The role of corporeal form in architectural thinking

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1.

In making a case for daylighting to be considered a significant generic function in determining the spatial form of our buildings, Prof. Steadman argues that topological structures representing patterns of accessibility may depend as strongly upon such physical factors as on sociological imperatives.[1] A generic theory for interpreting built-form, then, should deal not just with factors such as accessibility or visibility, in which space syntax theory invests direct sociological interpretations, but should also consider physical factors such as daylighting, or outlook, which may indirectly affect built form.

An immediate response from the point of view of space syntax theory would be to point out that factors such as daylighting requirements are treated as being inherently different from the socio-cultural factors that determine the form of buildings. The former are not *constitutive* in the sense that socio-cultural factors are. Socio-cultural factors, in space syntax theory, are like the injunction against handling the ball in football; they are constraints that determine the very nature of buildings and without them the buildings would cease to exist as particular types. Constraints from physical factors that Steadman discusses, on the other hand, would only modify the form, or restrict possible variations of it. It follows that whatever else may lead, in practice, to modify or even form particular patterns of access in a working building, the patterns of access cannot themselves be so distorted as to go against the basic sociological functioning of the building.

This argument however hides an unwarranted assumption in space syntax theory. Often the point of space syntactical analyses of buildings and environments is not to make comments on the social life made possible by the structure buildings, but rather to argue about the form-giving potential for sociological factors. In the latter case, a crucial assumption is that the topology of the spatial structure of a building determines its geometrical form. Or, in a stronger form, it is accepted that the graph of a building is determined completely by the sociological factors, and, and that other, less consequential factors, then determine the larger geometry of its form—the shape of rooms, relative sizes, orientations, and so on.

Professor Steadman's paper effectively overturns this assumption. Rather than accepting that the graph determines, although incompletely, the final geometry of the built form, Prof. Steadman's argument is constructed on the assumption that geometrical decisions

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[1] Philip Steadman, "How Daylighting Constraints Access." Keynote paper presented at the special session on Precepts, Structures, and Notations, 4th International Symposium on Space Syntax, London, June 2003.

regarding form may determine the topology of the spatial structure as described by the graph, so that features of the graph cannot be attributed to sociological factors alone. This assumption can be seen as a version of the point about evolutionary spandrels made by Richard Lewontin and the late Stephen Gould regarding evolutionary explanations of biological forms.[2] Lewontin and Gould argue that all features of biological forms cannot be described as consequences of natural selection; some features may have arisen as *unintended consequences* of evolutionary processes. In a comparable way, all features of the permeability graph representing the pattern of access in a building may not be explainable on the grounds of generic social function; some aspects of graphs may be a direct result of circumstantial factors such as requirements of daylighting, and are therefore best seen as spandrels.

In other words, all the features that a graph possesses cannot be unambiguously interpreted as having sociological significance. This presents a considerable challenge to space syntactical accounts for why buildings take the forms that they do, since the basic premise in such accounts is that sociological factors are the primary forces in determining the internal forms of buildings. But, as Professor Steadman points out, other factors may also play a significant part in determining built form, typically by constraining possible variations.

Professor Steadman's response to this problem is to systematically filter out the effects of such constraints upon built form. The solution lies in developing procedures to find other factors that would influence building forms at a generically predicable level and to account systematically, if not exhaustively, for all possible forms and their corresponding graphs. Professor Steadman's paper demonstrates such an approach with day-lighting requirements in mind. Presumably, once done, this would leave the ground clear for studying spatial syntax - i.e. the relationship between social factors and graphs.

2.

But another line of thinking may be explored here. It is often assumed within space syntax studies—on the basis of the premise that sociological factors are the primary determinants of the spatial structure of built form, and that the sociological factors are constituent factors in determining the type of buildings—that the spatial structure of buildings has primacy in the ultimate form of buildings. Or, in other words, it is often assumed that the internal spatial structure of buildings carries the essential genotypical structure, while the actual physical form of buildings carries the less significant phenotypical variations. It follows that any factors influencing physical form of buildings cannot seriously influence the genotypical spatial form; only structural changes in the nature of society being charged can influence the genotypical form. A byproduct of the thinking underlying Professor Steadman's paper is to throw doubt on this assumption as well.

