgefuhrte Bauten und Entwurfe von Frank Lloyd Wright* (Berlin: Ernst Wasmuth A.G., 1910); "In the Cause of Architecture II," *Architectural Record* 35 (May 1914); *Experimenting with Human Lives* (Chicago: Ralph Fletcher Seymour, 1923); "In the Cause of Architecture I-V" *Architectural Record* 61-2 (May, June, August, October, November 1927); "In the Cause of Architecture VI-IX" *Architectural Record* 63-4 (January-December 1928); *Modern Architecture:: Being the Kahn Lectures for 1930* (Princeton: Princeton University Press, 1931).

15. Wright, "The Art and Craft of the Machine," 55.

16. Ibid., 66.

17. Wright, "Why Not Prefabrication?" lecture at the Crystal Ballroom of the Blackstone Hotel, Chicago, 22 January 1958.

18. Wright, "The Art and Craft of the Machine," 71.

19. Wright, "Standardization, the Soul of the Machine," 135.

20. Vincent J. Scully, Jr, *The Shingle Style and the Stick Style* (New Haven: Yale University Press, 1955), 164.

21. Scully, generally.

22. Wright, "The Cardboard Box," one of six lectures given at Princeton University, first printed in 1931 as *Modern Architecture: Being the Kahn Lectures for 1930* (Carbondale: Southern Illinois University, 1987), 73-5.

23. As Wright wrote,

> Every house worth considering as a work of art must have a grammar of its own. "Grammar," in this sense means the same thing in any construction—whether it be of words or of stone or wood. It is the shape relationship between the various elements that enter into the constitution of the thing. The "Grammar" of the house is its manifest articulation of all its parts. This will be the "speech" it uses. To be achieved, construction must be grammatical.

Wright, *The Natural House* (New York: Horizon Press, 1954), 181.

24. Charles White, Jr, letter to Walter Wilcox, 13 May 1904, reprinted in Brooks, ed., 86.

25. Wright, a Sunday morning chat on 13 August 1952, printed in "Breakthroughs: Prairie Houses, the Larkin Building," in *Frank Lloyd Wright: His Living Voice*, ed. Bruce Brooks Pfeiffer (Fresno: The Press at California State University, 1987), 27. Wright's views were shared by Hitchcock, who considered the Willits house "the first masterpiece among the Prairie houses" (Henry-Russell Hitchcock, *In the Nature of the Materials* [New York: Duell, Sloan & Pearce, 1942], fig. 73 commentary), and Scully, who valued it as a culmination and maturation of Wright's early house experiments (Scully, 159).

26. Scully, 164.

27. This member spacing of 16-inch multiples was derived from the standard 4-foot long wood laths:

> it is because all plasters' laths are cut or sawn to a standard length, viz: 4 feet long, and it is for the purpose of overlapping and breaking the joints on the lath that they are thus spaced.

Owen B. Maginnis, *How to Frame a House, or Balloon and Roof Framing* (New York: 1896), 8.

28. Richard C. MacCormac, "The Anatomy of Wright's Aesthetic," *Architectural Record* 143 (February 1968): 143-6.

29. Charles E. White, Jr, Letter to Walter Wilcox, 13 May 1904, reprinted in Brooks, ed., 86-7.

> Wright's greatest contribution to Architecture, I think, is his unit system of design. All his plans are composed of units grouped in a symmetrical and systematic way. The unit usually employed is the casement window unit of about these proportions. [Plan sketch, dimensioning a 2-foot, 8-inch window and 7-inch jamb.] These units are varied in size and number to suit each particular case, and the unit decided upon is consistently carried through every portion of the plan. His process in getting up a new design is the reverse of that usually employed. Most men outline the strictly utilitarian requirements, choose their style, and then mold the design along those lines, whereas Wright develops his unit first, then fits his design to the requirements as much as possible, or, rather, fits the requirements to the design.

30. As White wrote,

> It remains an elastic system with unifying limits and clearly defined axes of development so that compositions suggest their own elaboration. Once a design was "set moving" by Wright, all that his draftsmen had to do was carry it through to completion.

Quoted in Daniel van Zanten, "Schooling the Prairie School: Wright's Early Style as a Communicable System," in *The Nature of Frank Lloyd Wright*, ed. C. Bolon, R. Nelson, and L. Seidel (Cambridge, MA: MIT Press, 1988), 73.

31. Scully, 160. See also Werner Seligman, "Evolution of the Prairie House," in Robert McCarter and Kenneth Frampton, eds, *Frank Lloyd Wright: A Primer on Architectural Principles* (Princeton: Princeton Architectural Press, 1991), 59-98.

32. Wright, "A Home in a Prairie Town," *Ladies' Home Journal* (July 1901): 15.

33. Ibid., 15.

34. Wright's familiarity with steel construction dates back to his apprenticeship with Professor Conover, at the Engineering School of the University of Wisconsin, Madison. Conover introduced him to timber and iron or steel truss designs. His exposure to the steel Chicago frame occurred primarily during his years at Adler & Sullivan, whose commercial works were primarily steel structures.

35. In his first year of private practice, Wright incorporated steel in the Lake Monona Boathouse proposal (1893), designing a steel and wood roof truss from which the second floor wood framing was suspended with metal rods or chains. This suspended floor concept was first experimented with in Wright's own studio at Oak Park (1895). Although the design proved inadequate, it nevertheless reveals Wright's early facility at incorporating steel tensile structures with wood frame—five years before the Bradley house and seven years before the Willits house. As recent restoration of the Studio has shown, Wright relied excessively on undersized wooden roof rafters, resulting in severe deflection. See Thomas Fischer, "Redone Wright," *Progressive Architecture* 68 (November 1987): 132.

36. Annotation on the first floor plan of the Willits house, Frank Lloyd Wright Foundation Archive, drawing 0208.003.

37. Edward R. Ford has speculated that the suspended floor sequence was problematic because of the need to erect the roof before the second floor framing could be suspended as intended by Wright. However, a conventional balloon-framing sequence could be retained by temporarily supporting the second floor from the first during the framing of the roof, prior to the installation of the tensile rods that hang the second floor from the roof rafters. Edward R. Ford, *The Details of Modern Architecture* (Cambridge, MA: MIT Press, 1990), 181-3.

38. To accentuate solidity and mass, Wright furred out from the studs in a battered expression at the Bradley and Henderson houses (1901). At the Hills house (1900) and Waller stables (1901), the siding is furred out in two horizontal bands, articulating the location of the floors. At the Francis Little house (1902), the masonry cladding clearly presents itself as a veneer facing for the balloon frame.

39. Charles E. White, Jr, letter to Walter Wilcox, 19 May 1904.

> When he designs glass, ironworks, furniture, fixtures, etc., he first analyzes the type of his building, and designs in the

same spirit (no searching of books for stereotyped details).
Brooks, ed., 90.

40. William T. Comstock, *Modern Architectural Designs and Details* (New York: William T. Comstock Architectural Publishers, 1881).

41. Wright's inglenook designs were derived from those of Tudor houses, Norman Shaw's Queen Anne residences, and H. H. Richardson's domestic works. Edgar Kaufmann, Jr, "Precedent and Progress in the Work of Frank Lloyd Wright," *Journal of the Society of Architectural Historians* 39 (May 1980), 145-9.

42. Mark David Lynch, "The Ward Willits house by Frank Lloyd Wright," *Frank Lloyd Wright Newsletter* 2 (#3, 1979): 4.

43. Wright's masonry designs for other Prairie houses included the novel application of metallic coated glass onto the mortar bed face, which produced an unexpected glimmering in the horizontal joint lines contrasting with the flat brick bands. The effect inverted that of his typically shaded recessed bed-joints. Other variations included the application of lightly colored mortar beds, which heightened the horizontal expression of the bed joints.

44. Wright, *Modern Architecture*, 73.

45. Ibid., 73.

46. Wright, "A Small House with 'Lots of Room in It'," *Ladies' Home Journal* (July 1901): 15.

47. As first noted by Banham, Wright skillfully incorporated passive environmental design with an ability to integrate structure, cladding, and interior finishes with the heating, lighting, electrical, and plumbing units, producing one cohesive architectural expression. Reyner Banham, *The Architecture of the Well-tempered Environment* (London: The Architectural Press, 1969), 105-21.

48. The existence of the heating system behind the bookshelves and the multiple-tube indirect heating elements below the dining room floor was confirmed by John Eifler, the restoration architect for the Willits and Bradley houses, in a 1 November 1988 conversation with the author.

49. Wright, "The Meaning of Materials—Glass," *Architectural Record* 64 (July 1928): 202.

50. Wright's lecture to a group of Chicago businessmen in 1916. *The Western Architect* 24 (September 1916): 121-3.

51. Bruce Brooks Pfeiffer noted that Wright began work on the ASBH in 1911. Quoted by Shirley duFresne McArthur, *Frank Lloyd Wright—American System Built Homes in Milwaukee* (Milwaukee: North Point Historical Society, 1983), 13. The first reference to a contract between Richards and Wright involved an agreement between Wright and the Knickerbocker Mill and Lumber Company, dated 31 August 1915. It was later replaced by a contract between the Richards Company and Wright, prepared in November 1916, and signed on page 2 in June 1917.

52. These plans, sections, elevations, perspectives, and component details constitute the largest collection of drawings in Wright's *oeuvre*.

53. Wright, 1916 lecture to a group of Chicago businessmen, 121.

54. Unfortunately, only a sparse record of the design and construction process has been preserved.

55. See McArthur for an extensive biographical backgound of ASBH collaborators.

56. Ibid., 29. Richards managed the capitalization, organization of production, marketing, and sales through a franchising framework. He assumed the dominant role by vertically integrating the disparate phases of development and construction, and formulated the collaborative framework for the ASBH. He set up a series of corporations to implement such phases as real estate development, financing, construction material supply and manufacture, and management operations; and subcontracted out the design and construction phases.

57. Contractural agreement between the Richards Company and Wright (d. November 1916), 3. This agreement transferred a previous contract between Wright and Richards's Knickerbocker Mill and Lumber Company.

58. Ibid., 2.

59. Ibid., 3.

60. The ASBH financing plan required a minium first payment of 10 to 15 percent, followed by a monthly payment plan inclusive of the additional finance service charge.

61. The ASBH brochure listed manufacturers' prices for 28 house models by Wright. Models and costs were as follows:

A-4:	$1410.	D-1:	$2537.	J-401:	$3693.
A-106:	$1674.	D-101:	$1767.	J-521:	$7427.
A-243:	$1970.	FF-121:	$3610.	J-902:	$5729.
B-1:	$1825.	FF-153:	$3875.	J-101:	$2684.
B-6:	$2041.	F-303:	$4620.	J-102:	$2755.
B-11:	$2523.	F-403:	$4866.	J-103:	$2842.
B-23:	$2673.	M-202:	$2451.		
B-121:	$1610.	N-253:	$3436.		
C-3:	$1984.	N-343:	$360.		

J Low sun porch: $265.
J-2 Story flat roof: $532.
J-2 Story hip roof: $572.
C-3 (with dining room): $2059.
B-6 Sun porch: $260.

62. Robert S. Woodbury argued that Whitney's guns were not interchangeable. "The Legend of Eli Whitney and Interchangeable Parts," *Technology and Culture* 1 (1960). Merritt Roe Smith clarified the central role of the United States Ordnance Department in the development of interchangeable parts in American production of small arms. Referenced by David A. Hounshell, *From the American System to Mass*

Production 1800-1932 (Baltimore: Johns Hopkins University Press, 1984), 3.

63. Edgar Kaufmann, Jr, "'Form Became Feeling,' A New View of Froebel and Wright," *Journal of the Society of Architectural Historians* 40 (May 1981): 130-3.

64. McArthur, 6A.

65. Model types A4, B1, C3, J400, and J900 incorporate this standardized unit.

66. Frank Lloyd Wright, "The House of the Future." Text of a speech to the 25th Annual Convention of the National Association of Real Estate Boards, printed in *National Real Estate Journal* 33 (July 1932): 25-6. Reprinted in *Truth Against the World*, Patrick Meehan ed. (New York: Wiley, 1987), 124-9.

67. Antonin Raymond, *An Autobiography* (Vermont: Charles E. Tuttle Company, 1973), 48-51. Although Wright claimed that the ASBH was a system of construction different from the pre-cut systems offered by competitors such as Sears & Roebuck, he nevertheless conceived its building technology along similar lines. As his chief assistant Antonin Raymond recalled, "Wright visualized the component parts of the structure to be delivered on the job site, some pre-cut and some prefabricated."

68. The 2-inch deep stud orientation can also be seen in Hodgson's Portable Houses, whose fabrication began in 1892 in Dover, Massachusetts. The E. F. Hogson Company built modest-sized panelized wooden structures. Their 2 x 3-inch studs and 2 x 6-inch floor joists were spaced 12 inches on center, fabricated in 6-foot long panels, and erected to form room sizes of 12 or 18 feet. Wedge key bolts were installed to fasten the panel assemblies. See John Burchard, 2nd, "Survey of Efforts to Modernize Housing Structure," in Albert Farwell Bemis, *The Evolving House* 3 (Cambridge, MA: MIT Press, 1936), 440-2.

69. Art glass window designs documented in Frank Lloyd Wright manuscripts 1506.366-371.

70. The standardization of size was certainly common practice in the component designs offered in Sears's building materials selection.

71. "American Homes" (Chicago: American Home Building Company, undated), Frank Lloyd Wright Manuscript 1082.001, 4-5.

72. The Mastic Wall Board & Roofing Co., Cincinnati, Ohio. Advertised in *The Western Architect* 24 (September 1916): back cover page.

73. The chronology of Sears's supply of plaster boards remains inconclusive.

74. For descriptions and records documenting building permits and building inspection reports, see McArthur, 47-70. ASBH Cottage A was constructed at 1835 South Layton Boulevard, from 20 October 1915 to 5 July 1916; ASBH B-1 was constructed at 1714 West Burnham Street; four of ASBH Two Family Flats C were constructed at 2720-34 West Burnham Street, from 20 October 1915 to 5 July 1916. The ASBH Model J-521 was constructed in 1916-7, in two four-family units, for the Munkwitz Realty & Investment Company.

75. *The Milwaukee Journal*, 21 January 1917.

76. Wright's speech "The Architect," delivered on 8 June 1900 to the Second Annual Convention of the Architectural League of America. Reprinted in Meehan, ed., 33-45.

77. Arthur L. Richards's letter to Wright in Tokyo, 6 February 1917.

FIGURE CREDITS

2. *Ladies' Home Journal* (February 1901): 17.

3. *Ladies' Home Journal* (July 1901): 15.

4, 5. A. J. Bicknell, *Cottage and Constructive Architecture* (New York: A. J. Bicknell & Co., 1873), plate 65.

6. Courtesy of Tom Heinz.

7. Drawings by Murray Monroe.

8, 9. Drawings by author, sketched from originals in the Frank Lloyd Wright Archives.

10. Courtesy of the Chicago Historical Society.

20, 21. Drawings by author, sketched from originals in the Frank Lloyd Wright Archives.

All other images courtesy of the Frank Lloyd Wright Archives, Taliesin, Arizona.

Frontispiece. Living room of the Lake Léman House, and bedroom of the Villa Schwob, La Chaux-de-Fonds. Le Corbusier, 1925 and 1916.

SMALL CRAFT WARNINGS: THICKENING HORIZONS, HOLLOWING WALLS

Mary McAuliffe

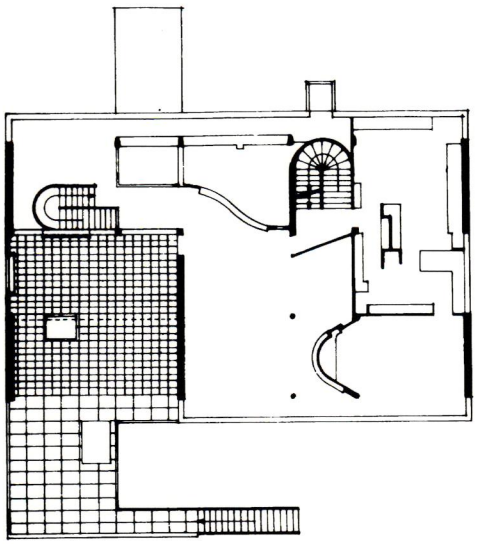
> What is true of manufacturing process is not also and automatically true of semiotic process, and only becomes true for the latter if the image is considered *solely* as a physical object artifact, a commodity; it is as though the Rosetta Stone were best approached through minerology, or the literary text through a systems-analysis of the printing works.
>
> —Norman Bryson,
> *Vision and Painting*

The reductive dangers of an exclusively formalist analysis of cultural artifacts are at least as great as those of the technical determinism described above. Yet our alternatives are often posed in just such contradictory terms: between the artifice of a hermetic system of signs, and the self-evident "naturalism" of productive processes.

In contemplating such a division, Bryson contrasts two semiotic models, one which emphasizes the sign as the foundation and producer of material practice, another which proposes the sign as the passive result of such practice.[1] It is within the legacy of historical materialism that he locates the division between a superstructure of cultural signification and a base of material production on which both semiotic models depend, and on which analysis of cultural artifacts is often impaled. Suggesting the need to "break the barrier between base and superstructure which in effect places the sign in exteriority to the material formation," Bryson ultimately proposes a materialist art history which activates and animates such a relationship, in the understanding of both the making and interpretation of artifacts as "the material transformation of signs."[2]

Within architectural theory, an analogous division between the act of signification and material practice may be found in the distinct emphases allocated by Vittorio Gregotti to the terms *composizione* and *progetto*.[3] *Composizione* ("from above") involves recognition of the *a priori* rules of an aesthetic canon, the specific artistic legacy of compositional procedures; *progetto* ("from below") involves recognition of the contingencies of production, material, and program. Recounting the evolutionary history of a "duplicity between the aesthetic character of the compositional norms, and the practical character of construction," Gregotti advances the suggestion that the aesthetic conventionalism of the *composizione* is most powerfully embodied in the elevational drawing, the material and constructional interests of the *progetto* in that of the section.[4]

The tenability of any conclusive opposition between the traditions of *composizione* and *progetto* is less interesting than the assignment of certain tendencies to specific forms of orthographic projection. The potential alliance of the section cut with construction processes is not a surprising one. The section drawing is at once the primary instrument of static force analysis, a method for the explanation and calculation of load behavior, and the central lever within the convention of construction documentation. Perhaps because of its recognizability in terms of gravity, the wall section is the principle origin of the construction fragment or detail. Whereas in plan the wall is cut at eye level, usually at the point of maximum openness, in section the wall is cut through its full height, revealing what is a darker and denser presence; whereas in elevation the wall is presented as a one-sided surface, in section the wall has a two-sided and po-



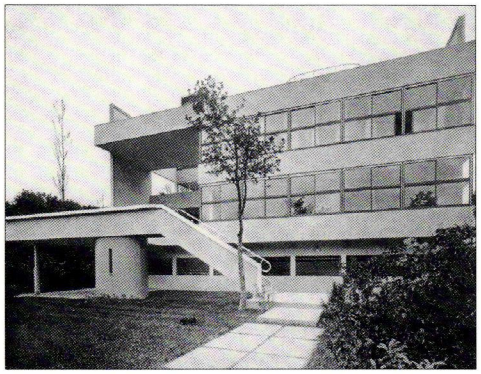


Fig. 1, 2. Piano nobile *plan and garden façade of the Villa Stein, Garches. Le Corbusier, 1928. Image selection and arrangement similar to those in the catalogue* The International Style. *Henry Russell Hitchcock and Philip Johnson, 1932.*

tentially complex interior condition. The section seems to face us with the weight of the wall.[5]

While verbal proclamations echoing the escalating materialist alliances of the *progetto* are not difficult to find within the documentation of early twentieth century architecture, specific graphic corroboration in the form of a prominence granted to section is rarer. The iconic presentation of modern architecture tends to occur primarily in plan and elevation.

