

## HARD COMMUNICATION

## Emergence-cy!

Notes on the Flow of Information in Architecture

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*"Architecture develops its characteristic cognition through the resultant space-time manifestation of the dominant forces successively at play in any time and place."*

—Knud Lönberg-Holm, 1929<sup>1</sup>

**SWEET'S**

For architecture, the critical tool of the information age has been neither the telephone, the computer, nor even the network, but the constantly expanding *Sweet's Catalog* and the whole messy system of distributing information about building materials, products, and processes. *Sweet's* originated in the 1890s as a service of *F.W. Dodge Construction* (who also began publishing the *Architectural Record* at the same time).<sup>2</sup> The first full catalog appeared in 1906 with an introduction by Thomas Nolan, then an assistant professor at the University of Pennsylvania, in which he "very gladly consented to commend the idea [of] a really scientific standard catalogue and index of building materials and construction." He explained that he himself had been working for 15 years at "finding some practical solution to the 'Catalogue Problem' which no architect has been able to work out himself."<sup>3</sup> His description of offices overrun with boxes, books, and piles of information and of busy architects with "less and less time" to do "more and more work" still applies today, though his confidence that a scientific catalog could solve the problem would have to be translated to the distributed capabilities of the internet.

Although the now multi-volume *Sweet's Catalog* has certainly prospered since 1906, becoming an essential tool in virtually every architectural office, the "catalogue problem" has in no way been solved. In 1929 a young Danish architect named Knud Lönberg-Holm sent an article to the *Architectural Record* in which he described the "catalogue problem" as a fundamental crisis for the architecture profession, arguing that the solution lay in a radical rethinking of the distribution of information in architecture.

*... the architect has lost his leadership. From a professional man with a professional ethics he has become a business man subject*

*to the whims of the buyer. The progressive architect acutely realizes that his problem means ultimately the negation of his profession. He has no power to meet his dilemma through his architectural work. As an individual businessman he cannot afford the research work necessary for the proper execution of his ideas; moreover, he is confronted by the gulf which separates him from a client unsympathetic toward an experiment at his expense. The rare exceptions from this do not alter the general aspect of the situation. And professional organizations have the problem's solution still less within their command since they are primarily interested in the protection of professional interests.*

He argued that "collective problems require collective thinking and collective work" and proposed the invention of an organization that would act as a "clearing house" and "an economically independent research institute," setting standards and organizing information.<sup>4</sup> Though the *Architectural Record* considered that article too extreme to publish at the time, Lönberg-Holm was quickly hired to edit the newly formed technical department of the magazine. By 1932 he found even that department too caught up in questions of style and moved down the hall to the *Sweet's Catalog Service* where he became director of research.<sup>5</sup> In effect he undertook to transform *Sweet's* into the "clearing house" that would transform the profession's relationship to information.

In 1939, he was joined in that effort by the Czech designer Ladislav Sutnar and together they reshaped the look and logic of the

