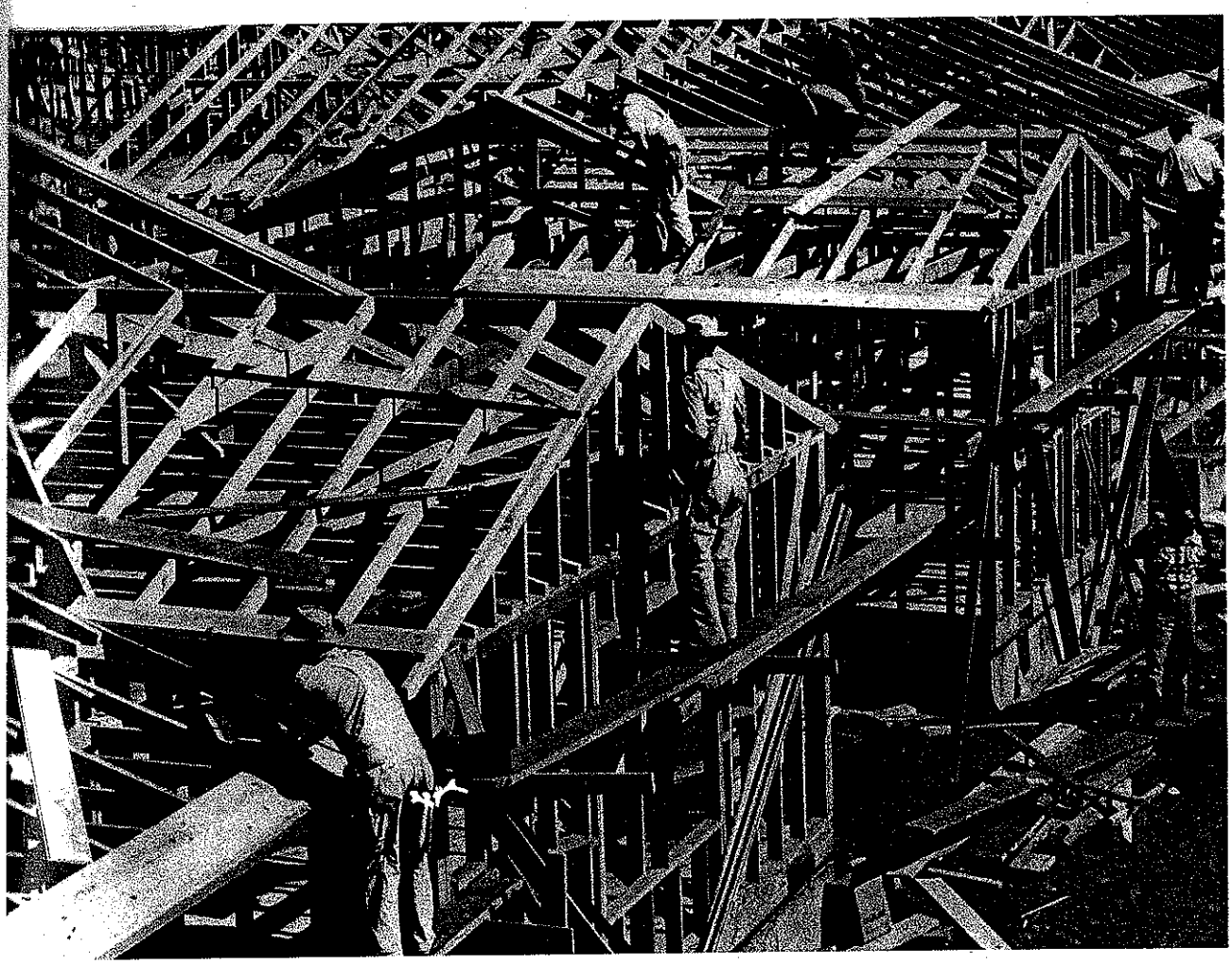
An American Culture of Construction

Tom F. Peters

Ever since the 1920s, an increasing convergence of architectural thought has made itself felt over the globe. The modern flow of information and international tourism encourage this. Formerly the phenomenon was referred to as the nebulous "International Style," but today it goes unnamed. Then as now, it worries many who fear a leveling of cultural variety and independence, and the fact that this body of thought is interpreted differently in the various cultures continues to escape notice; it is too subtle to excite much interest. Even when recognized, critics tended to discount such varying interpretation as provincial "misunderstanding" of the "true" meaning of a theory. But it is precisely such misinterpretation, or rather this creative misunderstanding, both within as well as across the borders of a culture, that vitalizes the manifold aspects of the world of architecture which flourishes beyond professional polemics.[1]

Architecture in the United States actually thrives on creative misunderstanding while apparently suffering both from an inferiority complex toward Western European professional theory and history and from the oversimplification of populist polemics. Meanwhile, American architecture strikes the European as familiar and yet, at the same time, as indefinably different.[2] Our built world both fascinates and simultaneously often repels the European. "Why," ask European professionals, "can we not do what works so unselfconsciously in the United States? Why are we in comparison so ensnared by our traditions and so slow to change?" Then, inversely: "Why do they seem to have no traditions at all, but jump from one form or fashion to another?" On the other hand, European architecture attracts us by its iconographic complexity, yet we experience insurmountable difficulty in translating European concepts into our own context. What we often forget is that our architecture is firmly rooted in its own theory and technology. The confusion on both sides of the Atlantic is caused by blindness to the differing value systems of the two cultural groups, and these value systems depend in turn on each culture's inherent systems of thought.

Empirical thought, which deals primarily in concrete problems rather than in concepts, is most highly developed in the United States. Based as it is on the philosophical doctrine of pragmatism, of cause and effect, empirical thought is linear in form rather than a matrix. Its opposite is conceptual thought which proceeds from the "higher" generalization to the specific. While pragmatic thought is synthetic in nature, conceptual thought is deductive or



analytical. This latter mode of thought is widespread in Western Europe, particularly in France and Germany. It is not that it is absent on our side of the Atlantic, it is of course common here too, but the underlying cultural values of our society tend to reinforce empirical rather than conceptual approaches to problem solving. This empirical approach seems to lack complexity, to recognize no subtle cultural boundaries or taboos. And it is precisely through that self-same independence from stultifying taboos that pragmatic thought can stimulate invention.

