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ARCHITECTURE AND BIOCLIMATIC DESIGN

Less is beautiful

by
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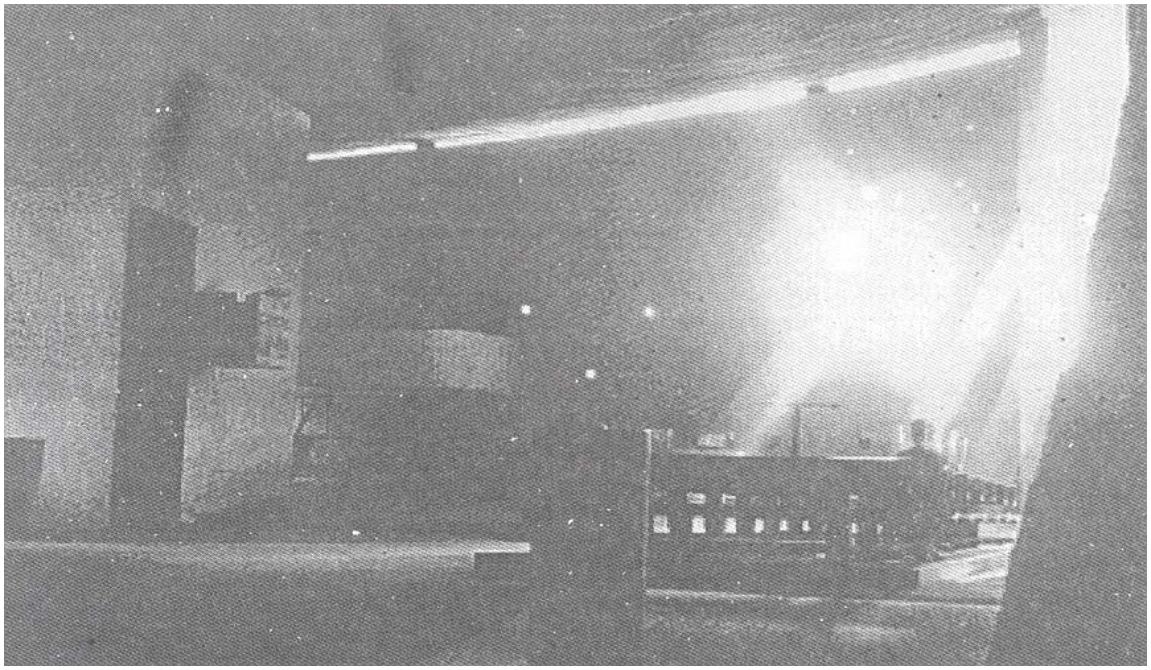
Bioclimatic design has indeed come a long way, but unfortunately at the same time it still has a long way to go before it is to be universally accepted by architects and the other members of the design team as being an integral part of architectural design and not just a fad that will blow away with all the other "isms" that have come and gone.

I will start by summarising briefly how things have developed up to now. Up to the dominance of the Modern Movement bioclimatic issues were more evident in vernacular than "official" architecture, except for cases mostly related to natural lighting as in the Pantheon in Rome or the great Gothic Cathedrals to name but two examples. Throughout the ages site and climate sensitive issues were taken into stride as a natural issue for different reasons of, which the more important were: the slow pace of evolution which allowed for learning by trial and error, the local character of construction and materials and the need to make the best use of the limited resources and means that were available. The development of glass as a manufactured material in conjunction with steel were the first to radically change this picture with the erection of the huge and beautiful glass structures of the 1 9th century.

In his later work Le Corbusier came to recognise - together with other things - the importance of shading and natural ventilation, even if from an arbitrary and predominantly aesthetic point of view. The pioneering work of the Olgyay brothers and the office of CRS (Caudill, Rowlett, Scott) put climatic issues into a much more systematic and scientific context. Mainstream architecture however was far from being interested in such issues. The availability of cheap energy and the development of sophisticated mechanical systems and different kinds of glass led to buildings highly dependent on services and of a global appearance irrespective of location.



