The National College of Art and Design

Faculty of Design

Industrial Design Department

ENLIGHTENMENT

The poetic intervention of light in architecture with reference to the works of Heikkinen Komonen Oy

By

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INTRODUCTION

All visual perception of what we encounter in our lifetimes depends ultimately, on light. When sources of light change, our surroundings appear to change with them. Be the light source natural or artificial, both can change during the course of a day and therefore changing the visual appearance of each and every object which the light touches. The artificial light, however, that most of us experience from day to day provides us with a dull, uninspiring and sometimes frustrating environment in which to live. On the other hand, natural light, natures greatest gift, provides us with a mostly pleasant, wonderful, unpredictable aesthetic world which is a necessary source of energy in everyone's life.

Daylight is the strongest and most influential force in nature, continuously changing every minute of the day. Light filtering into a room through a window is changing the interior from a treasure trove of colours in the morning, to a plain white light of midday, to a

beautiful warm glow of an afternoon, to a monochrome gloom of twilight. A room can seem like many different places all in the short space of time that it takes the sun to complete its daily routine.

Due to this enormous aesthetic power it would be shameful of any architect to design a building which has access to daylight without using this light to its fullest capabilities in providing a space which harnesses this energy to create an inspirational, living interior for as long as the sun graces sky. Light must be considered as much a building material as bricks and mortar. The whole visual interaction between a building and its occupants depends completely on light and because artificial light is so limiting in its aesthetic quality then the use of daylight, must, be capitalised upon.

It has been scientifically proven that daylight affects us both physically and mentally and in both cases the more daylight we come in contact with then the more positive these effects are. These are the reasons why standards and codes for lighting design have been drawn up and as to why laws exist stating that everyone has the right to light.

There is no better case to study daylight's aesthetic and psychological effects than the country of Finland and its people. In a country of such climatic extremes, the nature of the Finns is not surprising. A very

introvert race always deep in thought, with a sincere appreciation of architecture and industrial design. The Finns are a race who feel very close to nature and obviously light entering a building from outside is to them, like nature flooding to keep an eye on their construction. Finnish architecture and designs take so much from nature, yet seems to give so much back in respect and appreciation.

When discussing Finnish architecture, it is impossible not to mention Alvar Aalto. In beginning a study on the use of natural light in architecture, it is useful to use Aalto as a platform on which to start. He demonstrates the inseparability of the vocabulary of architecture and illumination in many of his buildings and is therefore topical in any discussion on natural light in architecture.

Mikko Heikkinen and partner Markku Komonen have also designed buildings with an obvious high regard and reverence for nature and daylight. They have designed for different climates and landscapes, yet always using light as a definite design feature - using it to reflect and complement these climates and landscapes. These architects have integrated "international ideas within the country's climatic, aesthetic and economic limitations." (Building Design, 1990, p.25)

Obviously the use of light as an architectural form has changed considerably with the continuing changes in materials technology and building construction. There are many examples of design from the past with the highest regard for light within structure, such as Stonehenge and NewGrange. However, today, Heikkinen and Komonen have taken the use of light to an entirely new level of awareness using new technologies and yet still retaining respect for ecology - another aspect concerning the use of light as energy conservation in recent years which has given huge reason to capitalise on natural light sources as much as possible.

CHAPTERONE Light and Nature

The importance of natural light and its source, the sun, has been recognised from the earliest of times. Many ancient peoples worshipped the sun as a God. They included the Egyptians, the Sumerians, the Greeks and the Aztecs. Even though these peoples had no scientific means of testing the energy which the sun emitted, they knew it was the source of everything they saw alive before them.

In the fields of architecture and building construction no one has shown more regard and respect for sunlight than these ancient races. Maybe their structures concentrated more on the movement of the sun than ensuring that workers got their fair share of daylight but these structures are the most astronomically and mathematically accurate designs since the beginning of time. They were used to study the sun's motion from north to south and back again as seasons changed. One such structure is Stonehenge in England, which was probably used to keep track of the motions of the sun and the moon. This stone structure in Wiltshire dates back to 1848 BC. Astrophysicists believe that it may have served as an astronomical calendar. A stone marker 80 yards from a central altar casts a shadow on the altar on the Summer

Solstice June 21. In 1963 Gerald S. Hawkin of the Smithsonian Astrophysical Observatory calculated the direction of various lines joining the stones. He found a remarkable correlation between the directions of these lines and the directions of the rising and setting of the sun and moon around 1500 BC. The chance of such correlation's being coincidental is about one in 100 million.(World Book Encyclopaedia) ref.

Plate 1. Stonehenge

NewGrange in Co. Meath, Ireland, dates back earlier still to 2485 BC.. This structure, an ancient burial ground, also demonstrates the high knowledge these societies had of the sun's movement throughout the year. On the Winter Solstice, December 21, the shortest day of the year, NewGrange demonstrates a wondrous, use of sunlight in a man

made structure. At dawn, the sun shines in through a small box above the entrance. The light travels down a narrow passageway until the centre chamber explodes in a burst of illumination. Then as the sun moves on the light makes its way slowly back down the passageway and leaves the tomb in darkness once more. The whole process lasts approximately 17 minutes from start to finish. (World Book Encyclopaedia)

Plate 2. NewGrange

Today, however, the importance of daylight and sunlight in architecture is far from being as obvious. Of course there are more practicalities involved, such as the endless hours of academic slog, and we also tend to spend much more time inside structures now than any of these ancient peoples did. The invention of electricity has also been a thorn in the side of daylight's occupancy of buildings as artificial

lighting becomes the easy solution to the complex problem of illumination. If Thomas Edison had had more an appreciation of natural light there would be more recent marvellous examples of structure and light integrating to produce great architecture.

Laws do exist on the matter, regarding the obstruction of light into buildings - the Rights of Light Act 1959, but "disputes about Rights of Light are not of frequent occurrence and their appearance in the Courts is even less frequent." (Cantwell, 1995, p.2) Cantwell's paper is the only one on this topic to be compiled and there is no mention of this Act in the curricula of any Irish architectural colleges (Cantwell). Maybe if these laws were better enforced, and more awareness made of them, the concept of natural light would change in some peoples' minds from being one which acknowledges light as being an unreliable nuisance, to one which realises the invaluable and unique characteristics of natural light as being an integral building material.

CHAPTERTWO Light as a Building Material

When all buildings were designed around a single fixed light source - the sun, the difference between great architecture and mere building could be measured to a large degree in the skill in which the source was used. The shapes and sizes of rooms and the materials and details in them were determined largely by the appearance the room would take on when rendered by daylight. Light was not always simply applied to structural innovations; more often, the structures themselves were developed to make possible desired lighting and spatial effects. It can therefore be said that in cases such as this light was considered to be an integral building material.

Light is what creates visual space. Bricks and mortar create walls, ceilings and floors. They create boxes and envelopes, with the inside of these boundaries being created by light. Given the fact that architecture is qualified by space within, by space that can be lived in a dynamic way, and without light this space did not exist, then without light the structure would become nothing more than a series of boundaries.

The ways in which light creates this space are numerous and rely on the creativity and imagination of the architect. The visual character of the space created is primarily dependant upon the means by which daylight is brought into a building and the way in which the interplay of light and shade is used to reveal the form and surface of the structure and the space within. The proportions of direct and indirect light will bring obvious different effects upon the character of a structure and space. A high proportion of direct light will give strong modelling and a heavy dramatic character. On the other hand, a room with a high proportion of indirect light will have lower contrasts and a softer, more restful character. Direct light will create deep, sharp-edged shadows giving an emphatic sense of form. Here the interplay between light and structure is at its most striking. The structure will take on a very three-dimensional form and will seem to protrude from itself into the space it defines. Indirect light, light reflected from the interior itself, will create less contrasting shadows, therefore giving a more two-dimensional appearance to objects contained therein and the structure itself. In this case, the space will seem to be holding its own in the battle for dominance, keeping the structure just a boundary line where the space begins and begins.

