Vernacular and Passive Sustainable Design

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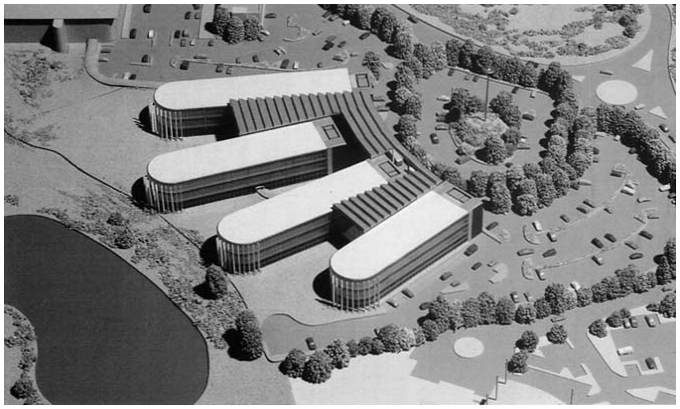
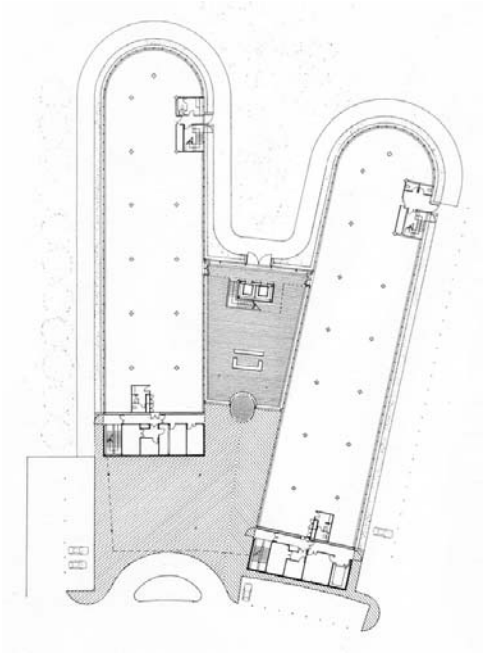
Technological innovation in architectural materials and method have expanded the possibility of form and aesthetic to give presence to a language that increasingly negates its own present tactical realities. The theoretical imagination of architects is an awesome source of inspiration for the seemingly boundless realm of the built form and its power to affect the everyday lives of man. In spite of these limitless visages of the built world, the growing need for a responsible architecture and human footprint on our already fragile environment sees the necessary marrying of this vigorous spirit with the most basic vernacular practice that was somehow forgotten in the giddy days of modernism and globalization. As the developing world yearns an antecedent existence worthy of its careless forebearers, it becomes an increasingly important responsibility of contemporary architects and practice to reawaken and reinvigorate an understanding of the regional and vernacular practices and theories that preceded the architectural universality that has been increasingly detrimental to the world we have made, and the world that is yet to be created. Encouragingly, the sheer simplicity of vernacular architecture is reawakening the imagination of responsible practitioners as being even more inspirational and dynamic in its holistic complexity, giving life and existence to what otherwise might be just structure on life support.

Passive practice is thus the common denominator for a responsible and sustainable architecture, an understanding which by no means is implicit of regression, but indeed of principles upon which great systems can be based and can exist. It supports a relationship of coexistence and balance between man, built form, and the environment that will be ultimately beneficial to the existence of all. Context thus becomes a preeminent factor in an architecture that is responsible and responsive to its geographic, cultural, and temporal surroundings in achieving this balance.

