# OSLO
# IMAGE, ARCHITECTURE & INNOVATION
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*Or, Up Against A Well Designed Wall*
*- subtitled The Wall that Sells or The Wall that Obtains Planning Permission*

INTRODUCTION

Although I risk oversimplifying, the International Style could be described as an image of white concrete in horizontal lines - stretched surfaces belying gravity.
If there has been an example of architectural imperialism since, it is probably that known as High- Tech. The myth of high-Tech is that it rarely exploits advanced technology, but does attempt to market images. Image, in the late twentieth century, threatens much of reality as we have known it. We will see the epitome of this when endless sunrises appear in all forms of media at the dawn of the third millennium. If the early morning happens to be foggy in the Chatham Islands (east of New Zealand), it will not prevent pre-recorded sunrises to be channelled throughout the world. Recognising, but not accepting the power of the image, I will focus my contribution to this conference on Tendencies to an appreciation of vertical surfaces, and potential meaning as edges to public space.

To place my own research work in context, I would like to suggest that the history of architecture is the history of the way in which light has entered buildings - through small openings in masonry walls and roofs, to infilling them with small pieces of glass, to total glass enclosures. From this point of view, architectural development could be described as the desire to master gravitas by levitas, and the means to achieving this being the application of continual industrial innovation.
Personally, I have been involved in many architectural innovations in glass, stone and metal construction, which include, chronologically: - *(design intentions in italics*)
In 1984, the world's first all-glass bridge, above a courtyard in Paris; (*image - click-click advertising*)
Between 1981 and 1986, the development of the world's first high performance toughened glass structural assembly in collaboration with Peter Rice and Martin Francis - this development, *through an investigation into defining physical transparency*, revolutionised suspended structural glass assemblies and created a new architectural aesthetic; (and a visual form of architectural measles!)
RFR also designed the first light transmitting insulated PTFE fabric roof, including solar mirrors.
In 1985, the first ever creation of 3D visible light forms, with J-L Lhermitte and François Bastien at the EDF laboratories in Clamart, France; (*desire*)
In 1987, the world's first structural fixing utilising one leaf only of a laminated glass pane, which we named the Phantom Glass Fixing; (*pearl + water surfaces*), unused on Pearl; used at Terrasson.
In 1989, the first ever application of structural glue alone to hold up a glass wall in a public building;
(- *the ecology gallery, to convey a sense of fragility*)

In 1989, with Pilkington, the world's first double glazed structural glass fixing, London; (*technical performance*)
In 1990, the world's first application of light memory coated glass (with Pilkington), Ingolstadt; (*research, inter-active short life graffiti*)
In 1991, the first glass installation which transfers wind load at the corner of the building through the glass edges (Reina Sofia, Madrid) (*transparency achieved through emptiness of the corner*)
In 1992, we designed the first public glass seat for London Underground at Bermondsey Station; (*lightness in darkness - levitas in gravitas*)
In 1993, the first cantilevered steel mesh caged stone walls (7m high) in Terrasson, France; (*modernity in visual relationship to history; unprocessed, tactile, ecological walls*)
In 1994, the first installation of inclined toughened glass fire escape doors, Leipzig, Germany (*maintaining architectural form, and by default overcoming Din Standards*)
In 1997, with Paul Gillieron, the first outdoor application in the world of an "active acoustic system", in the Crystal Palace Concert Platform, London;
(*non-visual perfromance*)
In 1998, the first application of a catenary roof using flat stainless steel sheet, at the Royal Albert Dock Rowing Centre, London;
(*more with less*)
What is significant about most of the above innovations, is that they all had to meet stringent construction safety codes.

Then, there are those innovations which have remained ideas, such as the world's first complete spherical projection for the Spheriscope at Greenwich (1984), the woven titanium structural ring in Japan (1989), and the potential fused glass brick from waste glass (1993).

