A Theoretical Exposé and Rhetorical Questions of Science and Art in Architecture

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Abstract

The derivative nature of architecture from several disciplines seemingly undermines its legitimate epistemological standpoint. Some schools of thought question the universality and the 'science' of architecture. To some; it appears architecture has not progressed for the benefit of Man. Others perceive Architecture to be disjointed and patriarchal thus far. Through historiography this paper attempts to anecdotally present worldviews on science and art in architecture; but mainly dominated by two architects conveniently selected to represent the two "worlds"- Europe and the Americas that strove to place architecture on the level of 'science'. This paper observed that, the derivative and normative orientation of architecture, makes it perceptibly confused and 'unscientific'. It is suggested in conclusion that if architecture seeks to solve human problems to merit the term 'science' then the theory and laws of nature (ragioni) as rules of operation (regole) are worth considering.

Keywords: Architecture, Universal human needs, Science, Art, and Progress.

Introduction

Thomas Samuel Kuhn (1922-1996) authoritatively questioned: "does a field make progress because it is a science, or is it a science because it makes progress? (Kuhn, 1962). Science refers to the understanding and the orderly organisation of rules and their judicious application (von Meiss, 2006). Again, science "is the earnest attempt to set in order the facts of experience" (Fuller, 1981). Perhaps any field that progresses is science. However, this paper cannot take for granted the notional definition or explanation of "progress" and its relationship to science. In other words, this paper argues, *progress* has presented nemeses to the advancement of the natural and material well-being of the human developmental activity through science.

To buttress the foregoing point with some example, this paper contentiously points out that, Charles Darwin's evolutionary theory of "survival of the fittest" was progressive but it exposed the vulnerable to their fate because they lack the propensity to survive and only the strong dominate to undermine moral standards. Arguably, same-sex marriage (homosexualism and lesbianism) is progressive since it satisfies the rights of the individual but it violates natural sustenance of the human race and circumvents nature through science. The medical field has, also, progressed in many areas such as cloning through science to present humanity the capability of super-human beings; but again the numerous ethical questions concerning cloning remain unanswered by science, to say the least.

Notably, Science, as argued elsewhere, must solve nature's behavioural problems. Richard Buckminster Fuller emphasized in most of his writings that:

'the scientist's concern with nature may be global in its extent…the problems on which he works must be problems of detail. More important, the solutions that satisfy him may not be merely personal but instead be accepted as solutions by many …Science must be seen as a tool of fundamental advantage for all, which Universe requires that man understand and use exclusively for the positive advantage of all of humanity, or humanity itself will be discarded as viable evolutionary agent' (Fuller, 1975).

This paper does not intend to engage in the discourse of 'what science is', but, positing the foregoing definitions as a background, it seeks to address the question, is architecture a 'science' or not? This further calls for an examination of questions such as, has architecture been used as a tool for the exclusive and positive benefit of humanity;

For example, finding solutions to social and individual needs and aspirations; of social exclusion, global warming, etc? How does architecture help organise physical and spatial structures in a scientific (orderly) manner; does architecture, as a 'science' contribute to the identification of universal forms or specific reflections of social relations of nature? And above all has architecture progressed for the benefit of Man? Some rhetorical questions in addition to the forgoing may include: how far is architecture a universal concept? Or isn't it a western concept? The least said here, people used to construct their houses on their own, without the help of any such thing as an architect and still people do in developing countries. What would one call this kind of 'building style'? Does it merit the label architecture also? Above all, is it necessary for architecture to be considered as a science?

It is asserted that "architects' understanding of man as the main client and his satisfaction ought to be the main goal in architecture and development processes (Doxiadis, 1968). Edward Hall asserted that:

"an understanding of man requires the ability to see him not only as our eyes see him - that is, as a body, or a body plus clothing; but as a system of concentric spheres…and that the system starts with a sphere representing man's vision and psyche, but this sphere expands to include what he smells or hears"(Hall, 1966).

Juhani Pallasmaa also pointed out that tactile and tastes experiences in architecture facilitate a sense of belonging and integration as well as holistic architecture and development processes (Pallasmaa, 2008).

Approaches and Methods

This paper uses architectural historiography (Leach, 2010) to anecdotally present worldviews on science and art in architecture; but mainly dominated by two architects conveniently selected to represent the two "worlds"- Europe and the Americas that strove to place architecture on the level of 'science'. To somewhat address the questions raised in the introduction, three sections attempt brief discussions of worldviews of architecture from the classical and the modernist viewpoints. The conclusion section draws on the discussion section to deal with the unresolved controversies of *ars* versus *scientia* in architecture.

