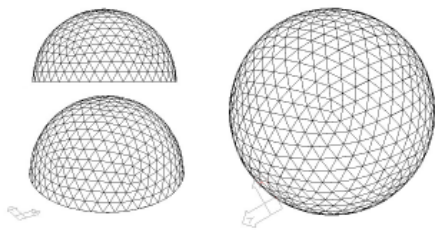


Daylight modelling : the sky dome



The sky dome

As a result of funding from HEFCW an integrated artificial sky and heliodon has been constructed. This major new facility allows researchers and designers to simulate, using scale models, the lighting conditions within, and around buildings.

The sky dome accurately simulates external lighting conditions, i.e. those emanating from the sun, the sky and clouds, and the reflections from the ground and nearby structures. It is able to do so for all weather conditions, and for any location on Earth. It is one of only a few in the UK capable of such complex and accurate modelling.

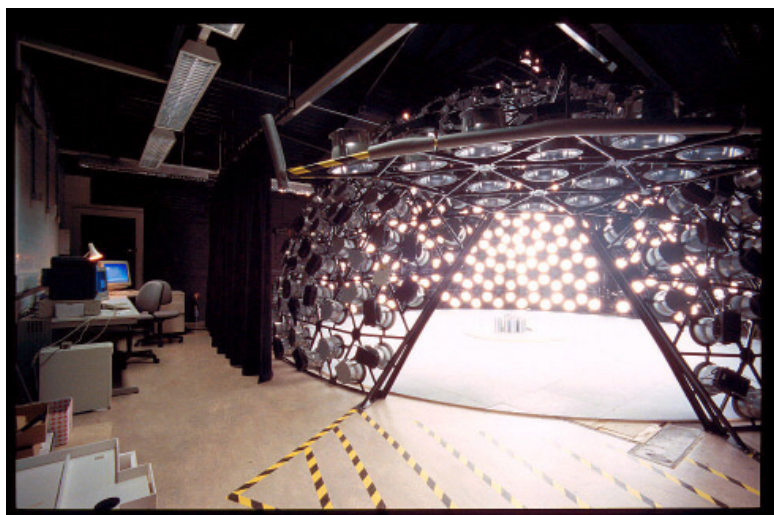
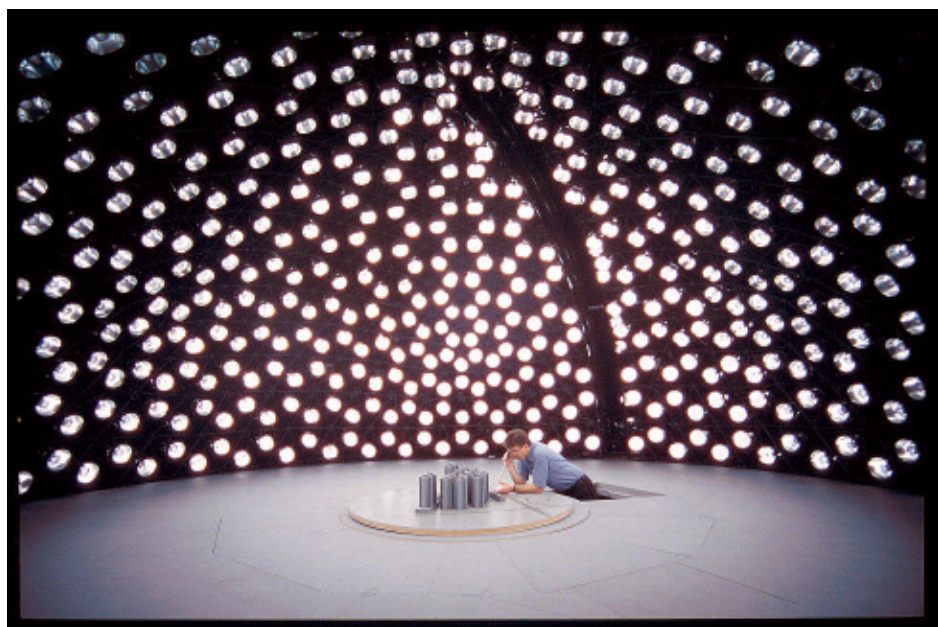
Daylight and energy

Electric lighting accounts for a large proportion of the total energy use of a modern building. The inclusion of daylight in a design can successfully reduce the energy demand of buildings, as well as providing a more pleasant environment. However, care must be taken in the design to eliminate excessive solar heat gains, glare or visual discomfort. Those prediction tools available to the designer are generally rule-of-thumb and may be limited in their application to modern materials, devices or concerns.