My research is driven by the architectural opportunity given by a client. This research concerns the nature and performance of space, and the performance of materials which make that space come alive in light - both natural and artificial. To realise some of the material innovations I have been fortunate to have forged strong links with some industries.

I would like to believe that some of these innovations have been valuable to architecture, and that as an architect, it is still possible to have a direct input into industrial innovation.

WHAT IS THE RELATIONSHIP BETWEEN ARCHITECTURE AND INDUSTRIAL INNOVATION?

Understanding the context is the first investigation of architecture. The context is both physical, intellectual and sensual.
The architectural process and architecture itself is synthesis, not separation - the synthesis of ideas, of people, of materials and ultimately a sense of man's union with nature.

Creativity and innovation in architecture works through the investigation of memory and the way buildings can be constructed. These investigations take place with both a sense of freedom and discipline.
A blank sheet paralyzes creativity, it is the context (or parts of it) which acts as the conceptual trigger to creative freedom. The context also imparts the discipline through the architects' response to it.

I mentioned earlier, windows and light. Another way of looking at architecture is how many towns and cities have always conveyed a sense of gravitas through their urban architecture.
Gravitas in architecture reveals a sense of belonging to the earth, of connection and of foundation. Gravitas recognises the idea of captivity, of being attached to the earth.
Levitas is about being above the earth. Levitas recognises the idea of freedom. Levitas suggests an inclination towards lightness, but lightness is fundamentally about the essential. Lightness is an exercise in reductivism - of the problem, of the concept, of the design, of the structure, of the materials. The International Style reflected this.
Superfluousness is an anathema to lightness.
Lightness tends towards minimilism, not necessarily transparency.
Lightness symbolically suggests a victory over gravitas, even gravity.
This search for architectural levitas has been the force behind much of the construction industry's innovations.
Levitas should not be confused with transparency. Transparency is about feeling, of openness, or of emptiness.
In individual buildings, the tension between gravitas and levitas is not equal, but can symbolize the degree of connectedness of the one to the other. This tension has also been at the heart of technological innovation in building.

We have witnessed how technical innovation has transformed the load bearing into framed systems - first timber, then iron and steel, then reinforced concrete.
Auguste Perret, dedicated much of his life designing with this new material at the beginning of the twentieth century, and managed to release the plan from load-bearing walls with his design for the Rue Franklin apartment block. Meanwhile, the British (Bessemer) and Germans (Siemens - Martin) led the way in the development of steel making.
Steel marked a quantum leap over the use of iron reinforcement. It not only gave engineers the opportunity to develop long spans, but was the essential element along with Portland cement which enabled reinforced concrete to dominate construction during the twentieth century.
It is possibly true to say that, at the turn of the last century, many architects began to believe that their conceptual thoughts were now informed by new techniques and new materials. Auguste Perret, Frank Lloyd Wright (Unity Temple Chicago - 1903), Le Corbusier (who had worked for Perret), Gropius and the Deutscher Werkbund, and others of the modern movement are obvious examples.
The improvements in materials have been based upon one single objective - to be able to better predict their performance, thereby improving performance and reducing costs.
Timber, steel and concrete are still the predominant frame materials of structures today.

With the frame came the significance and innovation of infills. During the twentieth century, and in particular during the past two decades, glass has become the favourite infill material, replacing the “punched holes” in masonry.
Glass in architectural facades can be used to embody and convey our present ideas about our union with nature, our attitudes towards society, our notions of both gravitas and levitas, and transparency. However, I am not suggesting that all architects see glass in this way.
There are so many factors which have to be taken into account in designing facades, but probably the most significant is the balance between architectural aesthetics and environmental engineering. The former can predetermine whether an environmental solution can be intelligently engineered or simply the best compromise that can be achieved by engineers and industry within the aesthetic limits defined by architects.

During my entire professional career, I have been very aware of the need for new methodologies to achieve a better synergy between aesthetics and engineering, particularly as all of our activities have become increasingly more complex and accountable.