Cultural boundaries may be mere mental barriers, but they hinder us as though they were solid. It is our present lack of impermeable boundaries which the European is both fascinated with and abhors; the fascination is with the potential freedom it implies by encouraging professional "border-crossing," and the abhorrence is with the lack of formal constraints with which all American cultural stages are set.[3] But of course our culture may well be in the process of inventing its own impassable boundaries too.[4] Each group, however, the American and the European, takes only its own limitations seriously while looking askance and at best with vicarious comprehension at the other's.

AN AMERICAN BUILDING SYSTEM

Cultural differences not only manifest themselves in modes of thought or in built form, but in building methods as well. The North American light timber framing system exemplifies the pragmatic thought process. Its standardized timbers, with nominal cross-sections of increments of two inches, are held in place by sheets of plywood nailed to them. They form the seemingly flimsy stick structures indigenous to our culture and peculiar to it. Most of our present construction volume, both residential and non-residential structures of modest span, are built using this light timber frame, so its impact on our built environment is a major one. Its influence extends even beyond the scope of residential structure as it probably formed the model for the development of steel framing systems for high-rise buildings at the end of the last century.[5]

The a-conceptual nature of the system is reflected in the imprecision of its name, "frame construction." It is namely impossible to determine whether "frame construction" really is a frame which derives its stiffness from the plywood skin nailed on it, or whether it is a panel system in which the panel elements are kept from flaring and buckling by the vertical ribs and edge beams nailed to them. Both forms of manufacture are practiced and lead to the same result. It is both a frame and a panel system at once, in precisely the same way that light reacts as either waves or as corpuscles, depending on which qualities are under consideration. The definition of the system is variable, and it must be redefined every time it is used according to which characteristics are preferred.

If we use the light timber frame as a panel system, certain basic rules of erection, connection and penetration are implied. The edges of the panels become important because they serve as loci where the elements of the system are interconnected. It is impractical to break a panel at its edges because that would weaken it. But whole panels can be removed without compromising the system. If, on the other hand, we view the system as a frame, then it manifests other characteristics. The elements are no longer structurally or formally so strongly defined; they are smaller, more differentiated, and specifically tailored to each special case. They are also more anonymous than the panels are. The rules for penetrating the skin of a frame structure are different too. Small holes can be made anywhere in the system by framing their edges with pieces of "two-by-four." There are no panel edges and everything is equally connected everywhere; there are no specially highlighted loci. But, in this case, large holes weaken the system.

CONSISTENCY IS NOT NECESSARILY A VIRTUE

As our light timber frame is by its very nature ambiguous, it can indeed only be our variable viewpoint which defines its form and not any predetermined criteria such as a consistency of method or means. Our architects thus feel free to mix and match the contradictory aspects of the panel and the frame. One corner can be designed according to the logic of the panel and another according to that of the frame.[6]

Such ambiguity is uncomfortable and even threatening to the European who immediately asks: "Yes, but what is it *really*?" What is it, in other words, that constitutes its essential characteristic? We coolly answer: "Who cares?" And indeed, what difference does it make what it "really" is, if only it functions to our satisfaction and fulfills our needs? American culture esteems philosophical clarity far less than the German or the French. We fabricate and apply and disregard in the first instance what the action or the result may mean philosophically. "Something as useless as that," say we pejoratively, meaning useless in the pursuit of money, "can be left to the professors," implying those who are merely capable of analytical thought. The European, however, wants to understand first. For only when the essence of a thing as well as all its ramifications have been fully understood does that render it operational to him.[7]

Faced with our American amorphism, the European will immediately ask whether the structural concept permits such behavior.[8] And we counter with the unanswerable, because anti-conceptual, question: "Why not?" Who is to forbid what and to whom, anyway, as long as the structure is sound? What the European considers a frightening lack of clarity, frightening because it provides no familiar boundaries, the American equates with freedom of choice. The bare technological facts of building may be identical on both sides of the Atlantic, but due to differing evaluation, they mutate culturally to mean the very opposite!

In European building, therefore, the design rules of systems are set a priori. The rules are characterized by consistency and a concomitant restriction of means. Logic then demands

that the form follow from the chosen limitations. If a European intentionally contradicts this logic, he designs "exceptions" to the system. If he does so inadvertently, he calls them "mistakes."

In Europe, the will to understand and to control through comprehension follows from the need for conceptual clarity and gives rise to the high esteem accorded theoretical work. The higher value accorded empirical thought in American work follows from the cultural difference.[9] In American culture, novelty evolves frequently by way of ambiguity in interpretation rather than through philosophical analysis of the problem.[10] Our process resembles more the world of Dada than what the lay person sees as the rationalized, optimized world of building. And indeed, the Dadaist movement in franco-germanic Europe preoccupied itself with ambiguous processes of invention which its protagonists recognized as forming the basis of a nascent American culture. Their self-conscious form of "creative misunderstanding" led to a novel, anti-traditional intellectual movement, turning it, however, from an American pragmatic approach to the world into a European intellectual one.[11]

THE RUBE GOLDBERG METHOD OF DETOUR

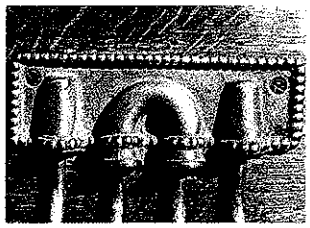
The European celebrates limitation as prerequisite to the creation of good form whereas the American tends to avoid any restriction. Where the German insists that mastery manifests itself in voluntary restriction, we insist with equal justice that mastery manifests itself in the skill with which problems are avoided or detoured.[12] We adopt the eminently defensible standpoint that systems and concepts should be helps and not hindrances. This causes our design behavior to appear to the European eye as unprincipled and devoid of philosophical rigor. In fact, what we do negates the whole development of European design theory.[13]

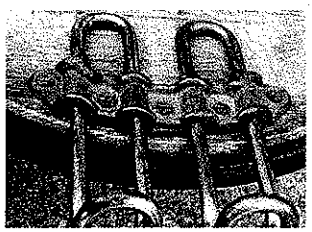
We have a lovingly admiring term for the method of detour: we call it the "Rube Goldberg method" after the famed cartoonist known for his whimsical mechanical contrivances.[14] Although the term has most commonly been used in derision and with negative import, its cultural overtones are ones of admiration for the cleverness of its detouring solutions to problems. Here the term is used in a positive sense to describe only the "method of detour" in solving problems and neither the problem itself nor its solution. The principle of problem avoidance transforms drawbacks into characteristics: the mastery lies in the economy of effort and therefore of time and money expended in solving the problem.

