Tillandsia SWARM

ecological art project by Lloyd Godman

space
ecological art
extreme gardening

A ground breaking ecological art/science experiment with plants that need no soil or watering system!

Tillandsia SWARM, is an ecological art project, somewhat similar to land art. It sees Tillandsias (air plants) installed at selected urban sites as an experiment to record how they adapt and grow in extreme urban sites. The work not only comments on environmental issues, but combines an ecologically active component.

Aim

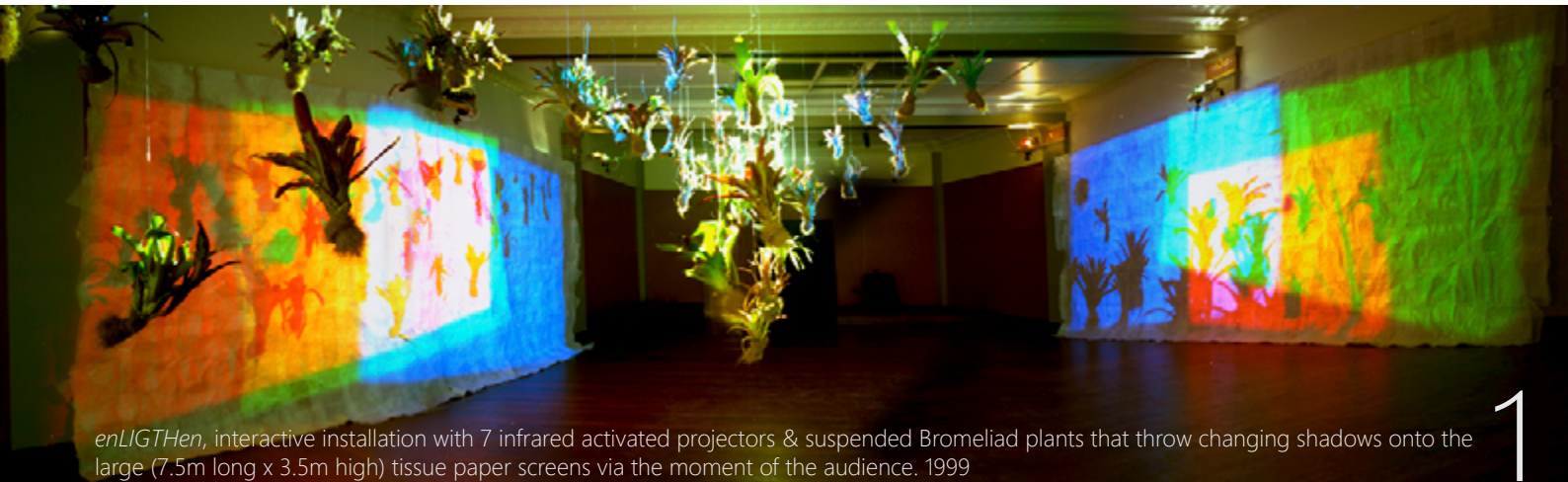
The innovative contemporary art project aims to not only offer a practically proven super-sustainable model for the integration of plants for greening of the built environment, but utilises the unique biology of these plants to reduce pollution levels at night while also acting as a comparative bio-monitor for heavy metal particulates. The project is somewhat similar to Joseph Beuys *7000 Oaks – City Forestation Instead of City Administration* - documenta 7 1982.

What is the context of the work?

Godman began working with light, photosynthesis and Bromeliad plants which includes the genus Tillandsia, in 1996 while completing an MFA at RMIT. He has exhibited living plant works in many galleries including, The Temple Gallery, Blue Oyster Galleries Dunedin N.Z., MOCA Ga Atlanta USA, Burrinja Gallery, Deakin University Art Gallery, Incinerator Gallery and Montsalvat, Victoria, Australia and also urban and industrial sites.

In 2013 he made a conscious decision to concentrate his work on integrating plants into the built environment in a super-sustainable manner. Rather than having traditional art works in "climate controlled storage" his active plant works actually "control the climate while in storage".