Le Corbusier, Ronchamp Chapel

As we all know by now it was the first oil crisis of the early seventies that jolted the design profession (or, to be more accurate, the specialists) to a rude awakening. The result of this was a concentrated effort (as most of the development was taking place in the more northern climates) in the reduction of the heating of buildings with a predominance of active systems to start with and the passive approach following later in the mid seventies.

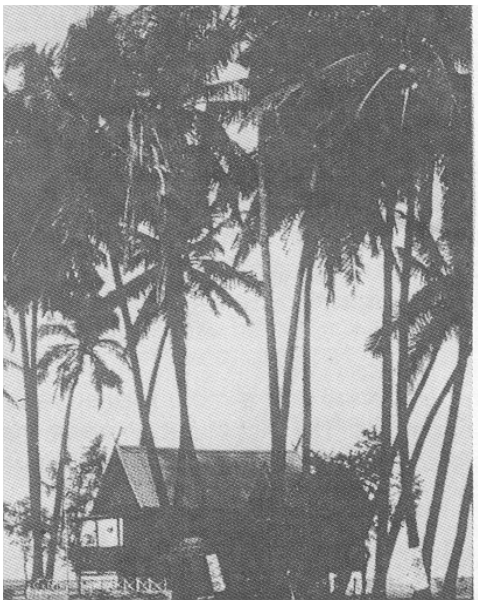
In the meantime the world population in the past twenty years has grown from some 3,8 to 5,2 billion. More than 50% of this population will by the end of this century be living in urban conglomerations. 20% of the world population is at present consuming more than 80% of the total energy creating the equivalent pollution. About 50% of the energy consumed is for the production and running of buildings. Within the span time of a generation we build the equivalent of what has been built on this earth from the beginning of history. Parallel to all this, we are now rudely coming to realise that if we continue depleting our non-renewable sources and polluting our environment at the ever faster rates of the present day, in conjunction with the high rates of population growth especially of the third world, it will not be long before there will be no need to worry any longer!

We have also come to understand that the whole problem is an intricate one of sensitive balances and not only an issue of energy consumption and the production of pollution and waste, and that the ecosystem in which we live has its limits. And finally that no new invention, as has already been proven throughout history, such as nuclear energy, is a godsend saviour if we cannot account for the by-products of its use. From the ethical point of view we have come to accept that we cannot continue living and inheriting from our forefathers while borrowing and mortgaging the future of our children.

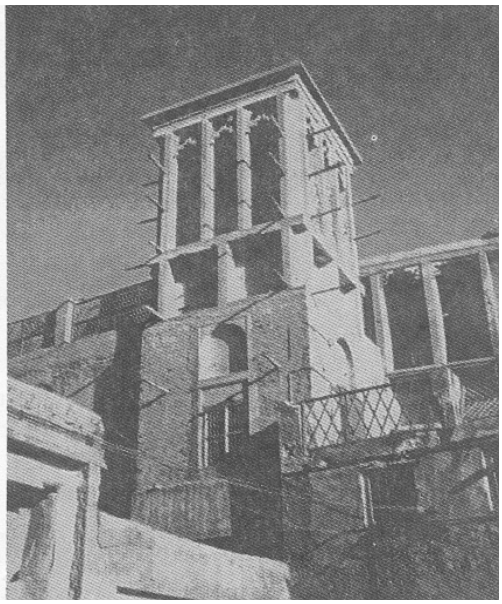
It is of course only natural that architectural design has, in recent years, started to alter course and to become much more holistic in its approach while trying to address itself to:

- the achievement of a sustainable development,
- the depletion of non-renewable sources and materials,
- the life cycle analysis of buildings,
- the total polluting effects of buildings on the environment,
- the reduction of energy consumption and
- human health and comfort.

