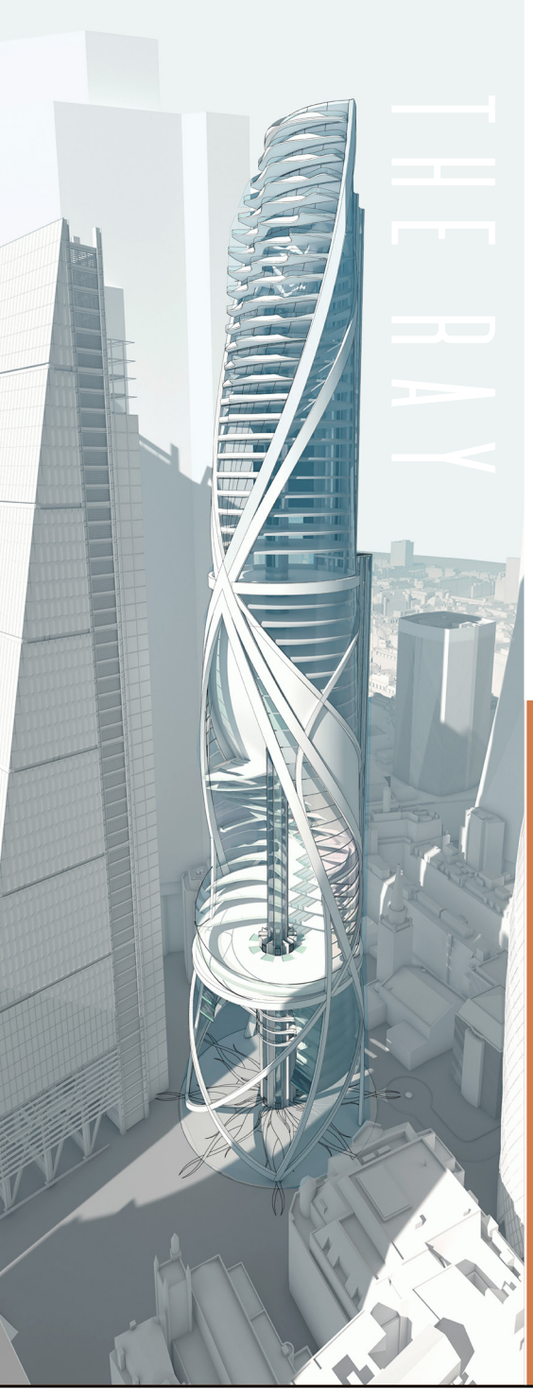


THE RAY

CASTING LIGHT ON THE FUTURE OF PUBLIC SPACE

ABSTRACT

In Diploma 2 at the Architectural Association, our 5th year projects explored how materials inform new ways of living. My project studied how daylight, the intangible architectural material, could produce contemporary forms of public space within vertical urban contexts:

Contrary to the surge of commercial and residential skyscrapers reshaping London's skyline, the quality and quantity of public space is precipitating. The public realm is not only becoming increasingly privatised (POPS), but it is also being confined to the dark ground level or glaring rooftops of these staggeringly high towers.

The project denounces the regulations and planning permissions condoning these impractical pseudo public spaces through the disruptive design of an entirely public tower situated at heart of the City of London.

The public intervention seeks to rethink the architectural trinity of programme, form and materials through the different types of daylight available within the vertical city: direct, reflected and diffused daylight. This holistic daylight design strategy will give rise to a new typology of vertical, rather than horizontal, public space. In the tradition of nicknaming skyscrapers, the "Ray" will cast light on the physiological, psychological and spiritual needs of London's future citizens.

01

PROGRAMME

Vertical Public Space in the hyperglazed city

The programme is reconfigured vertically according to the variations of light that exist at specific heights of the vertical city. Diffused light illuminates the lower floors creating meditative spaces; Reflected light animates the central floors encouraging spontaneous activities; whilst, Direct daylight shines on the upper floors promoting relaxation.

02

FORM

Temporal Architecture: Leaves of Light

By analysing daylight at the urban and building scale, the project explores different ways of designing the envelope, the section, the plans and the structure of vertical public spaces. Differently from flat, orthogonal layouts, the proposal formulates vertical 'leaves' that collect light and transform according to its temporal changes.

03

MATERIAL

Natural Daylight: direct, reflected, diffused

The design thesis considers daylight as the decisive material in the making of a successful public space. Direct, reflected and diffused daylight were used to evaluate the absorptance, reflectance and transmittance of standard architectural materials to generate new materials with specific light qualities.