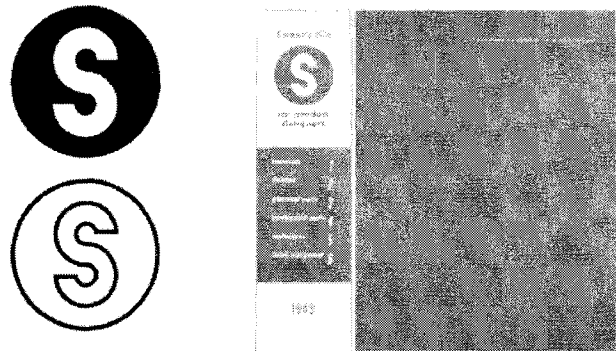


Fig. 1. Knud Lönberg-Holm and Ladislav Sutnar, *Sweet's Catalog*, 1949

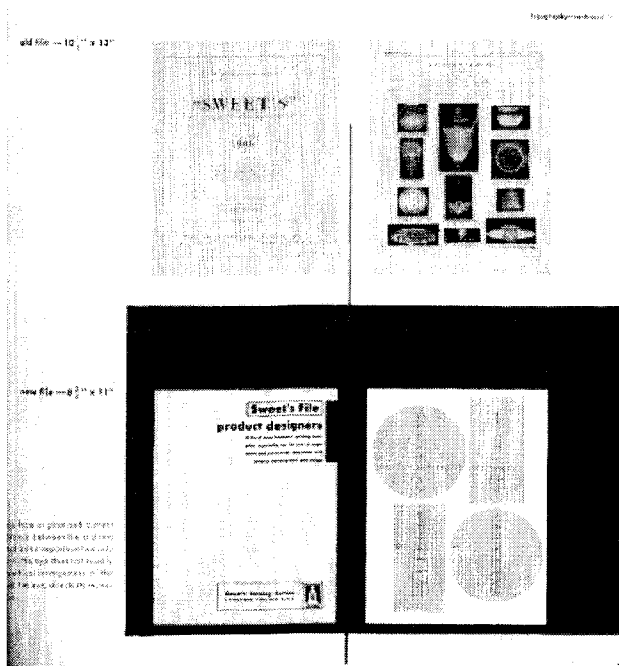


Fig. 2. Lönberg-Holm and Sutnar, "Sweet's," Catalog Design Progress, 1950

catalog, developing the bold graphics and characteristic "S" still used today. Of course *Sweet's* is in no way an economically independent institution. It is produced as multi-volume bound collection of short catalog sections provided by product manufacturers, whose fees and advertising tie-ins with the *Architectural Record* and *Dodge Construction Reports* directly supported *Sweet's*. As a result, most of Lönberg-Holm and Sutnar's work had to be executed indirectly by persuading and teaching manufacturers. They sought to standardize and discipline their advertising inserts, shaping them into documents readily used by busy architects seeking information. In the late 1940s they formalized their efforts in a pamphlet prepared for product manufacturers and that work was so popular that they brought out an expanded, full color version called *Catalog Design Progress* in 1950.<sup>5</sup> In the introduction they explained that their aim was to produce "dynamic," "living standards" that could keep up with the rapid pace of technological advance:

*Thus with today's industrial development and the concurrent higher standards of industry, corresponding advances must be made in the standards of industrial information itself. The need is not only for more factual information, but also for better presentation, with the visual clarity and precision gained through new design techniques. Fundamentally, this means the development of design patterns capable of transmitting a flow of information....*

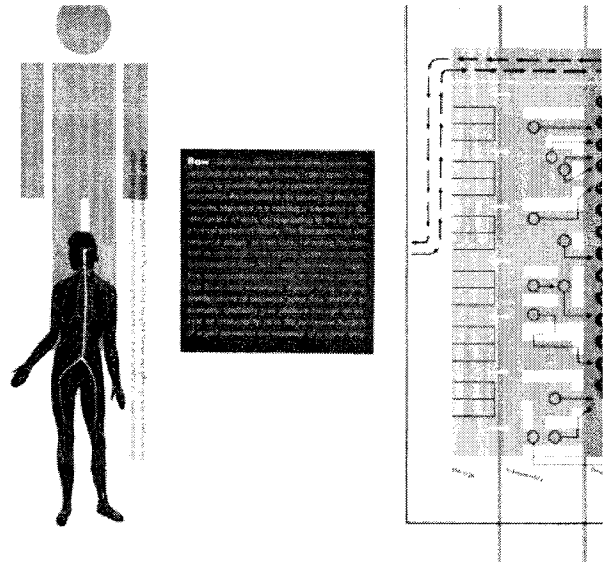


Fig. 3. Lönberg-Holm and Sutnar, "Flow," Catalog Design Progress, 1950

As product information now embraces thousands of more products (Since the first *Sweet's File*, not only has there been an amazing diversification of products, but industry has expanded into vast new fields of production: electronics, air conditioning, modern precision tools, plastics, and various other new materials), often extremely complex, and therefore involves more intense competition for attention, the old standards are inadequate for the needs of the present.<sup>7</sup>

