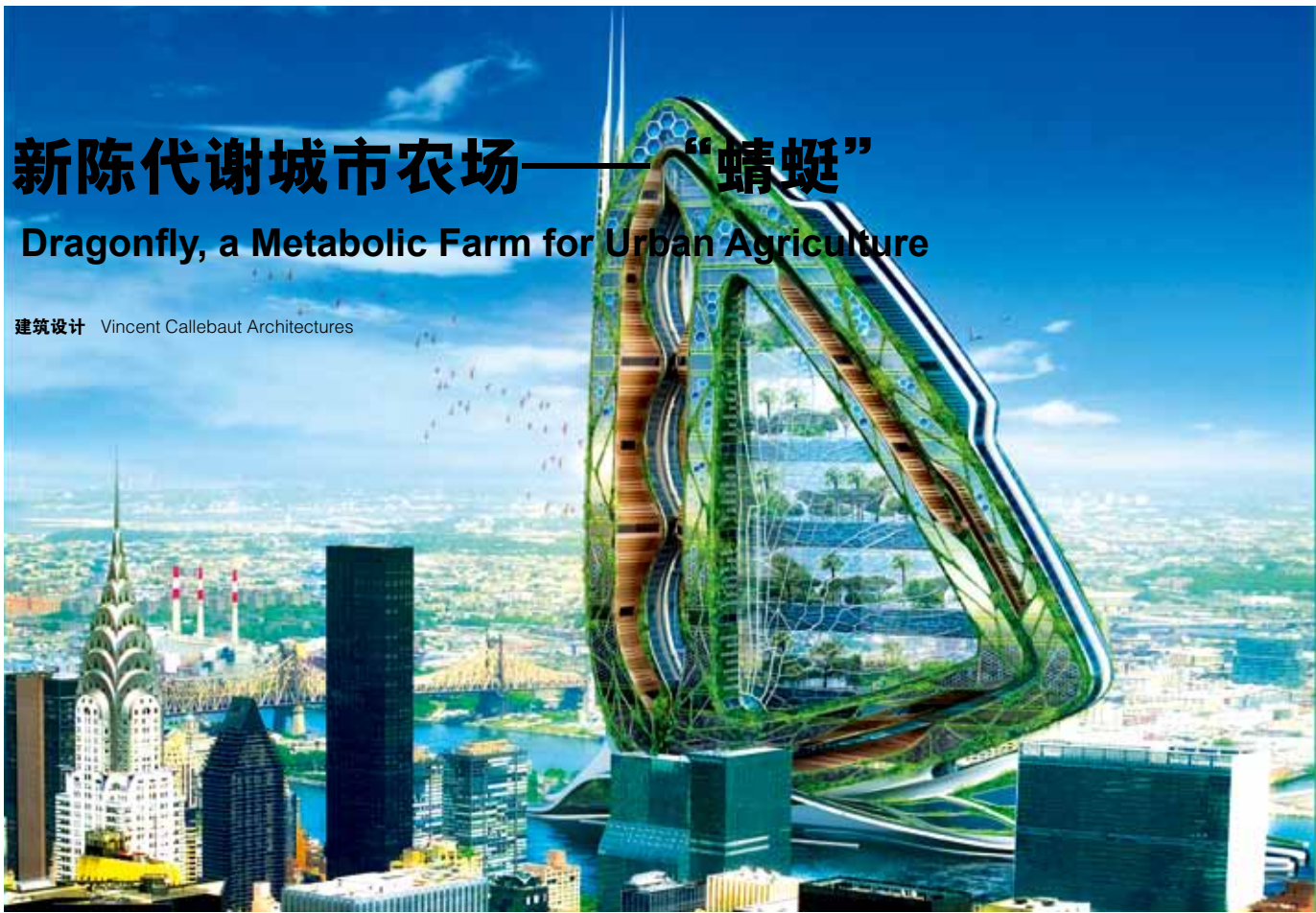


# 新陈代谢城市农场——“蜻蜓”

## Dragonfly, a Metabolic Farm for Urban Agriculture

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### 蜻蜓——立体中心公园

城市人口将面临粮食短缺的考验，“蜻蜓”建筑满足了新农业的服务要求，为生态型结构调整和粮食自主背景下的社会需求而设计。工程试图建造一个城市农场的原型，它综合了居住、办公、实验（生态工程）、种植等功能空间，分层布置并部分由居住者自行管理。这个立体农场建立了基于集约化生产的有机农业的所有的可持续应用，并且充分利用可生物降解废物，能够为生态系统致密化规划存储能源与可再生资源。

