

Ubiquitous Planting and Green Bricks: **Towards Dynactic Skins**

key words: human plant interaction, bionics, ethnobotany, urban gardening, modular blocks, smart materials, indigenous construction



First bloom, India, 2005

Marble Quarry, Italy, 1993

This is a moment of simultaneous attraction and repulsion for me. Every time a building gets created, a natural landscape is destroyed and a sterile signature left behind.

To be alive

Plants are the centre of the web of life. The growth of urban centres around the globe has had a critical impact on ecology. City dwellers have become increasingly disconnected and removed from the natural environment. In recent years there has been a growing interest and public movement to bring ecology out of the bush and into the urban and suburban environments where most people spend their time. Whereas traditional ecology is mainly about connectedness within the natural world, the new focus lies on having a holistic and inclusive approach to build deeper links with ecology in our midst beyond doing conservation in isolated national parks.

Some of the questions at the core of this exploration are:

- Is there an ecological limit to economic growth?
- Do we have the right to consider human beings as more valuable than other life forms?
- Can we be perceptive enough to see our planet, especially our cities in a way that tells them that they too are part of nature?
- Can we trigger forests within a city and bring wilderness in our midst?
- Can we give back more to a place than taking from it?
- Can we systematically address the challenges being faced by cities?
- Can we create living, pulsating skins around us?
- As per recent statistics, 73 million humans are born every year. Can we give birth to 73 million plants each year?
- Can we use technology and new developments in engineering to reverse the trend of widening schism between humans and ecology?

This proposal is the result of the author's ongoing research and interest in urban gardening and permaculture. The search for balance and integration has taken him from the Hortus Botanicus in Amsterdam to the Gurukula Botanical Sanctuary in Kerala, India. It has brought out the importance and indispensable nature of urban villages in New Delhi and the ominous reality of urban sprawl which most cities in India and China have

become synonymous with. The research has also been informed and inspired by his travels to remote Indian villages and experience with indigenous tribes, whose deep connect with natural forces is seamlessly manifested in their life and work.



Tribal Hut, India, 2005



Shanghai, China, 2004

One of the most crucial insights of this journey has been that "growth" in cities is inevitable especially in developing countries like India, China and Brazil. We can not ask people to slow down. We must find ways in which we can contribute to this "growth" in a responsible way. An effective green shift, can happen at the market level through new product solutions, which respond to this growth. So what are these growth symbols? Infrastructure would classify as a key "growth" factor within a city. By 'integrating' plants with a cities infrastructure we can create an enormous positive impact. The thrust of this research and thereby this proposal is to explore methods to help people contribute to the health of a city in a strategic and decisive manner, and thereby direct the benefits arising out of this to improve the situation globally. It is to create a *green tipping point*.

The research proposes the design of a green, intelligent, modular, structural, climate specific 'brick' which would have specific native plants and/or seeds integrated with it. The "plant tile" would act like a "living brick", integrated with the building structure and in the process trigger ubiquitous greens and diverse layers of green clusters within a city. This would gradually transform the city's infrastructure into a productive, healthy, edible and playful green fabric; a vision which goes beyond manicured lawns, horticultural imports, bonsai's and golf parks. The proposal strives to bring back native plants at the core of our daily life by integrating them with the built form and other symbols of 'growth' within a city.



Illustration A- Green Brick

The illustration above is not representative of the final product

People will buy this off the shelf and use it directly in construction, just the way conventional bricks and concrete blocks are used today. This would not be an add on. It will be indispensable for constructing any

habitat. It could be integrated with curtain walls/acoustic panels/aluminium sections/glass blocks/concrete slabs and become part of the building structure. It could be used inside or outside. Over time, cities would have innumerable green tiles and become associated with the diverse plants they give life to. Barren concrete walls, commonly seen in cities like Dubai, Brussels, New York would give way to exuberant and fertile green communities.

The choice of plants could be adapted to address pressing challenges within a city:

- The bricks could become a source of nutrition, vitamins and herbal medicine. They could together create home herbal gardens(*Leucus aspera* cures bronchitis and asthma, *Lia Indica* cures ulcers, *amaranthus* is used by dentists). Each home could become an independent seed bank, a space for abundant biological exploration and a living, evolving bio-archive.
- The integral plants could pre-date on pests and act as repellents for termites thereby substituting currently used chemical solutions(*Lantana* is a pest repellent)
- They could together create a green cushion which absorbs noise and acts as an acoustic buffer
- They could generate fragrance to counter foul smell of rotting garbage and urine which is common in numerous Indian cities (e.g. integrating *epiphyllum oxypetalum*, commonly known as 'queen of the night' with the tile)
- They could act as green filters creating protective micro climates in polluted urban realms, much like the delightful and defiant growth which emerges through the building cracks in dilapidated and derelict urban settings.
- They could reduce the urban heat island effect which is of major concern today. Many U.S. cities and suburbs have air temperatures up to 10°F (5.6°C) warmer than the surrounding natural land cover. This could be improved.