WHEN

2029

WHERE

CITY OF LONDON

WHAT

A NEW TYPE OF VERTICAL PUBLIC SPACE OFFERING DIFFERENT DAYLIGHTING CONDITIONS IN TUNE WITH THE NEEDS OF TOMORROW'S CITIZENS

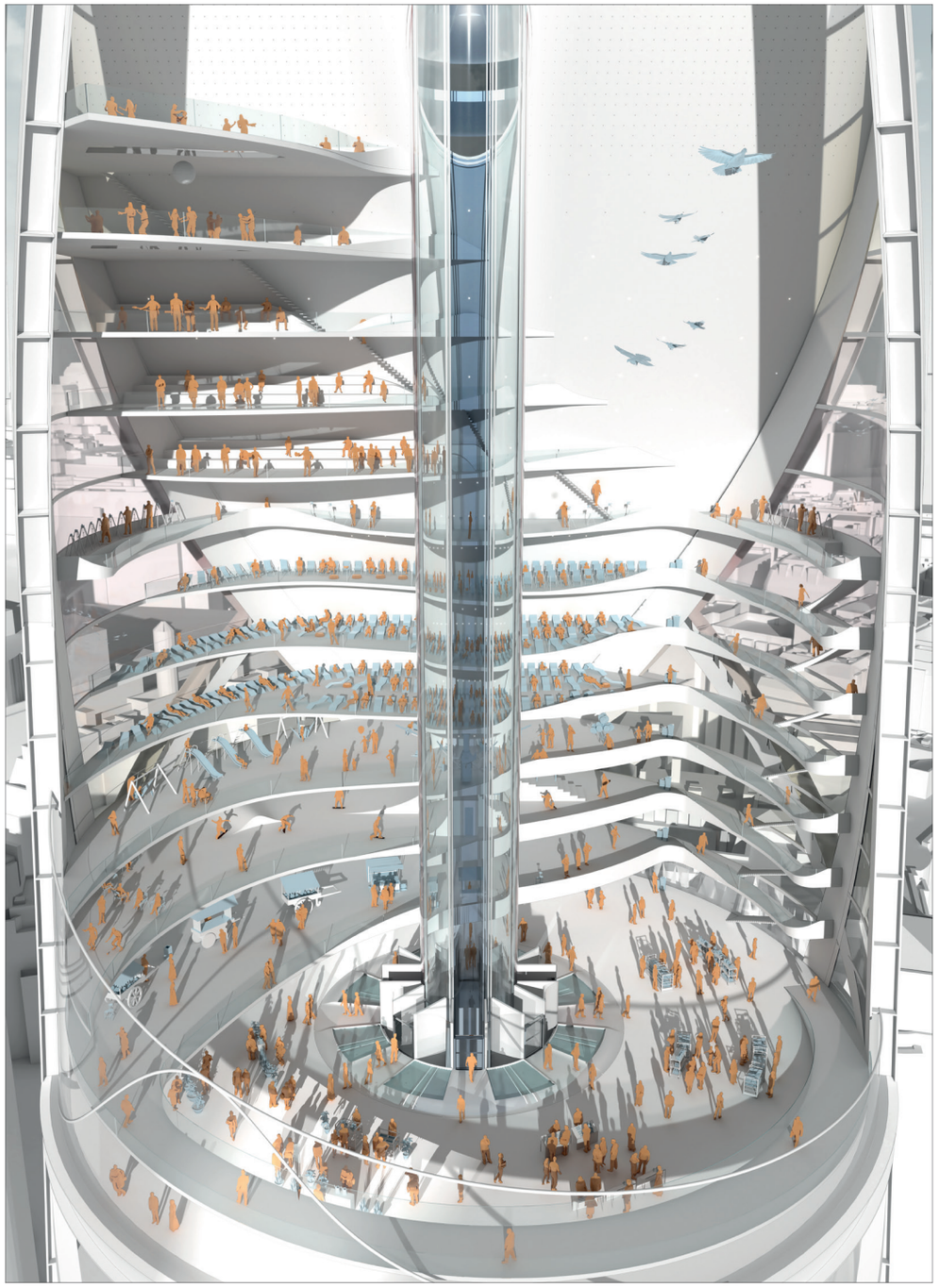
1. PHYSIOLOGICALLY
2. PSYCHOLOGICALLY
3. SPIRITUALLY

HOW

DESIGNING ANALOGICALLY AND DIGITALLY THROUGH THE ANALYSIS OF DIRECT, REFLECTED AND DIFFUSED

DAYLIGHT

1. PROGRAMATICALLY
2. FORMALLY
3. MATERIALLY



THE LEAF

CURVATURE OPTIMISATION

The main wall of the proposed vertical public space was studied extensively thanks to both analog and digital simulations

In particular, the sectional curvature was optimised in order to provide:

01_shelter
02_distinct light qualities
03_structural support

The curvature's function was optimised until daylight was reflected onto the elevated public space at a different location each month. The 12 resulting terraces are cantilevered across the leaf. The negative cubic curve allows each terrace to be visible from the central piazza and house a variety of activities which benefit from the reflected daylight. Sunlight decks, dancing platforms, markets and many other public activities can be found here.