With 2 published papers; one the Tall Building & Urban Habitat Council Journal, and other the Green Building Council Journal, he is considered a leading figure in this area.



enLIGTHen, interactive installation with 7 infrared activated projectors & suspended Bromeliad plants that throw changing shadows onto the large (7.5m long x 3.5m high) tissue paper screens via the moment of the audience. 1999

Tillandsia SWARM

Background

In February 2013 Lloyd Godman, Stuart Jones and Grant Harris installed a series of eight suspended rotating air plant sculptures in central Melbourne near Finders St Station, titled *Airborne*, as part of the City of Melbourne Arts Grants projects for 14 months. These living sculptures incorporated Tillandsia species that need no soil or watering system. During this time the plants endured extremely dry and record hot periods, but continued to grow and flower.

A living plant sculpture from the *Airborne project* Les Erdi Plaza, Northbank, 2013, with Melbourne's tallest building Eureka tower in the background.

Tillandsia biology

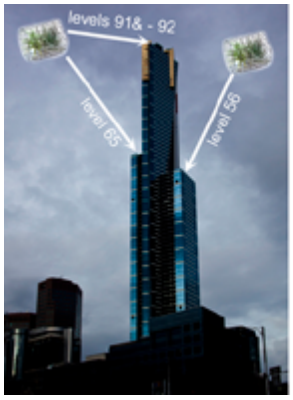
As a means of retaining moisture, Tillandsia plants actually grow in the darkness of night through a CAM cycle and are one of very few plant families that uptake CO2 and release oxygen in darkness. Therefore air plants are extremely valuable in cleaning urban air at night when most plants are dormant and pollution levels spike.

Because all their moisture and nutrients are absorbed through special trichome cells on the leaf, and the few roots are used as a hold fast, they negate the need for the weight and complexity of a soil medium or liquid reticulation. The silver trichome cells also act as a defence against high UV levels reflecting up to 93% of light, so as living sunscreens they provide excellent heat mitigation. More than this, Tillandsias also have the ability to absorb atmospheric heavy metals via leaf cells (few plants can do this).

Images demonstrate the slow but continual growth of Tillandsias. On left - work installed for *Airborne* 2013. Right - 2016

Eureka Tower Experiment

Following the City of Melbourne *Airborne* project, four small experimental mesh cages (cells), each with two species of Tillandsia were installed at four different locations on Eureka Tower including level 92, 91, 65 and 56. This was the initial experiment to observe how the plants would adapt to the extreme climate that evolved into *Tillandsia SWARM*. At 295m, the Eureka Tower is the tallest building in the world with plants living on its exterior. These plants have been exposed to extreme winds over 200 km/h, heat and dryness. These have been successfully installed now for over 3 years with no soil or auxiliary watering system and set Melbourne at the forefront of this work.



Left: Eureka Tower plant locations. Right: Grant Harris, Lloyd Godman, and Stuart Jones at level 92 Eureka Tower. The plant cage can be seen mounted to a rail on the right.

Detail of the plant cell cage mounted via 3 stainless steel cables on a rail at level 92 Eureka Tower. This ensures that even in the most violent storm the plants are secure. The cages are small (200 x 100) and very light weight.

Further experiments

Good science is based on successfully repeating an experiment and the Eureka Tower install has now been repeated with a *swarm* of other experiments at other iconic and challenging locations on buildings within the city to prove that plants can be integrated into a wide range of buildings with minimal infrastructure and maintenance. Because there is no need for a watering system or soil substrate nutrients, there is no risk to the structural integrity of the location. It also means the plants can be mounted on animated aspects of a building or urban infrastructure.

