PluginHUMAN

A Carbon Negative Project

www.pluginhuman.com

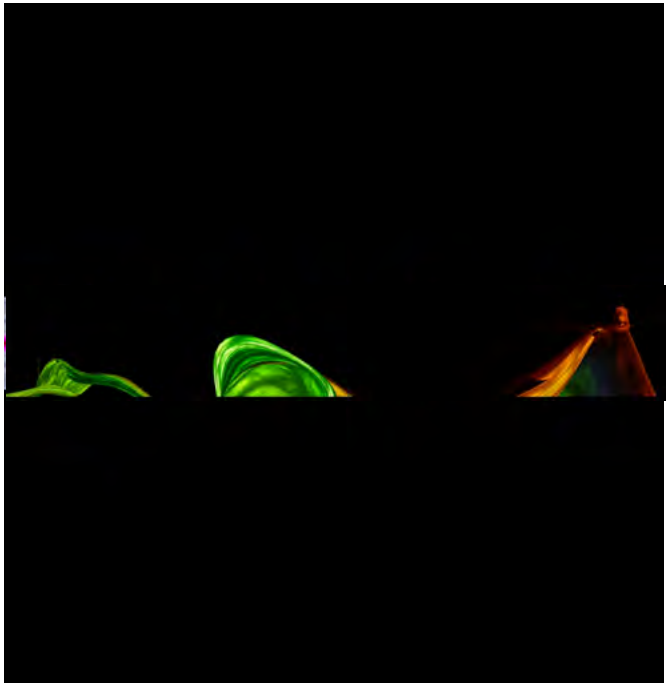
CAPTURE

CAPTURE is a carbon negative project by the art duo PluginHUMAN. It has involved research and development. We investigated materials and practices that support carbon neutral and carbon negative working methods.

This project involved:
1. Creating and presenting a video artwork.
2. Creating a series of sculptural artefacts.
3. Researching and producing sustainable materials and practices.
4. Creating a Carbon Calculator.
5. Creating a Leaf Area Calculator.

Supported by the City of Port Phillip:
Rupert Bunny Foundation Visual Arts Fellowship.

CAPTURE VIDEO ARTWORK



THE VIDEO ARTWORK

The CAPTURE video artwork showcases the microscopic qualities of our compostable biopolymer materials. It accentuates the beauty and intricate nature of these environmentally responsible materials. In making the video we used digital methods to reveal the biopolymers' hidden and subtle qualities. We photographed the biopolymers under microscope and animated the imagery using generative computer processing. The video artwork's soundtrack was developed from a fusion of electronic sounds and our intricate audio recordings of organic materials. This involved hydrophones, contact mics and field recordings.

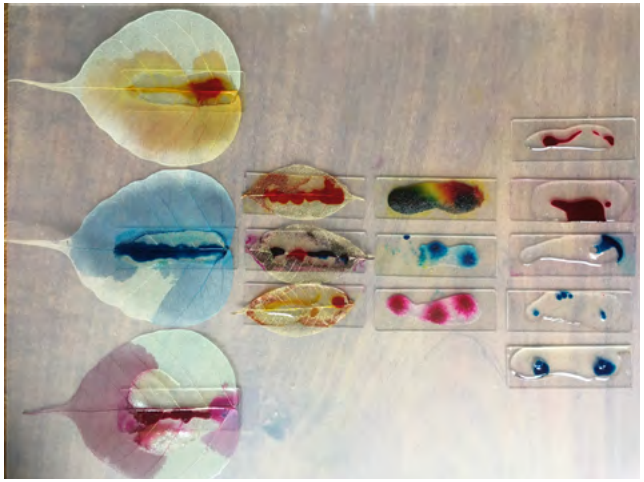
In using a fusion of digital and organic materials and working processes we invite audiences to experience aspects of nature that are not perceptible without the use of specialist technological equipment. We reveal hidden qualities of an organic material that can be used as a replacement for commercial plastics, and can help us achieve a carbon negative future.