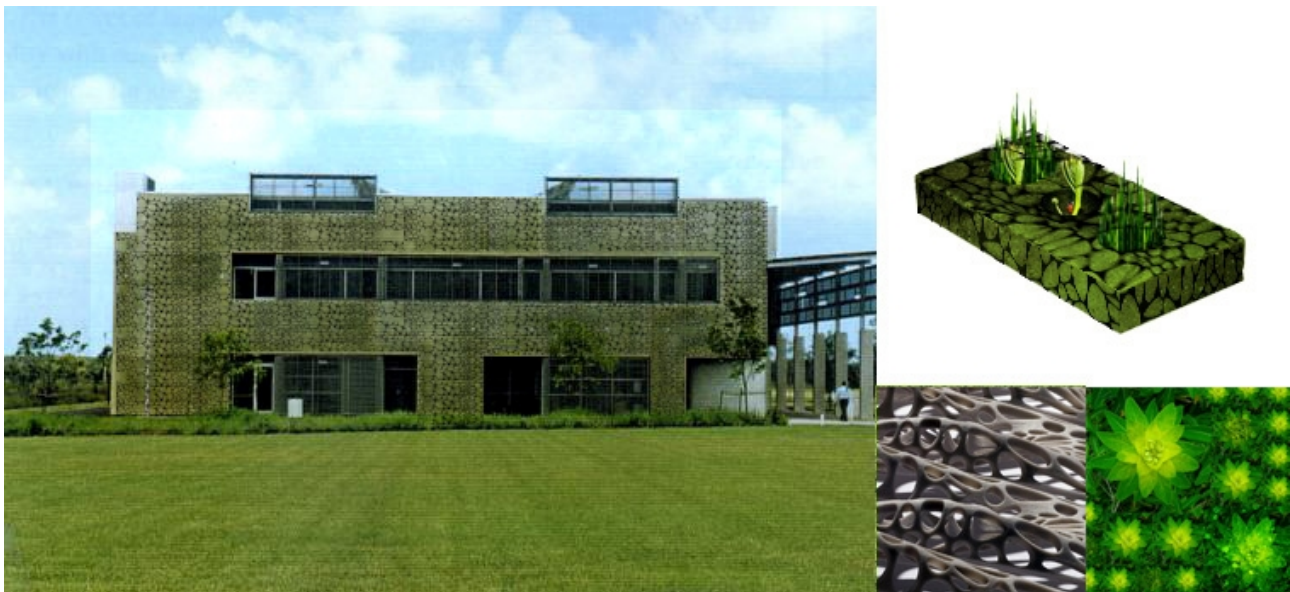


Illustration B- Green Brick

The illustration above is not representative of the final product

Numerous other benefits could result from such integration. The specific choice of these plants would differentiate the city, creating new transformed urban identities. The solution could strive to fuse local variables with global aspects of construction and need for structural performance. It could have cultural inputs and generate specialised brick communities becoming a cultural focus. Local nurseries, small farmers and gardeners could play a crucial role here along with input from established botanical resources. The team would be a hybrid mix of local specialists and global generalists who would together create a diverse evolving language.

The final product solution could draw from the intrinsic qualities of natural structures and result in a series of systemic solutions suitable for different regions and climates. This would be an opportunity to explore and possibly redefine the idea of a single unit or building block. Would this integral approach be visible and tangible to the naked eye? What would be the most efficient and appropriate form? What would it really feel like? What would constitute its parts and what would be the whole? Could we complete the cycle by reusing

industrial waste? How would the mental construct of an inert 'brick' change with the integration of a life form? Would the brick decay and 'die' one day? How can we design and build a platform for 'growth'? How can it be based on an inclusive, symbiotic model? Would it be an envelope or a skin supplying nutrients to the embedded plant? Would it resemble a lattice, a live tissue or an unassuming, potent seed! Could it become a breeding ground for more life forms and increase bio-diversity? How would it incorporate the growth of roots and branches? Would every single unit turn into a possible bio-nest? Could every unit represent a fractal? How would such a close and continuous spatial association with plants and their emergent growth patterns affect our outlook? Would we begin to understand them better?

With the knowledge that diversity and resilience of 'growth' in all its manifestations has been crucial for human evolution, would this process lead to a heterogeneous and synthesized urban community? Will it lead to a new language of *dynactic* design hybrids which balance static elements within a dynamic composition? Would it become a precise craft or still hold the uncertainties of living forms? Could this change the way we perceive architecture today, making it fluid, unbound and constantly evolving: the ultimate green variable? Could we learn aspects of integration and emergent behaviour from indigenous vernacular construction methods! Would this green approach further inform and transform other mass produced objects? Could the skins of cars, trains, ships and planes have embedded greens to neutralise their impact on the environment? Could evolutionary computation and new manufacturing technologies simulate such eco-systems for us to 'see' and 'play'? These are just some of the threads worth exploring in this project.

The message here is, we will not step back or cut back on the scale and pace of growth in urban realms but, we can definitely feed life and fertility into that growth and make it a green growth. We can do so by stepping back and redefining our understanding of the quintessential building block: the brick, which has been the substance and symbol of human habitat. The author hopes to explore further and develop this product in the form of interdisciplinary research which draws upon the fields of bionics, smart materials and evolving responsive environments under the larger purview of architecture, computation and ecology.

Glossary:

1. Permaculture: Permaculture is an integrated, interdependent, evolving, multidimensional and creative design response to a world of declining energy and resource availability with emphasis on design processes drawn from nature.
2. Heat Island Effect: The term "heat island" refers to urban air and surface temperatures that are higher than nearby rural areas. Heat islands form as cities replace natural land cover with pavement, buildings, and other infrastructure. The effect is further increased in areas with tall buildings and narrow streets.