For example, in their famous catalogue, Henry Russell Hitchcock and Philip Johnson confine the representation of examples of the International Style to plan drawings and exterior photographs (fig. 1, 2). In the plans, the dominant identity of the wall's thickness resides in either the single line transparency of the window pane, or the attenuated profile of the interior partition; in the photographs, the wall is presented as a continuous and flat exterior surface.

In the accompanying text, Hitchcock and Johnson describe an architecture of thin planes, in which the effects of mass and solidity have been replaced by those of volume. The subordinate structural role of the wall as a curtain or screen, which prompts corresponding questions of the window, is taken up in part by the term "window-wall." More than simple transparency, the term alludes to the prospect of a fluctuating relationship between architectural elements, in which both window and wall maintain the "continuity of surface."[6] The need to preserve the "integrity of the wall plane" reinscribes the traditional punched window opening:

> Today the general consistency of the design and the sense of continuous surface is emphasized by reducing the contest between the transparent and opaque sections of the boundary walls. Windows should be independent in character, but not a breach in the general coherence of surface.[7]

This elevational interest in the "coherence of surface" and in the ambiguity between two- and three-dimensional effects leads to the near automatic coupling of "wall" and "plane" in many accounts of modern architecture. For example, in the index of *Space, Time, and Architecture*, Sigfried Giedion lists seven entries under the heading "wall as plane surface;" and, in the text of the same work, he interprets the Pazzi Chapel's delicate screen walls to presage the contemporary attenuation of the wall, which, "taken simply as a surface, will soon be the subject of important architectural innovations."[8]

For such authors, the wall seems to act as a source of simultaneous fascination and threat: fascination because of new opportunities for the articulation of surface, and threat as a potential indication of mass. The dematerialization of the wall is therefore an objective to which both artistic autonomy and material inevitability (in the guise of structural efficiency) can subscribe, and it is achieved through a "double movement" of taut planarity in elevation and diaphanous enclosure in plan. Within this arena, it becomes possible to understand the neglect of the section as a deliberate marginalization of the question of mass. Given the prominence granted to the opposition between plan and elevation, it becomes possible to see in the section an unexplored—and strategic—third point of view.

Precisely because of the exhaustive commentary on the window-walls of Le Corbusier, any retrieval of the possibilities of the wall section as one indicator of wall-making might begin with his work. His insistent and fertile self-legislation, which both enlightens and obscures, makes few references to the conventions of section, perhaps due to its motivation in a rhetorical inversion of Beaux-Arts orthodoxy. The Five Points, for example, make explicit mention of the importance of the conventions of *plan libre* and *façade libre* to a new architecture, but implicate the section only indirectly, through the initial gravitational move from ground level *pilotis* to *jardin à toit*.

This investigation of Le Corbusier's walls will proceed from a review of influential critical writings on the vertical surfaces of the early villas to a particular focus on the section, which may then call into question certain persistent periodizations between "early" and "late" work, and permit us to begin to see a more continuous project of wall-making than is often assumed within the architecture of Le Corbusier.

FAÇADE LIBRE: THE WINDOW-WALL AS PLANE(S)

> What does it mean for the subject that there are no more casement windows to open, but only sliding frames to shove, no gentle latches but turnable handles, no forecourt, no doorstep before the street, no wall around the garden?
>
> —Theodore Adorno,
> *Minima Moralia*

A continuous preoccupation with the conventions of plan and elevation in the early villas of Le Corbusier may be found in the writings of Colin Rowe, who characterizes the work as an interplay of two structural types, the Dom-ino (a "sandwich" of horizontal layers) and the Citrohan (a "megaron" of vertical layers). In "Transparency: Literal and Phenomenal,"[9] an essay written with Robert Slutzky, Rowe introduces the term "phenomenal transparency" (drawn from gestalt theory, and in reference to Cubist painting), meaning "the co-existence of optical phenomena that interpenetrate without optical destruction of each other."[10] Such a "clearly ambiguous" overlap of figures, an "inherent quality of organization," makes possible the reading of a "virtual object."[11] Rowe and Slutzky offer as demonstration an analysis of the garden face of the Villa Stein at Garches, and in it discover a series of planar layers:

> By the introduction of a wall surface almost equal in height to that of his glazing divisions, Le Corbusier stiffens his glass plane and provides it with an overall surface tension...At Garches, one may enjoy the illusion that *possibly* the framing of the windows passes behind the wall surface...At Garches, the ground floor is conceived of as a vertical surface traversed by a range of horizontal windows...At Garches, the recessed surface of the ground floor is redefined upon the roof by the two free-standing walls which terminate the terrace: and the same statement of depth is taken up by the glazed doors in the side walls, which act as conclusions to the fenestration. In these ways, Le Corbusier proposes the idea that, immediately behind his glazing, there lies a narrow slot of space travelling parallel to it, and, of course, in consequence of this, he implies a further idea—that bounding this slot of space, and behind it, there lies a plane of which the ground floor, the free-standing walls, and the inner reveals of the doors all form a part; and, although this plane may be dismissed as very obviously a conceptual convenience rather than a physical fact, its obtrusive presence is undeniable ...And obviously, these two planes are not all, since a third and equally distinct parallel surface is both introduced and implied. It defines the rear wall of the terrace, and is further reiterated by other parallel dimensions: the parapets of the garden stairs, the terrace, the second-floor balcony.[12]

This description offers a powerful and emphatic reading of the building's vertical planes, which are later compared to knives slicing space. It is stated that "one might say that Le Corbusier is primarily occupied with the planar qualities of glass," more than its transparency, and that[13]

> the implication of all is that of a vertical layer-like stratification of the interior space of the building, of a succession of laterally extended surfaces traveling one behind the other...In itself, each of these planes is incomplete or even fragmentary: yet it is in reference to these parallel planes as points of reference that the façade is organized.[14]

The villa is presented as an ambiguous object constituted by overlapping vertical strata. The viewer's position is deliberately frontal, strategically centered on the façade as the locus of architectural artifice.

The position might be charactacterized as resolutely in the interests of the *composizione*, reasserting the presence of the boundary as composed, in the face of any "naturalized" interior determination of exterior form.

Such insights are overtaken by the structuring of the argument around a comparison between Le Corbusier's Villa Stein, on the one hand, and Gropius's Bauhaus building, on the other. The parallel and analogous allegiance to the "School of Paris" over that of the Bauhaus belies a strategic context confirmed by Robert Slutzky in a more recent essay, which describes a Bauhaus pedagogy centered on craft, "where technique prevails over content," and which would advocate a literal rather than a phenomenal transparency:[15]

> ...these...cerebral refinements...are scarcely so conspicuous at the Bauhaus; indeed, they are attributes of which an aesthetic of materials is apt to be impatient.[16]

The construction and maintenance of the "straw target" of literal transparency relates to the accompanying insistence on divisions between substance and organization, literality and phenomenality, actuality and virtuality, artifice and technique, etc. Descriptions of the planes' multiple, fluctuating, "incomplete," and "fragmentary" identities are overtaken by the didactic dualism of the demonstration. Discussing the innermost plane, for example, Rowe emphasizes its virtual nature, distinguishing between "the physical plane of glass and concrete and this imaginary (though scarcely less real) plane that lies behind it."[17] Multiple ambiguities thus congeal into the opposition of a literal obdurate object and an intellectually respectable "virtual" object of reading hovering behind it. "Material" is here allied with the materialist determinism alluded to earlier, and provokes an equally exclusive response in the guise of the "virtual object" of reading. Such static and insistent distinctions animate the title of the essay, and linger powerfully long after the subtlety and elegance of argumentation fade.

If Rowe and Slutzky's analysis tends to suspend the narrative possibilities of doors, windows, and other architectural elements in order to more effectively isolate the optical effects of the façade, another line of criticism foregrounds the interior presence of the *fenêtre en longeur* as an instrument of vision, exemplified by a series of essays by Bruno Reichlin.[18] Like Rowe, Reichlin asserts the presence of the façade and its challenge to crude structural determinism. In "The Single Family Dwelling at the Weissenhof," he points to the relationship between the 2.5 x 1-meter dimension of the window element and that of the 5-meter column grid, assigning to the window a determining, or "structural," role as a construction module. He goes on to explore the ambiguous function of the window element as both a subordinator of the *plan libre*, and, through transparency, an indicator of its presence.[19]

In "The Pros and Cons of the Horizontal Window," Reichlin describes the challenge presented by the horizontal window to perspectival perception. Echoing Rosalind Krauss's observation that "behind every twentieth century grid there lies...a symbolist window parading in the guise of a treatise on optics,"[20] he traces the history of the "figure of window itself as a medium of two-dimensional pictorial architecture."[21] By virtue of its panoramic qualities, the *fenêtre en longeur* "breaks through the cone of vision on both sides, and thus disappears out of the observer's field of view."[22] Furthermore, the elimination of the foreground and sky from view augments the truncation of the depth of field on which the "illusion" of the perspectival "peep-show" depends:

> The landscape is there in all its immediacy, as if it were sticking to the window, either because the effect of detachment and reassurance is eliminated or because the transition between familiar objects close at hand and farther away remains concealed to view so that our perception of spatial depth is significantly diminished.[23]

In another recent series of articles, this estrangement of the horizontal view has been linked by Beatriz Colomina to the "outward gaze of domination" of a subject thrown to the periphery of the house: "the site is a vertical plane, that of vision... property has moved from the horizontal to the vertical plane."[24] This telescoping of depth perception is linked to the new space of photography and cinema, in a move from the humanist eye to the camera angle. The house itself is identified as a camera, a mechanism of cinematic vision and framing.

> The window in the age of mass communication provides us with one more flat image. The window is a screen... this screen undermines the wall...a dematerialization of wall following from the emerging media.[25]

Within the cumulative insights offered by attention to the vertical surface summarized above, there emerges a tendency to

immobilize the eye. If a frontal viewpoint is explicitly stated by Rowe and Slutzky, it permeates the others' arguments, despite references to the mobility of the eye and the *promenade architecturale*. The perceived challenge to perspectival depth afforded by the *fenêtre en longeur* tends to position the viewer frontally, arresting the eye and reinforcing, paradoxically, in the description of its effects the very attributes of the "perspectival illusion" under scrutiny. If the eye moves in these accounts, it is from side to side in an immobile body.

CASIER-MUR: THE WALL AS VESSEL

> *casier*: (Fr.) cabinet, rack, card or music stand, ledger, rack, a set of pigeonholes; *casier à homards*: lobster pot; *casier judiciare*: file, police record.
>
> ...we *organize our affairs*, and having won our freedom, we think about something—about art, for example, for it is very comforting.
>
> —Le Corbusier,
> *L'Art décoratif d'aujourd'hui*

In "The Undertaking of Furniture," the last of a series of illustrated lectures given in Buenos Aires in 1929 and later published as *Précisions*, Le Corbusier summarizes his ideas regarding the furnishing of the modern dwelling.[26] As in earlier pronouncements, he advocates the streamlining and standardization of domesticity, an imperative which had led to the replacement of the terms "furniture" and "decorative art" by "equipment" and "beautiful tools," with their connotations of precision, exactitude, and logical classification. He goes on, however, to specify the two types of equipment which will satisfy the needs of the modern house: freestanding objects for eating, sitting, and sleeping; and built-in storage cabinets, or *casiers* ("in addition to seats and tables, furniture is mainly cabinets.").[27]

The storage proposition arises in the context of an interest mass-produced office furniture, extensively illustrated in *The Decorative Art of Today* (1925) (fig. 3, 4). Although such cabinets may be bought by the house owner from a commercial catalogue, Le Corbusier strongly suggests the incorporation of the *casier* by the architect into the construction of the house, offering the following demonstration of the built-in storage unit:

> The reduction of furniture to the state of cabinets making up the wall itself can also be obtained by rudimentary methods of reinforced concrete construction.
>
> I draw the ceiling and the floor of one story: I divide the height in four, for example, by means of three slabs of reinforced concrete, several centimeters thick, going from one wall to the other or stopping halfway. I close one side or the other of my shelves with masonry, depending on needs. A small "U" shaped track above and below each shelf takes sliding doors of sheet metal, in aluminium, in plate glass, in wood, or in marble...Here you have the magnificent closet partitions into which the [interior equipment] described above will be placed.[28]

This description of the *casier-mur* is accompanied by section and elevation drawings (fig. 5). The section shows the organization of the wall around a series of aggressively drawn shelves ranging between 15, 20, and 30 inches in depth. As

Fig. 3. Example of office furniture by Roneo, from The Decorative Art of Today. *Le Corbusier, 1925.*

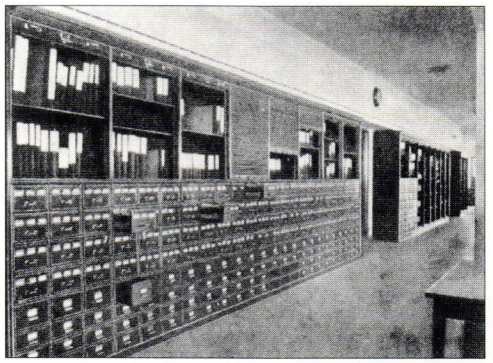


Fig. 4. Example of office furniture by Ormo Steel, from The Decorative Art of Today.

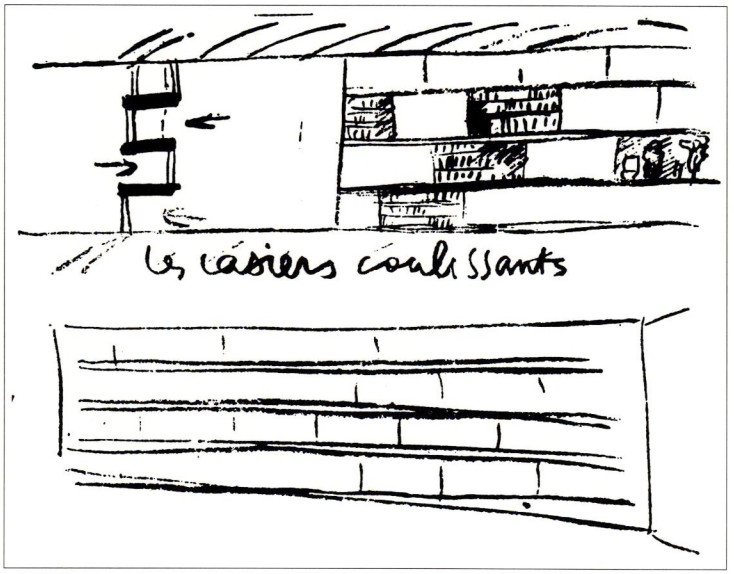


Fig. 5. Section and elevations of a casier-mur, *from* Précisions. *Le Corbusier, 1929.*

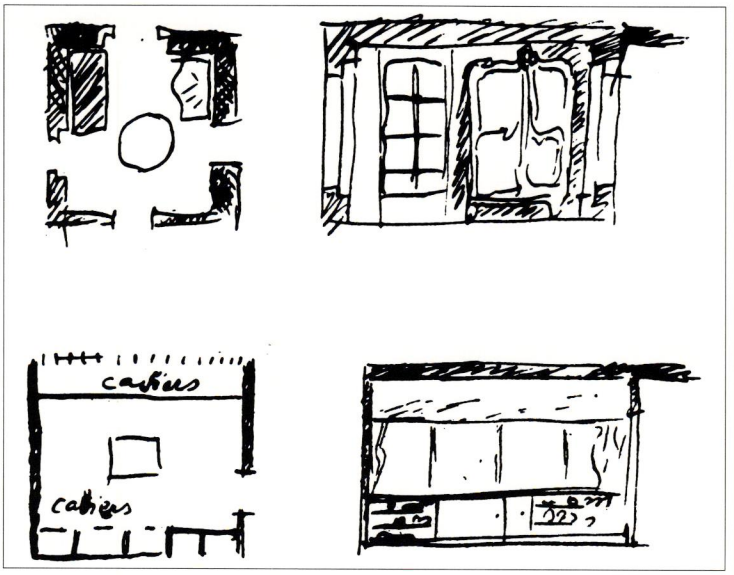


Fig. 6. Comparision between traditional and modern bedrooms, from Précisions.

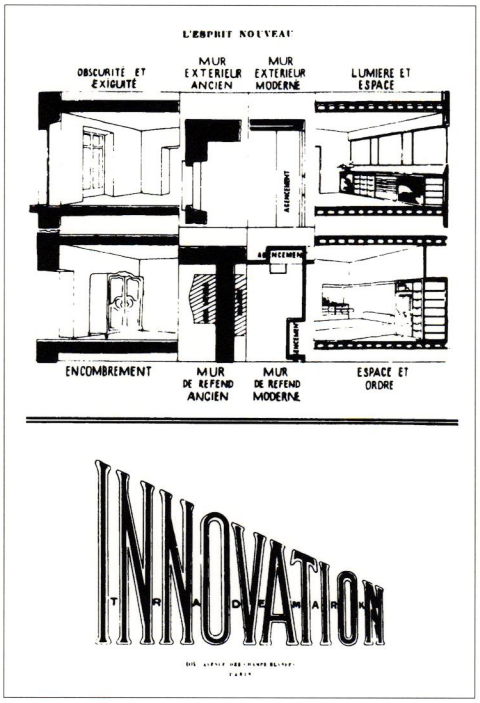


Fig. 7. Innovation *advertisement, from* Esprit Nouveau.