WHO INSTIGATES THIS INNOVATION WHICH THEN LEADS TO NEW FORMS AND SPACES?

It is rarely an architect. Architects are generally too far removed from industry, and as such the latter simply does not have sufficient confidence in architects. Architects are rarely industrialists. In fact, since the creation of professional apartheid of architects and civil/structural engineers in many countries during the 19th century, architects have ceased to be at the forefront of constructional innovation. Innovation has been largely led by industrial entrepreneurs with an engineering background, such as Eiffel, and engineers, such as Freysinnet (pre-stressed concrete). Even some of the more spectacular spatial explorations and innovations can be seen to have come from engineers who also practised as “architects” - Owen Williams, Candela, Nervi, Otto, and Calatrava today.
For architects to have an influence on constructional developments, their ability to collaborate is a precondition. The fact that today, architects, engineers and the construction industry are utilising the same or compatible computer programmes, suggests that this collaboration could be easier than it has been.
In 1994, when I read about nano-composite research work being undertaken on "ormocers" (organically modified ceramics) in Saarbrücken, I wondered if it could be possible to dope glass at the molecular level to overcome the inherent inability of glass to resist crack propogation, while retaining the optical properties and essential surface qualities which we associate with glass. This seemed to me a far more interesting line of research than one based upon further exploration of laminating transparent plastics with toughened glass.
To develop such a new material would inevitable require research either directly with industry, or at a research institution, or collaboratively between both. In 1983, I had been successful in bringing together three industries, (two French & one Belgian) to produce a 50% light transmitting permanent structural fabric; and again, in 1986, bringing together academia with industry to successfully realise a dream of controlling the 3-D form of visible light.
Exploratory discussions with different glass industries about a new glass material, and the need to develop it, have so far yielded nothing. Yet one is sure that this industry should be interested, and maybe some are secretly researching it as I talk. As an architect it is too often the case that one's credentials and ideas are not those that industry will accept. The alternative is academia, and the specialist research institutes. Here, there are several involved in new materials, but collaborating with them is constrained either by budgets and existing programme commitments, or by secrecy - a quite reasonable precondition of the research contract when they are being financed by a particular industry.

Convincing people to finance new products or industrial ideas, is a very difficult one to crack for an architect - but it can happen.

WHAT ARE THE CHARACTERISTIC CONDITIONS FOR INDUSTRIAL INNOVATION?

One presumes that the most significant agents of change are the individuals on the boards of the industrial companies. It is they who confirm R&D policy, not just in product research, but also with regard to the education and development of those people who work within the company, and those who supply the company with products and services.
I would also suggest that an innovation culture exists within the company, and that it does not reside solely in the boardroom.
However, in my experience of the construction industry, there are not too many companies that have this culture.

Innovation requires confidence, skill, judgement, understanding, and notably foresight - a sort of early warning system for the next 10 to 20 years.
A company structure that incorporates foresight thinking as an integral and shared part of its operations builds in the recognition and potential to innovate, and to survive.
The most difficult commodity to introduce into companies is the recognition of the importance of thinking ahead. This means making available both time and money to think ahead. Everyone everywhere seems to be fully occupied with the pragmatic issues of the present.
The most difficult attitude to get rid of within companies is the belief that holding onto information is to the benefit of the company. It is a notion which should be consigned to history. Sharing information is not dangerous nor detrimental to companies. Sharing information is essential if we are to help create a better world. It is what we do with the information that will differentiate companies more and more. It will reveal those companies which are better able to manage change, to innovate and to be successful.

Innovation is not only evidenced through products, but also in the way information is applied throughout the process. Innovation is a characteristic behind the reality of adding more value to a client's business. Business maxims at the end of the 20th century include:-
"we must add value"; "we must reduce costs"; "we must accelerate the rate of environmental improvement".
I will not attempt to identify differences between incremental or quantum leap innovations. In architecture and construction, few companies will pioneer, because it is often felt that the financial risks are too high, or the source of the financing of the development dictates that the risk shall not be taken. The principle that it is better to be second to apply a new concept, or even to be the hundredth, is the one adopted by most people in architecture and construction.

