





## ***A building is a struggle, not a miracle.***

(Kahn, 1953)



Among architects and educators today the proposal for *design research* is generally understood as follows: the design of buildings is not only a professional practice but also a form of inquiry, a member of the growing family of research disciplines at work in the world today.



The older siblings are well known, the highly regarded research fields in the natural sciences: physics, chemistry, and biology, for example. In the next generation are the social sciences: economics, political science, and sociology. Also related are the fields in which the basic sciences are applied: medicine, engineering, and information technology. This last group is more akin to architecture, for these academic disciplines are also professions. The problem with architecture is that it has also family ties to disciplines beyond the sciences, to painting, sculpture, urban design, and landscape architecture, even literature and poetry. Furthermore, artistic practices are not only non-scientific, they are purposeless, or so they seem, for we tend to see beauty as its own reward; we call it aesthetic pleasure. But these categories – natural science, social science, the arts – together with the terms that designate them are no less subject to debate than the words “design” and “research” with which we began.



Today’s wide enthusiasm for research in all fields is rooted in a long tradition. For two centuries centers of learning have turned from received wisdom to research. Professors still profess, but a university’s greatness is measured by the volume and quality of its *research output*. While the transmission of knowledge – teaching – is obviously necessary in higher education, it is insufficient for what we tend to see as society’s greatest need: the progress and production of knowledge.



How do matters stand outside the university? While some may think it odd to suggest that research could be undertaken in an architectural studio or workshop, dedicated as it often is to business success and career advancement, scientific advances in our time often do occur outside university settings. In recent decades we have witnessed the steady increase of research centers, institutes, and foundations.



Some have close ties with universities, others operate independently, not only to increase knowledge but financial profit. But even work in the basic sciences is no longer centered in academic institutions – still less in teaching programs – because the institutional support for research is often non-academic. The massive and thoroughgoing transformation of society through industrialization has had its effect on universities as much as on any of the institutions of modern life. Anyone involved in research today knows that the question concerning funding often determines the scope, setting, and personnel of study programs. Study programs are commonly seen as extensions of the *research industry*. Corporations not only supply funding, they propose topics. But the alliance between the academy and business is not without its critics, for the fundamental purpose of science, the advancement of understanding, together with



1. Louis I. Kahn, Dominican Mother House, “collage plan,” 1966. By Permission of the Kahn Architectural Archives, University of Pennsylvania.



2. Louis I. Kahn, Master Class jury, 1971; including, in addition to Kahn and a student, Robert Le Ricolais and Robert Engman. By Permission of the Kahn Architectural Archives, University of Pennsylvania.

its characteristic style of thought, free inquiry – independent of applications – and critique, including self-critique, is often compromised by the push toward practical results.

What bearing does this have on architecture—in teaching and professional practice? As I have said, design research is not entirely new to architecture, not to practice or education. Rather than present an account of its history I would like to illustrate the interconnection of research and teaching in the design studio by examining a case from the relatively recent past: the teaching of Louis I. Kahn at the University of Pennsylvania – an equivalent to Le Corbusier’s “*L’Atelier de la Recherche patiente*.” Through this case I will try to show how knowledge and skills – even those of the most talented and widely respected architect – are not only transmitted and acquired in the design studio, but *discovered* there, much like laboratory research in engineering and creative work in an artist’s studio. Research and discovery are even more important when studio work has become habitual.

Kahn’s texts show that he was very sensitive to the limitations on free inquiry when certain kinds of application gave design research with its goals and orientation. Only when the university is “cleaned of the market place,” he warned, can it become a site of real research (Kahn, 1986, p.92). Already forty years ago he observed that university researchers had brought their research goals into alignment with the interests and funding opportunities of government and industry – research on human association in urban institutions, for example, was not only funded but *constrained* by government agencies intent on urban renewal in the 1960’s. Opposed to such constraints, he said study programs of that kind belong instead to the marketplace not the university. “Only the purest kind of thinking [, only the kind that] leads the individual mind to its specific way of thinking should be in the university.” (Kahn, 1986, p.92). A potentially negative consequence of an exclusively disciplinary focus is the displacement of topics such as construction to industrial partners, whose concerns may be less with architecture than optimization and profit.