Link to videoartwork:
https://pluginhuman.com/art/capture/

9:37 mins.

VIDEO ARTWORK: MICROSCOPE PROCESSES

Dr Betty Sargeant from PluginHUMAN



SCULPTURAL AREFACTS

Biopolymer with reclaimed metal items.

SCULPTURAL ARTEFACTS

Developing Biopolymer and Sustainable Practices.

During this fellowship we experimented with new compostable materials, including indigenous grasses, barks and biopolymers. We had not worked with these materials or practices before. What we learned over the course of the fellowship will influence the materials and methods that we use in future projects.

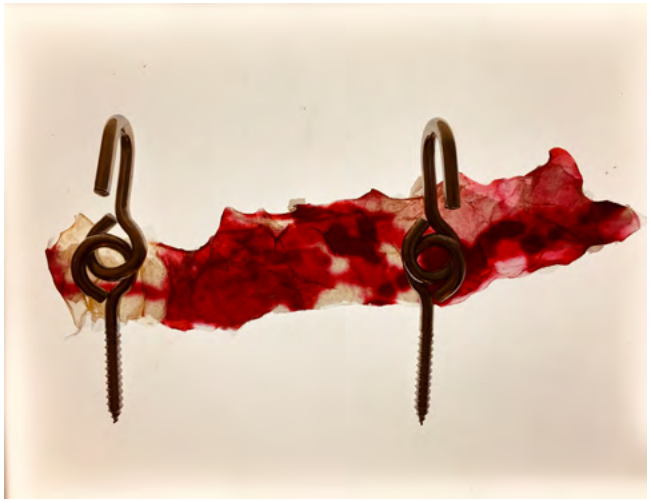
Grass weaving: 90cm
Approx 300 hours making time

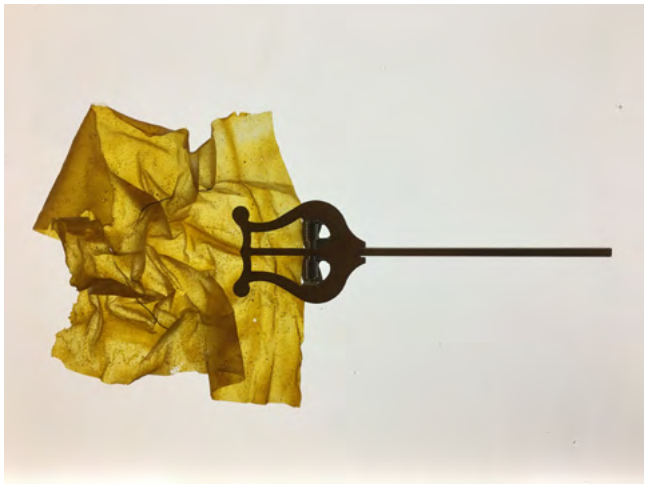
Light sculptures: 2m x 0.75m
Biopolymers and grass

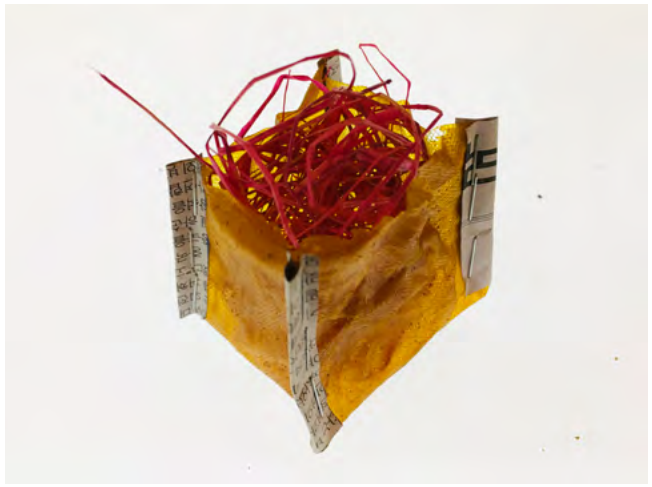
Grass weaving: 85cm
Approx 250 hours making time

