α space

ALPHA

Ecological Art
Extreme Gardening

where plants fly beyond the vertical garden

LLOYD GODMAN

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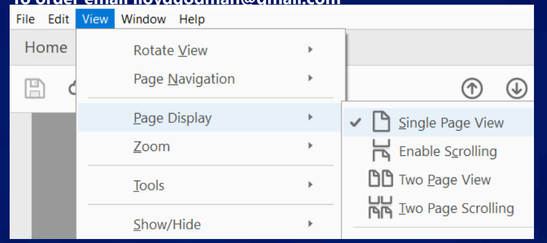

This book is always in progress!
You may find sections that are unfinished, end abruptly and need more attention. Eventually these will addressed.

Art and the built environment cannot be viewed in isolation from each other. The functionality of our finest public and private spaces has always rested on solid aesthetic and spiritual principles; our greatest buildings either showcase challenging artworks or incorporate artistic designs into their very fabric, reminding us that buildings without art are mere shelters.

Artist Lloyd Godman is at the forefront of a modern trend to bring an appreciation of the natural world into our structural domains. Buildings do not rest 'above' or 'outside' a landscape, separated from the surrounding environment. On the contrary, structures interact with the natural world as objects that cast shadows, consume resources and provide rich habitats for life.

Godman's living, plant-based artworks reinforce the necessary connectedness of buildings and the wider environment. Not only do these artworks convey powerful messages and philosophies of sustainable and ethical physical interaction, but they also reach out beyond ideas to become part of the actual structure – as physical objects, Godman's artworks are purifiers of the air as well as the soul, suppliers of colour as well as calmness, and filters of water as well as the human spirit.

..... it is highly unusual for an artist to forge new aesthetic, philosophical and architectural directions through his work; Godman, however, has managed to use his diminutive plants to convey global concepts, and in the process participate in a new wave of appreciation for plants in the built environment.

John Power - October 2011

John Power - Editor of Facility Management Magazine Aug 2011

Contents

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The green fabric that clothes the earth is fraying!

Sadly, through overuse, and mismanaged abuse, the living green garment we depend upon is wearing out. The construction of buildings and urban infrastructure like roads and car parks become "dead pixels" in the living image of the planet. Repairing the old garment by stitching plants into the structures of our cities is a vital option. Incorporating plants into tall building design is an important aspect of this restoration project. But how can this be achieved in a fully sustainable manner?

Collision - From Photography to Photosynthesis

In 1996, my interests as a passionate gardener and photo-based artist that both dated from the 1970s, collided when I made the conceptual connection that plants are actually a form of photography. (photography from the Greek - meaning light drawing). For both photography and plants use the magical, mysterious ingredient that is LIGHT and the essential force that drives life on the planet.

In fact, the largest photosensitive emulsion we know of is the planet earth. I draw inspiration and endless fascination from the awareness that the earth rotates in space and orbits the sun at a precise distance for the sun's radiation to affect the elegant process of photosynthesis through the myriad of plants that have evolved and grow on the planet.

The earth is a three dimensional living abstract photograph. The atmosphere and biosphere are critical factors that mediate the harshness of radiation bombarding the earth and nurture life on the planet that we know and depend upon. The process is an amazing phenomena and something we should revere and vehemently protect.

Image sequences from NASA shows how vegetation grows, dies back, changes colour with the seasons, how the "photographic image" that is our planet alters.

Increasingly human intervention plays a larger role in transforming the image of the globe we inhabit. Imagine foliated land as a photo-sensor (like in a digital camera) that responds to light speeding past the planet. The countless cells of plants are like photo-sensors and continually use this energy source to perform a complex series of functions that mediate the climate and atmosphere in a positive manner for thousands of species, including humans.

Over time the senors in a camera chip can die and become *dead pixels,* in a sense this is what happens when we place a building in the landscape - they become a dead pixel. But the recent initiatives to integrate plants into architecture mean these dead pixels can be revived.

Imagine the earth as a basketball, wrapped in the thinnest paper you could find. The thickness of this delicate paper is equivalent to the atmosphere, and the depth of the paper's texture is thicker than the tallest trees, even thicker than the tallest high rise buildings!

home

planet

earth

Beginnings

From this conceptual intersection of photography and photosynthesis, in 1996, I began by growing images into the leaves of wide leaved Bromeliad plants. Later, I engaged in a series of installations with Bromeliad plants in coal burning boiler houses. (plant rooms) Playing with ideas of dichotomy; the epiphyte and the parasite. Installations at other locations followed, including elevators. Quickly the work evolved into complex, interactive light installations of Bromeliads suspended from the ceiling of art galleries.

At this time I lived very close to the ocean in Dunedin, New Zealand, where I developed a suspended vertical garden of Bromeliads in the entrance to my house that did not need reticulated water. I grew some Tillandsias in trees in my garden where I learned certain species were tolerant of cold salt winds even at this southern latitude.

Through studying the unique biology of these amazing plants and experimentation, I came to realize how they could not only adapt to the harsh conditions of an art gallery's air con system, but to the extreme climate at the top of Melbourne's Eureka Tower at level 92. I came to realize that using living plants in or as art, transcends art as environmental comment and becomes art as an environmental action.

I was inspired by Joseph Beuys's *7000 Oaks – City Forestation Instead of City Administration*, 1982 and set about to explore living plant works as more than environmental comment. Establishing an art practice as an active solution.

Comprehensive documentation of the earlier plant work is in the book ***Working with Plants***.

Cause and effect - Various Alchemic symbols - unmasked state - Feb 1997
botanical photo-imprint on Neoregelia carolinae

In 2005 I moved to Melbourne which involved selling my collection of Bromeliads. This caused a significant disruption in the plant work and it was many years before a had established a large enough collection to begin creating living art works with these plants again.

Plant Room - Installation of epiphytic Bromeliad plants in the Plant Room (boiler house) at the Otago Polytechnic which contains 3 coal burning furnaces for heating the building complex. Dunedin New Zealand - December 1997

Panoramic view of *en LIGHT en* projection installation - Temple Gallery, Dunedin, New Zealand - 1999
tissue paper, 7 interactive projectors, Bromeliad plants, light, soundscape
enLIGTHen was an interactive installation with seven infrared activated projectors and suspended Bromeliad plants that throw shadows onto the large (7.5m long x 3.5m high) tissue paper screens.

From the early 1980s I had an expanding interest in collecting Bromeliads, (a family of epiphytic plants from South America). I began researching the different genera, species and hybrids, the amazing biotic strategies of these plants, particularly the leaf and inflorescence colour change at flowering, the efficient epiphytic system of water and nutrient gathering and retention, and the relationship of these plants to their ecosystem system.

While I had been growing these plants in pots with soil, in 1990 I experimented with suspended wall gardens using Bromeliads at the entrance of my house. I was intrigued how the plants used for this wall garden needed no soil and through regular misting continued to grow.

So it was not surprising that I selected wide leaved Bromeliads like Neoregelias to experiment with growing images into the living tissue.

Genera like Neoregelia, Nidularium, have a rosette form of tightly wrapped leaves that create a vase and hold a reservoir of water. When they begin to flower the leaf area near the centre produces strong anthocyanin pigments, spectacular reds, purples, almost blues. These may take months to form, but the plant retains the colour for up to 6-9 months. As strong light accentuates these colours they were perfect specimens to grow biotic images into, but timing is crucial.

The urban habitat

When we remove vegetation and replace it with buildings and urban infrastructure like roads, car parks, as in our cities, the materiality of the building becomes a what I term a "dead pixel" in the living sensor of the planet. The analogy comes from the millions of pixels in a camera sensor which are active and allow the recording of light levels, which can be interpreted as a photograph. Over time, some of the pixels become inactive and are termed "dead". Images from satellites also show unmistakable patterns of deforestation of not only the expansion of the urban environment, but the resources needed to sustain it, like logging, rural agriculture, mining etc. The green fabric that clothes the earth is fraying.

Sadly through over use the garment we depend upon is wearing out, a brand new covering appears unavailable and repairing the old one by stitching plants into the structures of our cites is the decisive option.

The scale to which our cities have exponentially expanded in recent times demands that we now consider, plan and act to integrate cites, including the tallest buildings, into the biosphere of the planet.

Envisage plants in continual conflict with the geology of the planet. For hundreds of millions of years the bio-force has employed an innate compulsion to cover geology with a green living membrane that supports other life. However, over millennium, natural process like storms, floods, volcanoes, fire, erosion, desertification tear at the green fabric revealing the underlying geology. But from the smallest lichens and mosses to the tallest of trees and epiphytes, plants use the power of light via photosynthesis to fight back with a life force to recover barren landscapes in a continual process.

While this modus operandi of covering, exposing and covering again has always found balance, and may not have been an issue for humans over thousands of years, the scale to which our cities have exponentially expanded in recent times demands that we now consider, plan and act to integrate cites, including the tallest buildings, into the biosphere of the planet. The combined surface of high-rise buildings can provide significant areas to support plants, to weave back the living green fabric. Buildings and urban infrastructure like bridges, lamp posts, communication towers, all have the potential to become support structures for plants and we see this with the expansion of roof and vertical gardens.

To plants, it matters not that the surface is a vertical rock cliff or the façade of a building, a desert or the roof of a high rise. If a species has the ability to germinate and grow in an environment it will find a way to survive and multiply. Recently I found a 400 mm high fig tree that had defiantly germinated and pushed through the pavement in Smith St, Melbourne. Since plants first evolved on the planet there have been epochs where they have flourished and periods where their cover has collapsed, but they have always rebounded.

The Holocene (or recent) is the current geological epoch which started some 11,500 years ago when the glaciers began to retreat. This retreat marked the end of the glacial phase of the most recent ice age. Its character was set by the spread of forests as the ice retreated. In more recent times as mankind's demand for rescources timber and agricultural land grew they have shrunk again.

People have been deforesting the tropics for thousands of years for timber and farming, but now, nothing less than the physical transformation of the Earth is taking place. Every year about – an area the size of England and Wales – is felled. In just 40 years, possibly, the equivalent of Europe, has gone. Half the world's rainforests have been razed in a century, and the latest satellite analysis shows that in the last 15 years new hotspots have emerged from Cambodia to Liberia. At current rates, they will vanish altogether in 100 years.

The Gaurdian

Although we think of the current Holocene as a warm climate for the planet, we are actually still in an ice age. This is indicated by the presence of ice caps at the poles - the planet as a whole is just in an interglacial phase and the climate has been significantly hotter before.

Drawing from Nature

The divergent interface of the urban environment and wilderness had surfaced much earlier in my work as in this image from the series *Drawing From Nature* - 1987 - 2002. This series of works combined photographs of real urban environments juxtaposed against imagined drawings. Key visual elements of the black and white photographs mounted on a large sheet of paper expanded as pen and ink drawings across the broader ground into natural subjects like rocks, water and plants.

At the time I wrote:

"While the building materials of modern city are concrete, glass and steel, the structure of wilderness tracts are from the ancestral elemental symbols earth, air, water and fire. Their manifestation being in the form of moist rich soils, remains of the generations before; great swirling clouds, driven from the very breath of the planet; free flowing rivers and streams musical in their search for an end; and great rocks and ash, reminders of volcanoes and lightning strikes, a fusion of this unity-in-complexity of organic form presents a visual challenge created over the millennia into the areas we call wilderness. A prolonged period of several days or more in this environment presents the possibility of becoming sensitized mentally to the visual irregularities and unfamiliar rhythm of patterns of the surroundings. This unaccustomed sensory stimuli may result in an overload of the cerebral conditioning, demanding a rectangle or at the very least simple straight line. However given more time and an open sensitivity to the 'here and now' we can reach a point where, confronted suddenly with a small rectangular sign post or similar object, amongst the inter-weave of variegation, we feel jarring of the organic rhythm and the sign may emerge as alien as a cosmic-string".

1992

An e publication of this work is available.

Integrating plants into the built environment improves air quality, moderates temperatures improves human well-being, lifts the spirit and can provide habitat for other species. In March 2015, it was promising to see a law passed in France, which mandates that rooftops and walls on new buildings built in commercial zones must either be partially covered in plants or solar panels.[1] I believe soemc ities in Japan have recently followed. This mandate draws a line, whereby inspiring contemporary architecture will be measured by the successful integration of living green texture into the fabric and form of the structure.

Imagination and experimentation have driven a welcome expansion of roof and vertical gardens in recent years. The urbane tall buildings we now see may quickly become historic symbols of a past age, when architecture was less connected to nature.

But how can this greening of tall structures work in practice? Present vertical garden systems have limitations, can be expensive to both install and maintain, present risks, require energy, use depleting phosphorus supplies and demand constant maintenance. In fact when a full analysis is undertaken they may even have a perverse affect. So, as a compliment we need to develop sustainable systems for more demanding situations like high-rise development, we need to explore "extreme gardening".

While the iconic Patrick Blanc gardens on the award-winning Parisian architect Jean Nouvel's 1 Central Park Building, Sydney, Australia are certainly impressive, the installers offer a cautionary word. The associate director of green-infrastructure design specialist ASPECT Studios Warwick Savvas — which collaborated with Oculus on One Central Park— stresses, projects must be sustainable, practical and, importantly, fall within budgetary and financial constraints. "We can't have Central Parks rolling out across the city," says Savvas, who points out that it takes six permanent staff just to maintain the towers' vegetation at an annual cost of $250,000." [2]

Other sources have estimated the full annual cost may actually be closer to $700,00. It is suggested that in periods of extreme weather, at times gardeners have been on the building replacing dead plants 24 hours a day. In 2020 maintenance costs for the building are rumored over $1,000,000.

A section of the Patrick Blanc, gardens on the award-winning Parisian architect Jean Nouvel's, 1 Central Park Building, Sydney, Australia

The success of humanity to constantly develop more sophisticated means of existence via an exponential growth in technology has seen the population and consequently the physical scale of cities explode. In 1927 the global population was calculated at 2 billion, by 1960 it had reached 3 billion, 1974 - 4 billion, 1987 - 5 billion, 1999 - 6 billion, 2011 - 7 billion and by 2023 it is predicted to reach 8 billion. Not only has the urban environment grown, but with it the demands of a resource hungry population have placed extraordinary pressure on the natural environment to the point where scientists suggest a mass extinction is eminent. However, along side the growth of humanity sits an ominous rise in an invisible gas that affects the climate, CO2 levels.

While it can be argued that the rise in what might appear to be an innocuous gas has always fluctuated as has the climate, the modulations need to be seen in the context of human civilization. Earth's last ice age began receding about 12,000 years ago. The warmer and more stable climate that followed allowed for the rise and expansion of human civilization. This important period encompassing the past 12,000 years is referred to as the Holocene geological epoch. The Neolithic Revolution, beginning around 10,000 BCE, saw the development of agriculture, which fundamentally changed the human lifestyle and critical to this was a sympathetic and relatively stable climate.

The geological history of the earth, that reaches back over 4 billion years, is entering an entirely new phase. The earth is in the Anthropocene or the epoch of humanity. The Anthropocene concept suggests that humankind is the new geological force transforming the planet beyond recognition, chiefly by burning prodigious amounts of coal, oil, and natural gas, and actively engaged in unsustainable deforestation. The Anthropocene also embraces the chemical "DNA" of new sedimentary layers deposited molecule by molecule on lake beds and the sea floor, which carry a synthetic chemical imprint from the new chemicals concocted over the past century, many poisonous to organic life. As these complex chemicals have never existed before, they are embedded as a distinct mark of the Anthropocene man-made in layers of embryonic stone.

The key markers of these changes are:

1. AIR TEMPERATURES OVER LAND ARE INCREASING.
2. AIR TEMPERATURES OVER OCEANS ARE INCREASING.
3. ARCTIC SEA ICE IS DECREASING.
4. GLACIERS ARE MELTING.
5. SEA LEVELS ARE RISING.
6. HUMIDITY IS INCREASING
7. OCEAN HEAT CONTENT IS INCREASING.
9. SNOW IS DECREASING.
10. EARTH'S LOWER ATMOSPHERE TEMPERATURE IS INCREASING.

With growing urgency, scientists are warning the astonishing aspect of this dramatic transformation is the scale and pace at which it is happening and there are tipping points which are when crossed spell catastrophic disaster.

Play structures found in a forest, Lubek, Germany 2019

Cities and Rivers

It is no coincidence that the great cities of the ancient world established near rivers. The ancien Egyptians established Cairo, Khartoum, Aswan, Luxor (Thebes), and Giza along the Nile. The Cephissus river, the Ilisos and the Eridanos stream are the historical rivers that flowed through Athens.

In the modern world we see large cites near rivers and particularly where rivers meet a lake or flow into the ocean. London on the Thames, New York at the mouth of the Hudson River, Tokyo the Sumida River. Beijing China, Melbourne Australia, Paris France, Mombai India , Buenos Aires, Argentina, Capetown South Africa all have rivers.

Generally, cities built near water have two main advantages: commerce and stainability. Rivers, lakes and the sea provide food and other resources, which help the population of these cities to grow and expand faster than landlocked settlements.

Across the globe, there are different river systems. Some rivers start as small streams in higher altitudes feed by melting snow, ice from glaciers, locations where there the terrain is largely rocky and steep with little vegetation. As they flow downward to the coast the gradient becomes less with the land opening out into wide expanses of fertile land. Typical examples are the Himalayan glaciers, which are called the third pole, in the Indian subcontinent which are broadly divided into the three river basins, namely the Indus, Ganga and Brahmaputra. The Andes mountains in South America, where many Tillandsias grow, also have a similar river system.

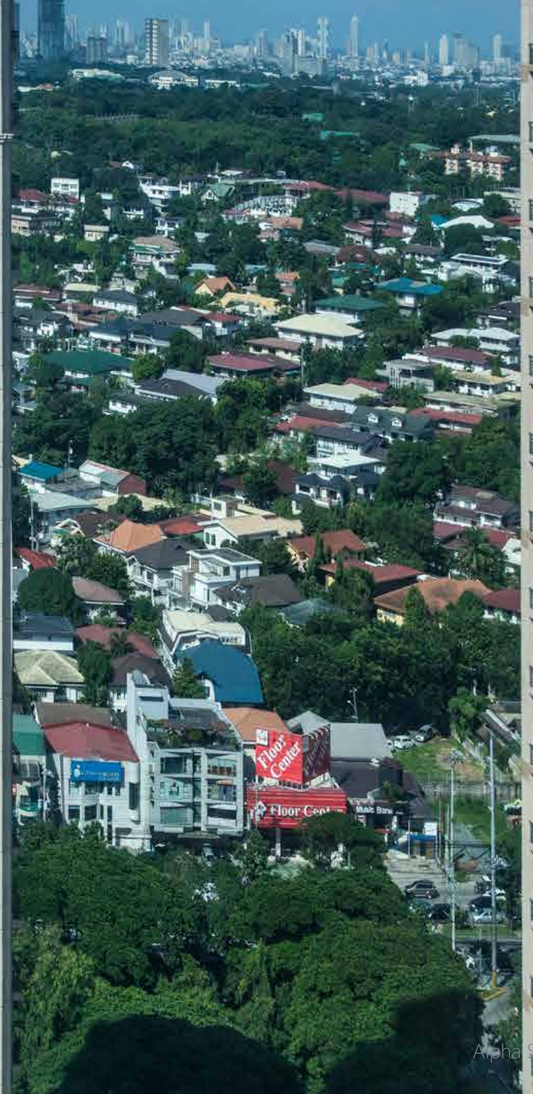
At the highest elevations, plant life is sparce, with limited species that are often tiny but resilient plants. The moving water carries minerals further down stream and deposits nutrients from soil at lower elevations where a greater range of plants grow. The process creates alluvial deposits on even flatter areas which are highly fertile for growing crops. While floods can erode, the torrents of water also deposit huge amounts of fertile material in a very short period of time along river banks. Because of the deep soil deposits that were created over millions of years and a reliable water supply, before human habitation, the surrounding areas were covered in the most luxuriant forests.

It is here, along rivers on these highly fertile areas, that many cities established. However, ironically, as cities have expanded these forests were cleared for agriculture then later the fertile areas were built upon, covering vast areas of highly productive land with concrete and asphalt and rendering it useless. With population growth the scale of large cites has continued to consume larger areas of arable land to the point where the World Wild Life Fund now estimates that over half of the worlds top soil has been lost.

These verdant areas that moderated the climate keeping it warmer in winter and cooler in summer, have largely been replaced with concrete canyons. I call areas of high density high rise buildings that resemble canyons, *cityons*. The towers of concrete and glass alter the climate in a number of ways. They create what is termed heat islands in summer increasing temperatures significantly and they create wind tunnels that amplify wind speeds. In latitudes that have a distinct winter, high rise building create areas of dense shade which means that some areas may not receive direct sun for months. These factors impact dramatically on the resilience of plants we might aspire to grow in a city.

Typically, reticulated vertical gardens are designed on paper, or a computer screen where various plant species are placed to create an aesthetic design. It is easy to be seduced by these impressive futuristic rendered images, however realizing the vision is more difficult. Any plant or garden is only as good as the most extreme weather event it can endure; an extreme once in a 100 year weather event can annihilate a planting in hours. Often greater consideration is given to the number of species to create the desired effect rather than specific plants that are resilient and will actually grow in the situation. With the prediction of more extreme weather events spurred on by a chaning climate, what might grow in a wall garden now may be totally inadequate in ten years.

Covering these towers to the highest elevations in plants can be done but it requires critical plant selection based on observations of similar environments in nature.



Over hundreds of millions of years, plants have evolved an innate drive to cover the planet's geology with foliage. While the diversity of species within the kingdom PLANTEA is vast, there are still areas of the planet exist where plants fail to grow. Incrementally tiny plants, lichen an mosses, begin to grow over the rock surface of the planet. This creates a more sympathetic environment where slightly larger and more sensitive plants can grow, which again creates another environment where even bigger plants can grow. Examples are see at the very top of a mountain or where plants have established along at the edge of the ocean. The line between ocean and land creates a dead zone where little grows. Plants establish above the tide mark and in the salt water, but little in the intertidal zone.

The importance of vertical gardens

From simple organisms, evolving through millions of years to complex biological systems, vegetation has employed an innate compulsion to cover the planet with a living green membrane that supports all other life. Plants have waxed and waned in their fight to cover geological surface since the Ordovician period (495 million years ago), and as we progress through our current era, the Anthropocene, it is evident that human actions are the primary determinant for the survival or extinction of species. The exponential rate at which our cities have expanded demands that we now plan and act to integrate our urban centers into the biosphere of the planet. The combined surface of high-rise buildings and other urban infrastructure can provide significant areas to support plants, to weave back the threads of green fabric.

Integrating plants into the built environment improves air quality, moderates temperatures (Saadatian et al 2013) improves human well-being, lifts the spirit (Townsend & Weerasuriya 2010) and can provide habitat for other species (Oberndorfer et al 2007). In March 2015, it was promising to see a law passed in France, which mandates that rooftops on new buildings built in commercial zones must either be partially covered in plants or solar panels. Other cities are embracing similar policies. This mandate draws a line, whereby architecture of the 21st century will be measured by the successful integration of living green texture into the fabric and form of the structure. Imagination and experimentation have driven a welcome expansion of roof and vertical gardens in recent years. The urbane tall buildings we now see may quickly become historic symbols of a past age, when architecture was less attuned to our desire to encourage nature in oyur cities

Vertical Garden Systems
Utilizing living plants as an effective façade poses many problems. Unlike metals, glass and concrete, which are inert, plants require nurturing. Concerns over increased maintenance costs (Zhang et. al. 2012), damage to façades and increase loading on structural systems (Wood et al. 2014) are barriers to the implementation of green roofs and walls. Zhang et. al. provide a succinct definition of "intensive" and "extensive" green roof systems.

Intensive green roof systems are characterized by deep (greater than (15 cm]) growing media, opportunities for a diverse plant palate on the rooftop, high cost and maintenance requirements . The intensive green roofs are being replaced by extensive green roofs, which have a much thinner, lighter media (thus fewer structural requirements), and different plant choices. Building on Zhang's categorization of green roofs, the we propose that incorporating vertical gardens into a building's design can employ two systems, which are adaptive or selective.

Adaptive systems
Analogous to intensive green roofs, adaptive vertical gardens require the environment to be adapted to support the plants' biological demands, which will vary depending on the eco-physiological characteristics of the selected species. This condition is met by mesh-mounted plant growth substrate, irrigation and fertilization. The benefit of adaptive systems is that they allow a greater selection of species, however, they have limitations, including the cost of installing and maintaining structures to support plant growth substrates (Perez et al. 2011).

Selective systems
Akin to extensive green roofs, selective systems use critical species selection to identify plants that naturally grow in environments similar to those encompassing an existing building's façade. They have the advantage of reducing or entirely eliminating the requirement for plant growth substrate and associated installation and maintenance costs; the limitation of selective systems is a reduced plant palette.

Our research, experimentation and plant systems are based on this premise: select species that naturally grow in a particular urban environment, fix in place and largely forget. Where as the maintenance on an adaptive system can be monthly, some Tillandsia installations have been installed for over 6 years with no maintenance at all.

Firstly I must point out that not every vertical garden or roof garden is riddled with problems, but there are problems that can arise and it is valuable to look critically at the potential and experienced problems to see how they compare to the use of Tillandsias in urban environments.

Understandably the vast majority of publications like magazines etc. present vertical and roof gardens in a positive light with seductive hero photographs that present the gardens at their very best. I have been studying and photographing these urban plantings when ever I encounter them, often returning to the same garden over a period of years building up a visual resource that offers a guide as to the success of the gardens. I have looked beyond the wow factor and looked critically at how well the gardens are preforming, I have asked questions of those working on the gardens and snooped around the back to see what is behind the scene.

The following is what I have found and some of my conclusions.

With the suspended air plant sculptures like those installed for the *Airborne* project 2013, we are interested in exploring how plants can occupy space but not surface. Suspension on and via wires extends the potential habitat of plants into what we term ***Alpha Space***. While vertical and roof top gardens have become popular in major cities worldwide, they occupy surface, but these intriguing ground breaking air gardens step beyond earthly confines to rotate suspended in air or Alpha space.

For many decades, my work had been termed environmental art. But more recently this term has been claimed by artists who create virtual environments. Ecology is the branch of biology dealing with the relations and interactions between organisms and their environment, including other organisms. I experiment using air plants within both ecology and an art context. The 22 March, 2015, online edition of The AGE newspaper, termed the experiments on Eureka tower as "Extreme Gardening". It was such a great concept for what we are doing with the Tillandsias within the urban environment, we decided to adopt it.

ASAPS - alpha space air plant systems
This is a system of integrating plants into the built environment in a unique and sustainable manner that far exceeds the possibilities of existing vertical garden and roof garden systems. Most vertical gardens rely on the reticulates use of gravity to trickle down the wall to a trough where they are collected and pumped back up to be dripped down again. In effect they are a form of hydroponic gardening. However once the garden breaks the gravitational law and leans past vertical the reticulates fall of the wall and land on the pavement below.

We identified an affect called *tracking*, where although the wall garden is vertical the water tracks off the wall via a leaf or plant structure and then falls to the ground below and is lost. I have witnessed this on many vertical gardens including the iconic Patrick Blanc's Quai Branly Jacques Chirac Museum, Paris. More concerning is when the reticulateants track off the wall onto concrete or structural steel. Phosphates in the water will attack and actually dissolve steel. I have witnessed this on a wall garden in Melbourne where the liquids have run onto the structure of the building and stripped the galvanized layer for steel beams. Unchecked the liquids will eventually compromise the structure.

Because some species of Tillandsia plants can grow on almost anything they can be used to create 3 dimensional forms, across spaces to create shade without the need or risk of reticulants.

SO, WHAT ARE THE DIFFERENCES?

LOCATION:
ASAPS can be located in places that other plants simply cannot including beyond vertical and across open spaces. In most locations ASAPS require NO auxiliary watering and nutrient reticulation system .

MAINTENANCE:
Unlike vertical gardens where maintenance schedules and costs can spiral out of control, ASAPS actually have the potential to generate an income for the building owner. We have had Tillandsias installed for over 6 years with no maintenance at all. It needs to be noted that although the weigh is very much reduced, the weight gain is exponential and at some point needs to be reduced.

The Patrick Blanc designed vertical garden installed in at Melbourne Central Station in 2008, was decommissioned because of maintenance costs. Staff who worked on the garden suggested that it became obvious after the first 3 months of its limited life the cost and effort could not be sustained. There location offered reduced levels of light and to supplement this huge grow lamps were installed to augment the daylight. One section of the garden was planted with Vrieseas (a genus of Bromeliad). While these are hardy resilient plants, they uptake water via their leaves. The garden was in doors under glass, the only watering system at the garden was reticulation at the roots, so the slowly plants died. They were replaced several times, before a friend of mine was invited to offer advice. He suggested changing the species, but was told "that is Patrick's design so they are the plants that have to be planted there.

I spoke to someone in Melbourne who runs a business maintaining vertical gardens who stated that the garden vertical garden on the Triptich Building in Melbourne only needs attention once or twice a year. However, I caught up with a team of gardeners who were maintaining the garden and quizzed them about the maintenance schedule. Their reply, "we are here regularly, at least every two months". I discovered an in-door vertical garden in Australia is given attention on a daily basis.

Ronald A. Wood suggests for a large installation, "A site visit every two months would be considered minimal; to expect 1-2 times per year is unrealistic for living plants. All building services require regular maintenance and is a cost to the tenants, including, but not limited to air-conditioning, elevators, swimming pools, external window cleaning and general maintenance."

WEIGHT:
Depending upon plant density, ASAPS weigh about 3 -5 Kg / m2 which is considerably less compared to vertical garden systems

The density of water is 1 kilogram per liter (kg/L) at 39.2°f /4.0°c, and reticulated systems need water to operate. The weight can build up to 60 – 90 Kg / m2. Besides this there is the weight of the infrastructure to support the garden and then the accumulating weight of the plants.

We were contacted by someone from Sydney who loved the idea of a roof garden on her block of flat but was advised the structure was oiut of the question as it could not support the weight. We are exploring how we can do a roof garden there with Tillandsias.

ANIMATION:
Because of the light weight, screens of air plants can be created which move across windows and skylight for heat mitigation. I have seen a video of an animated reticulated vertical garden which looked cumbersome. It required heavy duty winches to move it and there was also the complication of moving water hoses etc.