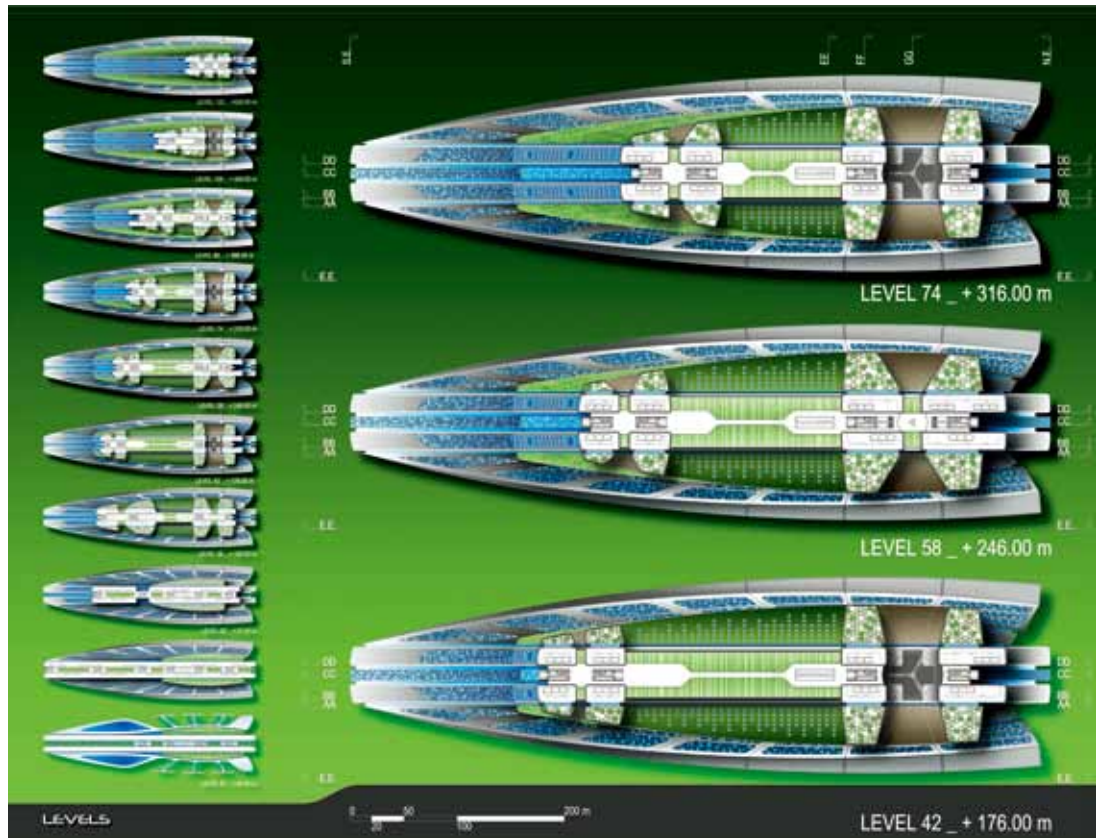
“蜻蜓”沿纽约南端roosevelt岛的东河而建，在曼哈顿岛与皇后街区之间。为了缓解土地紧张的压力，这栋仿生建筑自身竖向发展，为当地动植物重建了新的城市生活区，居民可自行管理食物的生产。