It has now become apparent to the architectural profession that these issues are really important ones, no longer fringe issues for a minority of interested individuals and that they are here to stay for a long time. It is no longer an exception to see them covering entire issues of the glossy page architectural magazines or being the theme of important architectural gatherings as in the joint Congress of the UIA and the AIA in Chicago or the EEC Conference on Architecture in Florence in 1993, both gatherings resulting in the issuing of relevant Resolutions.



Light construction adapted to hot, humid climate: Sulawezi, Indonesia



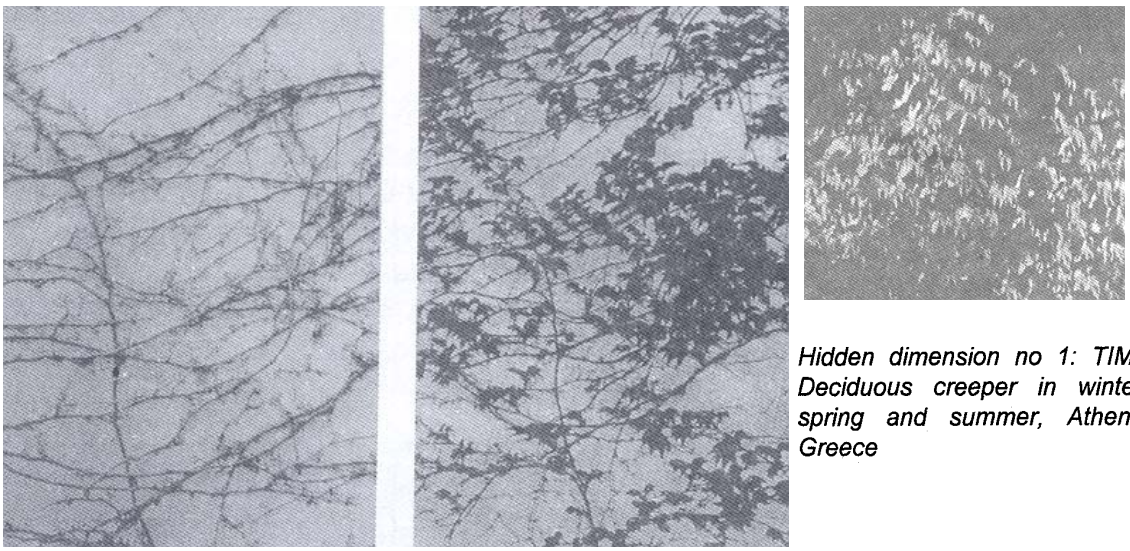
Natural ventilation: Wind towers, Dubai, U.A.E.

For me however the crucial issue is the following:

Is Bioclimatic Design, or whatever we care to call it, an option that we may or may not have, a specialisation left to the specialists or the enlightened while real architecture is something else, more important and more noble, to be practised by those who do not understand or care much about technical issues? Is climate and site sensitive design a technical issue? Have we really reached the mountain top or is it just a fad that will soon die away? Will it be a repeat of that terrible misnomer "solar architecture" for which a momentum was built up after the fist oil crisis only to fade away - at least in the conscience of the general public and the funding from national bodies - because it

did not yet prove itself cost-effective, as if the issue was that or the sun had all of a sudden died away?

I believe that there are a number of reasons why the mainstream architect has not been moved to think, design and create with bioclimatic issues as one of the important but not exclusive parameters of his work.

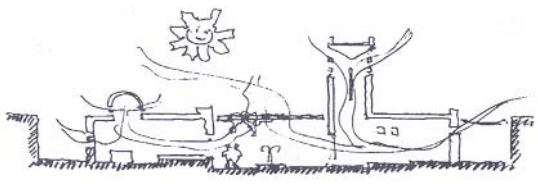


Hidden dimension no 1: TIME
Deciduous creeper in winter, spring and summer, Athens, Greece

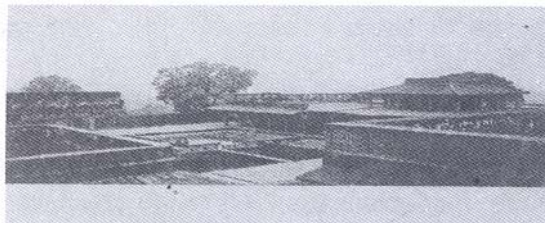
To start with I would like to give fault to architectural education. In many cases, at least up to a few years ago, the architectural student was not even made aware of the basic facts and philosophy of bioclimatic thinking. And when he was, this part of his education was left to the specialists as part of the extra technical knowledge that he was supposed to acquire parallel to his basic studio education, as if it was not all one and the same thing.

