Submitted on: 19/07/2014

Buildings with Brain Power: Library Architecture in Neural Terms

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Abstract:

The connection between neuroscience and the built environment is a fairly new interdisciplinary field and one in which both fields, in their respective pursuits, have worked to understand the relationship between design choices, human behavior, and biological processes. Taken together and applied in tandem, these two activities have potential to vastly improve the effectiveness of buildings designed with the healthcare facilities, laboratories, or elementary schools, all of which share objectives of healing and intellectual cultivation.

This paper will extend the dialogue to library design, perhaps the most representationally loaded expression of "mental space." The library has seen profound changes in its core program with contemporary expectations of the library looking for wireless "anywhere" environments, cafes, group study spaces, and some stacks. Designs aiming to meet these new requirements seek to accommodate the behavior of the person using the library – as opposed to programming for specific, more traditional behavior - in that the space is open and extensible. This is an historic shift for library design, with as many critics as advocates.

To help frame the discussion of how neuroscience and library design could inform each other, I consider the "productive research environment" (a term borrowed from the social sciences) as it relates to library spaces and programming. It is not clear how these "web 2.0" advances in physical space have impacted the researcher's process or thinking in neural terms. At the same time, neuroscientists should consider the representational aspects of architecture, as well as its functional requirements. In doing so, the dialog of neuroscience and architecture has potential to reinforce in new ways the spirit of learning and research that libraries have historically tried to embody.

Keywords: architecture, neuroscience, libraries, design, research environment

I.

The connection between neuroscience research and the built environment is a fairly new interdisciplinary field and one in which both camps, in their respective pursuits, have

worked to understand the relationship between design choices, human behavior, and biological processes. Architects determine spatial experience whereas neuroscientists measure this experience in neural and physiological terms. Taken together and applied in tandem, these two activities have potential to vastly improve the effectiveness of healthcare facilities, research laboratories, prisons, and elementary schools, all of which share objectives of healing, growth, and intellectual cultivation. The challenge facing this new area is its very infancy. It is feeling its way forward, without, at present, processes or mechanisms in place to perform precise analysis as, for example, neuroscience's partnership with molecular biology which, among other things, can transform the design of drugs to address disorders of mental functions. One of the fundamental and perhaps existential questions that the collaboration between architecture and neuroscience tackles is whether or not this new discipline will yield insights inaccessible to applied cognitive science. In the words of Dr. Michael Arbib, what might it take for an "applied neuroscience" in the service of architecture to emerge?[1]

My paper will extend the dialogue between neuroscience and architecture to library design, perhaps the most representationally loaded expression of what might be called "mental space." The library has seen profound changes in its core program in recent years. For example, contemporary research expectations of the library include available wireless "anywhere" environments, cafes, group study spaces, socializing areas and some stacks. Designs aiming to meet these new requirements seek to accommodate the behavior of the person using the library – as opposed to programming for specific, more traditional behavior - in that the space is open and extensible. This is an historic shift for library design, with as many critics as advocates. The recent proposal to renovate and expand the 42nd Street New York Public Library – a building as important to the city's collective consciousness as the Empire State Building or the Metropolitan Museum of Art – has been deeply divisive, seen, on the one hand, as a necessary step to remain vital to the citizenry and, on the other hand, as a move to become a kind of book-themed café and media hub. At no point, however, have the insights of neuroscience been brought to bear as a means of assessing the new design's functional promise. And if neuroscience could direct how such a space should be developed, as backed up by compelling evidence, would it be enough to convince the people of New York that this civic icon needs improving upon? It is as equally important for neuroscientists to understand the representational aspects of architecture, as well as its functional requirements. In doing so, the dialog of neuroscience and architecture has potential to reinforce in new ways the spirit of learning and research that libraries have historically tried to embody.

II.

To help frame my discussion of how neuroscience and library design could inform each other, I consider the notion of the "productive research environment" (a term borrowed from the social sciences) as it relates to library spaces and programming. Broadly, this term recognizes that the laboratory, field, or the office—the institutional environment—must be conducive to creative and collaborative engagement through office or laboratory layout and research programming. I am appropriating this notion of the "productive research environment" because the term suggests to me a new way of structuring the knowledge interaction experience as facilitated by a physical library setting. Consider for a moment the rationale that went to such structures as the Bell Laboratories in Murray Hill, New Jersey, built in 1941, in which the culture of creativity was paramount to the design of the complex.

[1] Taken from an email exchange between the author and Dr. Arbib.

There were no physically discrete departments; rather, physicists, theoreticians, electrical engineers, etc., were purposefully mixed together. Long hallways were designed to encourage diversions and off-the-cuff conversations for someone en route to, say, the cafeteria; the idea being to constantly nurture impromptu collaboration and debate.[2] More recently, Google, Twitter, and Facebook headquarters in California have been noted for their campus layouts and technological infrastructure, designed to cultivate innovation and creative thinking be it in the lobby, cafeteria, or a quiet corner.[3]

It is relatively easy to understand how neuroscience can inform functional aspects of architecture, specifically "intelligent buildings," such as the spatial structure of a building, lighting, temperature, and way-finding measures used to navigate a space. The idea of "neuromorphic architecture," for example, is "a complementary approach incorporating brain functions into buildings" which could inform how building systems, e.g., communication and control systems, are designed and implemented for a specific plan.[4] In addition, observing people's behaviors in specific settings can inform how a building might reduce stress, enhance cognition, or increase productivity. In the longer version of this paper, I will explore studies linking such observations with physical components or design choices made for a given space.

