archi|DOCT

The e-journal for the dissemination of doctoral research in architecture.

Supported by the ENHSA Network | Fueled by the ENHSA Observatory

January 2014
www.enhsa.net/archidoct
ISSN 2309-0103

SCARCITY 2

Lifelong Learning Programme

european network enhsa of heads of schools of architecture

European Observatory of Doctoral Research in Architecture

ISSN 2309-0103
www.enhsa.net/archidoct
Vol. 1 (2) / January 2014

Sense and Sensibility: The Behaviourism / Phenomenology Debate in the Portsmouth Symposium of 1967 on Design Methods in Architecture

Theodora Vardouli // Massachusetts Institute of Technology, Cambridge, MA // USA

Abstract

This paper is a critical analysis of a debate between behavioristic and phenomenological/existentialist approaches to the human subject which unfolded in the Porstmouth Symposium of 1967 on Design Methods in Architecture. *Part of the so-called design methods movement, a cycle of events and publications that aimed at a cross-disciplinary elucidation of design, the Portsmouth Symposium epitomized a critique to the rationalist approaches of the movement's early years and a turn toward subjectivity and the human sensorium. In this paper I argue that phenomenological and existentialist arguments did not dethrone the design methods movement's positivist attitude to design, but were incorporated in the movement's aspiration to systematize design and anticipate its social outcomes. Using the Portsmouth Symposium's published proceedings as source material, the paper is structured in terms of position and opposition. I begin by presenting the rationalist/behaviorist approach to human-environment associations, grounded on Christopher Alexander and Barry Poyner's earlier research on human tendencies. Consecutively, I outline the phenomenological/existentialist objections to the behaviorist stance, cast from the perspective of philosophy (Janet Daley), ethics (Janet Daley, Amos Rapoport, Tony Ward), and psychology (Jane Abercrombie). I close the paper by discussing the conference organizers' efforts to integrate the three objections in the design methods agendas. By orchestrating a synergy among psychology, philosophy and scientific rigor, the Portsmouth Symposium framed a critique of reason and found a reasonable way to address it. In doing so, it bridged the design methods movement's positivist impulses with its participants' humanistic aspirations.*

Keywords

Portsmouth symposium; design methods; behaviorism; phenomenology; subjectivity.

ISSN 2309-0103
www.enhsa.net/archidoct
Vol. 1 (2) / January 2014

Sense and Sensibility: The Behaviourism / Phenomenology Debate in the Portsmouth Symposium of 1967 on Design Methods in Architecture

Gone were the days of innocence. In opening his seminal work *Notes on the Synthesis of Form* Christopher Alexander urged designers to abandon the comfortable position of the artistic genius and accept the responsibilities of their difficult task (1964). The problems of the built environment, he warned, were too complex to be addressed by the traditional tricks of the trade, resulting in the dislocation of designers by engineers and information experts (Alexander 1964, p. 10). Alexander asserted logic as the remedy to the ills of the design profession and proposed systematic methods as a replacement to intuitive ad-hocism and a means to magnify the designers' cognitive and creative capabilities (Alexander 1964, p. 11).

Alexander was not alone in preaching the "Need for Rationality" (1964, pp. 1-14). Two years before completing his PhD dissertation at Harvard, which became known as *Notes on the Synthesis of Form*, Alexander had joined a group of similarly minded designers and engineers who convened at the Imperial College in London with the common intention to bring the process of design out in the open and discuss the possibility of its elucidation and systematization. This was the inaugural event of a cycle of conferences, symposia, discussions and publications that were grouped under the label of the "design methods movement." The members of this movement dissected environment, user behaviour, and the design process itself, to provide the units for a new science of design. Alexander expressed a pervasive attitude within the design methods movement when he accepted the designer's loss of innocence with sobriety. "The loss," he said "demands attention, not denial" (1964, p. 11).

Would the celebrated artistic genius be so easily defeated by mechanistic expertise? In "The Portsmouth Symposium of 1967 on Design Methods in Architecture" the phenomenal realm reciprocated. Invoking phenomenological and existentialist arguments, a group of participants in the Symposium questioned the movement's unilateral focus on analytical formalisms, quantitative evaluations, and explicit decision-making processes, and reclaimed both the designer and the user as sensorial subjects understanding the world through mind and body. Alexander, however, was right: Once the innocence was lost, it could not be regained (1964, p. 11).