PLASTICS & FIRE RISK:
Unlike other vertical garden systems ASAPS have NO plastic components. Early vertical gardens used organic felt made from wool and other natural fibers as a growing medium. The idea was to continually trickle nutrient laden water down though the fibers so the plants fine roots would grow to establish an intricate netted maze that would secure the plant and also allow the plant uninterrupted access to water and nutrients. This is somewhat like we might see at the edge of a stream or waterfall in nature. However over time the felt deteriorated and it was superseded by synthetic felt. This medium is created by stripping PET plastic into millions of fine micro fibers. While PET does not rot and break down like the organic felt, it loads the wall with flammable plastics that can produce toxic fumes in a fire. The construction of some vertical gardens that use this system design an air gap between the felt and the facade of the building to prevent water entering the building. This produces a chimney effect that combined accelerates any fire that might take hold. The assurance is that with liquids continually flowing the chance of fire is remote. However water supplies to such gardens have proved fallible, sections of plants have died and there are records of vertical garden fires.
PET is sensitive to UV light, especially at elevated temperatures, under high humidity, and in the presence of oxygen, all of which are present when PET fibers are exposed a reticulated system. The fine fibers can break off and become part of the reticulated water system before they are purged into a water way.

PATHOGENE RISK:
Unlike other vertical garden systems, the use of Tillandsias pose NO pathogen risk. There are two types of risk: one to the vegetation, the other to people and animals. Legionnaires' disease is an example that can affect humans. It is a severe form of pneumonia — lung inflammation usually caused by infection. It's caused by a bacterium known as legionella. Most people catch Legionnaires' disease by inhaling the bacteria from water or soil. The bacterium Legionella pneumophila is responsible for most cases of Legionnaires' disease. Outdoors, legionella bacteria survive in soil and water, but rarely cause infections. However, legionella bacteria can multiply in water systems created by humans, and a typical example is air conditioners. In the case of a closed loop reticulated vertical garden, there is potential for the bacterium to reach elevated levels. As older adults, smokers and people with weakened immune systems are particularly susceptible to Legionnaires' disease, some planners do not recommend reticulated systems be installed in associated hospital situations.

To address this problem the reductants are often purged on a regular basis and released into waterways. However the purged liquids can present another environmental risk. Depending upon the nature of the garden construction, they often contain plastic microfibers from the root medium and high levels of nitrogen and phosphates, all of which can have detrimental effects on waterways. In terms of plants, diseases that disperse in water are likely to proliferate at a higher rate in vertical gardens. The natural flow of water might carry water-borne pathogens from the top of the garden to the bottom. If a plant disease occurs at the upper part of a vertical garden, it will most likely spread to every plant below. This can be a reason for whole sections of a vertical garden to suddenly perish. On the ground, this type of disease spreads at a slower rate since it can only travel as far as the flow or splash of water.

CAM CYCLE:
Tillandsias used in ASAPS are one of few plants to use a CAM cycle to grow at night when most plants are in active.

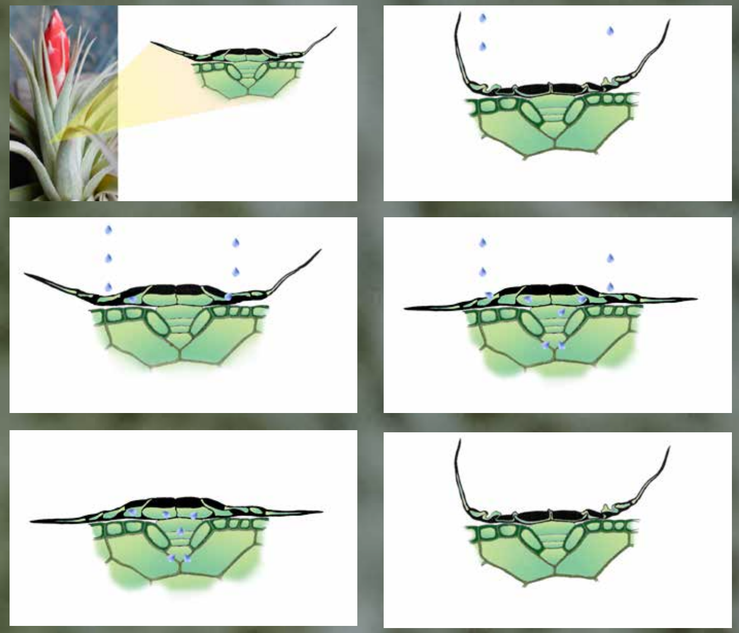
Biology of Bromeliads

Bromeliads are a recent addition to the plant kingdom and have displayed a tendency to evolve as xerophytes and epiphytes; that is they thrive in dry conditions and grow on other plants, rocks or some other support system. In doing this they have developed several sophisticated biological systems that make them ideal for incorporating into the urban environment. An analogy we might draw with their biology, is they are like driving a modern car compared to a vehicle from the 1950s with more ancient plant families. When we talk of Bromeliads, we mean a family of plants totalling more than 3,000 species across more than 50 genus of which Tillandsias are but one genus. The diversity of plants within the family grow from humid tropical areas on the coast to dry harsh environments many thousands of metres up on vertical cliff faces. Some genus and specific species of plants have developed the special biological systems to greater degrees than others, so it is important to understand that not all plants within the family or a genus will thrive in every situation.

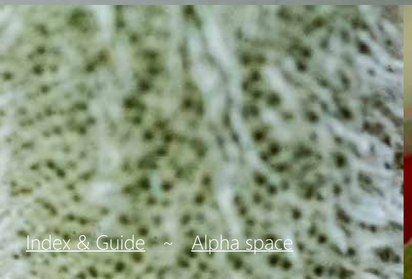
Trichomes

Bromeliad leaves have a covering of tiny cells called trichmes that allow the plant to up take water through this cell into the internal tissue. The familiar pineapple is a Bromeliad and the small silver cells seen on the leaf are trichomes. The most extreme example of trichome development is seen in Tillandsias or air plants, which in many species have completely discarded roots as a means of nutrient and water absorption relying entirely on leaf intake through the trichome.

The tiny cell is like a bowl which in this form closes the pores that absorb the water. When any moisture hits the cell it opens instantaneously to a plate shape, the pore openings are released and the moisture is channelled into the plant. As it dries the plate returns to a bowl and locks in the gained water. Some species are so efficient in this process that they can enact it just through differences between the internal humidity of the plant and the humidity of the atmosphere. In fact there are some Tillandsia that grow in areas where it has not rained for decades. As well as absorbing water and nutrients, they can also take in heavy metals from the atmosphere through the leaf and have been used in urban environments as biomonitors to track pollution levels. Biologist David Benzing, who wrote the Biology of Bromeliads and has been a supporter and consultant in our work with Bromeliads, carried out biomonitor experiments with Tillandsia on highways in Florida to gauge lead levels in the 1980s. Since then Tillandsia have been used in other countries to track pollution levels. Tillandsias can also offer a means of heat mitigation within the urban environment. The trichome is seen as a silver cell and is also a great reflector of radiation; in some species the cell can reflect 93% of the radiation falling on it.



In dry conditions, the trichome cell of a Tillandsia curls up and closes the ducts that take in moisture. When it rains these cells change shape and open the ducts allowing water to flow into the internal cells. As the plant drys out the cells changer shape again closing the ducts which retains water in the internal cells.

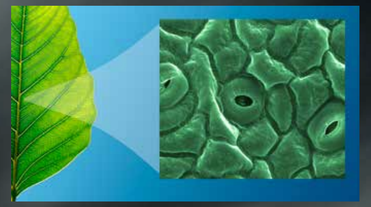


CAM Cycle

The other biological trick Bromeliads and some other plants like succulents, cacti and some orchids have evolved is a CAM cycle (crassulacean acid metabolism), whereby they actually grow at night. This is a reason succulents and cacti work well on many roof gardens where they are subjected to harsh daytime conditions.

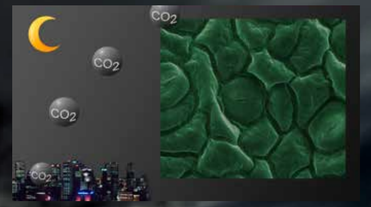
All plants have a stomata which takes in CO2 and releases oxygen, however as a by-product of this purifying gas exchange, moisture is transpired from the plant tissue into the atmosphere. Most plants have this cell open during the day and consequently, on a hot, windy day the plant may not be able take enough water through the root system to maintain the required transpiration at the leaf, the foliage dehydrates and in extreme situations dies. However by using a CAM cycle, the stomata is closed during the heat of the day and only opens at night when there is less heat and radiation from the sun.

This means that unlike most plants, CAM cycle plants capture carbon and produce oxygen at night; in the process they are very efficient at water retention. Pollution levels in cites peak in the evening with the return commute and plants fail to uptake CO2, so CAM plants can offer a great contribution in maintaining urban air through a 24 hour cycle.

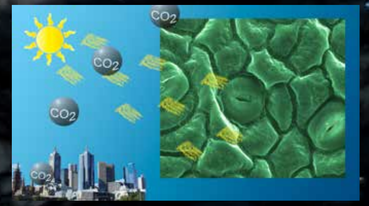


All plants have a stomata, which is an open cell plants use to uptake CO2 and release oxygen.

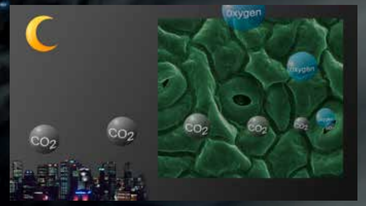
As part of this gas exchange, water is transpired, this is why many plants dehydrate in hot windy weather during the day.



In most plants the stomata is continually open or closes at night and they uptake CO2 during daylight hours but cease when darkness comes. This is a reason pollution levels in cities rise at night.



CAM plants like Bromeliads close their stomata during the day to retain water



Then at night CAM plants like Bromeliads open their stomata during the night and reduce transpiration significantly

projects in ....

With the suspended air plant work, we are interested in exploring how plants can occupy space but not necessarily surface. Suspension on and via wires extends the potential habitat of plants within the urban environment in what we term α space (Alpha Space). While vertical and roof top gardens have become popular in major cities worldwide, they occupy surface, a roof or wall, but the Airborne project for City of Melbourne Arts 2013, proved the intriguing and ground breaking concept that air gardens can successfully step beyond earthly confines to even rotate suspended in air or α space.

These suspended three dimensional rotating air plant sculptures we have been creating also throw intriguing animated shadows on the ground and or walls which reflect the changing position of the sun.

Existing urban infrastructure, like lighting poles, communication towers, bridges and fly overs can easily be adorned with these plants contributing in purifying the atmosphere, without adding risk to the supporting structure. The concept of α space extends to the utilization of existing urban infrastructure as a means of support for plants like Tillandsia

Utilizing a modular system, Tillandsia plants might be suspended across an open public space like a plaza during summer where shade is welcome, and then simply moved onto a building's façade for the cooler winter months when sun is welcome.

Experiments in Melbourne, Australia

Experiments with Bromeliads continued on simple wire screens, testing the plants to see how they preformed on different aspects of a building. Some were covered with a wider range of species across many genera, like Aechmea, Neoregelia, Billbergia, while others were adorned just with Tillandsias. At this time I also began creating simple recycled structures like bicycle wheels adorned with plants that suspended and naturally rotated on the wind. Adding to the visual complexity, when these rotated abstract animated shadows were case on the ground,

In 2005 I moved to Melbourne and once again began collecting and experimenting with Bromeliads in a quite different environment. While it took years to re-establish my collection, I directed more of my experiments to xerophitic Tillandsias which were drought and heat tolerant. At the Baldessin Press where I live, about 40km north-east of Melbourne, I created modest plant sculptures which are suspended in the air between buildings and trees adorned with Tillandsia, like the first version of "Entropy Spiral", 2008. These works have largely been left to their own devices to grow over several years. The "Entropy Spiral" work has constantly endured hot periods up to 46 degrees Celsius and long periods of little moisture, but thrived while demanding no maintenance for 8 years.

In early 2010 the first suspended rotating air plant sculptures were developed. These were simple structures utilizing recycled bicycle wheels embellished with Tillandsias suspended on swivels that rotated on the breeze casting animated shadows onto the ground. From this success, I was inspired to experiment further with these living plant sculptures, to bring them into the public domain in urban environments.

A suspended screen of Bromeliads. Note the screen sits out from the wall and at certain times of the day throws abstract shadow patterns against the rendered wall. 2011

Entropy Rotation I - Rotating suspended tillandsia plant work
Baldessin Press Feb 2011

Entropy Rotation I - Rotating suspended tillandsia plant work
Private Garden June 2011

Initially these were simple rotating wheels but developed into [illegible] elements that could rotate independently on the wind.

Energy Architecture

Early in 2008, while on a trip to Adelaide I called in to see Stephanie Britton, Editor of Artlink at her office. Just down the hallway is another office, here Stephanie introduced me to John Maitland of Energy Architecture who is interested in Green Architecture and for some time we talked over the potential of integrating Tillandsia into the façade of buildings.

Later in the year John was in the process of designing a multi story building at Mawson Lakes with a green atrium in the center of the building that he was considering using plants as a means to cool the building.

He emailed me the plans and asked me to sketch out some ideas on how Tillandsias might be integrated into the façade The building was an innovative design in that on the north side it lent forward and was angled, which would allow light and sun in winter to strike the facade, but created shade in the hottest time of day in summer. He was wondering how it might be possible to use Tillandsia on this façade. I worked on the idea of a series of blocks of plants on the façade, each with a cable adorned with Tillandsia suspended to a central point at the top right. These would span across the open space created by the angled façade.

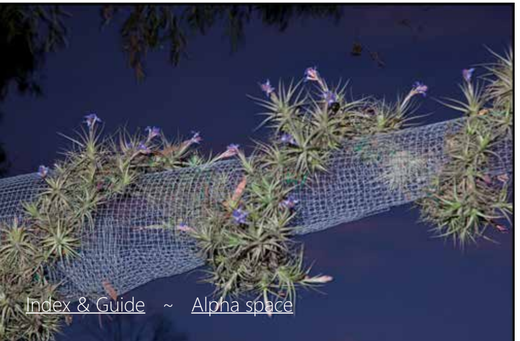
This would have created changing shadow patterns across the window, but also allowed the residence to experience the plants as they grow, and flower. John actually won an architect's award for the design, but did not get the contact, so unfortunately we never got to realize the project.

However it did open the way for a number of future projects with the plants attached to suspended cables. Tillandsias used in this manner can offer a means of heat mitigation within the urban environment. The silver trichome cell which adorns many Tillandsia species is also a great reflector of radiation; in some species the cell can reflect 93% of the radiation falling on it.

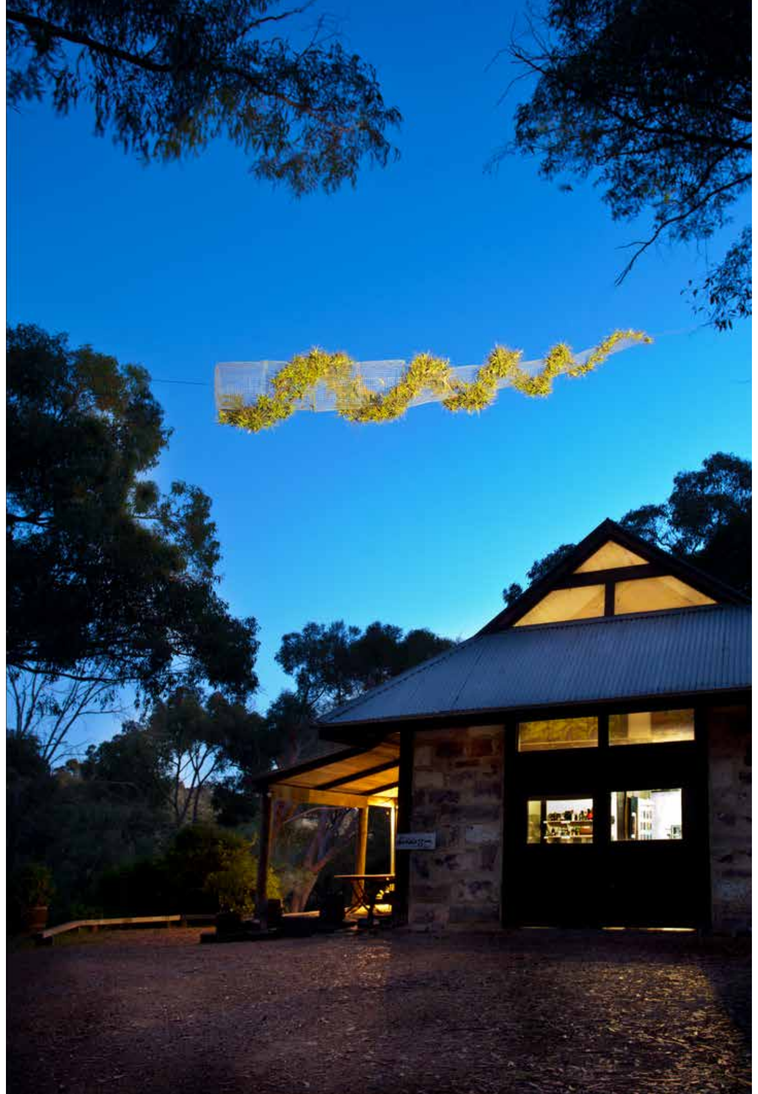
John and I continue to communicate and trust that sometime in the future we can complete a project together.

Entropy Spiral I-II-III

As xerophytes it was not surprising that experimentation with the Bromeliads was proving that various Tillandsia and Billbergia species were growing well in the heat and extended dryness of the St Andrews climate at the Baldessin Press where now lived. I retrieved a section of galvanized mesh from the local recycle shed - or as we called it Gods Drop Box, and was urged to create a structure to fix the plants to in the form of a spiral and suspend this high in the sky. The elongated cone shape was made quite quickly and in some regards flippantly, but has proved durable to the wild wind and elements. As the Tillandsia have continued to grow they have attached themselves via aerial roots not only to the structure but to each other. From installation in 2008 until 2014 no plants have been lost from the form and apart from removing plants with seed heads, no maintenance has been need during this time. The experiment has proved a model for moving my work art as an action and a super-sustainable practice.



Index & Guide ~ Alpha space



Entropy Spiral, living plant work, Baldessin Press Studio. The center photograph, taken in 2011 gives a comparison of growth to the photograph above taken in 2016 where the Tillandsias are forming great clumps and destroying the spiral form by almost merging. As the spiral morphs into a cone, I find it intriguing how nature will eventually subvert and over take our intentions. At this point the sculpture consists of thousands of plants can be left to grow on or can be harvesting to not only retain the original spiral form but to create new sculptures from.

Left top & centre: An early version of *Entropy Spiral* when it was broken in 2 segments
Left bottom: *Entropy Spiral* in flower

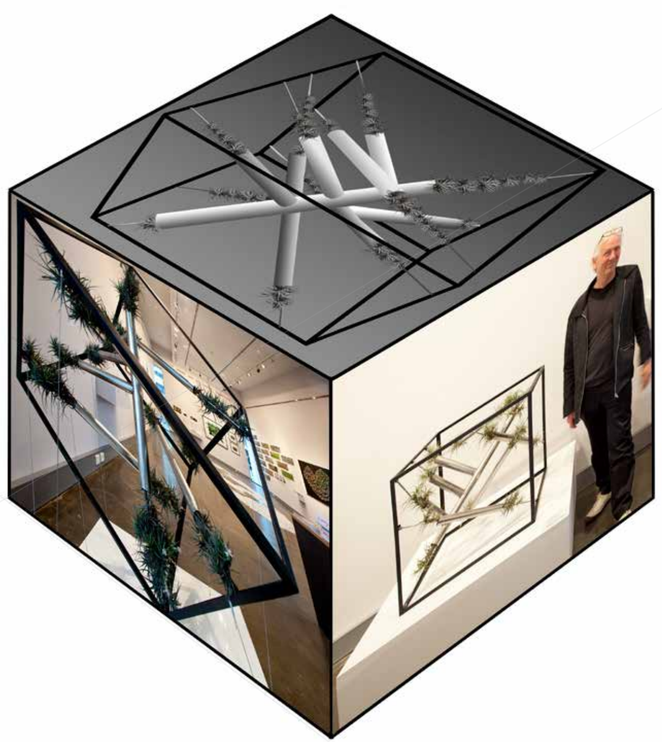
Expanding Dimensions

For a number of years, Deakin University had offered a small sculpture acquisitive award and I contemplated submitting work combining Tillandsia plants and the concept and application of super-sustainability. Initially I looked at the idea of a series of stainless steel tube structures suspended between that gallery and adjacent buildings. The concept was that over time the plants would grow and break the allowable physical limit of the award entry - 900 x 900 x 900. However after some discussion with Leanne Willis the director of the gallery, who was intrigued with the concept, it became obvious that the work would have to be free standing or sit on a plinth. So I decided to creates a linear steel cube to suspend t he tubes from via tensioned cables and attach to the plants to the cables. This would allow the work to be placed on a plinth for the duration of the exhibition but would afford other presentations like suspension in the future while retaining the potential of the plants growing beyond the dimensions of the sculpture award rules.

Expanding dimension is a super sustainable plant sculpture that combines the incongruity of industrial conduits, drains, pipes, exhausts, with Tillandisas, which are unusual xerophytes; epiphytic plants that reverse the day night cycle of photosynthesis and have special moisture absorbing cells called trichomes. Obliquely the super-sustainable work, also references organic structures of arteries, veins, membranes and epidermis. The work is a suspended living and growing garden.

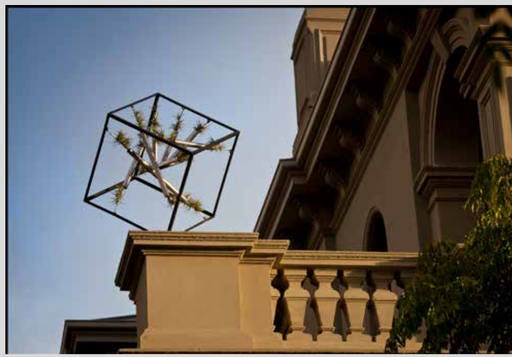
To fulfil the dimensions of an entry into the 2010 Deakin University small sculpture Art Award the work needed to be no larger than 700 w x 700 L x 700 H. However over a period of years the Tillandsia plant aspect of the work will grow larger than the original dimensions. The plants will grow down the wires that may ultimately suspend the work between buildings at an exponential rate.

Expanding dimension - An installation for FM magazine photo-shoot Camberwell Grammar School, Melbourne - 2011
(the image was used as a double spread in the magazine)



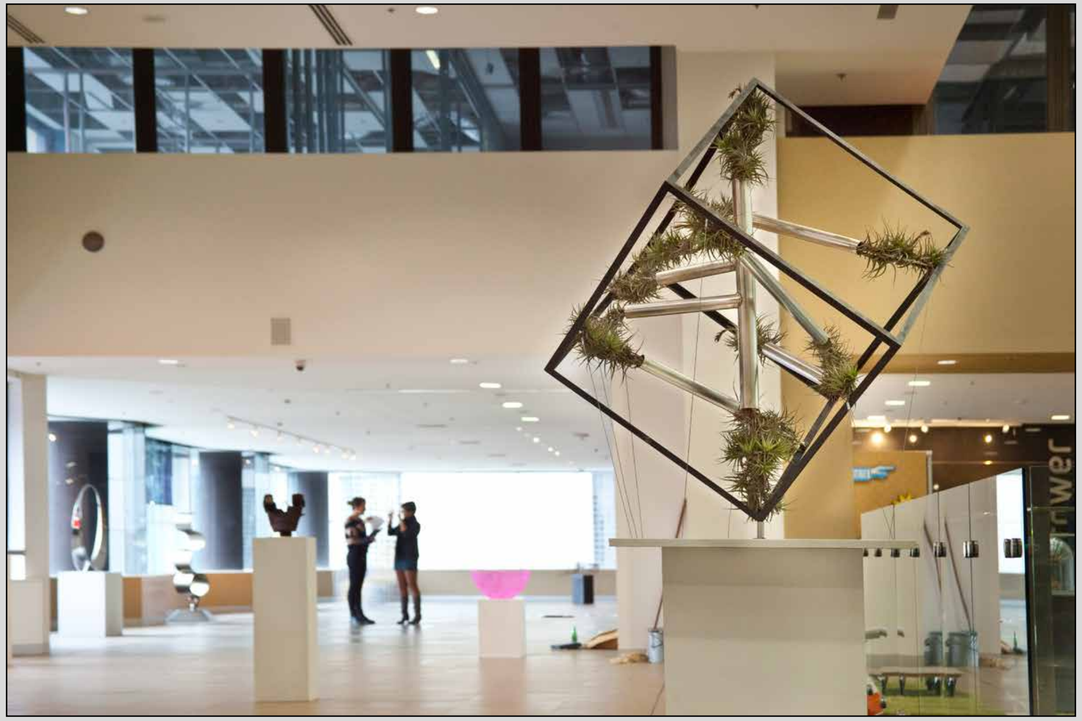
Cube top: *Expanding dimension* - rendered drawing
Cube left: *Expanding dimension* Deakin University Art Gallery, solo exhibition, *Lloyd Godman: A PHOTO: synthetic pathway* 2014
Cube right: *Expanding dimension* - Deakin University Contemporary Small Sculpture Award, Deakin University Gallery, 2010

Expanding dimension - installation for FM magazine photo-shoot Camberwell Grammar School, Melbourne - 2011



Expanding dimension - installation for FM magazine photo-shoot Camberwell Grammar School, Melbourne - 2011 **(the image was used for the cover)**

Expanding dimension



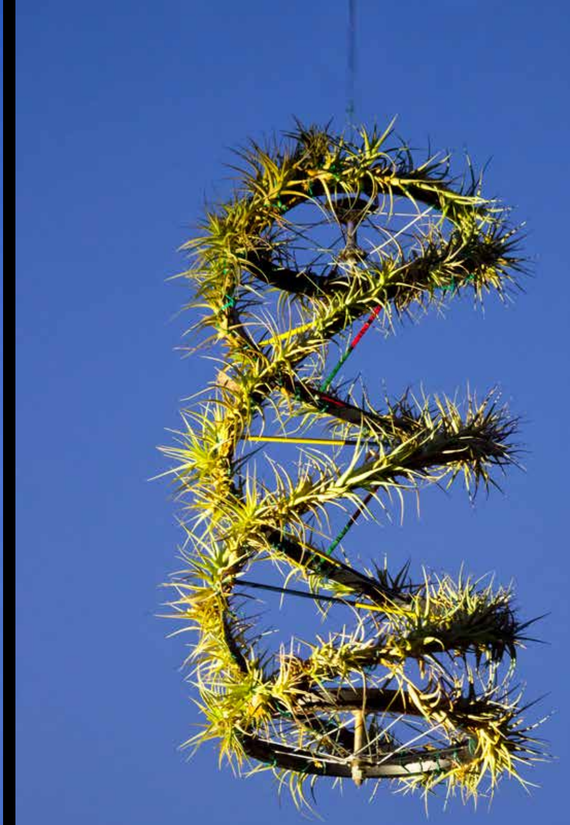
Nature Reclaims the Helix

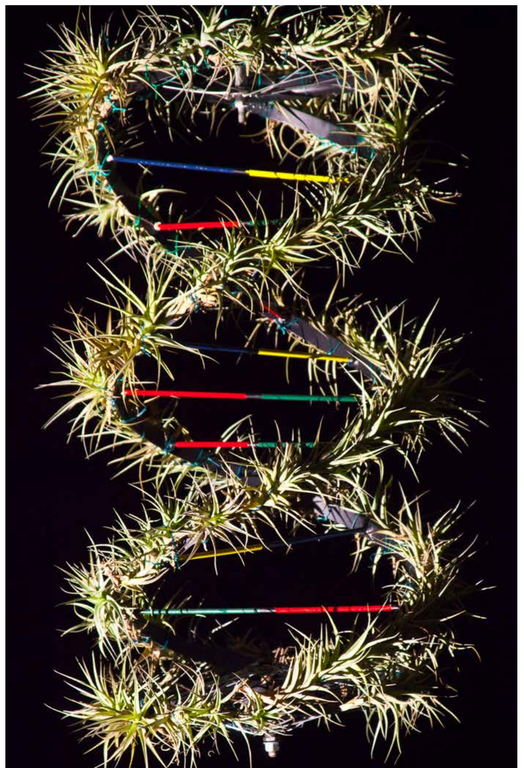
"Nature reclaims the helix" is a super-sustainable, naturally rotating air garden.

Like Joseph Beuys, "7,000 Oaks", the work moves beyond Art as environmental comment towards Art as active solution. But further to this, the materialization of a rotating air garden challenges and dislocates our perceptions of plants: no soil, no roots, no water system, suspension and motion.

Since 1996, I have been working with living plants as art and in particular Bromeliads and air plants, my new work with air plants is based on super sustainability. These plants grow very slowly, but over years they produce a resource to create further living sculptures. In fact many of the plants that form "Nature reclaims the helix" have been harvested from earlier living plant sculptures.

Through science humans have learned to understand and even control DNA. While the double helix adorned with Tillandsias represents this, over time the plants grow distorting the helix form. The plants replicate in as cells.