Light also plays a part in the physical structure of a building. If we consider windows to be a construction feature, then in the internal context of the building the windows are the primary, if not the only source of natural light. Windows have the dual function of not only admitting light, but also enabling us to see outside, and to maintain a vital visual contact with the world outside during the working day. The window is a "visual rest centre, an amenity which provides a link with the outside world and the different facets of the passing day." (Hopkinson, 1970, p.71)

Perhaps the best example of light being used as a building material can be found in churches, especially in churches built at the height of the Gothic movement, e.g. Chartes and Notre Dame cathedrals in France. These cathedrals are immense monuments of stone, steel and light. The light, however, in these buildings is quite different from most other structures which use natural light as their main source of illumination. The aspect of Theology with the use of natural light to reflect Heavenly powers and Divine influence is one of the reasons.

The other reason is, of course, the innovative structural techniques used in building these cathedrals. The introduction of the Flying Buttress must be one of the most influential developments in architecture's long history. These leg-like supports took the weight of

the roof away from the walls and therefore allowed for much larger window openings and this also brought about the introduction of barrel vaulting, which allowed for the high roofs which soar toward the Heavens.

Due to the immensity of the space in the cathedrals, light fell "towards space, informal and fluent cavities" (Lam, 1977, p.11) rather than lighting up entire walls. This gave rise to the brightness of the windows being in stark contrast to the dim interiors. This fact, combined with the enormity of the windows led to the window becoming a medium of communication. Stained glass was developed and windows became not only sources of illumination, but also sources of decoration and communication - depicting Biblical scenes so that both the literate and illiterate could learn.

> This conception of structure as a fluent concentration of essentials leaving large voids for illumination could never have been realised without the existence of glass. The Gothic cathedral presents the first unqualified use of glass as a building material and in many ways as daring a use of it as any attempted. (McGrath p.173)

Combining this with the way light seems to float in the space rather than penetrating it, the Gothic cathedrals demonstrate a highly competent use of light as an integral material, not dominating the structure but bringing the awesome architectural forms out of the darkness and into the overall space.

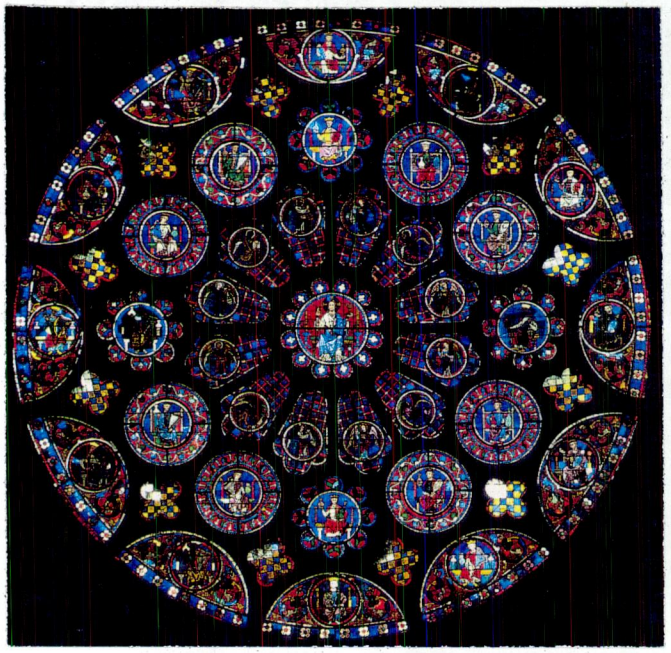


Plate 3. Rose Window - Chartes

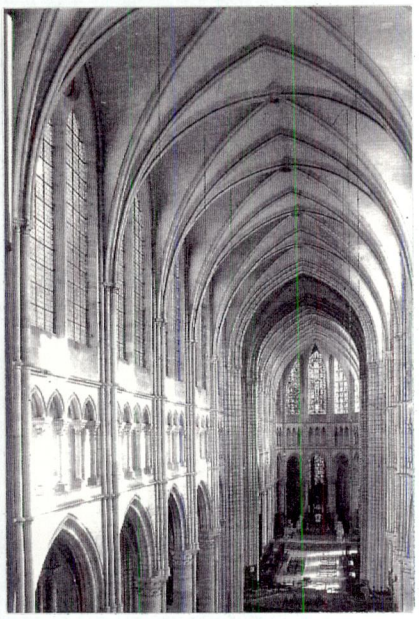


Plate 4. Interior - Soissons cathedral, France

CHAPTERTHREE

Finland's Magical Light

Plate 5. Frozen Lake outside Helsinki

The scarcer a resource the more fiercely it is coveted. It is no surprise then, that the Finns, whose territory extends into the Arctic circle, worship the sun. What is remarkable, however, is the sophisticated way in which Finnish architects have been able to manipulate the intense, but often rare, northern sunlight, bringing it into the heart of buildings with great such subtlety and variety. This has been a characteristic of Finnish architecture since Alvar Aalto's work of the 1930's.

Finland, like all countries at such a high latitude, has a natural winter light which is weak in quantity but exceptionally strong in aesthetics. In the winter, the sun does not appear in northern Finland for two months, yet the sky is full of wonderful alternatives which are invisible while the sun is risen. The Aurora Borealis is a mysterious phenomenon which lights up the sky in an ever-changing wavelike form. The sky is always full of stars, and also the moon, which reflect off the almost permanent blanket of snow which is being continuously changed by the wind and by man, creating an inspiring, dynamic landscape. In the south of the country, the sun always makes an appearance, even if just for a few hours. Again there is great reflection from the snow and frozen lakes, changing what can sometimes be a

dull, grey landscape into one which is beautifully breathtaking and full of colour.

The Finnish summer is green and warm with the country's huge population of trees contrasting beautifully with the intense blue of the sky, reflected in the thousands of lakes. Colour is the key-word when mentioning the Finnish autumn. The vastly vegetated landscape becomes ablaze with the rich colours of the leaves. The sun hangs low in the sky in the afternoons and evening casting long shadows and creating beautiful, golden sunsets.

The winter, however, is without doubt, the season which has most influence on the Finnish way of life and has produced through years of evolution the Finnish design identity, which emanates tradition and simplicity. With its bare trees and flat white landscape, the Finnish winter "simplifies your sense of form". (Horhammer, 1989, p.5)

Living with this winter, year in year out, the Finns have learned to be very self-sufficient, using only what surrounds them in the bleak countryside. The Finns have become experts in using natural materials in both design and constructional areas. This shows through today where such tradition lives on. The best example of this is the way the Finns have learned to use their greatest natural resource - the tree. Its wood has kept them warm by burning, it has sheltered them from the

wind and snow, has been used as an essential construction material and has made them pioneers in the technology of paper production. One Finn, when talking of trees and their importance to the Finnish way of life has said :

> "As protection from the changing weather and as a mediator on behalf of nature, the tree teaches us the wisdom of an ecological way of life".
> (Horhammer, 1989, p.48)

It is for roughly the same reasons that the Finns are so appreciative and conscious of their sparse, yet highly aesthetic sunlight. The endless hours of darkness they must endure has created this awareness within them. The Finns became experts in using the materials they found around them, there is no exception with light. Finnish architects have learned to use natural light like no other nationality of architect, as an essential building material, integrated wholly with the rest of the structure.

Their use of natural light in architecture reflects the age - old tradition of the Finns being a race very close to nature. Finns seem to appreciate private, enclosed spaces, like their sauna, but "they also demand an architecture that opens up to its surroundings."

(Architectural Record, 2/93, p. 41)

Houses and cottages in the Finnish countryside often have entire walls made from glass which break down the separation between indoors and out. Due to the Finns' experience of keeping warm, they can have these huge glass walls and still keep their buildings tropical, sometimes using triple-glazing windows to provide superb insulation. So the occupants get their warmth, their protection from the climate, plus they can take full advantage of any daylight, should it happen to appear, and they can still bring extreme arctic landscapes to within inches of their armchairs.

What makes Finnish architecture so special today is the ability of certain architects to combine this age old tradition of simplicity and closeness to nature with the modern aesthetic of today's architectural style and the use of hi-tech building techniques and materials. Their work with daylight has been inspirational to architects world-wide, who are beginning more and more to realise the importance, both aesthetically and ecologically of daylight integrated as a building material. Heikkinen and Komonens' Finnish embassy in Washington DC received a great deal of attention, not just in Washington but nation-wide.