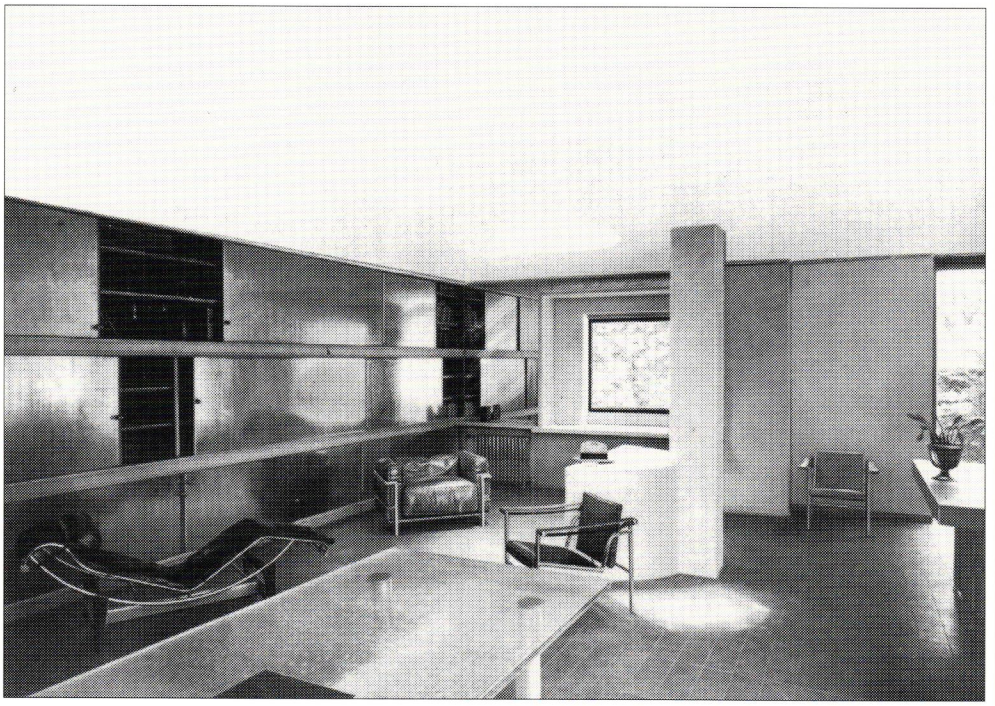


Fig. 8. Library of the Maison Church, Avray. Le Corbusier, 1928.

indicated by the arrows running through the spaces between the shelves, the *casier-mur* acts as a filter between the spaces on either side, belonging to both and neither. The interlock of adjacent territories is described in the placement of masonry planes inset between the concrete slabs. While the concrete planes provide a horizontal datum and structure the depth of the wall's armature, the masonry planes establish its apparent depth, orientation, and address.

The mobile vertical planes which serve as cabinet doors are made of precious materials, and slide in grooves against the edge of the shelves in order to maintain the efficient circulation paths and rapid movement necessary for the modern house. Elevation drawings show these doors in a staggered pattern reminiscent of masonry trabeation. The doors alternate between open and closed positions, between the exhibition of interior equipment and its concealment:

> ...blinds go up and down, screens slide. Behind them compartments appear, suited to what they are to contain... Every object is stored as in a jewel case; some equipment comes forward on ballbearings, your clothing is spread before your eyes...[29]

This account of display reminds us of the dual role of the *casier-mur*, as both a piece of equipment in itself and as a means of concealing and revealing other smaller pieces of equipment. The latter role derives from Le Corbusier's criticism of the clutter provoked by the modest dimensions of the bourgeois house.

> ...we make houses into museums or temples filled with votive offerings, turning our minds into...concierge or custodian...we try to camouflage accumulation...We set up the cult of the souvenir...[30]
>
> ...big pieces of furniture, understandable at the time of castles, or in the rooms of country houses, are a disaster in the modern dwelling.[31]

The incorporation of the cabinet into the wall will further effect efficiency by extending the architect's control to the interior: the cabinet wall will now be made without the cabinet maker.

> And thus, there is no more cabinetmaker's furniture in the house! I am so sorry to think of all these good craftsmen, but I think one should adapt oneself to the new conditions of modern life.[32]

Fully realized constructions of such walls may be seen in the Centroysus Center offices, Villa Church, Pavilion d'Esprit Nouveau, and Bestegui Apartment (fig. 8). The principle of the *casier-mur*, however, may be applied more generally to Le Corbusier's contemporaneous construction of interior and exterior walls. In the same essay in *Précisions*, for example, he illustrates the traditional bedroom, with its heavy, freestanding armoire placed adjacent to a punched window opening, contrasting this arrangement with the efficient modern one below, in which the *casier-mur* not only serves as an interior partition, but is also incorporated with the horizontal window into an exterior wall (fig. 6). The relationship between horizontal window and sliding cabinet doors in the lower drawing parallels that of the casement window and wardrobe doors in the one above.

> We have learnt that in the context of the rigorous order demanded by business, it is necessary to have a file on the filing system itself.[33]

While the *casier* proposition is formalized with great material specificity in a crayon drawing of 1929, and added as a "sixth point" of the new architecture in the accompanying lecture, Le Corbusier's preoccupation with domestic storage is far from novel at this time.[34] The issue had concerned designers of the bourgeois interior since the middle of the nineteenth century, and had informed the work of Mackintosh and Loos, among others, and Le Corbusier's earliest villas (frontispiece). Several years before the *Précisions* lectures, an advertisement in *Esprit Nouveau* for the trunk company *Innovation* promoted the conjunction of the storage wall and exterior envelope, drawing the window into a thick storage proposition in which the depth of the traditional wall is hollowed out and filled with shelves (fig. 7). The *casier-mur* may thus be seen as an adaptation of the masonry tradition of *poché* to serve the needs of the modern house. While many critics have remarked on Le Corbusier's transformation of *poché* in plan, the framed construction of the cabinets demonstrates the viability of such observations in section.[35]

The absorption of domestic objects into the depth of the *casier-mur* foregrounds its ambiguity and permeability as a constructive weave of horizontal and vertical surfaces. Its cabinetry embraces the possibility of its own interiority, its potential as vessel. As a container of domestic equipment, the *casier-mur* is a mechanism of concealment and display, a suitcase for the souvenirs of the modern tourist, and a museum for the compulsive but furtive collector.

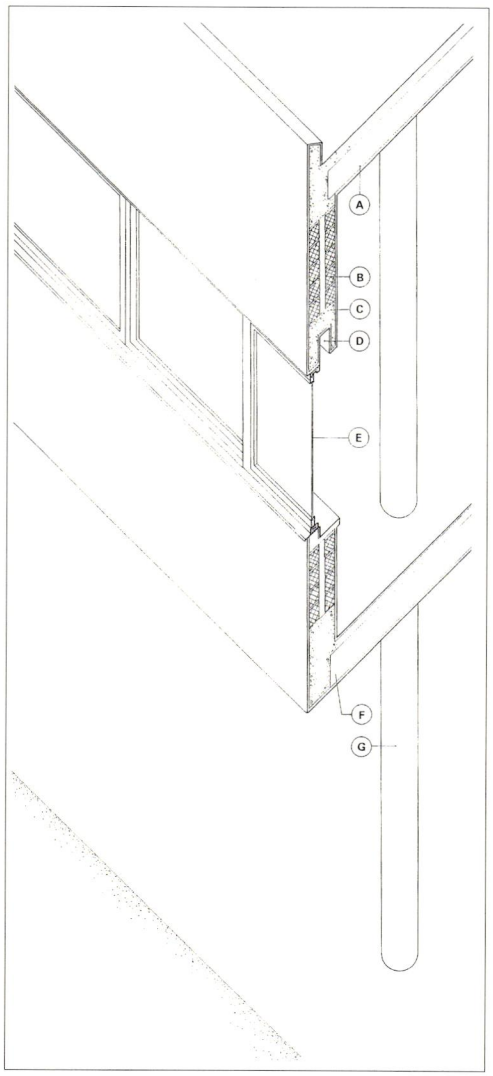


Fig. 9. Wall section of the Villa Savoie, Poissy. Le Corbusier, 1930.

FENETRE EN LONGEUR: THE SILL-SHELF

Rayon: (Fr.) shelf, department of shop, department; line, ray, beam, gleam, radius, furrow, zone.
Rayonnant: (Fr.) radiant.

Je dessin un rayon avec des chaussures, un rayon avec des chapeaux.
[I draw a shelf with shoes, and a shelf with hats.]
...Mr Vignola is not concerned with windows, but "between windows." I de-Vignolize with my "architecture is lighted floors."

—Le Corbusier,
Précisions

The development of any enquiry into Le Corbusier's wall-making must acknowledge the illustrations and insights offered by Edward Ford in his recent book *The Details of Modern Architecture* (fig. 9). In a chapter devoted to the construction of the early villas, Ford is initially troubled by the seeming contradiction between the sliding window element, with its necessarily biplanar depth, and the polemical requirement of a taut exterior surface. His subsequent examination of the interior, however, reveals that the wall may also be understood as an aggregation of layered planes, rather than as a single flat surface.[36] Ford situates this reading in the context of Le Corbusier's experience with masonry cavity wall construction, and relates it to the prefabricated laminated wall systems of the Monol and Loucher houses. Although he would characterize the walls of the Villa Stein or Savoie as "monolithic" in their constructional and weathering behavior (and, accordingly, excludes them from the book's conclusion regarding the preferability of layered assemblies for twentieth century construction), Ford's analysis rests on an apparent profusion of vertical surfaces. Acknowledging Colin Rowe's analysis of the layered peripheral spatiality of the villas, Ford concludes that "Le Corbusier's detailing systems...reproduced on a small scale the organizational ideas of the buildings themselves,"[37] and, as a series of planes, "the wall thus becomes an analogue or subsystem of the building itself."[38] While using a different *modus operandi* and set of objectives, Ford ultimately extends Rowe and Slutzky's trajectory of analysis into the microcosm of the detail. Although multiplied and subdivided, the primacy of the vertical plane persists.

As Le Corbusier constructs the *casier-mur* in drawing, a parallel description of the construction sequence of the early villas' perimeter walls may here prove instructive (fig. 10, 11). Following the casting of the main structural frame, the concrete trades are kept on-site to form the lintel and sill of the *fenêtre en longeur*. Running the entire length of each façade, these two concrete beams act as armature for the patented wood-framed sliding windows; masonry infill between the concrete subframe and the main floors completes the profile of the wall. Despite the optimism evinced by the sketch of the *casier-mur* regarding reinforced concrete's effectiveness as a slender beam in carrying its own weight over the long spans suggested, the reinforced concrete sill is propped by the masonry blocks below; likewise, the reinforced concrete head is suspended by reinforced concrete hangers formed into the hollows of the masonry blockwork above.

Despite an obviously secondary interest in the size and type of masonry units employed, the profiles of both the head and sill are formed with great consistency. In many section drawings, these horizontal "shelves" are rendered, together with the other concrete elements, in black. The bifurcated head, a double beam holding the double masonry layer above (whether of hollow block or cavity wall construction), houses the curtain track in its channel. The sill is formed as an "L" shaped seat ranging in width from 6 to 10 inches, positioned approximately 28 inches above floor level. Whereas the masonry and concrete elements act as a structural composite, the order of construction sequence described may be seen to reinforce the didacticism of Le Corbusier's rhetorical displacement and inversion of the window-wall elements.

In the essay "A Single Trade," Le Corbusier describes "mass-produced doors and windows being put in place just like bricks," which would seem to agree with the case made by Reichlin for the "structurality" of the window element (we must assume here that the analogy with masonry refers to its modularity, not the act of trabeation).[39] The prototypical window module comprises both the off-site fabrication of horizontal window frames and the on-site customization of the concrete head and sill armatures into which they are set, and which adjudicate the space between the standardized dimension of the window and the circumstances of masonry construction. While Reichlin cautions us against the conflation of "structurality" with that which is built first, within the context of window wall construction, it could be argued that the priority granted to the "window-brick" assumes a temporal as well as dimensional aspect.[40]

While the construction of the window before the wall challenges its hole-in-the-wall status, Le Corbusier's displacement of the wall is also effected by the main concrete frame itself. Here, the structural roles of wall and floor in traditional masonry practice are reversed: "the ribbons of the wall that make up the sill and eventually the lintels, *these ribbons are carried on the floors!* [italics original]"[41] The implicit affinity between the wall-supporting floor slabs and the "mini-floors" of sill and lintel challenges any simple isolation of the wall as a subordinate partition to the concrete structural frame. Within Rowe's terminology, Le Corbusier's window-walls may be seen as a site of intersection between "sandwich" and "megaron," not as the triumph of the latter's vertical surfaces.

Of course, such an account of construction, reliant on section drawings and construction photographs, risks alliance with material determinism unless it accounts for the ultimate perception of the wall. Any extended description of constructive activity must include the deposition of surfaces (often characterized as mechanisms of erasure) with which the *impasto* of construction concludes. The completed exteriors of the villas, covered with the "limelight" of white-painted stucco, show little evidence of the lineaments described above: the continuous white plane of each façade focuses the eye on the figure and dimension of the sliding wooden window frame elements, which are set as closely as possible to its surface. The finished interiors, however, also covered in white-painted plaster, present another aspect. The grooved lintel merges in profile with

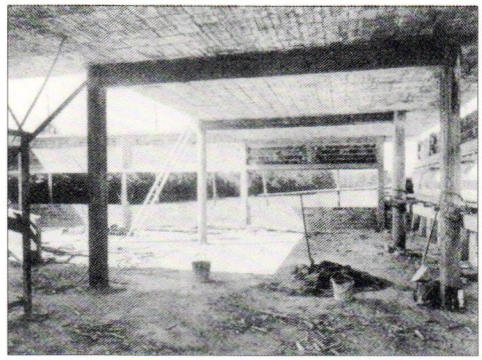


Fig. 10. Construction of the living room of the Villa Savoie, Poissy. Note infill masonry wall in progress at far right.

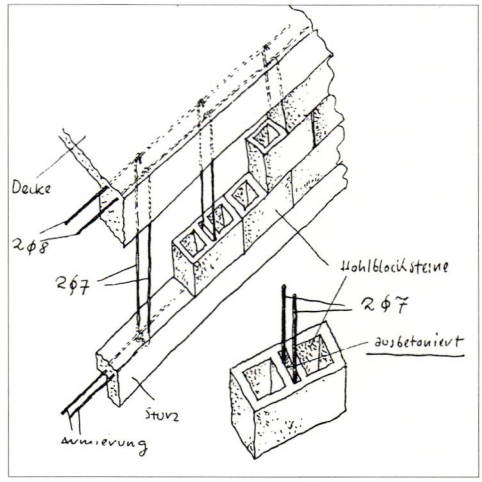


Fig. 11. Suspended lintel with reinforced concrete hangers, detail of Weissenhofseidlung construction. Le Corbusier, 1927.

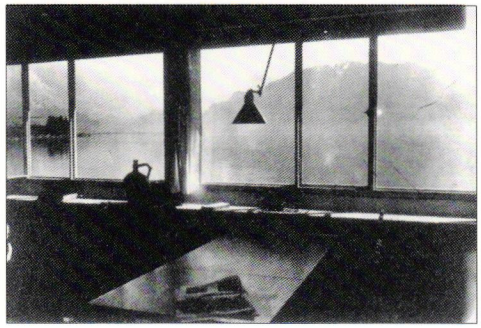


Fig. 12. Window of the Lake Léman House, from the Oeuvre Complète.

Fig. 13. Window of the Lake Léman House.

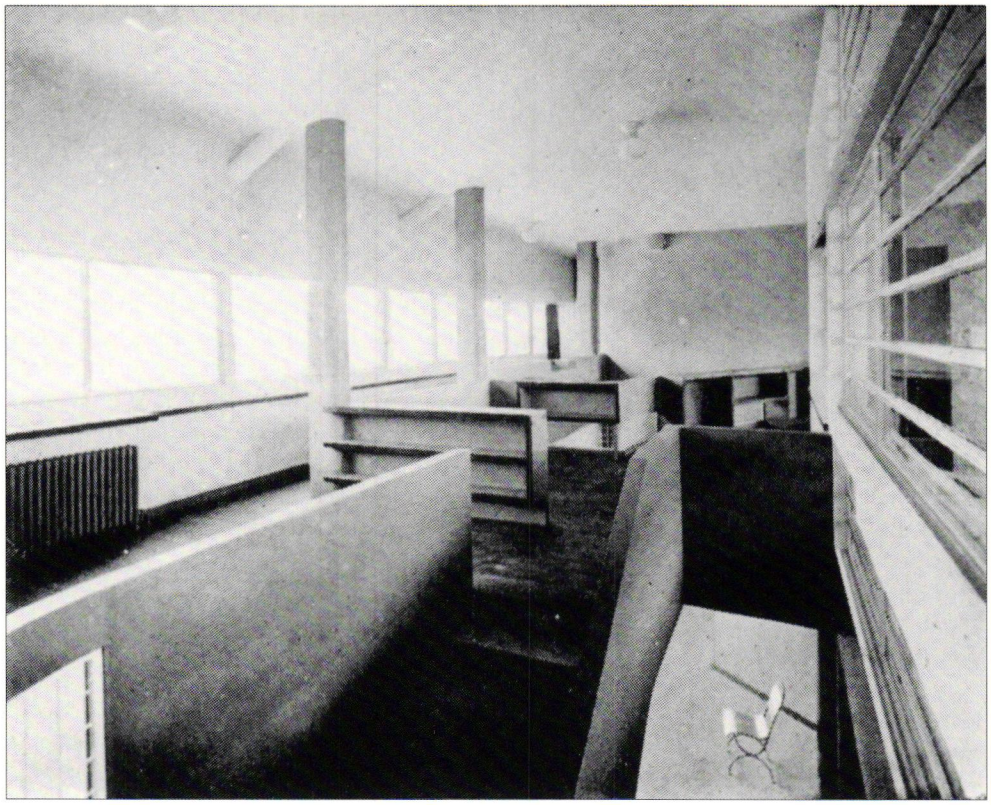


Fig. 14. Library of the Villa Stein, Garches.

the surface of the upper wall, thus allowing, as Ford has pointed out, the reading of a double wall plane. The sill-shelf, on the other hand, loses its "L" shaped concrete profile; its vertical surface, painted white, merges with the outermost of the upper wall-planes. While white paint registers the vertical surface on the interior wall, it presents an ambiguous, multiple reading, for the precise position or continuity of the wall-plane is difficult to establish. Darker paint covers the horizontal of the sill and accentuates its disengagement from the vertical surfaces of the wall. The *casier-mur*, in its concatenated, folded window-wall variation, recognizes the presence of the sill.