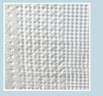
Technically, the morning light of the 21st of each month was used to design this space. Each month is assigned a 15 min light interval between 09:00 to 12:00 to optimise the reflected light within the tower's volume and create the geometries of the 12 floors above the circular piazza.

MATERIAL OPTIMISATION

REFLECTIVE CONCRETE

Due to the convex surface the concrete is casted against plastic to become reflective

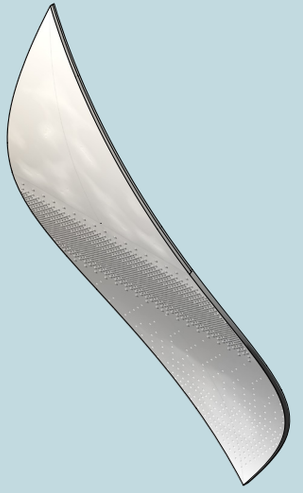
ROUGH CONCRETE

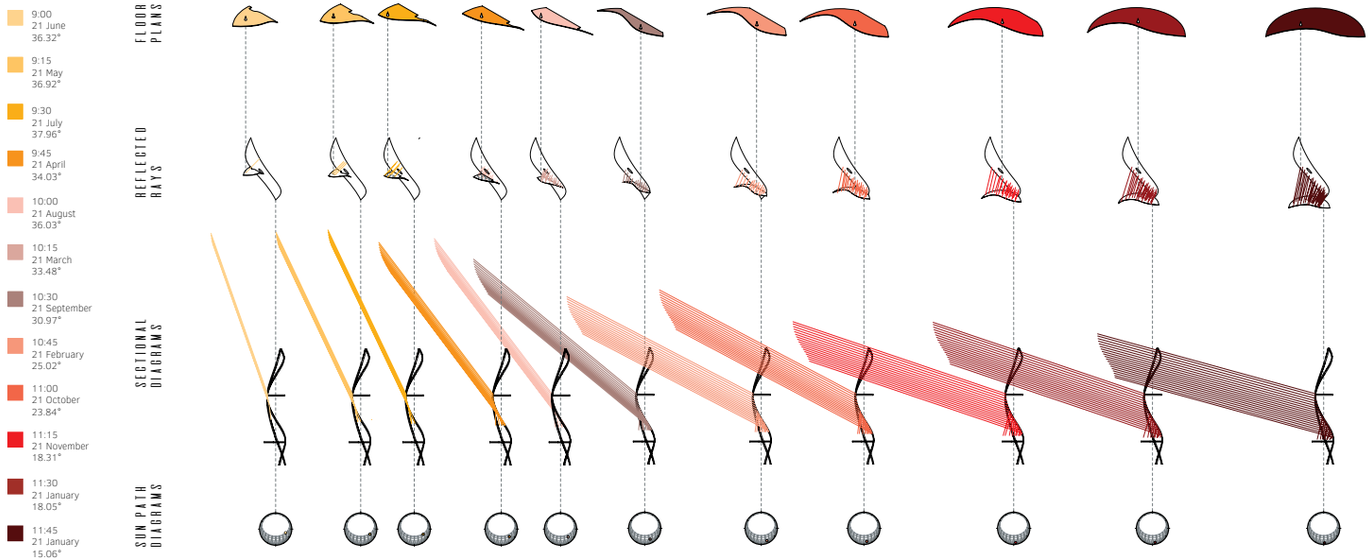


Due to the flat surface the concrete is roughened to gradually absorb the light

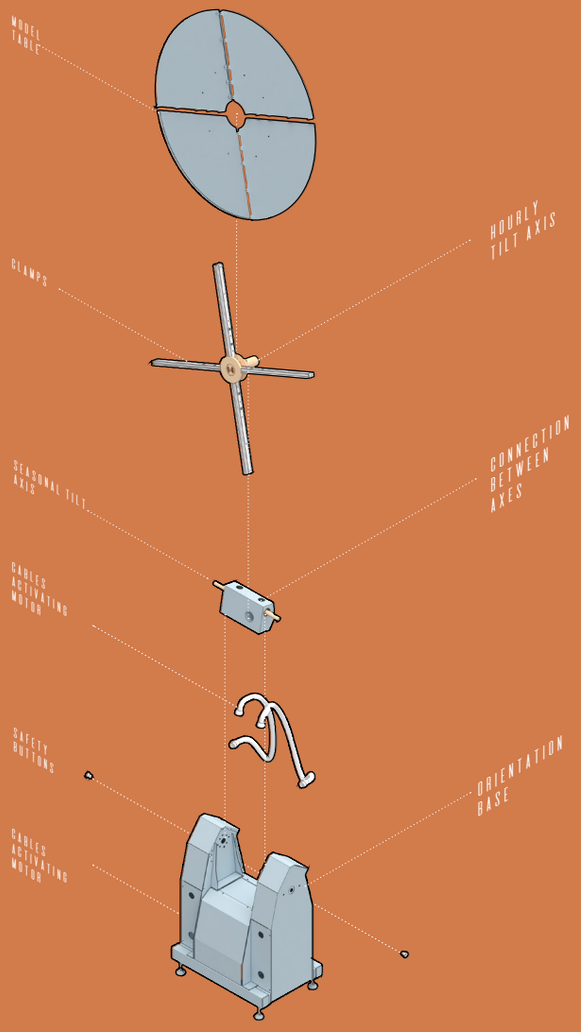
PERFORATED CONCRETE

Due to the concave surface the concrete is perforated with optical fibres to transport the intense light





HELIODON DAYLIGHT STUDIES



Orange is a family of automatic heliodon. The scale model is positioned around two axes automatically and accurately. Orange heliodons are very convenient to carry out frequent tests on large