> 'It's every inch a modern building and yet it's unashamedly metaphorical. It's at once simple and yet complex, closed yet open, serene yet playful, rational yet romantic,' wrote Benjamin Forgey, leading art critic of The Washington Post, on 4 June 1994.

(Form Function, 3/94, p9)

This is a remarkable achievement for the few people designing buildings in such a small nation set on the rim of the world.

CHAPTERFOUR Aalto's Libraries

Alvar Aalto, aside from being the renowned architect and furniture designer, was a man very much in tune with the uses of daylight as a building material. Aalto's use of natural light in his architecture has definite similarities and differences to the work of Heikkinen Komonen Oy. This is to be expected as they both have a sincere regard for the integration of light and structure. The main differences have come about through obvious changes in architectural styles and also through the developments in building technology and a now more heightened awareness of energy conservation.

The most obvious similarity in their work is the extensive use of rooflights as a natural source of illumination in large open spaces. The use of highly reflective surfaces is also a similarity, creating a large amount of indirect illumination, reflecting direct light from windows and rooflights into large spaces.

Aalto's series of libraries is a perfect example of his ingenious use of light. Libraries require large amounts of illumination due to the obvious

nature of the building and natural light is a strong preference for such environments. Natural light stimulates the brain rather than numbing it, as artificial light does.

It is doubtful that Aalto used lighting calculations to verify his designs even though the use of light in his libraries is extremely comprehensive. He did make extensive use of large scale models to visually access daylighting strategies, but given the nature of the models - typically sectional, without provision for extraneous light - it is unlikely they were used for lighting measurements.

Most Aalto libraries possess the same architectural characteristics. In addition to a fan-shaped plan, they employ a sunken study area located in the centre of the main library space. This creates a strong spatial focus. It also allows stacks to be located in the centre without blocking visual control from the circulation desk.

Aalto's library in the Cultural Centre, Wolfsburg, Germany employs such a fan-shaped plan. Aalto uses a series of rooflights and 'scoops' to illuminate the interior. The positioning of the rooflights is a result of the predominately overcast climate. These are orientated east, south-west and north-west with 70° clear glazing. The scoops that Aalto incorporates into many of his rooflights are the curved walls of the well which is created when a rooflight is inserted in a roof (resulting from

the thickness of the roof). Plate 6. Penetration of direct light is minimised on clear days by the pronounced curvature of these scoops. Thus the backs of the scoops receive either direct sunlight or diffuse skylight and become secondary sources for illuminating the perimeter stacks. Plate 6. Libraries are buildings where a large amount of daylight is desirable but direct sunlight should be avoided due to the ill-effects of direct ultraviolet radiation and also uncomfortable rises in temperature. Aalto's extensive use of scoops in the libraries eliminates direct sunlight from normal viewing angles and uses reflection from these scoops as a major source of illumination.

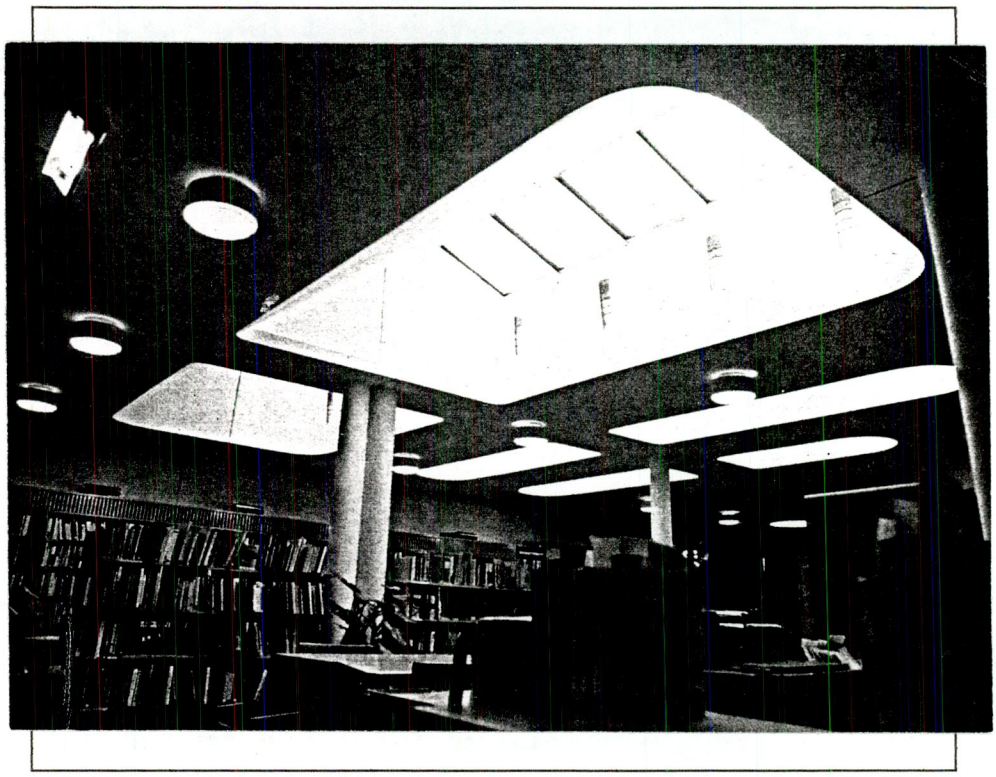


Plate 6. Rooflight and Scoop, Wolfsburg

The public library in Seinajoki, Finland, is a rich source of examples of Aalto's integration of this type of reflector into the form of the building. This library also uses the fan-shaped plan. The primary source of illumination comes from a high window along the curved edge of the fan. Most of the direct sunlight strikes the lower edge of a curved reflective scoop which is positioned along the circumference of the window. Plate 7. The lower portion of this scoop has a high luminance level so becomes the principal source of illumination for the vertical book stacks along this exterior wall beneath the window. The top of the scoop receives light reflected from the lower part of the scoop and from the ground outside. This serves as general illumination for the room. This luminance is important in reducing the brightness contrast around the window. The opposite side of the scoop serves as an eyebrow to screen the circulation desk from most of the low angle glare that would come from a high window. The window on the opposite wall serves as the main source for this desk reflecting light from the sloped roof and light reflected from snow on an adjacent roof. The sunken reading area is illuminated also by both windows, but the sunken location places both of these sources high, keeping them above the reader's field-of-view to reduce glare.

Plate 7. Curved light scoop, Seinajoki

Aalto's largest library is located in Rovaniemi, Finland, the same town as Heikkinen and Komonen's airport. Yet again the fan-shaped plan appears, and this is broken into segments each segment having its own high windows and light scoop. The backs of the light scoops receive diffuse daylight as well as direct low-angle summer sunlight in the morning. Like the Seinajoki library, the bottoms of the scoops here act as eyebrows preventing glare at the centralised circulation desk. This segmented lighting scheme does, unfortunately, create an uneven distribution of illumination, with the greatest amounts occurring at each sunken reading area. It is interesting that, even at this extreme northern latitude, reflective film has been added to reduce summer solar heat

gain in the east and south glazing. The large glazed area in a building so close to the Arctic would be expected to be a heat trap rather than an heat excluder.

The most obvious difference between Aalto's designs and Heikkinen and Komonen's is the difference in regard for energy costs. Aalto's buildings were designed at a time of abundant energy sources and show little regard for problems of excessive heat loss. Aalto's extensive use of diffuse light rather than direct sunlight, in not just his libraries, must not be taken as a modern-day example of good use of natural lighting in a structure. It would be more beneficial to take Heikkinen and Komonen's examples of using sunlight rather than just skylight which demonstrates a more practical yet creative use of natural light. This is significant progress in the use of light as a building material and will continue to be an emphatic factor, as the world's energy supplies will not get any bigger. This is particularly important in northern extremities, such as Finland, no matter how well the technology allows for insulation.