Secondly architects have a fear and lack of interest for all that is more mathematical and a lack of understanding of the basic laws of physics. The fact that this knowledge is presented in the way it is, makes it even more difficult to understand and even more improbable to influence his basic thinking.

Thirdly architects love to have freedom in design and formgiving. Everything that creates constraints is in their belief inhibiting and thus something to be avoided at all cost.



Hidden dimension no 2: AIR
Natural ventilation



Fatehpur Sikri, India
View from Panch Mahal

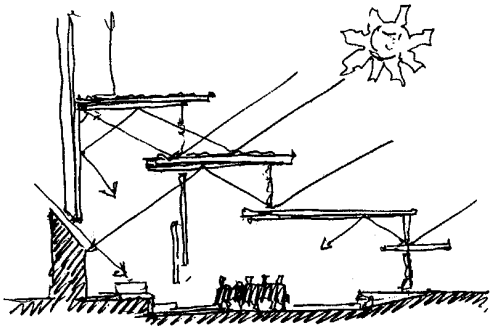
The problem of course is that it is exactly the opposite that is true. Architecture is, amongst others, an exercise of problem solving and a magnificent game as Le Corbusier so aptly said and, in order to solve problems and play a game, you must have constraints from where to start and rules with which to proceed. Within limits, the more constraints one has, the more interesting and creative the process becomes. It is impossible to design in a vacuum. If formgiving is the only concern then the result is sculpture and not architecture.

The next reason is that architects are basically trained to exercise only their eyes. An architect "envisages" space or a new situation, he does not feel it with any of his other senses, so these senses become dormant and he gradually loses the many hidden dimensions of architectural creation which are vital to the notion of bioclimatic design. Let me only mention what to me are the three most fundamental ones, although sound, smell and touch are no less important.

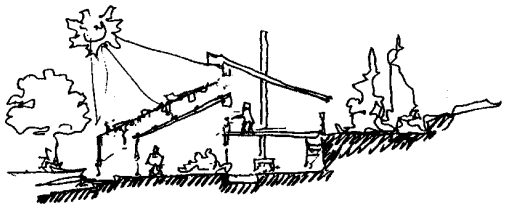
TIME, which has been called the fourth dimension of architectural space, is of importance because every object cannot exist but in time. The notion of time gives life to an object and relates it to periodic (predictable) or unperiodic repetition. Time relates to seasonal and diurnal patterns and thus to climate and the way that a building behaves or should be designed to couple with and not antagonise nature. It further relates to the dynamic nature of a building in contrast to the static image that we have created for it.

AIR is a second invisible but important element. We create space and pretend that it is empty, oblivious of the fact that it is both surrounded by and filled with air. Air in its turn, due to air-movement which is generated by either temperature or pressure differences, is very much there and alive. And related to the movement of air should be building shapes, sections, heights, orientations and the size and positioning of openings.

LIGHT and in particular daylight, is a third important element. Architecture cannot exist but with light and from the time we have been able to substitute natural light with artificial lighting, many a building and a lot of architecture has become poorer so. It is not an exaggeration to say that the real formgiver to architecture is not the architect himself but light and that the architect is but the form moulder.