Architecture is like a tree in its ability to record technological change and innovation.
Technologies do get supplanted: timber - cast iron - steel - reinforced concrete - ceramics - fibre structures - polymers, etc.
Architecture - or rather the construction of buildings - has nearly always been produced from man- handleable components. However, for more than a hundred years, new construction components have got bigger and bigger to such an extent that the "hand" has lost its primary role to the machine, and the machine in due course may well lose its role to the robot.
Also the component - whether it is the humble brick or the most sophisticated 3D woven titanium wire is becoming more and more standardised.
In the future, the art of architectural composition will probably be measured by the designer's ability to innovate using standardised components or standardised processes.
We have examples from history of anonymous and standardised prefabrication, but little on be-spoke solutions from standardised processes.

I would like to quote from my erstwhile partner, Peter Rice, an engineer.
"To build quickly we must standardise. We must use industrial techniques. Components become industrial elements which are used and re-used to create giant facades. Similar buildings multiply over the landscape and the building components dominate the architecture and the growth and power of technology is given the blame. To counteract this architects and designers have returned to the forms and images of old. But to do this is to miss the point and the problem. What is needed is something which returns the human scale and human involvement to buildings. It is the feeling that people are unimportant when compared to the industrial processes which is so damaging. The Victorians succeeded where we do not. "

Innovation is recognisable as individuality, and the means available to us through computers to be innovative have never been stronger. It is a question of attitude. One can use computers creatively to design, to analyse, to fabricate. If we do not innovate, we stagnate.

CONCLUSION

I know that the only way forward to develop better physical translations of our design ideas is to work closely with industry at all stages of manufacture, and to understand the fundamental nature of the material.
It seems to me that most architects are not interested in the fundamental process by which this can be achieved. Architects are concerned primarily with what products are available on the market (and accept the manufacturer's data about their performance), how much they cost per square metre, and how best they can serve their aesthetic demands. A profound understanding of their environmental performance, including safety, is often far too difficult.

I am concerned about how, as architects and engineers, we can contribute positively to the future, and in the context of materials, this leads inexorably to thinking about new products and how to obtain a higher technical and environmental performance from these materials. I am also aware that they can trigger new aesthetic possibilities and how they will then produce a new synthesis of technical and visual performance.

We are <u>not</u> at the dawn of another renaissance, but in the stream of a continuous technical evolution where we have the opportunity through the intelligent synthesis of art, nature and technology to make decoration performance and performance decoration; and where dynamic behaviour is understood as a fundamental characteristic of materials and constructions.

If only buildings could embody the intelligence of a tree!
They capture light, make energy, grow by processing $CO_2$ and water, support and are a home to other life forms; they do not appear to waste heat or energy, nor waste anything else for that matter; they are natural pollutant processors, they provide shade and they look great; they change colour and their leaves - alive and dead - make pleasant sounds in the wind. If there are appropriate architectural forms, they are to be found in nature.
But, as I mentioned earlier with regard to glass, we need to understand their composition and physical processes at the molecular level, not simply appropriate their forms for visual delight.
As history has shown us, it is through our imagination, unhindered but informed, that we will improve architecture.
It is also through cooperation and collaboration that we can become better informed, and our imaginations better nurtured.
I do believe that innovation, which has lasting value, can, nevertheless, come from the dreams of architects.

The only certainty in the future are surprises, some of which will be very surprising surprises. To speculate upon what they will be is at best a game, at worst they can bring economic and social disaster. The only certainty about certainty is its uncertainty.

We can set objectives, we can experiment and we can hope to create better solutions. But solutions for what future? If the idea of progress is still synonymous with the future, the present meaning of progress requires understanding.