An obvious goal for libraries is to facilitate intellectual development through collections, space, and services but it is not clear how these "web 2.0" advances in physical space, that is media hubs replacing stacks, extensible spaces, as well as service programming have impacted the researcher's process or thinking in neural terms. If library spaces are to remain distinct from wireless anywhere environments, they must offer something more than access to the Internet in a social, flexible setting. Where else but in a "productive research environment" will a library remain a library rather than veering into what James Elmborg refers to as the Third Place of leisure and conversation or, as Patrice Higonnet might put it, a glorified office building. A recurrent theme in today's literature about library buildings considers the physical space to the same degree as the "library without walls," "the virtual library," or the "digital library." A number of recent library studies go further by conceptualizing library space in terms of interface, casting a critical eye on the physical library, or what one author referred to as "the passive sense of a building with books."[5] Others have recently argued that the library should not be defined by a physical configuration but rather by a core set of services.[6] This is not to suggest that these arguments are iconoclastic attempts to minimize the importance of the library's physical space; however, priorities have changed, due in part to mounting pressure on libraries from their parent organizations, curricular trends, and user expectations.

The library is a functional building type but, at heart, a representational one and one then wonders what is more important in any library design? As the debate over the New York City'd Central Library Plan has proven, both are deeply important. With time, it will be possible for neuroscience to articulate precisely what constitutes an "intelligent building." In the longer version of this paper, I will explore the possibility of whether or not neuroscience's measure of architecture's representational language can contribute to a library's functional program. If some architects and some neuroscientists are to work together on libraries, they must define new and focused experiments and models in neuroscience to address specific challenges in architecture, both functionally and symbolically. As a result, a building can become "intelligent" on a number of levels between the functional and symbolic.

[2] (Gernter, 2012)
[3] (Hardy, 2014)
[4] (Arbib, 2012)
[5] (Pritchard, 2008)
[6] (Templeton, 2008)

III.

A comparison of Erik Gunnar Asplund's Stockholm Public Library (1928) and Norman Foster's Philological Library at the Free University in Berlin (2006), as one example, demonstrates how architectural design can assimilate and advance research protocols, a direct corollary to the intellectual process. At the same time, one can see how these two distinct libraries mediate the research environment by modulating the research or discovery process rather than merely accommodating it. Asplund's design, "the mind" appropriated by Asplund scholar Stewart Wrede, opened the city's collection to comprehensive and instant inspection. In so doing, it powerfully suggested a way to imagine not just the nature of research, but its importance to human fulfillment. Foster's design, nicknamed "the Berlin brain," is no less ambitious, aiming not only to encompass but to anticipate rapid changes in library technologies. Apart from the similar parallel of metaphor, it might seem that these libraries are vastly different from each other, with different research purposes, for different clientele bases. However, when discussed together, both libraries force questions about what transfers from pre-digital time to today and how the notion of intelligence is reflected in these contrasts. Asplund's library was built well before the point that library design became so focused on extensibility and networked technology. In contrast, Foster reflects ideas developed since then, especially that the mind can be programmed and that knowledge can be gained by adequate points of access.

The Foster design is popularly read as a much more literal correlation to the human brain than Asplund's symbolic representation of the human mind. While patrons network from the "cerebral cortex" of the Berlin Brain, or the network or campus incubator, the Stockholm Public Library offers a directed rigor so as to free the perceiver's mind from day to day realities, to refocus the mind, and, in a way, turn it inward. One might even argue that the Asplund library is more successful in reinforcing the spirit of learning and research, of imbuing the knowledge-interaction experience with a powerful sense of discovery, of intellectual vistas opening outward, even as actual vision has been channeled and enclosed. Asplund's "mind" provides a unitary and unifying function that is a synthesis of various mental faculties, such as memory or imagination. Although a distinct model for research and inquiry is somewhat elusive in Asplund's design, the route of discovery is reinforced with symbolic cues within the building program. Here, learning is hard won.

Indeed, both programs meet functional requirements but at the same time, their representational language creates a spatial continuum of another sort, one which engages the *mind* as well as the eye, the hand, the body at large. Juhani Pallasmaa goes one step further to suggest that a design, a library design for example, should liberate one's "historical, primal image" derived from a collective memory by way of a "liberating poetic image that opens new horizons to personal experience."[7] Although neuroscience is not yet able to quantify the role played by architecture's symbolic language, I maintain symbolism is central to functional success and that the "wireless anywhere environment," while convenient, will not enhance functionality without being incorporated into a larger architectural idea.

[7] Pallasmaa quoted in an interview with Yael Reisner (Reisner 2010).

Acknowledgments

I would like to thank Michael Arbib, Ken Kornberg, and Erik Kidwell for invaluable discussion on the matter of neuroscience and architecture. Their questions and challenges have had immense influence on my thinking for this paper.

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