建筑保证了肉、奶、禽、蛋等畜牧业的生产，种植和饲养种类的多样性为土地提供各种元素，保证了水、能源、生物肥料的充足。建筑机能得以维持，成为一个有生命力的系统。

### 一个仿生与能源自供给建筑

为了保证建筑内部的社会多样性与生命周期的长久性，整个规划围绕居住与工作场所两极布置。在居住空间周围，办公、研究，从最私密到最公共的农业空间与休闲空间被布置在公园、厨房花园、果园、草地、稻田、农场等。分配渠道则利用建筑内部大量的电梯、货梯和楼梯等形成的循环交通系统，同步分离从动植物和人类中收集的可用于二次利用的消耗与产出。





从建筑设计角度看，整个建筑包括两个对称的长圆形塔楼，像水晶两翼一般由中心巨大的气候温室连接。这些玻璃钢铁的轻型结构分担了建筑荷载，也像蜻蜓翅膀一样，其透明的膜结构具有精致的翅脉。

建筑具有蜂巢般的双层皮结构，最大限度地利用被动式太阳能。冬季，外围护结构的厚度足以积累温暖的空气；夏季，通过自然通风与植物蒸腾作用来冷却室内空气，保证了栽培免受纽约气候变化的影响。这些“能量”供给空间对农业的作用不言而喻，不仅只是从表面积方面而是从整个空间角度实现供给。实际上，在土地供给果园的同时，每个墙面与天花都变成了三维的菜园。居住与办公空间的室内墙面向纽约的天际线发展，六边形剖面的悬臂阳台栽种了各种植物，蔬菜供给丰富，土地上昆虫成群，家畜被城市低收入者饲养在箱子中。整个建筑变成了食物供应站。

除了被动式热工系统，从设计之初就考虑到可更新能源的整合，以满足其成为完全意义上的自我能源供给工程。实际上建筑南端的太阳能板提供建筑50%的能源消耗。另一半的能源由三个风力发电装置提供。建筑幕墙呈现出两种不同特点：在西部靠近曼哈顿的一侧被设计成种植幕墙，而东侧靠近皇后区的一侧则种植了典型的热带植物。这个竖向花园可净化雨水和人产生的废水，经过有机处理之后被用于农业灌溉，提供其所需氮、磷、钾等必需元素。

根据FAO2007年提出的城市农业的改革计划，有机农业在很大程度上要担负起未来粮食生产与供给的职责。“蜻蜓”项目使得纽约重新思考粮食生产问题。同时，这个可供人居住的垂直农场解决了当前在贫瘠的土地上不仅要生态生产而且要集约生产的窘境。（译/李昭君）

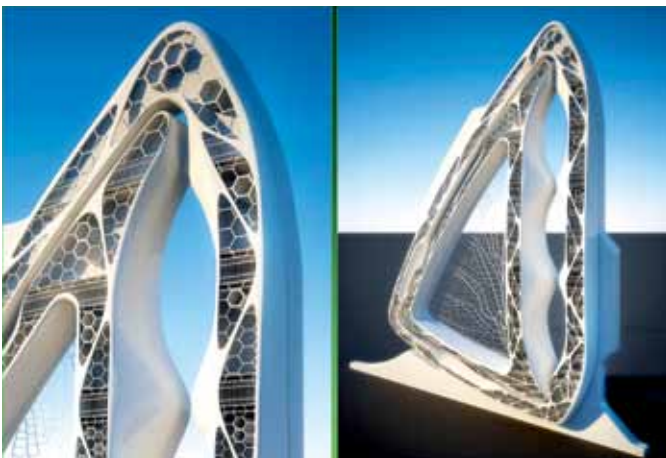
#### **dragonfly, a nourishing vertically cultivated central park**

The architecture has to be in the service of this new agriculture and to design this new social desire in this context of ecologic mutation and food autonomy! The Dragonfly project suggests therefore building a prototype of urban farm offering around a mixed programme of housing, offices and laboratories (in ecological engineering), farming spaces which are vertically laid out in several floors and partly cultivated by its own inhabitants. This vertical farm sets up all the sustainable applications in organic agriculture based on the intensive production varied according to the rhythm of the seasons. This nourishing agriculture is furthermore in favour of the reuse of biodegradable waste and the keeping of energy and renewable resources for a planning of ecosystemic densification.