SCULPTURAL ARTEFACTS

Creative experiments using biopolymer, organic and reclaimed materials

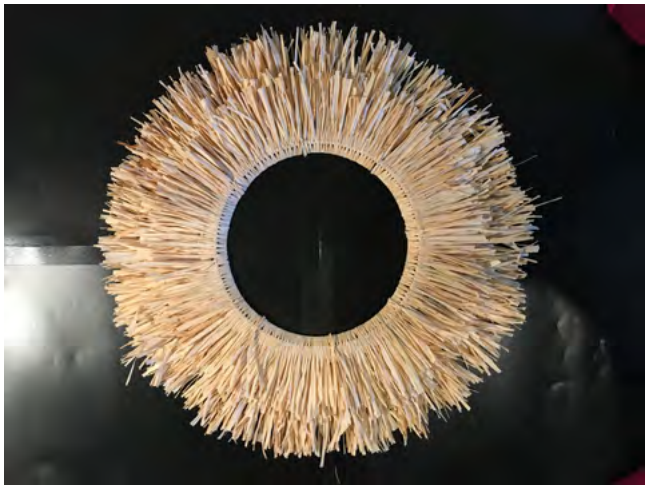


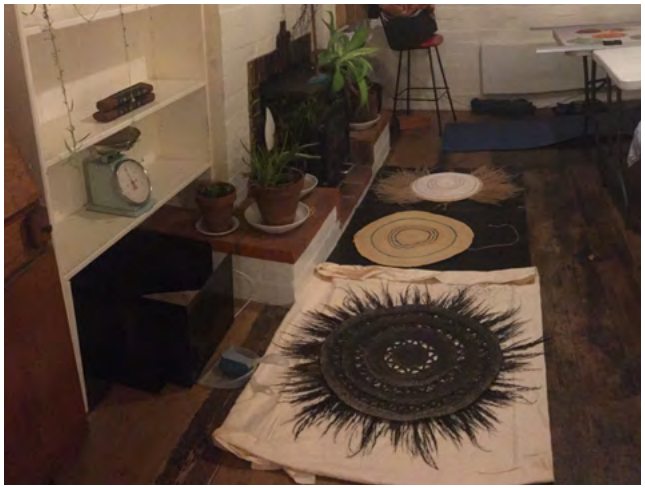




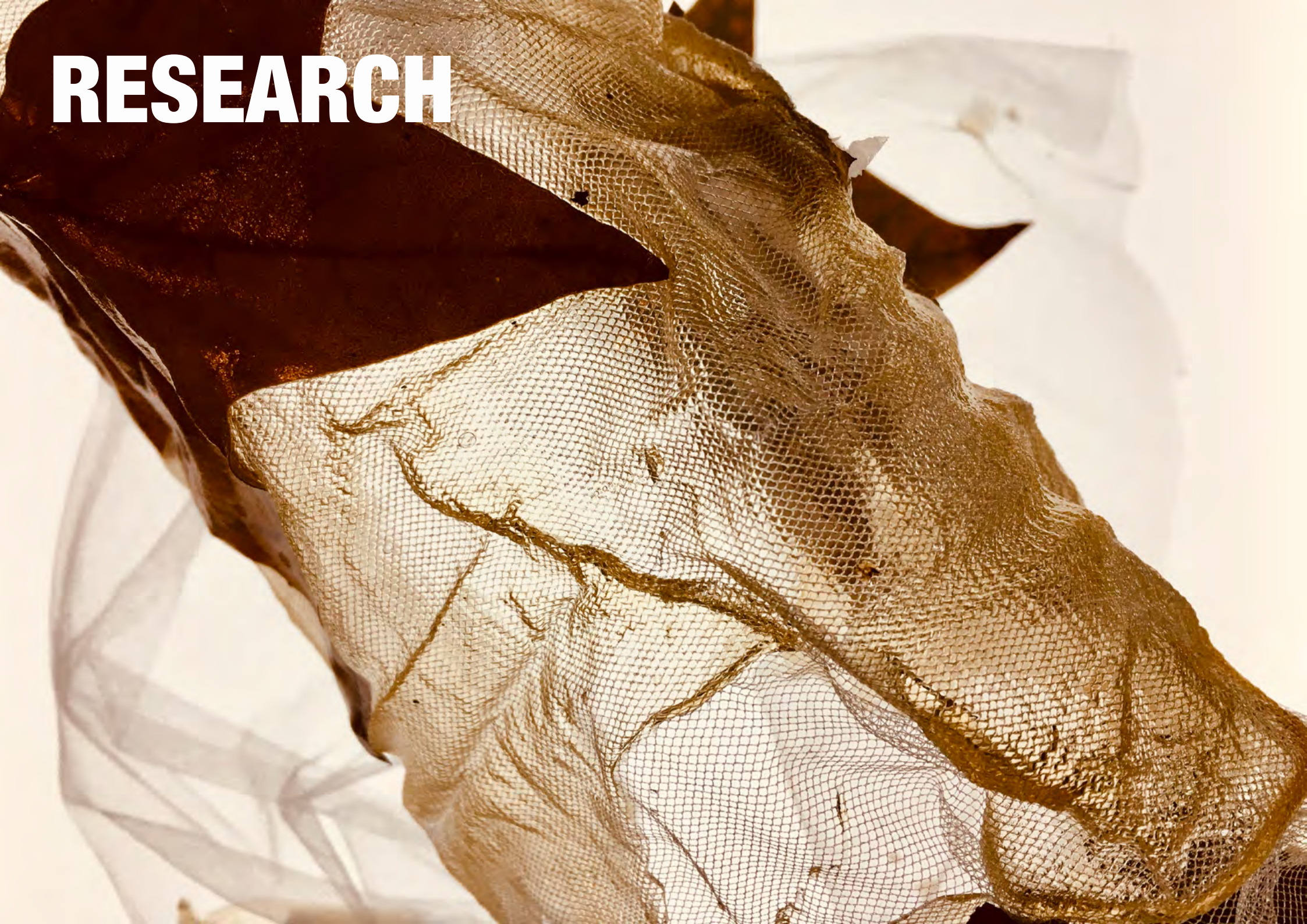
MAKING THE SCULPTURAL ARTEFACTS

We developed biopolymer and woven grass light sculptures. This process involved collecting, drying and sorting mass amounts of locally indigenous grasses.