Hidden dimension no 3: LIGHT
Daylighting

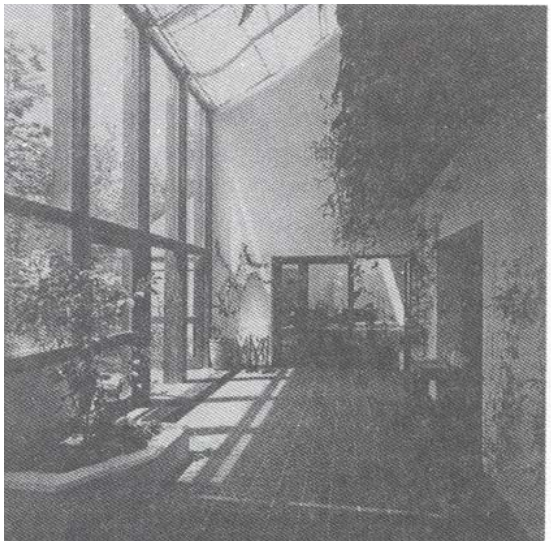


Passive Heating

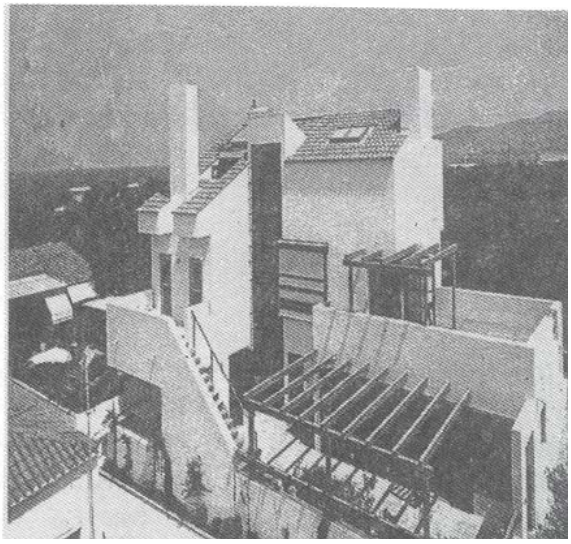
I strongly believe that an architect, during the process of design, should take separate walks through the plans and sections of what he is putting down on paper or computer screen and each time visualise how what he is designing is being affected by time, air and light. There exists therein so much to see that would be hidden to the untrained eye for ever and so much to be influenced by, that the end-product cannot but become richer and more complete.

The traditional approach to architectural design and way of thinking of a building is a static one in which the building has been optimally sized and finished. In this procedure and especially as far as services go, optimum sizing means calculating the agreed upon extreme conditions and then sizing the different elements accordingly. But in reality the behaviour of a building is far from static, it is just as alive and dynamic as any living organism like you or me. A building feels hot or cold, it breathes, it perspires, it should be able to put on or take off extra clothing, be able to sit out in the sun or shade, the wind or shelter, as necessary.

Computer programmes be they structural, electrical or mechanical, have made such a dynamic refinement of design possible. The most important fact however is not so much the refinement or the thousands of figures that they can churn out, but the design philosophy that they underline and on which they are based.



Helios 2, Passive Solar Residence
Ekali, Athens, Greece, Design: 1980
A.N.Tombazis and Associates



Helios 3, Passive Solar Residence
Perdika, Aigina, Greece, Design: 1981
A.N.Tombazis and Associates

The architect, at least as far as buildings are concerned, is the leader and initiator of the design team. He is the generalist who has to co-ordinate all the specialists that are involved. However, the more buildings become more complicated and issues more complex, the more he relinquishes this role and issues become confused with contradictory requirements fighting each other for dominance in the finished product. And what is the end-result? The building - machine dominated by the services (visible or invisible is of little importance) which to a large extent are only there to correct the wrong design decisions which were taken in the first place! What we have is heavy doses of medicine to cure instead of a logical and healthy programme of prevention to start with. But to be able to prevent one has first to set clearly defined and feasible