CH2 building, Central Melbourne

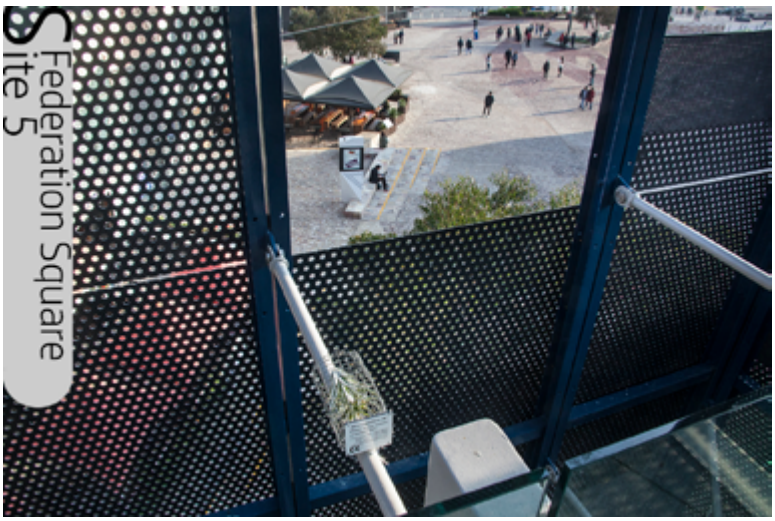
In December 2015, four Tillandsia cells (mesh cages) containing two species of Tillandsias were installed at challenging locations on City of Melbourne's CH2 building. One of these locations includes the automated rotating, wooden sun screens across the front façade. A sign has been erected directing pedestrians to the plants at level 1.

Essendon Fields (Essendon airport)

In February 2016, five Tillandsia plant cells were also installed at different sites at Essendon Fields. Site 1 and 2 on the roof of Essendon Fields House. Site 3 Roof of Coles supermarket. Of particular interest were site 4 and 5 airfield fence which experience aircraft exhaust fumes.

Federation Square

In May 2017, six Tillandsia plant cells were also installed at different sites at Melbourne's iconic Federation Square. Sites 1 & 2 were located on the roof of the ACMI building next to an urban bee hive project. Sites 3, 4 & 5 were located on the roof of the Cross Bar Building. Site 6 was located on the weather screen of the plant room of the car park.



Montsalvat

In June 2016, five Tillandsia cells containing three species of Tillandsias (air plants) have been installed at various locations around the historic buildings and garden of Montsalvat. Signs have been erected with a QR code directing the audience to the map web page that links to all the existing sites.

The Friends' School (Hobart)

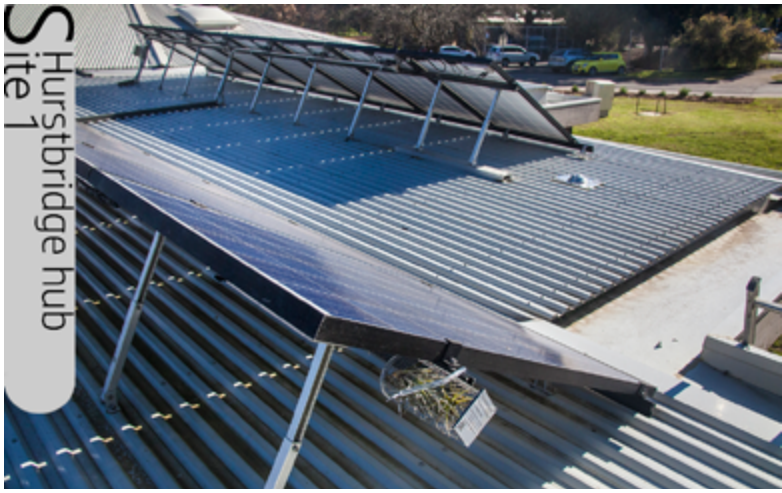
In July 2016, to compliment an existing permanent rotating air plant work titled *SPICEE*, that was commissioned in 2015, two *Tillandsia SWARM* plant cells were also installed at other locations at The Friends' School. One on a vent pipe, the other on an abandoned TV aerial pole. Signs are being erected with a QR code directing the audience to the map web page that links to all the existing sites.