Discussions

Architecture; Man and Universalism – the Classical worldview

Architecture reflects specific natural as well as cultural forms and strategies to solve specific building problems (Antoniades, 1992). Architectural historians and theoreticians have argued for architectural universality that "however much a period may try to disguise itself, its real nature will still show in its architecture, whether this uses original forms of expression or attempts to copy bygone epochs" (Padovan, 2013).Architecture is indicative of society's civilization (Mumford, 1955) and this is indeed agreed by many writers on civilization (Fragoulis et al., 2005). Architecture is an indispensable index to a period. For instance, to meet the aspirations of the people of Florence, Brunelleschi 500 years ago developed the dome of the Roman Catholic Cathedral of Florence which Coolidge described as "the most remarkable engineering achievement before modern times of which we have any precise record" (Coolidge, 1952). Brunelleschi's solutions were ingenious and unprecedented and led to 'design puzzles' which helped his students like Leonardo Da Vinci to achieve architectural feats and laurels (da Vinci, 1970).

Man's interaction with nature has had a double character since the ancient period; the "sensual" and the "cosmic". The sensual included everything the ancients experienced. The Greeks built in the 'surroundings they could see and feel. They enjoyed, played, prayed to their gods and revered every "natural beauty mark" and every unique natural formation' as a way of life (culture)'. The other character dealt with the cosmos as the remote universe. People endeavoured to grasp the cosmic sensually and demonstrated it through art and architecture. Again, Antoniades (1992) observed that the Greeks constructed their buildings by paying great attention to 'natural elements and topography' as well as socio-cultural and economic factors in sustainable manner.

Constantinos Doxiades (1914-1975); a visionary architect and a driving force behind "Athens Centre of Ekistics" confirmed through the Atticos tropos of buildings measurements of as 'a universal design practice dependent on the important poles of access to a complex of cultural buildings or to a holy compound' (Doxiadis, 1970). Architecture transforms nature into culture according to Lévi-Strauss in his Nature /Culture discussion; the degree of this transformation is then valued with hierarchical values, which one cannot be sure that they are valid. It is very much in the Western spirit to categorize everything on criteria that are "culture free", so to speak, but full of technical concerns (Anon. 2015).

Animistic and anthropomorphic perspective of architecture has been dealt with by several authors including Rapoport (2000), Hockings (1987) and Rudofsky (1964). Socio-cultural factors appeared to be more important than climate or techniques and materials in their effect on building forms. Once these other physical or functional factors are understood, then it is the aspirations of the inhabitants – restricted by what is acceptable – that are most significant. The most rigorous climatic conditions and limited availability of materials would leave some choices to the society as to how to house itself; and a house form is probably the building type least determined by physical conditions (Mitchell and Bevan, 1992).

Religion, the make-up of the individual, family and clan, work processes and the intercourse of individual relationships are all expressed and symbolized by house forms. Many choices are available, and different socio-cultural aspects are dominant in societies with similar physical environments. Some societies, such as the Dogon who inhabited the Bandiagara escarpment on the edge of the Niger valley, use the form of both their houses and their settlements as a complex symbol of their idealized universe. Demonstrably, the Dogon village is laid out in oval form to represent egg as the universe, as well as a person lying in the north-south direction (Mitchell and Bevan, 1992). Notably, the Bororos in Brazil and most of the indigenous people still live in their natural contexts that express their cosmology in the disposition of their houses and villages. The Kabyle house or *akham* as still has this symbolic meaning (Bourdieu, 1973). There is more about living in a shed/house/hut than just the material and the technique to build it. The Smithy in a Dogon settlement (a blacksmith or metal worker) is the head and certain shrines the feet; women's huts are the hands and are placed to the east and west (Mitchell and Bevan, 1992).

In Ghana, the courtyard in Asante's traditional building of family house (*Fihyia*) is considered the 'heart' of the house (Figure 1). Oral sources have it that, members of the family have their umbilical cord buried in the central portion (*Fieyem*) to keep members religiously tied to the family house. It suffices to mention that, as urbanization progressed, a series of transformations and changes have occurred in the design of the compound house especially in cities. These changes yielded urban tenement houses (in the suburbs of cities like Kumasi and Accra) which have ultimately been developed into the single family flats or estate houses. Similarly, the traditional Compounds in the northern Ghana have their granaries sited at the main entrances (Figure 2). Some of the Compounds have granaries sited in the centre. The granaries are symbols of life and sustenance of the Compound.