In this paper I argue that the invocations of phenomenology and existentialism in the context of the Portsmouth Symposium did not overthrow the design methods movement's positivist approach to design, but were integrated in an attempt to devise better design problem-solving methods and, therefore, gain control over the design output and its future use. Using as source material the Symposium's published proceedings, I propose that insights from cognitive psychology, creativity studies, even philosophy, were instrumentalized to devise a systematic phenomenality, one that does not challenge, but enhances the movement's inaugural vision to scientize design and anticipate its social outcomes.

ISSN 2309-0103
www.enhsa.net/archidoct
Vol. 1 (2) / January 2014

The Portsmouth Symposium of 1967 on Design Methods in Architecture

The birth of the design methods movement took place in 1962, when the industrial designers Christopher Jones and Bruce Archer organized "The Conference on Systematic and Intuitive Methods in Engineering, Industrial Design, Architecture and Communications" (Jones and Thornley 1963), at the Imperial College London. The Portsmouth School of Architecture 1967 Symposium was the movement's third convention. In his speech at Portsmouth, the movement's intellectual father, Christopher Jones, recapitulated the goals that underpinned the design methods enterprise since its first undertaking. He stated:

> Clearly the underlying aim is to bring designing into the open so that other people can see what is going on and contribute to it information and insights that are outside the designer's knowledge and experience (Jones 1969, p. 193).

The aspiration to transform the design process into a transparent object of scientific scrutiny had already been extensively discussed in the 1965 "Symposium on Design Methods," organized by Sidney Gregory in Birmingham, UK. Gregory had proposed the concept of "design science" to describe the scientific inquiry into the elusive, non-scientific processes of design (Gregory 1966). The discussion of a science of design is continuous with Fuller's 1950s ideas of a "comprehensive anticipatory design science" (Fuller and McHale 1965) and Herbert Simon's systematization of design in 1968, in his influential book *The Sciences of the Artificial.*

The scientific study of design required what any science does: units of description, computable representations, rational methods and objective evaluation criteria. The participants of the Portsmouth Symposium questioned the wholesale adoption of these epistemic properties during the early years of design methods, reclaiming the "human" as the center of design. The Symposium was co-organized by Geoffrey Broadbent, Head of the Portsmouth School of Architecture, and Tony Ward, Research Fellow in Design Method at Portsmouth. Broadbent later recalled:

> The Symposium had been set up by Tony Ward to include a specific confrontation between those whom he saw as behaviourists, representing a mechanized, quantified view of design and those (including himself) he saw as existentialist/phenomenologist (formerly Marxist) concerned, above all, "with the humanness" of human beings (1981, p. 309).

Tony Ward's proposal to Geoffrey Broadbent to organize a symposium on design methods in the Portsmouth School of Architecture was timely. Broadbent had just been appointed Head of the School, which was being transferred from the College of Art to the College of Technology, and was being equipped with more people, resources, materials and a new building. For Broadbent, design methods had a different meaning than the one adopted by its zealots. Methodological systematization was often at the expense of the

ISSN 2309-0103
www.enhsa.net/archidoct
Vol. 1 (2) / January 2014

design process and the designer's intentions, while architecture, with its complexity and environmental attributes, could not be equated with engineering or industrial design. "[...] the Portsmouth Symposium was intended to mark the beginning of a new phase of thinking in architectural design method", he wrote in the Symposium proceedings, and added: "on the whole, I think this was achieved" (Broadbent 1981, p. 309). In terms of attendance, the Portsmouth was a sensational success. Besides its only two-month preparation, it attracted 400 people, 50 of whom were from overseas (Ward 1969, p. 10).

If Jones's goal in initiating design methods in 1962 was to discuss rationality and intuition, and Gregory's motivation in 1965 was to talk about models, information and design processes, Ward's intention in proposing the Portsmouth Symposium was to test one of his main skepticisms against the traditional design method assumption that architectural design could be discussed with the same principles as engineering and industrial design (Ward 1969, p. 10).