MGA Monash Gallery of Art

Four Tillandsia cells were installed at MGA on May 2017. Sites 1 & 2 are on the wall near the cafe, site 3 is on the south wall while site 4 is located within the plant room air conditioner enclosure at the west side of the building designed by internationally renowned architect Harry Seidler.

Bunjil Hurstbridge Community Hub

Two Tillandsia cells were installed on the solar panel supports in May 2017 of the Nillumbik Shire Council's Hurstbridge Hub. The aim of the experiment at this site is to prove that both SVPs and a living plants can be combined in a single structure on a roof.



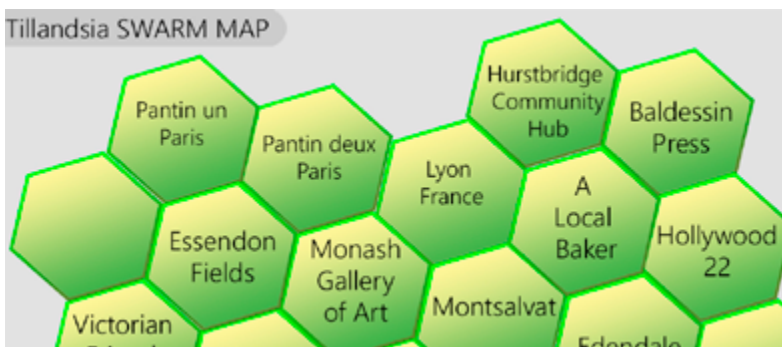
Edendale Community Environment Farm

Two Tillandsia cells were installed on the solar water heater panel supports on the roof of Nillumbik Shire Council's Edendale Farm in May 2017. The aim of the experiment at this site is to prove that both SHWPs and a living plants can be combined in a single structure on a roof.

Pantin Un, Rue Cartier-Bresson, Pantin, Paris
Aug 2017 saw one Tillandsia cell is sited at this soon to be renovated location in north east Paris. The plants are mounted to a pipe against a west facing wall.

Pantin deux Corner of Rue Floian & Rue Victor Hugo, Pantin, France
In association with architect Mathilde Jauvin, in Aug 2017 one Tillandsia cell was sited on rail of apartment within a metre of the roof of luxury fashion label Hermes head office.

écrivains den, Rue Hippolyte Flandrin, Lyon, France
September 2017 saw a Tillandsia cage installed on the window rail of an apartment in Lyon.



A schematic map of all the Tillandsia cell sites

The Process of installing a Tillandsia Plant Cage

Installing the cages with the Tillandsia's inside is a simple process with no risk, no cost, and only involves a few hours to install. Below is the typical process:

1. Stuart, Grant and Lloyd meet with the appropriate building staff to identify the selected locations. This usually takes about 20 -30 minutes.

2. The cages with plants and appropriate fastening systems are fabricated off-site. A double redundancy is incorporated with the cages secured via three separate stainless steel cables, which guarantees the security of the plant cages.

3. An install date and time is set - the install takes about 1 hour.

4. The plants and cages are checked periodically for security and to monitor the growth of the plants. After a period of time a leaf can be take to measure the comparative heavy metal particulate levels at a particular site.

Grant Harris installing the plant cages on the landing at level 56 Eureka Tower, with Stuart Jones and Lloyd Godman look on.

Left image: Stuart Jones and Lloyd Godman checking the plants Right image: Stuart Jones and State Liberal MP Cindy McLeish check the plants on level 65. Note the addition of the artificial grass and the wind on Cindy's hair. 20 May 2015

Lloyd Godman MFA : Ecological artist

"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 realisation of his polymathic vision".
John Power - Editor of Facility Management Magazine Aug 2011

Team members:

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 specialises 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.

Why is the title Tillandsia SWARM for this art project?