By giving the method a name we define the principle upon which it is based and we raise what was hitherto merely pragmatic to the level of a principle of design. In other words, we conceptualize the idea by talking about it; and by doing so we create a linguistic tool for the recognition of situations in which the principle is applicable, and perhaps even the recognition of the creation of the concept itself: *nomen est omen*. But the important thing is that by naming the method we render it present to our consciousness and make it into an operative means of design.

APPLYING THE METHOD OF DETOUR

The light timber framing system is not the only example of our building culture; our indigenous approach can manifest itself in any design area. An industrially produced typist's chair patented in 1895 manifests all the inherent qualities of our design culture in another way entirely.[15] The chair is made of copper-plated steel wire, cast iron and a primitive form of plywood. It was designed and prefabricated in a large series as a set of components and yet is clearly not the work of a conceptually trained designer with an interest in formal or structural logic.

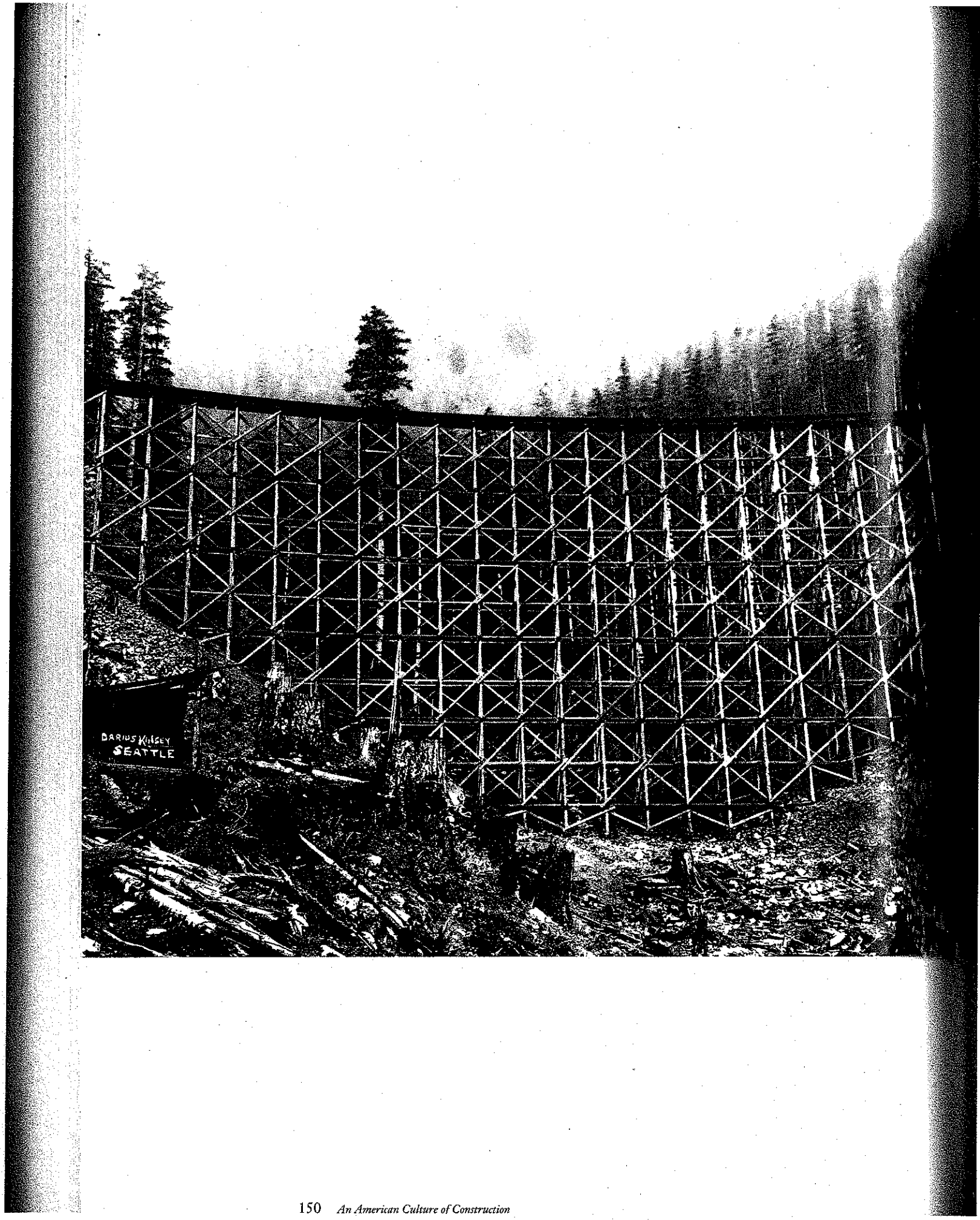




The snaking wire which forms the back support is clamped to the backrest by means of a cast-iron bracket. This connection cannot help wiggling, there is no way to prevent it from doing so, and no matter what is done, the wiggle will become ever more pronounced through use by compressing the wood slightly and wearing both the wire and the bracket. A European designer would be obliged to reject a solution of this type since adequate technical quality cannot be guaranteed. The designer of this chair certainly understood the technical "defect," but he circumvented the problem, he detoured around it, turning the drawback into a feature of the design by controlling the wiggle. By purposely "misunderstanding" the connection problem creatively, the designer transformed a poor connection into a new idea: the adaptable backrest.

The same phenomenon can be observed in the connection between the wire support and the seat: the wire will inevitably slip in the clamp fixed under the seat plate. In this case, the clamp is so designed as to permit it to slip easily in order to make the distance between seat and back adjustable. But no sooner does the sitter lean against the backrest, than the pressure he exerts will cause an overturning moment to act on the clamp. This stress will in turn jam the wire tightly in its sleeve and against the underside of the seat so that the back can no longer slip farther in or out. The principle of design is clearly the "Rube Goldberg" method of detour, inventively qualified by intentionally "misunderstanding" the problem. In both instances it is the application of the liveload, a factor not precisely controllable by the designer, which causes the desired effect of tilting or jamming. Effects that are uncontrollable are anathema to the conceptual designer. Because they cannot be proven mathematically, such effects occasion intellectual discomfort, reaffirming the European's need for a priori understanding and control of structural behavior. But lack of control is perfectly acceptable to the American, who is quite willing to approve of empirical evidence. Once again, as long as the desired effect has been arrived at *statistically*, the empiricist has no qualms in accepting and relying on it.[16]

Empirically "proven" details do not belong to the realm of conceptual thought because the connections are not seen as a family of similarly solved problems within a set of rules governing the assembly of the object. Here, the details of the chair are individual reactions to unique problems, and they create novel properties in the object by avoiding the necessity for solving the original problem, by instead solving problems that were not there at the outset.[17] The idea for the design of the connection is gleaned from the realm of practical experience in construction. It mirrors methods and processes of manufacture and the degenerative processes of use rather than conceptual thinking. And the eclectic use of structural detail in this chair also mirrors precisely the eclectic use of forms. The details are what the conceptual designer pejoratively terms whimsical or simply unsystematical, but they do demonstrate a high level of technical invention and understanding, and they continue to function perfectly after almost a century of use.