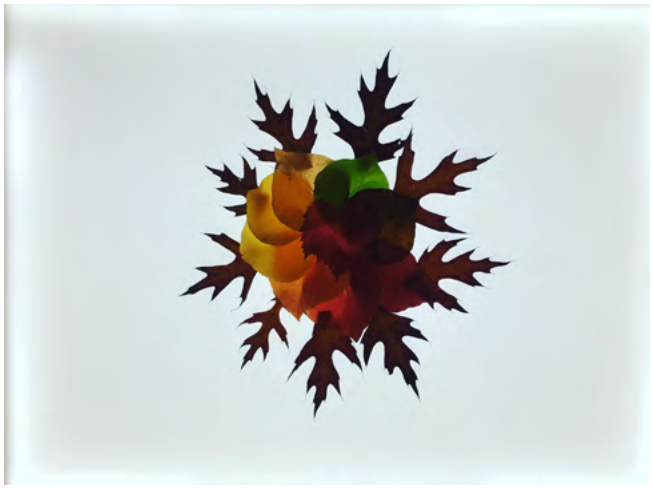


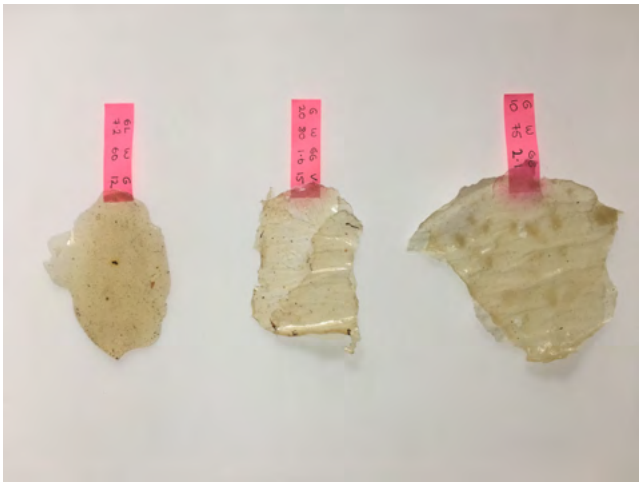
RESEARCH



BIOPOLYMER RESEARCH AND DEVELOMENT

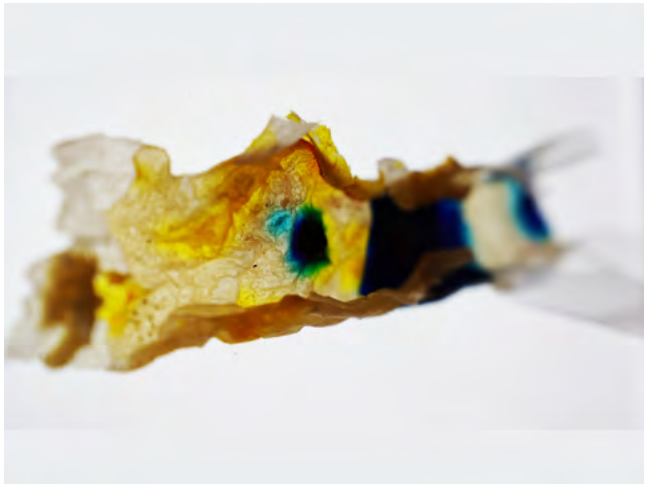
This project involved an intensive time of practical experimentation. We developed a reliable biopolymer recipe and production method. This involved testing recipes and observing the stability of the materials we created. As biopolymers dry and solidify they can dramatically change shape. This can lead to interesting and disastrous creative outcomes. We used our most stable recipes and methods to create large format (2m x 1m) biopolymer materials. These materials were observed over 1 year, to ensure that as they dried, they retained a shape and form suitable for our needs. We plan to use compostable biopolymers in our future installation work, replacing commercial plastics and many metals.

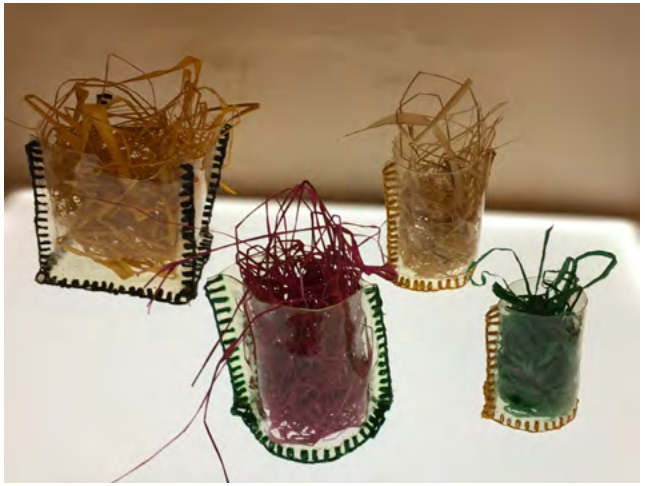




BIOPOLYMER RESEARCH AND DEVELOMENT

Experimenting with natural dyes and organic materials.