In order to conceptualize this project and give our point of view in the ecological and social crisis debates, Dragonfly sets up along the East River at the South edge of the Roosevelt Island in New York between Manhattan's Island and the Queens' district. So as to face the landed pressure, Dragonfly stretches itself vertically under the shape of a bionic tower relocating a new urban biotope for the fauna and the local flora and recreating a food production auto-managed by the inhabitants in the heart of Big Apple.

Floor by floor, the tower superposes not only stock farming ensuring the production of meat, milk, poultry and eggs but also farming grounds, true biological reactors continuously regenerated with organic humus. It diversifies the cultivated varieties to avoid the washing of stratum of soft substratum. Thus, the cultures succeed one another vertically according to their agronomical ability to provide some elements of the ground between the essences that are sowed and harvested. The tower,





true living organism, becomes thus metabolic and self-sufficient in water, energy, and bio-fertilizing. Nothing is lost; everything is recyclable to a continuous auto-feeding!

#### **a bionic and energetically self-sufficient architecture**

To ensure the social diversity and a permanent life cycle (24h/24) in the tower, the mixed programming is mainly laid out around two poles of housing and work places. Around housings, offices and research laboratories as well as the most private to the most public agricultural and leisure spaces are designed in gardens, kitchen gardens, orchards, meadows, rice fields, farms and suspended fields. The distribution of flows is made around a true safe spine spreading in loop the numerous elevators, the goods elevators and stair wells serving all the levels by separating simultaneously the inputs and the outputs recycled from plants, animals and human beings.

Architecturally, the functional organisation is represented by two oblong towers symmetrically arranged in pair around a huge climatic greenhouse that links them and deploys itself between two crystalline wings. These very light wings in glass and steel retake the loads of the building and are directly inspired from the structure of the dragonfly wings coming from the family of "Odonata Anisoptera" whose transparent membrane is very finely nervured.

The project forms «double layer» architecture in bee nest mesh that exploits the solar passive energy at its maximum level; by accumulating the warm air in the winter in the thickness of the exostructure; and by cooling the atmosphere by natural ventilation and by evapo-perpiration





of the plants in the summer. Protecting thus the cultures from climatic changes in New York (from  $-25.5^{\circ}\text{C}$  in the winter to  $+41^{\circ}\text{C}$  in the summer), these plug spaces are useful to reflect on the agriculture not anymore in terms of surface area but really in terms of volume. Actually, whereas grounds nourish orchards, each wall and each ceiling are metamorphosed into three-dimensional kitchen gardens. The interior frontages of the housing and offices throw towards the skyline of New York the cantilever of their hydroponic balconies with hexagonal section thanks to what it multiplies the culture layers by floors. The vegetation abounds, the earth is swarming of insects and animals are freely brought up in holding tanks by urban consumers with low income. The architecture becomes eatable !

In addition to this thermal called «passive» system, the integration of renewable energies has been thought from the design of Dragonfly to meet the needs of a completely energetically self-sufficient project in urban centre. Actually, the South prow of the tower receives in all the heights of its curve a solar shield producing half of the electric energy needed for its functioning. The other half is ensured by the three wind machines with vertical axes of Darrieus type that coils itself up in the three

lenses hollowed in the North part of the micro-pearled shell towards dominated wind of New York. The exterior façades of the tower present a double personality. Actually, in the West of the Island near Manhattan, the façades are treated in planted walls, whereas in the East near the Queens' district, the wet exterior walls are cultivated with tropical essences. These vertical gardens enable to filter the rain water and the effluents of domestic liquid waste of the tower inhabitants. The collected waters undergo an appropriate organic treatment for the farming reuse, bringing all the nitrogen and an important part of phosphorus as well as potassium needed for the production of fruits, vegetables and cereals. According to the evolution of the urban agriculture enhanced by the FAO (Food and Agriculture Organization of the United Nations) that has been realising since 2007 that the organic agriculture on a large scale would be able to nourish the planet, the Dragonfly project challenges the city of New York to rethink its food production. In response, this project of inhabited vertical farm replies to the contemporary dilemma of producing not only ecologically but also more intensively on non-extensive earth. This by merging also directly production place and consumption place in the heart of the city! **AT**