Their first section charted the "emergence of new flow patterns" in all aspects of contemporary life—transportation, production, communication—then devoted the body of the book to the visual and structural features with which such information flow patterns should be directed in their catalogue. They concluded with a brief theoretical section that offered "flow" as that form of information that emerges naturally from the functional demands of architectural practice. It was a clever formulation that overcame the form-function opposition that continued to worry modern architects. They explained the emergent condition of flow analogically, by comparison with a variety of other entities newly understood according to the generalized concept of system: "The flow pattern of any sequence adopts its own form, reflecting function, and its variety of forms may be observed not only in information flow, but in man (the nervous, digestive, and reproductive systems), in industry (production flow), and elsewhere."<sup>8</sup>

The management of architectural information by *Sweet's Catalog* has continued with the subsequent migration of their catalog information onto compact discs in the 1980s and onto the world wide web in the 1990s, currently offered as a component at of *construction.com* with all the attendant expectations of interactive

connectivity:

*Construction.com is the industry marketplace that enables construction professionals to do their job faster, better and cheaper. Building on The McGraw-Hill Companies' heritage as the world's premier information provider to the \$1.7 trillion commercial construction industry, construction.com uses the Internet to help its customers to get the latest industry intelligence and interactive solutions that help professional decision-makers do their jobs successfully. By leveraging the powerful content of The McGraw-Hill Construction Information Group's leading brands, including F.W. Dodge, Sweet's, Engineering News-Record, Architectural Record, and Design-Build, construction.com integrates unmatched market intelligence, unique project management tools, and end-to-end access to the construction community.*<sup>9</sup>

### EVOLUTION AND EMERGENCE

I have sketched this brief history of *Sweet's* Catalog to ask more fundamental questions about the information age in architecture, that age characterized by the necessity of tools like *Sweet's* itself. But what, after all, is an information age? The notion of an "age" recalls popular theories of the *zeitgeist* and draws on the assumption that like the citizens of the stone, bronze, or iron age, we are both characterized by our tools and always seeking better ones. The idea of technological stages and of the progress between them has led to repeated applications of the notion of evolution to architecture, a notion that when combined with the development of general systems theory and applied to the flow of information now stands as the dominant explanatory paradigm of our age.

Ideas about evolution have been appealing to architectural thinkers since well before Darwin's explicit formulation of natural selection because the process of incremental improvement and adaptation seems to apply so naturally to architecture. As Peter Collins observed in his review of the biological analogy, the very idea that "the moderns had improved on the Romans, just as the Romans improved on the Greeks" implies progressive evolution.<sup>10</sup> The controversial question of the late nineteenth and early twentieth centuries was whether such developments were directed toward some perfect conclusion or whether they proceed by accident and chance. In the contemporary understanding, any notion of progress or inherent improvement has long since been abandoned. The generalized "genetic algorithm" with which "Universal Darwinism" is now explained merely describes a technique for refining alternatives that are better adapted to prevailing conditions, but which are in no way guaranteed to be optimal or even superior.<sup>11</sup>

The principle question I would like to ask about *Sweet's* and

information flow in architecture has to do with the consequences and precision of the analogy with evolution. I ask it in this way for two reasons: first, because most forms of the biological analogy are largely metaphorical and can easily be used to conceal a host of other ideological assumptions and, second, because theories of evolution have been applied with new vigor to virtually every discipline in recent years and architecture is no exception.<sup>12</sup> The quite general biological and evolutionary analogies invoked through the nineteenth and twentieth centuries have been transformed into newly precise techniques of morphogenesis, using sophisticated computer graphic techniques to generate and refine architectural form. From Jon Frazer's work at the AA to Manuel De Landa's call for architects to "breed" their buildings, those evolutionary practices are being directly opposed to traditional activities of design, exemplifying the ultimate results of information flow foreseen by Lönberg-Holm.<sup>13</sup>

The basic notion of evolution has a long, contentious history, and certainly preceded any explicitly scientific formulation.<sup>14</sup> Darwin's critical insight, however, was not the notion of evolutionary change, which in some form had been around for millennia, but the idea that new forms of order might arise spontaneously from numerous discrete and individual acts of "descent with modification."<sup>15</sup> The underlying concept has been credited to the theorists of the Scottish Enlightenment-Mandeville, Hume, Smith, and Ferguson-of which Adam Smith's "invisible hand" of the market is perhaps its best known form.<sup>16</sup> In contemporary language, that effect is described as emergence and with the refinements in the description and analysis of complex, nonlinear systems it has been applied to virtually every field and discipline in recent years. According to the editors of the magazine of the same name:

*... the idea of emergence is used to indicate the arising of patterns, structures, or properties that do not seem adequately explained by referring only to the system's pre-existing components and their interaction. Emergence becomes of increasing importance as an explanatory construct when the system is characterized by the following features: 1) when the organization of the system, i.e., its global order, appears to be more salient and of a different kind than the components alone; 2) when the components can be replaced without an accompanying decommissioning of the whole system; 3) when the new global patterns or properties are radically novel with respect to the pre-existing components; thus, the emergent patterns seem to be unpredictable and nondeducible from the components as well as irreducible to those components.*<sup>17</sup>

In this spirit, Darwin's other critical insight was to apply the idea of natural selection to large populations over time rather than to individuals. With all the massive evidence he gathered of "descent with modification" through the millennia, he never attempted to iden-

tify discrete instances or mechanisms of mutation. Theories of evolution have never been monolithic and the history of the concept involves a steady appropriation of and reconciliation with many different ideological approaches. The immediate application of the idea to human social organizations, mostly famously in the case of Herbert Spencer and the subsequent flourishing of eugenics, exemplifies the danger of extending the analogy without examining either the ideological assumptions of the comparison or understanding its precise mechanisms of operation in non-biological cases. The classic theory of Darwin was partially reconciled with genetics in the 1930s and then more completely with advances in system theory and microbiology after the Second World War.

### MEMES AND CULTURAL EVOLUTION

The popular assumption that cultural artifacts like architecture do in fact evolve has been given new force by the concept of "memes," a term coined by the zoologist Richard Dawkins in a book of 1976 called *The Selfish Gene*.<sup>18</sup> That book was written to explain a group of ideas about evolution that had developed as a result of the attention to the mechanisms of genetic inheritance. The general proposition was that natural selection does not operate on species, races, or even individuals, but on genes, which are the only feature passed from generation to generation.<sup>19</sup> The title summarized the Dawkins's view that evolution had to be understood from the "gene's point of view" and focused the theory on the three basic elements of the evolutionary mechanism: "variation, selection, and retention (or heredity)." As he explained it, "if there is replicator that makes imperfect copies of itself, only some of which survive, then evolution simply must occur."

In the first edition, Dawkins concluded by examining the contention that genetic evolution alone could not explain the proliferation of human culture. By analogy with the gene, he proposed the existence of a second kind of independent replicator, the meme. Though it has been difficult to define, the meme is described as a unit of imitation, something that can be taught, learned, copied, or otherwise passed on from person to person. The clever coining of that term has spawned both a field of study (memetics) and a great deal of controversy about whether all that is described as "culture" merely emerges from the selective replication of bits of cultural information.<sup>20</sup> The analogy is supported by the commonsense feeling that human evolution is different from and somehow exceeds biological evolution, but it founders when efforts are made to identify specific memes or their mechanisms of replication. Many of the examples discussed in the literature on memes—advertisements, catchy tunes, styles of clothing—suggest that memes are merely the extraneous bits of cultural production, but when we consider how much of the infor-

mation in *Sweet's Catalog* is used by direct copying or some other form of (adaptive) reproduction, it becomes evident that we have to examine the analogy between memes and genes very carefully.

Architecture is really a very conservative art. It is heavily constrained by means of production and social habits, and even in its most innovative moments operates largely through the modification of previously existing forms, arrangements, and details. The success of books like *Architectural Graphic Standards* and *Time-Saver Standards* (which were also developed in the 1930s) attest to the kind and quantity of copying with which it proceeds. The "catalogue problem" results not only from the proliferation of products, but also from the simple fact of architectural design as a process of imitation, copying, and replication (with variations). But what aspect of that process constitutes a meme: a single construction detail, a whole building, a style, or is it some abstract "idea" that gets passed on? Even if we take the "meme's point of view," anyone familiar with architectural design would acknowledge that the fidelity of architectural replication is typically very low, while the potential for variation is high, failing two of the three critical tests for a Darwinian process.