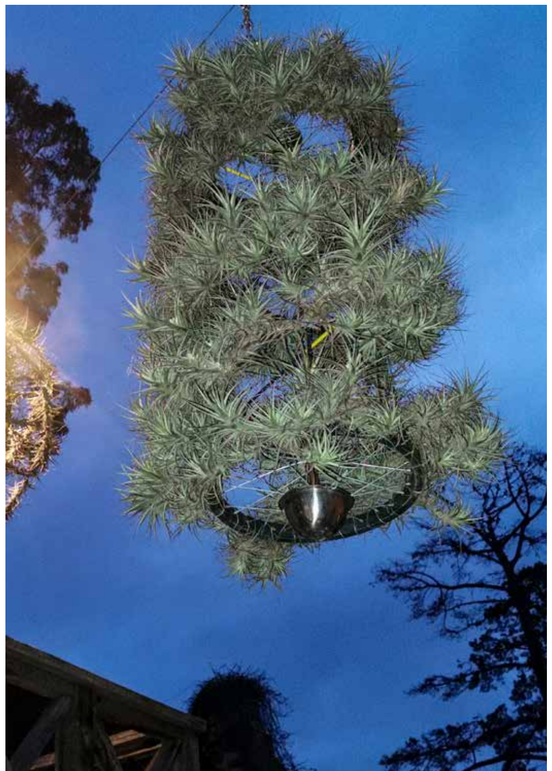




Nature reclaims the Helix - rotating air plant sculpture 2013 left

Installed for Montsalvat festival 2016 Montsalvat right

Left: Baldessin Press - 2018

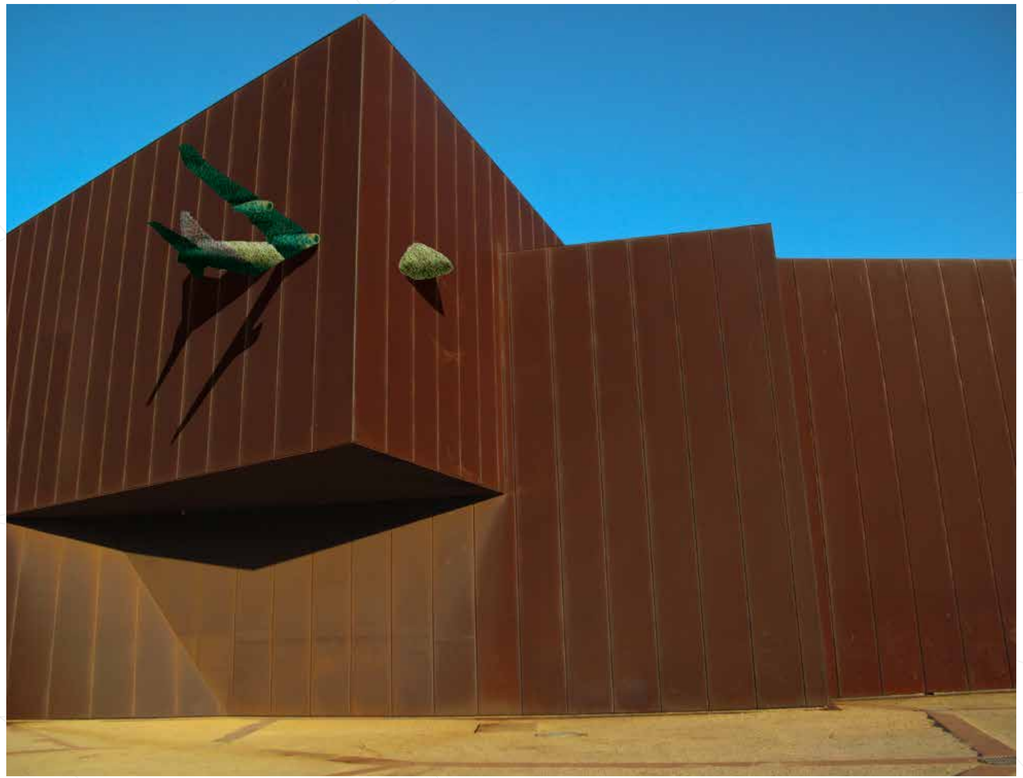


Right: Installed at Montsalvat for Baldessin Press exhibition - The Story 2019

Plain air

In 2009 I began exploring ideas of how air plants might be used to cover armatures with these two renders. The idea was to embed the plane into the side of the building with the missing components formed inside the gallery space.

Plain Air - Digital sketch for a living Tillandsia plant jet air plane embedded in the corner of the National Gallery of Victoria, Melbourne. 2009



Plain Air - Digital sketch for a living Tillandsia plant jet air plane embedded in the corner of ACCA, Victoria, Melbourne. 2009

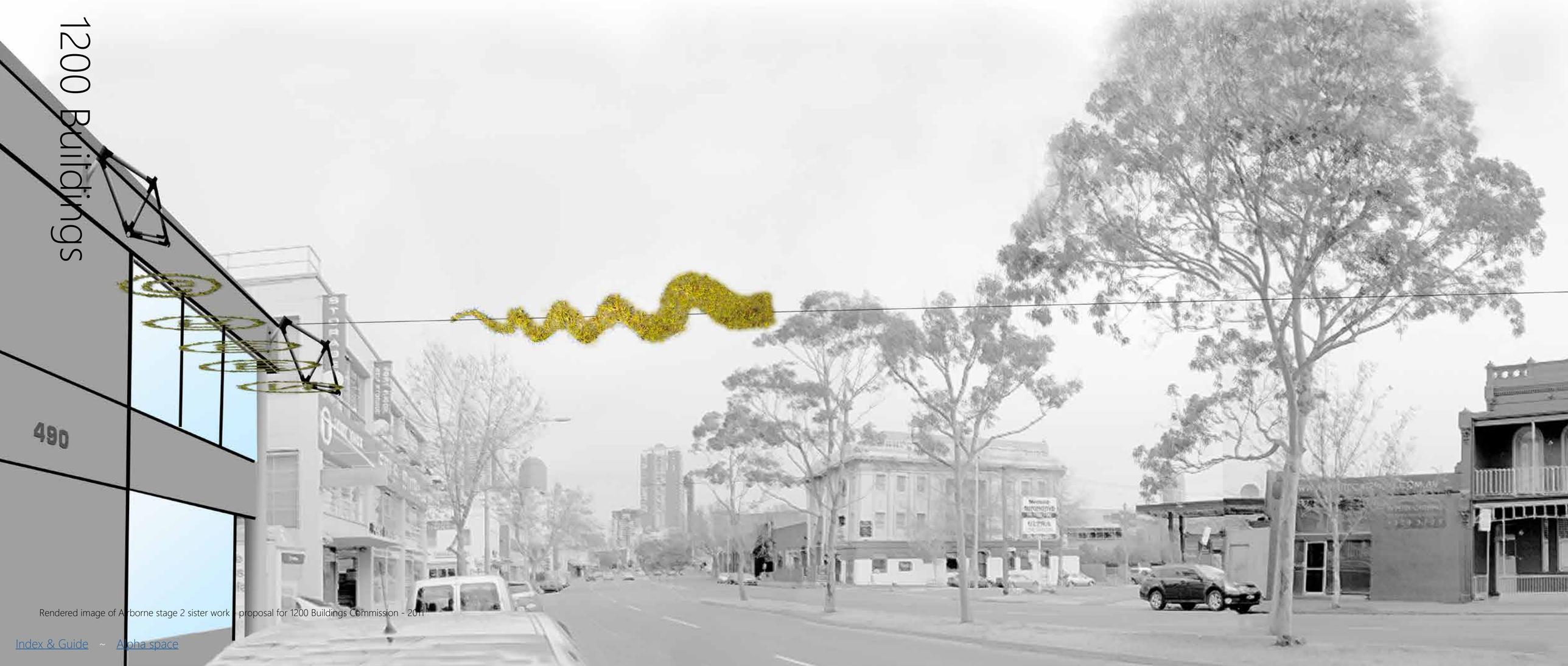
CH2 Building

In terms of sustainability Melbourne City Council are aware of the need to create a sustainable city, in some areas they lead Australia. One of the cities proactive developments I was interested in was the new green CH2 building the council had completed which was promoted as a great example of cutting edge green architecture. In 2011 I engaged in an experiment with Ralph Webster, Senior Architect with Melbourne City Council on the new CH2 building located at 240 Little Collins Street, Melbourne. CH2 was designed as a green building to not only conserve energy and water, but improve the wellbeing of its occupants through the quality of the internal environment of the building. Since its completion in 2006, climbing plants had been planted in water fed boxes on the north side of the building with the intention of growing them up metal netting.

However the aspect is subject to very hot dry winds and the narrow alley way acts as a wind tunnel, extenuating the effect, which was drying out the plants and killing them. Ralph mentioned the problem of growing plants in this location and I suggested mounting a hardy Tillandsia in the netting with no soil or water and simply leave the plant to its own devices as an experiment. The plant was left in this situation for 18 months and checked several times to prove that while they grew slowly they were thriving with no soil or reticulated watering system, whereas the climbing plants continued to struggle. While Ralph moved from his position at the council and this experiment was not followed after his departure, the experiment did lay the way for a larger project with City of Melbourne - "Airborne". In February 2015, I returned to check if the Tillandsia was still in place on the CH2 building, but it had disappeared. The climbing plants were still in place but covered much less of the netting than in 2011, suggesting the effort to replant and maintain them exceeded the ESD reward.

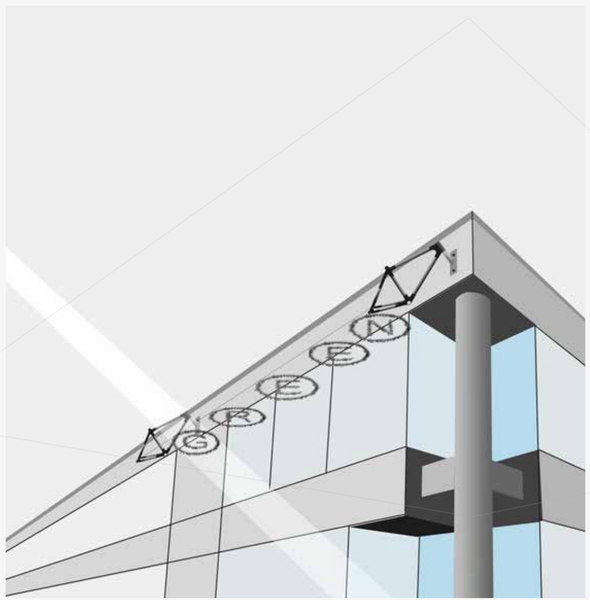
CH2 building North façade 2011. The location of the Tillandsia is marked with the red circle. Note the inconsistent growth of the climbing pants. The garden has been replanted many times since its opeing in 2006

1200 Buildings



Rendered image of Airborne stage 2 sister work - proposal for 1200 Buildings Commission - 2011

Index & Guide ~ Aloha space



Rendered image of Airborne proposal for 1200 Buildings Commission - 2011

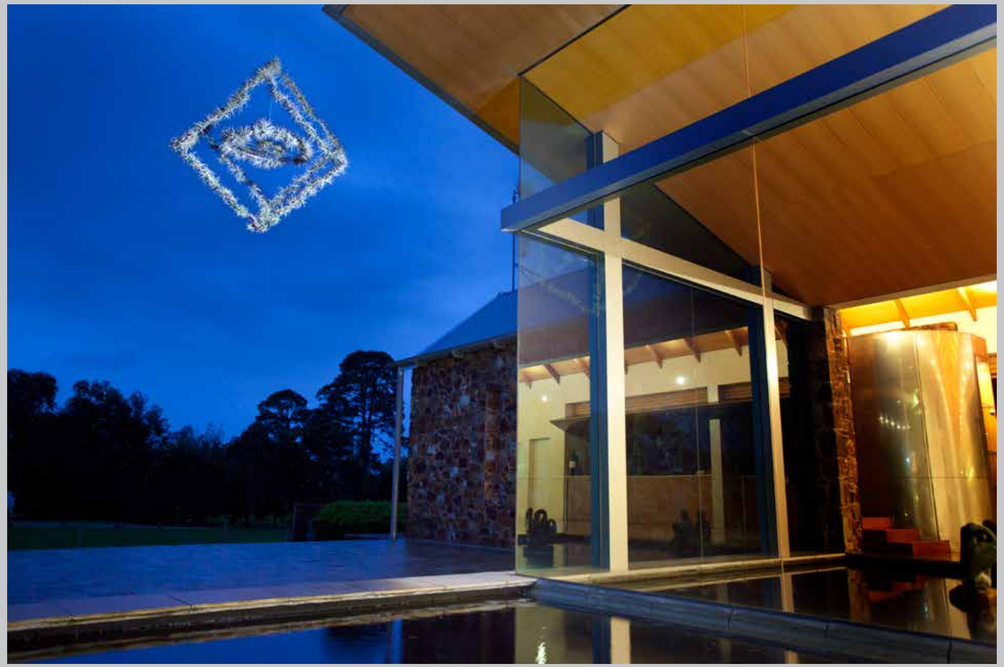
Commissioning the installation of this living sculpture carries the strong environmental ethos of the artist's recent work based on super sustainability or totally carbon minus, meaning more green output than input. While in situ, the Tillandsias (air plants) continue to grow and self replicate raw materials for future work. Through natural processes the plants offer a carbon positive impact, purify the air, cast shadows creating sun screening, while the intriguing installation challenges the viewer's perceptions of what plants are and how they grow.

In the spirit of the Green Spaces sustainable retrofit and the philosophy and active lifestyle of the staff who work there, the process of making the living art sculpture would include the use of as many recycled bicycle parts as possible. Potentially the frames and wheels that make up the support structure could actually come from the staff's old bicycles. With such a high percentage of staff within the building using bicycles, the staff would not only identify with the work, but take ownership in a connected and meaningful manner.

The specialised plants used in this living sculpture require minimal maintenance and in the practice of super sustainability the intention is that by 2014 the plants will have grown enough to divide and create another "sister" work. The physical form, installation, and location of this new plant sculpture would be developed in the future in consultation with the building owner. There may develop the potential to suspend a tensioned wire from the building to a lamp pole across Spencer Street, allowing a dynamic plant spiral to suspend airborne above the traffic.

While Airborne was not selected for the commission, (it was awarded to ARUP International), the deadline of Nov 2011 was not met, and by the time of writing, Aug 2016 the work was still not installed. More than this the budget on Carbon Arts webs site had been increased from $30,00 to $50,000

Atmocycle 1



Atmocycle i - Installed at The Incinerator Gallery Moonee Valley - *ARTECYCLE* exhibition - 2012

Atmocycle I - Installed at Yering Station for the 2012 Yering Station Sculpture Exhibition and Awards - 2012

Atmocycle i - Installed at The Incinerator Gallery Moonee Valley - *ARTECYCLE* exhibition - 2012

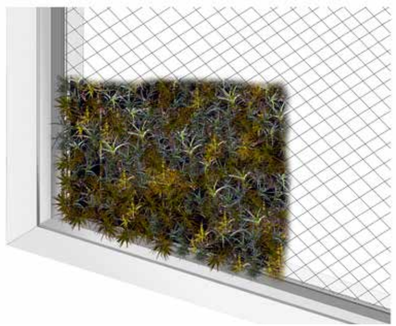
Atmocycle i - Six rotating positions - 2012

In the context of rising CO2 levels, *Atmocycle* references the atmospheric cycle, the exchange of atmospheric gases, particularly CO2 and Oxygen. The role plants play in this cycle is crucial, with Tillandsias which can uptake CO2 and expel oxygen at night offering a special place. With two living sculptural elements that can rotate independent has.

Code Green

In 2011 I collaborated with artist and writer Matt Blackwood to work up a proposal, Code Green would combine a living sculpture with digital literature into a suspended scannable code. This project proposed a super-sustainable sculpture using Tillandsias would be suspended on the cross bar building Federation Square Melbourne and could be scanned by any brand of smartphone, which will trigger a series of narrated short stories set in that exact spot where the audience is standing. The living QR code was an extension of the original concept of a bar code, the in-cuts on the facade of the building designed by the architect. Matt is a writer at the forefront of locative literature and he would design and organize this aspect of the project. With Melbourne as a city of literature it seemed an innovative combination.

While we had Donald Bates – one of the two architects who designed Federation Square and director of LAB Architecture, as the Supervising Architect for *Code Green*, and also Stu Jones the senior structural engineer who built the structure the proposal made the final 5 proposals for the $360,000 project but was not commissioned.

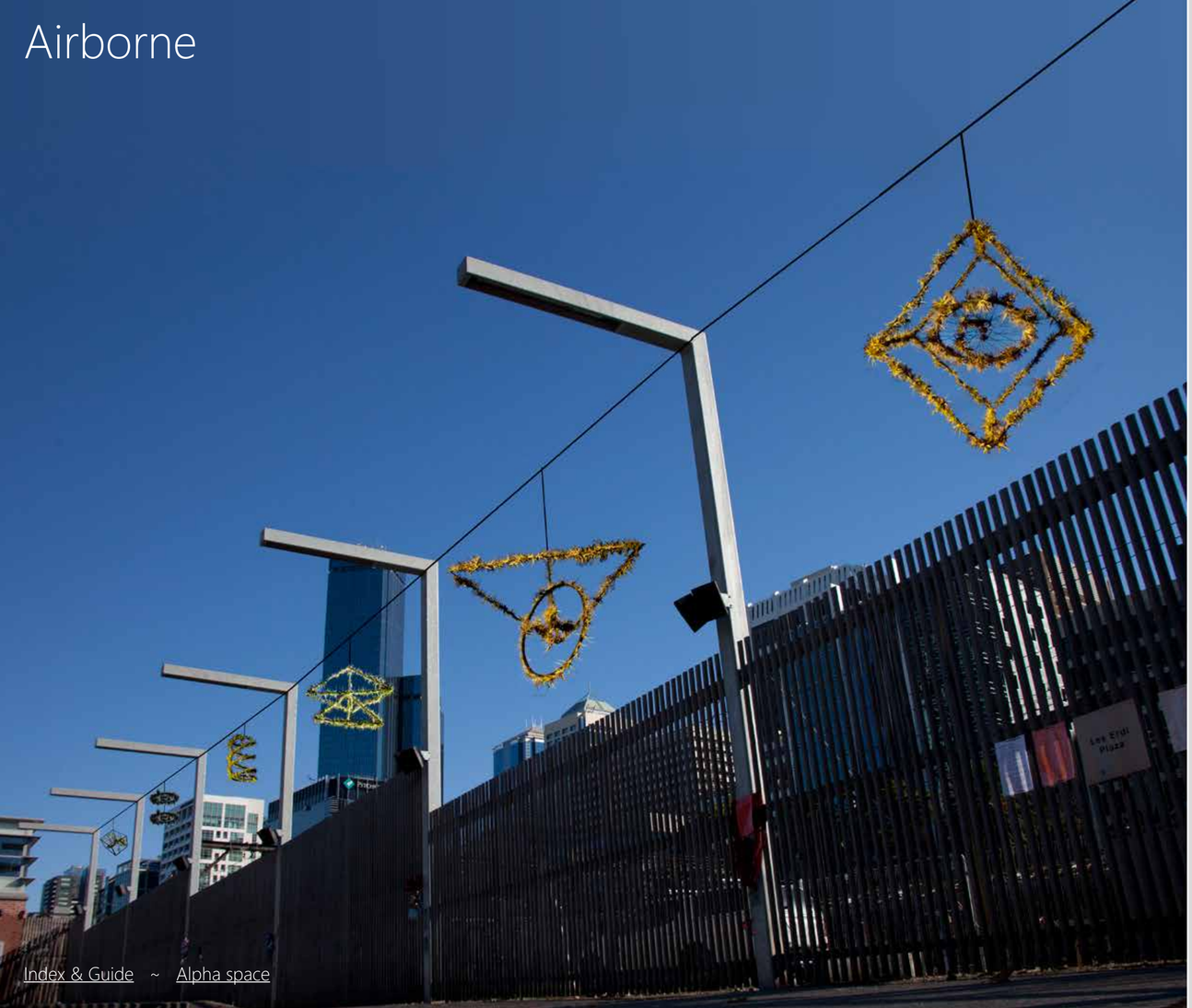


Rendered image for *Code Green* proposal, Federation Square, City of Melbourne Arts Commission 2011

Above: Interior detail - Rendered image for *Code Green* proposal

Below: Interior detail *Code Green* - 'Angled Garden' in Bokchoy Tang courtyard looking outward to the square

Airborne



Following the Code Green proposal, I was successful in gaining support by the City of Melbourne through the Arts Grants Program 2013 to complete another project, Airborne. project - first installation at Les Erdi Plaza, Northbank, 9 Feb 29 2013, with Melbourne's tallest building Eureka tower in the background

Supported as a temporary art installation by the City of Melbourne, through the Arts Grants Program - the work was installed for 13 months and removed early 2014

Air garden one installed Feb 2013 - Queensbridge Pedestrian precinct, Northbank ,of the Yarra River, Melbourne. The work is located on the fenced boundary between the public concourse and Platform 10 at Swanson St Station - intentionally the site is a difficult location to install living plants. The series of rotating air gardens extend between 8 existing lighting columns from SIGNAL towards Swanson St. As an urban concourse with high daily foot traffic, this is an area of significance to the inner city environment.

Right: Rendered image of installation for Les Erdi Plaza, Northbank

Supported through a City of Melbourne Arts Grants 2013, Airborne was an important test for the Tillandsias where air plant sculptures were installed for 13 months in central Melbourne with no soil or auxiliary watering system in a demanding location. The installation was to have a limited install life and to be removed by the end of 2013, but because the site was on Vic Rail land we gained an extension to leave the works installed for a few extra months. This allowed us to have the works in situ for more than a year as a trial through all seasons. The location was beside a busy rail line at Flinders St Station, at Les Erdi Plaza, Northbank, Melbourne. The work consisted of eight suspended rotating air plant sculptures and withstood prolonged periods of dry including record heat (five consecutive days over 41 degrees Celsius). Despite the conditions, the plants grew, flowered, and reinforced the concept of a new space plants could occupy in the built environment beyond the roof top, beyond the vertical garden in what we termed Alpha Space. At home, honey eating birds like the Eastern Spine Bill, honey bees and other small insects frequent the flowers so it was not surprising that some of the flowers set seed. Praying mantis seed casings had also been laid on some leaves, which was evidence that even in this central city location, other species were benefiting from the installation of the plants.

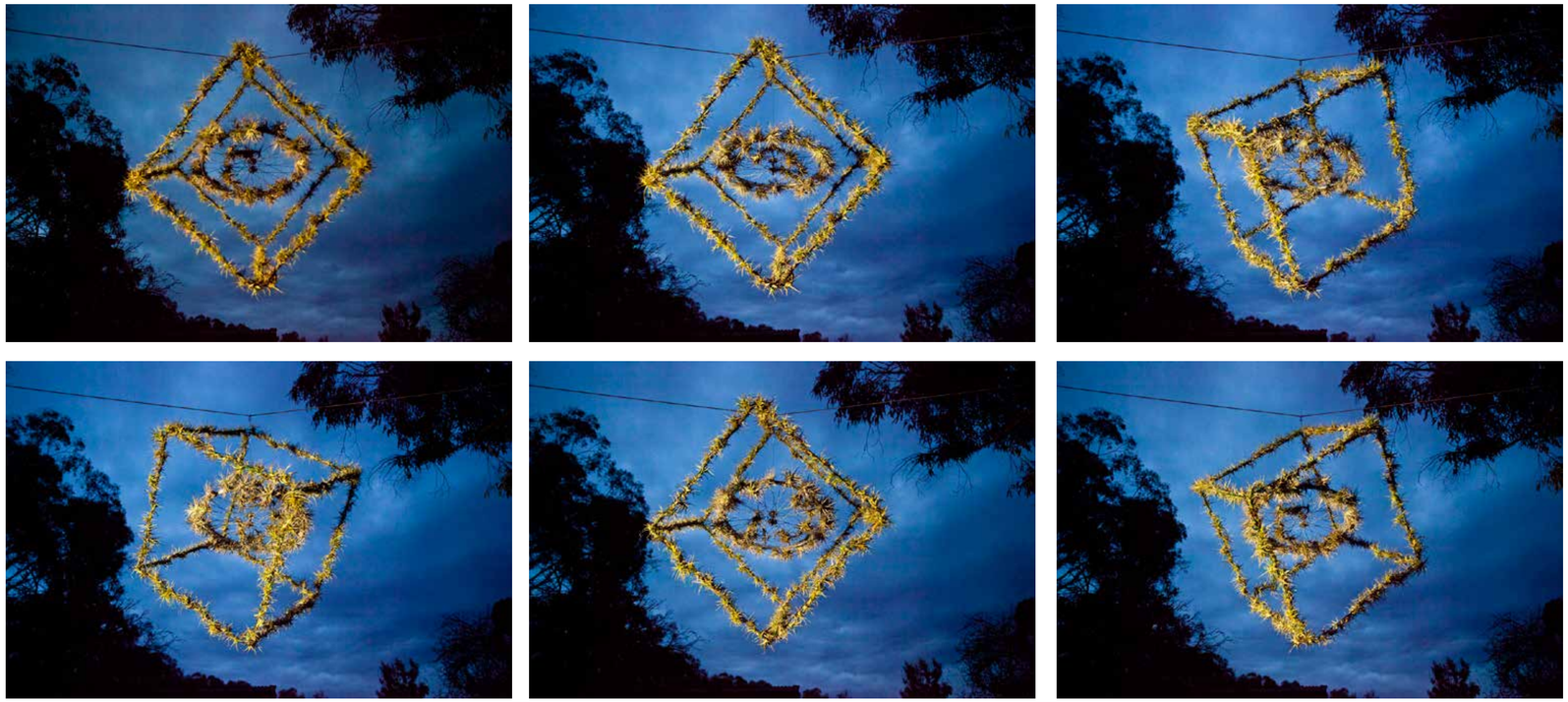
The eight works were suspended between lighting posts along the rail corridor where the diesel trains leave Flinders St Station. There are eight metres between each post so the works spread out for 64 metres. When the trains depart the nearest platform, there is a loud roar of the engine with large clouds of black diesel fumes as the train engages with its load; so it was no surprise that when the works were removed, the Tillandsias on the work closest to where
the trains leave from were covered in black particles. The particulates became less obvious on the plants as the distance away from the platform increased. However the particulates did not appear to hinder the growth of the plants. While the plants for the installation were hardened off before the install, after 13 months the growth habit of the plants had changed to a much more compact structure with shorter harder leaves. However the plants produced about seven
or eight pups (vegetatively produced new plantlets) per plant, many more than one might see in a less stressful location where pup production might be two or three. We attribute the prolific pup production to the plants biological insurance - if one or more pups die then the plant has more reserves growing shoots to prosper from. Of several thousand individual Tillandsia used on the eight sculptures, only two plants had died during the 13 month install. It is difficult
to ascertain the exact cause. During the installation period, the living sculptures experienced strong winds of up to 115 kmph a storm that ripped a large sculpture of a dog from its mounts but
a few hundred meters away and brought down a brick wall that tragically killed three people in Melbourne city. As the suspended works are able to rotate on swivels they can dissipate the energy and do not become excited as a sail might.

Atmocycle I

Atmocycle I, first installation at Les Erdi Plaza, Northbank, 9 Feb 29 2013

Left: *Atmocycle I*, suspended between lighting poles, with Eureka Tower in the background

Right top: Time exposure of *Atmocycle I*, with three independently rotating elements, illustrating wind driven rotation.
Right centre: *Atmocycle I*, suspended
Right bottom: Cast shadow of *Atmocycle I* on the pedestrian thoroughfare Les Erdi Plaza, Northbank, when the work rotates on the wind the shadow plays on the ground



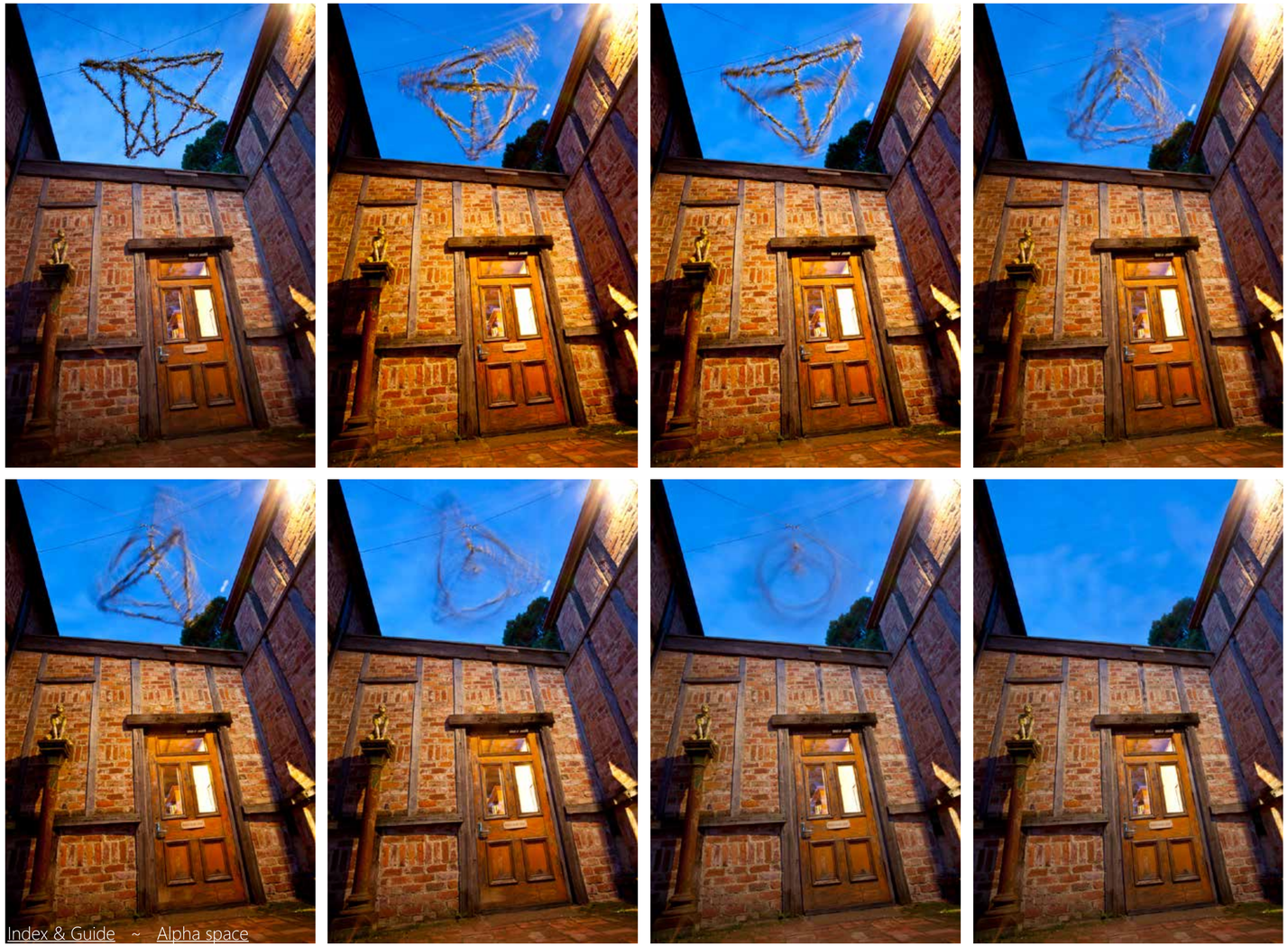
Atmocycle I, Image sequence of daylight time exposures shows the rotation with the two elements moving at various rates on the wind. Photographs taken at St Andrews before the work was installed in Melbourne.