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[2] S.J Gould, and R.C. Lewontin, "The Spandrels of San Marco and the Panglossian paradigm: A critique of the adaptationist programme." In *Proceedings of the Royal Society of London*, 1979. 281-288.

This issue comes to the forefront in the space syntactical analysis of architectural practice. In a study of Mies's houses, I found that for all the innovation that Mies introduced into his architecture, he did not significantly alter the sociological structure of the spatial configuration of his villas. The focus of Mies's architectural concern was the tangible and visible part of the building—the building envelope, or what Paul Frankl has called the *corporeal* form of the building. Nor is Mies an exception in this; most historical traditions in architecture have been predominantly about developing guidelines, principles, or rules for elaborating the physical or corporeal form of built structures.

It begins to appear, then, that the medium of change and innovation in built form is the corporeal form of buildings. This itself is not a surprising observation. But it begs the question whether the designers' concern with the corporeal form has any systematic genotypical consequences to the form of building. I would like to suggest that it has and illustrate how with an example.

3.

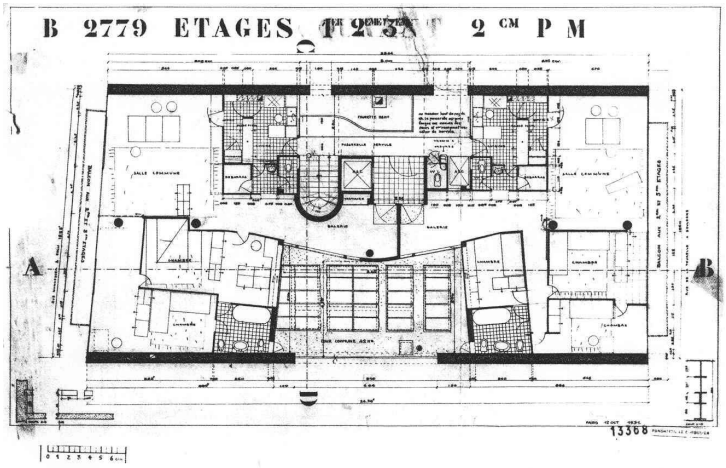

Figure 1

In 1933 Le Corbusier, already a confident and mature architect well on his way to international fame, was working on the plans for a multi-storied apartment block on Nungesser and Coli streets in Paris**.** Figure 1 shows the plans that he developed for a typical floor. The plans are as one would expect, designed with considerable freedom, with partition walls independent of structural elements, articulating a free-flowing internal space that looks out to the exterior through long strip windows. What is more interesting, however, are the earlier variants of these plans [Figure 2].