After a wave of technical adoptions of operational research, information technology and behaviourism, Ward noticed an emerging consciousness that architecture could, not only take, but also contribute to design methods. In introducing the Symposium proceedings, Ward attacked the self-referentiality of the design methodologists' logic doctrine and emphasized the singularity of architectural design:

> It is my own contention that the logical act of designing an environment for another human being is qualitatively different from the logical act of designing a machine part, because it involves an element of 'reciprocating choice' between the designer and the Other. There is at present no language for describing this relationship, so it has never been studied, and cannot be said to be identical to the designer's relationship to the inanimate world (Ward 1969, pp. 12-13).

Ward's self-acknowledged existentialist beliefs caused him to revolt against the design methodologists' behaviourist stance: "My conception of the human condition," he stated "has no place for the behaviourist's passive stimulus-response model of human existence" (Ward 1969, p. 13). Ward raised his personal revolt to a structuring principle of the Portsmouth Symposium, centering the debates on a confrontation between the "behaviourists" and the "existentialists/phenomenologists." The "behaviourist" front was mainly represented by the epigones of the physically absent, yet intellectually present, Christopher Alexander. Their positions were countered by the "existentialist/phenomenological" front, formed by Janet Daley, Jane Abercrombie, Amos Rapoport and Ward himself. Ward hoped that the confrontation between these two poles would engender questions of philosophical self-realization within the design methods collective.

The bahaviourist position

In the 1967 Portsmouth Symposium, Christopher Alexander was physically absent, yet very much present through a recent work that he had produced in collaboration with Barry Poyner, entitled *The Atoms of Environmental Structure* (1966). This work had been developed during Alexander's two-year visiting researcher appointment at the Offices

ISSN 2309-0103
www.enhsa.net/archidoct
Vol. I (2) / January 2014

Development Group (ODG) of the UK Ministry of Public and Building Works, which at the time was developing a variety of governmentally commissioned architectural projects, including workshops for blind people and prisoners.

Alexander and Poyner's claim (1966) was that every design problem is the realization of a pattern ("environmental structure"), and a set of physical relationships ("relations") between a design problem's decomposed parts. The basic units of the decomposition were "user tendencies," external, observable, and quantifiable behaviours, which Alexander and Poyner differentiated from the obscure inner user "needs." The goal of the design was then to prevent mutual inhibitions ("conflicts") between different tendencies. The replacement of "needs" with "tendencies" followed the basic assumption of the behaviourist school of experimental psychology: instead of studying the obscure internal workings of the mind, behaviourists proposed that subjects could be known (and controlled) through observation of the way that these workings are externalized via their behaviour.

In the context of the Portsmouth Symposium, Raymond Studer, Professor and Head of Planning Analysis at Brown University and recently appointed Professor of Environmental Design at The College of Human Development at Penn State, reiterated the assumptions that formed the basis of *Atoms*. In opening his contribution, "The Dynamics Of Behaviour-Contingent Physical Systems," Studer argued that design was entering a new paradigm involving a clearer epistemology of the manmade environment and more effective design methods. The environment, he argued (1969, p. 67), was a force field, which, if designed accurately, could produce and support the various activities required to meet the goals of its users. For the development of the new effective design methods, Studer sanctioned Alexander and Poyner's argument that the concept of the "need" was insufficient and had to be replaced by a different unit. "Human behavior", he stated (1969, p. 67), "appears to be the more correct unit of analysis; it has characteristics which are relevant, empirically verifiable and they are operationally definable." Studer also suggested (1969, p. 67) that designed environments should be seen as "experiments" in which behavioural or environmental variables are manipulated by the users to move the system toward a "state of consonance" with respect to the goal structure.

Studer's method was an ambitious development of Alexander and Poyner's ideas, expanding their rational design framework to encompass dynamic social phenomena. In Portsmouth, however, not everyone applauded.