Double Pyramid Power

Double Pyramid Power, first installation at Les Erdi Plaza, Northbank, 9 Feb 29 2013

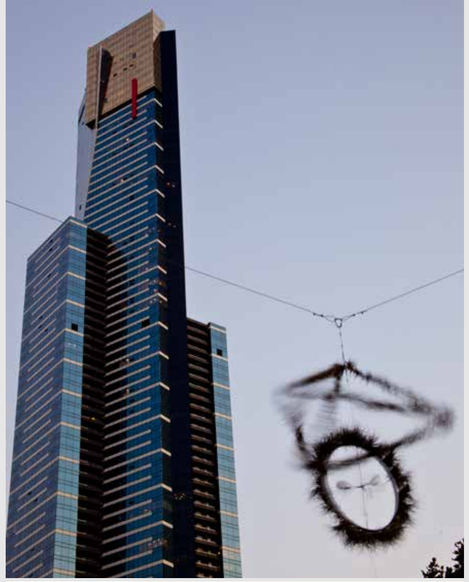
Left: *Double Pyramid,* with two independently rotating elements, Ernst & Young Building in the background

Right top: *Double Pyramid,* with the tower of Flinders St Station in the background
Right bottom: Flash lighting on *Double Pyramid,* Eureka Tower on right



Double Pyramid Power, Image sequence of time exposures shows the rotation with the two elements moving at various rates on the wind. Photographs taken when the work was installed in the court yard at Monstsalvat as part of the Nillumbuk Art Award

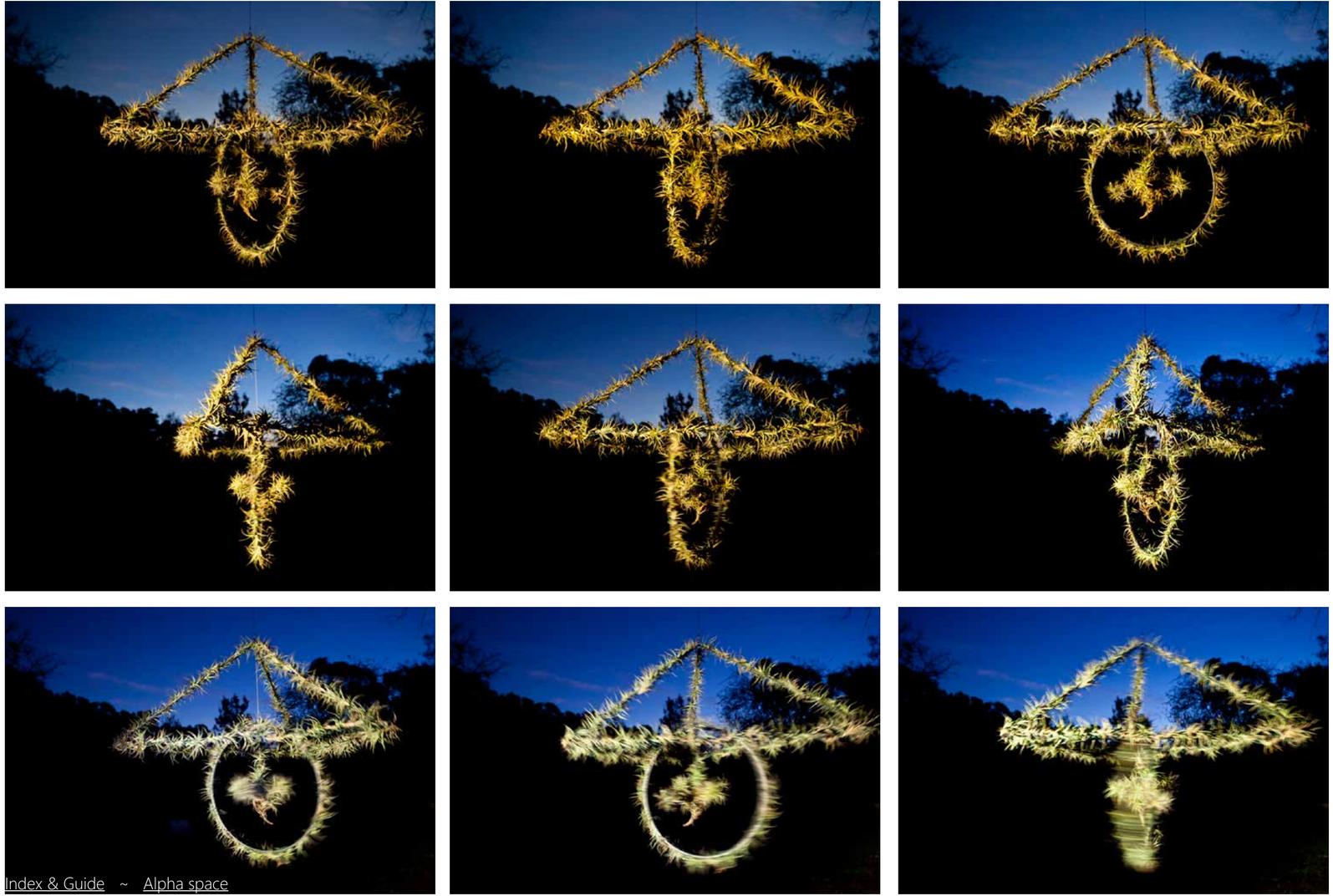
Atmocycle II



Atmocycle II, second installation at Les Erdi Plaza, Northbank, May 30 2013

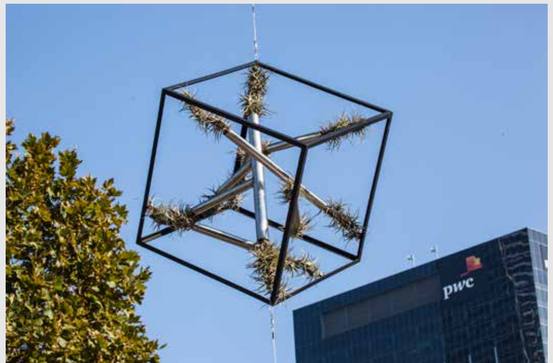
Left: *Atmocycle II,* note the flowers of one species of Tillandsia

Right top: *Atmocycle II,* with three independently rotating elements, with the tower of Flinders St Station in the background
Right bottom: Flash lighting on *Double Pyramid,* Eureka Tower on right



Atmocycle II, Image sequence of daylight time exposures shows the rotation with the two elements moving at various rates on the wind. Photographs taken at St Andrews before the work was installed in Melbourne.

Expanding Dimensions



Expanding Dimensions, second installation at Les Erdi Plaza, Northbank, May 30 2013

Left: *Expanding Dimensions*, Eureka Tower in background

Right top: *Expanding Dimensions*
Right Centre: *Expanding Dimensions*
Right bottom: *Expanding Dimensions*

Tipping point

Tipping point, recycled stainless steel pipe and gravy boat, the three elements can rotate independently while the gravy boat acts as a bucket fountain and tips the water out once it fills during rain. Third installed, 27 July, 2013

Left: *Tipping Point* , with three independently rotating elements

Right top: *Tipping Point*
Right Centre: *Tipping Point*
Right bottom: *Tipping Point*

Alpha Space Station I

Alpha Space Station I, recycled stainless steel pipe, rice spoons, large galvanized spring, the three elements can rotate independently. Third install 27 July, 2013

Left: *Alpha Space Station I,* with three independently rotating elements, IBM building in background

Right top: *Alpha Space Station I*
Right Centre: *Alpha Space Station I, long* time exposure in daylight showing rotating elements
Right bottom: *Alpha Space Station I,* time exposure showing rotating elements

Alpha Space Station II

Alpha Space Station II, recycled stainless steel woks, soup spoons, the three elements can rotate independently. Third install 27 July, 2013

Left: *Alpha Space Station II*, with three independently rotating elements, Eureka Tower background

Right top: *Alpha Space Station II*
Right Centre: *Alpha Space Station II, long* time exposure in daylight showing rotating elements
Right bottom: *Alpha Space Station II*

Alpha Space Station II, recycled stainless steel woks, soup spoons, the three elements can rotate independently.

Left: *Alpha Space Station II* from below
Alpha Space Station II 2013 in center and right 2018 demonstrate the slow but steady growth of the Tillandisa plants

Alpha Space Station II, recycled stainless steel woks, soup spoons, the three elements can rotate independently. Image sequence of daylight time exposures shows the rotation with the three elements moving at various rates on the wind.

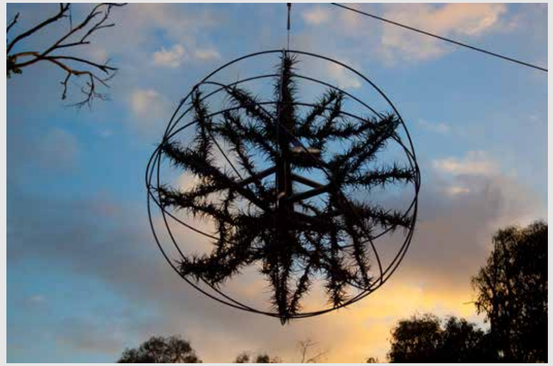
Nature Reclaims the Helix

Nature Reclaims the Helix, recycled bicycle wheels, stainless cups, steel, a single rotating element based on the DNA Helix. Third install 27 July, 2013

Left: *Nature Reclaims the Helix,* Eureka Tower background

Right top: *Site view, Atmocycle II,* and *Expanding Dimensions*
Right Centre: Site View from *Expanding Dimensions*
Right bottom: Detail *Nature Reclaims the Helix*

Pulse



Pulse explores tubular structures like; stomata, veins, bronchi, arteries, capillaries, pipes etc. Vascular systems where essential elements like water, blood, sugars, urine, waste etc. are transported through tubes from one place to another. Embedded in the work are references to macro, micro, atoms, planets, living cells, photosynthesis, balance, cycles, super-sustainability.

Pulse is a super-sustainable, suspended, rotating air plant sculpture. The crucial concept behind these works is that slowly, over time the diminutive Tillandsia plants grow exponentially to create a resource that can be drawn upon to create further work. This sculpture is constructed from 5 large stainless steel rings which suggest the trajectories of excited electrons. These make up the outer dimension and are fused at the intersections. Within this outer globe, are two stainless steel structures made of branching tubes independently suspended on thin tensioned wires. Hundreds of Tillandsia air plants are attached to the wires and continue to grow. The entire work is suspended via a high quality swivel which allows the work to rotate under the natural force of the breeze. (Experience has shown that high winds do not affect the work in a negative manner).

Left: Time exposure of *Pulse*

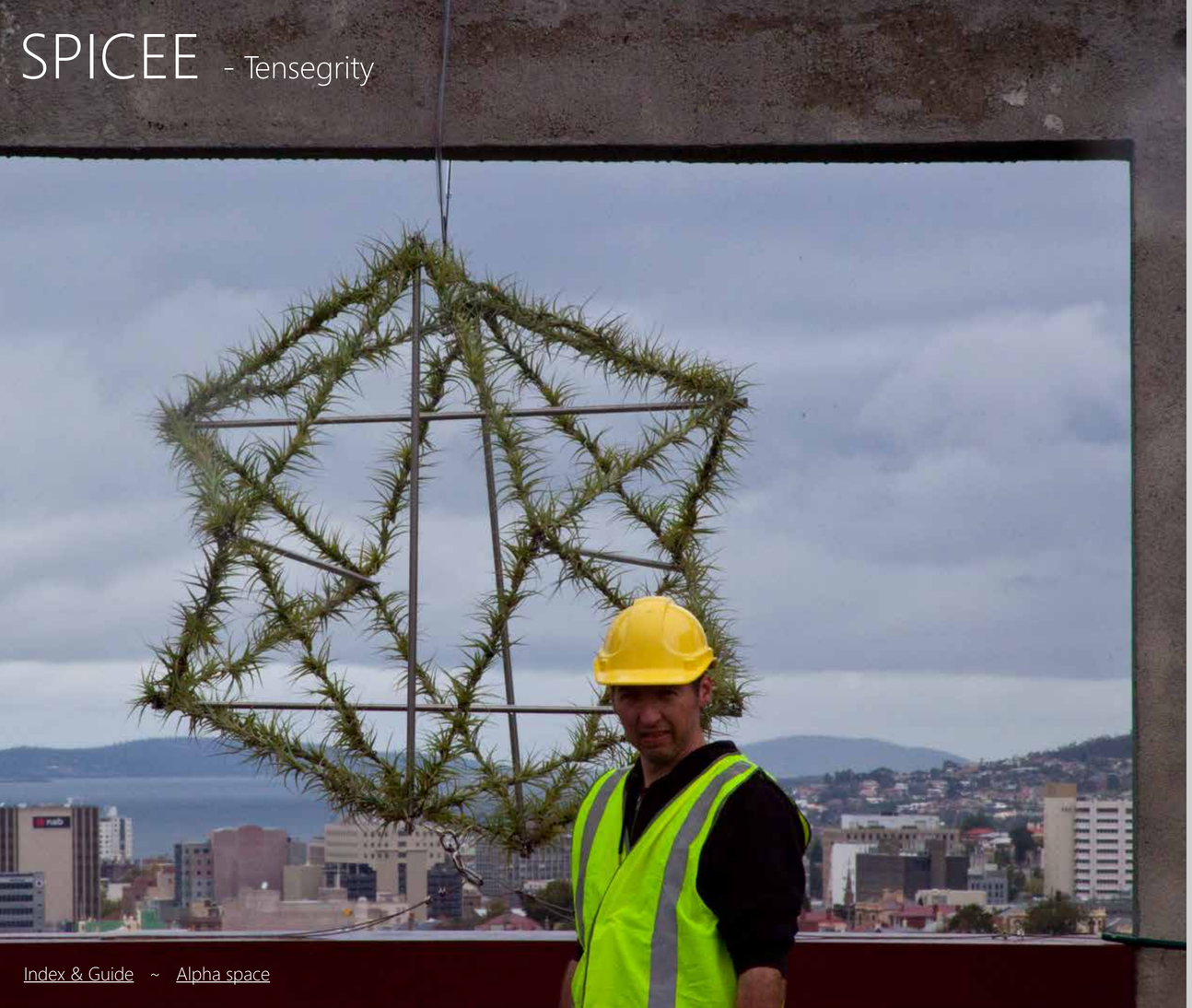
Right top: Twilight *Pulse*
Right centre: Twilight *Pulse*
Right bottom: Grant Harris and Stu Jones install *Pulse* for the Green Cites Conference in the Ball Room of the Grand Hyatt, Melbourne 2014 - Lloyd was commissioned by the Property Council to create a feature work for the Green Cites Conference

Aerial

Aerial - Tillandsias (aerial plants) re-purposed television aerial - 2016

The work connects with Tillandsia SWARM on page 102 and the dysfunctional tv aerial pole on the Walpole Building, The Friends' School Hobart.

SPICEE - Tensegrity

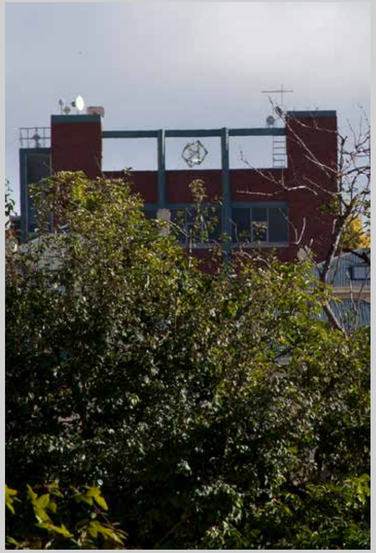


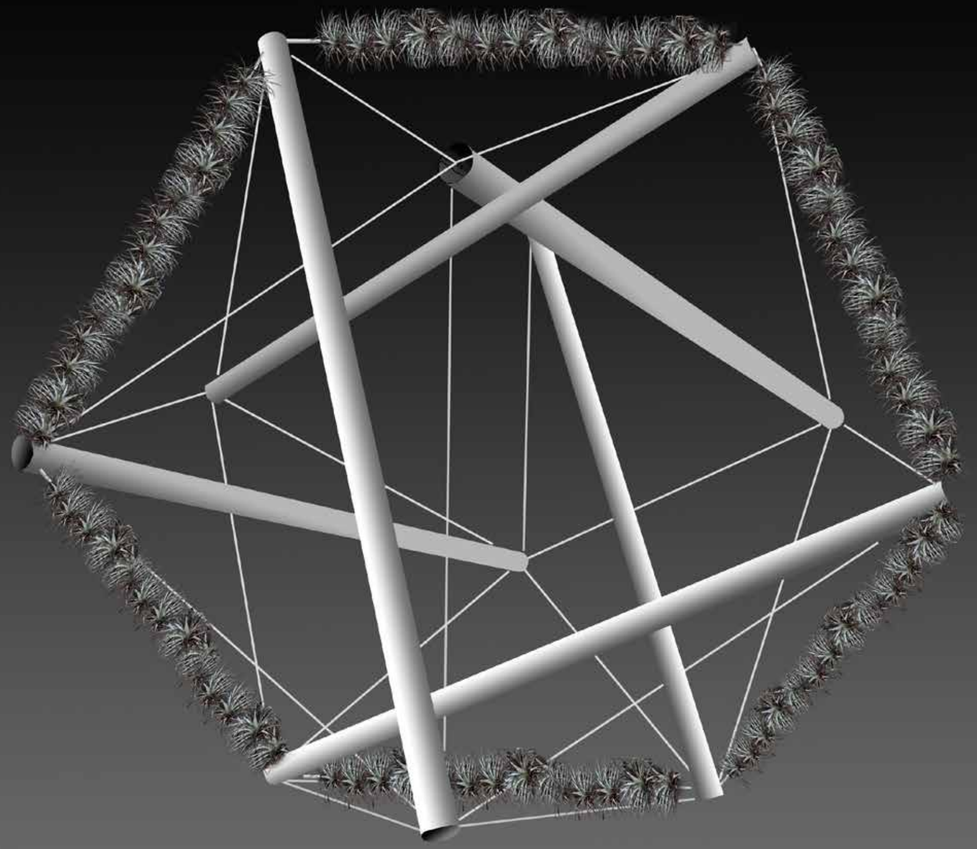
From 22 - 29 March 2015 I was invited to be Quaker in Residence at the Art department in The Friends' School Hobart. As part of this residency I spoke to many groups of students about how Quakerism informs my ecological art.

As part of the residency I also worked with students to create a living Tillandsia air plant sculpture SPICEE that was installed, and will remain, at the school continuing to grow. This was the first permanent installation of these living art works. When the plants have grown in a few years time, we are planning to harvest the excess growth to create more living air plant art works with another group of young enthusiastic creative art students. As an ecological artist in an age of pressing environmental concerns, the greatest legacy I can leave to future generations is an art work that cleans the environment, feeds the spirit and grows to offer the next generation of young artists a living medium to harvest and then create their own living plant sculptures. The work utilizes tubes and cables to retain its physical integrity in a tensegrity form. The wires that hold the structure in place then have the air plants attached. The final work is constructed from stainless steel and uses six tubes, one for each of the acronym SPICEE - this represents the Quaker testimonies and bear witness to **Simplicity, Peace, Integrity, Community, Equality, Earth Care.** A testimony is neither a rule nor a creed, but is both an ideal to strive for and a way for our lives to speak.

No testimony stands alone. They are like threads which we weave in and out of each other to create the material of our lives. I spoke to the students about the metaphor of this in the tensegrity model. When these testimonies are strong in our lives and an event or situation places pressure on the ideals of one testimony, the tensional integrity of the others pushes back to resolves the equilibrium of the one in stress.

The Tensegrity Tillandsia work at The Friends' School Hobart which I made last year had been restored and was installed at a new location at Friend's School on Wednesday - due to a series of crazy events it got cut up and thrown in a skip rescued by one of the art teachers and thanks to Nelson, Nick, Stuart and others has now been rebuilt





Gardening guru's uplifting experience building suspended, living sculpture

MICHELLE PAINE • MERCURY • MARCH 29, 2015 4:41PM

BE THE FIRST TO RESPOND

Friends' School artist in residence Lloyd Godman with Year 10 students, from left, Samson Blain, 15, Mirrin Stronach, 15, and Ella Smail starting work on the air plant sculpture.

STUDENTS have been working with a renowned ecological artist to make the world's first living plant sculpture of its kind.

SPICEE - the first permanent suspended rotating living air plant sculpture, The Friends' School, Hobart, Australia - left photograph July 2016 Photograph Nick Maxwell
Centre photograph plant check July 2019 reveals the growth over 3 years - Right photograph - reflection of Lloyd speaking about the work at the Quaker yearly meeting July 2019 photograph courtesy of Anna Wilkins

SPICEE - the first permanent suspended rotating living air plant sculpture, The Friends' School, Hobart, Australia __ July 2019

Index & Guide ~ Alpha space

Lloyd Godman:

A PHOTO: synthetic pathway - 2014

Deakin University Art Gallery

In 2010, when Expanding Dimensions Tillandsia sculpture was exhibited as part of the Deakin University Small Sculpture Award, the director of the gallery Leanne Willis not only became aware of my work, but intrigued. Sometime later she visited and invited me to have a survey show at the gallery.

As part of the major survey exhibition Lloyd Godman: a PHOTO: synthetic pathway in 2014 at Deakin University Art Gallery curated by Leanne Willis, several of the Tillandsia sculptures were installed. One inside the gallery, the others suspended along a walk way adjacent to the gallery.

The exhibition tracked the journey from traditional photography through, the exploration of photosensitivity, to the use of photosynthesis and the Tillandsia plant sculptures.

Included in the exhibition was a selection of works from:

The Last Rivers Song - 1984
Secrets of the Forgotten Tapu - 1986
Codes of Survival - 1990
Adze to Coda - 1992
Evidence from the Religion of Technology - 1994
Aprorian Emulsions - 1996
Equivalence - 2005
Entropy - 2010

Tillandsia Swarm

Tillandsia Swarm

Although only four meters from the ground, Airborne was juxtaposed against the second tallest building in Australia which called out for our next experiment. After contact and one meeting with the Fender Katsalidis designed Eureka Tower management, we had consent to proceed with a Tillandsia experiment. On 17 June 2014 Grant, Stu and myself installed some Tillandsia plants in wire cages attached to fixing points at four locations on Melbourne's tallest building Eureka Tower. A simple experiment - plant cages with two species in each cage were installed at level 56, 65, 91 and 92.

As far as we know this is the tallest plant install on a building in the world. Marina Bay Sands Singapore, is at 55 stories, so it is a significant step upwards and opens a new but effective way of incorporating plants on high rise buildings.

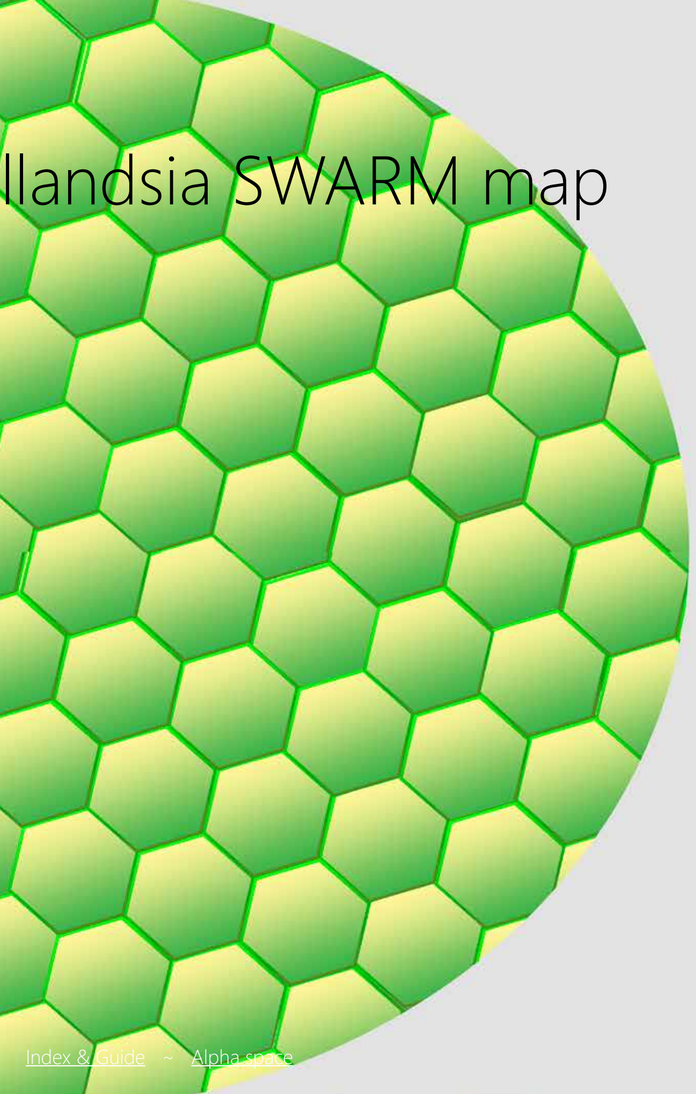
Tillandsia SWARM is an experimental art/science project where selected species of Tillandsias (air plants) are installed without soil or axillary watering at a range of exposed urban locations and monitored to gauge their success through extreme seasonal conditions. As the concept of ***α space*** extends to the utilization of existing urban infrastructure as a means of support for plants like Tillandsia, the project involves finding suitable sites, negotiating with the management or authorities to gain permission and backing for the install.

To date 42 plants are installed at 20 sites - 5 locations, including Eureka Tower, CH2 building, Essendon Fields, Montsalvat and The Friend's School (Hobart). The plants on Eureka have been installed at level 92 (295m) for more than 2 years, which is the tallest building in the world with plants atop and is a testimony to the resilience of these amazing plants.

As Tillandsias have the ability to uptake heavy metal particulates from the atmosphere through their complex trichome cells into the leaf tissue, they can be used as bio-monitors to measure comparative pollution levels.

Tillandsia SWARM is inspired by German artist Joseph Beuys 7,000 Oaks - City Forestation Instead of City Administration project at Kassel presented at 1982 Documenta 7.

llandsia SWARM map



As the number of exquisite landscape, paintings, prints, photographs - (images) - expands by acres each day, the acres of real landscape shrinks proportionally. With diminishing of biodiversity, the medium for artists to embrace in the 21st century is nature itself. Not to strive for reproductions, expressions and interpretations of nature, but to work with the living, to work in the REAL!

Urban Experiments

Tillandsia SWARM

In 2014, after the Airborne project, we decided to experiment with Tillandsias on a range of demanding locations within the urban environment around Melbourne. The first was at various locations on Eureka, which at level 92 is the tallest building with plants on top. Selected species were placed in a mesh cage and mounted to a hand rail at the top. There was no soil medium and no watering system. The plants were exposed to extreme weather, heat, long dry periods and salt winds that regularly reach over 200 kph. Over years, the plants have proved resilient, they have adapted to the harsh environment growing in a more compact form and producing a great number of pups than they would in a kinder environment. (compact growth and a higher pupping fate is the plants protection because of the higher stress levels)

The project continues to expand.

The mesh cages were developed as a means of securing the plants to the building infrastructure in a way that guaranteed they would not fall off. The cylindrical cages, now termed as cells, became emblematic of the project and reference the cells bees store honey and lay their eggs in.

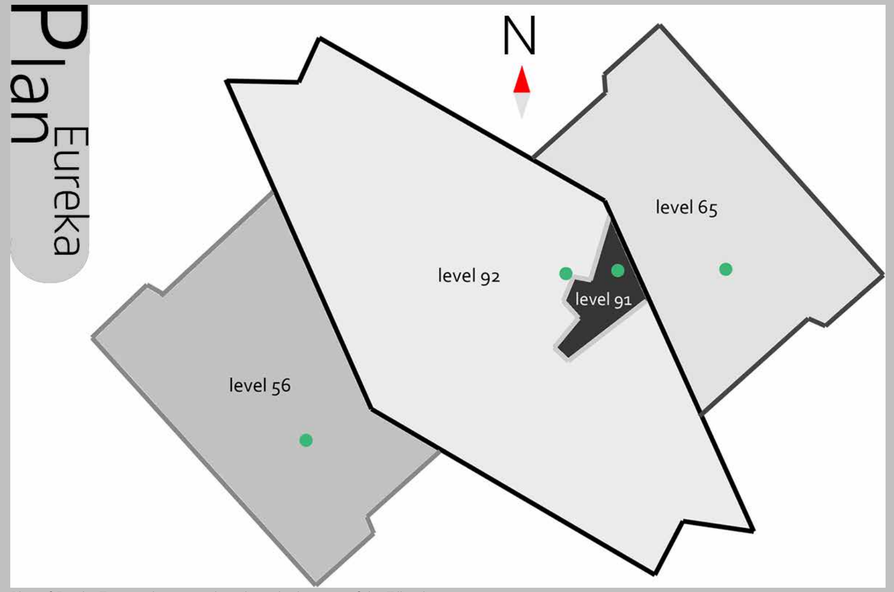
A project evolved titled Tillandsia SWARM and in the past few years other cages have been included in the experiment which now includes, many more plants. .

Tillandsia SWARM

- A ground breaking art/science experiment with Tillandsia plants that need no soil or watering system
- After a period of time the plants can be used as biomonitors to log comparative urban pollution levels
- The plants use a CAM cycle and grow in darkness cleaning the atmosphere at night
- They uptake all water and nutrients though trichome cells on their leaves
- Like bee swarms, the plant cells grow in number. Currently there are - over 40 Tillandsia SWARM cell sites - on 21 buildings, across 3 states - within 2 countries – at 1, 2, 3, 11, 56, 65, 91 and 92 (295 m above base)

Although many of the plant cells are in obscure and inaccessible locations, and appear to sit covertly, all plant cells are installed with approval by the building owners.

Eureka Tower



Plan of Eureka Tower - the green dots show the location of the Tillandsia plants on level 56, 65, 91, 92. Level 91 is an access way to the higher level 92.