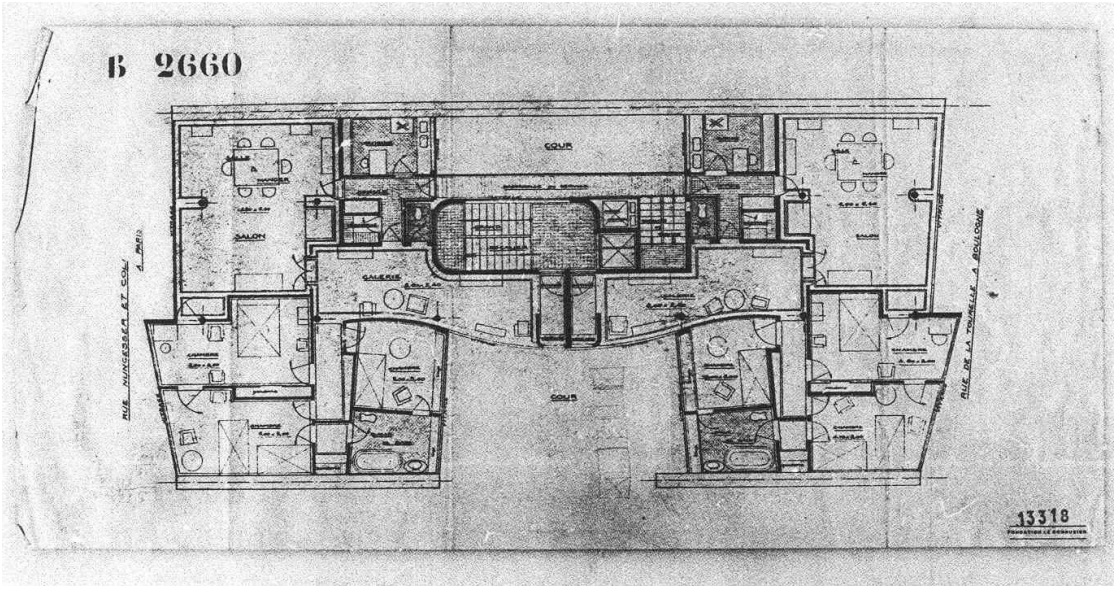

Figure 2.

These look distinctly *un*Corbusian; even Le Corbusier felt that they looked too nineteenth-century and ultimately revised them. This is slightly puzzling, because one does expect Le Corbusier, having executed a number of his masterpieces (including the villas Savoye and Stein de Monzie), to be struggling with the planning at a stylistic level. The puzzle deepens when we consider how similar in spatial form the two schemes were.

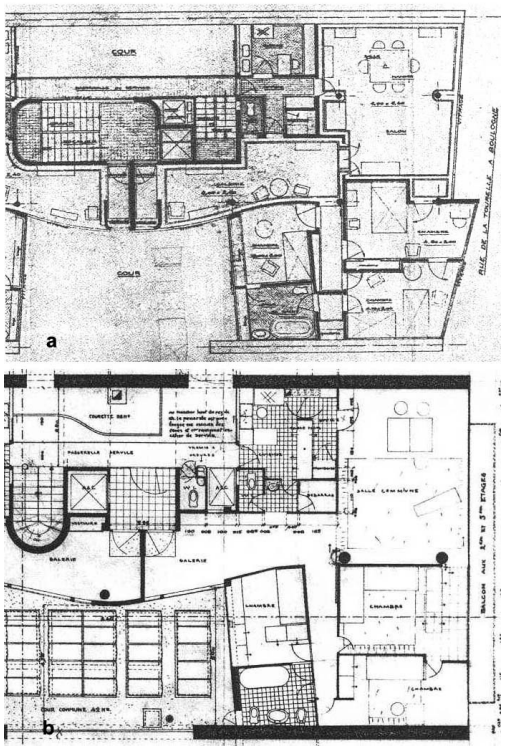

Figure 3.

Consider how little the organization of the plans changed [Figure 3] in a single apartment. The basic partitioning scheme and the disposition of functions remained more or less unaltered, and the original plans actually bear the signs of his radical innovations: freely disposed walls, structurally separated from the column grid, long strip windows, and a façade independent from the interior. In fact, the only substantial difference seems to be in the rendering style.

Syntactical analysis of the labels (through boundary graphs) of the plans, however, indicates that there is a deeper difference between the plans (Figure 4). The two plans might belong to substantially different genotypes, and it may be argued that despite formal similarities, Le Corbusier was really introducing substantial spatial changes in the two houses. Such an understanding is dispelled however in the face of further

