IDEA OF HOUSE

Do Houses Evolve? Neo-biology at House_n

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The complexly interconnected world in which we now live seems to say that both the [complex systems] model and its implications fit the current nature of reality. All is in flux, order is transient, nothing is independent, everything relates to everything else, and no one subsystem is ever in charge.
Emily Martin, Flexible Bodies[1]

Do houses evolve? The intuitive answer would have to be yes. The general assessment that houses are better apparently supports that conclusion, as does the fact that those improvements occurred incrementally over the last century or so with the steady introduction and refinement of indoor plumbing, central heating, refrigeration, air conditioning, electric lighting. Despite a certain resistance to the conditions of rapid change, best characterized in architecture by historic preservation, belief in evolutionary development is now so very widely accepted that the collective attention of designers has shifted to the process of adaptation itself, to anticipating and providing for the next technique, device, or development. The underlying premise that buildings evolve and adapt in some sort of Darwinian process of competitive selection clearly derives from the longstanding analogy with biology, but to quote the subtitle of Kevin Kelly's popular book of the 1990s, Out of Control, those processes are now assumed to operate universally in "machines, social systems, and the economic world."[2] Following his description of this condition as the "New Biology" I will use the term neo-biology to describe the complex network of concepts and practices which I believe has become both the dominant condition and dominant explanatory paradigm of the moment.

This paper inquires about neo-biology in architecture by examining House_n, a compelling house-of-the-future project that emerged from a design workshop at MIT conducted by Kent Larson and Chris Luebkeman at MIT in 1998. House_n has since expanded from a relatively direct "home of the future" to a "research consortium"

called Changing Places that "explores how new technologies, materials, and strategies for design can make possible dynamic, evolving places that respond to the complexities of life."[3] It is a remarkably successful project whose organizing concepts and keywords-changing, dynamic, evolving, and complexity-have made it broadly appealing to manufacturers, designers, researchers, and corporate sponsors. Not accidentally those concepts are also central tenets of the technological dimension of architecture, whose practices are still firmly organized by the ideas of function and perfectibility in architecture. I ask these questions about the evolution of buildings to better understand the nature of change and adaptation in architecture and also to criticize the naïve notions of function.

Houses of tomorrow (or of the future, or for the 20th or 21st century) offer particularly condensed versions of architectural technology. They are typically freed from the immediate constraints of the market or at least from the whims and desires of individual clients, which remain the province of dream houses and the anxious concern of developers.[4] Nonetheless, even the most technically futuristic house assumes a particular kind of occupant and mode of living, even when they are defined according to average or typical "needs" and imagined to be generic. Those depictions are further exaggerated in houses that seek to demonstrate some new principle of living or building, which also makes them especially amenable to this kind of analysis and interpretation. My purpose, however, is not to offer a history of houses of the future, which has been covered by many other works, but to look more closely at the notions of adaptation, complexity, and evolution that make House_n so interesting.[5]

House_n begins with the premise that it is no longer sufficient for a house to satisfy present needs, it must also adapt to future ones as well. This constitutes a profound shift in the premises of the mechanistic paradigm that sought to translate the precise analysis of human and environmental needs into perfectly responsive artifacts. Model houses of the twenties, thirties or fifties were developed to better satisfy the needs of their moment (Greater mobility? An airplane in every garage.) The new condition has a different premise: the world is constantly changing and the house and resident of the future must continually adapt to those changes (or perish). As the

introduction to the House_n web site explains:

The widespread adoption of digital technologies is leading to profound changes in how we communicate with others, shop for goods and services, receive news, manage our finances, learn about the world, participate in politics, deliver and receive medical care, conduct business, manage resources, find entertainment, and maintain autonomy as we age. Increasingly, these activities will take place directly in the home. As our notion of banks, bookstores, universities, communities, and cities change in response to new technologies, the home will take on extraordinary new importance The home as it exists today cannot meet these demands or take advantage of new opportunities created by social and technological changes. Most people live in spaces poorly tailored to their needs, and technologies for the home are too often irrelevant gadgets, meeting no fundamental need and developed out of context.[6]

Of course the mission of Changing Places is adapted to the particular strengths of MIT and to the very real digital revolution that we are experiencing, but the underlying assumptions about evolutionary adaptation appear throughout the House_n material. Accordingly the current House_n description focuses on the situation of houses faced with both changing technologies and changing modes of living.