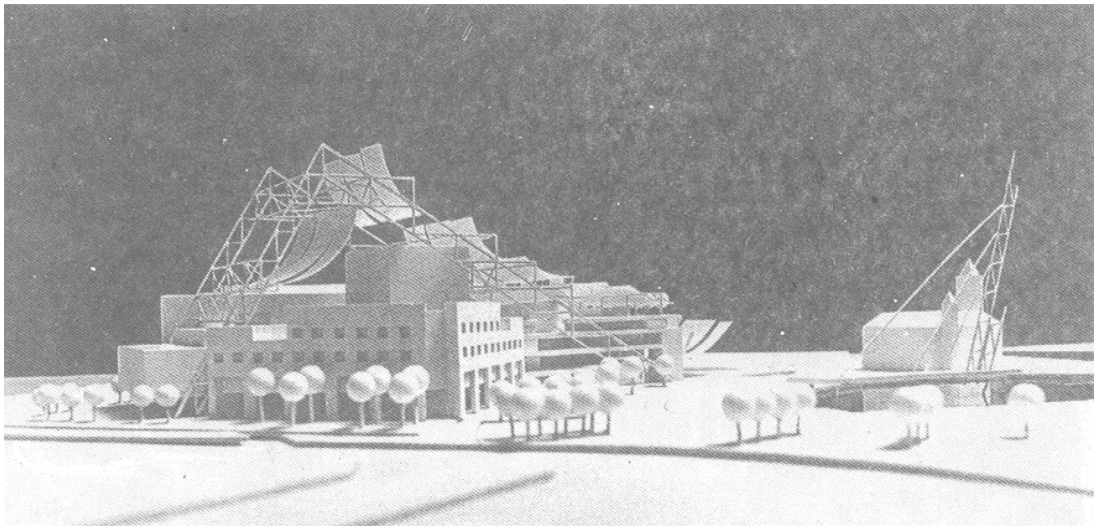
targets that fit into an overall philosophy and interdependent system. And that means getting the basics and the priorities right from the beginning.

But for the architect to be able to play his role as co-ordinator and creator, he must in the first place be able to understand at least the basic language of the other members of the team and he must also have a clear mind! And this brings us to the next issue.

Architectural design is a multifaceted and complex process. There exist many many issues of a specialised nature which must be dealt with by the specialist and which many times differ from case to case. There exist however some basic issues, such as those we are talking about, that exist everywhere and always. They are the same issues as were in the past or will be in the future, whether on the pole or the equator. The issues are the same, what differs is their intensity and content. After all there exist no buildings which are not solar! There exist only some which are more clever and others that are stupid.

These are the issues that the architect must master and that he cannot leave to the specialist to solve. After all he, being the generalist, should be in a better position to grasp and evaluate, learning the basics and the differences from case to case and then moving on to make use of this experience.

But how do we achieve that these issues become universally accepted by mainstream architecture and do not continue to remain fringe issues even though they have by now become more acceptable than what they used to be?



Cardiff Bay Opera House - International Architectural Competition, Design: 1994
A.N.Tombazis and Associates

I believe that the wrong way is to present them to the architect in a way that makes him feel only that it is his duty to make them part of his vocabulary, both as a citizen of this earth and someone whose decisions influence the future of our planet. To evoke his power of influence, his stewardship, commitment for action for a sustainable future, to terrorise him by taking the doomsday approach is fine and maybe even necessary as much as it is both urgent and true. But is this enough? The pure architect - designer will always believe deep inside himself that architecture should be a bird that can fly