Thought as pure as Kahn intended begins with wonder, the courageous and frank admission of unknowing, of doubt about basic things, such as a room, a wall, or window. The first impediment to architectural research that must be cleared is the notion that study programs are dedicated to solving problems, such as the one I just mentioned, the disorder of American cities in the post-war years. Kahn maintained that even if clients pay for answers, architectural research depends on questions, as does creative design. A good question, he said, is much more valuable than a brilliant answer. Why? Because questions bridge between what he called architecture’s *measurable* and *un-measurable* dimensions. One way to think about this distinction is to couple it with another that was very provocative when he first posed it: the difference between buildings and architecture. Architecture, Kahn said, does not exist; only buildings exist. For this reason architecture



must be searched for, as if it has been lost, sought after, as if were out of reach; and not once or twice, but repeatedly. What the philosopher Edmund Husserl said of himself, that he was a perpetual beginner, can be said of the architect who has a research program. This self-identification also defines the central and simple meaning of design research: its real challenge is that it is a *quest without an object*.



This explains Kahn's familiar question: "how am I doing Le Corbusier?" (Kahn, 1991, p.297-312). Kahn, too, was moving *towards an architecture*, in full recognition that one did not exist. At the same time, he felt, and I believe, one can only imagine architecture through specific buildings.



Defining research in this way couples it with the issue of beginnings, what Kahn called the search for *volume zero* or *minus one*. Each problem in the design studio was an opportunity for students and teachers to begin again, to reverse the roles of the clear and the obscure, not to make the second the preamble to the first but to discover what is unclear in what seems so obvious. Moving forward depends on going backward. The target of this kind of inquiry can be called *the beginning of the beginning*. While radically preliminary, this kind of start anticipates its end. For this reason he also called the beginning an "eternal confirmation" that reveals what is natural to man. "I try to look at my work," he said, "with a sense of what is forthcoming," the yet not said and yet not made, for that, he advised, is what "puts the sparks of life into you (Wurman, p.176-177). But again, the subject matter is "his work;" which is to say, the set of tasks he was given *in those days, in that city*. There can be no approach toward an architecture apart from explorations of the concrete problems of a particular building – its location, program, kind of construction, and so on. Here, then is the unavoidable paradox: the search for beginnings unfolds in the midst of current conditions. Research finds its foothold in the middle of things, but in that context it seeks beginnings that anticipate ends.



Kahn's sense of unending beginnings in research allowed him to offer a surprising view of teaching: "as you know," he said, "I am a teacher which means really I am teaching myself and whatever rubs off, the student gets." (Latour, 1986, p.102). Again we find an injunction against routine instruction. The university is not a place for the transmission of knowledge; that's the task of trade schools. His standard was high. Let me repeat one of his lines: the work of teaching "is to present the yet not said[,] the not yet made. It is [a form of] self-inspiring." (Latour, 1986, p.309). Obviously, this couldn't be done on one's own; the self-inspiring he proposed required dialogue. He organized his studio in the manner of a seminar. Together with the students were fellow teachers. For most of the juries there were besides himself, the Head of School, Dean Holmes Perkins, another architect, Norman Rice, and two other key figures: Robert Le Ricolais, an engineer, and Robert Engman, a sculptor. That a group discussed student projects is not surprising, today that's the norm; but Kahn brought together a-typical types: architects, engineers, and artists. Engman the sculptor and Le Ricolais the engineer were not there to talk





3. Louis I. Kahn, at work in his professional office, the Fisher House, c. 1965. By Permission of the Kahn Architectural Archives, University of Pennsylvania.

like architects, they were included because they typically focused on aspects of projects that Kahn felt were essential even if not obviously architectural.