The phenomenological opposition

In the following section I describe the Portsmouth Symposium's phenomenological opposition to the rationalist/behaviourist stance in three objections, from philosophy, ethics, and psychology. The philosophical objection, argued by Janet Daley, denounces the fallacies of behaviouristic syllogisms and exposes their value-laden character. The ethical objection, issued by Daley, Amos Rapoport, and Tony Ward, rejects the behaviourist approach of social conditioning and advocates for user agency and participation. The

ISSN 2309-0103
www.enhsa.net/archidoct
Vol. I (2) / January 2014

psychological objection, posited by Jane Abercrombie, and extended by Ward and Broadbent, emphasizes the senses and the human pre-cognitive processes as central to design creativity. My argument is that these three objections neither intended, nor managed, to shatter the movement's aspiration to produce a well-ordered, efficiently designed world, but on the contrary laid the ground for new synergies between the rational and the phenomenal realm.

The philosophical objection

By the eighth line of her text, Janet Daley, at the time instructor of social philosophy at the Kingston School and at the Bartlett School of Architecture, had characterized behavioural psychology and its various ideological offspring, such as behavioural sociology, statistical psychology etc., as fascist and dangerous (1969, p. 71). Located immediately after Raymond Studer's text in the Portsmouth proceedings, her paper entitled "A Philosophical Critique On Behaviourism In Architectural Design," was a direct attack on the ethical and argumentative problems of the application of behaviourist ideas in architecture. The factuality and lack of imagination of these fields, argued Daley, were dangerous and frightening. As her text proceeded, the list of adjectives to characterize the behaviourist front grew: "megalomaniac," "incoherent," "ideologically muddle-headed," and therefore a cause for "serious alarm" (Daley 1969, p. 71).

Daley's first criticism of behaviourism was the air of neutrality, objectivity, and naive experimentalism surrounding it, which obscured the value-laden character of their theories:

> And it is precisely at this claim that I want to aim my most vituperative abuse: at the naive notion that because behaviourists operate in a conceptual vacuum it follows that their practices (not to speak of their ends) do not inherently contain theoretical presuppositions and even ethical assumptions (1969, p. 71).

Daley was not as concerned about the value-laden nature of behaviourism per se, but the reluctance to admit as such. By examining the behaviourist philosophical presuppositions, she argued, one would be able to see its intellectual roots that rested on "a naive philosophical position compounded of the crudest forms of eighteenth century empiricism and Newtonian mechanization" (Daley 1969, p. 72). Daley dismissed Alexander's "Relational Theory" as "grotesquely, and rather dangerously, naive and confused" (Daley 1969, p. 74). How could the "rightness" or "wrongness" of a design decision be evaluated outside the value system of the designer? By asserting all "tendencies" as worth expressing and all "conflict" as necessitating elimination, Alexander made the biggest value judgment of all: the entire Alexandrian enterprise, Daley contended, was hypocritical, and its hypocrisy concealed with incomprehensible jargon (1969, p. 75).

The ethical objection

It was not the behaviourism's logical fallaciousness that Daley's critique mainly targeted, but its moral and ethical implications. In looking at the intentions of the behaviourist enterprise, Daley saw a "monolithic sort of utilitarianism," whose ultimate value was

ISSN 2309-0103
www.enhsa.net/archidoct
Vol. 1 (2) / January 2014

grounded on the "utility and conformity of the human being as a societal unit" (1969, p. 73). Behaviourists were the engineers of a specific kind of subject for a specific kind of society, they were the normative forces preserving societal norm. "What if the world were totally intolerable?" she asked, "would it do to 'recondition' all those sensitive enough to find it so?" (1969, p. 73).

Tony Ward carried a firsthand experience of the *Atoms* project, having directly worked with Alexander in the UK Ministry of Public and Building Works. His paper "Rightness and Wrongness in the Physical Environment" focused on the case of prison house development to question the assumptions and practices that underpinned most of behavioural applications in design. Ward challenged the assumption that more rationality can lead to better results. "Better," he said, "has a 'for whom' and 'in what way'" (Ward 1969, p. 166). By focusing on the comforting sphere of environmental mechanics, self-restrained logical operations of analysis, synthesis, and evaluation loops, design methods had overlooked the ethical questions concerning these ends:

> Unfortunately, design method techniques culled from operational research and systems analysis do not make ethical judgments for us. [...] I am becoming more and more confirmed in my opinion that these attempts to be objective, particularly in the human sphere, are nothing but very clever covers for attempts to evade moral responsibility for design decisions (Ward 1969, p. 166).