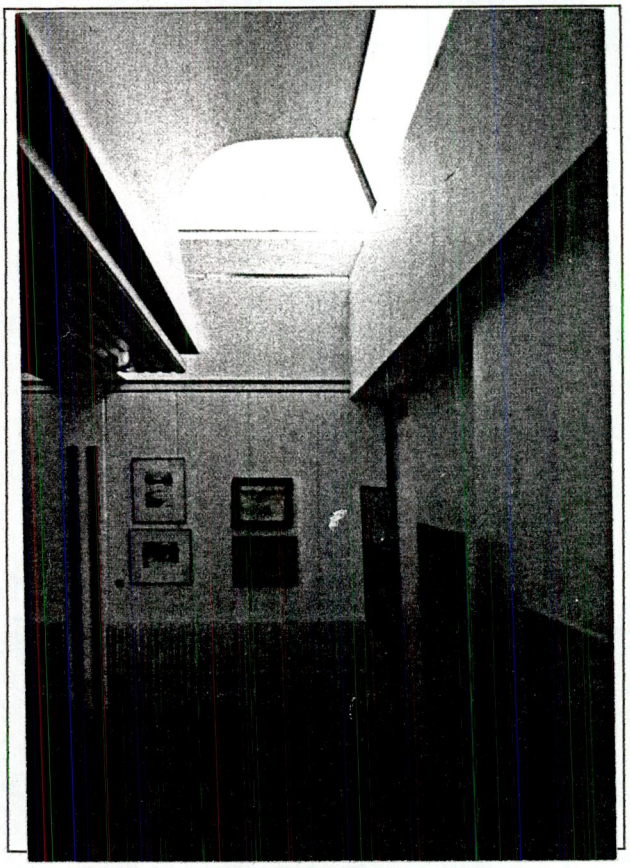


Plate 8. Light scoop, Rovaniemi

CHAPTERFIVE

Heikkinen Komonen Oy

Plate 9. Rovaniemi Airport

Mikko Heikkinen and Markku Komonen, partners in the architectural firm of Heikkinen Komonen Oy, Helsinki, began their studies at the Helsinki Institute of Technology in the 60's. After graduating in the mid 1970's and moonlighting together for ten years, they shared the first prize in the design competition for Heureka, the Finnish science centre, just outside Helsinki, and were awarded the commission for it's design in 1986.

Heikkinen and Komonen are two architects whose work characterises 20th Century contemporary Finland. They reflect "a highly sophisticated urban culture, in close contact with climate and nature." (Building Design, 12/90, p. 25) They have also integrated international architectural ideas within their own countries "climatic, aesthetic and economic limitations." (Building Design, 12/90, p.25) The two architects have always demonstrated a knowledge and high regard for daylight and combined this with intelligent, creative architectural awareness, modern technology and modern building techniques.

One of the reasons the architects are so aware of what is going on internationally is probably due to the fact that Komonen was once editor of Finland's leading architectural magazine, Arkkitehti, which gave him the opportunity to come into contact with much wider

European ideas than other young architectural firms in the same country. Finland has only gained membership of the E.U. in the last few months, before which, the country had had most of its dealings with Russia and other Scandinavian countries.

Heureka science centre

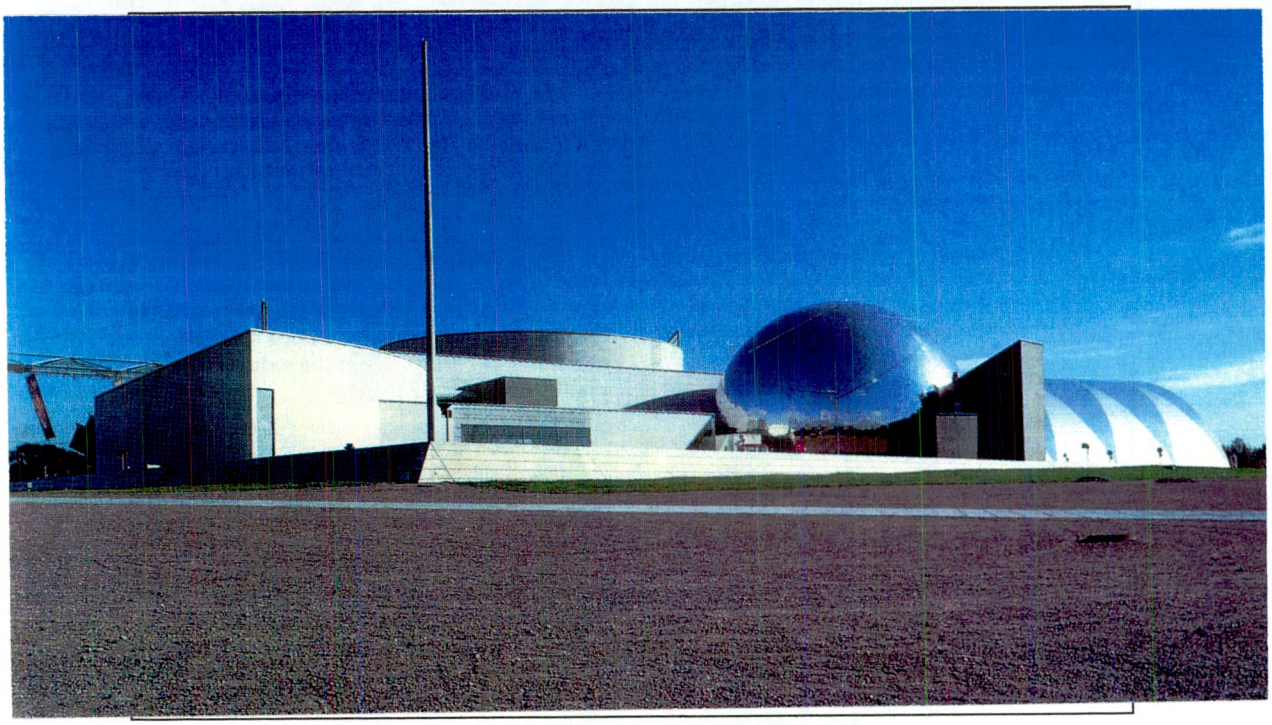


Plate 10. Heureka Science Centre

Finland's science centre, completed in 1989, is one of a new generation of museums giving a new look at science and offering a more interactive, fun attitude to science in the eyes of the public.

It situated in a north-east suburb of Helsinki, an area typical of Scandinavia Suburbia, dreary, industrial, neither countryside or residential. The centre is situated at the edge of this suburb, in an area reflecting "technology and wild nature" (Architectural Review, 3/90, p.33) being flanked either side by a rushing railway line and the winding Keravanjoki river. What the area needed was "presence and a sense of place" (Architectural Review, 3/90, p.33). The science centre certainly provides this.

Typical of the architects' now well-established style, the basis of the centre is a large rectangular box, with a central concrete drum. This drum is the focal point of the exhibition hall. Also in accordance with the architects' style, light provides a focal point in this main area. The drum is lit by a rooflight that runs round part of its circumference. Heikkinen and Komonen seem to have a fetish for rooflighting, like Aalto, as it appears in several of their buildings. This is the most obvious feature in the centre to manifest the architects' awareness of natural light.