The banality of this observation is offset by what might be called "the embarrassment of the sill," evident in accounts of the horizontal window's internal challenge to perspectival vision. As the "planing" of the window extends itself across the surface of the interior wall, the sill seems to undergo not merely a slippage from the aperture of the window, but a complete disappearance. For example, in the aforementioned article, Reichlin offers a photograph taken by Le Corbusier of the house on Lake Léman, asserting that "everything that forms part of the solid structure of the building merges into an obscure and indistinct background against which, from one side to the other, there stands out the euphoric picture of 'one of the world's most beautiful panoramas'" (fig. 12, 13).[42] This conclusion seems to be contradicted by the photograph concerned, which records the incident light on the surface of the sill, in addition to the subtle reflected light on the bisected window head above. Reichlin goes on to contrast the effect of the *fenêtre en longeur* with the perspectival "peep-show" produced by the deep embrasures and frame of the traditional window.[43] "In dispensing with the sill," he claims, the horizontal window "removes its own limits."[44] In such observations, the presence of the sill and head, together with the vases, books, and lamps which they support or enframe, evaporates.

Beatriz Colomina describes the same house as "no more than a series of views choreographed by the visitor, the way a filmmaker effects the montage of a film."[45] From her consequent characterization of the window as a screen "issues the insistence on eliminating every protruding element, de-Vignolizing the window, suppressing the sill."[46] Le Corbusier's "de-Vignolizing," his concern with windows, not "between" windows, while challenging traditional perceptions of the window aperture, does not seem to presuppose the complete truncation of its framed depth presented in these descriptions.

The standard width of the sill-shelf accommodates domestic artifacts and acts as a continuous datum connecting window-walls and interior partitions (fig. 14). Visible in sections and interior elevations as a strong horizontal line, its presence in plan is denoted by a white strip inside most of the perimeter walls. Running near continuously around all vertical surfaces, this reincarnated dado-shelf subverts the spatial integrity of the rooms and insinuates new collusions between the activities of the house, recalling the affinities remarked on between the table of the Cubist still life and the work of Le Corbusier.[47] Distinguished by a paint color similar to that of the baseboard and heating system, the sill-shelf projects slightly over the planar radiators, marking their presence while incorporating them into the shadowy hollow of the wall under the window. While occasionally the sill swells out to form a work surface, such as a kitchen counter, only outside does it offer a dining surface, for, within the architect's legislation, interior dining tables are to be purchased by the owner of the house. In the Villa Stein, the window sill-shelf becomes the top of the library bookcase; in the Villa Savoie, its passage through the bathroom, kitchen, and living room transforms its identity respectively from cabinet top, to worktop, to chimney mantle (fig. 14).

Combined with the *casier*, the window-wall becomes at once "an expression of concrete structure, an interior solution...and a storage wall."[48] This configuration may be understood in relation to Cubist painting, which, according to Bryson, "relies on the forms of still life to provide stable, legible anchor points for the fragmented planes and spatial torsions it cultivates."[49] The *casier* window-wall is bottom heavy, its sill providing ballast against the vertiginous effects of the panorama. Within the recesses of its storage capacity, one can identify an estrangement which concentrates less emphatically on the truncation of perceptual depth, revolving more around the ambiguous "solidification" of the window as the "light-brick" around which the wall is made.

FENETRE EN LONGEUR: THE PRESENCE OF THE JAMB

Jamb: (Fr.) sides of an aperture, connecting two sides of wall.
Embrasure: (Fr.) enlargement or splay of the aperture of a door or window, generally within the side of the wall, for the admission of a greater quantity of light.

... A room lit by a horizontal window, which touches both side walls (that is the whole point: the refraction of light waves...)

—Le Corbusier,
Précisions

It is important to distinguish the panorama offered by the *fenêtre en longeur* from that afforded by the painted panorama of Paris exhibited in the Pavilion de l'Esprit Nouveau, in which the outer edges are hidden from view, and a handrail designates the optimal viewing condition sustaining the illusion. In Le Corbusier's early villas, the lateral layer of space which sustains the disjuncture between the horizontal window and the internal divisions of the house, and which maintains the ambiguities of its frontal view, is, of course, an avenue of movement. These attenuated slots, a product of "the fact of extending the floor of the building in relation to the columns in the manner of a balcony surrounding the building," present a complex condition of occupiable space, not merely a rhetorical void between the devices of *plan libre* and *façade libre*.[50] In describing the movement patterns therein, Rosalind Krauss has observed "the snake-like deployment of balconies over and around spaces,"[51] which, she argues, display an insistence that "any comprehension of even simple geometries must be the product of motion around and through them."[52] To this lateral movement, which the sliding of the horizontal window both facilitates and mechanically reenacts, Krauss attributes the term "walking on the walls."[53] This activity occupies a space which both sustains the proscenic frame of the frontal view and provides the mechanism which reweaves and undermines its effects. When one turns parallel to the wall to walk its length, the light-sill becomes a handrail.

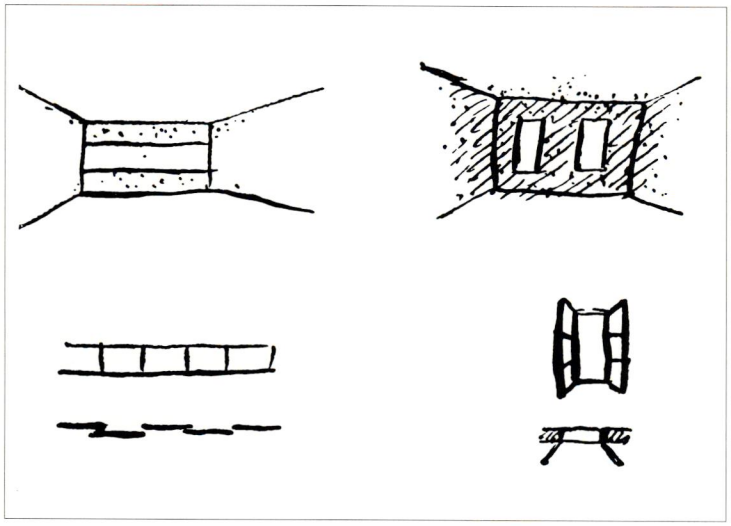


Fig. 15. The fênetre en longeur *compared to the traditional window.*

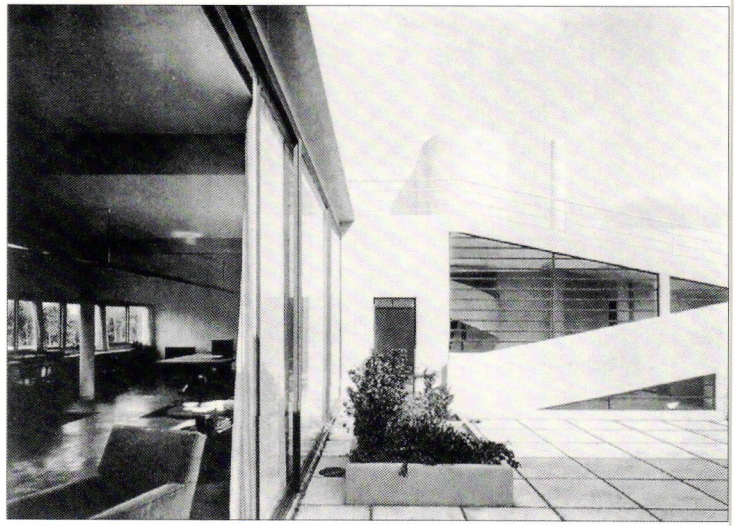


Fig. 16. Albert Levy photograph of the Villa Savoie living room.

Thus, the blinkers which direct the view discreetly from one direction assume in another the width of a moving person. These "turning spaces" remain as attenuated as possible, and their development suggests that Le Corbusier tried to maintain their continuity, breaking up the sequence of movement only reluctantly, and then often with a door (fig. 17). It is within these spatial layers that the partition walls make the transition between their internal placement and intersection with the window mullion.

The "balconies" of the early villas tend to be oriented toward the initiate, rather than to the visitor, the more private rituals of domestic life being enfolded into their intimate *en filades*. The *piano nobile* of the Villa Stein, for instance, presents such a layer behind the garden façade connecting the terrace, salon, and dining room, while a parallel layer behind the street façade leads on down a disengaged library slot to a protruding exterior balcony. The *dégagement* inscribed here is the lateral view of the spectacle, that of the actors and stagehands, the space of the wings.

The "turn" of the wings, aligned with the point of view of the cross-section, animates many of Le Corbusier's sketches, which often position the viewer along the window, between the column and the external wall (frontispiece). The horizontal window frame is then seen to slip behind the wall or door panel, allowing the unobstructed passage of the sun's rays across its surface. Le Corbusier's polemical sketch of the horizontal window from the interior of the room, accompanied by claims for the distribution of light, conveys even within the rapid punctuation of the dotted surface an interest in the darkness of the window wall and in the shadow on the side wall (fig. 15). Similarly, one of the set of photographs taken by Albert Levy of the Villa Savoie in 1930 dramatizes the projection of the afternoon sun on the end wall of the living room, isolating the wall under the sill-shelf in mysterious darkness (fig. 16). The space of turning faces us with the thickness of the shadow.

BRISE-SOLEIL

> ...By the opening of windows, an important play of secondary surfaces is begun, releasing rhythms, dimensions, tempos of architecture...inside the house and outside.
>
> —Le Corbusier,
> *Précisions*

Le Corbusier's semantic redefinition of the relationship between window and wall within the *fenêtre en longeur* is not limited to the shape and action of the window element alone: it also presupposes the reorientation and reinscription of the embrasure. Internally, the closure of the hole-in-the-wall window frame is dis-

sected and recombined in the horizontals of lintels and sills, and in the verticals of "shadow-fins," i.e., jambs, of intersecting partitions. The interior embodiment of the *fenêtre en longeur* as an enigmatic "light-brick" in an ambiguous shadowy wall thus maintains an attachment to the projective light-effects of the traditional window, but without the corresponding depth of an identifiable wall surface. It is an articulation of multiple planes and small armatures which is less visible on the exterior, whose vertical surface remains relatively continuous. In the context of the interior "light brick," however, devices like the *brise-soleil* may be viewed as differentiations of emphasis rather than of kind. They might be seen less as a corrective to the flatness and tautness of the earlier work (with the tensions between "light and shadow," "flatness and depth," "concrete and stucco," etc., which typify such interpretations), and more as a torqued and rotated incarnation of the *casier-mur*.

In Le Corbusier's post-War buildings, the decreased interval of vertical fins and more equivalent relationship between horizontal and vertical armatures lessens the centrality and role of the sill-shelf. Although it remains a datum in many projects, the extension and visibility on which its former emphasis depended has shifted within a general retraction of the evidence of interior occupation from the wall. Despite the *brise-soleil*'s increased depth, which emphasizes the *casier-mur*'s capacity to hold, its contents seldom comprise domestic artifacts. Where the window-wall does act as a repository for objects, they tend to be of the same import as the statue of the Madonna behind the altar in the church at Ronchamp; or to appear embalmed, congealed in aspic, as in the "vitrines" of the nursery school at Nantes. While the architectural concern for the display and organization of domestic equipment begins to wane, the role of the *casier* as a light-vase is enlarged, and the meditation on the shadow redoubled. Eventually, the capaciousness of the *casier* grows beyond that of a cabinet, becoming that of an aedicule fitting the dimensions of the human body.

These changes in scale affect the surface elaboration of the *brise-soleil*'s ambiguous two-sided condition. If the *casier-mur*'s "interior" provenance as a permeable partition is challenged by distinctions between internal and external surface treatments within the horizontal window-wall, questions of permeability and interiority are most forcefully sustained by the *brise-soleil*, which attenuates the closure of the wall, drawing attention to the prominence of its interface (fig. 18). The depth and material continuity of the *brise-soleil*'s fins accentuate the strange permeability of the exterior envelope; moreover, their rotation contributes to the simultaneous opening and closing of the cabinet-wall—i.e., its simultaneous continuity with and estrangement from the suroundings. The view of the jamb (and its shadow) is now shared equally by occupant and passerby; the cantilevered layer of the early villas has become a matter of public record, not a private moment for one person. This quality of reversible obliqueness has been remarked on by Robin Evans in his discussion of the south window-wall of Ronchamp (an infilled version of the *casier-brise-soleil*), where one remains always, on both sides of the wall, on the outside looking into its depth.[54]

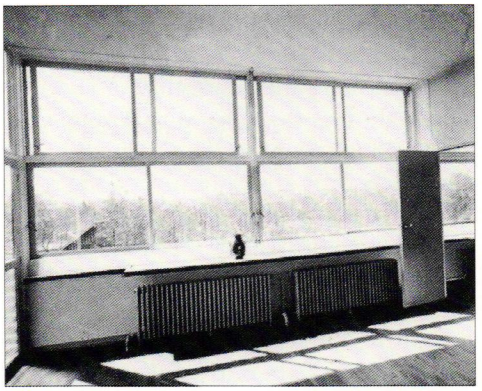


Fig. 17. Dining room of the Villa Stein, Garches.

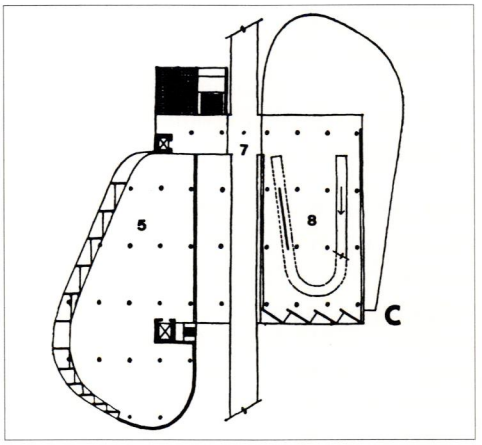


Fig. 18. Plan, Carpenter Center for the Visual Arts, Cambridge, MA. Le Corbusier, 1960.

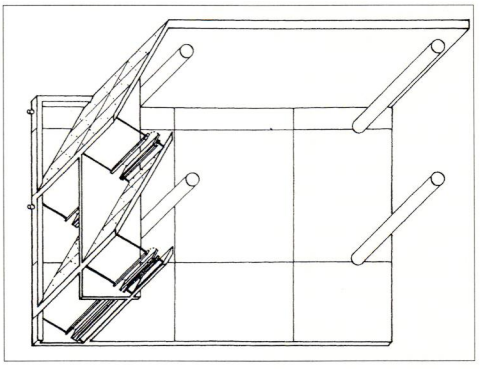


Fig. 19. Brise-soleil *and pivoting* aerateur, *Carpenter Center for the Visual Arts, Cambridge, MA.*

The priority of this interface extends to the detailing of surfaces to maintain (whenever possible) the continuity of shadow. When the *brise-soleil* fin is part of an exterior colonnade, as at the Carpenter Center, it absorbs the framing of the glass envelope at their intersection (fig. 20). Here, Le Corbusier's "window-brick," within the *fenêtre en longeur* a combination of sliding window frame and concrete armatures, collapses one into the other. Panes of glass are butt-jointed with sealant into concrete fins, and the truncated material palate extends to the operable vents (*aerateurs*), also framed in slender vertical members of precast concrete. In this collapse of frame and embrasure, mullion and jamb, the oblique glass layer developes an enigmatic presence.

The affinity between the movements of the eye and body around Le Corbusier's windows, and the action of mechanical opening remains, although altered in trajectory. While the *fenêtre en longeur* imitates the sliding of the viewer's gaze or person along the wall, later embodiments of the *casier-mur* describe the pivoting of the viewer before it. Rotated surfaces contribute to equivocal readings of depth and foreshortening (an effect enhanced by the angle of the shadow),[55] and their implied *kinesis* may be recalled in James Stirling's disappointed observation that the concrete fins above the entrance doors at Ronchamp suggest movement, but are in fact fixed.[56] The pivotal movement suggested by the *brise-soleil* is activated mechanically by the *aerateur*. This ventilation element recapitulates the window-wall at a smaller scale in the pivoting action of an opaque door, and the narrow width of the opening necessitates a parallel turning of the human body for passage (fig. 19).

The interest in the lateral cutting of the wall overtakes its exterior assertion as a uniform vertical surface. The "false right angles" of the rotated fins and projected light promote the *casier-mur* in the form of a series of light-vases, a luminous museum.[57]

CONCLUSION

Exclusive distinctions between *composizione* and *progetto*, sign-making and production, continue to maintain themselves and permeate an obsession with what might be characterized as a moralism of revelation, apparent in argumentation between the primacy of mask or disguise, on the one hand, and of the self-evidence of honesty, on the other. Such categorization extends to forms of architectural representation, such as the distinction between a "design" and a "construction" document, or the "realism" of the section and the "artifice" of the elevation. The opportunity presented by a fine scale of observation, the "piecing" of construction in the detail, which, as Naomi Schorr has suggested in her treatment of the literary detail, may play a part in the "dismantling of an idealist metaphysics," remains underutilized.[58] More often, the "construction document" is automatically consigned to an assumption of technological determinism, what Bryson calls the "natural attitude" associated with naïve materialism:

> The persistence of a natural attitude riddled with error and contradiction might well seem mysterious...might seem clear proof of the narcotic power of naturalization, were the metaphysic of presence not embedded in the concrete practice of representational painting, in the actual craft: if the natural attitude is bewitched by a false logic, the spell is first cast by material technique.[59]

While the definition of "actual craft" and "concrete technique" remains a challenge for the activity of painting (to which Bryson is here referring), for architecture, "craft" assumes a particularly equivocal status. If automatic assumptions of identification with handicraft and simplistic arguments about an opposition between hand and machine production are discarded, craft often insinuates a vague modesty or humility, little more. Frequent reports of its death are issued. Le Corbusier consolidated the proposition of the *casier-mur* as he ushered the cabinet-maker offstage with the inevitable forces of progress; Frank Gehry announced on a recent television program that "we live in a craftless society."[60] If not dead, craft may be identified with its intellectual equivalent—the kind of sleepwalking technological determinism associated by Rowe and Slutzky with Bauhaus pedagogy (the "school of craft").