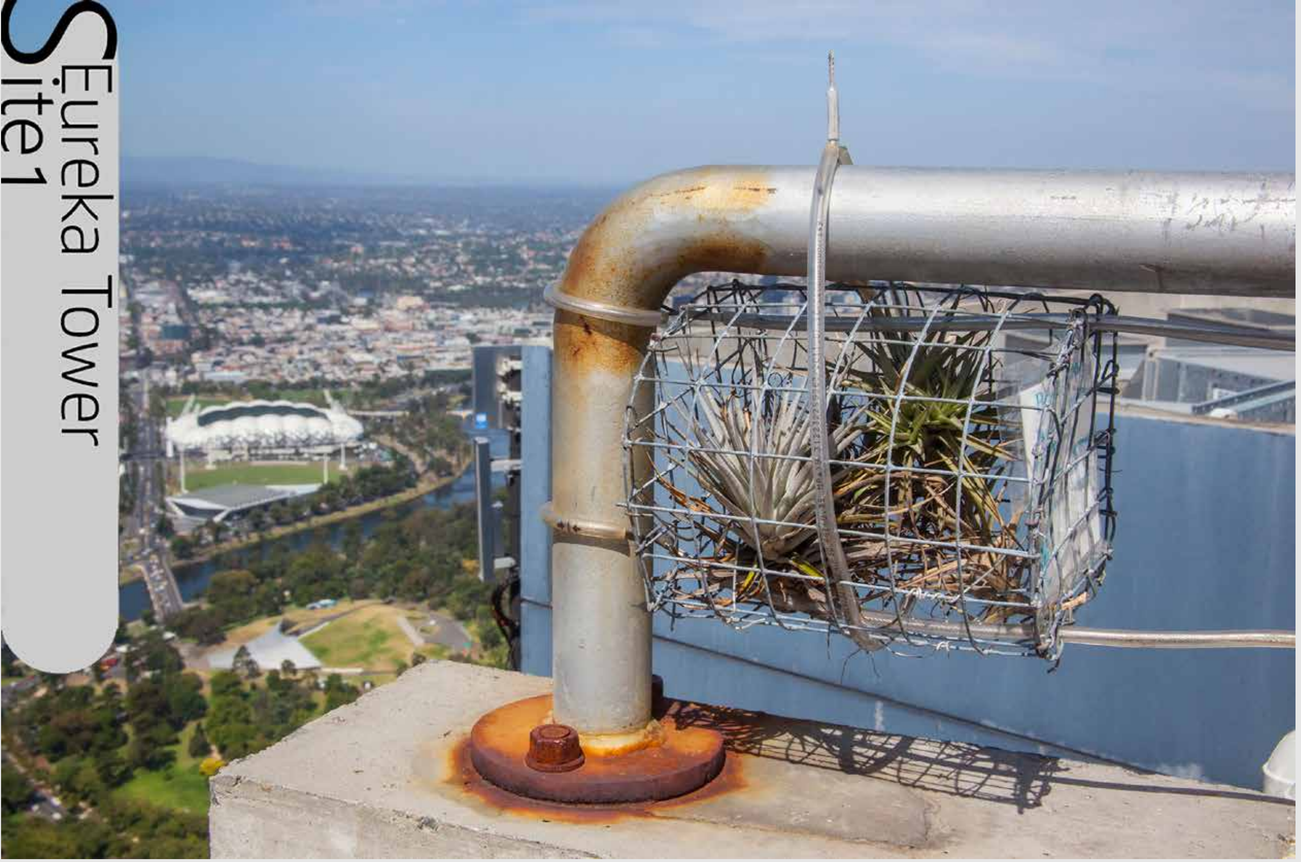
On 16 Oct 2014 we checked the plant experiments on Eureka Tower. It was wild weather with fine saturating rain driving in on a strong wind and not the most pleasant place to be at that height. The plants had survived the past four months of winters cool, wild salt winds and apart from some old leaf die back (these are the leaves farthest from the growing tip) which is probably attributed to the acclimatization to the plants to the new environment, they are fine. The Tillandsia at all four locations are growing well. Everything is secure, nothing has blown away and one plant at level 91 is even flowering. The next phase is to see how the selected species of Tillandsia perform in the dryer and hotter months ahead. On 25 February 2015, Stuart and myself visited the plants on all four locations with Angela Fedele, a writer for Sourceable, from which she published a piece in titled "Air Plant Experiment Happening Atop Melbourne's Eureka Tower."

Grant Harris works on fixing a Tillandsia plant cage while Stuart Jones and Lloyd Godman look on.

Grant Harris environmental scientist, Lloyd Godman ecological artist and Stu Jones structural engineer,
on Eureka Tower level 92 about 300m at the top - 200km plus winds. Now we wait to see how they grow! (the air plant cage is above Stu's head).

The tower is named after the Eureka Stockade, a rebellion during the Victorian gold rush in 1854. This has been incorporated into the design, with the building's gold crown representing the gold rush and a red stripe representing the blood spilt during the revolt. The blue glass cladding that covers most of the building represents the blue background of the stockade's flag and the white lines also represent the eureka stockade flag.

While the plant cages are designed to protect the Tillandsia plants from being blown away, they are also a reference the only person imprisoned as a result of the Eureka Stockade, Henry Seekamp Editor of the Ballarat Times, who was found guilty of seditious libel.



Eureka Tower

Location: Eureka Tower, Melbourne CBD
Site: 1
Latitude: 37.821545 S
Longitude: 144.964477 E
Aspect: Open, exposed to all elements, direct sun all day
Level: 92 (295m) This is the tallest building in the world with plants growing at this height.
Install date: 17 June 2014
Public Visibility: No - restricted private access only

Eureka Tower

Location: Eureka Tower, Melbourne CBD
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Aspect: Open, exposed to all elements, direct sun all day
Level: 92 (295m) This is the tallest building in the world with plants growing at this height.
Install date: 17 June 2014
Public Visibility: No - restricted private access only

Site visit 20 May 2015 with architect Toby Reed, Lloyd Godman, Stu Jones, and State MP Cindy McLeish.

Site visit - 11 May 2017 - Lloyd Godman, plants have put on good growth. Species one has 12 pups

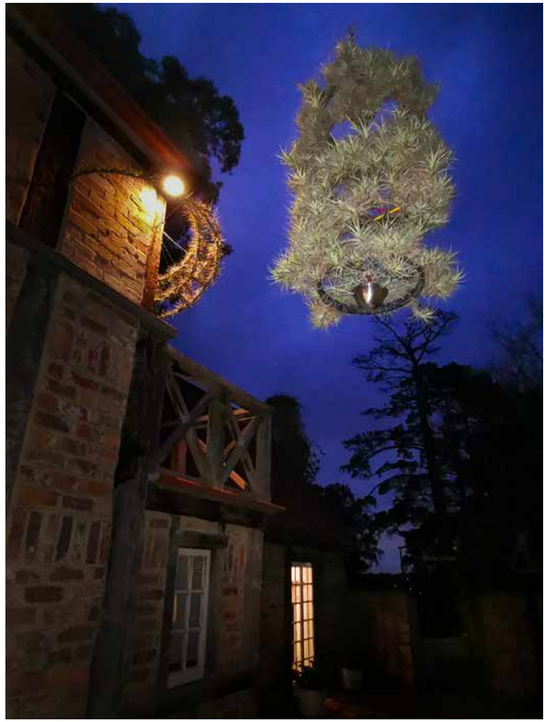
Site visit 7 June 2019 - Lloyd Godman and Geoff Beech despite the driest 2 years recorded the plants are alive and have expanded to a point where they are growing outside the cage. T. *bereri* has now expanded to 14 plants and are growing outside the cell mesh.

Site visit 29 Jan 2020 - Lloyd Godman, Geoff Beech and Jane Clark Senior Research Curator MONA. The plants were removed form the galvanized mesh cell and placed in a much larger plastic mesh cage. The reason for the plastic cage is that the metal can give a false heavy metal contamination reading.

Full documentation of the SAWRM project is available in the PDF
Tillandsia SWARM

Within You Without You

Index & Guide Alpha space



This Tillandsia living plant work Within *You Without You*, was created for BALDESSIN STUDIO - THE STORY exhibition at Montsalvat, Eltham curated by Christine Johnson. The work consisted of two curved pieces where one was installed outside while the other was installed inside. It appears that the plant sculpture enters the space from the outside through a window in a door, then curves down the wall inside the space.

To augment the work *Nature Reclaims the Helix* was installed outside in the courtyard and *Double Pyramid Power* was installed inside the gallery space. While both these works had been exhibited in the in previous times, the growth of the plant in the intervening years presented then as new works.

Working in the REAL world

In a review of Olafur Eliasson's Tate Modern retrospective titled Olafur Eliasson the art world is 'trying to find its feet' on climate change, Gareth Harris, Chief contributing editor at The Art Newspaper on 9th July 2019, suggests that the art world has struggled to reconcile contemporary practice with the key issues of climate change. The major exhibition of more than 40 works by Olafur Eliasson at Tate Modern reflects the Danish- Icelandic artist's ongoing quest to raise awareness of the climate emergency. Harris points out that in an effort to reduce the carbon foot print the exhibition features works drawn largely from European collections.

For many artists concerned with these issues an honest microscope reveals substantial cracks in their practice where the melting ice of both poles can drain out leaving a trail of CO_2 in the atmosphere. When scrutinized, the art world is a most often a reflection of other consumer driven industries which contribute to CO_2 emissions. For me working with living and growing plants offered a means to a sustainable art practice. In a growing climate emergency, there was a nagging concern to explore alternative ways of being an artist. While I began using plants as a living medium in 1996 it was not until 2013 that I began working exclusively with plants. Over a number of decades several issues kept surfacing from the way the art world operates and it took time to discern these.

Climate Controlled Storage
For many artists having their work collected by a major art gallery offers a prestigious acknowledgement that relaters to the perceived value of their work. It is assumed the gallery will care for the work in climate controlled storage 24/7 which requires significant investment of energy. When in storage" the Tillandsia sculptures I construct simply live out doors and albeit in a small way, absorb CO_2 thereby controlling the climate while in storage.

Scale
Production of Art Objects
Within the common population of the 18th century art objects like paintings were rare. In the second half of the eighteenth century, many private collections of art were opened to the public, and during and after the French Revolution and Napoleonic Wars many royal collections were nationalized, even where the monarchy remained in place, as in Spain and Bavaria.

Over the intervening years, the means to produce images became easier and the structures within society allowed more people to work in a creative manner with an exponential growth in the quantity of art works. In now means that so far this century there have been more art objects created than all recorded history combined. Again like so many other industries the sheer scale of operation is likely to leave a liability rather than cultural legacy.

However after decades of collecting many galleries have store rooms full, limited wall space and growing numbers of work in storage. All artists I know produce more work than any market demands so the consequence of storage arises.

There is no doubt the creative process offers much to the artist, but in an age of species extinction and climate change the historical concept of reproducing nature in an image or sculpture needs to be challenged. When there are more images of a rare an endangered plant than there are real plants in existence, perhaps it is time to grow plants as art works. Many art works are in reproductions of nature. As exquisite as a painting, print or photograph of a plant, flower or landscape maybe it is only an interpretation of the real. As well crafted and intriguing as it might be, a metal, stone or wood sculpture of a flower may stir emotions and sentimentality but again it is not real, not a living plant.

At a time where the natural world is in decline at an alarming rate, species are diminishing, a challenge for artists is to work in the real. To work with in the REAL.

Extreme Gardening

Hard and soft tissue plants

Plants that we might incorporate into the fabric of a high-rise building can be divided into two types, hard and soft tissue. Of course there are countless variations in between, but for convenience we will outline the difference between the two extremes.

Hard tissue plant material are trees that have solid trunks and branches. Examples of these within the high-rise built environment are the impressive row of tall palm trees on the roof of the Marina Bay Sands in Singapore at level 55 – 200 m up, Milan's recently completed twin apartment towers Bosco Verticale with 900 trees placed at sites on the facade and roof up to 110 meters high, and the planned 46 story Clearpoint Residencies in Sri Lanka which is due to be completed in 2015. While it is encouraging to see these initiatives to bring nature and trees back in to the urban environment, there can be risks. The roots and main trunk can be successfully anchored down to the structure of the building, but securing all branches that could break off is impossible. In nature branches do break off, but in general circumstances the trees are rooted to the ground and the branch falls a relatively short distance to earth. Even in this situation falling branches do damage, inflict injures and kill people.
When large trees are mounted on high-rise buildings and a branch breaks, either from its own weakness or a violent storm, the material has a greater distance to fall to the ground. If this is several stories - say 30 or 40 stories - the gravitation pull means the branch will reach terminal velocity. The exact speed is determined by the fall distance, weight and aerodynamics or gravitational resistance of the material. Heavier wood with a greater moisture content and fewer leaves will reach a greater speed than lighter wood with more leaf material. The important point is that this loose material will hit the ground with greater impact than a tree growing at ground level. Further to this is a factor called wind throw. Here the material can be carried along with the wind and impact many metres from the source. With the changing climate predictions suggest more extreme weather events and intense storms, so the risks of hard tissue plants breaking, falling or being thrown from the anchor point increases.

vertical garden systems to air plants

Whenever any plant grows, at some point the living tissue has to die. Often plants that grow quickly and produce luxurious leaves also have these leaves die quicker. While they can look fantastic, they can be more effected by extreme climatic stress - heat, wind, lack of water. In recent years it seems there has been a race to claim the largest or highest vertical garden. But as plants are nstalled higher up buildings, as in the One Park Building up to level 33 in Sydney, Australia, the climate alters. Constant wind becomes a factor that pulls moisture from the plant when the stomata is open during the process of photosynthesis. The One Park complex has a team of five to six gardeners constantly maintaining and replacing plants Successful application of integrating the living texture of plants into the fabric of a building is dependent of four factors: Species - Aspect - Acclimatization - Extremes. Selecting the right species for the aspect and acclimatizing the species before installation is crucial, as is understanding and managing extreme events.

I witnessed an example of poor species to aspect adaptation in a vertical wall garden in Melbourne Central Station. The garden design had a section of Vrieseas planted on a reticulated wall. As specimen plants coming into flower, the inflorescence which can last for months, they looked stunning. However, Vrieseas are another genus of Bromeliads and as mentioned their water uptake is through the leaf, so the constant water at the root causes rot, while lack of moisture on the leaf caused dehydration. Not surprisingly the plants slowly lost their vibrancy and vigour before they died. But more surprisingly the Vrieseas were replanted several times with the same affect before the wall garden was eventually decommissioned.

With a reticulated watering system, an extreme event might be:

- a pump failure or blocked pipe or drain
- extreme weather event like wind, cold, heat, dryness
- tracking, where the liquid tracks from the wall down a leaf surface and falls onto the ground below which denies the plants below this point water

Vertical and roof gardens most often fail because these factors are not considered. Because Tillandsias have no need of soil medium or a reticulated watering system the risk factors are reduced. Importantly, there is also no risk of water entering an undesired aspect of a building, as there is no risk of roots penetrating and damaging the façade or structure.

Biological insurance

The Eureka air plant experiment strongly suggests that tillandsia plants can be grown with no soil or auxiliary watering system on the tallest of buildings in a city like Melbourne, and opens a portal for installing plants in a creative but effective and environmentally beneficial manner on high-rise buildings. The management of the Eureka Tower was very supportive of the experiment, and there is potential for a larger project in the future.
The authors continue to believe that “air plants” provide a significant advantage over plants that need to be supported by active watering and fertilization systems, not least because of the probability of “extreme events” that could rob the plant of its water and / or nutrients.
With a reticulated watering system, an extreme event might be:

- a pump failure, blocked pipe or drain
- a weather event like wind, cold, heat, or drought
- tracking, a condition where the liquid drips from the wall, down a leaf surface, and falls onto the ground below, which denies water to the plants below this point

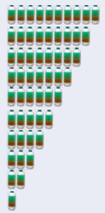
Vertical and roof gardens most often fail because these factors are not considered or maintained. Because Tillandsias have no need of soil medium or a reticulated watering system, the risk factors are reduced. Importantly, there is also no risk of water ingress to an undesired aspect of a building, nor is there risk of roots penetrating and damaging the façade or structure.
Therefore, even if such an experiment should prove a “failure” with widespread plant deaths, the lightweight characteristics of the Tillandsia would not pose the same kinds of issues as hard-tissue plants such as vines, such as scarring on and penetrations in the facade, if at anytime they were detached from the building.

Vertical Garden water usage
annual liters per sqm - excludes rain

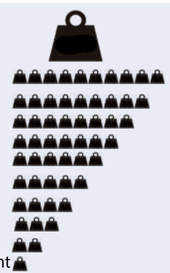
1 - 3000 L or more - excessive
2 - 2500 L - extremely high
3 - 2000 L - very high
4 - 1500 L high
5 - 1000 L moderate
6 - 750 L low
7 - 500 L very low
8 - 250 L exceptionally low
9 - 100 L extremely low
10- 0 L xerophytic - self sustaining

Vertical Garden nutrient (PNK) rate
annual ml per sqm -

1 - 1000 ml or more - excessive
2 - 700 ml - extremely high
3 - 500 ml - very high
4 - 300 ml high
5 - 200 ml moderate
6 - 100 ml low
7 - 50 ml very low
8 - 30 ml exceptionally low
9 - 20 ml extremely low
10- 0 ml xerophytic - self sustaining

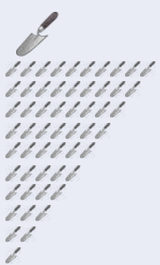


Vertical Garden Gross weight
per sqm - plants, medium, water



1 - 90 or more kg - extremely heavy
2 - 80 kg -
3 - 70 kg -
4 - 60 kg - heavy
5 - 50 kg - moderate weight
6 - 40 kg - light weight
7 - 30 kg - very light weight
8 - 20 kg -
9 - 10 kg -
10 - 3 -5 kg - exceptionally light weight

Vertical Garden Maintenance rating



1 - daily attention
2 - weekly attention
3 - fortnightly attention
4 - monthly
5 - bi-monthly attention
6 - quarterly attention
7 - half yearly
8 - yearly
9 - biennially
10 - 4 yearly or longer

In answer to your query about trees on buildings and the reference to Marina Bay Sands in Singapore – the trees are at level 55 on MBS and form what the MBS web site describes as, “a garden of Palm Trees“.
As we have discussed many times, in my book, it is about selecting the right plants for the aspect in the same manner that plants naturally select their niche habitat within nature.
Palms have several characteristics that lend to the MBS application.
Palm tree roots do not widen out as they grow; rather, they tend to grow straight down. As a result, they are unlikely to damage nearby sidewalk or pavement. ...Palms have no tap root. Instead, their roots are fibrous and jut out from the root ball in all directions. In nature, they draw nourishment and water from a wide swath of ground; however, they can become root bound and still stay alive.

Palm trees are monocots, and things like maples or oaks are dicots. ... They give the trunk of a palm suppleness and allow it to bend in the wind. That’s why when you see TV news people broadcasting from a hurricane-swept shore, you almost always see palm trees bending – but not breaking.

As typhoons usually move towards the poles and away from the equator, Singapore is not likely to get hit by extreme winds. The wind records for Singapore show maximums of 103.7km/h for the west coast and the highest wind speed recorded for the whole island was144.4km/h

In Paris, it could be possible to get winds about the same speed, but the trees in the render seem to be dicots. The design of the building with cantilevered sides that overhang the area below is certainly stunning – I love it - but I would be cautious about placing large dicots trees near the edge. As you know I am a huge supporter of greening urban infrastructure but there can be issues in this that need to be considered. It is really important that these projects be realized in a successful manner.

In terms of placing trees on building it is worth noting:

What is termed “organic weathering” happens when plants break up rocks with their growing roots or plant acids help dissolve rock. This is a gradual process that happens over many years and go be unobserved. Without question, over time they can do the same to concrete, and there are instances where trees have compromised the integrity of the structure on which they sit. Over time, the trees are likely to become root bound and need feeding with nitrates and phosphates, both of which can hasten the process of concrete deterioration. Creating a safe barrier between the tree roots and the water proofing of the structure is essential, as is regular maintenance.

Dicots also have a great risk of breaking and or losing limbs in high winds. As the structure is not high it would be unlikely that falling limbs would reach terminal velocity, but they would still have the potential to do significant damage.

As any plant grows, particularly plants like dicots, they capture CO2, other gases and also increase their potential water uptake. Consequently, their weight increases which is a factor that needs to be accounted. It is great to capture and store carbon, but not at the expense of a greater risk.

Another aspect which is just coming to light with integrating plants into buildings is the increased risk of fire. Some countries are beginning to offer guides (I believe Germany and Argentina) have acted on this. The trees in the render appear deciduous which means they can drop large volumes of leaves in autumn in a short period of time. While it might seem ridiculous, who would have guessed that the Crystal Palace made of glass and steel would be destroyed by fire.

As you know, these are the issues we avoid by integrating plants like Bromeliads and in particular Tillandsias (air plants) into more difficult urban infrastructure.

Super sustainability

As Bromeliads grow asexually, the living art works are super-sustainable, that is over time they can be harvested to provide a bio-resource to create new works, as in the work at The Friends' School. A significant advantage of integrating Tillandsias into a green building design is that a living wall can be completed in sections, where over time the plants are harvested and assigned to the next section of a wall. A high-rise façade might be completed several levels at a time. Unlike current vertical gardens, there is no operating cost of water, pumps, no new replacement plants. In fact, managed accordingly, living walls and suspended sculptures using Tillandias can actually generate an income for the building owner.

Adaptation of green public art & the facades of building as creative new spaces

Unlike other art forms which often create more dead pixels in order to present their sustainable themed art, this super-sustainability is one of the truly unique characteristics of creating art with plants, and is especially so with Tillandsias. Through the direct use of appropriate plants in their work, artists have the potential to occupy the largest of gallery walls and spaces in both a permanent and super-sustainable way, reach the widest possible audience and effect real change in the urban habitat. The walls, roofs and "alpha spaces" of our cites are the blank canvas of the 21st century, these are the spaces artists must invade with their ideas and living green medium. Plants are a new (old) medium and one we must begin to use more often. By assisting plants to colonize the bare surfaces that are our buildings and the sky space between them in an imaginative manner, contemporary artists can evolve a blue print of urban nature and green spaces as fundamental as the discovery of single point perspective. If we turn to art action, future generations will experience this next millennium in a sustainably positive manner

Plants as living texture

Plants as weather shields & moving screens

The future: A "flight manual" for air plants
Buildings are statements; architects define surfaces and geometries within the overall structure through the integration of metals, concrete and metals like coloured steel, stainless, zinc, copper each have their own aesthetic quality and contemporary architects use these to design stunning structures that most often relate the materials to a defined geometry within the overall structure.

However, responsible architecture of the 21st Century not only considers the advantages of plants within the urban environment by simply "tacking" on a vertical garden onto a wall, but draws from the diverse array of possible living textures of green, juxtaposing them against existing materials and textures, into the overall visual design of the structure at the concept design stage. Plants become another material to draw from and the addition of this new living material offers an exciting potential for the future, where imagination can soar to greater heights.

Imagine tidal gardens with multiple screens that move independently at various rates up and down a building's façade. Imagine whole façades of plants that shimmer on the wind and move from aspect to aspect on a building. Imagine a modular system, where Tillandsias suspend across an open public space like a plaza during summer, creating dappled shade, and then simply moved onto a building's façade for the cooler winter months when the sun is welcome. Imagine roof gardens with suspended Tillandsia screens designed to create modulated shade patterns to complement other, less stress-tolerant plants that might grow on the roof surface below.

The results of these experiments with tillandsia over the past few years have shown that designers can act with the knowledge and confidence that these systems work. Air gardens break new ground, offering fresh dimensions by incorporating plants in our cities for high environmental benefit. They write a "flight manual" for plants to escape their earthly confines in the urban habitat and occupy new and existing space within our cities.
Tillandsia screens could be:

- moved horizontally or vertically in parallel from the building's facade across a window
- rotated on a curved axis, so while they can be set to block direct sunlight, they can also allow a clear view out the window
- set on a swivel off the building and rotated
- positioned horizontally out from the building for shading or hinged upward.

Because there is no need for reticulated liquid, screens of Tillandsia can defy gravity in ways that are restrictive for other vertical garden systems. They can be mounted on façades that overhang or have complex, intricate geometric or organically curved surfaces. For future green architecture, they offer a flexible living texture which, with little maintenance, can be juxtaposed against glass, steel, or concrete. In fact it is possible to create living facades that alter their shape and form during the day.

As bromeliads grow asexually, over time they can be harvested to provide a bio-resource to create new material. A significant advantage of integrating Tillandsias into a green building design is that a "living wall" can be completed in sections, along which, over time, the plants are harvested and assigned to the next section of a wall. A high-rise façade might be completed several levels at a time. Unlike current vertical gardens, there is no operating cost of water, pumps, and no need for replacement plants.

As the silver Trichome cell which adorns much of the leaf surface of Tillandsias reflects up to 93% of the light that falls on them, these plants are excellent for living heat mitigation screens. Because of their very light weight and adaptive biology, Tillandsias are ideal plants to use for weather shields and sunscreens, even on the highest facades. Whereas vertical gardens weigh up to 90kg/sqm a screen mounted with Tillandsias weighs about 3kg/sqm. While the weight per sqm depends upon the density of the plants on the screen, the extraordinarily light weight of these living structures affords applications that are unimaginable to reticulated systems that cannot overhang a vertical axis.

Unlike vertical gardens that demand reticulated water and nutrient systems and most often sit directly against a building's facade, with air plant systems there is very reduced infra-structure required, Tillandsia screens can be set off the building by up to a meter or even more. We have experimented with Tillandsia screens which can be moved across windows for heat mitigation. From inside the building looking outside these screens have a lace like effect allowing dappled diffused light to enter the building. Rather than attaching the plants to a fixed screen, they can be designed in various configurations.

On Lloyd's St Andrews house, two double glazed skylights sit on a steep inclined roof letting welcome light into the room during winter and cooler days. However, on days 35ºC to 40ºC+, despite the double glazing, excessive heat enters the room.

In terms of comparative costs it is difficult of offer exact figures, but depending upon the system and complexity of an installation, a reticulated vertical garden system can run anywhere from $1200 to $3500 per sq meter where as a Tillandsia screen system costs $1200 sq meter for the plants plus infrastructure and installation. Where a huge cost disparity arises is in the on going maintenance. Reticulated systems require regular maintenance which can run from 15% to 30% of the install cost per annum. This equates to a maintenance bill of $30,000 - $45,000 per annum for an install cost of $350,000.

Vertical gardens with large areas of dead plants look dreadful. With reticulated systems much of the cost is in replacing dead plants on a regular basis. While the manager of a vertical garden business told me they only have to do maintenance once or twice a year, his installation supervisor had a different story that the same garden required attention every 2 months.

On the other hand, Tillandsia screens can be left for 3-4 years with no maintenance at all. Simply fix and forget. However the screens do need harvesting where excess growth is trimmed and the plants reset every 4-5 years.

Animated plant screens

Experimental movable living Tillandsia plant screens

In 2013, the South China Morning Post, based in Hong Kong, were about to publish an article on the *Airborne* plant works in Melbourne which had been installed since the beginning of Feb 2013 with no life support system at all (watering system etc and were thriving). After the interview, the editor also wanted a shot of the experimental movable air plant screens I have at home but I had just a few hours to get a photograph to them.

As I did not really have a good photo and the setting was not aesthetically sympathetic, I took the plant curtain at the house added some more plants at the base then set it up on a neighbors new house a few km away. The house already had a sun screen system so it offered a great comparison to the Tillandsia plant screens. After an hour or so setting it up I managed to get the photograph and e-mail to the news paper. The screens can be moved from the widow to the façade of the building to screen the sun as required. This is a prototype and they need more development but it gives a good idea of the concept. Of course the screens could easily be applied to a multilevel building.

SCMP life style article - Dec 2013

View from inside of experimental movable living Tillandsia plant screens. While the 3 dimensionality of the Tillandsia plants offer shade they also allow light to enter and offer a sense of the space outside.

Skylight screens

At home there are double glazed skylights on the galvanized iron roof. Despite the double glazing, the heat of summer when temperatures reach over 40°c, still allow excessive heat to enter the building through the glass.

Two Tillandsia plant screens were constructed from recycled materials and can be lowered or raised on wire cables over the glass. The screens have a an old scooter wheel on each corner and sit about 250 mm above the roof. This allows the skylights to be opened for air circulation and also allows some light to enter the room below even when the screens cover the skylight.

Metal cables run up to the ridge line of the roof through a pull and down the opposite side where they can easily be moved by hand. The screens were installed in 2013 and have had no maintenance since, however some plants were lost due to a -6°c 60 year frost.

Metal is highly conductive and temperatures on a roof like this can quickly rise and fall within a short period of time.

Tillandsias respond well to small but frequent exposure to morning dew as seen on this roof.

Above: the Tillandsia screens over and away from the skylights.
Right: Tillandsia screen in flower.

Temperature reading summer 2018 ambient air 30°c, iron roof 63.7°c shade from Tillandsias 38.4°c - heat mitigation on iron roof of 25.3°c

Temperature reading summer 2018 ambient air 42°c, iron roof 84.5°c, shade from Tillandsias 53.1 c - heat mitigation on iron roof of 31.4°c

Private residence

Installed March, 2017

Animated nose shaped Tillandsia sun screen
Commission for private residence St Andrews, Victoria

Friends who live close by saw the experimental skylight plant screens at home and wanted one for their house to rise and fall over a triangular window on the west wall. During summer the setting sun would pour through the glass and screening the sun was a priority.

The light weight screen is raised and lowered via a series of pulleys, a hand winch and moves on wheels that run in a track to guide the screen into place.

A hybrid Tillandsia Houston was selected for the install and the plants have continued to provide shade, grow, produce colourful flowers at regular intervals. The owners are more than happy that the plants can sustain themselves without a watering system and the screen has never required maintenance.

Armature frame for movable Tillandsia sun screen. Rather than creating the screen as a 2d shape, the triangular shape is formed like a nose which screens the sun but also allows light to enter from the bottom while adding a third dimension that creates changing shade patterns.

Frame for movable Tillandsia screen on triangular window lowered.

Frame for movable Tillandsia screen on triangular window raised.

The screen is held in place during the installation before the wire cable and pulleys were installed. Notice how the screen is projected out from the wall at the bottom to allow light to enter the space. Photograph 2016

Photograph 2019 - Over three years the screen required no maintenance, and despite hot dry conditions, no plants died - the 2 photographs demonstrate the growth in the plants over this period. One plant far right bottom has slipped the mount but is still attached.