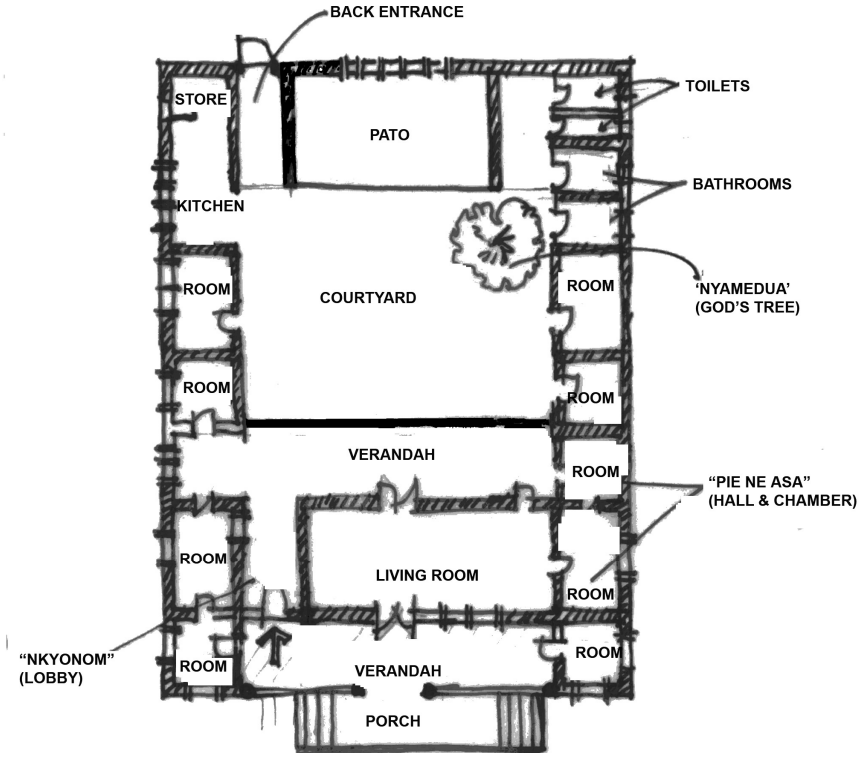

Figure 1: Plan of Asante traditional courtyard house built of mud.

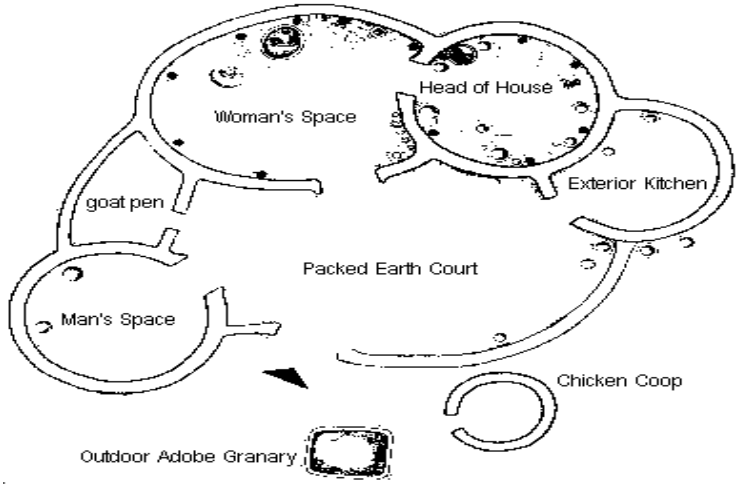

Figure 2: Plan of Dagomba Compound built of mud with courtyard and granary at the entrance.

Orientation of the house is frequently a cultural concern. Usually this will coincide with climatic or naturalistic considerations. However, in the case of the Feng Shui's rules for the determination of traditional form in China, if the cultural rules conflict with climatic factors, the cultural rules are allowed to predominate (Mitchell and Bevan, 1992). The house form, thus, is used to extend and prolong the life of the ideals, values, attitudes and images, not of an individual but of the specific traditional society as a whole. 'A house is not only a physical object with functional attributes but it also reflects a traditional society's worldview, ethics and codes of behaviour' (Mitchell and Bevan, 1992). As the next section tries to position architecture as 'science' through the modernist perspective; this paper hints that architecture has supplanted the inherent symbolic values of a house by vain economic ostentation.