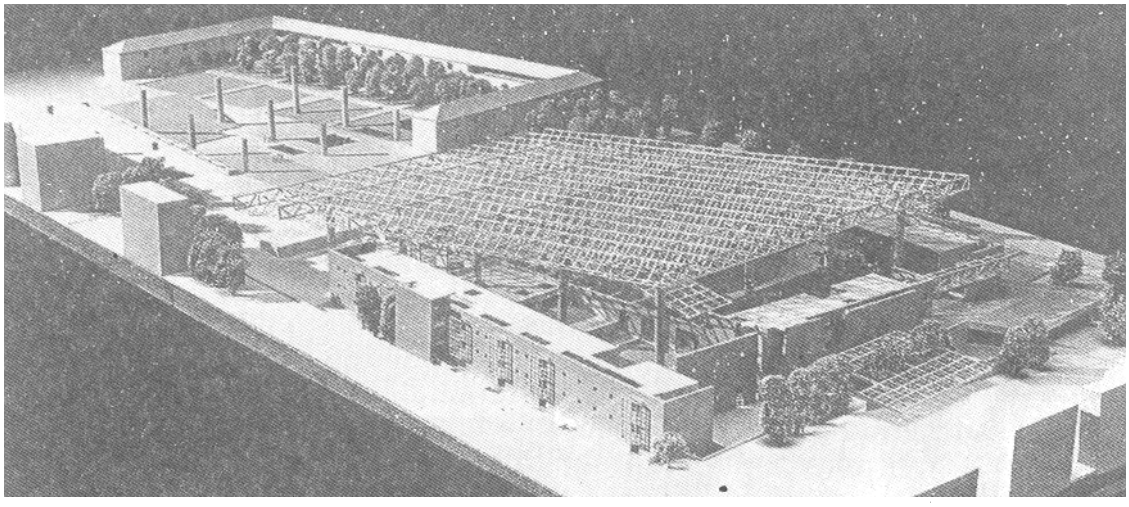
free, that can soar high above everything else that is practical, mundane and restricting. Thus he will say that all this that we are talking about is in fact true and necessary, but let's leave it to the others to take care of. He will still want to ride the train of freedom and creativity for as long as will be possible and leave to the politicians to make the decisions, the different ecomaniacs to make the necessary noises and the good old doctor/engineer to prescribe the necessary medication!

I believe that a better approach is to put these issues in their real and proper context and that means that these issues are **real design issues of the most abstract nature** just as much as being technical issues or issues of vital importance to the survival of our planet. These issues are issues with a hidden inner beauty that should influence architectural design in a most direct and basic way. They should not influence design only in a stylistic or add on manner but define the very essence such as whether to build or not to build and how the form of a building is to develop. They are issues related to both logic and sensitiveness and architects do pride themselves after all in trying to combine matters of the mind with those of the heart!

And in order to emphasise the importance of what we are talking about and just to be provocative, let us assume that the day has come and that electric generation from P/V cells is cost effective and that the process is benign with no ill effects to the environment. Would that mean that the architect is at least free in his design process? Should he then disregard all other considerations just because he can? And if he were to, would the end-result be more satisfying? Surely not.

Moving through recent history by way of famous sayings we have had the one by Mies Van der Rohe that said: *less is more*. The essence of this being the importance of purity rationality and simplicity of design in an age in which more, greater or larger was of vital importance.

Then came Robert Venturi with his *less is a bore*, meaning that after all purity and control are restrictive and unnatural and one must admit that there is a lot of truth in this statement too which advocates diversity



National Competition for the House of Representatives, Cyprus, Design: 1994
A.N.Tombazis and Associates - A.Charalambous Partnership, Honorary Mention

Then comes the reaction to the large and centrally governed from E. F. Schumacher with his *small is beautiful*, questioning the very essence of uncontrollable growth. And again one must admit that now more than ever this statement is important too.

Maybe the time has come to advocate that **less is beautiful. Less**, in the sense that this is a conscious and well judged decision, that less does not mean necessarily small, but it does mean the appropriate minimum both as a philosophy of living, development and, in our case, architectural design. And **beautiful**, that this choice for less is in itself beautiful and satisfying. That there is an aesthetic quality in being able to achieve the same end-result in design, by using simpler, more natural and sustainable means.

