

# If carpenter ants built future systems...



*Earth Centre's set piece solar canopy fuses timber to PVs for leaf cover and clean green energy*

Up close, it looks uncannily like an elaborate and complicated piece of organic meccano. From afar, Doncaster's Earth Centre's solar canopy feels more like a prehistoric beast, although, the above-ground root-and-branch analogy quickly takes hold. In its context, covering the central concourse, or in southern Europeanese, the Plaza, the canopy's timber structure is undeniably impressive. To one side is the Earth Centre's restaurant with five of the canopy's supporting concrete pillars. On the other, adjoining the Planet Earth galleries, two wooden pillar structures, issue up and out of the ground rest, multiplying in number and reaching upwards into a crow's nest gantry of ochre brown larch rods, or members, joined by steel nodes. There is an elegant sculptural quality about the form, needing six of these members to cross from side to side. The architects' – Feilden Clegg Bradley – description of an 'abstracted tree canopy' is also apt, even if the canopy holds nothing else but a space frame, sitting at a five degree angle, and upon that, 250 or so photovoltaic cells. The pencil thin, dark brown larch members supporting the space frame with its load of photovoltaics, showcases a compelling if novel environmental synergy, combining wood's living quality and the renewable hopes symbolised by the latest hi-tech generation of cutting-edge photovoltaics.

Actually trapezoidal in form, appearing like a distorted or irregular space frame, the irregularity adds to its beauty. A regular space frame would have been

significantly less interesting, if lower in cost. The concept's origin, according to Brighton-based Atelier One's Neil Thomas, owes much in inspiration to Jane Wernick, an ex-colleague at engineers Buro Happold. Wernick had proposed a timber space frame canopy for a project in Atlanta USA, where she distorted the frame. This set Thomas thinking and the canopy, after much testing, was the result. Historically there have been related round-wood structures in Germany, which used adhesive strapping systems, a lower-tech approach deriving from the farm building tradition. The solar canopy also updates the radical lightweight structures developed on the continent through the seventies. The tradition harks back to the groundbreaking work of Frei Otto, and a host of other engineers, mainly German, some of whom helped build Buro Happold into the engineering powerhouse it is, others developing further Otto's Stuttgart Institute of Lightweight Structures.

Atelier One arrived at the distorted space frame by imagining the frame as an upside down membrane surface, with a doubly curved surface to prevent buckling resistance. Such mixing and matching is the fruit of the enabling facilitation of computers. If Gaudi toiled many hours over his membrane structures, the compressed hanging arches, Frei Otto spent an equal amount of endless days and nights on his lightweight structures and building. These twentieth century experiments in pure tension surfaces have taken a quantum leap with the

coming of computerisation, and their capacity to model, analyse and simulate before the building begins.

But this was already after considerable nursing. Peter Clegg, one of the earliest members of the original team who initiated the whole Earth Centre project, was also, early on, a central part of his practice's involvement in the building, working on the project for what is now near-on a decade. When the Centre registered an EU Thermie bid for PV usage and monitoring, the decision was made to integrate this bid with an earlier version of the space frame, so inaugurating the solar canopy concept. Linking the two projects under one roof, as it were, worked well, and the space frame became a showcase for PV and what potential uses and effects the specific roof space could have in terms of renewable energy creation.

The near-horizontal array of panels display the latest stage in the emerging art and technology of Bioclimatics. The roof has a five percent pitch leaning towards its south facing aspect. The European Thermie project is trying to figure out the effectiveness of solar panelling at the comparatively slight vertical pitch, and at the latitude of 52 degrees. The research wants answers to the levels of solar energy generation that can be derived at this latitude, where the optimum solar gain is at 45 degrees. It depends of course on the path of the sun, and its given height in the sky, high at midsummer, shallower in spring and autumn. It is estimated that between 70 and 80,000 kilowatts can be generated from the solar array a year, enough for 20–30 percent of electricity for the conference centre, galleries and restaurant.

As such the solar canopy is a testbed, first to provide a shelter, and second, as a structure to support photovoltaics. On both of these it demonstrates to a regional and indeed national audience what can be done. Although there are very few similar Bioclimatic projects – two flats in Rotterdam at a seven degree pitch have been equipped with 25–35 roof panels, and some smallish road canopies that cars drive under – there is no canopy structure in Europe, which compares with the Earth Centre's. Even if there are no further projects that have issued from the Earth Centre's template this far, the project appears to have demonstrated that space frames topped with PVs are a prospective realistic option. There are any number of contexts they might be applied to, from shopping malls, atriums, to railway and other transit centres.

For Atelier One's Neil Thomas it is a design first; he states he knows of no other structure in Europe like it. Thomas is also confident that further structures like the solar canopy are inevitable as people become familiar with the concept. Not only this, but with PVs becoming part of a standardised range of products on the continent, despite their lagging application in Britain, the solar canopy's integration of lightweight timber and canopy design, alongside the exploration of PV Bioclimatics, inaugurates a new direction for environmental synergies. *OL*