The overlooking of the "for whom" question was the source of many evils. For Ward, user agency was necessary. However, besides his critique, Ward did not surpass his underlying behaviourist impulses and Alexandrian influences. In his paper, he approached user agency as a behaviour that can be induced by specific spatial and environmental configurations. He proposed a systematic framework that would allow the necessary degree of control on behalf of the designer without impeding the user's individuality. Ward stated:

> Design is a problem of assisting individuation and the designer can only be successful when he becomes superfluous [...] In my work I have tried to make people independent, but this is operationally difficult, because as yet we have no phenomenological method which we can apply to design problems. We need to develop ways of including the user into the total process in an active role (1969, p. 178).

Adding to Ward's position, Rapoport argued for the importance of incorporating meaning, how people make sense of the environment, in the design process. This had so far been omitted by the logico-positivist and behaviourist tendencies of the design methodologists. According to Rapoport, design methods required a new wave of interdisciplinary openings, but this time toward ethology, cultural geography, cross cultural studies, anthropology, sociology, and psychology (1969, p. 141). Designs needed to be evaluated and appraised, cross-culturally. "Rather than an 'either-or' attitude," he argued "we need an 'and' attitude and at most we should probably supplement our existing methods rather than give them up" (Rapoport 1969, p. 146).

ISSN 2309-0103
www.enhsa.net/archidoct
Vol. 1 (2) / January 2014

The psychological objection

Jane Abercrombie, who had previously been involved in the Bartlett creativity experiments in England, was determined to open the "black box" of human perception and construction. In her homonymous paper, she proposed an approach that resembled that of the behaviourists in its use of experimentation and empirical evidence, but instead of looking at the "black box in other people's skulls" (Abercrombie 1969, p. 118) she turned to the one in one's own. Knowing thyself was a valuable virtue for a design methodologist: "the more each knows about his or her own behaviour, the more likely he or she is to behave in a reasonable way, and make their own behaviour more effective" (Abercrombie 1969, p. 118).

In her paper "Perception and Construction," Abercrombie argued that reason could not be without the body: perception, she argued, does a lot of work (Abercrombie 1969, p. 119). Her paper revolved around the importance of working "actually with the material" (Abercrombie 1969, p. 118), in what she defined as the two stages of design: receiving information (i.e. "perceiving") and "putting things together [...] at an extremely elementary level" (Abercrombie 1969, p. 118). At a time where drawings were being reduced to communication media, following the conventions of the new potent computer graphics programs, Abercrombie reclaimed the importance of visual representations as problem-solving mechanisms and argued for two different levels of design: one which manipulates real things and one which manipulates symbols and abstractions.

The first level was "simple, primitive and concrete" (Abercrombie 1969, p. 118); it involved the ability to combine "real things" to produce a "satisfactory" (Abercrombie 1969, p. 120) result. "Satisfactory," in this context, is not a process of rigorous mathematical evaluation in order to identify an optimum solution. Instead, the term points to a form of non-rational contentment, the intuitive judgement of the output of a rudimentary design process. Virtually anyone could do this first step. The second kind of skill, observed Abercrombie, was much more difficult. It involved the manipulation of abstract concepts, "codes" and "analogues" in lieu of concrete objects from experience. Abstraction and codification was a response to problems which were inaccessible to experience, cases were "you simply can't manipulate the real things -they're either too big or too heavy, or too complex or they're not there anyway in the case of a building that you're projecting" (Abercrombie 1969, p. 120). Learning to work in code, in abstractions and analogues of the "real thing," was inevitable for the designer. However, the importance of the design as an embodied experience, Abercrombie argued, should not be disregarded. Cognition needed to be supplemented with perception. The proposition to be apperceptive of the sensorial was not a romantic's lament for the virtues of the concrete, but an experimentally verified scientific recommendation by researchers such as Abercrombie.

The Portsmouth synthesis

Was this the synthesis (Ward 1969, p.13) that Ward was anticipating in organizing the Portsmouth Symposium's on the basis of oppositional dipoles? Ward seemed to think so. As early as in the Symposium's introduction he had stated his enthusiasm about Abercrombie's proposition for a coupling between reasoning, perception and embodiment.

