The SerraLux Interview:

Professor Michael Wigginton, author of

"Glass in Architecture"

&

"Intelligent Skins"

Harnessing the Power of Daylight

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MICHAEL WIGGINTON, EXPERT BUILDING ENVELOPE ENGINEERING

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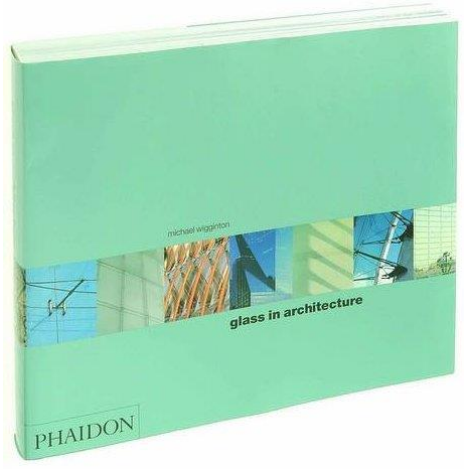
At SerraLux; we are understandably interested in the history and science behind sustainable building design and the integration of daylighting technologies. Recently, we had the good fortune to speak to University of Plymouth Professor Michael Wigginton, author of "*Glass in Architecture*" and "*Intelligent Skins*", and a leading expert on building envelope engineering.

SerraLux: Professor Wigginton, who were the biggest influences on your architectural career and how did you come to spend the earlier years of your career in New York?

Michael Wigginton: The greatest influence which evolved during my education was the work of Mies van der Rohe, which seemed to me to be driven by simplicity and order, with a passion for construction and detail. After graduating from Cambridge, I was offered a job at Skidmore Owings and Merrill in New York, possibly the greatest corporate firm in the world. The idea of the large firm appealed to me because I felt that only large firms could generate income sufficient to support research. The work of SOM was also the greatest manifestation of the Miesian philosophy, and Gordon Bunshaft, the senior design Partner in New York, was a major 20th century figure in his own right.

SL: What did you enjoy most about your academic career as professor of Sustainable Architecture at the University of Plymouth and what are the main differences between the world of academia and the cut and thrust of the world of construction?



MW: Academia enables people to explore research avenues without the need to earn fees, but (in my view) these are of no value if they do not engage with practice.

I took the job as Head of the Plymouth School because the Partnership with Richard Horden in 1986 ran out of work. I had been teaching since the 1960s, including at seven Universities, and I was telephoned by the then Head of School, Adrian Gale, suggesting that I take over when he left.

I kept my Practice going, completing three projects including a Classroom of the Future for Devon County Council. The VC offered me £25,000 to carry out a research programme of my own choosing, and I proposed a programme for the intelligent façade, which had interested me as I worked (for 10 years) on my book "*Glass in Architecture*" in the 1980s. I hired a Research Assistant, and we produced a set of case studies. I felt it was good enough to be published and wrote the background chapters explaining the principles. This became the book "Intelligent Skins", which in turn became the agenda for the EU COST C13 5-year Research programme, with 17 nations.

SL: When your book "*Glass in Architecture*" was published, you, as an architect in the UK, won the Research Prize awarded by the American Institute of Architects. Is geography a determining factor in building design? Having worked on both sides of the pond and with buildings in Asia and Europe, to what extent are design criteria universal and to what extent are you constrained by local circumstances.

"Every design project should have overriding considerations of climate particularly heating and cooling seasons

MW: Some design criteria are universal. Every design project should start with the consideration of the Client brief and available technology, with the overriding considerations of climate particularly heating and cooling seasons. The criteria which have to be considered force a designer to lengths of ingenuity in terms of building physics. I found that the study of physics, and the excellent teaching by Alex Hardy in Cambridge, had provided me with a sufficient grounding to understand how to approach architecture in a way in which functionality could be seen as the basis for beauty.

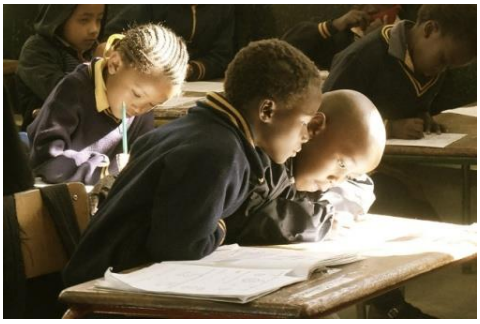
Geography should be a determining factor in the design of buildings, but the invention of central heating and air conditioning has allowed architects to become lazy, which explains the "sameness" of architecture around the world. The environmental engineers have overcome the laziness of the architect.

SL: How and why did you come to focus on energy and climate as major drivers for architectural design?