The difficulty becomes clearer when we examine the basic analogy between gene and meme. In biological reproduction, the genotype directs the production or growth of the phenotype, the resulting morphology, physiology, and behavior of the organism (though precisely how is still the subject of intense research). One of Dawkins's subsequent books even explored how the evolutionary activity of the gene can be extended into constructions like nests or hives and behaviors like parasitism, making the comparison to architecture seem even more applicable.<sup>21</sup> By analogy, the memes of building would be those guiding rules or principles with which architectural forms and functions are generated, but though we intuitively recognize that such rules exist, is there any precise mechanism for their replication or transfer? As anyone who has tried to teach design knows, it is quite the opposite. As Robert Boyd and Peter Richerson observed in their critique of memes, "ideas are not copied and transmitted intact from one brain to another. Instead the information in one brain generates some behavior, somebody else observes this behavior, and then (somehow) creates the information necessary to generate very similar behavior."<sup>22</sup> What this means for the analogy is that unlike biological replication, architectural "information" is stored in buildings, books, and sites, and then re-interpreted through layers of social practices and beliefs. In effect, taking memes literally means returning the architectural discourse to the neo-classical idealism of Quatremere de Quincy with his search for definitive building "typologies" as opposed to models for copying.<sup>23</sup>

The danger of a good analogy is that you can carry it to far: memes simply overstate the kinds of similarities between biology

and culture, which isn't to say that similar processes don't operate at all within design. The history of architecture certainly exhibits the kind of directional, non-reversible development that characterizes evolution. No one, after all, could imagine a historic chain of development that began with a building like Garnier's Paris Opera and yielded the Parthenon. But because of the many different kinds of forces operating on the production of architecture-physical, economic, social, cultural, etc.-any explanation of emergent forms in architecture must begin with the absence of a simple replicator and the complexity of interactions by which buildings are developed. For this our guide would have to be the many other theories about self-organization and complex adaptive systems that have been developed in recent decades, and which even inform some of the competing theories about how biological evolution itself has proceeded. It is a very different matter to extrapolate from the behavior of a simple analog than it is to characterize the kinds of organizations and behaviors that develop amidst real complexity. The long running dispute between Richard Dawkins and Stephen Jay Gould has something of that character, and the startling insights of Deleuze and Guattari or De Landa begin by looking at the emergent forms themselves.<sup>24</sup>

Examining the case of *Sweet's Catalog* allows us to study a "population" of restlessly evolving architectural information and of the highly self-conscious ways in which that information is interpreted. As such, I would argue that the two most important features of the "catalogue problem" for this study will be to understand the emergence and regulation of design norms and the question of technol-

ogized if the notion of evolution in architecture is to avoid being reduced to mere determinism.

**FLOW AND NEEDS**

At the same moment that Lönberg-Holm was moving to *Sweet's Catalog*, he was also an active member of Buckminster Fuller's *Structural Studies Associates* (SSA), which had just taken over *Shelter*, a transformation of the venerable *T-Square Journal*.<sup>25</sup> They subtitled the magazine, "A Correlating Medium for the Forces of Architecture," and undertook to explain their radical vision of architecture. Lönberg-Holm's contribution was titled "Monuments and Instruments," which opposed the two concepts and argued that buildings were evolving in to instruments, producing constructions of less and less substance.<sup>26</sup> I cite that article because like the concept of the meme, the idea of architecture as a an evolving adapting tool also founders on the reduction of architectural production to a single criteria like structure, weight, or use. Lönberg-Holm conceded as much his examination of function a decade later in *Catalog Design Progress*:

*Definition of function implies differentiation of an infinite variety of forms to satisfy specific needs. As suggested by the foregoing pages, definition of function within a catalog is expressed in such specialized elements as cover, visual units, charts, selector guides, and the like. To the human eye - itself an example of high specialization in function as an organ of perception-definition of, function through differentiation becomes a common-; place of everyday observation, as in the forms here illustrated from such divergent fields as industry, household wares, sports. Opposed to these purely functional differentiations, common objects are often marked by irrational differentiations to satisfy the individual's craving for distinction, as in fashion's differentiation of umbrella handles.<sup>27</sup>*

The role of "irrational cravings" in information flow was explained by another SSA member also immersed in thinking about evolution, Frederick Kiesler, who wrote an article on the subject for the *Architectural Record* in 1939.<sup>28</sup> Kiesler's insight was to recognize the degree to which the human "needs" on which functionalist methods are necessarily based were themselves endlessly changing and evolving. He argued that man, his tools, and his natural environment were all interacting, each following its own principles of "heredity" and each changing the evolutionary environment for the other.