DARIUS KINSEY
SEATTLE

"ONE NAIL IS NO NAIL"[18]

QUALITY VERSUS QUANTITY IN CONNECTION TECHNOLOGY

The light timber frame is put together by means of an admittedly poor connector, the nail. But when the nail is used in large numbers and spread evenly throughout a structure, it behaves "statistically," as each nail carries the stresses of the structure in conjunction with all others. Nailed connections therefore hold because of their quantity and pattern of distribution rather than the quality of each connection. The nail is thus a "democratic" rather than an "autocratic" connector, and its success is governed by behavioral "consensus" and its "geographical" distribution throughout the structure rather than by individual excellence, much the same as our political behavior is regulated by the Gallup poll rather than by individual opinion. Of course, the nail holds some stress, just as the individual in our political system does make a decision, but the effect of the nail or the individual is entirely conditioned by its respective context. According to our political analogy, each unit or person in the system is considered to be equal and interchangeable. Any one unit may fail without endangering the whole. This is anti-elitist in nature because individual excellence is not at all a criterion of the system. But, on the other hand, anonymous statistical excellence does imply reliable stability. There is a consistency of attitude here which permeates our life from politics to construction which cannot be other than culturally determined.

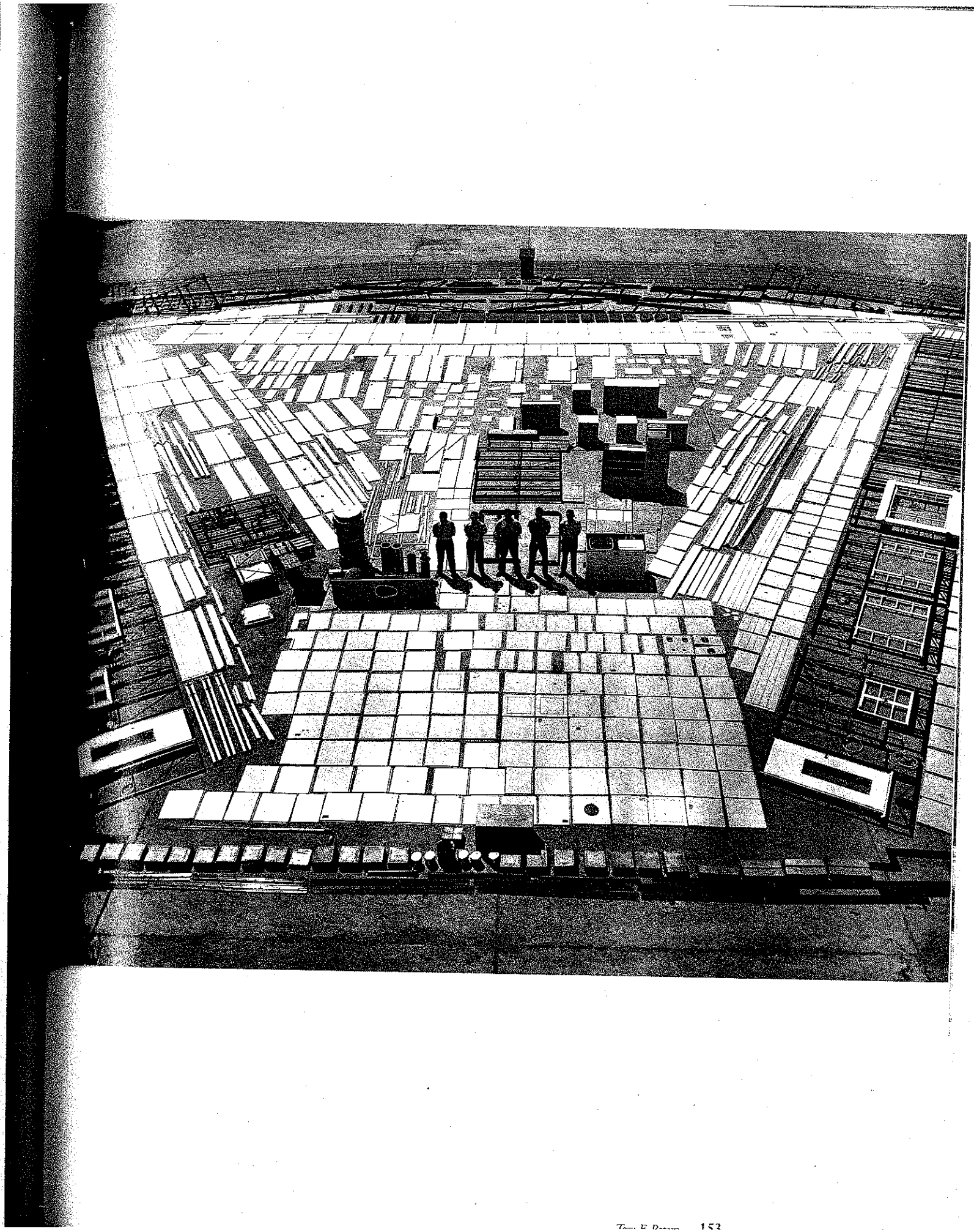
This is of course a very different approach to connection technology than the traditional European one, in which every connection has to function in itself and independently from every other.[19] All methods of calculating nailed connections are based on the replacement of connection quality by the number of components. There is indeed nothing at all illogical about this: it is clearly uneconomical to expect a connector, acting in concert with other similar connectors, to withstand more than its share of stress – as though it were acting alone. The reason that European construction theory regards each connection on its own lies in the logic of the concept of system in which the connection is understood merely as one component among others. Systems are analyzed into their constituent parts in order to dimension them piecemeal, element by element, according to the nineteenth-century tradition of analytical statics. Once the whole has been fragmented into its parts, it is the connections between these parts which are seen as giving the system structural continuity. The parts in a European system must be usable in many configurations in order that the whole can function as a viable system. Therefore, the connections must be so conceived that they can satisfy many different loadbearing conditions; thus, each connection must be overdimensioned for most uses, as it has to be capable of transmitting the entire stress received from any combination of elements. Economy in such a system lies in reducing the number of elements by making each of them of the highest possible quality. From our North American standpoint this logic, useful as it may be for analysis and in the manufacturing process, is very wasteful indeed; our overriding criterion is, as we have seen, the economy of effort and cost effectiveness.