MW: There are two major drivers. Firstly, considerations about what is now called sustainability, which to me came out of the reading Victor Olgyay's book "Design and Climate" and the Club of Rome book "*Limits to Growth*" published in 1972, which I bought and read just as the recession caused by the then oil crisis made the buildings I was working on in Yorke Rosenberg and Mardall impossible to build. I managed to design and build one building in the Hague, by persuading the QS and the Client that we should add the cost of the mechanical systems (air conditioning and heating) to the cost of the envelope. This enabled us to reorganise the Cost Plan,

HOT TOPIC

DAYLIGHT DESIGN



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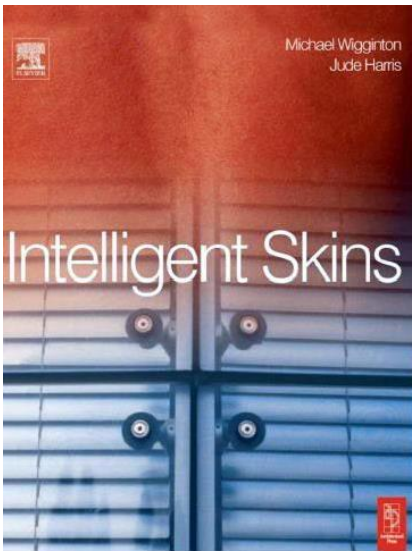
and put more money into the envelope to decrease the cost of the air conditioning.

Secondly, obvious issues of cost. Complex buildings such as teaching hospitals can have 30% or more the building costs devoted to solving comfort problems which (I maintain) can mainly be resolved by appropriate form and the use of Technology.

Moving parts cost money, and break down. Passive solutions must provide a better alternative to large spending on mechanical systems. They also support the development of regional architecture, which was the basis of all architecture until the invention of central heating, air conditioning, and electric lighting, made it possible to overcome environmental deficiencies by the enormous use of energy: in the western world 50% of all energy is considered to be used in buildings.

SL: What do you consider are the limiting factors on the use of daylight in architectural design?

MW: Daylight should be considered as a fundamental characteristic of building interiors, because the human system (and the eye) has evolved to respond to it. The use of daylight was fundamental to all building design until the invention of electric light. Windows make the interiors of buildings habitable. Unfortunately they also provide views of the sky which can be hundreds of time brighter than the interior, particularly in positions back from the window. The limiting factors are the ability of designers to enable daylight to reach building interiors whilst avoiding the problems of glare. The problem for design with daylight is the depth to which daylight



"Quantification of value is hard in relation to some spheres, but all research supports the notion that our buildings should be day lit

extends to the interior, and the resulting large external wall: floor ratio, which opuses the cost of the external wall up. This is why the search for light bending has been so important.

SL: You describe using energy as a morphological driver. Can you please explain the meaning and significance of this description in architectural design?

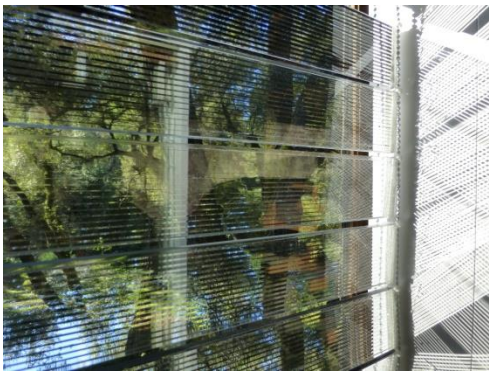
MW: A morphological driver is simply a factor or set of factors which must be considered in the development and design of form. Gravity is a morphological driver, and energy should be.

SL: What do you understand and teach as the principal elements of sustainable architecture. Is the effective use of daylight essential to sustainable design?

MW: In the design algorithms I have developed, daylight has been an early morphological driver, because it enabled the building interior to be used optimally, exploiting the functioning of sight to operate in the spectrum it was evolved to use, without cost, except the cost of the window. The removal of the requirement for artificial light except during the hours of darkness means that the lights can be turned off. Conventionally lighting requires ~10 Watts per square metre.

SL: How do you view the value and importance of daylight in building design – offices, schools, hospitals and residences?

MW: I think it is fundamental. It is what we have evolved to see by, and it is free. Quantification of value is hard in relation to some spheres, but all research supports the notion that our buildings should be day lit. Our eyes interpret colour best in



daylight, and the whole spectral distribution inherent in the perception of form is properly interpreted.

SL: You are the author of the book “Intelligent Skins”. How does the metabolism of a building complement the metabolism of human beings in terms of sight, sound and survival (i.e. effective living and working environment)?

MW: Much like the metabolism of a human being, buildings respond to external changes and internal demands. Intelligent Skins sets out the principles for the design of intelligent building envelopes where the prime objective is to control internal environments through a responsive building fabric rather than by energy consuming building services systems.

ABOUT SERRALUX

Headquartered in England and California, SerraLux develops and manufactures cleantech window products that harvest daylight and redirect it deeply into a building. Built on the work of founder Peter J. Milner and his collaborator, David Willetts, SerraLux’s patented technologies combine cutting-edge optical science, electronic design, and engineering into products that harvest daylight from outside, and redirect it so it can illuminate the room—all while mitigating glare and preserving the view.

The company’s flagship product, SerraGlaze® Daylight Redirecting Film, is a transparent, easy-to-install, acrylic film that redirects incoming daylight to the ceiling. The newest product, SerraView™ Smart Daylighters (currently in prototype) adds Bluetooth-enabled control to daylight redirection. Both products contribute to credits/ points for LEED, BREEAM, and GREENSTAR

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