The modernistic notion of progress was based on optimism, yet, now evident all around us are the social and environmental consequences of it. Individuals have become more passive and more powerless vis-a-vis the overwhelming presence of society, as that society seeks ever increasing apparent power over nature. Yet, as we watch competition globalize, the tempo of technological innovation, originating from man's desire to master nature, can no longer be controlled even by the most advanced societies, but is accelerating through the interplay of worldwide forces with little control or overall purpose. Everyone and every country is affected.
In advanced industrialised countries, the continuation of technological progress for economic power, the continued amassing of worldly goods is neither a valid national purpose nor one which will provide personal satisfaction. National spirit or achievement can no longer be measured by GNP. In this century, the idea of modernity attempted to distribute the wealth within industrialised societies resulting from economic growth. Only the type of government differed from society to society, but in each there was a notion of a better future for man. Without an idea of a future, political activity would have no defined direction or aim. This idea of future gives the modern age a characteristic which is essentially optimistic.
The modernistic notion of progress is no longer satisfactory or appropriate.
Why is progress considered so important?
Is the idea of progress "more gain than loss"? What happens when there is "more loss than gain" - environmental distress, poverty, unemployment?
Is it because individuals can measure their own idea of it - achievement, success; because companies within which the individual works can also measure it - growth +profit; and because nations can measure it - GNP and low unemployment?
Is progress a measure of the quality of life, or rather a quality of life compared to that in another society or country?
Does our society limit the measure of progress to scientific knowledge, technological and economic achievements?

What happened to man's moral and ethical development as a measure of progress?

In our society, we have seen workers become consumers, and it is this paradigm, manifested through the power of the image, which has led to much myth-making in architecture.
Sustainability may be relatively new to us, but it has been and still is a way of life for most societies.
A new (human) economic order is required where there is more ecological or holistic eco-nomic exchange as a basis for man's collective well-being and survival.

Because architecture is rooted in material, and light its primary one, the legitimate response of many architects is to focus their attentions on the nature of its performance - more with less - lighter, light interactive, intelligently responsive, healthier, recyclable etc. By aiming to use materials which use less energy at all stages in their evolution towards an element of architecture and aiming to obtain higher performances in terms of energy efficiency, architects are expressing a desire to seek better data about material sourcing, processing, manufacture and their behaviour in use. As this information becomes clearer and more easily available, and architects begin to use it more intelligently, architecture will evolve positively.

Our architectural thoughts are inescapably concerned with the past, present and future. In the act of designing we acknowledge what we have already learned and experienced, and we have to consider what could be the consequences of our designs in the future.
This last consideration implies that we speculate, yet we cannot predict. If we do not speculate then we are accepting the accepted. Through speculation we can find innovation. As designers we speculate on the social and material aspects of shelter. We also recognise that the materiality of architecture is inextricably linked to social behaviour and use of the building. Searching for appropriate solutions to particular situations drives innovation, not innovation for its own sake.

Material research informs us of present and past performance, whether this or that material was successfully and appropriately used on land or water, in air or space.
History shows us how new structures and architectures developed from new materials and techniques; so too will the materials of our immediate future release us more and more from the bondage of static buildings. Information processing gives architects a renewed chance to reveal humanity, and human scale in the material products of the building industry.

The process of architecture is fundamentally concerned with providing society with better technical, environmental and aesthetic solutions for different types of shelter for different human activities. As we approach the next century, a new optimism must be based upon working better with people and the environment, by not attempting to dominate them, but acting with them, with local sensitivity and global awareness.
In this, architecture has a significant role to play as a mediator between culture and commerce; and perhaps can give some signposts as to how we may make progress in rebalancing our present "civilised disequilibrium", where ideology or technology or social organisation are clearly out of sync with each other.
Architects, together with all those involved in the creation of our built environment, can and perhaps should try to make evident the fact that design and environmental concerns are the same issue in a more holistic design methodology for the 21st century. While striving for appropriate and beautiful architecture, we must also act with compassion and with a social conscience.

**"Progress is nothing but the victory of laughter over dogma"**
[Benjamin De Casseres)