Let's first consider the artist. Kahn believed that painters and sculptors are uniquely and intensely expressive. Their works result from inspiration, not calculation; they bring before us images that are compelling and beautiful, even if they show us things that haven't and can't be seen. Kahn called them "expressive impossibilities." (Kahn, Wurman, p.50). To explain himself he often referred to two painters, Giotto and Marc Chagall. When he invoked Giotto he alluded to the disproportion between a man and his house in some of Giotto's paintings. For Chagall it was the matter of men and women appearing to fly across the space of room or landscape. Kahn observed: "Now you can see that [both Chagall and] Giotto knew that man can't fly, [they] knew that a castle is much greater than a man... But [they were] expressing something; [their distortions and impossibilities made a kind of sense]." (Kahn, Wurman, p.50). Wonderful as it is, this way of working is not right for the architect. Kahn continued: "the painter has found this marvellous thing in the validity of what he is doing because he is a painter and not an architect, who's a different animal." (Kahn, Wurman, p.50). While a sculptor can express the futility of war by placing a canon on a cart with square wheels, an architect must use round wheels. The distinction can be summarized as follow: while the artist intends possible realities, the architect intends real possibilities. Yet, the differences are not absolute, for there is something of the artist in everyone. Each of us feels the desire to express ourselves, no matter what our vocation. One way we do so is by making things. Kahn called the art of craftsmanship "the poetry of expression." (Latour, 1986, p.154). Craft like art brings things into being; it creates life, through images. Students learning the craft of architecture share with sculptors and painters not only the desire to express themselves, but often the same means—drawings, models, etc. For this reason painters and sculptors can play productive roles in architectural education. Without art, architectural education loses something essential. Kahn said, "our schools fail because there isn't an element about them that brings out the artist... [without art they] don't instill the will to work, to discover, the will to produce something coming from inside yourself." (Latour, 1986, p.54).

The engineer's role is different, not a view within, but without; not into the person but outward to the world. Changed focus means changed results: the outcome of scientific study is not something unseen but something understood more fully. The engineer, like the scientist, "is concerned with measures, with the nature of nature." (Latour, 1986, p.147). Unlike the painter who makes what does not exist, the engineer inquires into the world that is given, particularly the natural world. The engineering (or more properly scientific) concern is not with new worlds but seeing the world anew. Kahn wrote: "It's the discovery of nature's powers, that's all—that's what anyone does

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who's a real engineer." (Latour, 1986, p.307). Speaking particularly of his teaching colleague Le Ricolais, he said that his great desire was to get from nature its most guarded secrets, for those secrets would allow him to put before those who had not yet found ways of expressing themselves ways they might do so. He summarized the engineer's contribution as follows: "knowledge feeds the desire to express." (Kahn, Wurman, p.76).

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So when the student presented a project in one of Kahn's studio juries three sets of eyes—three viewpoints—were there to guide the search for beginnings: those of an artist, an engineer, and an architect. The artist encouraged self expression, the engineer advocated for what is right by nature, and the architect looked for ways these two vantages could be combined. Outside of studio these same students often took courses in art and engineering, working in Engman's sculpture studio or Le Ricolais' structures lab. His long-time collaborator August Komendant taught them in structures every Friday morning. Here's my simple conclusion: good architecture requires more than good architects.

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What types of projects were studied and discussed in these ways? What were the vehicles of research in Kahn's studios? In point of fact, he often assigned students one of the projects he was working on in his professional office, usually an institution, sometimes a single house. (Latour, 1986, p.177). Rarely was a detailed program given; instead, he introduced projects with a short philosophical statement, sometimes a single word, such a *room* or *forum*. Norman Rice then gave data on requirements and location. Rice saw similarities between Kahn's way of working and that of his mentor, Le Corbusier. Rice explained: "my preceptor, Le Corbusier, who was both an architect and a painter, once told me that he fought out his architectural battles in his paintings. I believe that the discussions in Kahn's studio, with their give and take, helped Lou fight out and resolve many of his architectural battles." (Kahn, Wurman, p.294). Another analogue is play: the give and take of dialogue is comparable to playing with and being played by another person. The aim is not so much to score points but build agreement on topics of shared interest. The basic premise was that different professional viewpoints would be mutually enabling.

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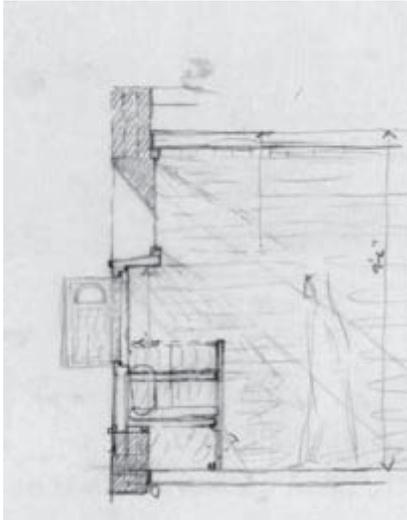
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Surprisingly perhaps, a similar style of work and communication existed in Kahn's professional office. Kommendant wrote that the assistants in his office spent most of their time drawing repeated studies. Komendant distinguished studies of this kind from what he called proper architectural drawings, by which I assume he meant production drawings, details, and specifications. Kommendant wrote: "Kahn's office, in a true sense, was not an architect's office but a studio. Almost all his architects, mostly graduates from his master class at Penn, tried to behave, think, and act like Kahn" (Kommendant, 1975, p.172). The engineer was critical of their structural understanding, as he was of Kahn's. He wrote that Kahn misunderstood the semi-circular roof structure of the Kimbell. He reports that Kahn wrongly considered the semi-circle as an arch, not a beam, which it