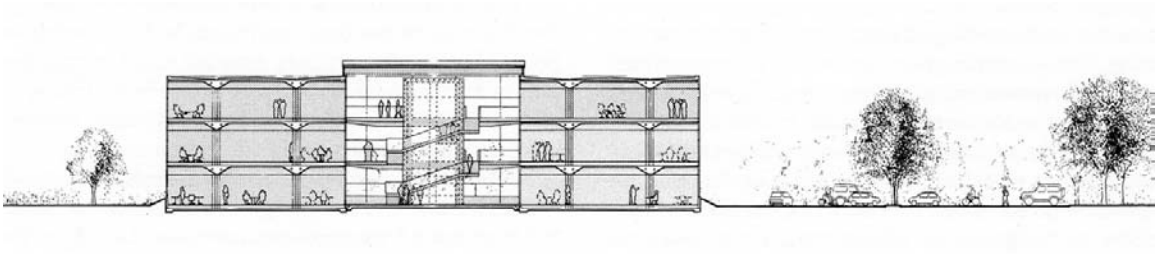
“As important to contemporary architecture is the use of traditional vernacular as a storehouse of ingenious passive environmental techniques developed to mediate between climate and interior. When fossil and nuclear fuels come at such a high environmental price, we cannot afford to dismiss low technology methods using renewable energy. This should not imply a repudiation of modern technology, but does suggest its redirection. What characterizes sustainable building technologies, high or low, is the consideration of the building as one integrated system, not a collection of systems that may be at war with one another.” (Frey, p.104)



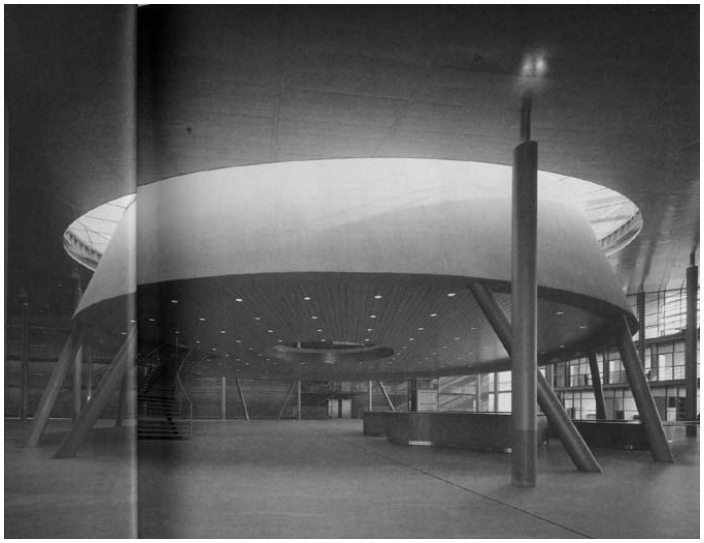
The Mistral Building for British Gas in Reading, UK by Foster and Partners engages passive principles in creating an elegant and altogether contemporary solution for a large office building that works with its context in guiding both aesthetic and environmental design strategies. The building was situated and oriented toward the north of the site, away from the busy roadway and rail tracks to the south, to take advantage of views over the Thames valley. Natural ventilation and daylight access were important to the client’s, British Gas, mandate for an energy efficient office, which inspired the office spaces as four radiating peninsulas off of the south facing service and entrance spine of connecting atriums, resulting in an effective building section of 16.5m in depth. Operable windows and vents act to both take advantage of differential air pressure between the atrium and exterior conditions in providing cross ventilation, and to cool the exposed concrete structure by night. Landscape strategies like the storm water pond were located near the office wings to cool the air that is drawn into the building, and indeed the building’s siting towards the natural riverside landscape was also beneficial to these passive endeavours.