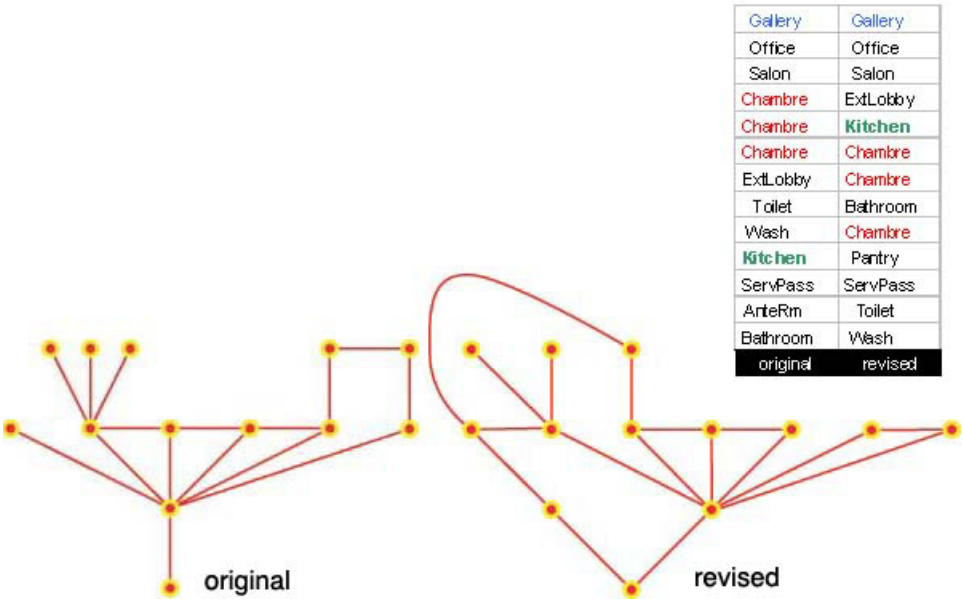

Figure 4.

evidence. An intermediate plan that bears all the hallmarks of the latter, final, form (Figure 5a), actually seems to belong to a genotype of the original plan (Figure 5b). The entire exercise seems to be a pretty good illustration of the issues that Prof. Steadman has raised. The governing factor in Le Corbusier's house designs seems to be not just the graph, but actually decisions made in fully geometrical spaces.

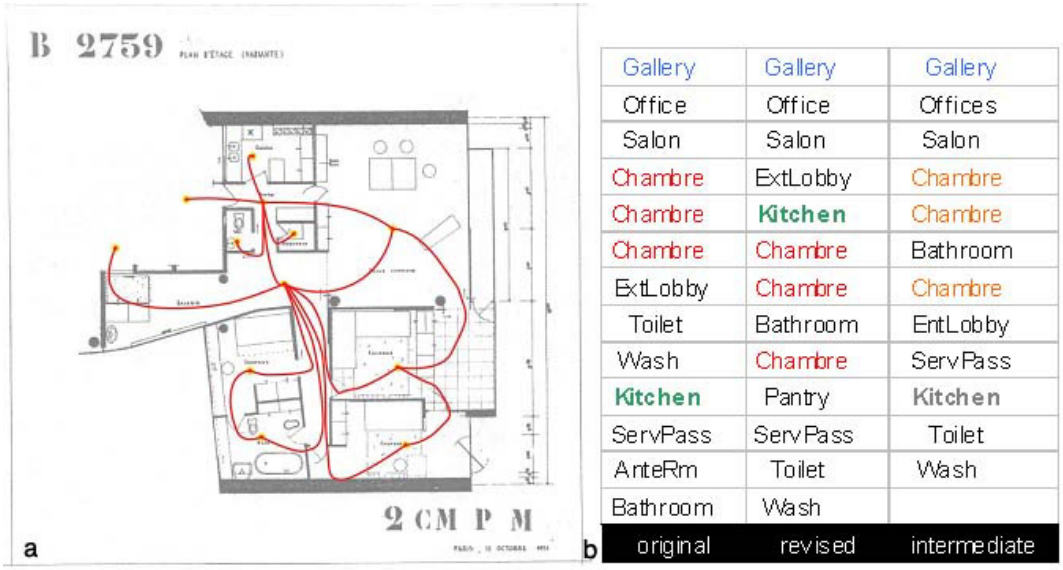

Figure 5a & b.

4.

Looking again at the two plans, now we can see that there is at least one systematic difference between them [Figure 6]. The thresholds of the original plan lose definition in the new plan, and often disappear altogether, erasing any sharp sense of transition between two spaces. The rendering of the flooring and furniture actually accentuates this. All this contributes to the characteristic quality noted by several observers in the spatial arrangements in early modern interiors—the relatively undefined free-flowing space.