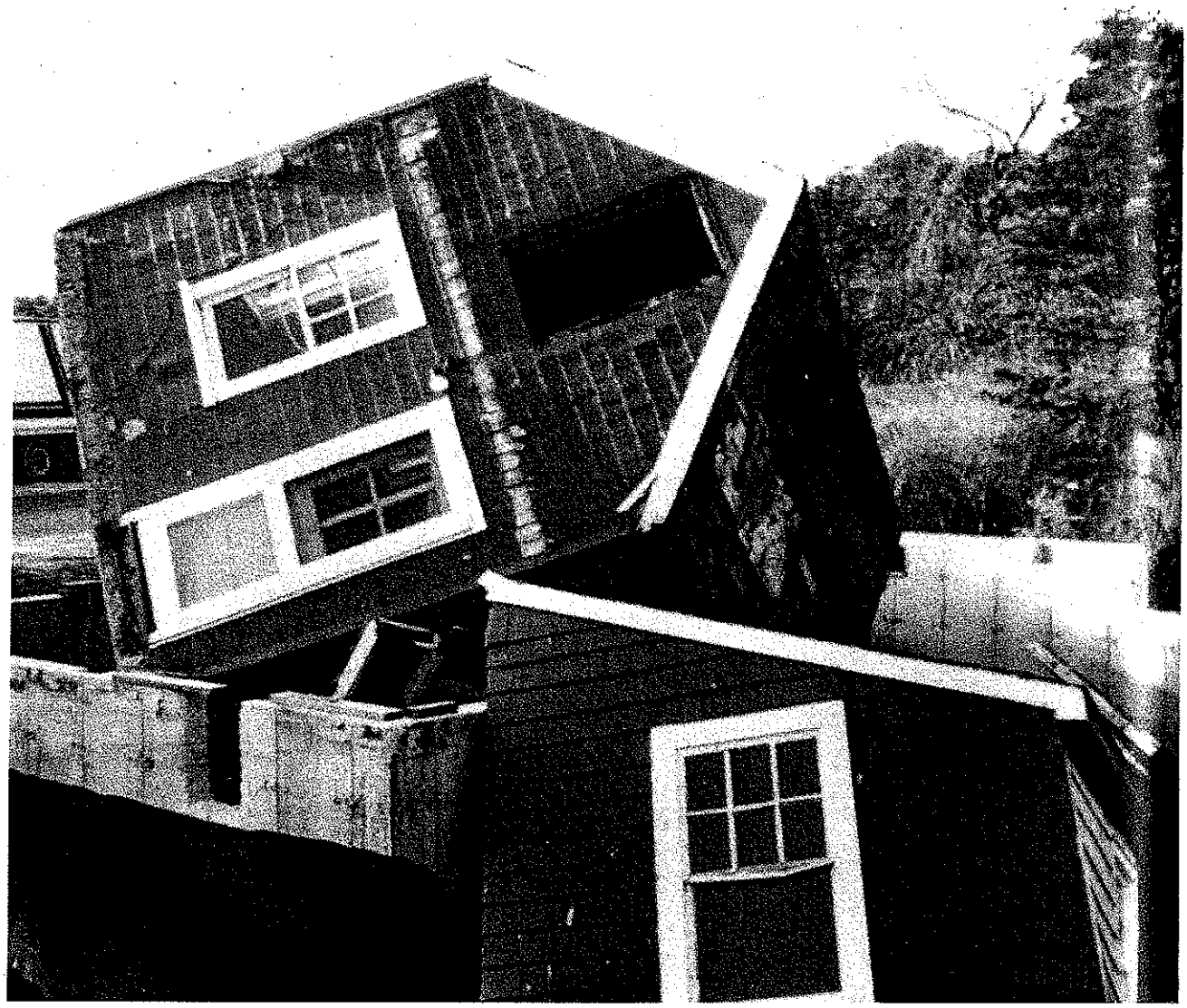
The replacement of connection quality by quantity influenced the development of the American form of timber bridge in the nineteenth century. The evolution of trussed construction on this side of the Atlantic was very different from that in Europe, although both resulted in similar forms. Materials have always been more abundant in this country than skilled labor. Builders of light timber frames and bridges very rightly doubted the capabilities of their job-trained laborers. Therefore, they replaced few good but specialized connections by many modest but identical ones. This greatly facilitated the training of their workmen and they were able to avoid an important source of construction error at the same time. The stratagem worked and the bridges they built held, even when some of their connections failed. Because of their high level of structural redundancy such bridges required a great deal less inspection than specialized ones of "higher" quality, which used less material and fewer connections. Any damage became readily apparent long before it became dangerous. The poorer quality of the connecting technology, coupled with a greater number of such connections, paradoxically meant safer structures.[20] American culture may indeed be a consumer culture in which the emphasis lies more on quantity than on quality, but here the trade-off is clearly of practical advantage.

The "statistical" or cumulative principle of many identical connectors led to a standardization of building components. The American light timber frame is a fully industrialized, prefabricated system. Studs, plywood, particleboard, nails and connectors are all manufactured in standard lengths and sizes, but in such an elementary way that precise tolerances are irrelevant and quality controls superfluous. Ironically, precision and the interchangeability of parts, the hallmarks of Yankee industrialized prefabrication from the end of the eighteenth century on, simply do not apply.

The novelty lies in the realization that quantity can replace quality. This requires that the system be seen as an integrated whole. No part can be pulled out of context and analyzed – it simply makes no sense without its context. The single nail is nothing other than a very poor connector, the single stud is a thin stick indeed. Yet together they form a sound structure. This integrated, anti-analytical approach led to the creation of the American form of prefabricated construction. And the sesquicentennial success of the American frame was guaranteed by the cunning primitiveness which gave us the greatest possible liberty in formal design. Liberty is another of our most treasured cultural values.