and heavy models for which you want to automate the analysis. This experiment was carried out in collaboration with **Beta nit**, the company which produces the heliodons and **Arup**, the engineering firm which owns one of them in their London office.

ARUP

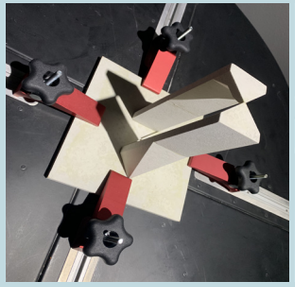
Bnit

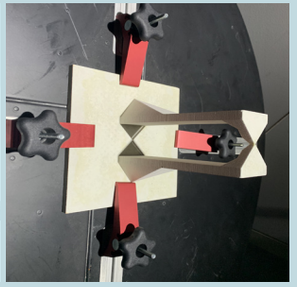
EXPERIMENT SETUP

The leaf was tested across all seasons to study its reflective behaviour within the year. In order to obtain reliable results a few steps were taken before starting the experiment.

CALIBRATION

The gnomon's shadows were used to align the model table so that it is perpendicular to the virtual sun. This step is essential each time the heliodon is used to avoid mis-representations.



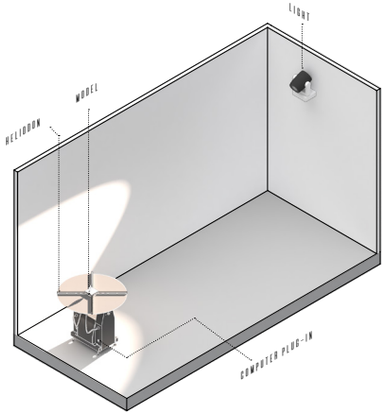


SCALED MODEL

A small scale model of the leaf was 3D printed to conform with the limitations of the model table size - the smaller the model the more precise the results since the source of light has to act as the parallel rays of the sun.