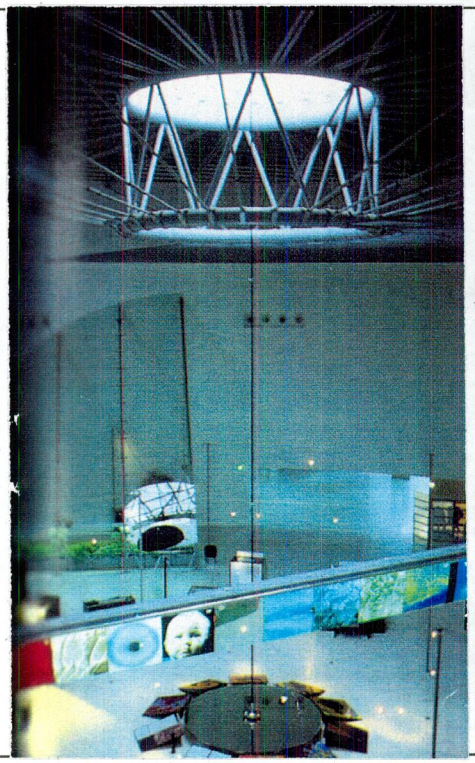


Plate 11. Central Exhibition Hall, Heureka

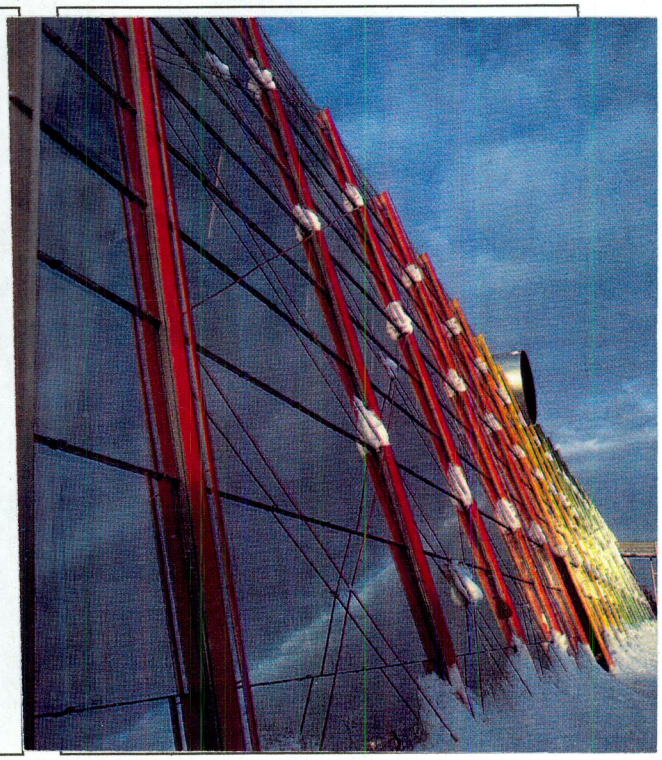


Plate 12. The spectrum wall

Another feature typical of their work is the layered effect they create in their buildings. They create a great sense of space, a feeling of rooms and areas flowing into one another, rather than full solid boundaries separating them. The viewing slit which runs some of the length of a ramp which rises round the circumference of this cylindrical exhibition

hall provides a great sense of movement. You can always see where you have been and where you are about to be. This also allows daylight from the rooflight to access other areas, a very important factor in the architects' work: making the most of all sources of natural light. A unique element in the centre is the huge outer wall of glass which forms an inclined plane from ground to roof all along the railway side. This glass wall is painted in 31 different, calculated colours which represent the spectrum. Particularly when seen obliquely, this simple device is very dynamic, like a rainbow of colour which comes from sunlight flooding through a block of glass.

Plate 13. Ramp and viewing slit curving up outside central exhibition hall

The project does have its faults, though not entirely the architects' doing. Due to a tight budget, several features of the original plans were never completed, the most interesting being the idea to surround the entire centre with a square of blue laser. The 30 metre masts to support the lasers are in place so maybe someday..... Also, the inside of the cylindrical exhibition hall unfortunately becomes dark as it spreads out from its centre. These areas would be dull and gloomy if it were not for the wonderful scientific gadgets which are spread around or the interesting architectural features such as the viewing slit.

Overall, the building is a success, and as with the National Air and Space Museum in Washington DC it leaves behind stuffy old museums like The Louvre, Paris, which has had to turn to a brash new building to attract punters.

The project was a good starting point for Heikkinen Komonen Oy bringing a whole new populist approach to science. Many of the features which have become hallmarks of the firm's work have their origins here.

Rescue Operation Centre, Kuopio

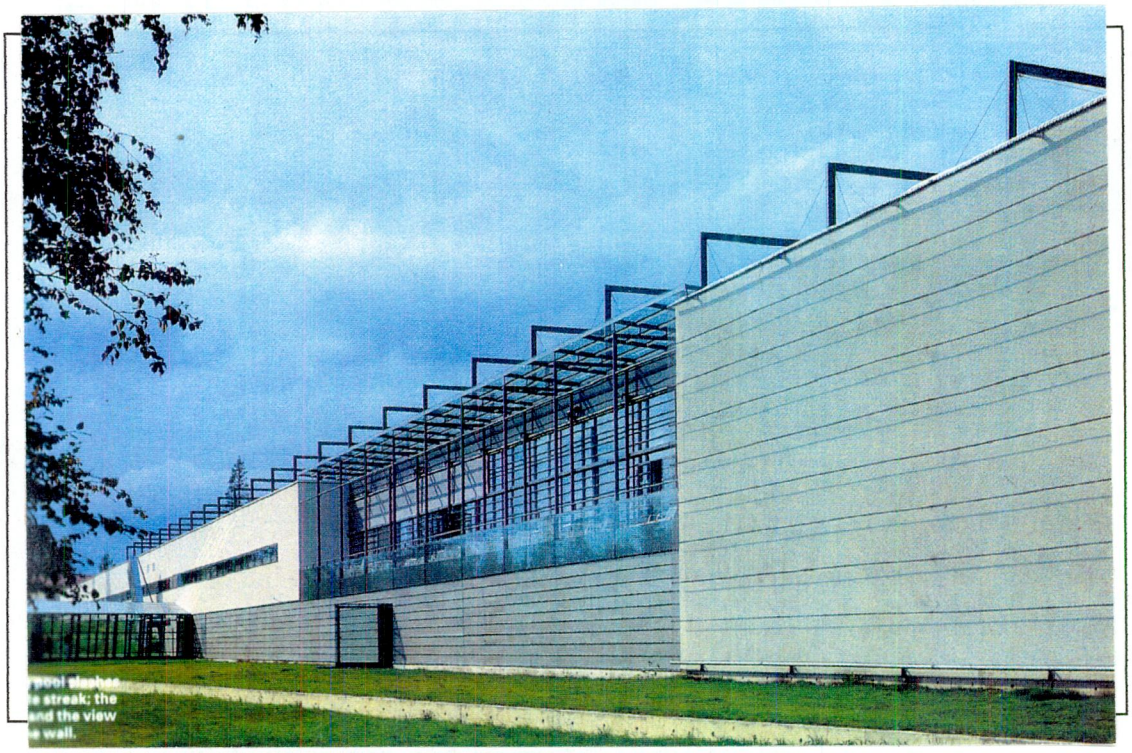


Plate 14. Rescue Operations Centre, Kuopio

The rescue operations centre, near Kuopio in eastern Finland, is a virtual prototype in northern Europe. Its central purpose is training fire-fighters, paramedics, rescue divers and other emergency operations personnel for employment in communities throughout Finland.

Because of the prototypical nature of the institution Heikkinen and Komonen were deeply involved in developing the programme, which is unusual for most architects. The school trains personnel for operating in chaotic conditions so the architects believed that a clear and compact, spatial layout should provide the basis of the deign.

Inspiration for the design came from a very unusual source; not Finnish tradition, not directly nature, but the acknowledged training book of Japanese Samurai in the art of Kendo, dated back to the 17th Century. (Architectural Review, 8/93, p.58) The architects felt that the Eastern philosophies of training for martial arts were a good platform from where to start building. The aesthetic implications of the book's emphasis on grace and movement, rhythm, control and decisiveness resound throughout the design of the centre.

Due to the practical and functional nature of the building, creativity and imagination were purposefully subdued for this project. The use of light

is of a purely functionalist approach, reflecting its formal design. Again, a rooflight is the main source of illumination in the building's central corridor. The shaft of light, whilst not essential, provides a dramatically luminous reinforcement of the building's linearity and serves as a landmarking beacon. The rooflight runs the entire length of the building.

Plate 15. Corridor with rooflight

The library, a room in which large amounts of daylight are desirable, takes full advantage of the rooflight as it is a glass box which angles precariously out over the double-height corridor reflecting and refracting the daylight streaming in. This is a very different approach than any of Aalto's designs for libraries. This is a very direct yet simple solution to the problem of capturing daylight in a closed space.

In this building the overall linear formality of the structure tends to out-weigh the use of light as a building material. The light features, as always, but in a less dominating way. It seems to be an added bonus rather than an integral part of the design.