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4. Louis I. Kahn, Dominican Mother House, plan, 1968. By Permission of the Kahn Architectural Archives, University of Pennsylvania.



5. Louis I. Kahn, Dominican Mother House, wall section, 1966. By Permission of the Kahn Architectural Archives, University of Pennsylvania.

actually is. Once its workings were explained, Kahn changed his design.

The key in both the professional office and the academic studio was questioning, beginning again. Kahn wrote: Now I wish to tell you what I feel when I enter the classroom. To me the class is a check. I really couldn't practice without it. I consider the students sort of pure in their way, and I consider myself as having to answer to that purity." (Kahn, Wurman, p.248).

Let us turn, then, to one of the themes or topics he used to orient the research dialogue. One type of project Kahn often gave is the monastery. It was also an instance of an institution that he researched while he was working on the very same theme in his professional office. We can take it as an instance of searching for beginnings by starting with specific conditions, renewing beginnings, I said, in the middle of things.

Kahn described his approach as follows: "The problem was a monastery. We began by assuming that no monastery existed... We had to forget the word monk, the word refectory, the word chapel, the cell..." (Kahn, Wurman, p.221). I suspect this was no simple task, but I also believe it was an essential methodological premise. Although the search for beginnings was mutual – teachers and students together – Kahn was more skilled in both design and questioning, for he remained preoccupied a few themes throughout his life. In the case of the monastery project given in 1965 Kahn reported that no progress had been made after two weeks had passed. But that did not mean the days were wasted. Instead of moving forward, the students and teachers went deeper into primary issues. Then, in an afternoon's discussion, a key insight was offered by a student. A girl from India said: 'I believe the cell its the most important element of this community and that the cell gives the right for the chapel to exist, and the chapel gives the right for the refectory to exist, and the refectory gets its right from the cell, and that the retreat is also given by the cell and that the workshops and all were made by the right of the cell.'" (Kahn, Wurman, p.221) Kahn thought: fine! But a good premise does not mean a good design. The student's project was rather poor. While the Archive at Penn has some of the projects from this period, the one by the Indian girl was not photographed. Others that were show elements and configurations that resemble the forms and patterns Kahn himself was exploring at the time: bi-axial symmetries, centralized spaces that opened diagonally, cluster configuration, enfilade planning, repetitions of simple forms (particularly the square), and so on. Kahn singled out one project for particular praise, a design by an English student that invented new elements: an unusually dominant fireplace and a refectory half a mile from the monastery's center. He concluded his account by saying that the originality of thought evident in the projects would not have occurred if he had given the students a specifically detailed program of requirements.

It is not surprising that plan configurations of the projects vary – linear, centralized, and diagonal; with single and double courts. They also differ in the ways their patterns relate to the building's location.



Some projects are exceptionally compact, suggesting an introverted institution, detached from the wider milieu; while others open into the landscape, as if outward reach were more important than internal coherence, association rather than self-definition. There is also the matter of proportioning. In some projects all the elements are commensurate with one another: same-sized elements are turned 45 degrees to one another, squares are set within the circumference of circles, and smaller units are half the size of the larger ones they join. Other projects seem indifferent to the task of proportioning, but express the nuances of different uses. Nevertheless, the basic requirements were the same for all the projects: secluded contemplation, learning, ritual community, and interaction between the nuns and visitors from outside.



Accordingly, a number of disciplinary themes seem to have oriented the discussions and research in Kahn's studio.<sup>1</sup> One was the reality of a defined place, as opposed to the then-current preoccupation with unlimited space and its ever-more immaterial modulation. The room was researched as architecture's 'degree zero.' Another topic of study was the principle of association, cell to cell, as we've seen, but also among the several parts or types within the institution, library to refectory, and so on. This research would clarify the possibilities for an architecture of connections, as opposed to systems of circulation. Connections were sought not only between the parts of the institution but also the terrain beyond it. Aldo van Eyck, Kahn's friend, and fellow teacher at Penn called this type of connection *reciprocity*. He once advised that the "medicine of reciprocity" be administered to the sick body of modern architecture.



