GIUSEPPE MAGISTRETTI
A R C H I T E T T O

BIOMIMICRY PROJECTS

ARCHINGEGNO-BIO
by GIUSEPPE MAGISTRETTI ARCH

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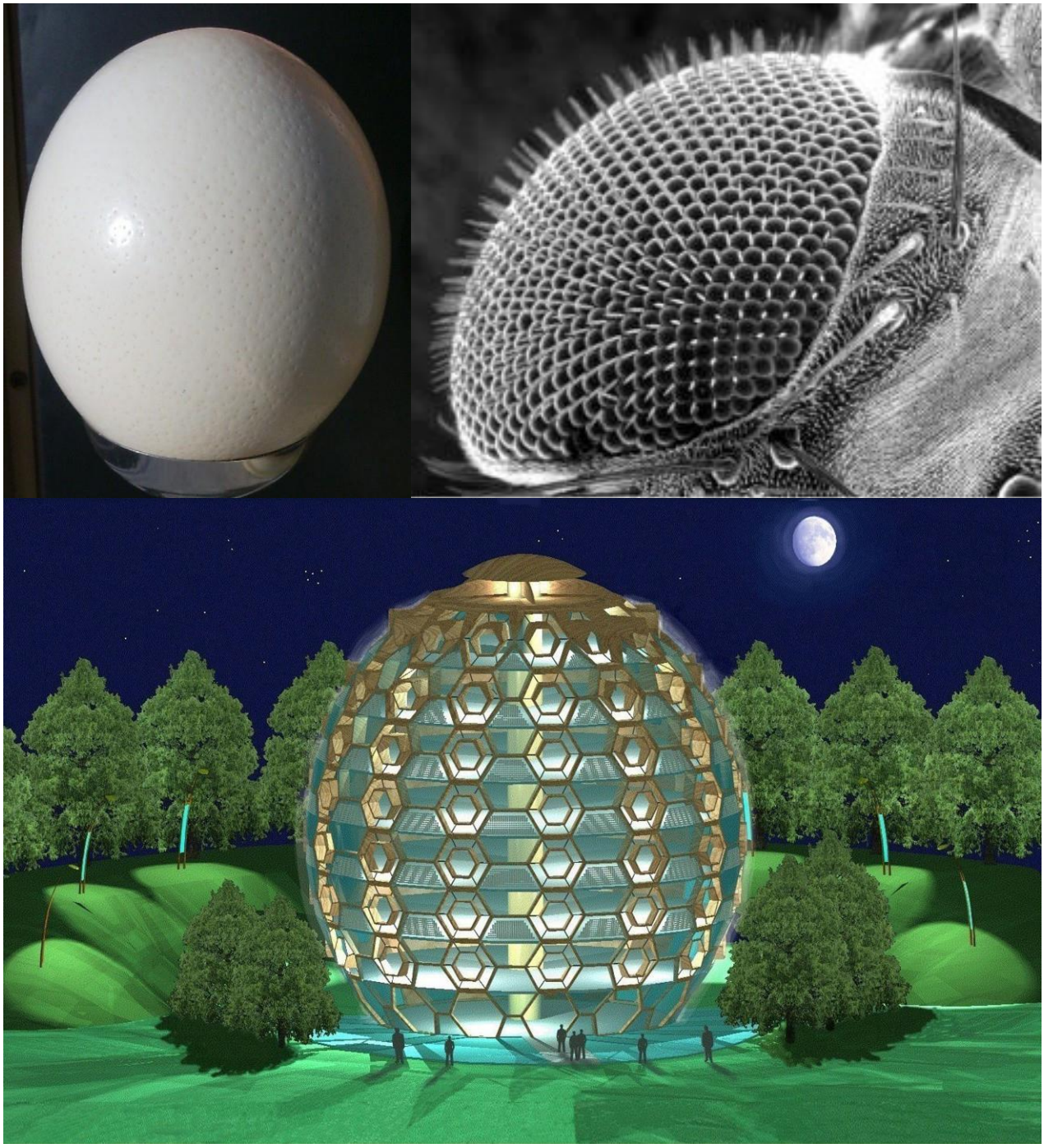
OSTRICH EGG WITH FLY EYES



This is an interesting experiment/proposal of an architectonic structural unit, for residential or tertiary use, which exploits current technologies of power production and sustainability, in order to offer a possible solution for tomorrow's cities. The architect and professor Giuseppe Magistretti, the project's author, illustrates it in detail