This strange "removal" of craft may relate to the elliptical and complex nature of the relationship between the architect and construction. So often located in the artisanry of the "other" (whether carpenter, cabinet-maker, shoe-maker, etc.), the situation of craft is implicated in habits of avoidance or delay. It is the site of a profound disciplinary neurosis about the current relationship between architecture and building, of an unease about the place of the architect within the chain of production.[61]

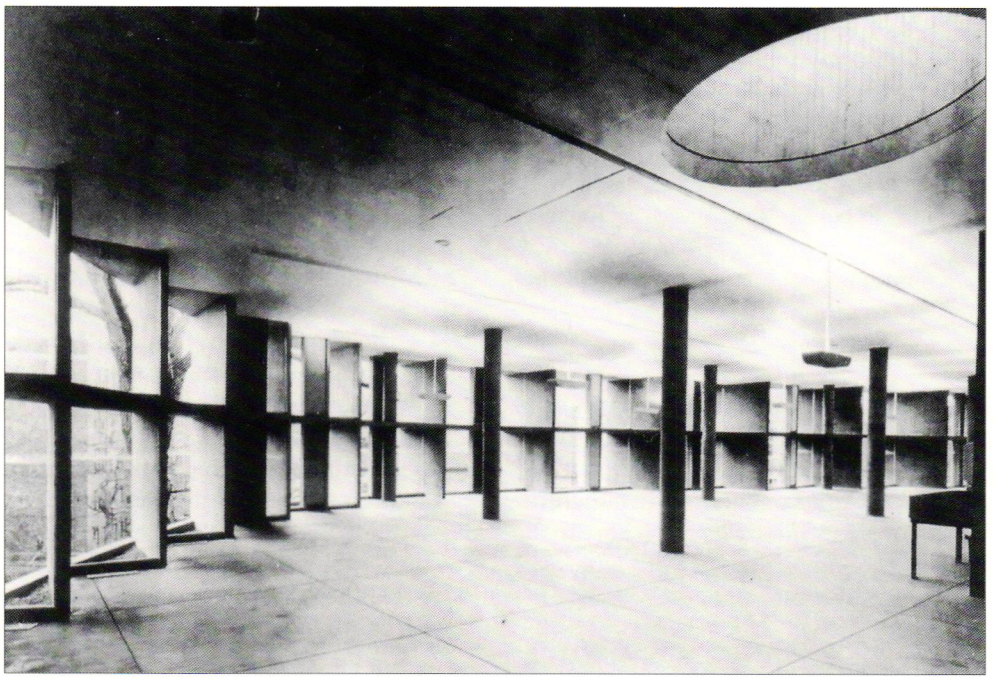


Fig. 20. Interior of studio, Carpenter Center for the Visual Arts, Cambridge, MA.

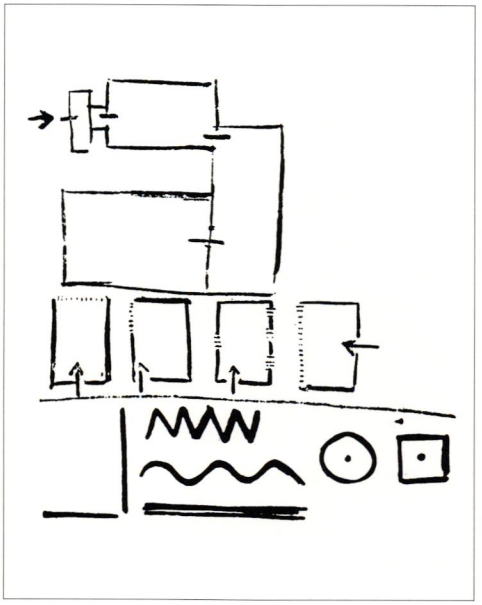


Fig. 21. Pivoted line notation of windows and doors, from Précisions.

If craft assumes the status not of a presumption, but of a question, two tentative observations may be made: the importance of the making of drawings as analogous constructions in the act of making architecture has been consistently underestimated, and the capacity of craft (including the making of drawings) to serve as a reminder of the labor involved in the making of artifacts is often forgotten. Within Bryson's integrative proposal of the cultural artifact as the "material transformation of signs," it is the transformative capacity of labor (of both maker and interpreter) which accounts for such activation. Within "the capacity of practice to exceed the fixities of representation,"[62] he observes, it exceeds

> ...only by working, by transforming the signifying material provided by the painting that the process of recognition unfolds...Recognition is always in movement...viewing is mobility both of the eye and of discourse.[63]
>
> ...painter and viewer...are agents operating through labor on the material of the visual sign.[64]

In understanding the artifact of "painting as a locus of mobility," we are urged that "to understand the painting as a sign, we have to forget the proscenic surface of the image and think behind it..."[65] In pursuit of such "thinking behind," Bryson asks us to imagine a space intersecting with the surface of the painting, that of the body of the painter.[66] While the resemblance of such an act to the lateral cutting of a section may be misleading, the resonance which such "thinking behind" has for the activity of architectural drawing is of interest. If the act of lateral cutting is seen not as the "final unmasking" of the static reality "behind," with the accompanying assumptions of surface vs essence, frontality vs rotation, ideality vs experience, etc., the activity of architectural drawing presents a series of continual shifts of position. Although currently identified at times with the "triumph of the gaze," architectural projection may be seen as a set of displacements which reinforce and question one another. In addition to the acts of projection and compaction, architectural representation describes a sequence of turning. Rather than a set of competing dualities (plan vs section, section vs elevation, etc.), it is a complex, multi-dimensional three-step, a gymnastic spatial choreography, endlessly resulting and repositioning itself.

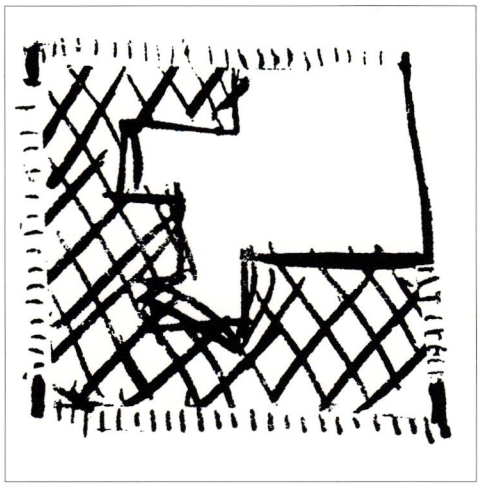


Fig. 22. Pivoted line notation of windows and doors, piano nobile *plan of the Villa Savoie, Poissy, from* Précisions.

With regard to the *casier-mur,* the "recovery" of the section is not intended to privilege its effects, but to activate its potential within the context of more familiar plan and elevation images. The *casier-mur* is introduced and formalized as "furniture," and influences the articulation of the interior. As the intimacy of its role as domestic container lessens, it increases its rhetorical aspirations in the guise of the *brise-soleil.*

This account of the *casier-mur* is not intended as a counter-proposition to the importance of vertical surfaces, nor as a plea for the fundamentalism of either furniture or interiority. To return here to the series of crayon drawings with which the *casier-mur* is presented, Le Corbusier's sketch notation for openings in walls may be brought to mind (fig. 21, 22). Openings of both windows and doors are drawn as lines similar in density to those of adjacent walls, but parallel to the line of sight. The passage of the body and eye is indicated by pivoting the wall's surface.

The conventions of architectural drawing involve, within a sequence of drawing types, the obsessive rhythm and activity of the "turn," in addition to the projection and compaction of the singular "cut." Le Corbusier's wall in section faces us with a surface which "re-turns" toward other representations of its aspects, other surfaces. It is as the locus of Le Corbusier's "turn" on the wall, in the alchemy of the act of rotation, that the *casier-mur* assumes its most potent resonance.

NOTES

1. Norman Bryson, *Vision and Painting* (New Haven: Yale University Press, 1983), 136-7.

2. Ibid., 139.

3. Vittorio Gregotti, "The Building of Architecture," *Casabella* 50 (January/February 1986): 2-4.

4. Ibid., 2.

5. In a recent article, Stanley Allen makes a comparable point regarding the "ideality" of the plan, and the "pragmatism" of the section. See "Tracks, Trace, Tricks," *Architecture New York* 0 (May/June 1993): 8-13.

6. Henry Russell Hitchcock and Philip Johnson, *The International Style* (New York: W. W. Norton & Company, 1966), 41-5.

7. Ibid., 45-6.

8. Sigried Giedion, *Space, Time, and Architecture* (Cambridge, MA: Harvard University Press, 1967), 41.

9. Colin Rowe and Robert Slutzky, "Transparency, Literal and Phenomenal" in Rowe, *The Mathematics of the Ideal Villa and Other Essays* (Cambridge, MA: MIT Press, 1984), 160-83.

10. Ibid., 168.

11. Ibid., 161.

12. Ibid., 167-8.

13. Ibid., 167.

14. Ibid., 168.

15. Slutzky, "Rereading Transparency," *Daidolos* 33 (15 September 1989): 106-9.

16. Rowe and Slutzky, 170.

17. Ibid., 168.

18. For Bruno Reichlin's writings, see, for example, "The Single-Family Dwelling at the Weissenhof," and "The Pavilion Church," in Carlo Palazzolo and Riccardo Via, eds, *The Footsteps of Le Corbusier* (New York: Rizzoli, 1991); and "The Pros and Cons of the Horizontal Window, *Daidolos* 13 (15 September 1984): 65-78.

19. Reichlin, "Single-Family Dwelling," 55.

20. Rosalind Krauss, "Grids," in Krauss, *The Originality of the Avant-Garde and Other Modernist Myths* (Cambridge, MA: MIT Press, 1991), 17.

21. Reichlin, "Pros and Cons," 74; quotation from J. A. Schmoll, "Fensterbilder" (Munich, 1970).

22. Ibid., 75.

23. Ibid., 75.

24. Beatriz Colomina, "The Split Wall: Domestic Voyeurism," in Colomina, ed., *Sexuality and Space* (New York: Princeton Architectural Press, 1992), 117.

25. Ibid., 128.

26. Le Corbusier, *Précisions: On the Present State of Architecture and City Planning* (Cambridge, MA: MIT Press, 1991).

27. Ibid., 111.

28. Ibid., 115.

29. Ibid., 115.

30. Le Corbusier, "Type-Needs," in Le Corbusier, *The Decorative Art of Today*, trans. James I. Dunnett (London: The Architectural Press, 1987), 188.

31. Le Corbusier, *Précisions*, 109.

32. Ibid., 115.

33. Le Corbusier, *Decorative Art*, 77.

34. Le Corbusier, *Précisions*, 123 ("The Plan of the Modern House").

35. Alan Colquhoun, "Displacement of Concepts in Le Corbusier," in Colquhoun, *Essays in Architectural Criticism* (Cambridge, MA: MIT Press, 1985), 51-66.

36. Edward R. Ford, *The Details of Modern Architecture* (Cambridge, MA: MIT Press, 1990), 241-6.

37. Ibid., 241.

38. Ibid., 243.

39. Le Corbusier," A Single Trade" (1925), in Tim and Charlotte Benton, with Dennis Sharpe, *Architecture and Design 1890-1930* (New York: Whitney Library of Design, 1975), 137.

40. Reichlin, "Weissenhof," 41.

41. Le Corbusier, *Précisions*, 54.

42. Reichlin, "Pros and Cons," 72.

43. Ibid., 75.

44. Ibid., 72.

45. Colomina, 114.

46. Ibid., 128.

47. See, for example, Peter Carl, "Le Corbusier's Penthouse in Paris," in *Daidalos* 28 (15 June 1988): 65-75; "Architecture and Time" in *AA Files* 22 (Autumn 1991): 48-65; "Ornament and Time" in *AA Files* 23 (Summer 1992): 49-64. See also Jacques Lucan, "The Search for the Absolute," in Palazzolo and Via, eds.

48. Tim Benton, "The Villa Savoie and the Architect's Practice," in H. Allen Brooks, ed., *Le Corbusier* (Princeton: Princeton University Press, 1987).

49. Norman Bryson, *Looking at the Overlooked* (Cambridge, MA: Harvard University Press, 1990), 84.

50. Le Corbusier and Pierre Jeanneret, "Five Points for a New Architecture," in Alfred Roth, ed., *Zwei Wohnhauser* (Stuttgart: Akad. Verlag Dr. Fr. Wedekind & Co., 1927), 5-7.

51. Krauss, "Le Corbusier and Léger," *Artforum* 10 (#8, April 1972): 52.

52. Ibid., 51.

53. Ibid., 52, unfootnoted quotation attributed to Le Corbusier.

54. Robin Evans, unpublished lecture given at the Harvard Graduate School of Design, Fall 1992.

55. Rowe, "La Tourette," in *Mathematics*, 186-201.

56. James Stirling, "Ronchamp, Le Corbusier's Chapel and the Crisis of Rationalism," in *Architectural Review* 119 (#711, March 1956): 154-61.

57. Le Corbusier, *Vers une architecture* (Paris: 1958), 39, 154, 166; quoted in Rowe, "La Tourette," 186.

58. Naomi Schorr, *Reading in Detail* (New York: Routledge, 1989), 3-4.

59. Bryson, *Vision*, 87.

60. Interview with Charlie Rose, Public Broadcasting System (USA), 1993.

61. Bryson, *Vision*, 170.

62. Ibid.

63. Ibid., 152.

64. Ibid., 170.

65. Ibid., 164.

66. Ibid., 164.

FIGURE CREDITS

Fig. 9. From Edward R. Ford, *The Details of Modern Architecture* (Cambridge, MA: MIT Press, 1990), 248.

Fig. 11. From A. Roth, ed., *Zwei Wohnhauser* (Stuttgart: Akad. Verlag Dr. Fr. Wedekind & Co., 1927), 18.

Fig. 19. Drawing by Chava Danielson and Peter Samaran, 1990. Prepared for "Concepts : Constructs" a Harvard University Graduate School of Design (GSD) course taught by Kenneth Martin Kao. Reprint courtesy of the GSD.

All other figures courtesy of the Fondation Le Corbusier.

Frontispiece. View from terrace, House in Paddington.

THREE HOUSES

Glenn Murcutt

Australian architecture after the Aboriginal hut and before Glenn Murcutt was almost exclusively of Western and English influence. That is, a foreign method of making buildings, which ignored the *genius loci*, was plunked down on the island continent.[1]

Murcutt does not set out to design contemporary Aboriginal huts as corrective. Rather, he begins with two passionate concerns regarding the human occupation of the landscape. The first is a respect for the power and delicacy of nature, which he embraces with reverence and delight. The second is the "primitive," which manifests itself in a simplicity and, sometimes, a "do-it-yourself" approach, even when using materials like anodized aluminum.

Murcutt's close scrutiny of the environment informs his recapture of shelter as dependent on the site from which it borrows. His range of observation, however, is not limited to such natural conditions as the shedding of a tree's bark to seek warmth for its survival in the colder months; it extends to contemporary materials and historical circumstances. For instance, with the onset of air transport to Australia, corrugated sheet metal became part of the Aboriginal vernacular: it was new, it was light, it was cheap.

Necessity, logic, and beauty, along with certain aspects of the work of early modernists like Chareau or Mies, inspire Murcutt's efforts to "touch the earth lightly." Murcutt's buildings maintain a tenderness to nature, while being obviously man-made. Their seemingly odd forms are instinctively pleasing, but, more importantly, they make sense.

—Edith MacArthur

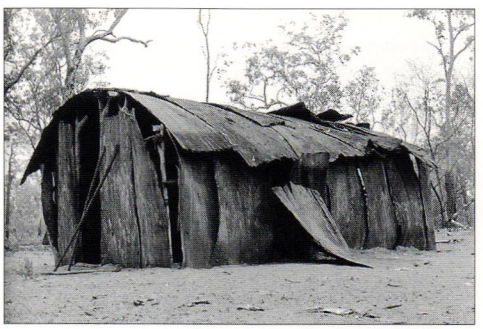


Fig. 1. Aboriginal dwelling.

NOTE

1. For a monograph of Glenn Murcutt's early work, see Philip Drew, *Leaves of Iron* (New South Wales: Harper Collins, 1985).

FIGURE CREDITS

1. Courtesy of Jennifer Isaacs.
2-7. Photographs by Eric Sierins of Max Dupain & Associates. Courtesy of Glenn Murcutt.
13, 14, 17. Photographs by Anthony Browell. Courtesy of Glenn Murcutt.
All other images courtesy of Glenn Murcutt.

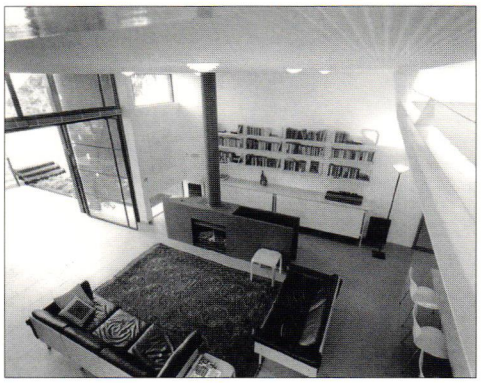


Fig. 2. Living room, House in Paddington.

Fig. 3. Living room, House in Paddington.

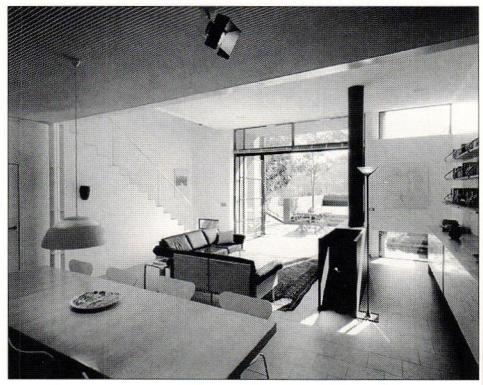


Fig. 4. Living room, House in Paddington.

Fig. 5. Entry, House in Paddington.