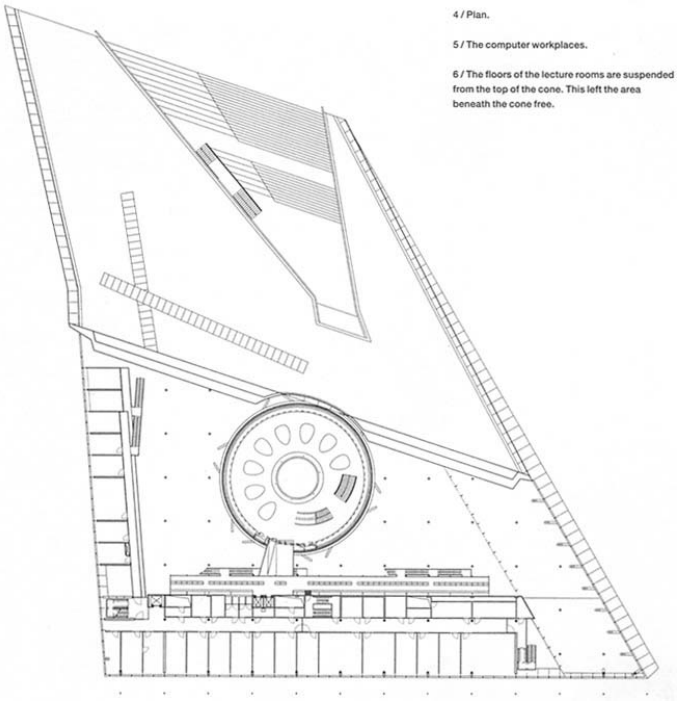
The cantilevered floor plates provided an unencumbered perimeter which also helped in accomplishing these strategies. The treatment of the peninsula facades were important as each were exposed in all directions, and so the building envelope purposely changes in material treatment depending on orientation, with virtually clear elevations to the north and east, and more solid panels to the west to abate the effects of the low afternoon sun. The solidity of the service cores to the south provided the necessary solar protection and no additional intervention was required. The atriums that unite the individual fingers serve to promote air movement through stack effect, while their scalloped roofs orient glazing northward to provide a consistent source of natural light and restrict heat gain by closing off the southern exposure. Additionally, the building's non-passive lighting strategies sought to minimize the dissipated heat by uplighting the exposed coffered concrete ceiling with baffles to reflect the light and absorb the resultant heat into the thermal mass of the slab. The Mistral Building's peninsula design strategy allows the bulk of office spaces to be versatile and adaptable to different purposes and allows each to have an attractive and individual relationship to the site and thus take advantage of sustainable strategies related to landscape planning initiatives that will contribute to the longevity and usefulness of the building over time.



The library at Delft University of Technology by Mecanoo architecten embraces its site by employing sustainable method creatively to enrich the campus fabric and create an enjoyable and livable focus for student life. The built form seems to lift the earth up a gentle slope, making all the benefits of a green roof accessible to the pedestrian and the ground plane. The green roof is purposeful beyond social engagement, providing significant insulative properties and sound proofing. The gradual evaporation of rainwater held by vegetation grown on the sloping roofscape provides natural cooling in the summertime. Natural lighting is ample and provided for in both the main body of the library and for the offices that line the building's perimeter. The defining feature of the library is a large cone that penetrates the green slope admitting light into the principal space through a "necklace" of glazing the encircles the cone at the roof plane. The exposed façade is almost entirely glazed bringing natural light into perimeter offices that, through interior partitions of several kinds of translucent glass, admit dappled light through to the interior of the library. Operable windows at the exterior benefit individual interior comfort by enabling natural ventilation. The building's close relationship to the ground plane, and a desire to keep the roof plane free of mechanical obstruction inspired a sustainable



"cold storage" system, whereby groundwater has the capacity to store cold and heat, and when circulated throughout the building conditions the air. "…the storage is in a layer of sand at a depth of 45 to 70 metres below grade. The sand is sealed off above and below by an impenetrable layer of clay. Two tubes stand vertically in the sand 60 metres apart. In winter relatively warm ground water is pumped up through one tube, used to temper the building until it cools, and then pumped back into the other tube. In summer the water takes the opposite route, with the relatively cold ground water being used to cool the building." (Mecanoo architecten) A glazed double skin façade at the exterior abates the negative effect of a glazed façade by using stack effect to exhaust heated air through the cavity to reduce heat gain. Eco-technological strategies work well with more passive measures to create a dramatic structure that is both social activator and successful precedent of sustainable practice that has allowed the form of the building to remain true to the drama of its concept by alleviating the typical mechanical equipment requirements that so often are detrimental to form.