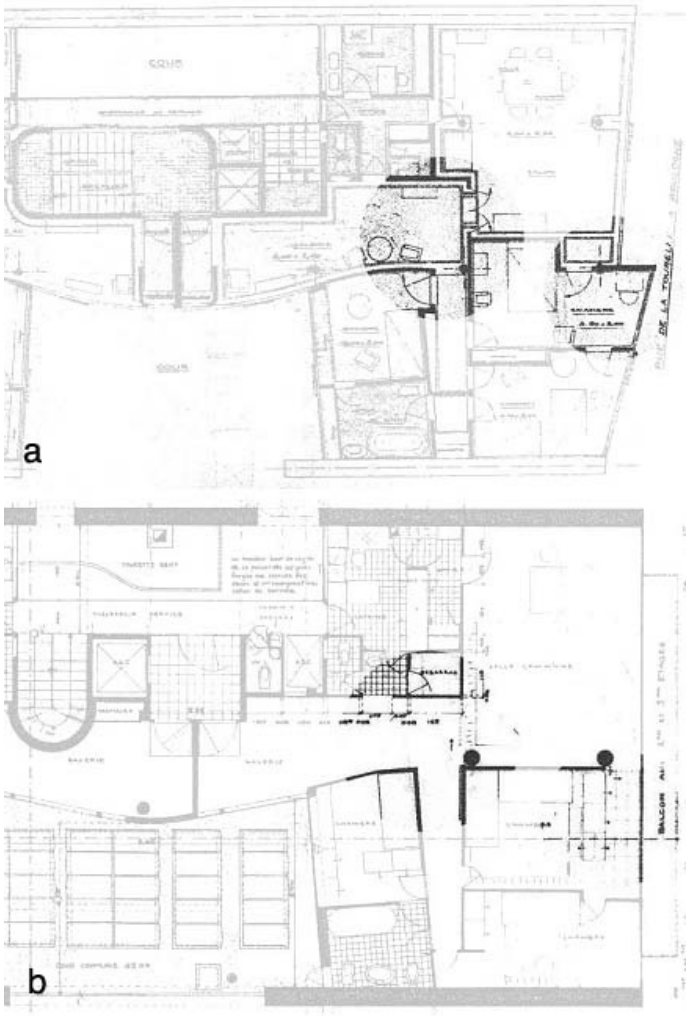

Figure 6.

What was the use of such a change in the style of articulating space? Was it simply to give a different feel or character to the plans? To answer this question, it is useful to invoke some findings from studies of human perception. Psychologists working on visual perception have proposed that we tend to discretize what we see, and that we do so systematically but unconsciously, following rules that hold consistently for all of us.[3]

One of the common rules is to interpret a shape having concave curvatures as composed of constituent shapes that are separated along the concave curvatures. This is easily tested by the example in figure 7. Although the separating curve on both sides is the same, we interpret the two curves as made up of different parts because we read the constituent shapes as those forms that are convex with respect to the interior of the shape. An

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[3] My primary source here is Donald D. Hoffman, *Visual Intelligence* (New York: Norton and Company, 1998).

analogous rule for three-dimensional objects is to interpret any concave crease on a solid object as a boundary between two objects; particularly if the concave crease is sharp [figure 8].

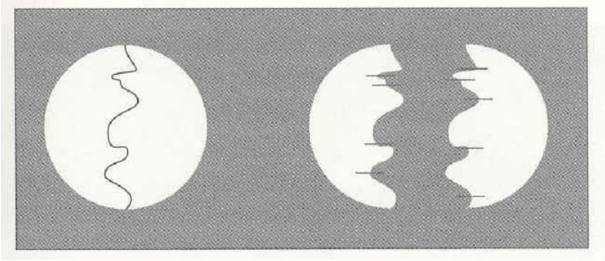

Figure 7.

This general observation has natural consequences for architectural interiors. A typical cellular arrangement presents its internal space to an observer situated within, not just in a piecemeal manner, but also without a sense of the form of the overall space of which any particular room is a part. Typically, the defining surfaces of the internal spaces—the visible surfaces of the internal partitions—all end in convex corners, leaving the internal observer with no sense that they continue beyond**.** Most occluding edges occur as jambs of doorways. In the types of free plan that Le Corbusier designed, several occluding edges occur as reflex corners formed by folds in walls, columns in space, or edges of partitions [Figure 9]. The resulting experience has several interesting features. Reflex occluding edges not only destroy sharp transitions between labelled spaces, they also bring a possible experiential asymmetry to the space. The space to which the reflex corner is presented can be read as folded around and, therefore, *outside* the space being "enclosed" by the folded wall.