ISSN 2309-0103
www.enhsa.net/archidoct
Vol. 1 (2) / January 2014

Ward positioned this evidence as a definitive proof that the designers' claims of objectivity and rationality were fallacious, and that design was inevitably a value-laden activity. He lauded Abercrombie's paper as being the most important contribution in Portsmouth:

> Mrs Abercrombie [...] spoke of the differences between the real world and the world perceived by our senses. At first sight, this had very little of direct applicational use, but by inference she (Abercrombie) summed up the Studer - Daley confrontation. Her emphasis on the subjective interpretation of perceived "objective" phenomena pointed the ultimate validity of "values" as opposed to "facts," and for this reason it was probably the most important paper of the symposium (Ward 1969, p. 11).

Broadbent agreed. Referring to one of Abercrombie's experiments which demonstrated the subjectivity and erraticity of visual perception, by prompting different subjects to look at objects through a trapezoidal window, Broadbent argued: "We like to think that we are objective in our observations of the physical world; we refuse to believe the evidence of Jane Abercrombie's window that inevitably, we cannot" (1969, p. 20). The drift away from fantasies of objectivity and the "philosophical shift" toward "caring (his emphasis)" about satisfying people's needs were announced as the programme for a design methodology with new goals and aspirations. "And design method then could begin to serve its purpose" (Broadbent 1969, p. 20).

Epilogue

The Portsmouth Symposium included voices that framed design objectivity not only as fallacious, but also as morally suspect. Arguments from psychology and philosophy emphasized the centrality of perception in logic and reasoning, the sensibility of sense, declaring the cognitivist approaches of operational research and behaviorism inadequate and reductive. But the Portsmouth proceedings are no obituary. Infused with optimism, Broadbent and Ward announced a new era. The elusive world of the phenomena does not come to design methods as a catastrophic force, but rather as a corrective. The synthesis between subjective interpretation and methodological rigor appeared as a very real possibility. All that it required was the expansion of the design methodologists' vocabulary to include the "softer" concepts of perception and experience; to devise a sensible rationality. Projects like Abercrombie's positing a form of introspective behaviorism as a way to place design creativity on the anatomy table and dissect, understand and operationalize it, opened new avenues for even "better" and more efficient design methods. Claims to phenomenology became the reconciliatory mechanism between the design methodologists positivist impulses and humanistic aspirations.

After systematic efforts to transform designers into computers, mechanical and transparent operators of explicit functions, boisterous doubts emerged: design methods were taking away from the designer the most powerful problem solving apparatuses: perception and intuition. When the realm of the phenomenal made its way back in the design methods, however, it was of a different kind. It was a sensorium that could be known, controlled and instrumentalized through the advances of the study of the mind and of

ISSN 2309-0103
www.enhsa.net/archidoct
Vol. I (2) / January 2014

the psyche. The 1967 Symposium was one of the many events that articulated a critique of reason and found a reasonable way to address it, orchestrating a synergy between psychology, philosophy and scientific rigor.

Existentialism and phenomenology postulate the irreducibility of being to science and posit that the grasping of existence and experience requires new categories, formed around the norm of authenticity (Crowell 2010). In the Portsmouth Symposium of 1967 on Design Methods in Architecture, allusions to these philosophical strands formed the core of a critique on the reductionist logics of the movement's first generation. This critique, however, did not subvert the basal underpinnings and goals of the idea of design method, to bring design out in the open and turn it into an object of scientific knowledge. Instead, the movement recuperated existentialism and phenomenology to formulate new research programs and agendas, which sustained the positivist enterprise of "better" design methods for a "better" world. The designer's and the user's subjectivity was acknowledged, even celebrated. It was a subjectivity, nonetheless, grasped within an information processing world picture. Designers turned away from the behavioral "world as laboratory" (Lemov 2005) and started seeing the "black boxes in their skulls" (Abercrombie 1969, p. 118). As psychology, cognitive science, neuroscience, and artificial intelligence proceeded, a new optimism was engendered: Subjectivity would cease to be a black box. Someone, eventually, would turn on the light, and tame the unknowns of perception and intuition under the rubric of the comfortable, rational, analytic scientific knowledge.