Positioning Architecture as 'science' –the modernist worldview

Amongst architects of several architectural dispositions – positivists, rationalist as well as functionalists or, perhaps naturalists - are Richard Buckminster Fuller (1895-1983), probably the best-known American thinker, innovator, inventor, social engineer and philosopher; and Le Corbusier (1887-1965), a famous proponent of the architectural modernist movement who perceived "better living conditions and a better society" by scientific methods of housing and town planning concepts. Richard Buckminster Fuller and Le Corbusier as major contributors to the twentieth-century thought on architecture believed that, most of the world's problems could be accomplished through 'science' and technological revolution. Richard Buckminster Fuller and Le Corbusier endeavoured to reintroduce the symbolic value of the "house" (for the space one lives in general) by a top down procedure, which has obviously not worked. Oscar Niemeyer (1907-2012), a Brazilian architect was and one of the key personalities of modern architecture was the last of the disciples of that ideology and still believed it till his death that world's problems could be accomplished through 'science' and technological revolution Oscar Niemeyer demonstrated this ideological belief in Brasilia's development as modernist city (Holston, 1989).

Between 1943 and 1955, Le Corbusier re-introduced the *Modulor* concept in architectural practice. The *Modulor* concept was Euclidean in nature to discover mathematical proportion in the human body to enhance architectural anthropometrics, standardisation and functionality as well as economy. The *Modulor* brought the universal connection between architecture and humanity (Ostwald, 2001).

Despite the numerous criticisms, Le Corbusier's *Modulor* marks "a curious turning point in architectural history", a landmark which works on nexus of architecture and mathematics (Ostwald, 2001).Le Corbusier designed the Carpenter Center for the Visual Arts at Harvard on *modulor* to create generous space which enhanced excellent interaction of users (Schilling, 2000). Le Corbusier objectified architecture; for instance, his use of Choisy's cross-sectional, isometric diagrams in *Versune architecture;* shapes generative of basic structural and formal relationships to enable the architect reconstitute the past as primal piers, primal columns, primal domes, and to feel as basic experiences the kinaesthetic, psychic and metaphysical possibilities in their combination (Jordy, 1963). Nature's landscape was also organized as a configuration of objects and Corbusier demonstrated this in the garden design at Chandigarh; which became a 'paradigm' for Landscape architects and several architects such as Alvar Aalto and Jorn Utzon.

In 1938, Buckminster Fuller on the other hand introduced the terminology *Ephemeralization* into architecture. By which he meant 'intangibility, non-sensoriality; or simply, "in nature all progressions are from material to abstract" (Siagri, 2007). He later came to refer to *Ephemeralization* as:

'the principle of doing ever more with ever less weight, time and energy per given level of functional performance; to wit: a corollary to the ephemeralizing-toward- pure-energy progression that is taking place throughout all sciences and, by extension, into industry – which simply translates science into bread and butter for people' (World Design Science Decade, 1963).

Buckminster Fuller believed 'efficiency to be equal to doing more with less (economy of architecture) and therefore efficiency ephemeralizes' (World Design Science Decade, 1963; and Fuller, 1981). The concept of *ephemeralization* brought to two billion previously deprived humans; and relieved about 99 % of humanity of poverty before the advent of the twentieth-century (Fuller, 1983).Fuller invented the Dymaxion house as the physical manifestation *ephemeralization.* The Dymaxion house brought of changes to building construction (Lieberman and Levitt, 2004). Many components of the building system such as plumbing, electrical and mechanical systems were prefabricated for efficiency to meet the predicted housing need of two million people over eighty years across the world (Fuller, 1928). Buckminster Fullerbelieved in the universality of architecture and travelled across the world to propagate the Dymaxion house and its tensegrity construction principle as a universal architectural and engineering principle for building construction. Fuller's world travels brought him to the Department of Architecture of Kwame Nkrumah University of Science & Technology (KNUST), Kumasi, Ghana in 1970. He led students of Department of Architecture of KNUST to build a miniature of Dymaxion dome; the relic of it is still hidden on the mezzanine floor in the Building Technology Workshop in the College of Art and Built Environment, KNUST-Kumasi.