European building technologists also developed systems, some of them industrially prefabricated as well. But they were of a completely different type. The European approach was less synthetic and more analytical. It was not based on the logistics of the manufacture of acceptable connections but developed from simplified and incremental theoretical models of structural behavior. Such models, developed particularly in France in the early part of the

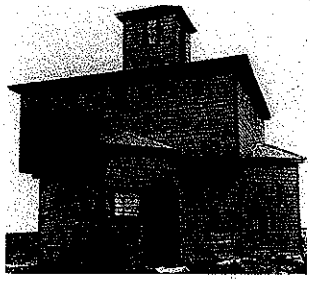




nineteenth century, permitted designers to understand and simplify the calculation of forces and thus to achieve economy in dimensioning members. These models – the simple, continuous or articulated beam, the cantilever, the hinged or fixed arch, the suspension system and so on – were seen to be addable but separate elements for reasons of computability. Each structural member, therefore, had to function independently of its neighbor, in the same way that the elements of a European system functioned independently: each form had to remain pristine for theoretical reasons.[21]

THE MONOLITHIC FRAME

The "statistical" spread of the nail throughout the light timber frame, and the consequent structural redundancy this occasions, give rise to yet another quality: they make frame structures behave monolithically in spite of skimpy materials and weak connections. Nailed frame buildings can bear the most upsetting of loads in completely unexpected ways. Forces can detour around trouble just as traffic does in a grid street system like that of Manhattan. This makes frame buildings exceedingly adaptable and resistant to abuse. Dorothy's house whirling high above Kansas in a tornado is a truly American form of load testing; no other timber building type could withstand such forces.



But there are many daily occurrences in our timber frames which are just as sensational if not as photogenic. We can remodel our frame houses to an extent that traditional European heavy timber buildings could never accommodate. Any hobby-minded person can and indeed does disjoin, eliminate or mutilate any and every member of his house without precipitating a structural catastrophe. Almost everything can be removed with impunity before a light timber frame will collapse. This need for extreme and unprofessional modification is a long-standing characteristic of American construction. Such a non-professional attitude to house construction does exclude architects from most general housing work and particularly from modification. But this foolproof, do-it-yourself freedom, inconceivable in a European building, is another of our most treasured traditions.[22] It is an inalienable criterion for the design and construction of our housing. If a timber building cannot be "maltreated" in this manner, it is simply not an American house. Not by overdimensioning the structure do we attain this freedom – that would be the European way of accomplishing this type of redundancy. We achieve it by replacing quality with numbers, which inadvertently bestows upon the structural system both monolithic behavior and an ambiguous relationship between construction and form.[23]

FORM AND STRUCTURE

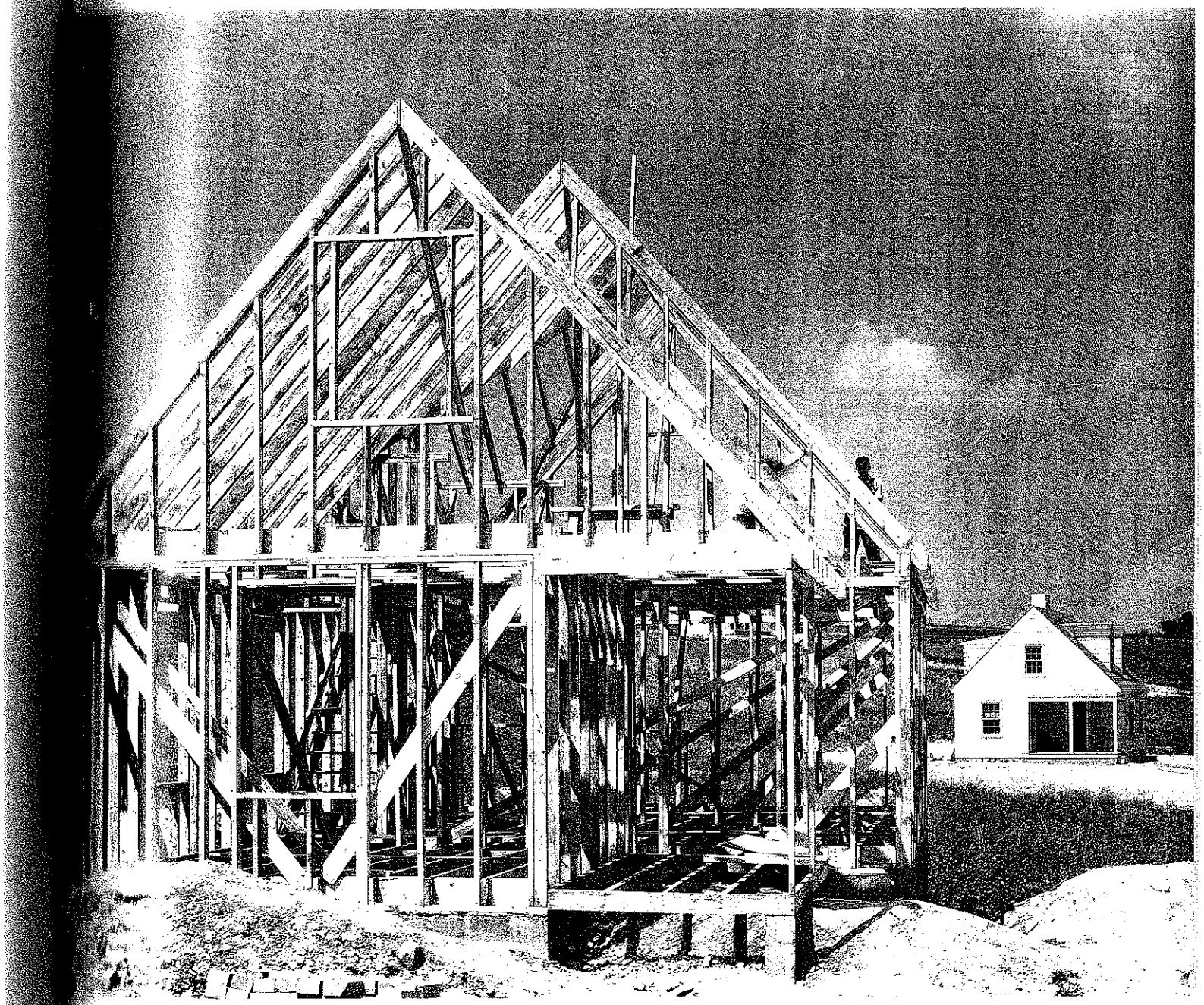
"Nail the hell out of it!" the contractor cries in earnest when faced with a particularly complex connection problem. What the result looks like is immaterial, as the whole is soon to be covered with a skin anyway, to give it form. Conformity to the rules of a system and their

response in form have no place here. Ours is a culture of the primacy of packaging over substance. American automobiles are traditionally styled rather than designed, and as any gourmand knows, it is the icing and not the dough that makes the cake. Ours is the Angel Food Cake of sugary visual delight, not the solid Schwarzwälder Torte in which no covering masks the layering of taste and texture.[24]