Rooting for Swarm Intelligence in Plants - from Science News -
They're underfoot and underappreciated. But the roots of a plant may demonstrate the remarkable wisdom of crowds just as swarms of honeybees or humans can. Three plant scientists now propose that roots growing this way and that in their dark and dangerous soil world may fit a definition for what's called swarm intelligence. Each tip in a root system acquires information at least partly independently, says plant cell biologist František Baluška of the University of Bonn in Germany. This also connects with Florianne Koechlin's ideas about plant communication.

An interesting idea - So if many plants communicate via root structures because Tillandsia do so much through the trichome cell on the leaf, perhaps Tillandsia communicate via air waves?

Tillandsia AIR

AIR, is a gallery-based work that links to Tillandsia SWARM via a digital portal. Tillandsias and their cells are combined to form the word AIR. However, here, each plant and cell corresponds to a plant and cell outside the gallery walls. In another formation of the word *AIR*, viewers are provided with a photograph, location, installation date and QR code / short URL that directs to further information on the particular site.

Separated by geography and context, *AIR* is an expanding, ecological sculpture with a twin; titled *SWARM*.

SWARM consists of a diaspora of caged Tillandsias (air plants), scattered across a range of urban sites.

AIR in the Barn Gallery at Montsalvat for the 2017 Nillumbik prize

Edendale Community
Environment Farm
Level 1
Install date: 22 May 2017
Web: goo.gl/koFIwc

Monash Gallery of Art
Melbourne
South wall
Install date: 3 April 2017
Web: goo.gl/LypqBi

Eureka Tower
Melbourne
Level 65
Install date: 17 June 2014
Web: goo.gl/oZ41B1

Federation Square
Melbourne
Crossbar building
Install date: 15 May 2017
Web: goo.gl/UvNQP5

air plants in space

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extreme gardening

As a means of integrating plants into the urban environment, **Alpha Space Air Plant Systems (ASAPS)** should not be confused with present vertical or roof gardens. ASAPS are distinctly different. However to gain an understanding of the advantages of ASAPS it is useful to make constructive comparisons between the two.

Alpha Space

The term Alpha was coined in reference to the new spaces that air plants are capable of inhabiting within the urban environment, particularly to create shade and mitigate heat.

For instance they can be:

- suspended between built structures
- fixed to structures that rotate on the wind
- mounted on movable window screens
- mounted on movable roof screens
- mounted on structures beyond vertical

Biological advantage

Because of the sophisticated biology air plants (Tillandsias) have evolved, where they take all their water and nutrients through special cells on the leaf, they can be utilized in a much great range of situations with no physical risk to a building, virtually no maintenance, and minimal on going costs. These amazing plants have also evolved to grow at night through the use of a CAM cycle, which means they shut down during the heat of the day to conserve water.

So, they uptake CO2 and release oxygen at night when nearly all other plants are inactive and pollution levels within the urban environment spike. More than this, they have the ability to assimilate toxic heavy metal particulates from the atmosphere through the leaf which can be tested to monitor comparative pollution levels.

Both soil & water less

This means ASAPS can be designed into urban infrastructure without the cost, complexities or problems of a rooting medium or reticulated watering system.

Light Weight

Consequently ASAPS weight about 3 kg a sqm as opposed to many vertical gardens which can weigh 60 -70 kg a sqm. They can be utilized into facades as living movable weather shields and even suspended across an open space to offer shade and mitigate heat in summer.

Beyond Vertical

Unlike vertical gardens, which can not be constructed beyond vertical, ASAPS can be designed in a 3 dimensional manner to suit any location and the plants will grow at any angle, even upside down!

Adaptive or selective systems

Most vertical garden systems rely on adapting the environment to suit the desired plants. ASAPS installations are based on knowledge and experience in selecting resilient species that have evolved to grow in a habitat similar to that which exists at a particular urban site, negating the need for extensive infrastructure and ongoing maintenance.

Proof of concept

Current experiments with air plants at over 45 sites on 22 buildings across 2 states have proved the resilience of this plant system. One of these sites is atop of Melbourne's Eureka Tower (295m) where the plants have been located for over 3 years and are exposed to extreme winds, heat, cold and long periods without rain.