Inquiring about evolution in architecture connects two aspects of the architectural discourse that are often treated separately: the long discussion about the role of function and the equally long concern over the role of imitation. Through the modern period function has been offered as a restraint, an internal discipline, to the apparently unfettered proliferation of products and devices thrown up in

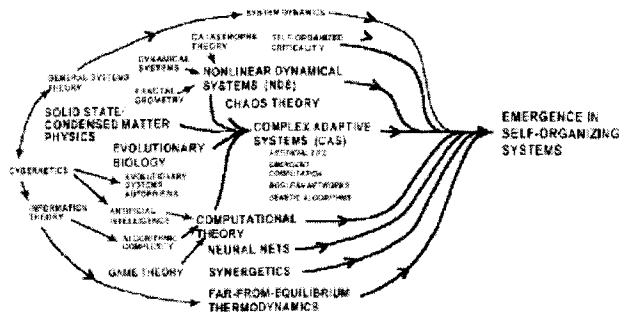


Fig. 4. Emergent Self-Organizing Systems

ogy. Design norms emerge as stabilizing entities from within the flow of innovative variations in products and materials, which are driven by all the forces of the marketplace and culture of images. Conversely, the very notion of function, which itself emerged from the biological analogy, and of architecture as a kind of tool has been used to explain and market all those endless variations. Those are two quite different questions, the one theoretical and the other historical, but their interaction points to the kind of explanation that must be elabo-

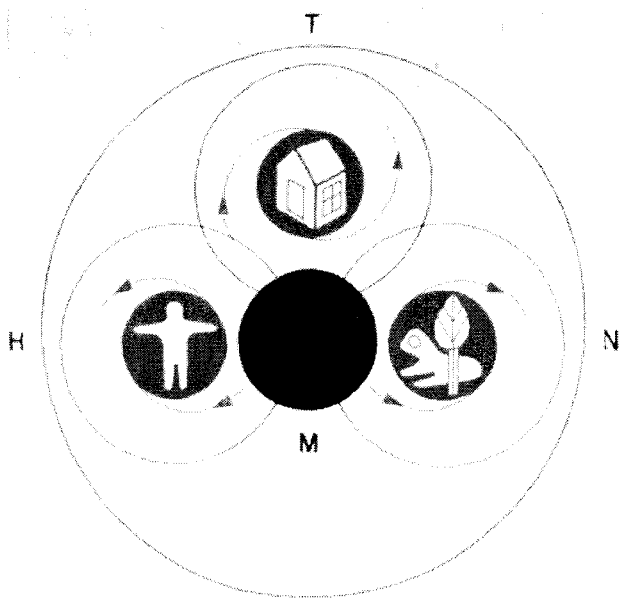


Fig. 5. Frederick Kiesler, "Man = Heredity + Environment," *Architectural Record*, 1939

the accelerating process of industrial development. Rules about imitating principles (types) and not copying forms have served a similar function. They are connected through the needs (and desires) shaped by biological evolution, and which have been tuned, amplified, and distorted in the contemporary marketplace of images and products. The provisional conclusion of these introductory notes can only be the suggestion that the flow of information experienced by architects is governed by an update of Kiesler's diagram, which would summarize the co-evolutionary relationship between (1) the self-organizing properties of matter and energy (geology, climate, etc), (2) biological evolution (biosphere), and (3) evolution of cultural norms.