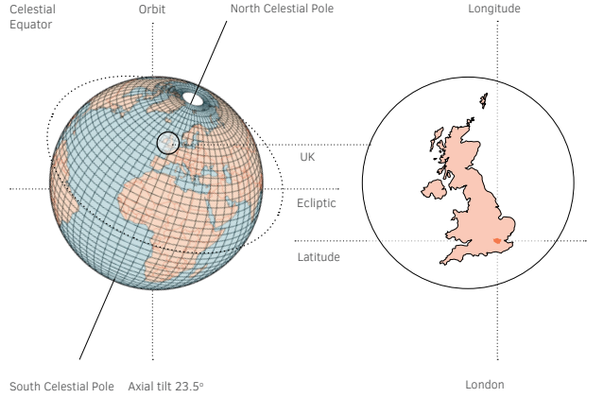
MODEL ROOM

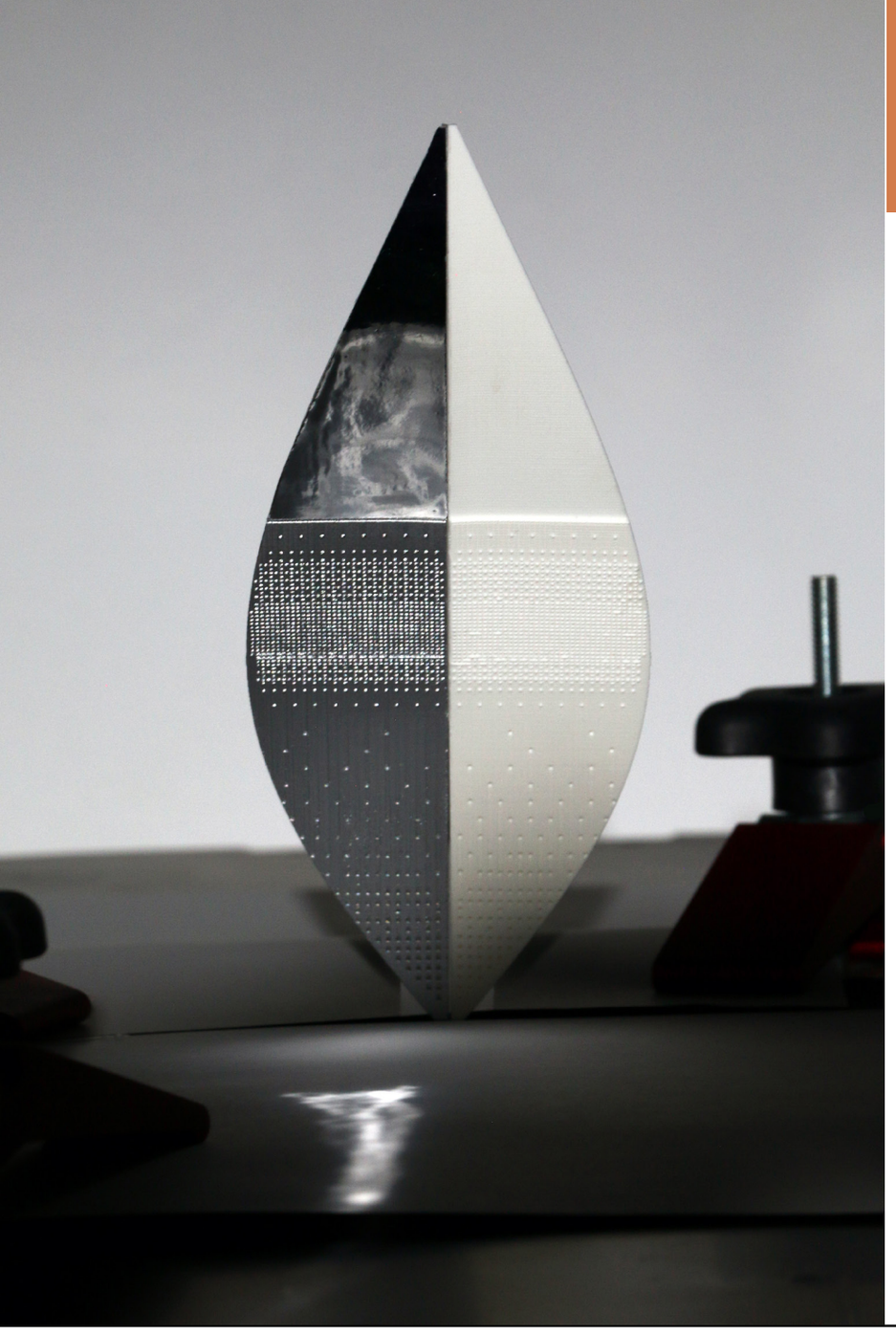
The light source representing the sunlight is placed at a fixed point on the opposing end of room compared to the heliodon. The rest of the room must be dark to avoid interfering with the experiment.



GEOLOCATION

The location of the project's was set into the heliodon system to mimic the correct sun's angles and orbital rotation:
London - latitude 51.51°, Longitude -0.08°





SPECULAR REFLECTIONS

Specular Reflections are most intense in winter

Winter: further away from leaf and very intense
Spring/Fall: fairly close to the leaf and noticeable
Summer: next to the leaf but not very visible due to bright summer light

SOLAR ANGLES

The movement of the sun between each hour is longest in summer

Winter: LOW: 9-15, short movements: fast change in reflections
Spring/Fall: MEDIUM: 8-17, medium movements : medium change in reflections
Summer: HIGH: 8-18, long movements : gradual change in reflections