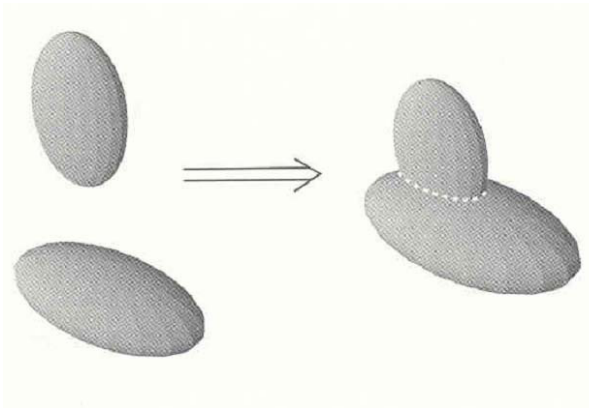

Figure 8.

In the example under discussion, this inside-outside dichotomy is apparent in the revised plans of the apartments. To an observer entering the apartment, the entry *gallerie*, which continues into the *salon*, and into the passage leading to the bedrooms, is experientially read as the *exterior* - or *carrier* - space, within which blocks of bedrooms, and kitchen-service-toilets are arranged [10]. The stylistic change between the two plans, thus allows a significantly different experience of space to emerge.

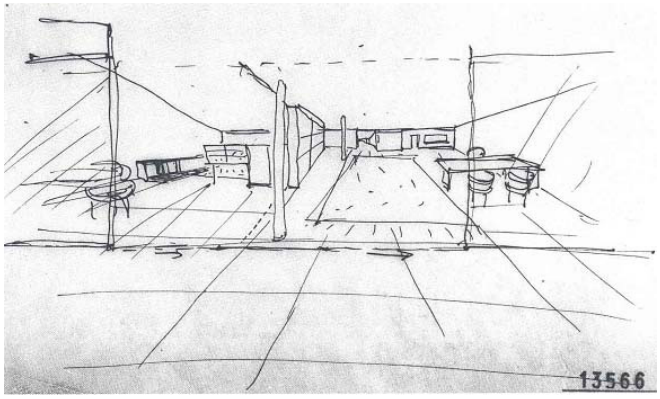

Figure 9.

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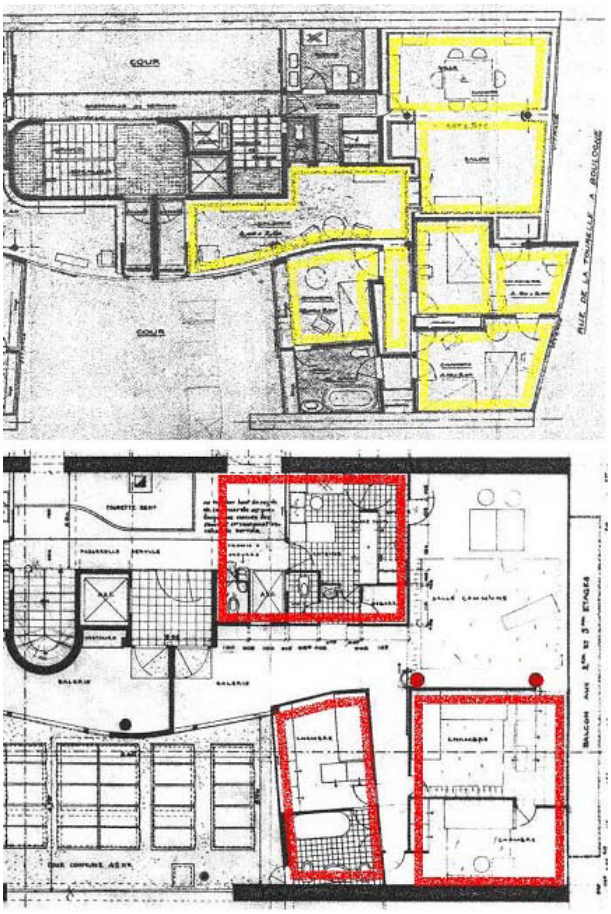