**NOTES**

<sup>1</sup>Knud Lönberg-Holm, "Monuments and Instruments," *Shelter* 2 (May, 1932): 4-8.  
<sup>2</sup>Susanne Lichtenstein, *Editing Architecture: Architectural Record and the Growth of Modern Architecture 1928-1938* (Ph.D. Diss., Cornell University, 1990).  
<sup>3</sup>Thomas Nolan, Introduction, "Sweet's" *Indexed Catalogue of Building Construction* (New York: The Architectural Record Co., 1906).  
<sup>4</sup>Knud Lönberg-Holm, "Architecture in the Industrial Age," *Arts and Architecture* 84 (April, 1967): 22.  
<sup>5</sup>Buckminster Fuller, "The Age of Astro-Architecture," *Saturday Review* (July 13, 1968): 17-42.

<sup>6</sup>Knud Lönberg-Holm and Ladislav Sutnar, *Catalog Design Progress* (New York: Sweet's Catalog Service, 1950). Walter Sanders, "Catalog Design," review of *Catalog Design Progress*, in the *Architectural Record* (March, 1951): 32, 35.  
<sup>7</sup>Lönberg-Holm and Sutnar, *Catalog Design Progress*.  
<sup>8</sup>Lönberg-Holm and Sutnar, *Catalog Design Progress*.  
<sup>9</sup>[www.construction.com/AboutUs/](http://www.construction.com/AboutUs/)  
<sup>20</sup>Peter Collins, *Changing Ideals in Modern Architecture: 1750-1950* (Montreal: McGill-Queen's University Press, 1975).  
<sup>11</sup>Susan Blackmore, *The Meme Machine* (Oxford: Oxford University Press, 1999).  
<sup>12</sup>Philip Steadman, *The Evolution of Designs: Biological analogy in architecture and the applied arts* (Cambridge; New York: Cambridge University Press, 1979).  
<sup>13</sup>John Frazer, *An evolutionary architecture* (London: Architectural Association, 1995). Manuel De Landa, "The Genetic Algorithm in Architecture" (Lecture presented at the University of Pennsylvania, November 15, 2001).  
<sup>14</sup>Thomas A. Goudge, "Evolutionism," *Dictionary of the History of Ideas: Studies of Selected Pivotal Ideas*, Philip P. Weiner, ed. (New York: Charles Scribner's Sons, 1973), 174-89.  
<sup>15</sup>Charles Darwin, *The Origin of the Species by Means of Natural Selection*, 6th ed. (London, J. Murray, 1888).  
<sup>16</sup>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).  
<sup>17</sup>*Emergence: A Journal of Complexity Issues in Organizations and Management* (emergence.org).  
<sup>18</sup>Richard Dawkins, *The Selfish Gene*, revised edition (Oxford: Oxford University Press, 1989).  
<sup>19</sup>Dawkins attributed those achievements to G.C. Williams, J. Maynard Smith, W.D. Hamilton, and R.L. Trivers. *The Selfish Gene*. There are disagreements with that position as well. See Kim Sterelny, *Dawkins vs. Gould: Survival of the fittest* (Cambridge: Icon Books/Totem Books, 2001). Paul E. Griffiths, and Russell D. Gray, "Replicator II - Judgment Day," *Biology and Philosophy* 12 (1997): 471-492  
<sup>20</sup>Aunger, Robert, ed. *Darwinizing Culture: The Status of Memetics as a Science* (Oxford: Oxford University Press, 2000).  
<sup>21</sup>Dawkins, *The Extended Phenotype: The gene as the unit of selection* (Oxford; San Francisco: Freeman, 1982).  
<sup>22</sup>Robert Boyd and Peter Richerson, "Memes: Universal Acid or a Better Mousetrap," *Darwinizing Culture*, 155.  
<sup>23</sup>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.  
<sup>24</sup>*Dawkins vs. Gould*. Gilles Deleuze, and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia* (Minneapolis: University of Minnesota Press, 1987).

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

<sup>25</sup>Marc Dessauce, "Control lo Stile Internazionale: Shelter e la Stampa Architettonica Americana," *Casabella* 57 (September, 1993): 46-53.

<sup>26</sup>Lönberg-Holm, "Monuments and Instruments."

<sup>27</sup>Lönberg-Holm and Sutnar, *Catalog Design Progress*.

<sup>28</sup>Frederick Kiesler, "On Correalism and Biotechnique: A Definition and Test of a New Approach to Building Design," *The Architectural Record* (September, 1939): 60-75.