Rovaniemi Airport

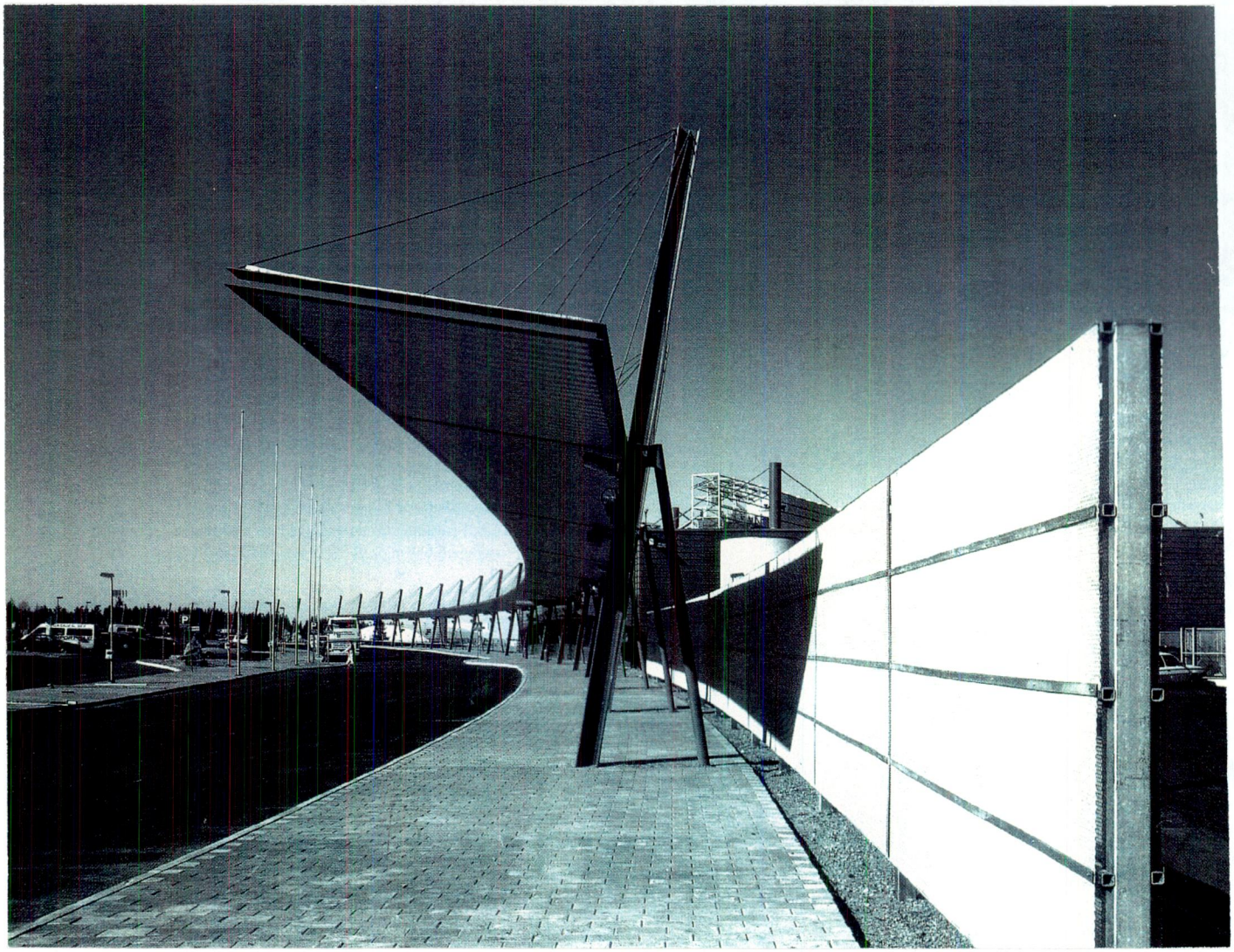


Plate 16. Crescent Canopy, Rovaniemi Airport

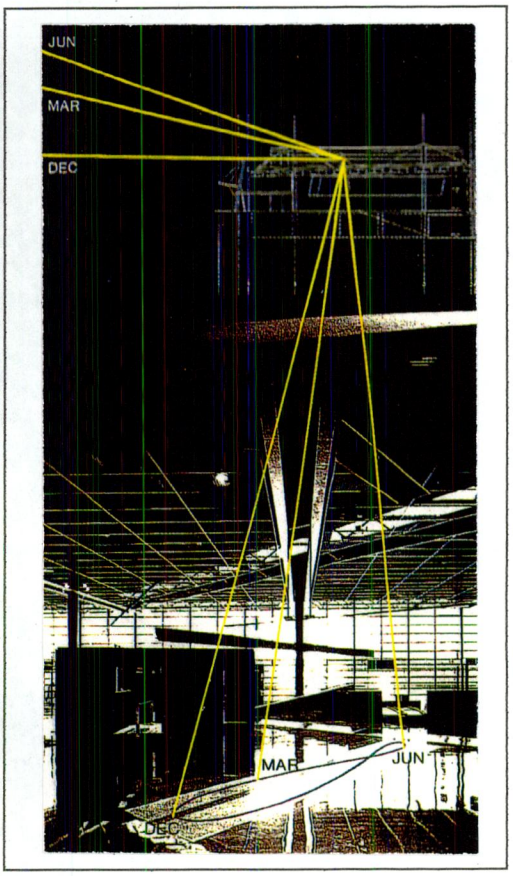
"Heikkinen and Komonen are concerned with creating simple, powerful spaces modulated by poetic interventions of light" (Architectural Review, 9/93, p.67)

This is no more obvious than in one of the most northern airports of the world which Heikkinen Komonen Oy designed in 1992. Unsurprisingly, Rovaniemi's airport on Finland's Arctic Circle has been dubbed 'Santa Claus' airport. What could be more logical than his departure from an airport so close to home?!

Rovaniemi is the capital of the Finnish Arctic, a town that has been almost totally rebuilt since the end of the war when the Germans laid waste the whole of Finnish Lapland as they retreated before the Finns round the top of the Gulf of Bothnia to Norway. In the past decade the town has become quite prosperous, mainly due to tourism and this new airport is expected to have a capacity of 370,000 passengers a year by the end of the century.

This building is one of the finest examples of architecture with regard to location and landscape. The airport's proximity to the Arctic Circle forms much of the basis of its design which again reinforces the architects' awareness of natural light and the sun. The whole building resounds with solar and astronomical influences.

The Arctic Circle is, at the moment, steps away from the airport. In 23,000 years it will have risen to the top of Scandinavia. On the roof of the building there is a long rooflight parallel to the Circle. This strip of rooflight throws light onto the floor marking out the location of the Circle in 9648 BC, 1958, 1962, 1974, 1984, 1990 and the next time it will pass through the area which will be 47957 AD.



Plates 17 & 18. Antilla's Maan Lentorata Installation

It is features like this, which turn a potentially dull and gloomy steel box into an astronomical treasure trove, which reflects all the strange properties of sunlight in the far North.

The architects were again working a very tight budget which left them with very little scope. They designed the simplest of airports giving it a clear sense of arrival and departure - from one side of the building to the other. The airport is almost like a metaphysical gateway, you pass under the roof and already you feel a sense of movement and travel. On entering the airport you immediately see the plane on which you will soon depart. The movement through the building is a natural progression from entry to exit.

A long crescent-shaped canopy runs along the entrance side of the building which welcomely breaks the geometrical shape of the box. Inside, this canopy is echoed in a sweeping curved screen for projected displays suspended from the roof. This screen adds to the great feeling of free flow of space and sense of movement.

The light-magic and cosmic references are complemented by an installation devised by the Finnish artist Lauri Antilla. Antilla worked with the architects before on the Heureka project. "Lauri Antilla was

our 'Leonardo' when working out the Heureka competition entry, giving ideas to integrate science to our project - there he was more like a generator." (Fax 2.1.95) In Rovaniemi, though, they asked him to do his own installation which was later called Maan Lentorata which means 'Orbit of the Earth'. This is a simple device which shows how the Earth orbits the sun. A small aperture in the ceiling admits sunlight for only ten minutes a day, around noon. A spot of light is projected by the sun which changes to a different position everyday. The pattern drawn by these spots in the course of the year forms an elongated figure of eight, called the Analemma of the sun. This is a projection of the elliptical orbit of the Earth.