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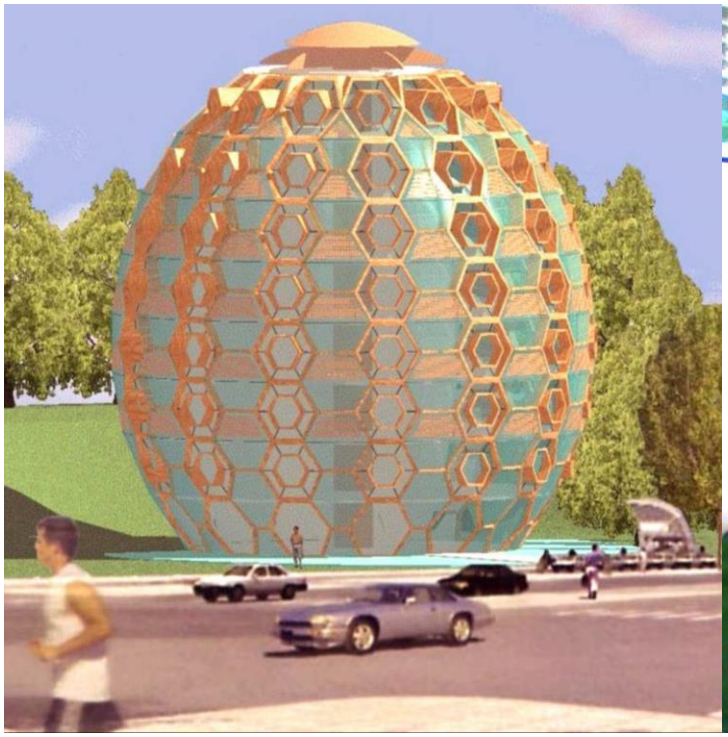
The building with such a denomination was designed with basis on the observation of natural phenomena and criteria adopted by nature (in its complexity of vegetable and animal world); lessons were drawn for a symbiotic balance between man and constructed environment.
Based on this fundamental contribution, the project was to reinterpret and put into practice the following characteristics: geomorphologic, physical, those of resistance and defence from atmospheric agents.
Subsequently, with the help of the most advanced technology and natural materials, the project would transfer these characteristics to the conception of a new "bioclimatic building", bio-compatible with low power consumption, excluding the traditional heating and cooling system and exploiting the environmental resources through the building's orientation and shape.The singular egg-shape finds its justification as a natural defence response to external climatic conditions. In a detailed analysis of the formal and stereo metric look, one can affirm that a building with elliptical sections has the best characteristics to hold heat in the winter and stay cool in the summer.
This conviction is based on the fact that a building of this sort combines the most volume with the least external surface, and offers minimal aerodynamic resistance to the winds.In fact, at all latitudes the optimal ratio between the biggest and smallest axis of the building depends on the climate, even though the buildings extended along the axis east/west are the most efficient. Specifically in Italy, in cold climates corresponding to the climatic zones E and F (as identified by the Decree of the President of the Republic 412/93) a compact shape is preferable, which exposes minimal area to a hostile environment.
Furthermore, since the external shell is structured with a hexagonal mail containing a wide glass surface, the thinking was of resolving the problem of sunbeam filtration and luminosity intenseness regulation with another unique defence system, devised similarly to a fly's eye.
The characteristics of this organ present a double system of filtering and regulating light, compatible with a structural mail.
Two concentric hexagons are assimilated on the glass surfaces, functioning with double screens, which allow choosing the solar energy beams' incidence according to the season and the time of the day.
Regarding energy savings while dealing with the functional planning of the building, it was decided to realise a structural mail with transparent scansions that include Trombe walls alternated with scansions that carry integrated transparent photovoltaic solar panels.
This system allows the achievement of high power efficiency levels, but also of protection, due to a significant thermal inertia.
Complementing the passive systems (concerning the capturing and shielding of solar energy) and the photovoltaic one, a wind blade with a vertical axis is inserted at the summit of the building, installed at the top of the natural ventilation duct.
The aero generator contributes significantly to the electric energy production, while the ventilation duct, inserted in a barycentric position of the building, has the function of natural ventilation and change of air.
Regarding the efficiency of building/installation, the idea was to install a system that uses geothermal energy of the ground around the building, to respond in full to the need of thermal energy and to obtain the ideal comfort in the whole building.
Summarising, the fundamental function of the shell is to mediate the external climatic conditions, while the heating and conditioning systems (realised without usage of fossil energy sources) are no longer crucial to maintain the internal comfort conditions, but are "auxiliary", i.e., necessary only when the building itself cannot guarantee the internal wellbeing any more. The building can be used for residential or tertiary-administrative purposes.
Residential usage. The residential building foresees 7 floors aboveground, a belvedere terrace on the eighth floor (which is also used for the maintenance of the ventilation duct and the wind blade devices), and a basement. All this is included in a land where stretches of water are planned on the south, and a consistent green structure with hedges and forest trees on the southeast and southwest, while on the north, northeast and northwest, the trees placed on the soil embankments have a wind breaking and noise-abating function. Still towards north, on the outside of the building, a recreational area is planned, dedicated to collective activities (children's play, leisure time), where comfort during summer is guaranteed through the shadow of the building, and by the presence of two ducts – created within the wind breaking escarpments – that are natural