Geoff Beech and I installed this xeric Tillandsia moving nose cone screen on a neighbor's house in March 2016. The wall faces west and breaks the heat entering the house. It is exposed to a lot of heat, but it does get rain. There is No watering system, No root medium, No fertilizers and it is light enough to move up and down over the window. Vertical gardens most often require regular maintenance every 3 months. Reticulated systems often require new plants to replace those that have died, but after nearly 5 years not one Tillandsia was dead.

By December 2021 the Tillandsia plants had become very thick and today we did our first maintenance call to thin the plants.

The maintenance tool 30 minutes. We took clumps of 3-4 plants off, in all over 150 large plants. Over the same period a typical reticulated vertical garden may have required 14 maintenance calls. In a truly sustainable manner, the clumps of Tillandsia plants removed which have been used on another wall.

The xeric Tillandsia nose screen with the plants removed. ready to re-install

Harvested plants ready to be mounted on another wall garden.

Edendale Farm

As part of the 2017, Nillumbik Practically Green Festival at Edendale Community Environment Farm Gastons Road, Eltham, I was commissioned to create a moving Tillandsia plant sun screen to be permanently installed on a building. As the festival is a community event, members of the public attending the festival were able to select a Tillandsia and wire it onto the screen with an aluminium tag where they could write their name. The screen was later installed July 2018. Edendale offers many examples of sustainable systems and the work adds to these.

- Title: Alpha screen – animated
- Date: 2017-18
- Medium: Aluminium, galvanized mesh, Tillandsia plants
- Dimensions: H 1100mm x L 1500mm X D 300mm

The plants suffered a minot set back in Oct 2018 when a severe frost descended upon the area and a few plants were lost. However since then and despite the driest two years ever recorded the plants have grown well, are beginning to multiply and cover the screen.

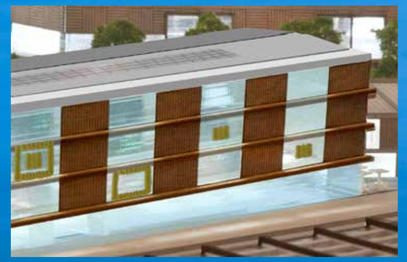
Pulse was also installed as a temporary ground based sculpture for the duration of the festival

Fixed plant screens

Even the most refined architecture can have awkward areas where utilitarian facilities like water and other services sit on the exterior of the facade. As this experiment shows, in this situation Tillandsias are used to screen a spouting down-pipe. When access is needed the structure supporting the Tillandsias is simply hinged away from the pipe.

In this situation, the Tillandsia screen is fixed and used as a screen to break one space from another affording privacy to both. There is a mix of Tillandsia species that offer flowers at various times of the year. At the base is Tillandsia *lajensis* growing containers.
Photograph 2016 left - 2021 right

Tidal air plant gardens



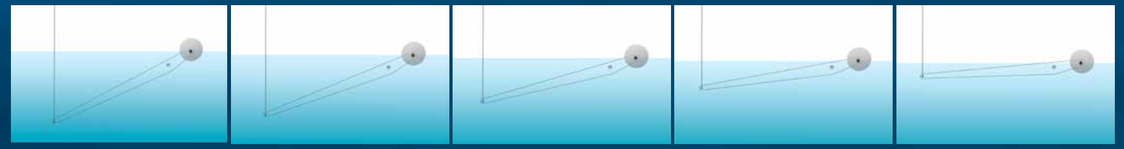
In 2012 Matt Blackwood and Lloyd submitted a proposal for a major commission for the new City of Melbourne Library building that was positioned on the wharf above the water at Docklands.

The project was titled Echology: Making Sense of Data initiative and was a partnership between Carbon Arts, the Australian Network of Art and Technology and developer, Lend Lease. The proposal for the commission was for the worlds first tidal garden of air plants that would rise and fall up the facade of the building driven by the tide.

Like *Code Green*, the work would include a large QR code created from Tillandsias. Scanning the code would direct an audience to a short story contributed by a range of local writers. As the brief was to utilize data from the library the proposal explored an innovative means of using data relating to items being loaned from the library at the point the code was scanned.

The series of air gardens would be located on the front facade of the building. As the library was positioned over a wharf with the water below the site was perfect for a project like this. The animated gardens would be driven by a series of floats and levers.

Unfortunately the proposal was not successful, is unrealized but remains a potent conceptual idea. In fact in late 2016, the winning proposal - The Melbourne Mussel Choir, by artist Natalie Jeremijenko has never been completed.



Private Tillandsia screen


Flat screen


Nose screen, projects outward at the bottom which allows light to enter the room from below but screens direct

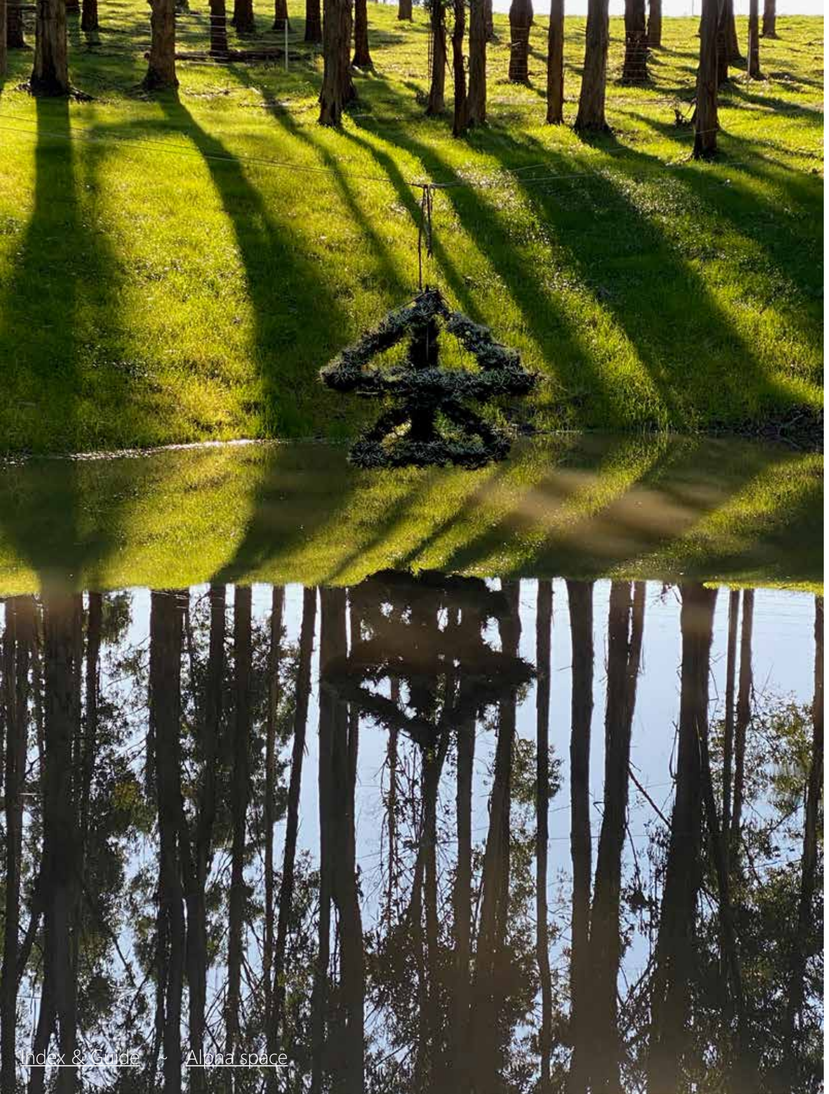

Jib screen, similar to a set of jib sails on a yacht, the screen projects outward at the bottom and the one side which allows light to enter the room from both below and from the side, but screens direct summer sun

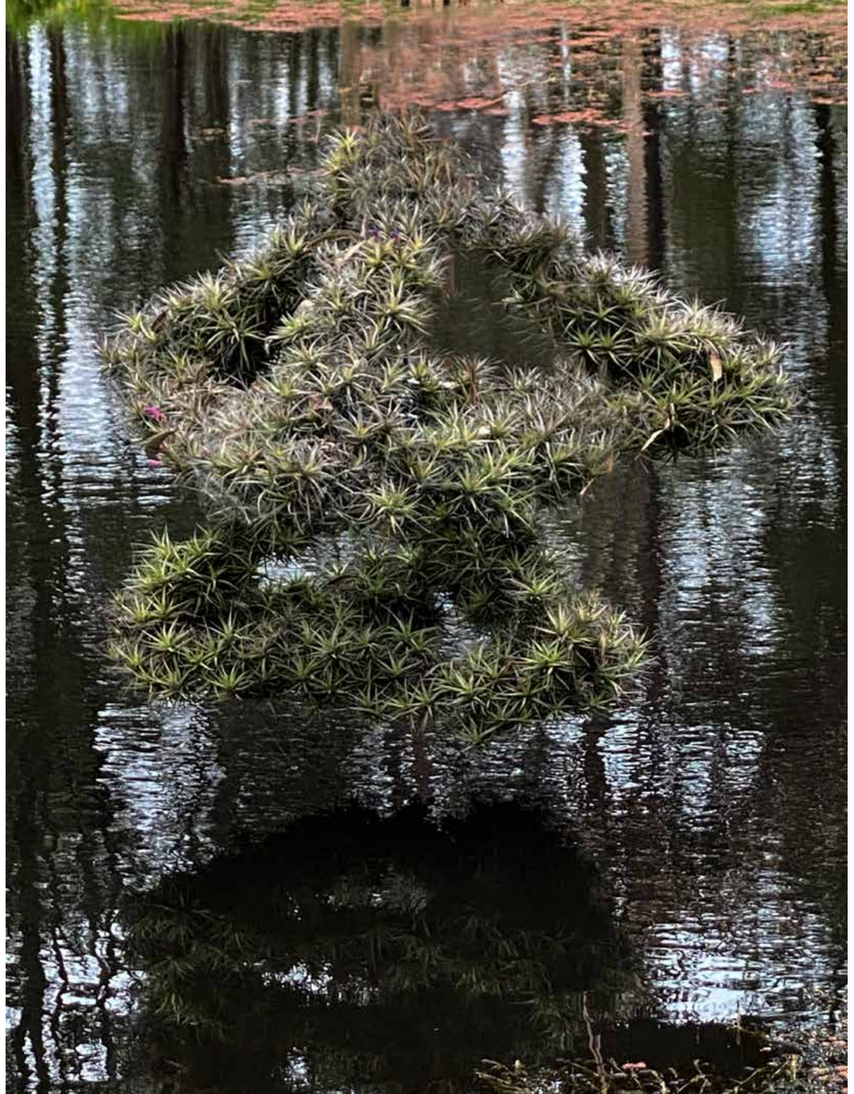
The Grove Gippsland

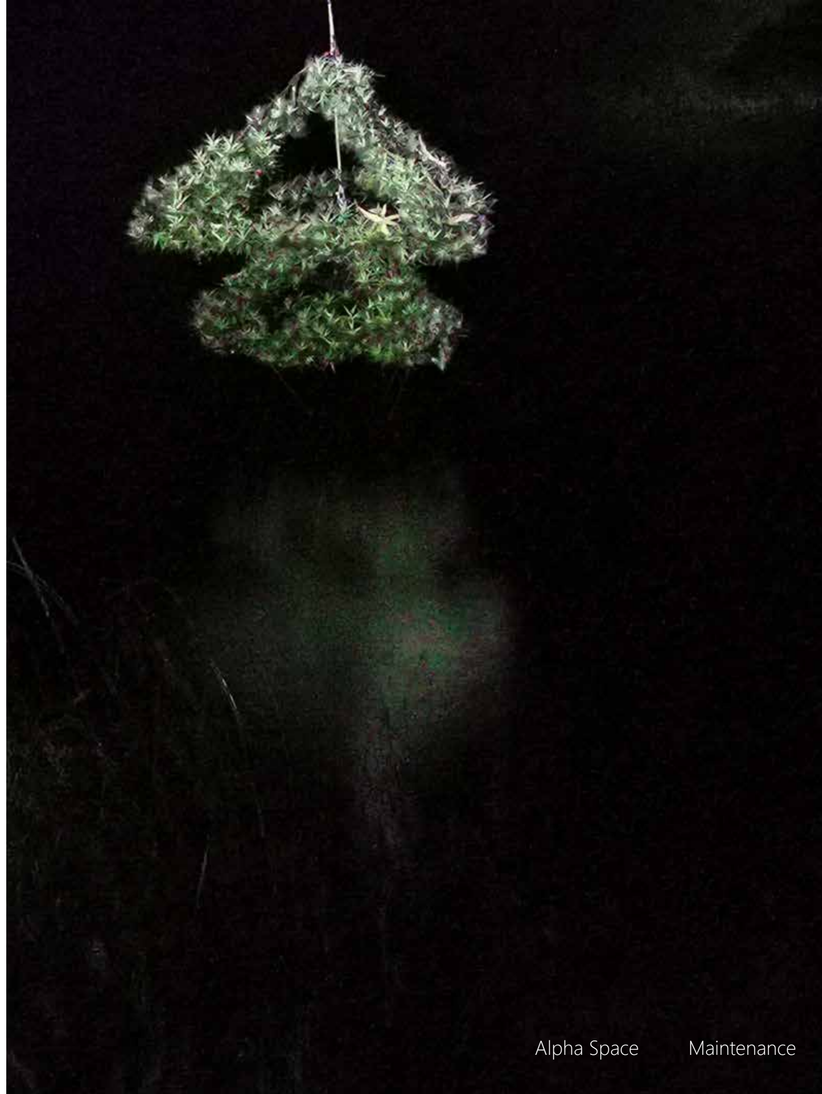
The Grove is perched atop the rolling hills of Bass Hinterland, The Grove Gippsland is an immersive food and nature destination comprising an Olive Grove and Truffe-rie, Market Garden, Restaurant and Function Space, and Nature Walks across our sprawling 60 acre property. The owner and director, David Erlich was in the process of creating a series of nature walks incorporating sculptures. Over a few years I have watched the project evolve and together we conceived the idea of suspending a rotating Tillandsia sculpture over a newly formed dam.

Before the Tillandsia sculpture was installed 250 plants were harvested from the sculpture to lighten the loading and provide a resource to create another plant sculp-ture for a second location at the Grove. The photographs show the dramatic trans-formation from the newly formed dam to when it was full a few months later and the grass had grown.

Index & Guide Alpha space



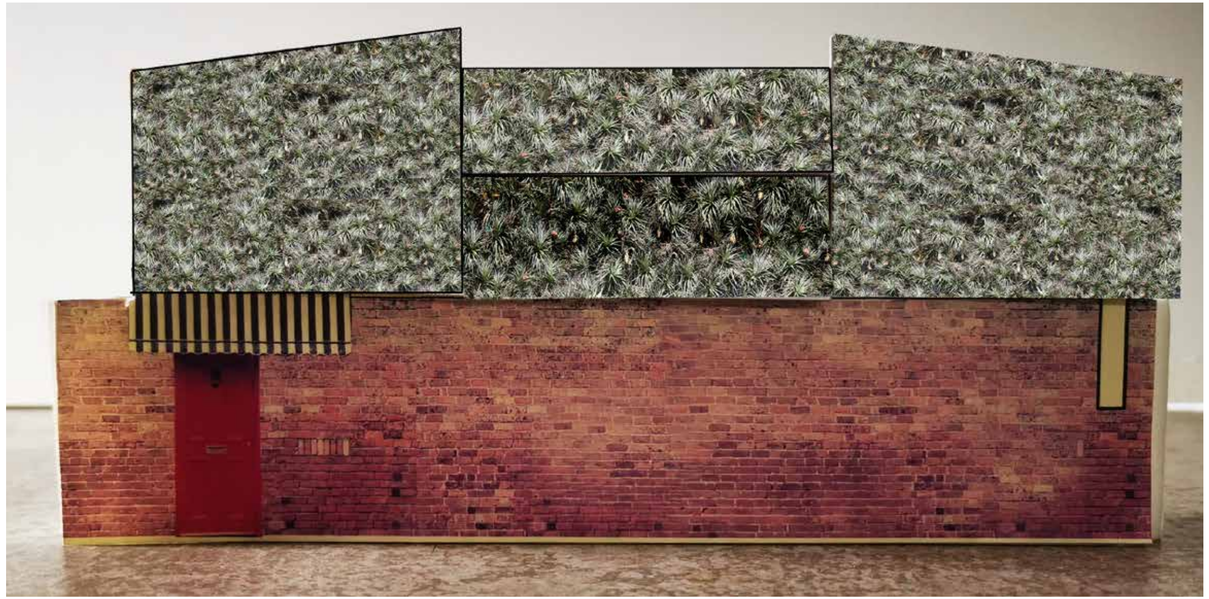





ERNST & YOUNG

Residence East Melbourne

The proposal is to cover the upper wall on this residence to create a living insulation layer to cool the west wall in the heat of the afternoon summer sun. The panels would be covered with a mixture of proven hardy Tillandsias which would mean that no watering system would be required. Although the planting appears dense, from inside the rooms there is a veiled view of the environment outside similar to the photograph of the screen in the photograph lower right. on this page.

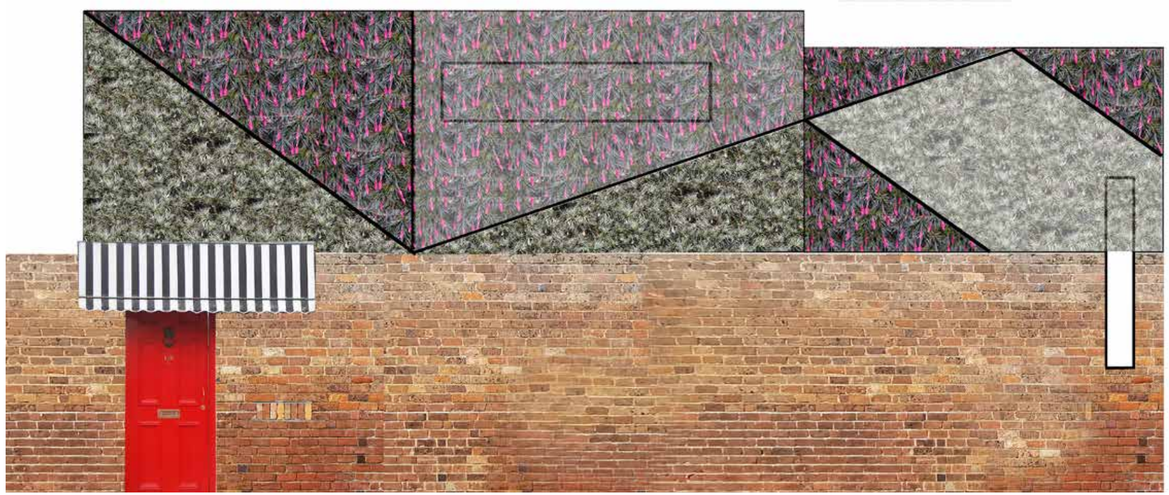


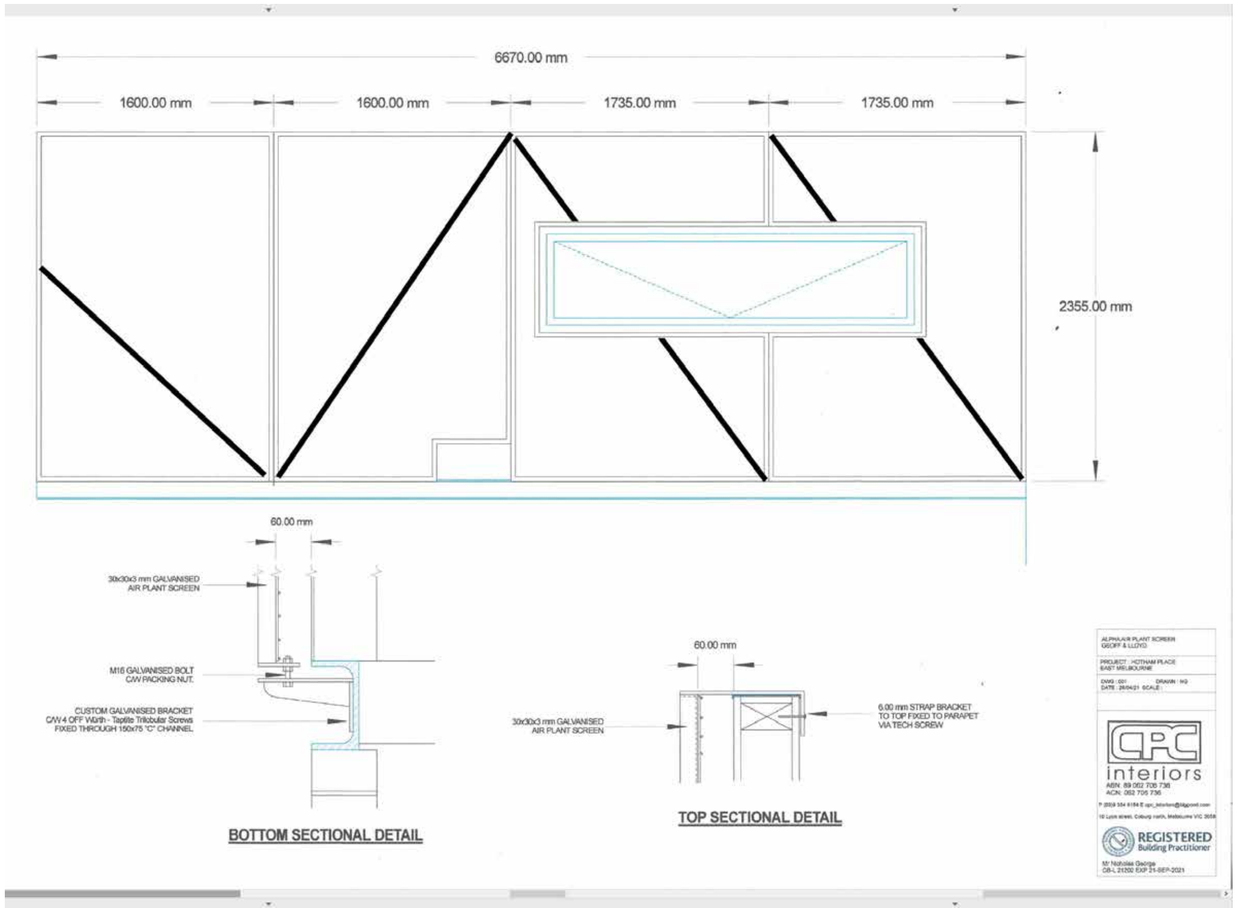
The initial concept for the project was to offer a sense of a third dimension by setting the various plant panels at different angels. Also to extend the screens higher than the facade of the building. However both these ideas had to be abandoned. The first because the lane way is very narrow and the building sits hard against it, so any projection could become a hazard. The second because of an aeriall power cable is suspened close to the top of the building.

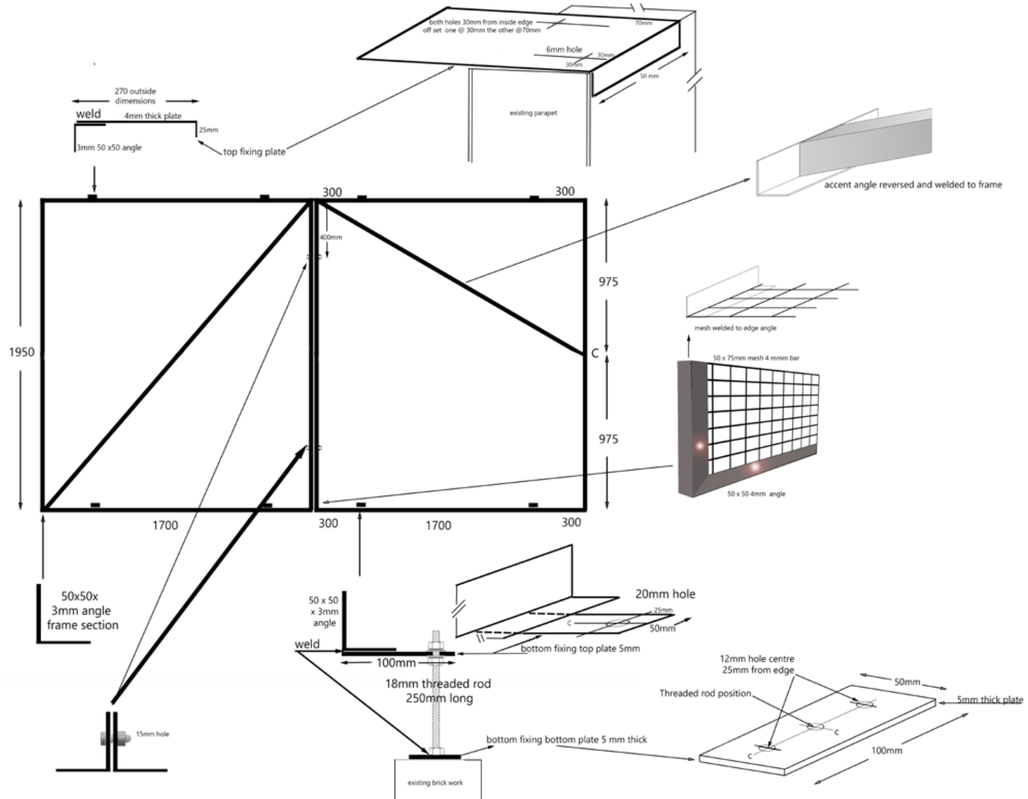
The project got delayed for nearly a year due to the 2020 Covid lock down in Melbourne. We looked at ways to break up the rectangular facade into triangular sections demoted by the silver lines of galvanized steel which offer a zigzag line.

However, the delay in installing the first screens allowed a valuable data set of temperatures to be taken, both of the exterior wall surface and also interior of the dwelling. While recent summers in Melbourne have been hot with at times temperatures over 45C recorded, the summer of 2021 in Melbourne was not extreme with a maximum temperature of 38C recorded in January. At this point, the temperature of the exterior wall reached 70C.

It is expected the effective heat mitigation of the Tillandsia air garden will reduce the temperature of the wall dramatically.







Technical specifications for the support screens

Screen fabricated and ready for hot dipping galvanized in the fabrication workshop.

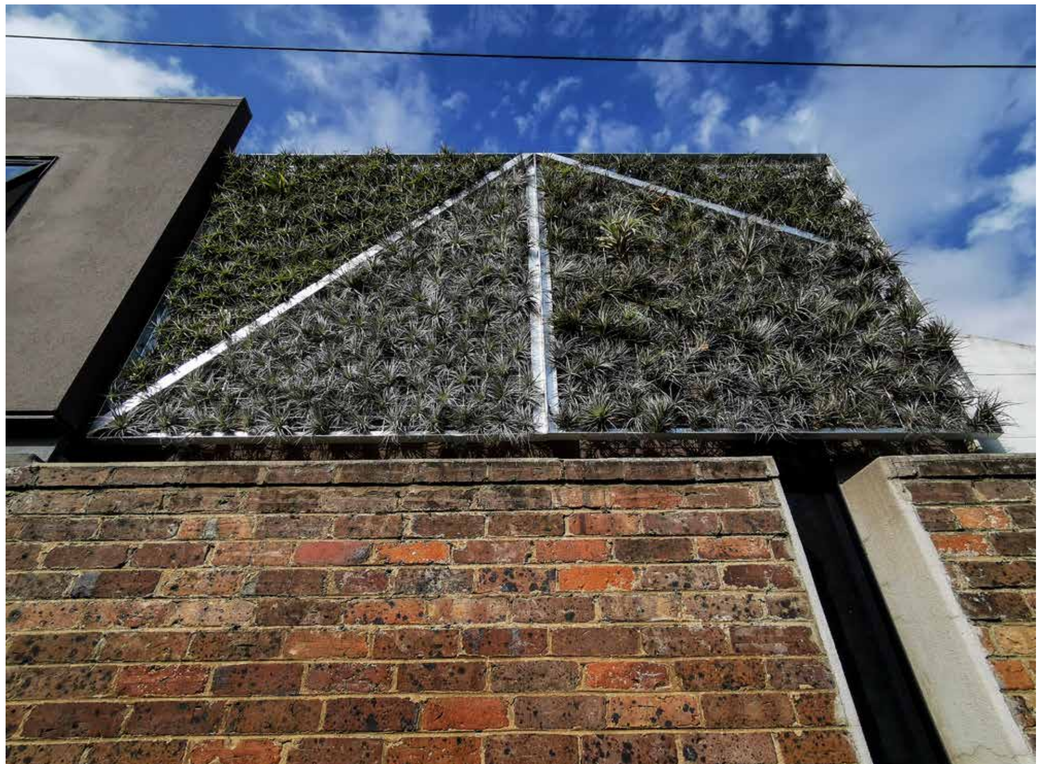
First two screen delivered ready for the installations of Tillandsias - the screens weigh in at 35 kg each.

Installation of Tillandsias on mesh screens. The plants are tied onto to mesh. As the biology of the plants allows all water and nutrients to be taken into the plant via trichome cells on the leaf there is no medium or watering system which dramatically reduces the weight. Total weight with the screen infrastructure and wet plants is 52 Kg - 7.8 Kg/M2. Comparatively a reticulated vertical garden when loaded with plants and water weighs in at over 100 kg/M2

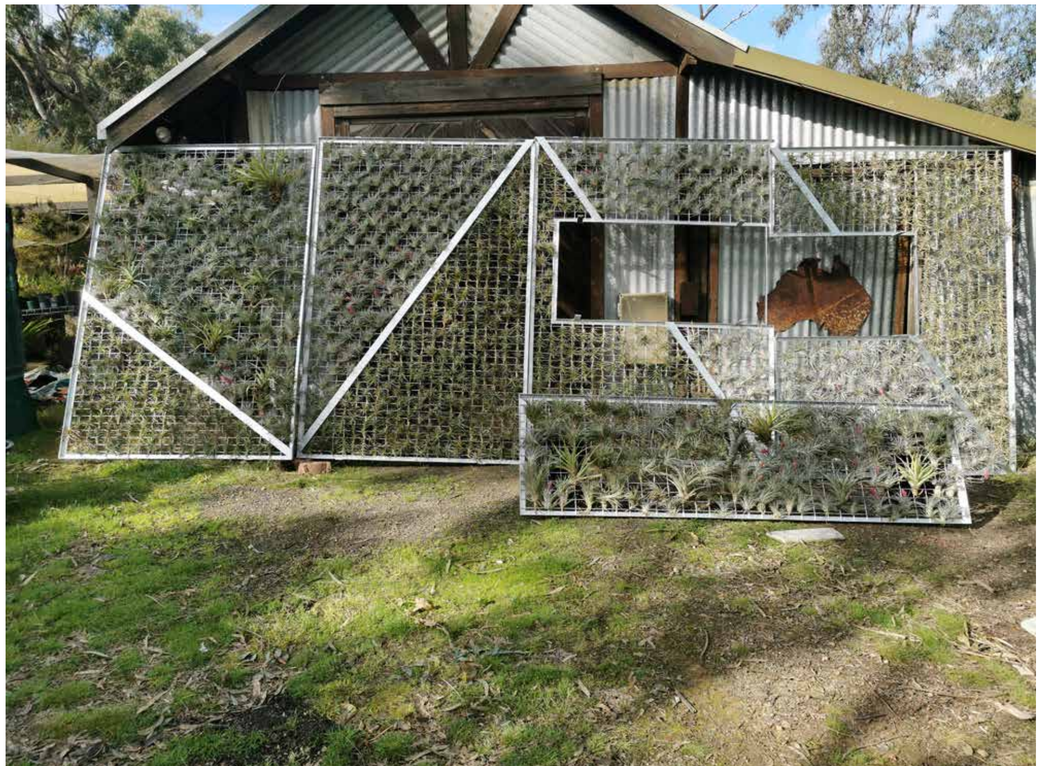
Index & Guide Alpha space

Completed screen section ready for installation.