So that this very subtle astronomical device is not lost in the crowds, it is explained in plaques in various languages, the number of which will be increased as passengers of different nationalities pass through the airport. The first plaque was in Saame, the Lapp language.

Heikkinen and Komonen have really separated themselves from any other Scandinavian architects with this project. This airport is surely a magical way to enter or leave such an enchanted world as Lapland. The airport resounds with the mystical solar qualities of the North and the whole concept of aviation. You know when you have arrived in Rovaniemi - and you know that it is very far away from where you

came, no matter where you departed from. The architects have done an almost impossible thing with the low budget restrictions but they have tried "to give an airport a sense of particular place - and make it a memorable moment in the homogenised world of international travel." (Architectural Review, 9/93, p.72) They have succeeded.

The Finnish Embassy, Washington DC

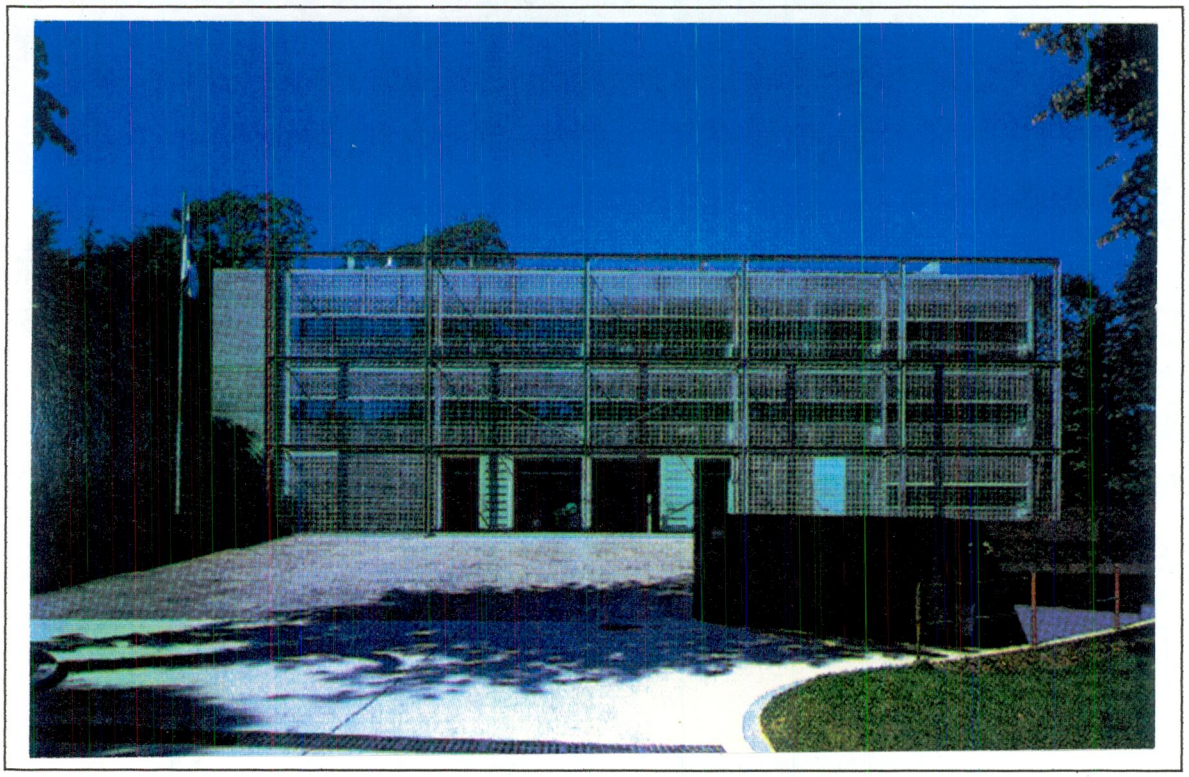


Plate 19. The Finnish embassy, Washington DC

The Finnish Embassy on 3301 Massachusetts Avenue in north-west Washington DC is Heikkinen and Komonen's latest work. Finland acquired this much sought after piece of land, through their diplomatic skills and the fine Finnish architecture of Heikkinen Komonen Oy. A city which is a showcase for America's 'great' history and political system provides an environment which does not bode well for architecture.

Massachusetts Avenue, often known as Embassy Row, is the capitals most prestigious address for foreign diplomatic missions; the Finns neighbours include the Vatican Embassy and the vice-president of the USA.

An embassy should always reflect the country it represents, regardless of the country in which it is set up. It is the face of a race. Massachusetts Avenue is a colourful collage of national identities, with people of different races and nationalities parading on its footpaths. Here was a chance for the remote, introverted, race of the Finns to present themselves to America and the world. It was the extreme conditions of the site, and their remarkable reputation that led to the selection of Heikkinen Komonen Oy to design the building. Designing

for geographically unusual sites has been part of the expertise of the firm.

The architects call the building a "jewellery case" (Form Function, 3/94, p. 5) What looks from the outside an unassuming building conceals a treasure trove within. The building has a compact footprint and is yet again a steel and concrete box. This is due to the local codes that limit cutting down trees - the rear of the site slopes down to Rock Creek Park where there are more than 20 species of trees many of them over 30 metres high. Heikkinen and Komonen must have felt at home in an area surrounded by trees and obviously used this feature to make other Finns feel at home, surrounded by nature. The steep gradient of the site was a blessing in disguise as it formed the basis for the whole concept of the design - the "appreciation of the dialogue between man-made and natural."

(Architectural Record, 11/94, p.64)

This is obvious from the minute one faces the building's entrance. A green-patinated bronze trellis conceals the entire south elevation and acts as a natural climate modulator. White rambling roses and blue Clematis will, in the future, climb over it to give shading from the sun in Summer and to allow December sunshine to penetrate in the Winter

through leafless stems. The building is designed to change dramatically with every season.

Behind the trellis the wall is constructed of glass blocks which filter the surrounding green light into every office in the embassy. The glass blocks make up the walls of the rear offices also.

The side elevation walls are made of polished green granite which creates a marvellous effect. The walls are extremely reflective, bouncing the light which pierces through the branches of the trees and indeed the trees themselves, in a mirror like fashion. This creates a multi-dimensional illusion of intangibility.

Plate 20. Reflective granite walls

A glass wall at the rear/north elevation lets light flood in from the park and again creates the free-flow of space between inside and out. The light then pours into a large open space - the Finlandia Hall, which is

used for conferences and exhibitions. This hall extends into the centre of the building as a spacious concourse known to the architects as the 'Grand Canyon'. Bridges and curving maple staircases link the four stories across the Canyon, attractively and unintrusively breaking up the open space. Two pairs of towers also penetrate the space - one pair clad in red dish copper and the other, sandblasted steel. These towers provide interesting reflections around the Canyon.