Changing Places of Living (House_n): The home must accommodate the complex activities of multiple generations through all phases of life. Increasingly, it is where we learn about the world, participate in politics, conduct business, manage resources, produce energy, and maintain health and autonomy as we age. But homes of today are poorly prepared for this future, and most people live in spaces poorly tailored to their needs - with technologies developed as isolated devices. House_n research is focused on how the home and its related technologies, products, and services should evolve to better meet the opportunities and challenges of the future.[7]

This particular use of the term evolve may merely be rhetorical, and imply almost any kind of progressive development. It may

have been used to suggest that no revolutionary or drastic changes will be proposed and that the research ethic of Changing Places will focus on the refinement of existing products, devices, or configurations. However I believe it also carries overtones of the more precise sense of the term, which suggests that technology has its own internal, evolutionary logic of development, independent of the interests of the designers, manufacturers, or occupants of houses. Since Darwin, the term evolution has meant a blindly driven process of development regulated by a fairly simple mechanism involving variations in reproduction with selection by environmental pressures. That notion applies to the products of human design with much greater difficulty, but it has nevertheless inspired architectural theorists since at least the mid nineteenth century (with varying degrees of precision) to suggest that architecture of the modern period has been driven by or conditioned by evolutionary advances in technology. The careful historical research of Lewis Mumford or Siegfried Giedion in their canonizing histories of modern architecture sought to uncover the precise mechanisms and effects of these influences, but for most architects the conclusion goes something like this: technology evolves according to its own agenda and architects cope with the results.[8]

What a project like House_n makes visible is a set of assumptions shared by so many people that they can be referred to briefly and rhetorically in explaining the goals of a project devoted to adaptation. Even when the concept is mentioned explicitly, as it is in a research project by John. Fernandez and Chris Carbone called "Evolutionary Adaptation," it can leave open the very critical question of mechanism.

Although buildings seem to possess a steadfast monolithic presence, they are actually continually changing and adapting to the varying conditions of daily, seasonal and lifetime use. It has been determined that changes to the interior layout and overall volume made to residential buildings over their lifetime exceeds the initial cost of the building by three times on average. Essentially the house is built again three times over after initial construction. This project explores the next generation of superstructure and infill that allow for an intelligent spatial and physical adaptability. The project will address

adaptable systems that allow for an optimal migration of uses into, through and out of the building as well as the site over a wide range of time periods. Adaptable interior systems allow for the evolution of the house in conjunction with its changing role through initial purchase, expansion, acceptance of extended family and allowance for assisted and augmented living systems. In addition, the project addresses various technologies and structural morphologies that allow for a variable volume that may both expand and contract as needed. [9]

The general claim of this paper is that the very possibility of this kind of project, with all its attendant assumptions, marks the full ascendancy of neo-biological thinking in architecture. Since the formation of scientific biology in the early 19th century, biological and evolutionary analogies have strongly influenced the theory and practice of architecture: from Sullivan and Wright's reading of Herbert Spencer to Le Corbusier and Ozenfant's concept of "mechanical selection" to contemporary experiments with the genetic algorithm.[10] This often quite productive influence has also led to a number of serious problems: first, the tendency to reduce architecture to functional, often just structural or morphological elements and, second, the assumption that evolution guarantees a certain optimization, or at least inevitability in its results. Like the criticisms of free-market economics, the question rests on the nature of the process of selection, on who selects or benefits. The old specter of social Darwinism has reappeared, as has the more subtle question of authority and authorship, now displaced onto the blindness of evolutionary mechanisms.

To better understand the role of evolutionary thought in architecture, my opening question needs to be elaborated. Thinking about the house as a complex system represents a profound philosophical position that challenges most of the conventional notions of architectural authorship. In recent years Manuel De Landa, among others, has called for architects to "breed" buildings using the genetic algorithm, relinquishing control of the design process to the editing or selection of the results.[11] The fundamental premise of such a procedure could not offer a greater challenge to conventional design: "to conceive the genesis of form (in geological, biological,

and cultural structures) as related exclusively to immanent capabilities of the flows of matter-energy-information and not to any transcendent factor, whether platonic or divine."[12] This means that houses are imagined to emerge primarily from the interactions of their many contributing factors, and not from the intentions of their planners. In this sense, architects and designers only modify ongoing processes, like agriculture and animal husbandry, rather than creating form ex novo.

To explain the themes latent in House_n's formulation means that we have to examine both the concept of evolution as it applies to the products of design and the specific case of the house as an emergent result of the forces that constitute its environment.