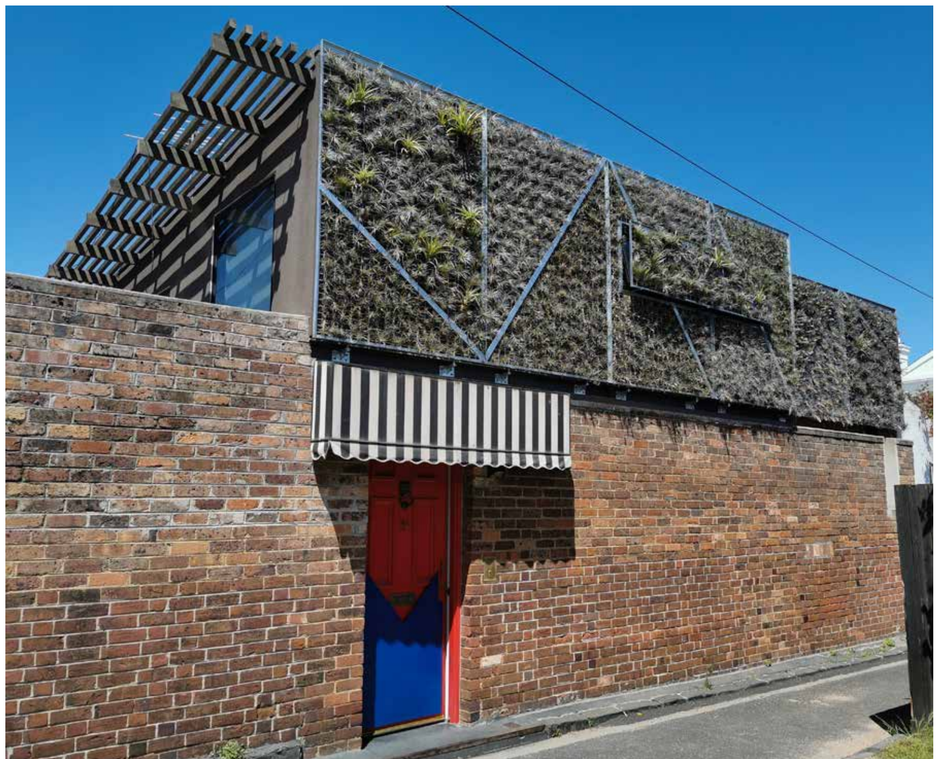
First two panels of Tillandsia screens installed March 2021..

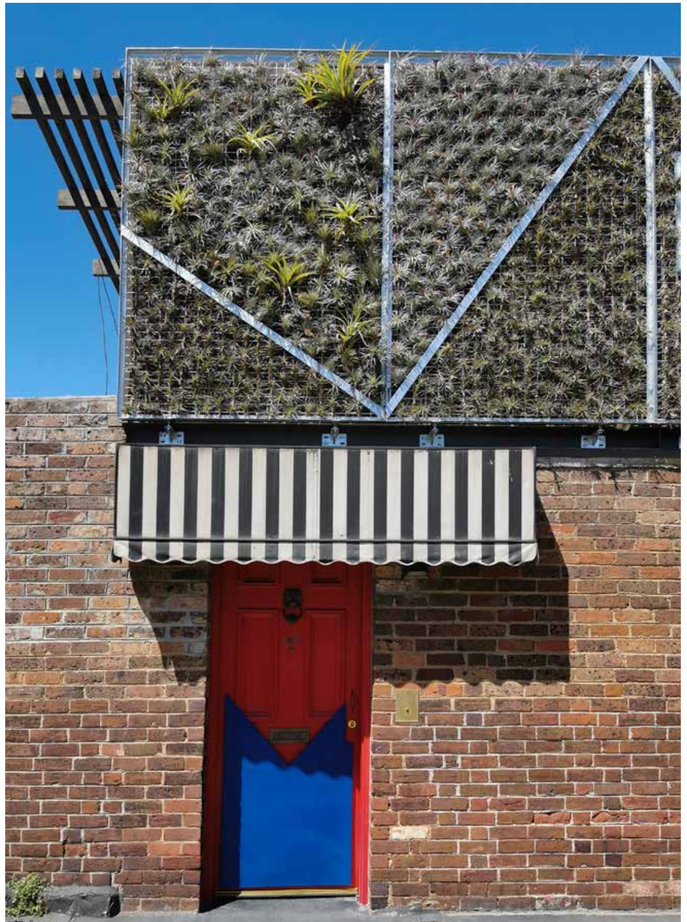


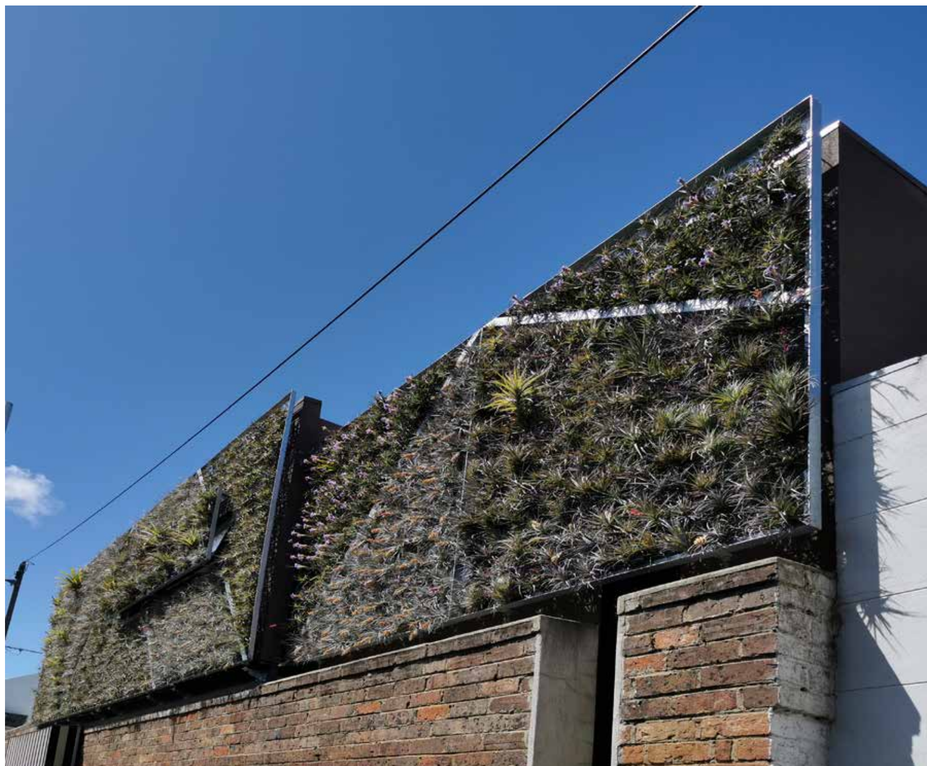
Second four panels of Tillandsia screens ready to be installed July 2021..



Second four panels of Tillandsia screens ready to be installed July 2021..

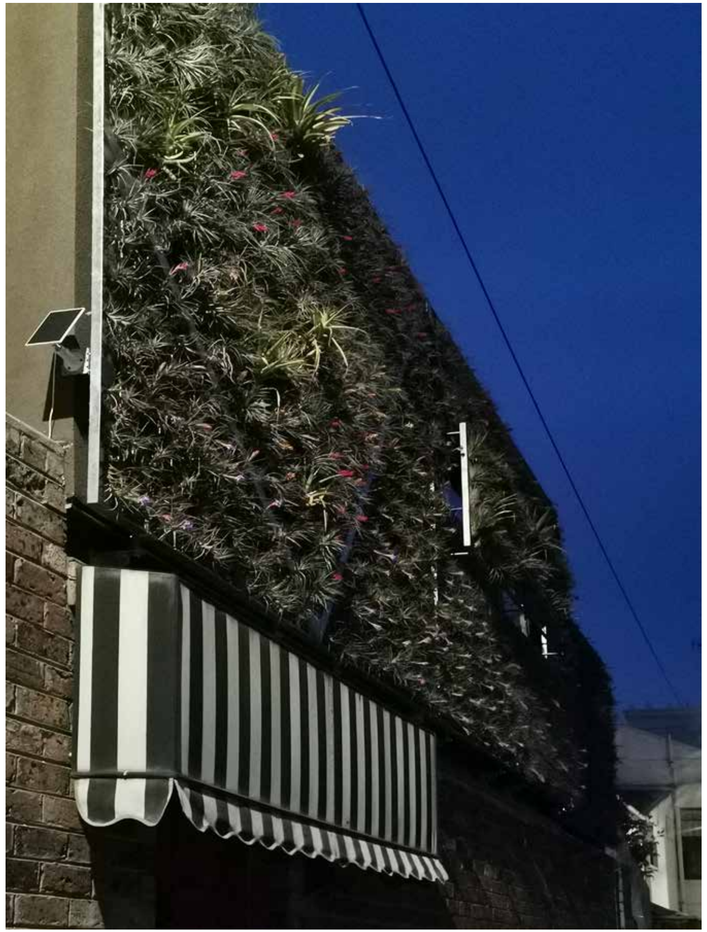


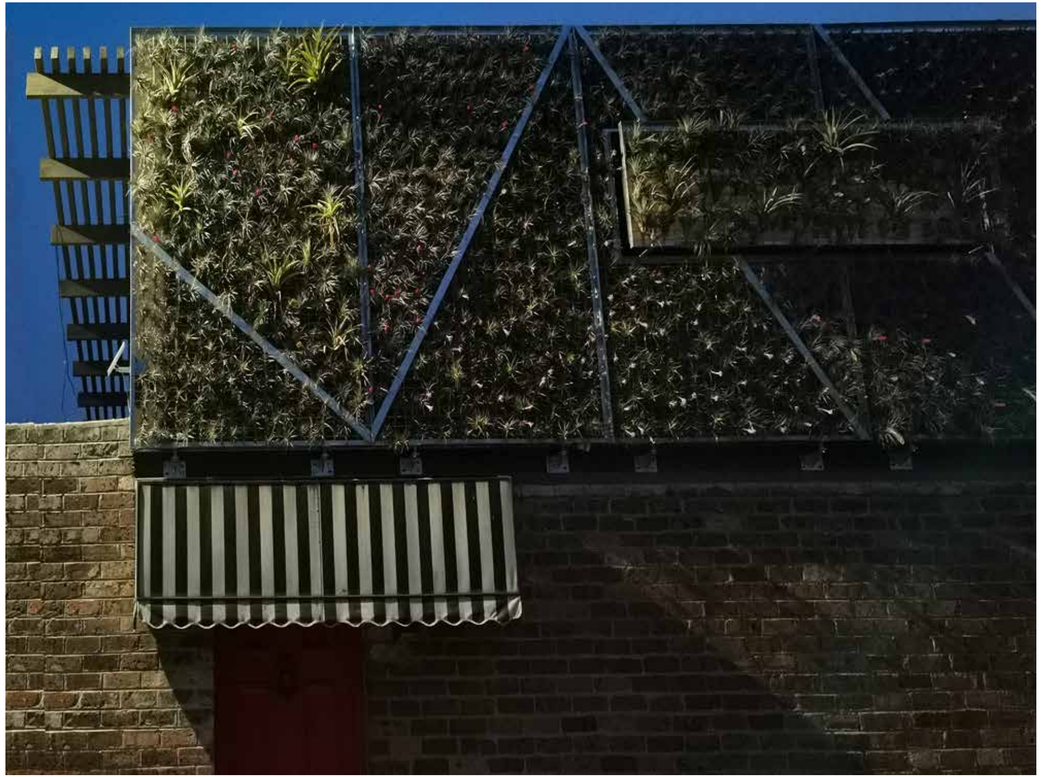




Second four panels of Tillandsia screens installed late October 2021. (due to Covid lock down installation was dramatically delayed)

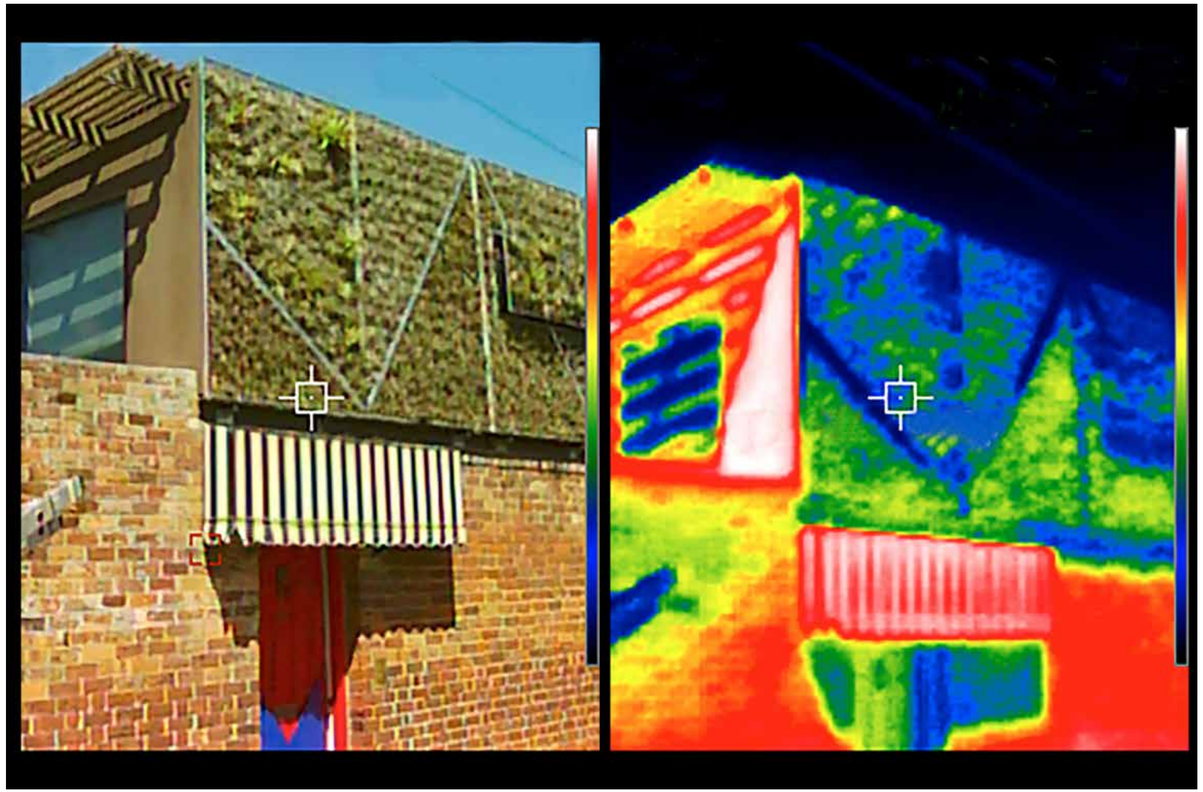
Composite image of completed tillandsia screens.





Nocturne photographs of the Tillandsia screens November 2021.

Index & Guide Alpha space

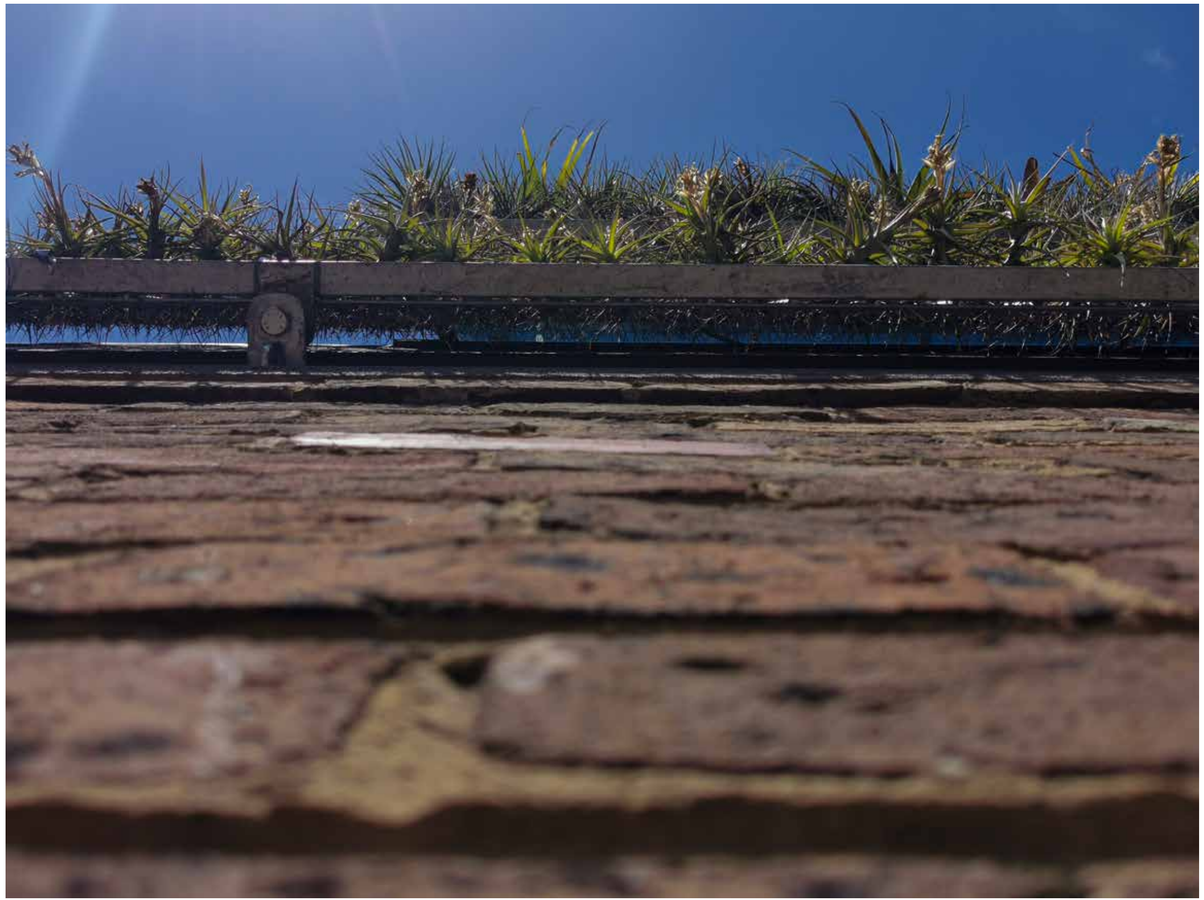


Graphic illustration of heat mitigation. Thermal imaging camera photograph on the right which clearly shows the cooler areas where the plants are against the brick wall.

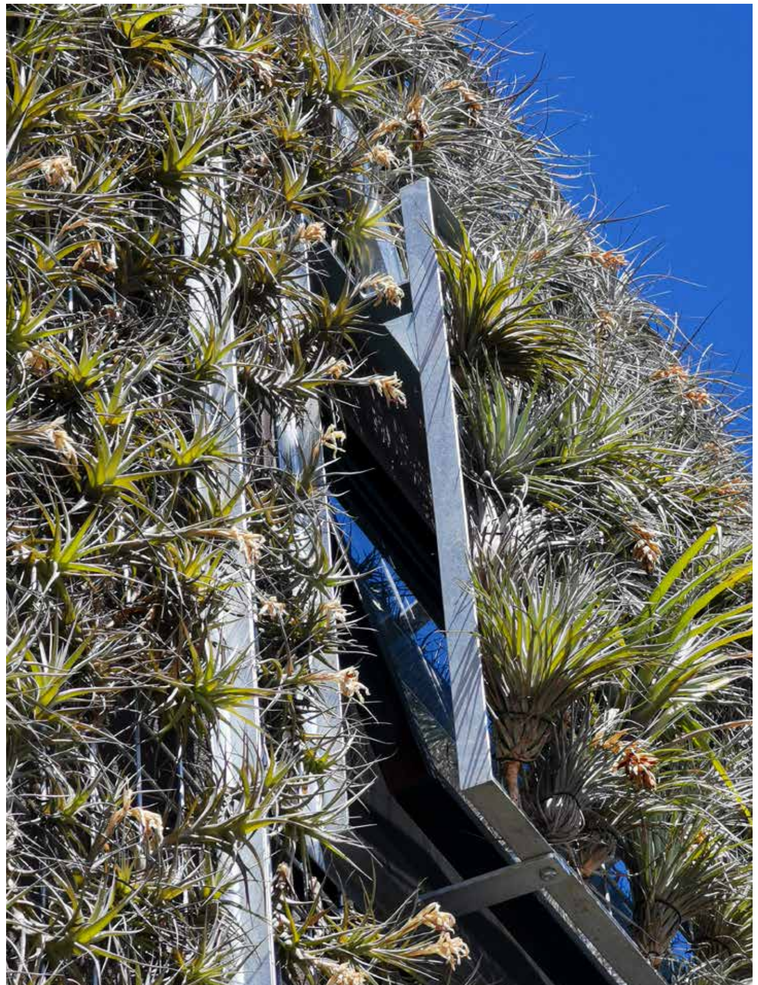
An insightful photograph of a cross section xeric tillandsia vertical wall. No plastic water proof membrane required. NO medium for roots. (many vertical gardens use compressed plastic micro fibres) NO fertilizer. NO reticulated water system. Very light weight

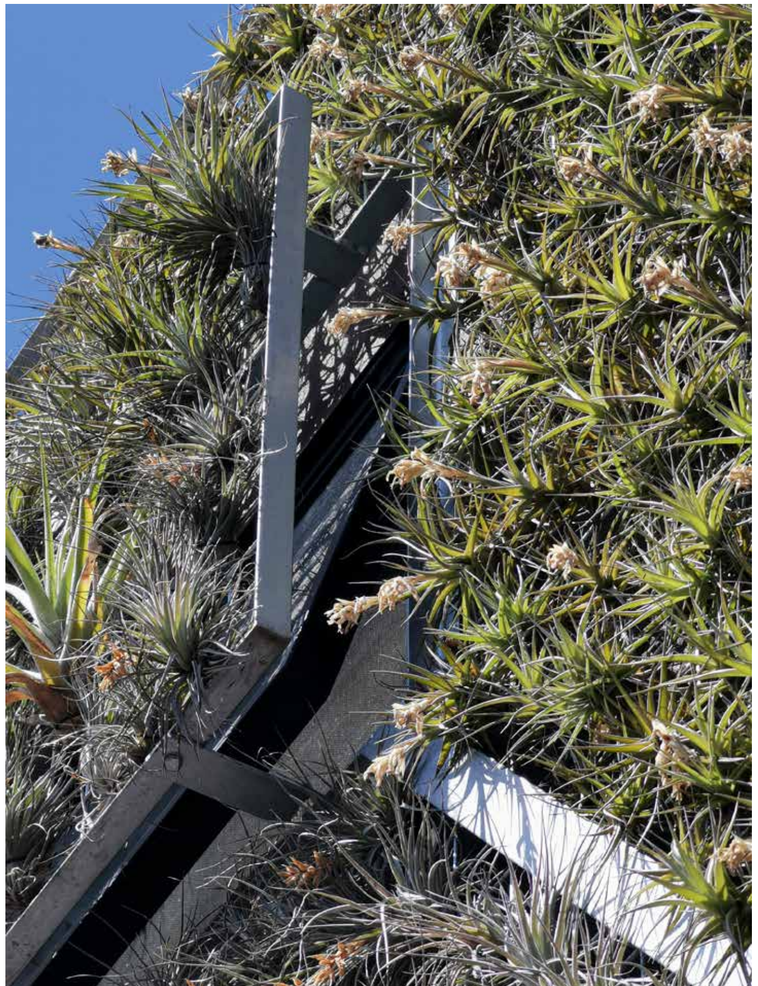
This side view gives a good idea of shade cover on the wall to mitigate heat.

View looking directly upwards from the brick wall to the xeric wall garden.



Index & Guide Alpha space





Detail of protruded window screen section with opening window behind the Tillandsia screen

Index & Guide Alpha space

Surfing - Air plant meets air mat

Surprisingly many Tillandsias can tolerate salt winds etc. I have often wondered how much salt they can withstand. I grew Tillandsias on the coast in the south of New Zealand at Dunedin where they would often be exposed to strong salt winds. As a further test, I could easily have dunked the plant in a container of salt water to see the result. But as a surfer who often rides an inflatable air mat, for sometime I had been fascinated by this and wondered about taking an air plant for a surf. It took over a year for the conditions to align. I wanted a smallish swell on an overcast day in autumn. Easter 2018 proved perfect. On Easter Friday 2018 I put a Tillandsia to the acid test. Air plant meets surf mat meets the ocean.

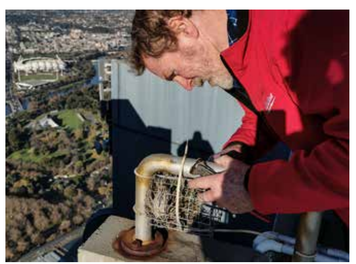
David Benzing generously offers these comments
I personally found that members of a healthy colony of Tillandsia paucifolia growing on mangroves in south Florida were full of sodium probably from salt spray. I'll have to rely on speculation to try to explain why your surfing tillandsias remain alive five weeks after what was definitely a novel marine experience. The grey tillandsias do grow and die slowly but if that ride was lethal all its botanical participants should have expired by now.

You've probably noticed that the leaves of bromeliads, especially those of the tank forming species, often die back beginning at the tip, the oldest part of a monocot type leaf. Why they die back this way probably has multiple explanations/causes. Irrigation with hard (lots of calcium/magnesium carbonates present) water seems to be one cause. Being the oldest part of a bromeliad leaf this is where buildups of substances such as these that at some point reach toxic concentrations will occur first. Highest buildup occurs here because this is the part of the leaf where water loss through stomata has been occurring longest and accordingly where substances in the water vascular stream will build up to highest levels within that organ as it expends moisture while acquiring CO_2 to support photosynthesis. It wouldn't be difficult to check for circumstantial evidence for or against this hypothesis. Simply section leaves that exhibit this dieback and assay each for comparative buildups of potentially problematic substances. It's possible of course that as leaf tissue ages it become more vulnerable to injury caused by this or that ion or other substance in which case the concentration of the substance of interest would be doing its damage despite being evenly distributed across the entire leaf.

Index & Guide Alpha space

Alpha Space Team members

Lloyd Godman MFA : Ecological artist
www.lloydgodman.net lloydgodman@gmail.com 001161448188899
"Lloyd Godman is one of a new breed of environmental artists whose work is directly influencing 'green' building design.....Godman's installations are the result of a unique blend of botanical science, environmental awareness and artistic expression. All three elements are intrinsic to the practical realization of his polymathic vision".
John Power - Editor of Facility Management Magazine Aug 2011



Geoff Beech - Technical director and Tillandsia grower - Geoff trained a a jeweller then later moved to the construction industry in Melbourne. He offers extensive expertise in the construction and installation of the Tillandsia sculptures and screens while as a grower and enthusiast of Tillandsias he fully understands how the plants grow.

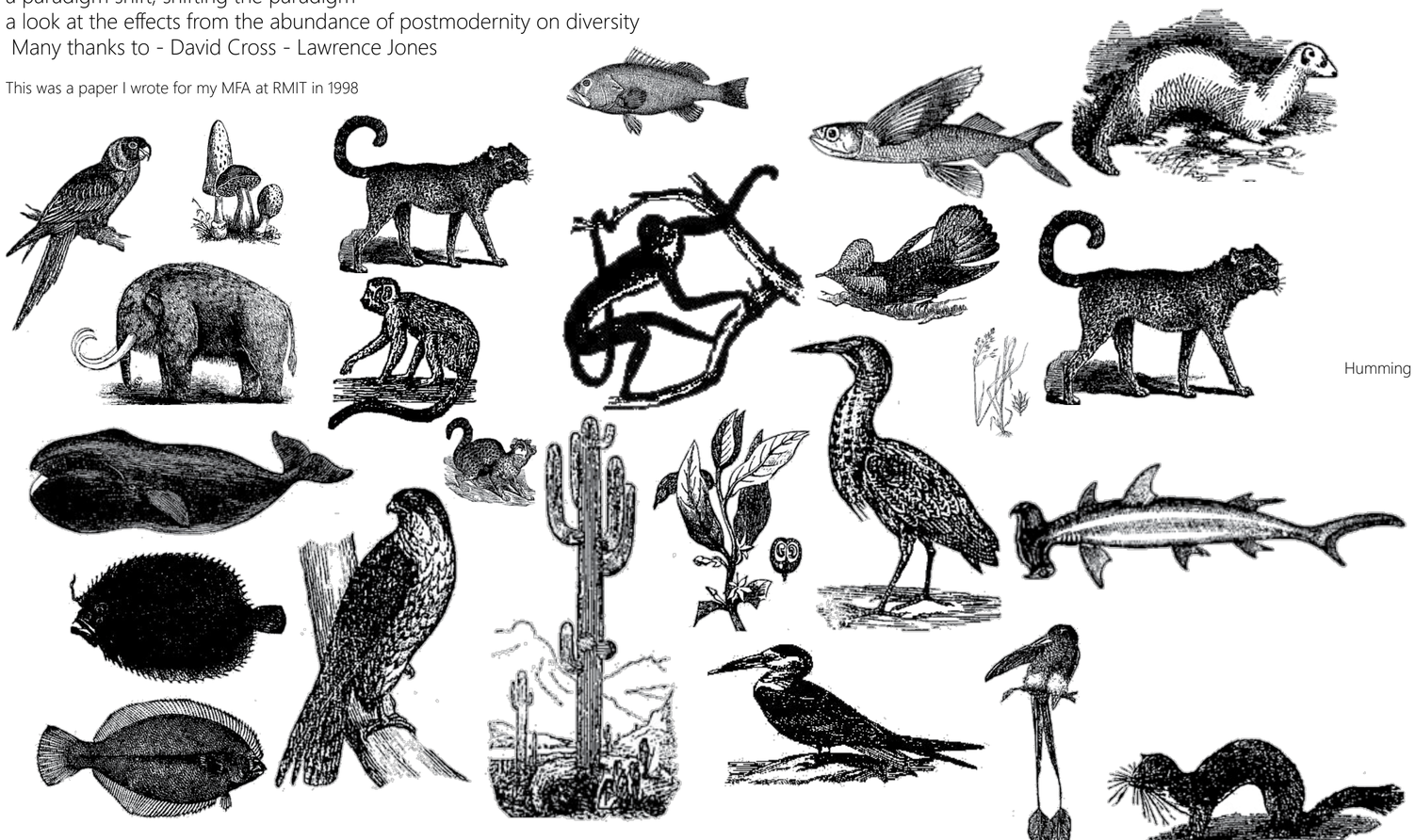
Stuart Jones:
Structural Engineer BE(Civil & Computing), FIEAust, CPEng, NPER
Stuart Jones has recently been appointed Technical Director for Hyder Consulting (now Arcadis) in Melbourne. Previous to this he was the Owner/Director of Point 5 Consulting in Melbourne for 14 years.
Stuart has over 25 years professional experience in all phases of project delivery and specializes in creative structural design with extensive experience in Australia and throughout Asia.

