ABSTRACT

Since the time when the solitary hunter dwelled in caves, and discovered and controlled fire, Man has continually sought new ways and means to mediate the ravages of nature. As Man evolved, so did the dwellings and implements of environmental control. Each new technological advance affording Man greater control over his immediate environment. Such devices and implements included amongst others, the choice of site on a global or regional basis, with the understanding of the inherent qualities of the site which would make it amenable for habitation, and sustenance; indeed, history reveals that a great many wars were fought over control of such prime sites, and around such sites great civilisations flourished. Even locally, there was a discerning evaluation of the inherent strengths or weaknesses in the site, such as proximity to water, altitude, and protection from the harsh elements amongst others. Then there was the need to select the materials for the construction of the dwelling, as well as the form of the dwelling itself. There was also the selection of heating or cooling systems, whether complex, or simple and the controls of these devices, both active and passive. In addition to the physical environment, the inhabitants of a site were aware of the need to adjust their attire, posture and activity, and other physiological changes that would increase their efficiency of function.

However, after the 19th century, there has been a shift of focus from passive and site orientated climatic control systems to “power-oriented” devices such as Heating Ventilation and Air-Conditioning (HVAC) systems. With the advent of Miesian Modernism of the minimalist concealed aesthetic, there was a clear disjuncture of the implements of environmental control, and the architecture itself, clearly articulated in the rapid proliferation of false ceilings, raised floors and service cores. The re-emergence of the “servant” aesthetic as propounded by the likes of Kahn and more recently Piano, remained purely that, an aesthetic that nonetheless merely celebrated the separation rather than proposed a possible mediation. The growing reliance on these “power-oriented” systems has many implications, such as power consumption, cost, environmental friendliness and so on.

However, the motivations for this study, lies perhaps in more banal origins. What has irked this author more than anything else, is the fact, arising from personal experience, that the design and implementation of such “power-oriented” systems, while guilty of most, if not all of the accusations levelled at them, are sometimes guilty of the biggest sin of them all; that is, failing to provide comfort conditions for the users of a particular space. It is ridiculous to behold people in Singapore working in spaces with polar temperature settings, huddled in their workplaces sporting winter wear while temperatures are searing on the outside. To the author, this is a reflection of the flagrant abuse of technology, and a sad state of understanding and empathy with the site on which we exist.

Of course, there are those who would point an accusing finger at the processes of globalisation and the rabid hegemony of the CIAMist modernism, and champion a return to dried plant roofs and timber construction and an unabashed return to the
tropical paradise of ancient lore. However, that is, to the author, not a viable, nor sustainable option. The reality is that neither the societies, nor the economies of the world will permit this retrograde action. Humankind has never revoked a technological advance in history, and most certainly will not do so now. Each age has sought to reconcile itself to its Zeitgeist, and in the information age, we must certainly attempt to do so as well. And as such, it falls upon us to make use of the technology and information availed to us in an attempt to fashion an architecture that would permit the function of society in that infrastructure, while remaining sensitive to its site.

The author refuses at this point to address socio-cultural issues for these are debatable to death, and do not proffer any particular benefit, or advantage to this endeavour. Rather, this exercise is an exploration of what it means to be comfortable; to want of nothing, and of bliss. Again, the term "comfort" is too large to be addressed in a single venture such as this. Hence, in light of the single greatest affective element present in the tropical environment, the author has chosen to address the notion of "Thermal Comfort".

Thermal comfort has been defined as "that condition of mind which expresses satisfaction with the thermal environment", emphasis being on condition of mind, which explains itself as a psychological phenomenon, which is of course dependent on physiological responses to the environment, but nonetheless relies on an entirely subjective interpretation of the same. As such, since the pioneering work of Ole Fanger in Kansas State University in the United states and the Denmark Technological University, a great deal of study has gone into the analysis, and attempt to qualify and quantify the notion of "thermal comfort". However, given the subjective nature of comfort perception, one recognises that whatever methodologies and standards adopted will never be perfect. The more credible studies rely on large pools of statistical data to provide quantifiable averages, which to a certain extent, move towards a semblance of objective qualification. This study will look at a sample of the studies in the tropical and sub-tropical regions an attempt to piece together a better understanding of thermal comfort parameters, in particular, in relation to South-East Asia, and specifically, to Singapore.

The study will also look at the tools which will enable a better adoption and execution of design based on existing data. Given that we have already accepted that no single standard or method is perfect, then means to afford flexibility in the design of such thermal comfort affording systems must be considered. The author also suspects that the variance comes about not only in the individual but also in the configuration of the space itself. It is well known that thermal conditions are never uniform throughout even a singular space. Hence, such computational and simulation tools will allow designers to have a better grasp of the thermal organisation of a particular space, allowing for zones to be set up which would match activities within a space to its corresponding, suitable thermal zone.

Due to logistic constraints, the author will not be conducting any field surveys of his own, but will instead rely heavily on existing studies, all of which will be duly credited in this exercise. The author will however, move to selectively deploy data from these studies to test possibilities of achieving thermal comfort. The author has also decided that to keep this exercise manageable, he will focus on a series of simulations based on variations of a singular test vehicle, in this case, an office space, the reasons for which will be given in a later part.
The ultimate aim of this study is to provide a framework (not necessarily entirely new) for viewing the factors of thermal comfort at a design stage, rather than as a reaction after design has been finalised. This so that the function of environmental mediator in architecture is not relegated to being a mere accessory, but an integral, and designed for, element of Architecture. Also, this study targets the architecture design community, and as such will not be entirely technical in nature. The author apologises for any lack of data that might present itself in the course of this presentation.