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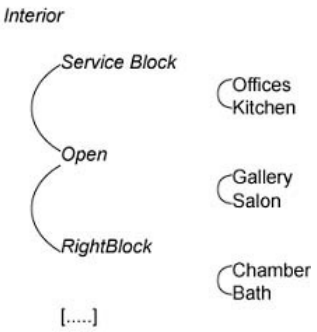

Figure 10.

corporeal form of buildings, then, is to *present* the spatial structure of the building. In other words, it can be made to give visual form to the spatial configuration that defines a building.

5.

This also leads to another distinct role of physical forms in the articulation of spatial form. They are a *means* to develop alternative spatial strategies, and, in effect, different spatial genotypes.

An illustration is provided, again, by Le Corbusier's designs for the Nungesser & Coli street apartments. With the redesign of the apartment plans, Le Corbusier introduced a further crucial change in their planning. The older plans featured an identical set of paired apartments for the second, third and fourth floors (the first floor housed shops and services, the sixth a large single apartment, and the seventh, a penthouse block with apartment and studio for Le Corbusier himself). With the revised set, Le Corbusier introduced different designs for each floor, [Figure 11] with substantial rearrangements of the spatial sub-units in some cases, and a triplet of smaller, one bedroom or studio apartments in the other. There appears to be a far greater range of possibilities in the second scheme than the first one.