Genetic or Mechanical Selection

One way to rephrase the question of whether houses evolve is to examine the changes made between versions or generations of a design, to ask by what mechanism those changes occur. The theory of evolution has its own quite complex history and debates about its mechanism(s) still continue, but in the now classic synthesis achieved in the early twentieth century between Darwin's followers and geneticists, the mechanisms of genetic evolution can be described so precisely that they can be coded into a few lines of computer code (genetic algorithm). All that is required is some mechanism of fairly precise reproduction (some genotype) that admits of some variations and then some other mechanism of selection among those variations. When this process occurs within large populations over many generations the result is a testing of many possible configurations and the survival of those best suited to the criteria of selection in effect at the time. The problem of translating this genetic model to design is immediately apparent. It requires that some genetic, essential description of a house be faithfully reproduced between versions. Well before Darwin's more explicit formulation, the concept of typology was adapted from biology by Quatremere de Quincy as the essential aspect of a building that was imitated in successive generations and explained the apparent continuities in design.[13]

Like the theory of evolution itself, building typology offers a theory

to explain the formal (square, round, courtyard) or functional (house, office, train station) similarities among buildings.[14] To achieve a genetically evolutionary development in one of these types, such typical descriptions would then have to be faithfully reproduced in each act of construction, but building typologies just don't exist as reproducible entities or as governing elements in the unfolding of a design.[15] What typology does capture and what has made it such an intuitively correct assessment is the categorical similarities and differences among classes of design products: rowhouses are similar to one another but different from freestanding houses or apartment blocks. There is no reason to assume that these are essential, transcendent differences, especially since so many new formal and functional types have been produced through the modern period, but rather that the similarities we call types come from some similarity in the process of designing and constructing buildings, from physical and economic constraints to cultural conventions.

That observation allows me to answer the opening question in terms of type, asking whether the development of new building types-the ranch house for example-derives from some evolutionary process of variation and selection? In the strict terms of genetic evolution, the answer is clearly no. The problem is copying. There is no faithful mechanism of reproduction between buildings (except perhaps for the actual copying of plans). Designers may copy their own work, and the work of others, but the actual reproduction of typical features still requires their imaginative, mental reconstruction of the building type. Not only are there no genetic elements controlling the process, but the designer is free to incorporate any new feature he observes or imagines, specifically violating the terms of Darwinian evolution. This does not mean that typical categories or the appearance of similarities among buildings are meaningless, but that they derive from some other process than the evolution of a genetic attribute of the building.

This brings us back to neo-biological thinking whose central proposition would have to be that an entity such as a building is the product of many competing forces and scales of influence, that it has no essence as such.[16] In contemporary terms that condition is called emergence and includes a whole variety of processes in addition to genetic evolution, including the self organizing properties of matter and energy, co-evolution, and even cooperation. The fact that buildings, particularly in pre-industrial cultures, do seem to develop through the testing and selection of discrete variations has added strength to the narrow analogy with evolution, but I would argue that buildings emerge in this sense from a host of intertwined mechanisms in which the forces of culture, and now media, are every bit as important as the narrow functional terms such as structural efficiency. In fact, looked at in this way, it seems remarkable that building forms or uses are at all stable when there are so many kinds of forces active.

A great deal of work has been done through the twentieth century to understand and characterize different kinds of emergent behaviors, and it is not surprising that many of those have been translated directly into architectural theory. Among the most innovative suggestions to explain the apparent evolution, and stability, of industrial products was the notion of "mechanical selection" advanced by Ozenfant and Le Corbusier to justify the selection of everyday objects as the subjects of their Purist paintings. They called these objet-types (as opposed to objet d'art) and explained their evolutionary origin quite explicitly.

Man and organized beings are products of natural selection. In evolution on earth, the organs of beings are more and more adapted and purified, and the entire forward march of evolution is a function of purification. The human body seems to be the highest product of natural selection. When examining these selected forms, one finds a tendency toward certain identical aspects, corresponding to constant functions, functions which are of maximum efficiency, maximum strength, maximum capacity, etc., that is maximum economy. ECONOMY is the law of natural selection. It is easy to calculate that it is also the great law which governs what we call "mechanical selection.[17]

They described the objects of mechanical selection as "true extensions of human-limbs" suggesting that mechanical selection is both a continuation of natural selection and, with mechanization, potentially independent of it.[18] Both of them continued to rely on

the concept of objet-type after their collaboration ended, but in Le Corbusier's treatise on decorative art, in the chapter called "Type-Needs, Type-Furniture," an even more interesting proposition becomes evident.[19] To sharpen the distinction between objet-type and objet d'art he links the objet-type to "type-needs," illustrating the section with pictures of standard American office furniture. The implicit and explicit argument is that mechanical selection operates as an expression of the typical, generic needs of the population designing, making, and above all buying such industrial products. The awkward functional appearance of steel desks, filing cabinets, and hole punches suggests that they conform to the real "needs" of their users, which can only occur in utilitarian objects freed from aesthetic concern. In other words, the beauty and optimization achieved by natural selection can also occur "mechanically" as an expression, a selection, through the mass market choices of a particular kind of "needy" body, one without taste or sentiment. Those are the needs that drive the evolution of the technical.