ISSN 2309-0103
www.enhsa.net/archidoct
Vol. 1 (2) / January 2014

References

Abercrombie, M. L. J. ,1969. Perception And Construction. In: G. Broadbent and A. Ward, eds. 1969. *Design Methods In Architecture*. London: Lund Humphries. pp. 118-127.

Alexander, C.,1964. *Notes On The Synthesis Of Form*. Cambridge Mass. : Harvard University Press.

Alexander, C. , Poyner B. , 1966. *The Atoms Of Environmental Structure,* Center for Planning and Development Research. University of California, Berkeley.

Bayazit, N., 2004. Investigating Design: A Review of Forty Years of Design Research, *Design Issues*, vol. 20, pp. 20-29.

Broadbent, G. , 1981. The Morality of Design. In: R. , Jacques, and J. Powell, eds., *Design: Science: Method*, Guildford: Westbury House, p. 309.

Broadbent, G., 1969. Foreword. In: G. Broadbent and A. Ward, eds. 1969. *Design Methods In Architecture*. London: Lund Humphries. p. 9.

Broadbent, G.,1969. Notes On The Design Method. In: G. Broadbent and A. Ward, eds. 1969. *Design Methods In Architecture*. London: Lund Humphries. pp. 198-204.

Broadbent, G.,1969. Design Method In Architecture. In: G. Broadbent and A. Ward, eds. 1969. *Design Methods In Architecture*. London: Lund Humphries. pp. 15-21.

Broadbent G., Ward A., eds., 1969. *Design Methods In Architecture*, London: Lund Humphries.

Cross, N., Naughton, J., and Walker, D.,1981. Design method and scientific method. *Design Studies*, vol. 2, pp. 195-201.

Crowell, S., Existentialism, The Stanford Encyclopedia of Philosophy (Winter 2010 Edition), ed. E. N. Zalta, [online] Available at: <http://plato.stanford.edu/archives/win2010/entries/existentialism/> [accessed 5 Dec. 2012].

Daley, J.,1969. A Philosophical Critique Of Behaviourism In Architectural *Design.* In: G. Broadbent and A. Ward, eds. 1969. *Design Methods In Architecture*. London: Lund Humphries. pp. 71-75.

Fuller, R. B. , McHale J. , 1965. *World Design Science Decade*, 1965-1975, Southern Illinois University.

Gregory, S. A., ed.,1966. *The Design Method*, London: Butterworth Press.

Jones, J. C., 1963. Fitting Trials. *Architect's Journal* vol. 6, pp. 321-325.

Jones, J. C., 1969. The State-Of-The-Art In: G. Broadbent and A. Ward, eds., 1969. *Design Methods In Architecture*. London: Lund Humphries. pp. 193-197

Jones, J. C. , D. G. Thornley, eds.,1963. *Conference on Design Methods*, Oxford University Press.

Lemov, R. M., 2005. *World As Laboratory: Experiments With Mice, Mazes, And Men,* New York: Hill and Wang.

Poyner, B.,1969. The Evolution Of Environmental Structures. In: G. Broadbent and A. Ward, eds. 1969. *Design Methods In Architecture*. London: Lund Humphries. pp. 31-36.

ISSN 2309-0103
www.enhsa.net/archidoct
Vol. 1 (2) / January 2014

Rapoport, A., 1969. Facts And Models. In: G. Broadbent and A. Ward, eds. 1969. *Design Methods In Architecture*. London: Lund Humphries. pp. 136-146.

Simon A., 1968. *The Sciences of the Artificial,* 1. Cambridge, Mass. : MIT Press.

Studer, R. G., 1969. The Dynamics Of Behavior Contingent Physical Systems. In: G. Broadbent and A. Ward, eds. 1969. *Design Methods In Architecture*. London: Lund Humphries. pp. 55-70.

Ward, A., 1969. Introduction. In: G. Broadbent and A. Ward, eds. 1969. *Design Methods In Architecture*. London: Lund Humphries. pp.10-14.

Ward, A., 1969. Rightness And Wrongness In The Physical Environment. In: G. Broadbent and A. Ward, eds. 1969. *Design Methods In Architecture*. London: Lund Humphries. pp.166-178.