Sky modelling

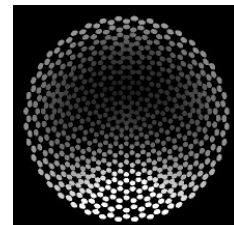
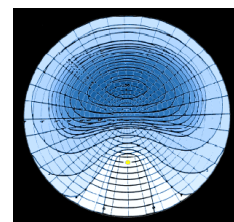
Physical scale modelling provides a more general but easily accessible technique for evaluating lighting designs.

The sky dome can simulate both clear and overcast conditions, as well as all types in between. This is achieved by 640 individually controllable lamps, mounted within an 8 meter geodesic dome. By selectively dimming appropriate areas, the brightness of different parts of the sky can be simulated. An integral high intensity heliodon models the sun and sunlight. The dome lights and the heliodon are usable concurrently, allowing the testing of novel daylight strategies or technologies such as "smart" glazing.

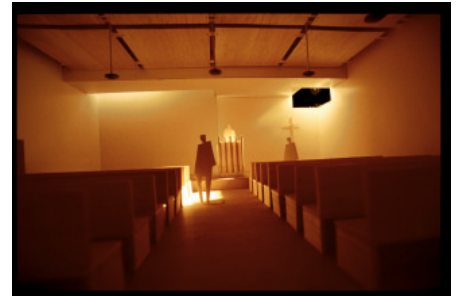
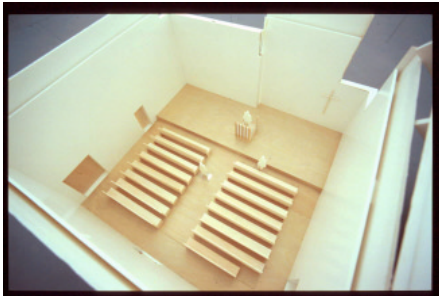


The artificial sky dome

A standard CIE clear sky luminance pattern, and the simulation of the sky luminance distribution a discretised sky with 640 lamps



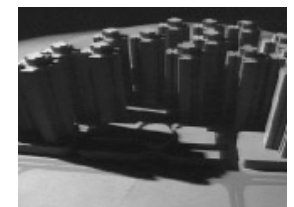
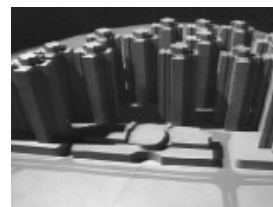
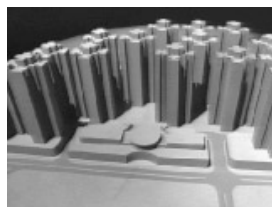
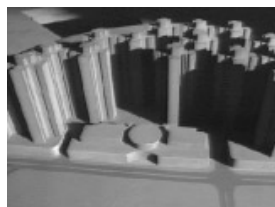
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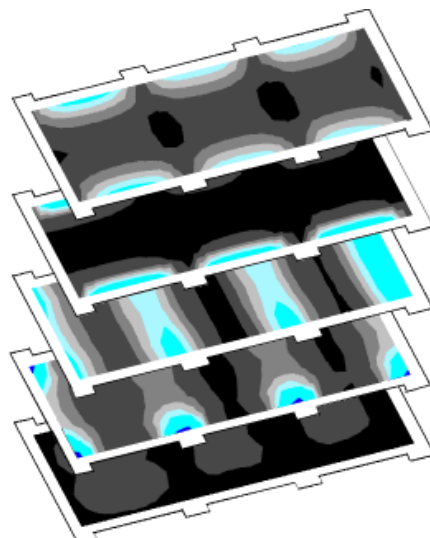
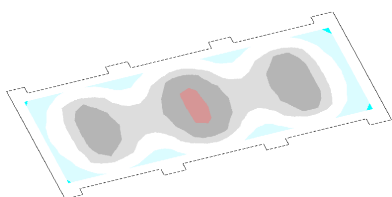
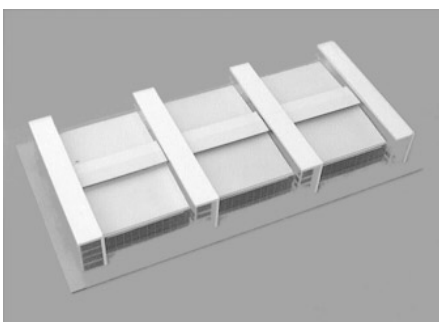
A design for a new church for Cardiff, tested for direct sun-beam entry and glare, at different times of the day and at different times of the year



A student design exercise on an office, showing sunlight penetration in winter, in summer, and investigating the effect of a light shelf in summer.



An investigation of a new housing estate in Hong Kong, checking shadowing and obstruction over the course of a day



A low-energy factory, determining the daylight contribution of each component of the design; roof-lights, popups, and side windows, so that the combined effect provides sufficient illumination across the entire floor area with the minimum glazing requirement

For further information on the Sky dome, contact Professor P. Jones or D.K. Alexander at the Centre for Research in the Built Environment.
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