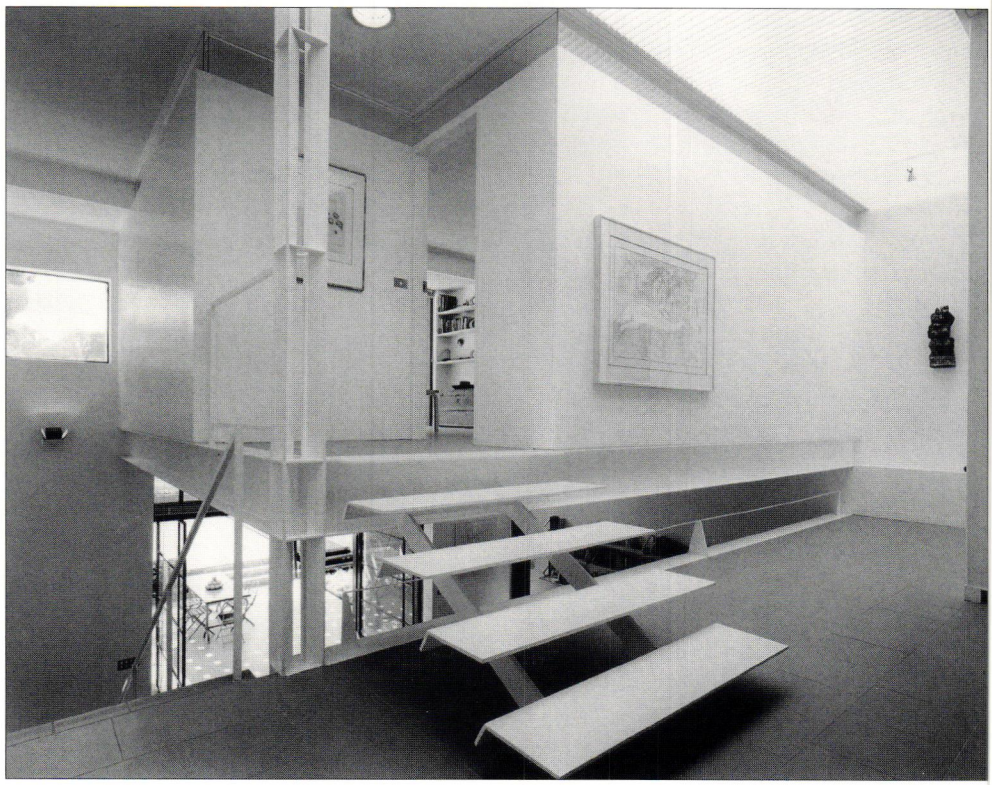


Fig. 6. Stairs to bedroom, House in Paddington.

Fig. 7. View to terrace, House in Paddington.

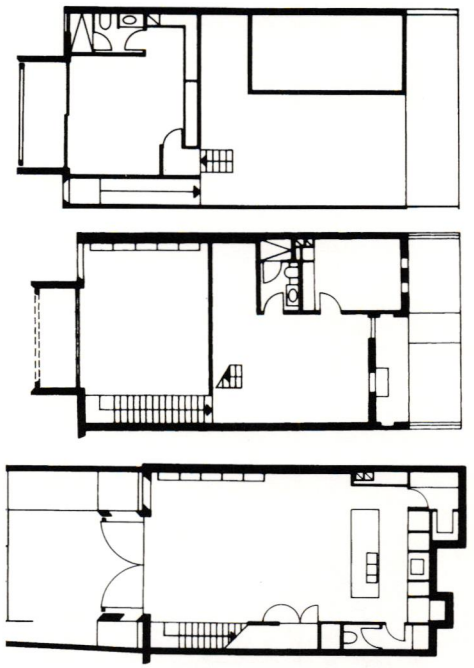


Fig. 8. Plans, House in Paddington.

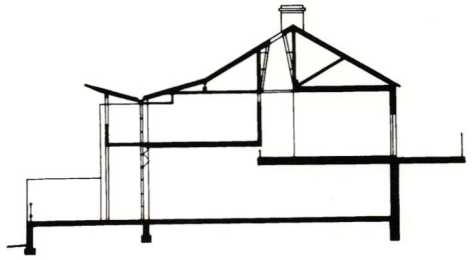


Fig. 9. Longitudinal section, House in Paddington.

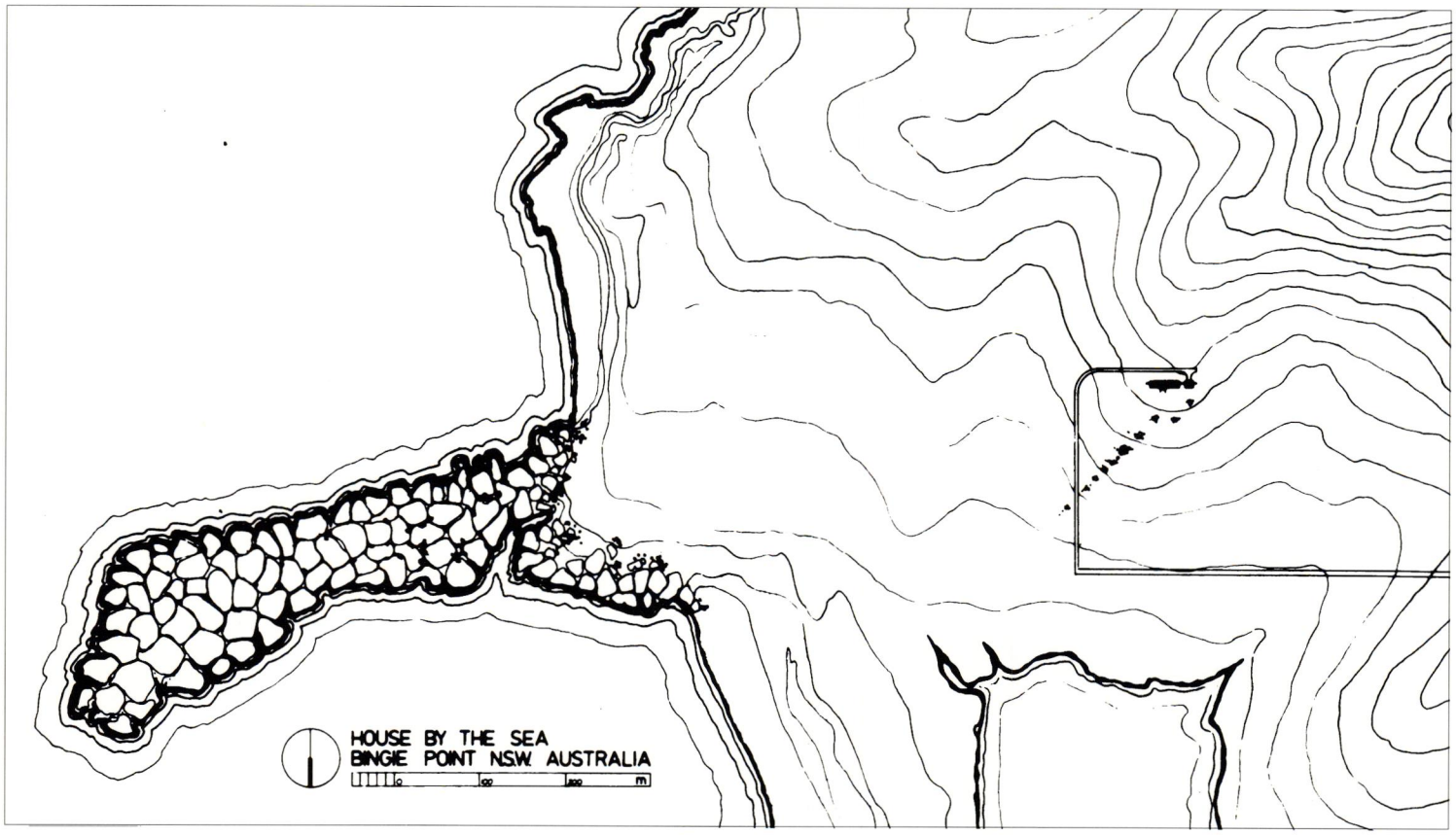


Fig. 10. Site plan, Moruya House.

The Moruya House was designed for clients who had camped on the site for ten years, and who wanted the same ease and informality in a permanent shelter.

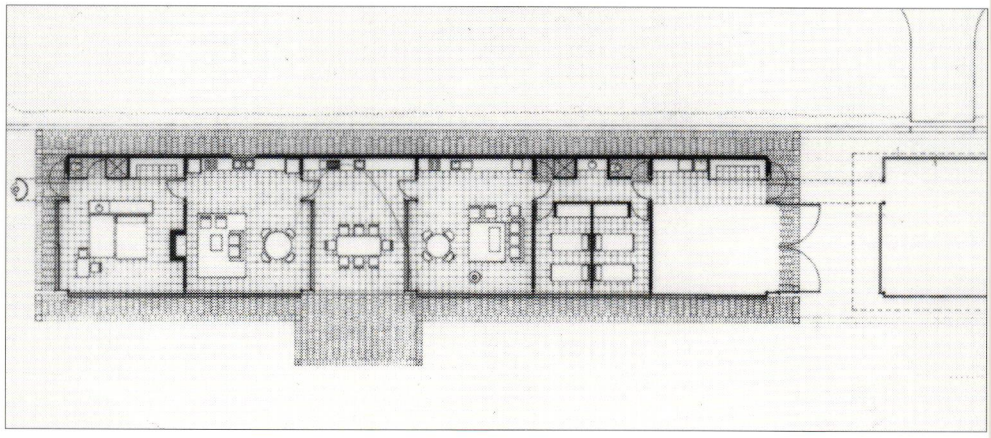


Fig. 11. Plan, Moruya House.

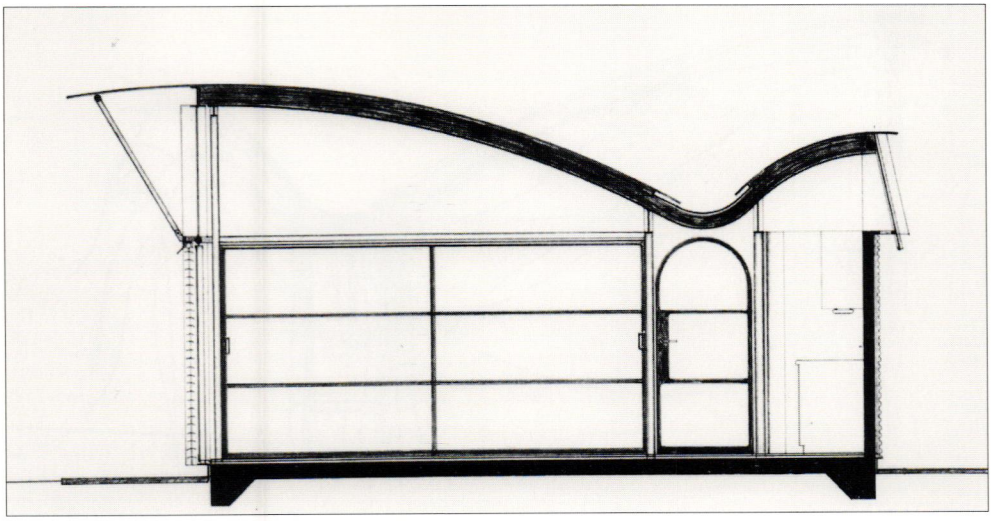


Fig. 12. Section through dining room, Moruya House.

The roof is a gracefully formed opaque element juxtaposed with the steely or glazed straightness of the walls, which "dissolve" into the surrounding landscape.

To allow for transparency while providing relief from the brutal Australian sun, the windows employ a louver system similar to that of venetian blinds. Murcutt places this system on the exterior because, as he notes, when glazing is in the shade, one has the sense of being in an exterior rather than interior space, and therefore feels more closely in touch with the elements. The effect is much like being beneath the canopy of a tree, where the delicate tracery of the leaves filters the sunlight.

Fig. 13. Moruya House. Rain water—which is collected in huge cisterns underneath the building—is the only water supply in much of Australia.

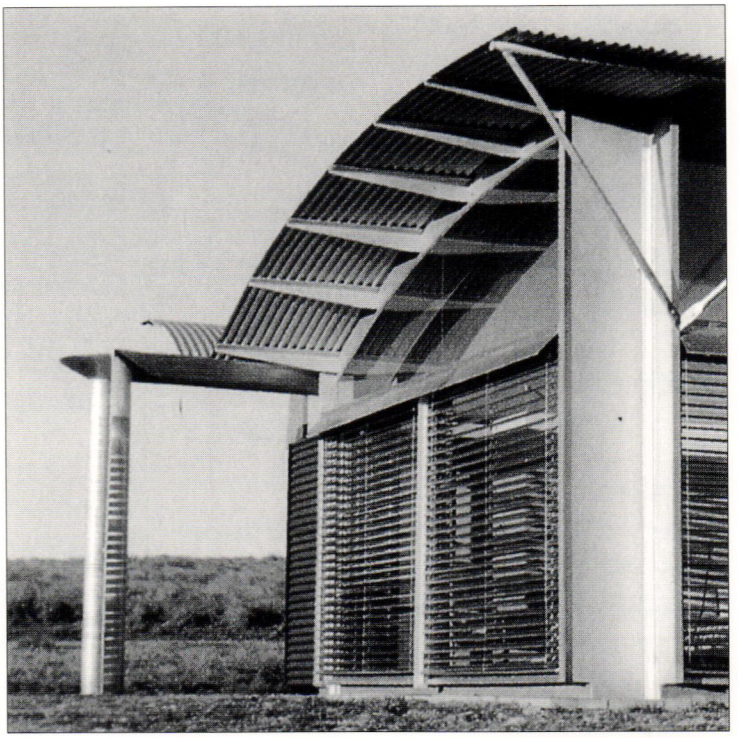


Fig. 14. Moruya House.

The wall system of this building is an inversion of typical masonry practice. The brick is on the inside and acts as a passive solar collector. It is sheathed with horizontally run corrugated sheet metal, which reflects the sun and heat.

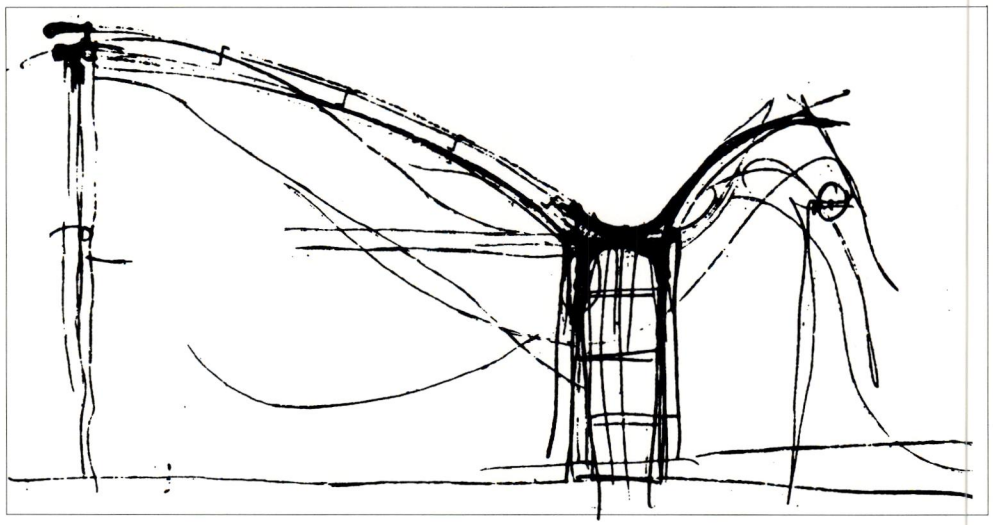


Fig. 15. Conceptual sketch, Moruya House.

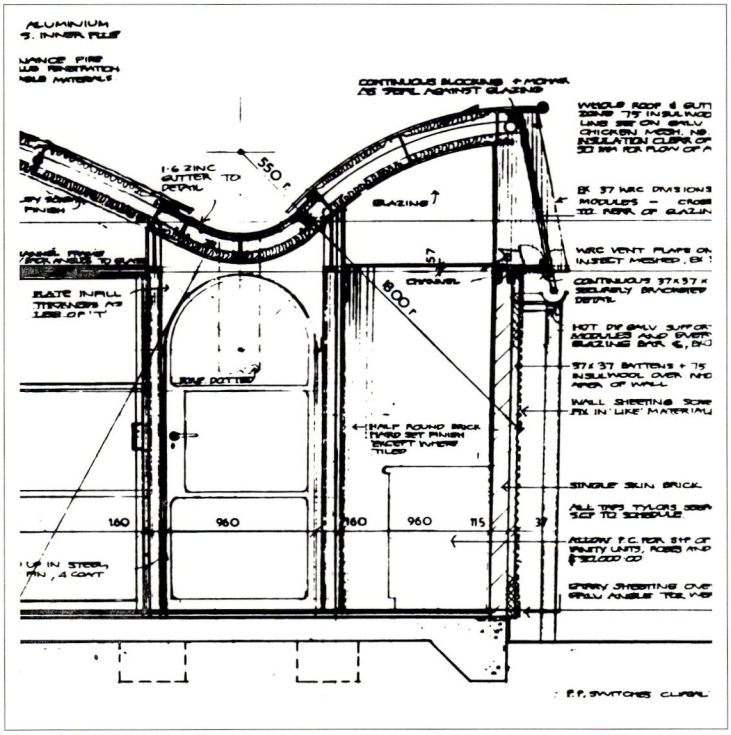


Fig. 16. Wall section, Moruya House.

Fig. 17. Dining room, Moruya House.