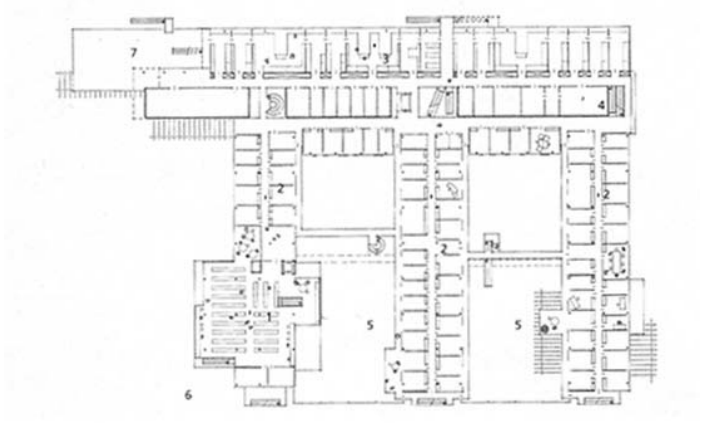


4 / Plan.

5 / The computer workplaces.

6 / The floors of the lecture rooms are suspended from the top of the cone. This left the area beneath the cone free.

A research centre in Wageningen, Netherlands by Behnisch, Behnisch and Partner concentrates on passive methods through elemental design principles for the success of the project. The building forms the shape of a capital E between which two glazed atriums help to regulate solar gain and even out temperature differences. Winter sunlight warms the air which is stored in the thermal mass of the concrete building structure, while in summer the air is cooled by evaporation from the atrium's pools and plants. Natural ventilation through stack effect and electrically operated valves extract hot air from the building through the atrium. Internal comfort is moderated by operable windows in the external envelope to admit fresh air and provide natural ventilation. The internal environment is refreshed by planting and water features in the atriums returning oxygen to the system. The wings of the E comprise single depth rooms off of a double loaded corridor creating a thin section that allows natural daylighting through the external façade or through the glazed atrium. The green roof coordinates with the rainwater recovery system to provide water to the atrium pools and for toilet flushing reducing typical water consumption requirements. The research centre's sensible sustainable strategies provide simple solutions to basic needs that otherwise might typically be met with high energy



demanding mechanical systems, and serves well as an example of design initiatives that can be beneficial to most building applications.

The inherent and timeless knowledge of vernacular architecture remains key to the future of responsible design and planning, providing an important foundation of design initiatives that will inspire eco-technological advancements that might one day alleviate our reliance upon energy abusive mechanical systems that have become dangerously universal. The innovation that builds upon established vernacular precedents are important touchstones for future inspiration, whether demonstrating the most basic of passive strategies or complex eco-technologies, engendering the small steps in the right direction to abate the dangers that globalization has wreaked on the world, and reawakening the memory of a contextual cultural identity and pride in the balance of man and his environment. Simple elements such as natural ventilation or daylighting do so much to enhance the comfort of the interior environment and to connect the built environment with its natural surroundings, while contributing a small but concerted effort toward a beneficial sustainable future.

Bibliography

Edwards, Brian (editor). Green Buildings Pay. London, Spon Press, 1998.

Frey, Hildebrand. Designing the City: Towards a more sustainable urban form. London, E & FN Spon, 1999.

Vale, Brenda and Robert. Green Architecture: Design for a sustainable future. London, Thames and Hudson, 1991.

Gauzin-Müller, Dominique. Sustainable Architecture and Urbanism: Concepts, Technologies, Examples. Basel, Birkhaüser, 2002.

Melet, Ed. Sustainable Architecture: Towards a diverse built environment. Rotterdam, NAI Publishers, 1999.

Mecanoo architecten. http://www.mecanoo.nl