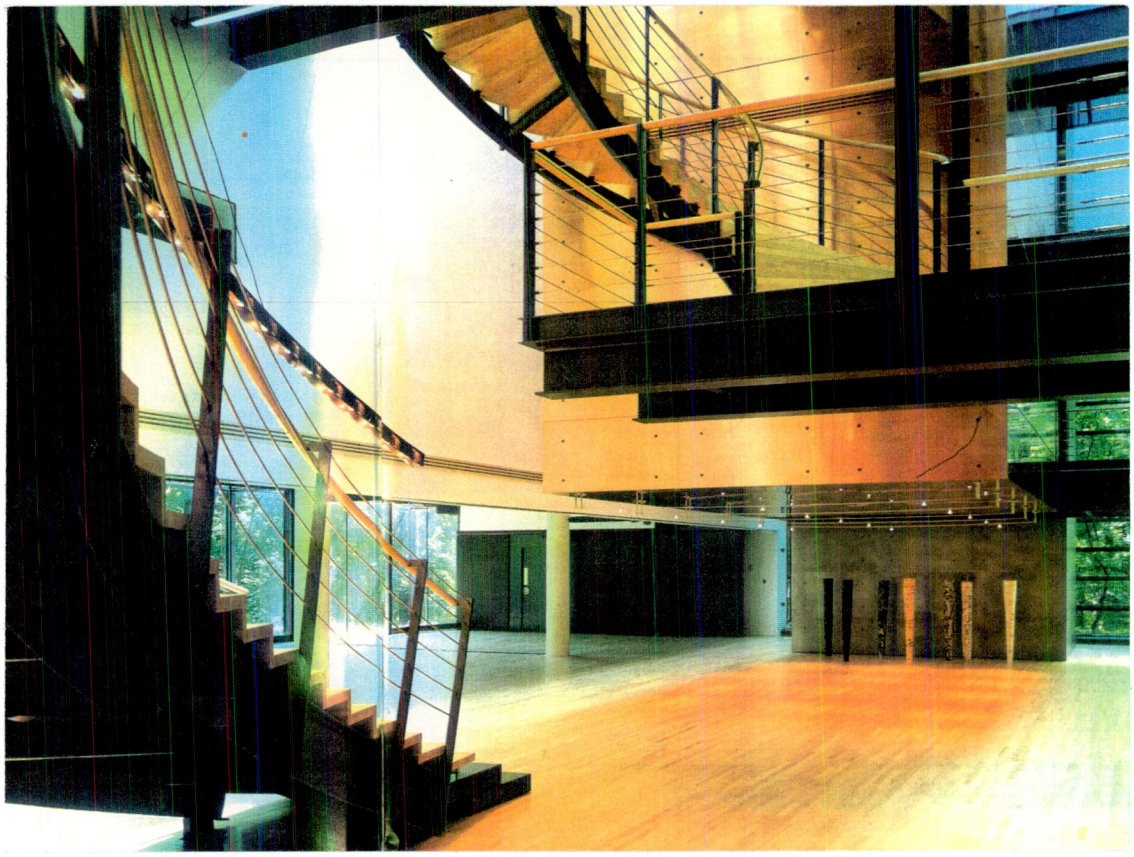


Plate 21. Finlandia Hall with copper tower

The four stories of the Canyon are lit by the hallmarking rooflight which runs the entire length of the roof. The sunlight, which is much stronger and more plentiful in Washington DC than in Finland, is

broken up by a series of plant rooms over the centre of the slot with glass on each side. The intention is to drive sheets of sunlight down into the Canyon, rather than to flood it. The offices have windows on their internal walls as well as external walls, so that they too can benefit from the light from the roof.

Plate 22. Rooflight

No matter where one stands in the Embassy there is always a window and the outside world visible through it, be it through an office window, the rooflight or one of the glazed walls. This again helps to create a

fluid movement of space throughout. When you enter the building initially you enter into glass rooms with, for obvious reasons, high security locks. You catch a glimpse of the rest of the Embassy and also of the park beyond through the glazed wall of the Finland Hall. You feel an urge to continue, to carry on into the space, but the bureaucracy, which seems a minor detail inside, needs to be attended to. Once inside you really feel part of a living, breathing, dynamic structure. Descending the curving staircase to Finland Hall the entire drama is revealed and "the juxtaposition of man-made and nature can be experienced." (Fax 2.1.95)

The electrical lighting in the Embassy is subdued but a few strips of halogens and some spots help punctuate features such as stairs and copper-clad surfaces. Heikkinen says himself "they do not dramatise the space, not to interpret, not to pick up or emphasise - but just to give reasonable light to substitute the natural one." (Fax 2.1.95) Artificial is used to some effect outside the building. The embedded grid of lights in the forecourt lead you into the building at night. At the rear of the building, lights sit on thin poles extending the light from Finlandia Hall into the park outside, giving the impression of the building melting from the road back into the forest and disappearing in the ultimate progression from man-made to nature.

The architects rarely work with lighting designers as they feel they push for the use of electrical lighting too much. They usually come up with the design principles themselves and get help with the technical aspects. The Finnish Embassy is, at the moment, the finest work of Heikkinen Komonen Oy. It has all the characteristics of their style, executed with the utmost of precision and thought. It is one of the finest examples of the use of light as a building material and many architects could do worse than imitate the building's dynamic qualities.

The staff find it an inspiring and comfortable place in which to work and all visitors are made to feel welcome, by the characteristic Finnish sincerity and respect.

The firm are currently working on a gas-station / supermarket on the border of Finland and Russia and also on an competitional entry for the design of the control tower for Stockholm's Arlanda airport. Both projects promise exciting results and will no doubt produce two designs which will be very influential on any future architects of both types of building.

Plate 23. Swooping curving staircases

When asked of the future of natural light in architecture, Heikkinen, replying in his usual insightful and concise English, said: "I am positive that light will have as important a role (not bigger, not lesser) in architecture as it has had during previous millennia." (Fax 26.01.95)

CONCLUSION

Heikkinen's prediction of the importance of light in the future may be true, but perhaps light should play a more important role with the energy resources of the world depleting rapidly. We could see a return to a less artificial way of living, more resourceful and resolved.

The ancient peoples of the world understood the importance of the world's most vital natural resource. They have shown more regard and respect for sunlight than anyone in the modern world. Their worshipping the sun makes much more sense than many of religions widely practised today. The sun gives life. It produces everything they and we need to survive - food, light and inspiration. It is something real. Too many buildings have been designed as mere sets of boundaries doing little more than enclosing a space. The space inside must also be designed and light is the most important material of this construction. Gothic cathedrals demonstrate a perfect balance between design of structure and design of space. It is light inside the space that gives the interior of these cathedrals their awesome, immense atmospheres.

Heikkinen and Komonen have brought this into the 20th Century following in the footsteps of the many great Finnish architects who have worked wonders with light. Aalto, probably the most ingenious of all, held many characteristics vital to his work that Heikkinen and Komonen's now hold, but the Helsinki partners demonstrate a more creative, mystical use of sunlight. Rovaniemi airport and the Finnish embassy are two masterpieces which should be elevated as two of the finer examples of great architecture, monumental in their marvellous integration of structure and light.

Finland is an inspiring country full of inspiring people. There is no better place to go in the world to study the aesthetic and life-giving qualities of the sun as it battles with the Arctic conditions. There is no better place to visit, to find a heightened appreciation of natural light and its assertion as an essential building material.

Bibliography

Books

CANTWELL, Wilfrid, Rights of Light in Practice, Dublin, 1957, Revised 1995

CLARKE, Brian (Ed.), Architectural Stained Glass, London, John Murray Publishers, 1979

HOPKINSON, R.G., PETHERBRIDGE, P., LONGMORE, J., Daylighting, London, Heinemann, 1966

HOPKINSON, R.G., KAY, J.D., The Lighting of Buildings, London, Heinemann, 1970

HORHAMMER, Arja (Ed.), Cold - Design From Finland, Helsinki, Finish Society of Crafts and Design, 1989

LAM, William, Perception and Lighting as Formgivers for Architecture, New York, McGraw-Hill, 1977

McGRATH, Raymond, Glass in Architecture and Decoration, London, The Architectural Press, 1961

PERIAINEN, Tapio, Soul in Design, Helsinki, Finnish Society of Crafts and Design, 1990

PRITCHARD, Lighting, London, Longman Group Ltd., 1969

Journals

"Finnish in Style", Building Design, July 7,1989, pp. 21-22

"Rovaniemi Airport", Arkkitehti, 4/5, 1992, pp. 54-59

"Claus and Effect", Building Design, December 14, 1990, pp. 25

"Finnish Embassy", Architectural Review, March, 1993, pp. 52-53

"Heureka Science Centre", Architectural Review, March, 1990, pp. 32-33

"Emergency Finnish", Architectural Review, August, 1993, pp. 57-61

"Perspectives", Progressive Architecture, May, 1992, pp. 154

"Finnish Light", Architectural Record, February, 1993, pp. 40-41

"Diplomatic Manoeuvres", Architectural Record, November, 1994, pp. 60-67

"Jewel in a paste crown", Building Design, September 25, 1992, pp. 10

"Circle of Light", Architectural Review, September, 1993, pp. 66-73

"A Building that blends in", Form Function, 3/94, 1994, pp. 4-9

"Daylighting", AIA Journal, June, 1983, pp.58-73

Communication with M. Heikkinen took the form of written interview through the following facsimiles :

Fax dated 19.12.1994

Fax dated 02.01.1995

Fax dated 11.01.1995

Fax dated 26.01.1995