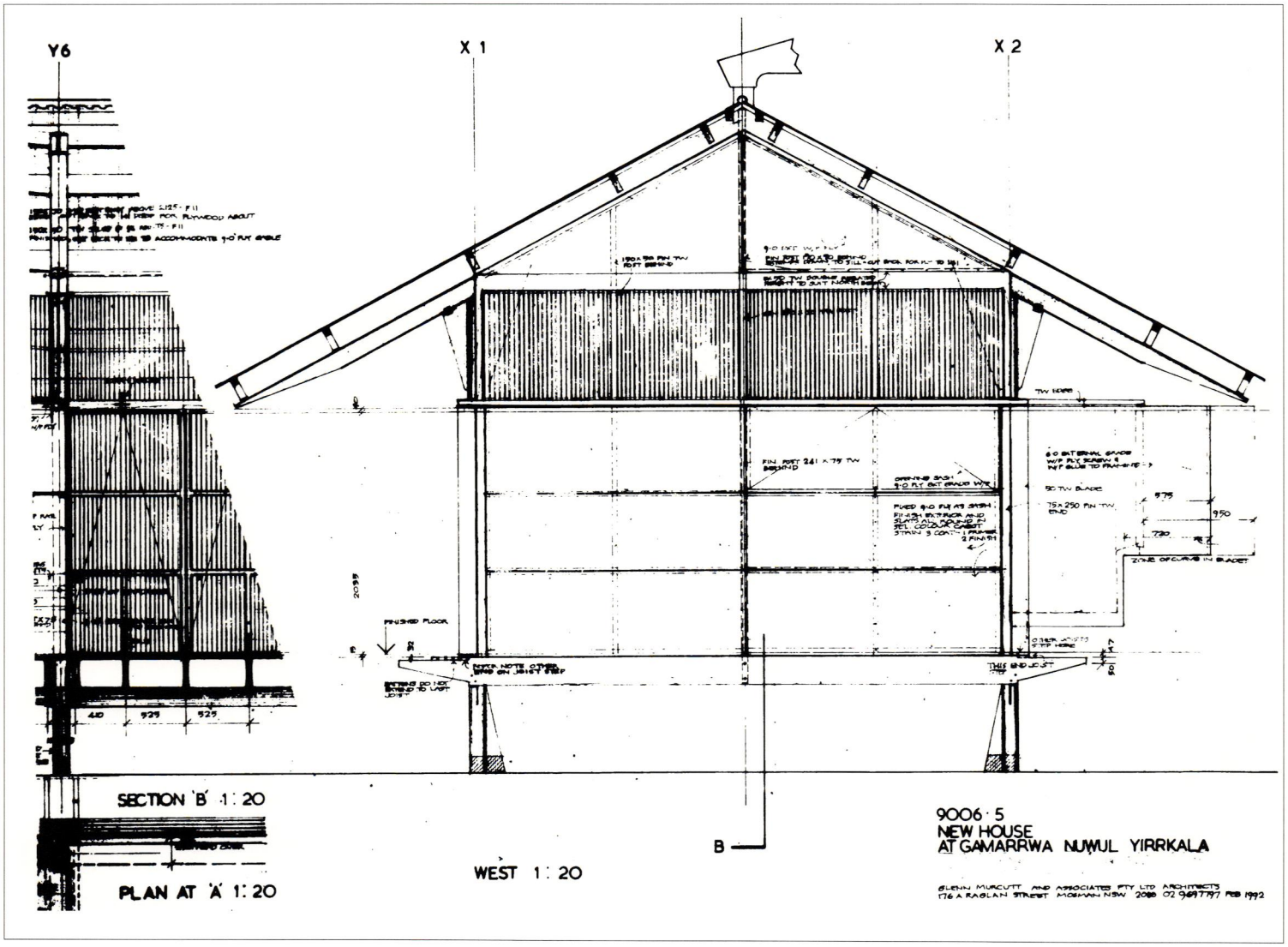
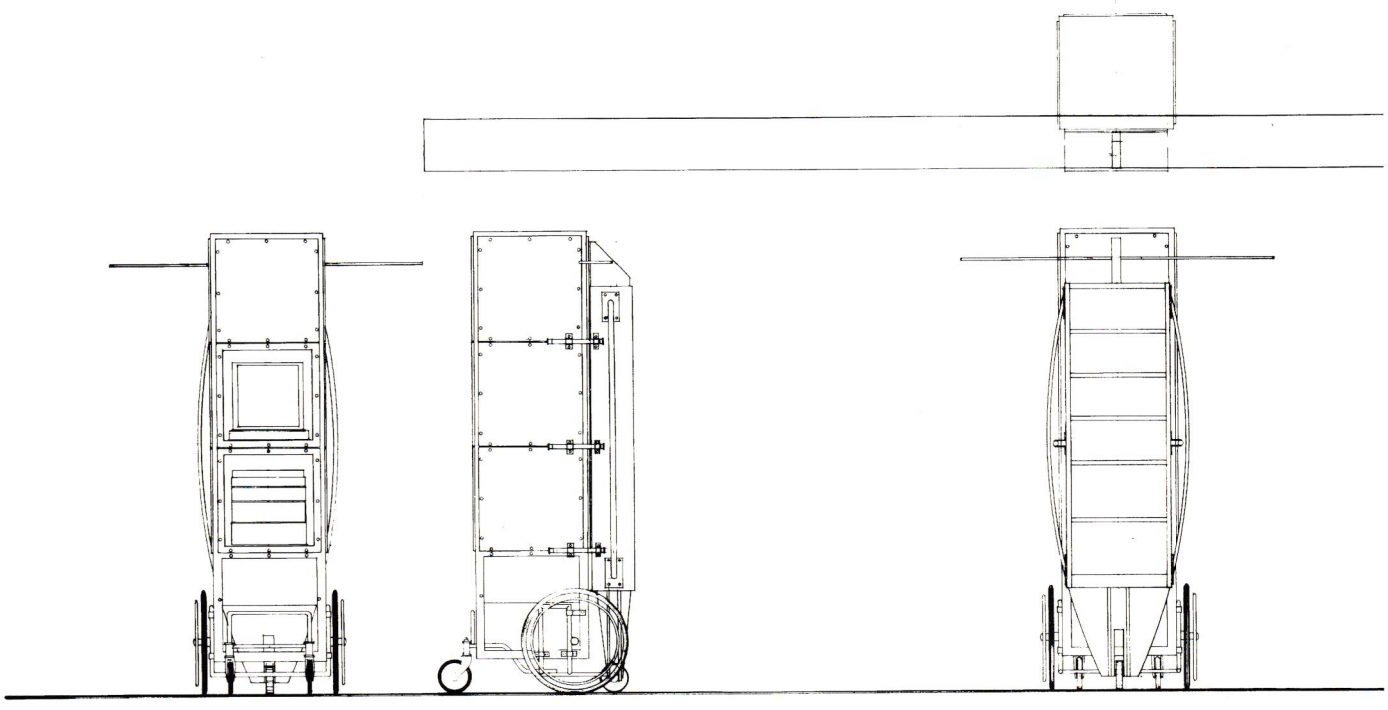


Fig. 18. House at Gamarrwa Nuwul, Yirrkala.



Frontispiece. The Ark.

THE IN-VALID HOUSE: AN ASYLUM FOR THE THREE LITTLE PIGS

Peter Waldman

AN ASYLUM FOR THE THREE LITTLE PIGS

Exactly one year ago today, in the midst of a tropical storm, three refugees found themselves seeking shelter upon the high ground of an ancient landfill located at the edge of a New World City.

The wind and rain slashed away at the glutinous gumbo clay to reveal layers of concrete shards, wrecked packing crates, and a battered but operative wheelchair. They harnessed this vehicle to ferry salvaged "sticks and stones" to serve as an expedient refuge that night, and as the warehouse of conventions, the builder's workshop thereafter.

One prudent pig was the first to excavate the site, to reveal the treasures of this former construction dump. An inventory was made of doors and windows, attics and basements, and special care was taken with all stone products in anticipation of their final grave use. This pig laid up a stone cell at the northern edge of the site to contain the first hearth. These walls were then extended as a raised foundation for the tentative constructions of others in anticipation of the Flood, a Wolf, or any other deconstructive menace.

A more tentative pig would be the one to gather studs and mend trusses; to flatten flashing and straighten screen; and to join sill to plate time and time again.

Finally, the most pretentious pig found his trough full indeed. This venerable engineer salvaged a front porch post which would not quite fit; the narcissistic flue sections were traced back to an outlawed crematorium once on this Bryne Avenue site. This flue pipe would serve as a furnace for the burning of rubbish on the threshold between house and garden, and record the measures, cooly predictable, of sunrise and sunset. Abandoned scaffolding sections bridge the abyss between the somnabulist retreat to the north and the projectionist's tree house to the south. Finally, this curious pig discovers an ancient reliquary on wheels, which would be refitted to contain "the book and the box," the treasury of late twentieth century culture.

The storm has subsided now, the prudent and tentative pigs have set up house together with the help of the pretentious one, who is their architect.

The drawings and models contained herein constitute the specifications for construction of a strong house, a fragile pavilion, and the remnants of a construction shed appreciated by nostalgic neighbors as yet another cottage familiar in their fantastic neighborhood.

THE IN-VALID HOUSE

An able-bodied couple seeks to build a house to support the anticipated needs of their aging mothers. This first house of their union is the last house of their generative origins.

One large room contains the distinct dimensions of their youthful aspirations: a cradle for a garden, a modest mantle, a pretentious bridge, all serving a grand promenade to the more deliberately distinct territories of sleep and study. The mothers find themselves in a familiar but partial house, a pavilion estranged in a garden. A screen porch veils the guest house from the garden; the painter's stu-

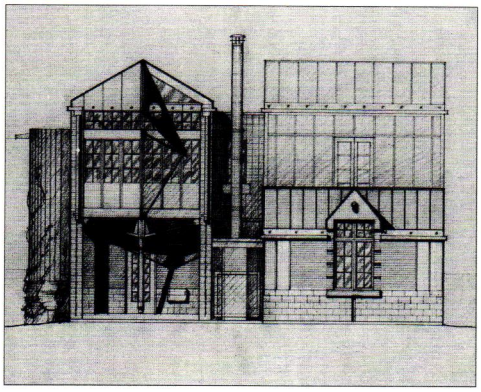


Fig. 1. Street façade.

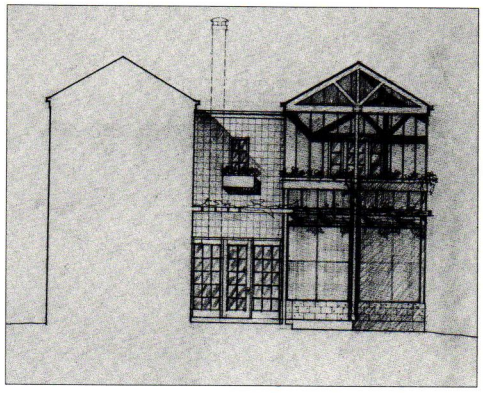


Fig. 2. Court façade.

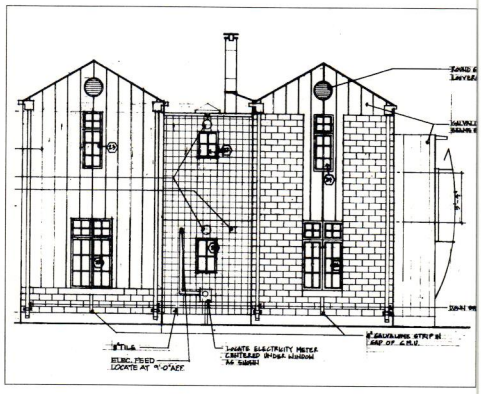


Fig. 3. End façade.

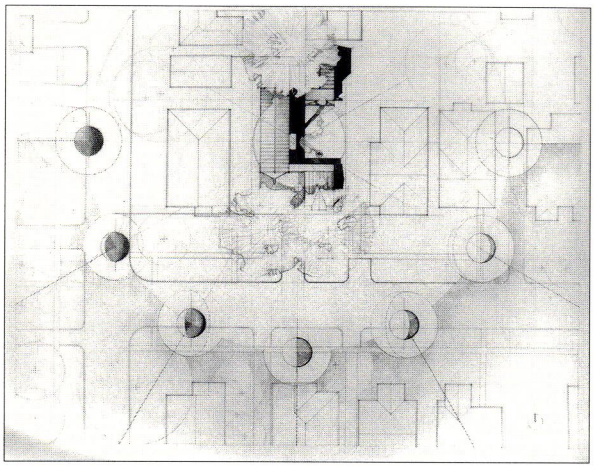


Fig. 4. Site plan.

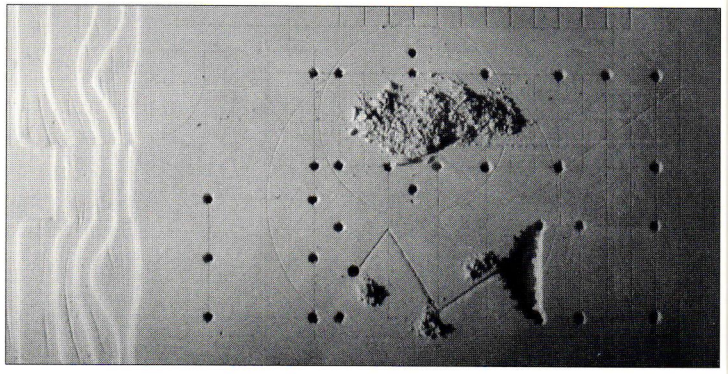


Fig. 5. Pre-conditions to construction.

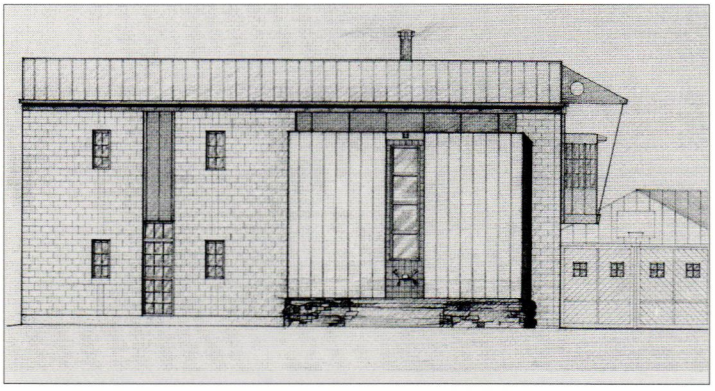


Fig. 6. Side façade.

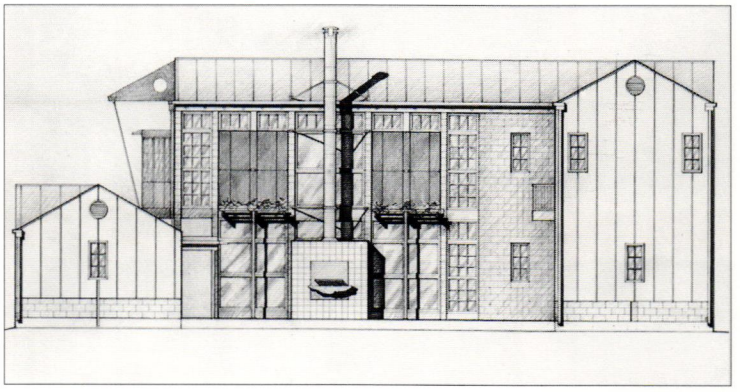


Fig. 7. Court façade.

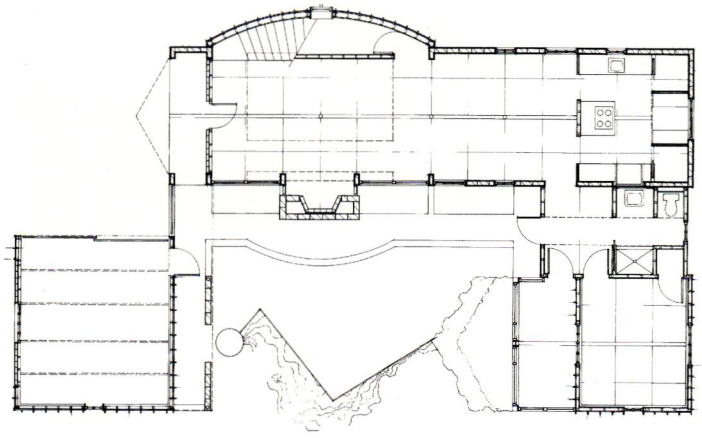


Fig. 8. Plan of first floor.

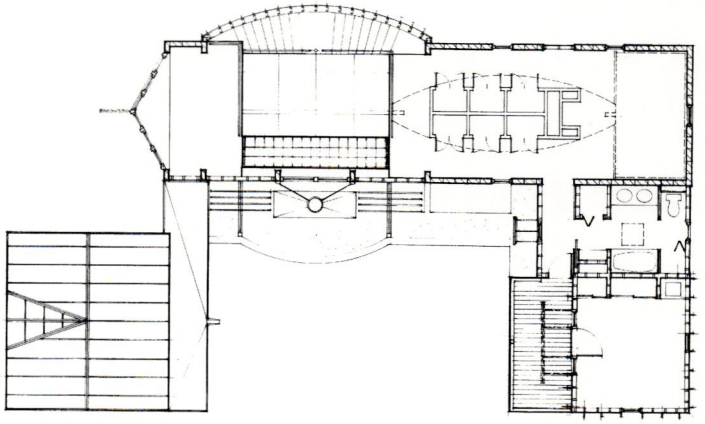


Fig. 9. Plan of second floor.

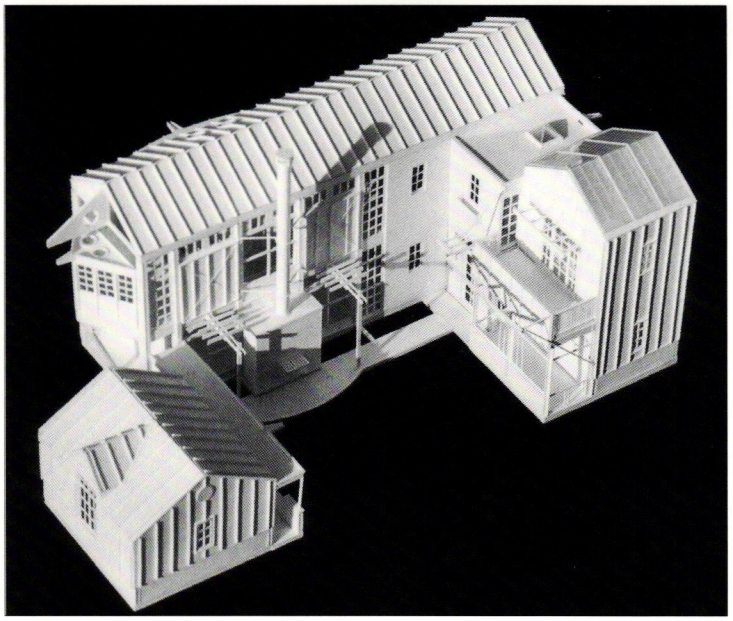


Fig. 10. Model.

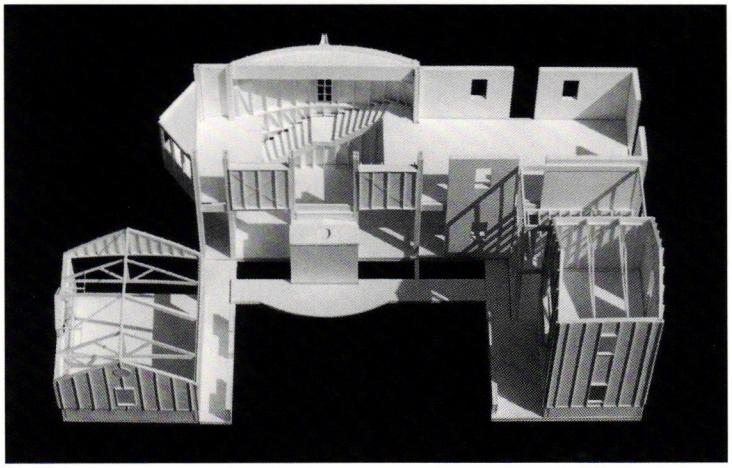


Fig. 11. Model from courtyard, second floor exposed.