vectors for masses of fresh air, with the additional function of connecting the landed property with the territorial context. Still within the recreational area, a system of mirrored streetlights is foreseen, which (in the wintertime) improve the microclimate, reflecting the sunrays.
The average housing surface is of 110 square metres. In this case, there are housing sizes that go from 70 square metres up to a maximum area of approximately 190 square metres.
Following the bioclimatic architectural principles, the housing distribution arrangement foresees the placing of the daytime premises (kitchen and living room) to the south, the night area (bedrooms) to the southeast, the working area (studio and laboratory) to the southwest, and the service and buffer area (bathrooms, store room, stairs and accesses) to the north.
Tertiary-administrative usage. The building for administrative use foresees a functional distribution with a free layout – characteristic for office space – on every floor.
In this case, there will be useful areas ranging from 150 to 400 square metres, diversified by floor. The peculiarity of the internal distribution foresees the realisation of a "thermal water wall", on which the work emplacement partition walls are positioned. This thermal water wall is used as a heat accumulator of sunrays (during the winter). The heated water mass contained in the wall, transmits heat to the adjacent areas, contributing to the internal thermal balance.
Another technological peculiarity of this plant is that the floors of the various levels are thermo-active, i.e., there are ventilation ducts of hot and cool air running within them. The cool air is conveyed directly from air inlets connected with the main natural ventilation duct, while the hot air is produced by geothermic heat pumps, which also delivers cool air upon activation when needed. The external space distribution for this usage purpose is the same as that of the residential usage.
The biocompatibility is certified by the use of natural materials, such as lamellar wood for the structural mail, transparent low-emissive glasses for the windows, wood fibre, cellulose fibre, mineral wool (in conformity with the Health Ministry circular dated 15/03/2000), Celenit and cork for
the thermal and acoustic isolating panels, copper used in sun screen telescopic systems for the sheet metal parts, plasterboard for the internal and external plugging, coating stone for the façades on the north, northeast and northwest, and/or the thickness in mechanically stabilized earth as alternative to stone coating, electric materials protected by special sheaths with tension circuit breakers, and all internal finish materials.



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THE NEW BIOCLIMATIC LABORATORY

The project idea involves the building construction with architectural and typological characteristics guided by the reduction of energy consumption, the use of biocompatible materials and - covering the new building with soil - a pleasant and environmentally friendly place.
The design has chosen a hemispherical shape because it is able to defend themselves from the weather and to obtain the lower dispersion energy for the same volume.
The shape is covered with grass and it is in harmony with the surrounding land, it is in harmony with the surrounding nature.

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THE EARTH MOUND BECOME A HOME

This is a project example of naturalization of an urban abandoned area.
In a green area a earth-mound was filed. It's looks like a big hole in a human scale, placed among the other houses. From this idea born the designing of a house with this anthropomorphic form.
This new building takes the morphological form of the earth- mound and surrounded this place will grow wild plants and green farmland for the nature and for the house- insulation.
The building structured stands for maximum energy performance, maximum biocompatibility and the immediate and direct symbiosis with the nature.

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THE OFFICE

The office ArchingegnoBio by Giuseppe Magistretti is based in Milan. It's specialized, for twenty-five years, in the design of bioclimatic architecture and urban planning, it's using design models with renewable technologies and biocompatible materials.
In his experience it includes several experimental projects integrated with renewable technologies.

THE ARCHITECT

He was registered in the Register of Architects since 1981 and was a teacher in "Bioclimatic Architecture" at the Engineering Faculty of the Pavia University.
He is specializes in the rational use of energy design in buildings and in urban environments, with a focus on environmental restoration and landscaping.

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