Grant Harris:
Environmental Scientist & Arboricultural Consultant
Grant Harris is the principle of Ironbark Environmental Arboriculture, with over 12 years experience in the arboricultural sector he also holds a degree in Environmental Science (Wildlife and Conservation Biology). His particular areas of interest are the use of green infrastructure to mitigate urban heat island effects and urban ecology.

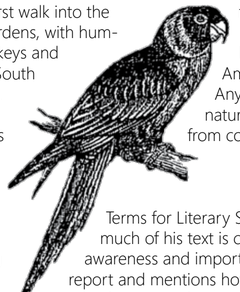
Diversity / Abundance

a paradigm shift, shifting the paradigm
a look at the effects from the abundance of postmodernity on diversity
Many thanks to - David Cross - Lawrence Jones

This was a paper I wrote for my MFA at RMIT in 1998



Parrakeet



'Wallace later recalled the "fever-heat of expectation he felt". "On my first walk into the forest I looked about, expecting to see monkeys as plentiful as zoological gardens, with humming–birds and parrots in profusion." But after several day of seeing no monkeys and hardly any birds, he "began to think that these and other productions of the South American forests are much scarcer than they are represented to be by travellers". Any one who has stepped into a rainforest, head full of images from glossy nature photography, has had roughly the same disappointment, which derives from confusing diversity with abundance. [3]

In a different context, Louis Menand in his text 'Diversity', in Critical Terms for Literary Study, states 'Diversity is one of the problems of modernity," and much of his text is centered around the issues of multiculturalism and the growing awareness and importance of this from the 1960s. He discusses the Harvard report and mentions how the authors consider 'diversity exclusively as a socio-economic phenomenon, a consequence of the natural inequalities of aptitude'. [4] The consequence of group mixing, not group separation'. [5] He then concludes, by arguing that 'what has happened to American life since the mid-1980s is a cultural phenomenon which is the commercial mass media a "common culture" has emerged. And he then states, ' The deeper difficulty is that diversity is a paradox; the more attention you pay it, the more quickly it disappears'. [6]

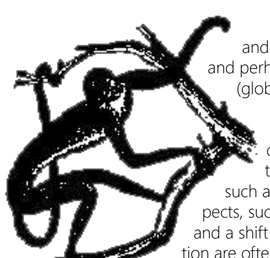
Humming bird

Globalization

If diversity is explicit in modernity in its catch-cry to "make it new" and (make it different), then perhaps bundance is implicit in postmodernity and perhaps this abundance is a signifier of the emergence of a "common culture" (globalization) that Menand talks of.

For it is a culture where mass-media, universal marketing and digitization have created universal codes that are often self-cloning and that have continued permeating economics, science and the arts with such a degree that it has implications for diversity. A range of economic aspects, such as the rise of multinational corporations and economic super powers, and a shift from an economy based on production to one based on consumption are often held to be hallmarks of postmodernity. Through economic globalization, multinational corporations have used aggressive marketing, advertising, and mass media to monopolize a growing market share with abundance but not necessarily diversity.

Spider monkey



Index & Guide Alpha space

Minnow

Grouper

Sucker

Flounder

Flying

Examples of this situation abound ! For instance, up until the late 1960s, through the circumstances of relative isolation the soft drink industry had developed a diverse culture; each community had its own companies, which generated their own labels, bottles and flavors unique to that area. If one was fortunate to travel at the time there was noticeable difference from one town to another, but as these small localized companies were either taken over or succumbed to a larger universal 'cola culture' diversity diminished as abundance increased.

The strategy was to produce a universally understood and safe product, one that is based on a set standard and is globally available. Before this era, social attitudes to soft drink consumption accepted it as a novelty to be drunk on special occasions only. But the expanded availability of the product through "cola-culture' permeated society with an abundance, that in some places displaced water as a safer, more "natural drink" of the human and left a cola dispenser on every second urban corner. This strategy became a contemporary marketing trend applied to almost everything, with some products dominating market share and becoming global fashion labels. Idioms like Nike, Rebok, and Adidas dominated and displaced countless smaller regional companies with their associated work forces.

Dollar Fish

Hammer- head

Fall Fish

Based on the concept of limitless abundance, design, usually western, took place in one country, and manufacturing, usually Asian, where labour was cheap and environmental laws less stringent, took place in another, and availability ultimately became global. Franchises like KFC, McDonalds, Burger King and KMart expanded across the international market eventually breaching the "iron curtain" and markets in China. Similarly, hotel chains like Centra, Park Royal, Carlton etc. expanded globally and like "cola culture" they used the strategy of a universally understood product, where the meals, service, décor, and in some cases architectural designs were not only similar but identical.

Chess

Corporations mainly based in the United States and Europe, took advantage of deregulated environments in smaller economies, swamping markets through technological production advantages and advertising hype in a manner that could not be reciprocated, particularly from the agricultural strengths of the host economy because of tariffs, quotas and trade restrictions.

Much earlier, Walter Benjamin, one of the key thinkers of modernism, identified the idea of model and series, where the model represented the original and the series represented copies from the original. The inventions of photo-mechanical reproduction and other devices created an abundance of images such as the world had never seen before. As mass production has continued to grow, with a greater range of products produced at faster rates the line between original and series dissolved.

Further to Benjamin, the postmodern theorist, Baudrillard suggests the era of the code superseded the era of the sign. He implies that through the use of code-binary code of computer technology, DNA codes or digital codes in television-" that the original in reproduction is the principle of generation, and not the object generated. Complete reversibility is possible; the last 'original' produced can be perfectly reproduced. The difference between the real and its representation is erased; the age of the simulacra emerges."[7]

While the postmodern discourse of abundance has been loud in its self-celebration, at the same time, John Lechte comments in his book Fifty Key Contemporary Thinkers, "in the discourse of consumption, there is an antidiscourse; the exalted discourse of abundance is everywhere duplicated by a critique of consumer society". [8]

The question of the effect of abundance on diversity has frequently been raised. Fredric Jameson argues, "Where Fordism and classical imperialism designed their products centrally and then imposed them by fiat on an emergent public, post Fordism puts the new computerized technology to work by custom-designing its products for individual markets.

Bunch grass

Chati

This has indeed been called postmodern marketing and it can be thought to 'respect' the values and cultures of the local population by adapting its various goods to suit those vernacular languages and practices". [9] But Jameson's use of the automobile industry to llustrate his point appears inappropriate. From the invention of the automobile, a proliferation of companies developed their own technology and design ideas and from this, a range of distinctive body shapes emerged: a Rover looked like a Rover, a Renault looked like a Renault, a Ford like a Ford and so on.

Weasel

While Ford might now offer wider range of colours than they did in the days of the model T, there are now fewer manufacturers. Through computer-aided designs, wind tunnels, etc., a generation of automobile has evolved that appear remarkably similar from one manufacturer to another, so while we might have a range of styles (station wagon, hachback, sedan, saloon, sports, etc) a single hybrid dominates within these styles that combines function and form. The "custom designing" as Jameson puts it appears on a cosmetic level only, with variance in some cases the manufacturer's badge and of course the price.

Ferret

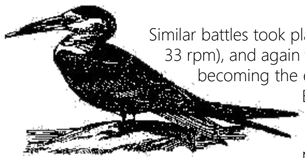
Contemporary technology often demands a specific type of function, a function that exploits abundance, and guarantees domination through proliferation and in turn helps secure its future survival, it is a function where diversity is not desirable. While various operating systems evolved at the birth of the computer age, through monopolization, IBM- formatted PCs dominated in a manner that left consumers locked into a specific system that was not appropriate for all situations. It left consumers with a Y2K problem to rectify and coincidentally Bill Gates as one of the planet's wealthiest individuals.

The effects of this monopolization within the computer industry are even more evident with the recent court cases of plagiarism between Microsoft's Windows 95 application and Macintosh, and also the anti-competitive practices suit between Microsoft and Netscape. Even now, some commentators argue Linux is a more flexible operating system, but Microsoft dominates by offering Windows 98 in package deals with new hardwear sales and ensuring an abundance of their system for future updates.

Weeping Willow

Redstarts

Yew Tree



Skimmer

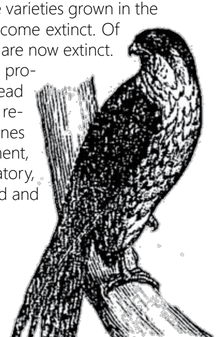
Similar battles took place in the early years of vinyl recordings regarding the speed of the disk, (78, 45, 33 rpm), and again with various systems in the popular recorded music tape the familiar cassette becoming the eventual winner. Again, while there was some validity in the argument for Betamax as a superior system, the battle for a global video format was won through aggressive marketing, introduction into key markets, and a longer recording tape time by the VHS format developed by JVC and Matsushita. [10]8

Now we face similar battles with Zip, and Jaz disks, CD rom and DVd rom. While a system can become deficient or even obsolete, efficient global information exchange relies on universal codes and systems to decipher these codes, and the extravagant abundance of a system guarantees its survival. The implementation of and untried system on a global scale could bring digital communication into temporary chaos, a risk not worth considering for those already locked in to a system.

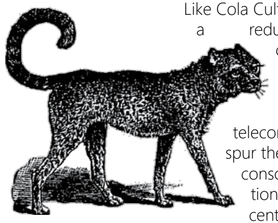
In the arena of biotechnology, diversity might appear to be more essential. At least on a techno-scientific level it would seem the age of genetic engineering provides the potential for unlimited diversity, with an infinite potential of hybrids that could be developed, but in reality the opposite occurs. Jeremy Rufkin says "The practice of biotechnology – gene splicing, tissue culture, clonal propagation and mono-culturing - is likely to result in increased genetic uniformity, a narrowing of the gene pool and loss of the very genetic diversity that is so essential to guaranteeing the success of the biotech industry in the future".[11]

Bittern

Already various factors including market forces have conspired, forcing farmers to grow high-performance mono-cultures. Jeremy Rufkin states "The Rural Advancement Foundation International (RAFI) reports that of seventy-five kinds of vegetable grown in the United States, 97 percent of all the varieties have become extinct in less than eighty years. According to the RAFI study, of the 7,098 apple varieties grown in the United States between 1804 and 1905, 6,121 or 86.2 percent have since become extinct. Of the 2,683 pear varieties in use in the last century, 2,354 or 87.77 percent are now extinct. The grim statistics are repeated for every food crop". "Garrison Wilkes, professor of botany at the University of Massachusetts, says that the spread of modern agricultural practices is quickly destroying the genetic resources upon which it is built and likens the situation to "taking stones from the foundation to repair the roof ". In the present environment, even this technology can not create useful new genes in the laboratory, biotechnological science needs as large a genetic pool as it can find and preserving diversity guarantees a rich resource to draw from.



Hobby



Cheetah

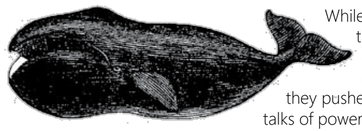
Like Cola Culture, the Biotech industry is also another example of a looming abundance of products with a reduced number of suppliers. Rufkin comments further, “Several factors have combined to create what industry analysts are calling a global “Life industry”. The relaxing of trade restrictions with global trade agreements, including the General Agreement on Tariffs and Trade (Gatt), Maastricht, and the North American Free Trade Agreement (NAFTA), the new ease of managing and integrating far-flung business interests by way of computers and advanced telecommunications technology, and the spectacular advances in biotechnologies have all helped spur the creation of a new kind of global commerce that trades in “life products” of every kind. The consolidation of the life sciences industry by global commercial enterprises rivals the consolidations, mergers and acquisitions going on in the other great technology arena of the twenty-first century, computers, telecommunications, entertainment, and the information services, although much less attention has been focused on the life sciences companies in the media and public policy”.

The contemporary abundance of images, has no historical parallel, and through mass media the proliferation of images confronts nd even confuses the global society it represents. Dissemination through advancement of processes, distribution and growth of venues means the image is just another product of the consumer society, and once consumed can be easily discarded. The increasing world’s population also has an effect on this great abundance of images. Some commentators suggest there are more people that have lived on the planet in the past 10 years than have lived in all recorded history. By transposing this into art practice advertising etc, taking into account social changes that allows a greater percentage of the population participation in the visual arts and related fields, there are probable more people making art in the past 10 years than all recorded history in the long previous period. Images are no longer the peculiar, precious objects they once were, they are no longer a rare commodity within society, and despite a market, constantly hungry to consume new images, there is still and abundance and over supply.

Gopher

So while there is this unquestioned abundance of images; perhaps contemporary art practice is the area of postmodernity where diversity survives, perhaps it is an area where diversity is acknowledged and encouraged, perhaps it is an area where it is necessary, perhaps it is the nucleus of the arts activity and drives conceptual, aesthetic and technical investigation. From the 1970s, a trend that grew in contemporary art practice that appeared to encourage diversity, was the under-pinning of theory and image, theorist and artist. Art schools began acknowledging art theory employing lecturers and establishing departments to teach it. These new lecturers projected themselves as an innovative, exciting, subversive proposition that challenged not only society, but the tradition, power and privilege of the established art history departments.

Howler Monkey



Right Whale

While they exposed students to contemporary global issues in a manner that initially directed a minority of students to base their work on specific issues but later became a formality for the majority undertaking art education. As the theory departments grew and their power grew, they pushed the reset button on the climate within academia. In his text Menand talks of power and privilege and how ‘demographics of American higher education have been transformed’ [12] in the past few decades, particularly in education. White males no longer exclusively lecture to other white males, and in art practice events took place that shifted the focus from art objects and aesthetics to issues: issues that largely dealt with interpretations of equality, race and gender.

Hump back Whale

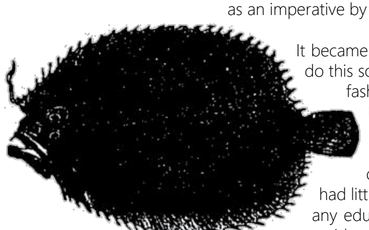
The ideas of Lyotardrd, Baudrillard, Lacan, Foucault, Barthes, Kristeva, Saussure etc. were introduced to students as a means of exploring contemporary issues through the visual arts that challenged existing systems and pushed the boundaries. It was and exciting and stimulating time when there was a diverse range of new work, and students that accepted these challenges and incorporated them in their practice, were soon promoted through the inclusion in key exhibitions, collections, reviews etc. They became role models and soon it seemed a message emerged; if as an artist you wished to succeed your work must have theoretical support. And more importantly self-promotion, networking and social relationships with writers, curators etc. was more important than making art. As a second generation of theorists became employed, in some schools, like the art history departments before them, the art theory departments inevitably became institutionalized. For some students, doors opened that offered relevant debate and dialogue that progressed their ideas and extended
their work.

Grey Whale

However, for others doors closed and they found only a narrow corridor of fashionable prescription to work from that they had little interest in and which they could see no relationship to their work, but felt compelled to follow to attain reasonable grades. In some circles, rather than providing a base to expand a diverse culture from, theory also became a means of gaining credibility, a means of attaching fashionable labels to new cliches. From one phase to another, the representation of specific objects (false breasts, corsets, barbie dolls, angels, Saint Sebastian, preserving jars etc.), the use of certain materials and processes, (stripped willow, bees wax, muslin, slate, copper, unmounted and unframed photographs, fragmented text, etc), and especially the exclusivity of language became a necessary currency, knowing the currency allowed one access, without it you were “no one”.

Despite the deconstruction and death of the master narrative, the power and privilege of institutionalized theory ensured the birth of another narrative, as his/tories were replaced with "her/stories" a "miss narrative" evolved. As work with favored current ideas was promoted it became immensely popular with a younger generation of students, to the point of cult status. Artists like Cindy Sherman, Robert Mapplethorpe and others replaced their heterosexual male counterparts from the generations before as contemporary models. They replaced the tired old patriarchal models of modernism and because of the increase of students undertaking fine arts, they were emulated in art schools on a global scale as never before, creating more Cindy Sherman look a likes than sun sets. It ensured a global abundance of practice centered on the new diversity of theories promoted by theorists, institutions curators etc., it cemented a new set of players in a new narrative, and as it became established as main stream in Western culture, it also imposed itself as a universal culture. In some cases, not only the directions students followed, but the materials their art work was made from, how the work looked, how and where it was hung, was described as an imperative by people who had never made art.

Lemming



Top Knot

It became more than important to have one's work sanctified by the right people and to do this some artist were willing to take the advice or sacrifice their own input. Despite the fashionable rhetoric about diversity, multiculturalism etc, like the generation before them, students work was often cloned directly from the ideas and art practice of lecturers or the references presented to them. While a minority of students benefited from the system, many still left art schools as they had during modernism; disillusioned, and on reflection felt they had been side tracked into areas they had little interest in and not achieved their original objectives. To varying degrees within any educational system, students risk conditioning, a move from the potential of their own ideas to those promoted by the institution or staff, and much later they may also face an eventual commodification of their productivity by curators, dealers and collectors. In a search for a context to place their work in, or a means to succeed, artists may opt or the safety net of "contemporary familiarity" of exhibited or published work.

Glutton

A familiarity that arises through technological structures that allow the rapid dissemination of new ideas in art practice communicated, assimilated, re-communicated to a larger audience and re-assimilated as work that has a contemporary aesthetic and theory base; but a predictability about it where he only diversity comes from interpretation. Despite the best intentions, in New Zealand and other Western art education systems, methods often over centre around the artists model and emulating the existing which ensures a great abundance of capable work but not necessarily the diversity or innovation one might expect from people involved in a creative activity. The abundance of submissions for U E and Bursary Art produces the necessity for a standard format and assessment criteria, but like a microsoft operating system it also assures

Teasel

But the hierarchical relationship of art practitioners and other interested parties that effects the diversity of works acknowledged, and the abundance of works created is not new. H.A. Fields writes in Egyptian Art; "It may seem strange that in Egyptian society, which believed that artists possessed the power to perform such miracles, and in which art was not just a pleasant pastime but a primary and vital necessity, their actual social status was low, far below the status of prehistoric witch-doctors. The fact was that the craftsmen-artists were only material executants, bound by rules which they had to apply but which they had not drafted, as well as ritual formulas, the real significance of which they were unaware. The true creators were always the priests, or rather the magician–priests. Without their intervention, the images produced by craftsmen-artists, even though in accordance with the canons of art or magic, would have possessed no magic power at all".

Fungi

And in 1930 R.H. Lilenski made the comment in A Miniature History of European Art; "Thus the human activity that we call art, which began with the creation of the magic image to secure some vital need, which has been at other times a most powerful instrument of tyranny and at other times again a most powerful instrument of religion, has now become an activity pursued for its own sake by a small group of experimenting artists, who are kept going by another small group consisting partly of people who believe in the metaphysical value of this work as an accompaniment and symbol of contemporary thought, nd partly of people who hope to make profit eventually from these artists' researches".

Rhubarb

Multiculturalism may be seen as an attempt to preserve and encourage diversity in the postmodern age of abundance but itself may be co-opted by the universal culture, becoming merely cosmetic. Mendand states,""multiculturalism" means genuine diversity-[only] insofar as it refers to functionally autonomous subcultures within a dominant culture", then nominally 'multicultural' societies such as the United States are really becoming less multi-culturally diverse, "for when the whole culture is self-consciously "diverse", when television is self –consciously "diverse" – real diversity has disappeared." [13]

Fly trap

Yucca

David Quammen refers again to Wallace when he talks of diversity in nature. "Distribution, Wallace had seen, is commonly delineated by some sort of geological barrier – a ridge of mountains, a wide river a discontinuity of vegetation reflecting a discontinuity of geological substrate. He had noticed that two similar species of animal, closely related often occupy opposite sides of such a boundary". Diversity occurs through isolation and islands offer the best examples of diversity in Biology.

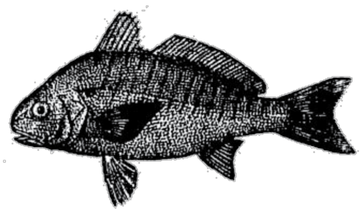
Sweetsop

Despite human intervention and depletion of the gene pool through species extinction etc., biodiversity is seen by biologists as a desirable attribute to be preserved. Perhaps more through circumstance than design, a typical nature/culture dichotomy, emerges for in economics, science, and art it appears to be abundance that prevails in the present environment. In an article in Time Magazine David Quammen draws a comparison with the erosion of biodiversity and the unworkable idea that biotic diversity can survive in ever decreasing islands of nature, and the erosion of culture as McLuhan's global village becomes a reality and contemporary communication pushes local cultures to extinction. He finishes the article "The dismal irony of our age is that these two seemingly opposite trends, cultural unification and ecological fragmentation, yield a common result: loss of diversity. The global archipelago will be a world that's starker, uglier, duller and lonelier for us humans as a species and we will experience that loneliness together"[14]

To finish, I go back to an opening statement I made by Menand. ' The deeper difficulty is that diversity is a paradox; the more attention you pay it, the more quickly it disappears'. If, in the arts, it is similar to bio-geology, and it is cultural islands that offer the greatest diversity, perhaps there is a place for the islands of regionalism amongst the abundant, conformist postmodern climate of globalization. Questions arise: is diversity in art practice desirable, and how can a diverse art practice exist outside the paradigm of institutionalized art theory? Do artists working outside the model wait for a paradigm shift, or shift the paradigm?

Mammoth

Artichoke



Spot

Cereus

Coffee

Species extinction / Nevolution

Twenty years after the ***Diversity / Abundance*** paper of 1999, the issues of have not diminished in fact they have become even more critical. The current *Extinction Rebellion* is a global reaction to the loss of environment and in particular the alarming rate of species extinction. For many the catalyst appears to be that scientists are now predicting an catastrophic ecological collapse, a mass extinction, including Homo sapiens as a threatened species in the long range forecast.

Since angiosperms first appeared within the green Kingdom, Plantea, about 125 mya, plant species have been evolving through cross-pollinating, creating natural hybrids that over time can establish as a species in a process called 'swarming". However in nature what often prevents cross pollination of species are geological barriers and distance.

As the Andes mountains rose upwards about 15 million years ago, Tillandsias got stranded in isolated valleys, plateaus, cliffs and hillsides. As a reaction to the rapidly changing climate there was a prolific evolution of Tillandsias that occurred over a relatively short period. Of the 3,500 species in the Bromeliad family, there is about 60 genera, one of which is Tillandsia. Over 700 or 1/6th of Bromeliad species are Tillandsias, so the diversity is quite amazing and they evolved to fill extreme habitats few other plants could survive in.

When I am asked by people "what do you do?"

The conversation often goes like this.

Lloyd: "I am an artist".

Inquirer: "what do you paint".

Lloyd: (I play the game by answering) - "Flowers".

Inquirer: "Oh that's nice, what sort of flowers"

Lloyd: "Bromeliads".

Inquirer: "Wow. They are such amazing plant I bet the painting are beautiful".

Lloyd: "Actually I literally paint Tillandisas. I take a very fine brush and use it to pick up the pollen from the anther of one species and transfer it to the stigma of another species, thereby creating a potential new hybrid in a process I term ***Nevolution***. The seed takes from months to years to ripen. Then, from germination to maturity can take 6 to 20 years before I see the result of a new hybrid. I have about 10,000 seedlings in the *Llobo-ratory* (Lloyd's laboratory) and each will have a unique DNA sequence. As a reference to the climate crisis and species loss, the new plants are then given Latin names after automobiles, like *Tillandsia oldsmobilae cutlassae supremae sedana*".

Once they mature, some of the plants will prove to be more resilient to heat and drought.

As an ecological artist the concept is to move from representation of nature back to the REAL not to be confused with realism.

FOUND OBJECT
A found object is a natural or man-made object, or fragment of an object, that is found (or sometimes bought) by an artist and kept because of some intrinsic interest the artist sees in it[15]

HYBRID

While, there is not only an expectation, but obligation that artworks collected by prestigious galleries will be stored in climate controlled storage, the living Tillandsia sculptures I create actually *control the climate while they are in storage*. They uptake CO2 release oxygen and even take in heavy metal particulates.

While, the mode of operandi for most artist is to get their work *into an art gallery* collection, for me it is getting living work onto the building.

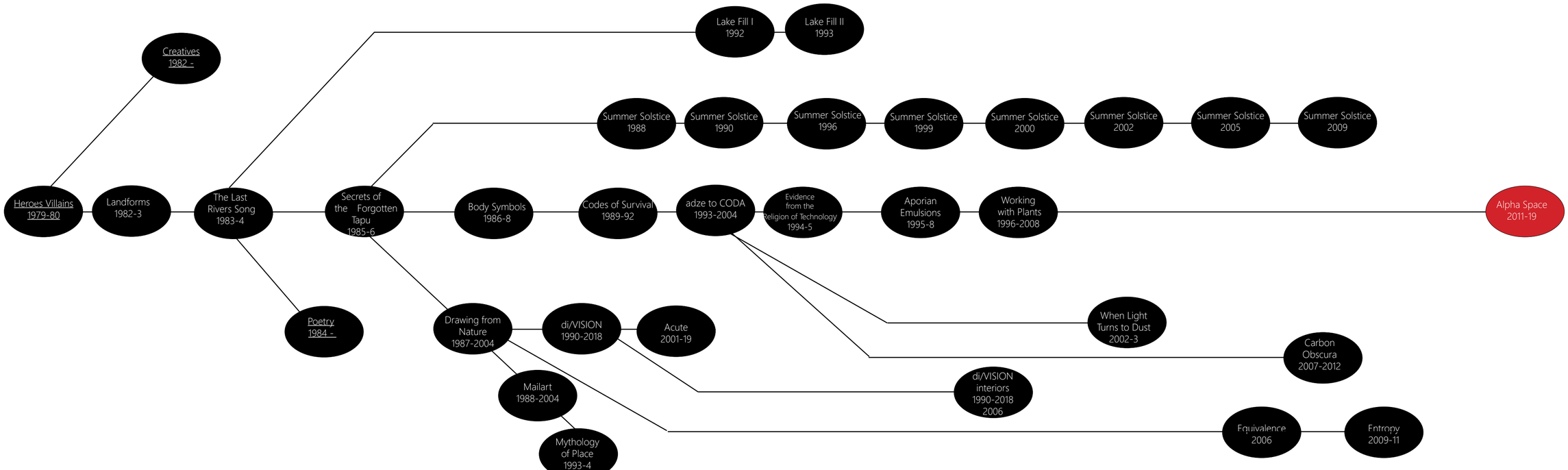
With the growing climate emergency the agency of the living Tillandsia Sculptures will only increase.

Climate change exhibition
There are many exhibition call pouts fort works commenting on climate change. The conditions often state " submit photographs of your painting, print or photograph'. Paradoxically, as there is no consideration that an art work could be an active piece created from living plants, and therefore will not meet the criteria.

It seems incredible, (based on population growth) - that there are more artists alive today than have ever lived, the creative process lives on and the production of art continues, while every day nature is further diminished. This was a reason I moved to working with plants as a living art medium.

Lloyd Godman Project EPublications

gives free access to the large body of creative work by this artist. The schematic outlines the various projects and pinpoints where *Alpha Space* sits within the oeuvre.



Lloyd Godman with his grand parents and their grandchildren, Lloyd is in the bottom row centre in the dark clothing with Auguste Rodin's, The Thinker pose. Grand father Harold Kindley is on the left, Grand mother Rachael Kindley is on the right.

Endnotes

1 New Law In France Requires Commercial Buildings To Focus On Sustainability -
2 Living architecture gets cities green and growing
3 David Quamen 1996 The Song of the Dodo , Page 62
4 Frank Lentricchia and Thomas McLaughlin 1995, Critical terms for Literary Study, P343
5 3. Frank Lentricchia and Thomas McLaughlin 1995, Critical terms for Literary Study, P348, 344
6 4. Frank Lentricchia and Thomas McLaughlin 1995, Critical terms for Literary Study, P347
7 John Lechte. Fifty Key Contemporary Thinkers, 1994 P235
8 John Lechte. Fifty Key Contemporary Thinkers, 1994 P235
9 F.Jemeson, The Seeds of Time, New York Columbia Press 1994 P204
10 WWW Urban Legens com/products/beta vs vhs html
11 Jeremy Rufkin, The Biotech Century, Tracher/Putman Books, 1998, p107
12 Frank Lentricchia and Thomas McLaughlin 1995, Critical terms for Literary Study, P344
13 Frank Lentricchia and Thomas McLaughlin 1995, Critical terms for Literary Study, P348
14 David Quamman Special issue Time November 1997 P 58
15 Tate Art Gallery