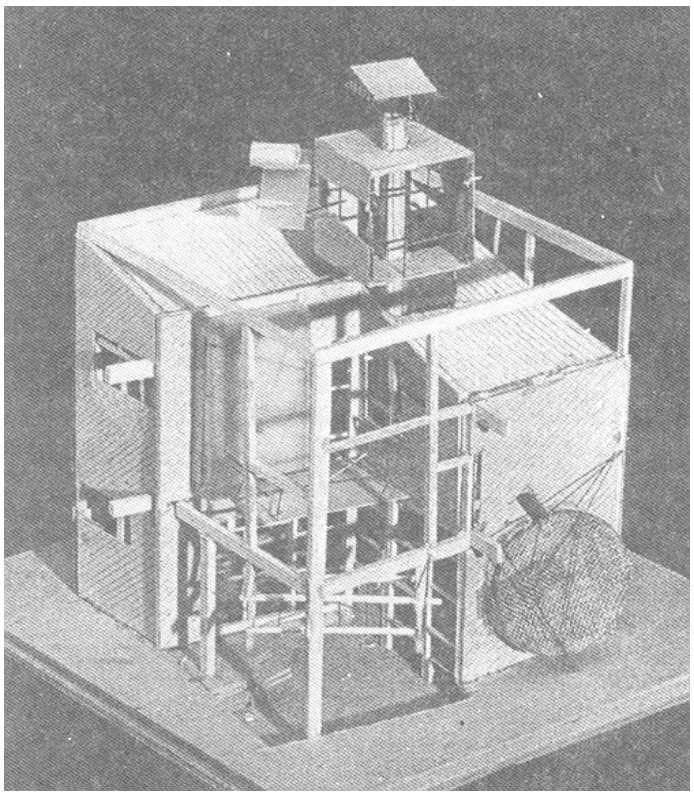
I must confess a personal sense of satisfaction for how things have developed for me over the past some twenty years. I have always been interested in technology, innovation and its relation to architecture. That is what drew me to solar in the first place: that it was something innovative and new, the potentials of which were to be explored. In reality however it was just more machinery to be incorporated into my design. I have in the course of time come to understand that it is the exact opposite that is true: that solar in itself is a misnomer and that what is important is the inner beauty of climate, site and place-sensitive design as part of that wonderful ecosystem which is that spinning blue miracle: our spaceship earth.

Although we do not like to admit it, I believe that it is generally acknowledged that architecture although very distant from fashion design passes through phases. In fact the more design (with the narrow sense of the word) oriented it is and the less it takes into account all the other parameters that should enter into the whole process the more prone it is to be influenced by fashion or fads if you prefer.

Architecture which is sensitive to site, sustainability, climate, the teachings of simplicity and beauty to be learnt from the common-sense lessons of the vernacular and the needs and aspirations of human beings is in itself so comprehensive and fulfilling that there is little else to be added.

It is in this way that I believe that we should regard bioclimatic design as part of this overall picture. We do not need to and should not exaggerate. Exaggeration is the sign of superficial comprehension. It is the characteristic of the novice. With maturity and ripening everything enters into a more balanced equilibrium.

Such has been the case of bioclimatic design or solar design as it has been called. It started believing that it should be a case in its own, different from the rest of architecture. First of all this meant that it could only be designed by a special kind of animal, the specialist designer/architect and not everyone. Second it resulted in a different kind of aesthetics that put it aside (and between you and me in many cases turned many people off).



World Project "Just Married", Belgrade, Yugoslavia, Design: 1992, A.N.Tombazis and Associates
Twelve architects were invited world-wide to each create one house of 50m2 to be used by newly wed couples from all over the world.

Third it became related with an environmental and/or social radicalism of the misfits who could not fit into society and for whom the hands of the clock should be turned back before they would be anything of any technological significance would contaminate the human mind.

I strongly believe that this kind of exaggeration is detrimental to an issue that is of so vital importance and such profound beauty!

On the other hand however to pay lip service only is misleading and surely not enough! And by this I mean the increasing number of examples of present day architecture which pretend that they are bioclimatically sound but in reality pick and choose only what can give some "in vogue" - let us not be afraid of admitting it, pictorial components of value for their design. In many of these cases it is very often that it is still extra unneeded technology or complicated M/E systems that are again taking over. We for sure do need this technology, automation and what - have - you, but we need it only in what I like to believe should be our guiding philosophy of **less is beautiful**.