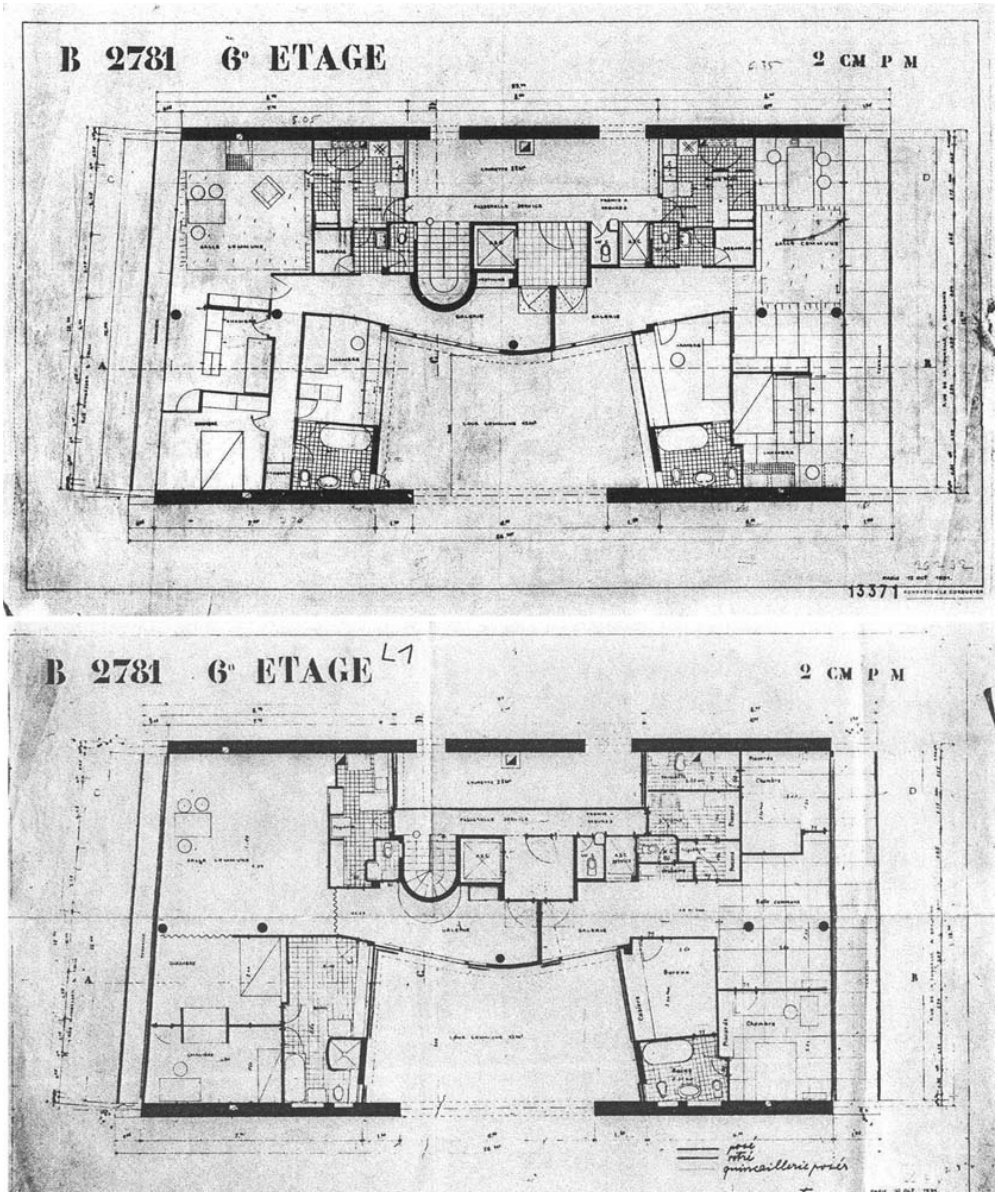

Figure 11.

The important point here, however, is that the increase in the range of possibilities was not due to finding a set of rules that allowed a greater range of mathematically possible spatial structures to develop. Rather, what the change of stylistic format in the revised plans gave Le Corbusier was a different sense of *aesthetic* possibility. The condition of cellularity having been relaxed, Le Corbusier was now in a position to consider alternative possibilities for bedrooms, amongst them—bedrooms accessed through the living area, bedrooms accessed through other bedrooms, or through undefined areas not dedicated to circulation. But this is not because he could not have physically done that within the constraints of the original scheme, with cellular arrangements, or even with

maintaining a stricter symmetry between the two end units, but rather because such an arrangement would not have *made sense* within a cellular scheme.

This example illustrates how explorations at the level of elementary geometry may allow radical changes to be introduced to the topology of the plan. This is an important point because it inverts the traditional view that the topological structure of the internal space of a building is the generative element in a building.

6.

Hillier, in *Space is the Machine*, has argued that what distinguishes architecture from building is the transformation of ideas to think with into ideas that designers think of.[4] What our example shows is that the corporeal form in buildings is a means just for that. Consideration of corporeal form in building, as we see above, is not merely a matter of giving visual shape and meaning to buildings, but is central to the making and understanding of spatial form as well: it allows spatial form to be presented to the inhabitants in ways that allow it take on different meanings, and it provides the means by which alternative spatial forms may be developed. Both these cases are perhaps not necessary for buildings to exist in a basic sociological sense, but are central, even essential, to the architectural elaboration of buildings.

The crucial question, as ever, is that of methodology; what is needed is the development of a theory that will allow a systematic interpretive methodology to be constructed in a manner comparable to the sociological interpretation of the accessibility graph of buildings. The discussion of Le Corbusier's design above might suggest that our systematic and natural parsing of the visual forms around us may offer leads in the direction in which such interpretive methodology might be constructed; the parsing, in other words, might help determine a universal and natural syntax of forms upon which a semantical structure, analogous to the sociological one constructed over the topological structure of space, might be constructed.

Acknowledgements

I am indebted to Professor Julienne Hanson for inviting me for presenting this response paper during the Fourth International Symposium on Space Syntax, and to Professor John Peponis for organizing the special session during which it was presented. In addition, I owe a long-standing intellectual debt to them both, and to Professor Steadman, as well as to Professor Bill Hillier. Readers will no doubt find traces of several of their ideas underlying the arguments that I have made here.

Note on sources of figures

Figures 7 and 8 from Donald Hoffman, *Visual Intelligence*. The rest are either reproduced from, or based upon, published archives of Le Corbusier.

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[4] Bill Hillier, *Space is the Machine*, (Cambridge: Cambridge University Press, 1996) 44-45.