The typical American separation between structure and form never defines a dialectic design relationship, nor does it imply a mutual control analogous to the role of the legislative, the executive and the judiciary in our political system. It is perhaps more akin to the divorce between church and state in our society, which is unique in its uncompromising radicalness and which can, on occasion, also adopt hilariously extreme forms.[25] The separation between form and structure is thus not only related to a socio-political concept to which we assign value, but it is also, historically, based on the lack of a culturally bound iconography. This helps to explain our free choice of style, much freer than the eclecticism of nineteenth-century Europe, which probed the concept of appropriateness in the relationship of function to form and style against the background of historical meaning.[26] It may also help to understand the post-modernist, licentious mixing of formal metaphors, which can only be seen by the European designer as some kind of feeble joke, as he is only able comfortably to graze in segregated historical paddocks.

Choosing a style in the American sense conceals a paradox. Historical style implies and thereby creates the illusion of temporal permanence. At the same time, it illustrates cultural impermanence by the butterfly-like frivolity with which the choice is made, with very little in the way of support other than personal preference. Based on the strict separation of structure from form, North American designers, therefore, have formal languages at their disposal which are really free of premised meaning. They are no longer tied to history but are open to unbounded interpretation, to creative misunderstanding. Historicizing designers in our culture have thus always been able to graze on the prairie rather than in the historical paddock, an enviable situation. And, if we wish, we can even create our personal history in our own image. There is, therefore, not only a formal but also a temporal ambivalence underlying our slowly evolving design autonomy.[27]

The light timber framing system and the manufacture of the typist's chair illustrate a number of the salient characteristics of a unique design and construction process founded on empirical thought. The danger inherent in the empirical method is clear to all of us who design, but the possibilities are probably less so. We remember that all cultural invention is vulnerable, dangerous, simply because it is hypothetical, tentative and open by nature. But it is also evident that American concerns and motives differ radically from those of other cultures. The fabric of an American approach to design, or of any other facet of our life for that matter, is that of which our culture itself is made. It will therefore be from the iconography of American culture, however nondescript it may initially appear to us, that the solutions to our concerns must issue.



NOTES

1. The concept "creative misunderstanding" designates an intentional or unintentional reinterpretation of an accepted and expected meaning. The concept stems from the movement, prevalent in the 1960s, which examined design methodology and process. It was coined by William J. Gordon and George M. Prince in their writings on design methodology which they called "synectics." (See William J. Gordon, *Synectics: The Development of Creative Capacity* (New York: Harper & Row, 1961) and George M. Prince, *The Practice of Creativity: A Manual for Dynamic Group Problem Solving* (New York: Harper & Row, 1970); I am grateful to Tom Emodi, Technical University of Nova Scotia, for these references.) The phenomenon, commonplace enough to the artist, was picked up by architects from Harold Bloom's 1975 book, *Map of Misreading* (New York: Oxford University Press, 1975), according to Mark Jarzombek, Cornell University. But, until now, it has remained unnoticed in architectural theory.

2. I shall use the adjective "American" for convenience rather than Frank Lloyd Wright's contrived "Usonian" to denote cultural traits manifested in the United States. We must remain aware, however, that the other major American cultures, for instance those of our immediate neighbors, Mexico and Canada, are quite distinct.

3. Crossing borders between fields, cultures or professions leads to a shift in values and thus a shift in perceptions on the part of the "border-crosser." According to Sander Gilman, Cornell Unversity, this term was coined by the anthropologist Clifford Geertz in the late 1950s or early 1960s.

4. The heterogeneous cultural mix of our society has until now tended to de-emphasize the value of consensus. And it is that lack of absolute closure that fascinates the European. The creation of a consensus seems to have been one of the original intentions of the concept of the "melting pot," and many now deplore this as a cultural leveling process similar to that of the "International Style." The danger is possibly quite real: the recent term "silent majority," although apparently merely a politically expedient fiction, indicates a continuing yearning by a portion of our nation for the comfort of such a confining consensus.

5. See Tom F. Peters, "The Rise of the Skyscraper from the Ashes of Chicago," *American Heritage of Invention and Technology* (Fall 1987), especially p. 16.

6. The houses of Frank Gehry spring immediately to mind as does the older "woodbutcher" tradition, a term derived from the 1973 book, *Handmade Houses: A Guide to the Woodbutcher's Art*, by Arthur Boericke and Barry Shapiro (San Francisco: Scrimshaw Press, 1973). However these tendencies may develop in the future, our native and originally anti-conceptual design method permits a fascinating open-endedness in formal expression.

7. However, we do need to keep in mind that "understanding" is also a matter of cultural definition: everything is explained in terms of other concepts whose essences are as equally inscrutable as the concepts themselves.

8. There is a half-humorous, half-ironic self-evaluation of Germanic culture which states that everything not expressly permitted (by law) is forbidden. *Darf man das?* or "Is it allowed?" is a common German question which in its general

applicability to almost any situation is untranslatable into English. The corresponding characterization of general Anglo-Saxon culture would be that everything not expressly forbidden by law is fair game.

9. American society values the theoretical physicist only because we believe that his work leads directly to industrial application and thus to earning power. It is generally the applier, the inventor who truly excites our admiration. Einstein, our culture's icon of "The Physicist," is considered to be a humorous and lovable curiosity, an intellectual teddy bear – a far cry from the cultural value assigned to him in Europe. Posters depicting him as a superannuated proto-hippy are common. Edison and Bell, our cultural icons of "The Inventor," on the other hand, are held far more in awe. Photographs of them are always properly heroic; there is nothing even remotely humorous or condescending about our admiration for them. In Europe, on the other hand, *bricoleur* in French or *Bastler* in German (empirically bumbling inventor, tinkerer, dabbler, handyman) are derisive terms.

10. The Germans and French differentiate between "the essence of a problem" – *das Wesen eines Problems*; *l'essentiel d'un problème* – terms denoting the conceptual aspect, and the problem itself, encompassing the specific side of the matter.

11. Mark Mack examined the antithesis of the American approach in an analytical, "euro-systematic" use of the stud, nail and concrete block in his noted exhibition "Furnitures 82," held in 1982 in San Francisco. Particularly his four-poster bed made of two-by-fours dealt with the perennial problem of the Ionic column: how to turn a corner logically in a directional system using a corner post which looks different from one side than from the other. This is a conceptual concern that is meaningless to framing contractors.