Neo-biology at House_n

The most sophisticated premise of House_n is that such needs are themselves complex and ever-changing, but they are still the needs of the emotionally truncated figure that lurks behind so much of the architecture of the modern period. Moreover, the implicit assumption of both "mechanical selection" and the references to evolution in House_n is that this kind of market driven adaptation automatically produces a better and more refined product, but this is precisely why we have to ask for whom these adaptations are occurring. The analogy will be productive only when its real dynamics are acknowledged and investigated directly, when it is understood that even biological evolution never produces perfectly adapted entities, but ones that are just capable of surviving. The adaptability of the current generation of future houses, whether that adaptation is accomplished through physical reconfigurations or the management of data flows, still promises the elusive optimization hinted at in evolutionary debates. Never mind the difficulty of optimizing for all the competing physical and economic constraints on house building, but the messy process of "cultural" evolution guarantees that no house will ever be a perfect extension of the needy body.

Of course I am using House_n as a somewhat unfair example of a tendency present throughout the technological discourse of architecture, an unrepentantly utopian functionalism combined with the very sophisticated concepts of neo-biology. My criticisms also recall those of earlier attacks on modernism, such as Team 10's call for the "study of human association as a first principle," or Venturi and Scott-Brown, whose attention to the "ordinary and everyday" echoes that of Ozenfant and Le Corbusier, except that it addressed symbolic meaning rather than function.[20] However, this is not a renewed argument for post-modernism, quite the opposite, I believe that the very powerful concepts of complexity, adaptation, and evolution can only be useful if they are shorn of any remnant of idealist or utopian tendencies. The corrective criticisms leveled by Team 10 and Venturi Scott-Brown both sought to raise the results of "other" processes of cultural evolution, the one in the primitive, indigenous, or folk cultures, the other in the lower class activities of the strip and the subdivision. Both implicitly argued that those groups could achieve the kind of authentically natural cultural evolution denied to the self-conscious process of high-design.

At the moment, I can only answer the opening question with another analogy, inspired by Kevin Kelly. In a discussion about the stability, even inevitability, of certain ecosystems- prairies, hardwood forests, etc.-he noted that ecosystems have no genes, meaning that like buildings, their development was not narrowly Darwinian: "evolutionary dynamics exert themselves most forcefully in tightly coupled systems. In systems connected loosely, such as ecosystems, economic systems, and cultural systems, a less structured adaptation takes place. We know very little about the general dynamics of loosely coupled systems because this kind of distributed change is messy and infinitely indirect."[21] Houses, of course, exist in (loose) connection with ecosystems, economic systems, and cultural systems, and so their dynamics are even harder to fathom. Not only do we have to renounce the utopian dimension of the evolutionary analogy, but any hope that houses can have any linear, optimizing tendency whatsoever. Perhaps the best conclusion of this brief essay would be a comparison between two images of the technological evolution of the house carried to its logical conclusion. One from Reyner Banham's 1965 article "A Home is Not a House" reduces the house

to a bubble of environmental comfort, the house as the ultimate refinement of the powerful devices required to moderate the local climate.[22] The other, Superstudio's contribution to the 1972 MoMA show curated by Emilio Ambasz: Italy: The New Domestic Landscape. They proposed a "network of energy and information extending to every properly habitable area," a network in which "nomadism becomes the permanent condition: the movements of individuals interact, thereby creating continual currents . . . as with fluids, the movement of one part affects the whole."[23] That extended, distributed network used the natural landscape as the condition of enclosure, suggesting that the ideal house was not only nature itself, but the competitively adaptive conditions of nature at its wildest.

Notes

1 Emily Martin, Flexible Bodies: Tracking Immunity in American Culture — From the Days of Polio to the Age of Aids (Boston: Beacon Press, 1994).