While Kahn was exploring the monastery at the university he was also at work on one of his most fascinating projects, even if it was never built, the Dominican Mother House for a rural site outside Philadelphia. He worked on the project for four years, 1965-69. In Penn's Archive there are 16 portfolios of work devoted to this project, containing over nine hundred sketches, drawings, and prints. The images range from charcoal sketches to carefully constructed plans, sections, facades and details – but no perspectives or axonometrics. Hundreds of sheets also contain annotations, in Kahn's hand and that of his assistants, which attest to dialogue in design development. The architect's thinking obtains great tangibility on these sheets, his single-minded dedication to certain research themes – those I've just listed as the topics of his Penn studio work – as well as his struggle with the concrete particulars of this specific task: the interests of the nuns, the site, the budget, and the local building traditions.



The start of the project was disarmingly simple: Kahn drew a number of elements on a sheet of yellow paper that outlined the sizes of the several key elements of the program: rows of cells for the different types of nuns (older and junior professed sisters, novices, postulants, and so on), together with blocks for the refectory, chapel, and library. From this point onward Kahn struggled with the arrangement of these same elements – distances, associations, connections. His basic question concerned the





6. Louis I. Kahn, Salk Institute, Le Jolla California, façade detail, 1959-65.

right relationships between the parts and the whole, as well as the entire ensemble with its wider landscape. Between June and December of 1966 he developed and presented three very distinct schemes. Configurations changed, as did sizes: the first scheme measured about 16,000 square meters, the third had been reduced to 12,000. Further reductions and simplifications followed in the coming months and years. One of the most remarkable layouts is shown in the so-called collage plan of October 1966. Historians have struggled to make associations between this drawing and the designs of other architects and artists – one of the most convincing association is with Isamu Noguchi, with whom Kahn was collaborating at the time on the Levy Memorial Playground in New York City – but that kind of interpretation shouldn't distract us from the discovery this design represents: after spending so much time and energy researching the problem of movement from room to room this drawing shows him hitting on the idea of making connections at the corners of well-defined settings, preserving the clear individuality of each, but integrating them into one unified ensemble. A good precedent for this in his own work is Erdman Hall. The rotations are apparent in the Fisher House, as well as the Levy Memorial Park. In each case, the space of the whole is articulated through the spacing of the parts. An equally beautiful development shows his sense of inhabiting thickened walls. At one point in the project's development he asserts that even the wall can be a room. One beautiful version of this can be seen in the Exeter Library. Delamination isn't required, rather a kind of excavation or digging into the wall's thickness, hollowing and extending is elements into the equipment of reading, storage, ventilation, and viewing. But money problems called for still more reductions and still more designs, more and more compact. Yet Kahn still sought to preserve the idea of an ensemble of discreet rooms. The key task of the later schemes was to engage the wider milieu, following the principle of reciprocity. Construction documents were produced for a final scheme, but once the sisters saw the cost—even with all the reductions and down-sizing it represented—they stopped work on the project. In the end, nothing was built. An up-scale housing enclave laid out by some developer stands on the site today.

Kahn's way of working has been described as a culture of making. (Merril, 2010, p.9) It can also be seen as a journey; not one that rides on rails, still less in the air; but grounded and subject to all the congested traffic, road-blocks, and dead ends that actual terrain presents, as well as the straight streets, clearings, and smooth connections to which one is sometimes treated. The drawings and discussions in both the university studio and the professional office show a combination of false starts, reversals, insights, accumulations, and conclusions unfolding over time. What was initially sought after sometimes revealed itself to be chimerical, at other times what appeared at a drawing's margins as an accidental mark indicated an unforeseen possibility. One should not say projects of this kind – of any kind – develop by chance, but their outcomes are



far from pre-given. Retrospectively the results make sense, but during the work's unfolding the process is not entirely clear where it is going. It could be described as a kind of blind logic that creates itself along the way.