12. The German proverb states: *in der Beschränkung zeigt sich der Meister* or "the master manifests himself through restriction." In fact, we do not disagree with the German proverb, we merely replace "restriction" by "cost effectiveness." We transform what we deem the negative connotation of "limitation" into the ethic of saving, not of materials or the environment, but of labor, which has always been scarce in our society. It is an apparent paradox that our culture's overriding concern with economy of effort should be coupled with a blatant celebration of consumption, but it contains its own inherent logic: we save effort in order to produce more at less cost.

13. At present, all American schools of architecture are entirely dependent on traditional European models of conceptual thinking. It is therefore important for us to remember that our indigenous method of detour is in every way as logical and potentially as rich as the foreign insistence on conceptual consistency.

14. Reuben Lucius Goldberg (1883-1970) was an American cartoonist and humorist critic of the rampant and uncritical adoration of mechanization. The term "Rube Goldberg" does not yet appear in the 1944 *Dictionary of American Slang*. The first use is documented in 1956. Then it appeared in *Webster's Dictionary* in 1961, in *Time* in 1962, in *Johns Hopkins Magazine* the following

year and in 1978 in *Nature*, thus documenting its penetration into ever more socially acceptable usage. See *Rube Goldberg vs. The Machine Age*, edited by Clark Kinnard (New York: Hastings House, 1968).

15. The patent for this chair (#552.502) was noted in an editorial in *Domus* by the Italian designer Mario Bellini in October 1986.

16. "Proof," like "understanding," is subject to culturally definable consensus. Here "the proof of the pudding lies in the eating," not in abstract deduction. This empirical freedom existed in European culture too, but it was lost in the Industrial Revolution.

17. Today, with the ubiquity of computer methods of modeling and analysis which, due to their speed, are able to deal with far more complex problems than ever before, such empirical methods are swiftly becoming conceptualized. It remains to be seen whether this is conducive or detrimental to the Rube Goldberg method of detour.

18. Heinz Ronner, at the Swiss Federal Institute of Technology (ETH) in Zurich, coined this pedagogical slogan to dramatize the statistical as opposed to qualitative characteristics of nailed connections.

19. The American attitude to connection technology may be unusual, but it is by no means unique. It does, for instance, bear a certain resemblance to traditional Japanese timber framing in which stiffness is achieved "statistically" by the cumulative resistance of a multitude of orthogonal connections rather than through shear bracing as we know it. There are still differences though, as *resistance* to horizontal forces in Japanese framing is achieved partially (just as it is in the traditional Viennese bentwood chair) through *accommodation*, by absorption of energy in the movement of the unstiffened connections rather than by *opposition* to the action of the force. All these examples, of course, relate to their respective socio-political matrices, and an examination of these relationships in other cultures would prove most rewarding indeed.

20. Inspection and maintenance have only recently become of pressing concern to us in this country. "If it ain't broke, don't fix it" runs our popular adage – an unknown sentiment in Europe, where great effort is generally expended in maintenance so that things do not break. The cost effectiveness of both approaches is complex and has to be determined from case to case. One reason for our long-standing neglect of maintenance may be our having gradually reduced redundancy in long-span and high-rise structures. We have done this through ever more refined techniques of calculation and better knowledge of material behavior. Yet we have not recognized the broader consequences of this form of economization, as the more reflective and more material and energy conscious European builders have.

21. The best continental European bridges of the nineteenth century exemplify these theoretical models, while the corresponding American ones are almost invariably hybrids.

22. The need for unlimited remodeling was graphically demonstrated by the iron founder James Bogardus, in an advertisement showing his factory (built in 1849) in which he illustrated the supposed

subtractive advantages of his cast-iron framing system. See James Bogardus, *Cast Iron Buildings: Their Construction and Advantages* (New York: J. W. Harrison, 1856).

23. We have encountered the concept of redundancy several times now. It is the one factor which guarantees this desirable high level of design flexibility in our building culture. On the negative side, it is certainly closely related to our wasteful use of natural resources and to our traditional reliance on semi-skilled labor which is, in itself, another form of waste: that of educational potential. The use of structural redundancy in continental Europe ended with the rise of traditional analytical statics in the first decades of the nineteenth century (see Tom F. Peters, *Transitions in Engineering: Guillaume Dufour and the Early 19th Century Cable Suspension Bridges* (Basel: Birkhäuser, 1987), especially pp. 9-11). Today, it is gradually beginning to excite interest again, due to the dangerously high precision of computer methods of structural modeling and dimensioning, which leaves no room at all for accommodating the unexpected.

24. However, the analogy masks our true values, just as the fixation on European models inverts and thus hides the true qualities of our building culture: it is not really the aristocratic cake at all that represents the essence of our culture, but rather the democratic pie, and that is, of course, all content. The British expression "that's a piece of cake" becomes "as easy as pie" in America. The pie as symbol of the "American Dream" was brilliantly captured by Joe Hill (1879-1915) the popular bard of the radical International Workersof the World, in the famed satirical refrain to his song, "The preacher and the slave," composed about 1906:

You will eat bye and bye
In that glorious land above the sky:
Work and pray, live on hay,
You'll get pie in the sky
when you die.

25. This was written in the aftermath of both post-modernism and the 1987-88 ecclesiastical PTL scandal.

26. Gottfried Semper's pamphlet on Gothic versus Classical, *Ueber den Bau evangelischer Kirchen. Mit besonderer Beziehung auf die gegenwärtige Frage über die Art des Neubaues der Nikolaikirche in Hamburg und auf ein dafür entworfenes Project* . . . (Leipzig: B.G.Teubner, 1845), is a good early German example of such an examination, as are the subsequent theoretical works of A.W. Pugin, Ruskin et al. in Britain, and Viollet-le-Duc and others in France.

27. Sigfried Giedion's last and uncompleted work bears the title *The Eternal Present: A Contribution on Constancy and Change* (New York: Bollingen Foundation, 1962-64). Giedion was strongly influenced by American culture and intended to imply by the title of this work that, in contrast to previous modern doctrines, history has its place within our modern design repertoire because it is present to us. This is, of course, not an original thought, but it does correspond rather well to American cultural needs. What Giedion did not say, but which follows from this thought, is that our understanding of history also mutates with a changing temporal standpoint. Objectivity is non-existent. And it is on the basis of such thoughts that we can legitimize our freedom to manipulate historical form and style.