2 Kevin Kelly, Out of Control: The new biology of machines, social systems, and the economic world (Cambridge: Perseus, 1994).

3 "Introduction," Changing Places/House_n The MIT Home of the Future Consortium, see: http://architecture.mit.edu/house_n/.

4 An example of an attempt to examine such dreams appears in Iñaki Ábalos, The Good Life: A guided visit to the houses of modernity (Barcelona: Editorial Gustavo Gili, 2001).

5 H. Ward Jandl, Yesterday's Houses of Tomorrow: Innovative American Homes, 1850-1950 (Washington, DC: The Preservation Press, 1991).

6 "Introduction," Changing Places (http://architecture.mit.edu/house_n/web/intro/intro.htm).

7 Ibid. [emphasis added by author]

8 Lewis Mumford, Technics and Civiliation (New York: Harcourt, Brace and World, 1934). Siegfried Giedion, Mechanization Takes Command

9 John E. Fernandez and Chris Carbone, "Evolutionary Adaptation," Changing Places: Research Themes, 2002. (http://architecture.mit.edu/house_n/web/projects/cp.htm).

10 Probably the best examination of the biological analogy in architecture is by Philip Steadman, The Evolution of Designs: Biological analogy in architecture and the applied arts (Cambridge; New York: Cambridge University Press, 1979). His work followed on the historical work of Peter Collins, Changing Ideals in Modern Architecture: 1750-1950 (Montreal: McGill-Queen's University Press, 1975), though Steadman gives much greater credit to Alan Colquhoun for seeing the vast reach of the biological analogy. Alan Colquhoun, "Typology and Design Method," Persepecta 12 (1969):

71-4.

11 Manuel De Landa, "The Genetic Algorithm in Architecture" (Lecture presented at the University of Pennsylvania, November 15, 2001).

12 Manuel De Landa, A Thousand Years of Non-Linear History (New York: Swerve Editions, 1997), 263.

13 Antoine-Chrysostome Quatremère de Quincy, An Essay on the Nature, the End, and the Means of Imitation in the Fine Arts (1823; London: Smith, Elder and Co., Cornhill, 1837). "Type," Encyclopédie Méthodique 3 (Paris, 1825; translation, Oppositions 8, Spring, 1977): 147-50.

14 Alec L.Panchen, Classification, evolution, and the nature of biology (Cambridge University Press, 1992).

15 Aunger, Robert, ed. Darwinizing Culture: The Status of Memetics as a Science (Oxford: Oxford University Press, 2000).

16 That is also one of general premises of genetic evolution, a premise that was not original to Darwin, but which seems to have arisen during the Scottish enlightenment of the eighteenth century. The most familiar formulation is Adam Smith's "invisible hand" of the market, though Bernard Mandeville appears to have been the first to suggest that complex and seemingly intentional entities could arise spontaneously from many independent activities. Ronald Hamowy, The Scottish Enlightenment and the Theory of Spontaneous Order, Journal of the History of Philosophy Monograph (Carbondale, Il.: Southern Illinois University Press, 1987). Adam Smith, The Theory of Moral Sentiments (1759). An Inquiry into the Nature and Causes of the Wealth of Nations (1776).

17 Amédée Ozenfant and Charles Edouard Jeanneret, "Le Purisme," L'Esprit Nouveau, no. 4 (1921): 369-86. "Purism," In Modern Artists on Art: Ten Unabridged Essays, ed. Robert L. Herbert (New York: Prentice Hall, 1964).

18 Samuel Butler, Erewhon (London, 1872). Steadman considers the question of whether they read Butler directly: Evolution of Designs, 134-5.

19 Le Corbusier, The Decorative Art of Today (1925), (Cambridge: The MIT Press, 1987), 69-79.

20 Doorn Bakema, van Eyck, van Ginkel, Hovens-Greve, Smithson, Voelker "Doorn Manifesto-CIAM Meeting 29-30-31 January, 1954," Architecture Culture 1943-1968: A Documentary Anthology, edited by Joan Ockman (New York: Columbia Books of Architecture/Rizzoli, 1993), 183. Robert Venturi and Denise Scott Brown, "A Significance for A&P Parking Lots, or Learning from Las Vegas," Architectural Forum (March, 1968).

21 Kelly, Out of Control, 99.

22 Reyner Banham, "A Home is Not a House," Art in America 2 (April,

1965): 70-79.
23 Emilio Ambasz, Italy: The New Domestic Landscape: Achievements and Problems of Italian Design (New York: Museum of Modern Art, 1972): 240-51.