Its path is often indirect, detouring after advancing, then turning back, renewing beginnings, and moving forward once again. Perhaps it could be described as a mixture of chance and reason: chances must be taken because repetitions never advance, yet reason must intervene because the initial problems still lack a solution. The games people play would lack structure and never develop momentum if players did not know with reasonable certainty the outcomes of certain moves. At the same time they would fail to excite if foresight could be extended indefinitely. Projects play with circumstances and are played by them. In his last text Le Corbusier said one thing in life is key: to play the game.<sup>2</sup> Such a process is less a matter of foresight and calculation than of cunning, requiring alertness to possibilities as they emerge.



Drawings can be said to be the instruments of this emergence; but drawings of a particular kind. There is much repetition in Kahn's drawings. We've seen the same thing in the work of his students. On the matter of repetition, the philosopher Søren Kierkegaard (1983, p.149) once wrote: "The dialectic of repetition is easy, for that which is repeated has been—otherwise it could not be repeated—but the very fact that it has been makes the repetition into something new." I realize one must always be wary when a philosopher says the issue he is about to address



is easy, but Kierkegaard's sense of the repetition dialectic accords very well with what appears on the pages of Kahn's sketches: dedication to a few themes, repeatedly beginning again, each attempt revealing a new possibility, sometimes a new insight. As with architecture generally, the same is sought but never achieved. The pace of the project is, of course, slow. Le Corbusier called his work *patience research*. There is in Kahn dogged dedication that never hurries. Slowness delays progress so that opportunities are not foreclosed; doors are kept open for the entry of something unexpected that may be better than the answer that seemed so obvious. Kahn wrote: "While drawing I'm always waiting for something to happen: I don't want it to happen too quickly, though."<sup>3</sup> He hand lingered on essential topics, sketching was a way of abiding with primary questions.



His work was not indefinite: drawings would fix intentions but leave the possibilities of final resolution open for future consideration. Openness was not the end, only the means; architects must *draw the line somewhere*. But as I've said, when design is construed as research, lines that have been finally drawn eventually provoke the same questions once again.



As I conclude I would like to summarize my arguments in five points:



1. Design research in architecture contributes to the discipline when it redefines itself through encounters with neighboring disciplines, such as art and engineering
2. Its practice is at once dialogical and individual, participatory and personal

3. It is rooted in particularities of place, program and production; but also transcends itself into other projects, recalling some and anticipating others
4. That it follows a kind of blind logic, both intuitive and interrogative, clearest retrospectively, but never clear enough
5. That its history and development are peculiar and maybe paradoxical, moving forward by going backward, ending in ways that allow subsequent beginnings.

Lastly, I want to comment on the striking contrast between the apparent finality of Kahn's buildings, the inevitability they express, and the doubt, uncertainty, and openness that paced their development. Starting from the Trenton Bathhouse and progressing through Dacca and Salk, Kahn's built work repeatedly reasserted architecture's constancy, its implacable and resolute permanence. Yet, continual change seems to have given him these results, continual questioning and rethinking. But rethinking, like beginning again means that his themes were *resumed*, that the study continued, project to project, from one set of insights to another, also mistakes, some decisions surpassed and others retained, each step recasting those before and suggesting others to follow, all together clearing a path that makes great sense when seen retrospectively even if it didn't at the time. Kahn was a Philadelphia architect, but became more than that. He was also a man of his time, but speaks to us today no less than he spoke to ancient Rome. He redirected the modern tradition, but never had that as his aim. His concerns were more local, which is to say disciplinary: the architecture of being in a situation, of association or connection, and of concrete embodiment. Thanks to the depth of his research, these themes are not only his but ours.

1 → These observations correspond to those made in Michel Merrill's excellent study of Kahn's project for the Dominican Mother House, to which I will turn shortly. For full documentation and an insightful description and interpretation, see Michael Merrill, Louis Kahn On the Thoughtful Making of Spaces (Baden, Switzerland: Lars Müller, 2010), plus the accompanying publication of the key drawings: Michael Merrill, Louis Kahn. Drawing to Find Out (Baden, Switzerland: Lars Müller, 2010).

2 → Le Corbusier, Mies au point [1966] (New Haven: Yale University Press, 1977), 144: "Rien hors de la règle! Sinon je n'ai plus de raison d'exister. Là est le clef. Raison d'exister: jouer le jeu.

3 → Louis Kahn, "Signature Against the Sky," (1967), in Eye on Art "Signature against the sky", a portrait of Louis I. Kahn, architect; produced by WCAU-TV Philadelphia.

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