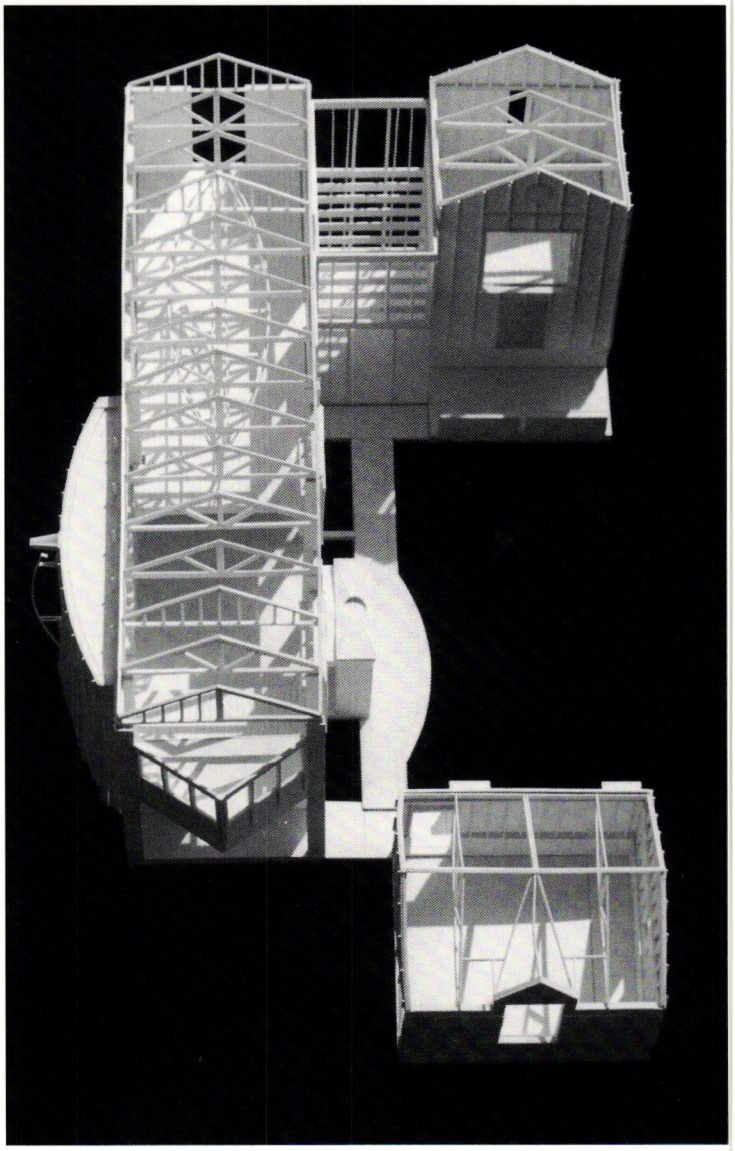


Fig. 12. Model with roof framing.

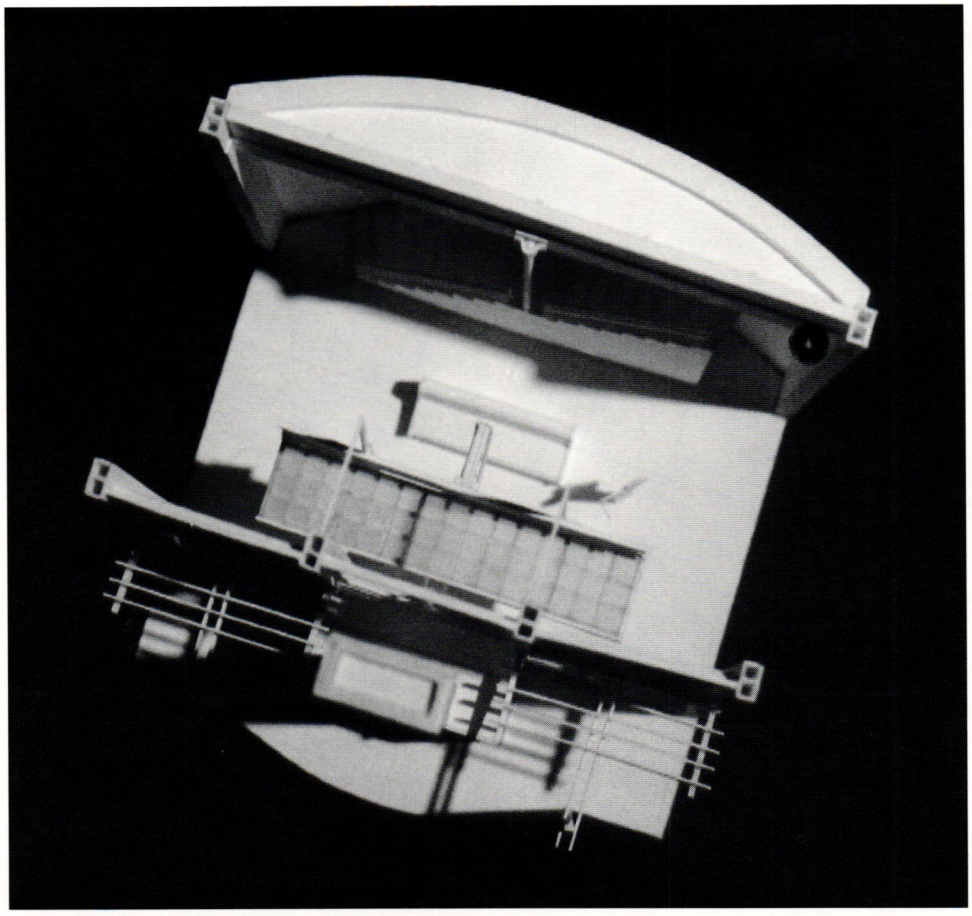


Fig. 13. Catwalk.

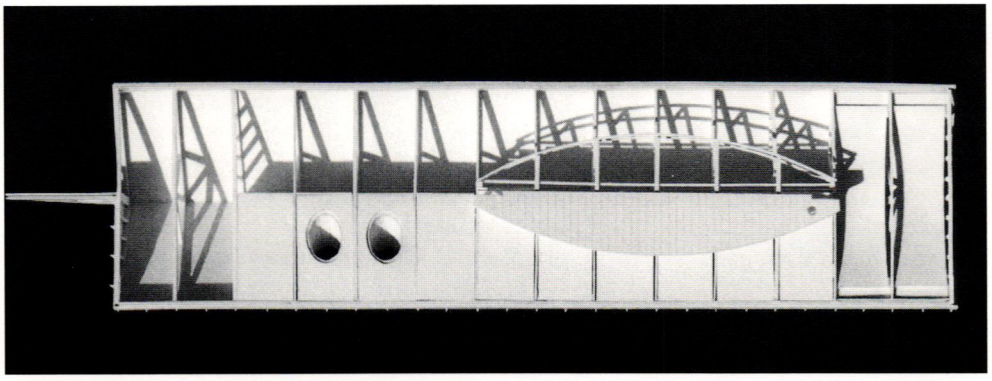


Fig. 14. Roof.

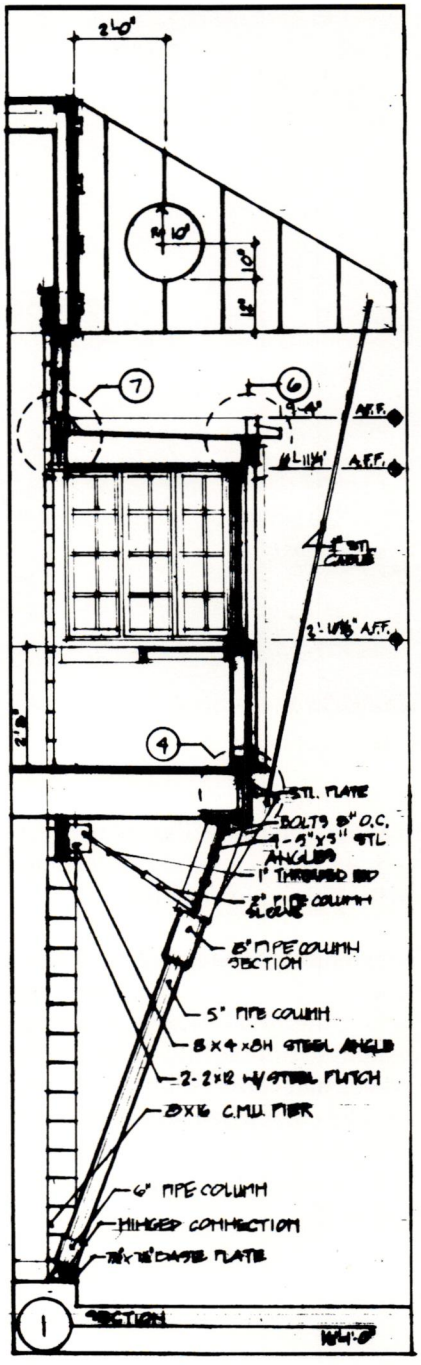


Fig. 15. Gazebo detail.

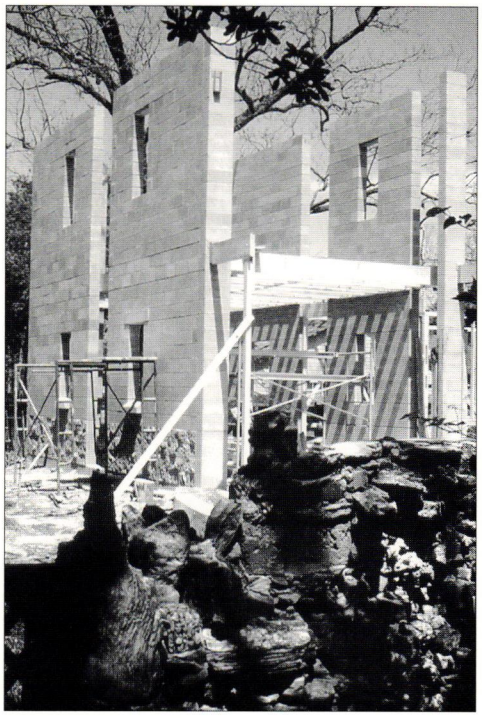


Fig. 16. Construction.

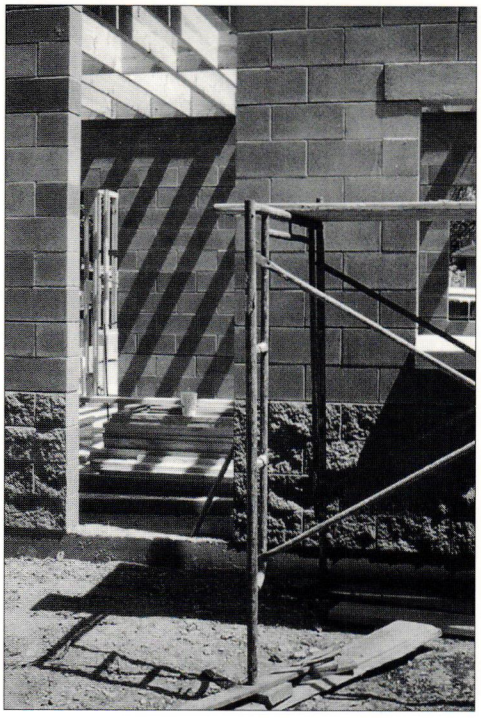


Fig. 17. Construction.

Fig. 18. Construction.

dio above proclaims the energy of a sun room, while the invalids are rumored to howl at the shadows of the moon.

An extending quarry locates the hollowed/hallowed ground of this tentative pavilion, the in-valid house, whose façade threatens to tumble into the grotto below. A wheelchair conveys the library and media center compacted into its dimensions, serving equally as totem, casket, and reliquary for ancient truths: the vehicle for the invalids.

THE SNOW HAMILTON HOUSE
Bryne Avenue, Houston, Texas

Pre-Conditions to Construction
Site surveyed, 1891.
Landfill, 1891-1940.
Children's playground, 1940-90.
Site purchased by the Three Little Pigs, 1990
Site excavated; materials retrieved, sorted, and stockpiled, 1990-1.

Schedule
Construction commences 10 September 1991.
—1. Lunatic drills twenty-eight bell piers bypassing generations of debris.
—2. Pour scoured concrete plinth; apply Texas tobacco spit finish.
—3. Build basement; use ancient blocks quarried from site.
—4. Lay-up C.M.U. walls for the strong house; frame stud partitions for the estranged pavilion.
—5. The construction shed is the composite forum of all the trades: a pattern book, a sampler of all familiar possibilities.
—6. Span stronghouse with open web steel joists; 2 x 6-inch pine sub-flooring.
—7. Wood trusses give measure to the sky; install galvalume roof and all frame partitions.
—8. Closets and cabinets will be retrieved plywood/batten packing crates.
—9. An outhouse serves both strong house and in-valid pavilion, and is the barometer to the greening of the garden.
—10. Projected completion: August 1993.

Fig. 19. Gazebo.

BIOGRAPHICAL NOTES

MARC ANGÉLIL is Associate Professor at the University of Southern California in Los Angeles. He received his architectural degree from the Swiss Federal Institute of Technology (ETH), Zurich, where he also completed his doctoral dissertation on theories of architectural technology. With Sarah Graham and Manuel Scholl, Mr Angélil practices architecture in the United States and Switzerland. His firm was recently awarded first prize in an international competition for the new town center of Esslingen, Zurich.

TIMOTHY CULVAHOUSE received his Bachelor of Architecture degree from Tulane University, and his Master of Environmental Design from Yale. He practices architecture in Providence, Rhode Island, where he is Assistant Professor and Head of the Architecture Department at the Rhode Island School of Design. Mr Culvahouse was co-editor of the 1978 *Tulane Architectural View* and has contributed articles to *Perspecta, Tulane School of Architecture Review, Rhode Island/AIA Newsletter*, and *RISD Views*.

MARCO FRASCARI was born in Mantua, Italy, in 1945. Since his 1969 graduation from the IUAV in Venice, he has divided his time between academia, writing, and small scale practice. He completed his formal studies in 1983 with a Ph.D. in architecture from the University of Pennsylvania, where he now teaches design and theory, as well as directs the doctoral program. His book on architectural anthropomorphism, *Monsters of Architecture*, was published in 1991 by Rowman & Littlefield, and he is presently working on a new volume with the temporary title *Under the Sign of Wonder*. Mr Frascari's current practice includes residential work in Vicenza, the second phase transformation of the Dogana Veneta in Lazise (Verona), and the design of his dream house for the next millennium. In addition, Mr Frascari has been appointed architectural consultant for the restoration of Alberti's church of Sant'Andrea in Mantua.

KENNETH MARTIN KAO has been Lecturer in Architecture at the Harvard Graduate School of Design since 1987. He previously taught studio and building technology at the Lehrstuhl fur Architektur und Konstruktion at the Swiss Federal Institute of Technology (ETH), where he received a Doktor der Technischen Wissenschaften. His dissertation focused on the role of technology and experimentation in the work of Frank Lloyd Wright. Mr Kao received his Master of Architecture degree from Harvard University, and his Bachelor of Arts in Architecture from the University of Pennsylvania. His professional practice has included institutional, commercial, and residential building types. Mr Kao is currently a senior associate at Jung/Brannen Associates, Boston, working in a joint venture with Ove Arup & Partners, International, on the A.O.A. headquarters complex in Abu Dhabi.

MARY McAULIFFE is Assistant Professor at the Harvard Graduate School of Design, where she teaches architectural design and technology. She received her masters degree in Architecture from Rice University and has taught at the University of Cincinnati and Tulane University.

WILLIAM ALEXANDER McCLUNG has been teaching Renaissance English literature and architectural rhetoric at Mississippi State University since 1984. He received his undergraduate degree with

highest honors from Williams College in 1966, and went on to earn both master of arts and doctoral degrees from the department of English at Harvard University. Mr McClung has authored many books and articles on literary-architectural relationships, including *The Architecture of Paradise*, "Light in a Landscape of Desire" (in *Places: A Quarterly Journal of Environmental Design*), "Dialectics of Literary Cities" (in *Journal of Architectural Education*), and "The Matter of Metaphor: Literary Myths of Construction" (in *Journal of the Society of Architectural Historians*). He has lectured widely and held visiting professorships at Meisei Univiersity, Tokyo; the University of California, Los Angeles; and the Georgia Institute of Technology. He is currently editing a forthcoming volume on the poetry of John Donne.

GLENN MURCUTT spent his early life in Papua New Guinea and was educated at the University of New South Wales (NSW), Australia. He has served as project architect in the office of Ancher, Mortlock, Murray & Woolley; and maintained a private practice in Mosman, NSW, since 1969. His early work, consisting of both residential and institutional commissions, is the subject of the monograph *Leaves of Iron* by Philip Drew. Mr Murcutt was awarded the 1992 Alvar Aalto medal for regional architecture, and presently teaches in the department of landscape architecture at the University of Pennsylvania.

PETER DAVID WALDMAN was born in New York City in 1943. After receiving his B.A. and M.A. degrees in Architecture from Princeton University, he spent two years in Arequipa, Peru, as Chief Architect for the Junta de la Rehabilitacion y Dessarrolo De Arequipa in conjunction with the United States Peace Corps. Mr Waldman has since taught at Rice University, the University of Cincinnati, and Princeton; and held visiting professorships at the University of Texas, Harvard Graduate School of Design, and Southern California Institute of Architecture. Since 1992, he has taught design and theory at the University of Virginia, where he has been involved in numerous extra-curricular activities, including *Modulus*, graduate admissions, and individual research. Mr Waldman has lectured and exhibited across the United States, and his work has been featured in such journals as *Global Architecture*, *American Craft*, *The Princeton Journal*, *Progressive Architecture*, *Center*, and *Texas Architect*. Mr Waldman is currently designing his own house in Charlottesville, Virginia.

WILFRIED WANG was born in Hamburg and studied architecture in London, where he is in partnership with John Southall. Together with Rosamund Diamond, Marcel Meili, and Linda Pollak, he edits *9H*. Mr Wang currently teaches architectural design and history at the Harvard University Graduate School of Design (GSD). With Caroline Constant, Kevin Kieran, and a number of students at the University of Florida and the GSD, he is preparing an exhibition on the architecture of Eileen Gray.

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