It suffices to mention that the Dymaxion house faced a lot of challenges resulting from antiquated hierarchical bottlenecks within the American building trade made up of mason and carpenters etc. who found the systemic change to the building industry by Buckminster Fuller (Lieberman and Levitt, 2004).Other fields apart from architecture adopted ephemeralization because it is self-reinforcing and generates new paradigms for the greater efficiency of institutions and technologies to bring about greater output of goods and services to humanity (Heylighen, 2007). A pioneering and towering master of modern architecture: Ludwig Mies van der Rohe - adopted the aphorisms "less is more" (ephemeral) and "God is in the details" (economy) as a rationalist approach to guide the creative process of architectural designto recall Classical and Gothic eras to modern times. At least, Japanese and Vietnamese with their Asian living style have traditionally been observing the economy of architecture till today. Fuller and Corbusier were philosophically convergent and divergent in some ways. Both 'erroneously' patented their inventions which arguably caused failures in some aspects of their search for economic solutions to human housing needs universally. Perhaps they both believed in the Baconian critical methodological dictum that "Truth emerges more readily from error than from confusion" (Bacon, 1869).

Theoretical and epistemological controversies unresolved

Architects widely believe that '*scientia sine arte nihil est* (science without art is nothing)'whilst scientists assert that *'ars sine scientia nihil est* (art without science is nothing)' (Ackerman, 1949). The question of architecture as 'science' (*scientia)* or 'arts' *(ars)* is controversially rooted in history (Bohme et al., 1978); a great number of literary works in architecture have described architecture as a "Mistress of all Art" but Nuttgen explicitly wrote that Architecture is not just an activity or an event or a collection of artefacts, and it is not even simply an art (Nuttgens, 1993).Architecture is inescapable, universal, endless and continuous as well as elementary; it spans between the crudest forms of accommodation in a cave from the prehistoric times to the most complex kind of sophisticated, artificial environment. Nevertheless, whatever the scale and complexity, for the most part of it, architecture means shelter- a basic need of nature (Nuttgens, 1993).

The Italian philosopher Benedetto Croce (1866 -1952) , in the early years of the twentieth century, defined art as "expression"; for architecture expresses human limitations, potentials, and needs, as well as finding out these needs by examining the history of people's experiences (Croce, 1900). Notably, architecture may call "into being by all sorts of external conditions, but once it appears, it constitutes an organism in itself, with its own character and its own continuing life"; and, it is instructive to note that the value and origin of architecture cannot be stated or explained in the socio-economic terms and "its influence may continue after its original environment has altered or disappeared" due to the universality of architecture (Giedion, 1967).

To understand architecture of a building in terms of its creativity, buildability, adaptability and changeability, it is appropriate to locate it both in "architectural context and contemporary discourse" (Forgan, 1989).According to von Meiss (2006), "architecture can reach out beyond the period of its birth, beyond the social class that called it into being, beyond the style to which it belongs". In spite of the foregoing, the 'epistemic- battle' goes on: for example, postmodernists appear not to recognise and consistently reject the paradigms set by the modernists and rather seek non-rational use of building techniques, angles, and stylistic references in a neo-eclectic manner. The modernists have interestingly compromised parts of their principles leading to the necessity of the new architecture (Breuer, 2006) and the new architecture is also considered to be "problematic" (Mendelsohn, 2006).Where does architecture then stand? This question, albeit, rhetorical, further question are posed with some provisional answers in the conclusions.

Conclusions

There is epistemological diversity and anything goes in architecture. Architects are perceived as generalists. Architects in academia and practice as well as students always come to the conclusion that architecture is interdisciplinary; hence any method is applicable. Perhaps, Architecture is still in darkness it is at the cross road between the arts and the sciences; because it borrows from several methods and principles of philosophy.

Though Vitruvius strove to place architecture on the level of 'science' which integrates the art of building, functionality and aesthetics; the question still remains: on *which side is architecture?*[Italics are author's]. In 1967, Howard S. Becker pointed out in his seminal article-'Whose Side Are You On? That, "in the greatest variety of subject matter areas and in work done by all the different methods at our disposal, we cannot avoid taking sides, for reasons firmly based in social structure" . Therefore, if architecture seeks to solve human problems to merit the term 'science' as the introduction of this essay seems to suggest; then it may be concluded that da Vinci's discoveries of much laws of nature (*ragioni*) as rules of operation *(regole)* ought to be considered in architecture both in practice and academia.

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