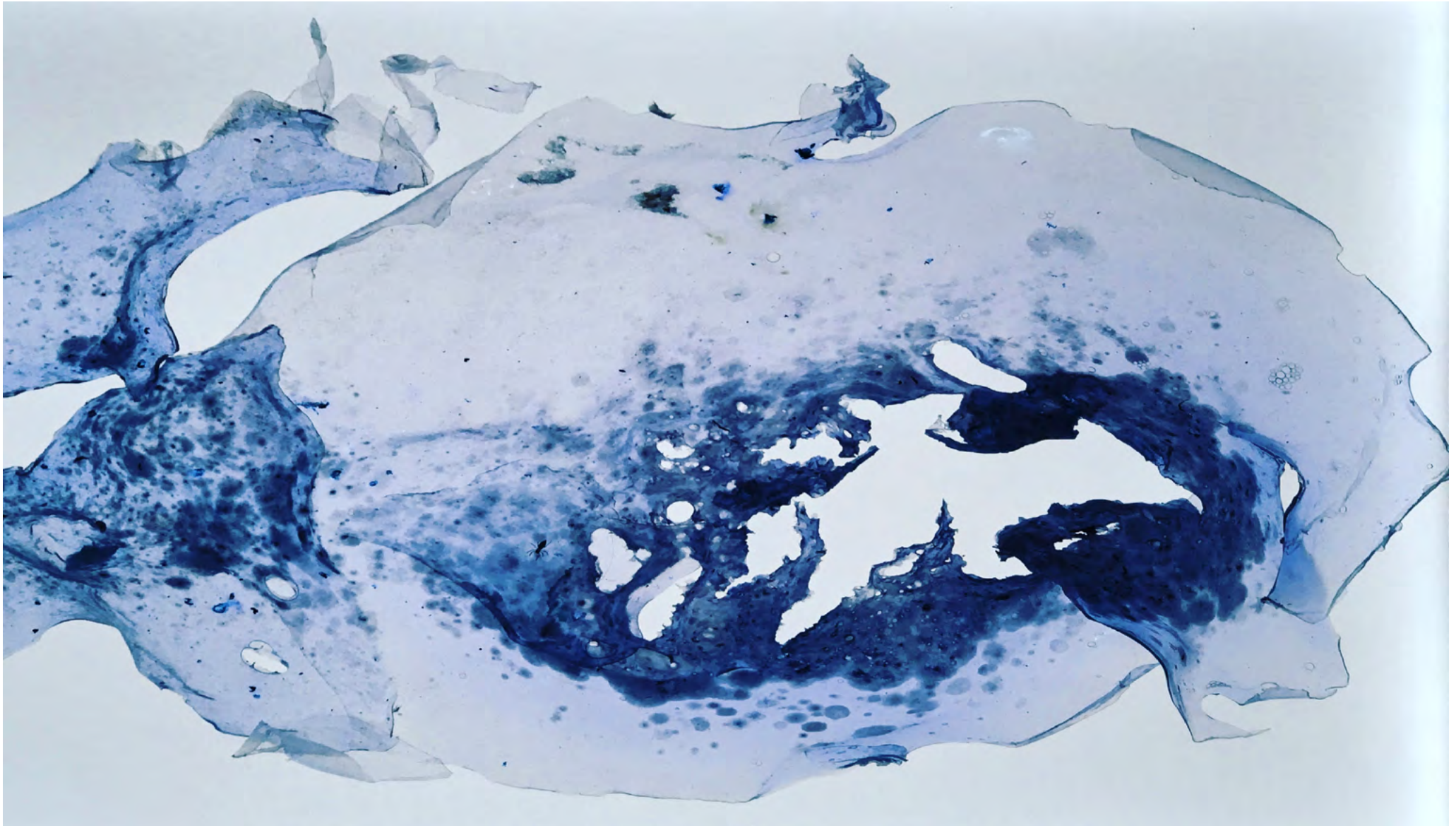
OUTDOOR BIOPOLYMER KITCHEN

SUPER STRONG COMPOSTABLE BIOPOLYMER RODS

These rods may replace metal structures in our future installations.

BIOPOLYMER EXPERIMENTS

Mould was an issue with our early biopolymer experiments.



BIOPOLYMER EXPERIMENTS

RESEARCH WORKSHOPS

As part of our fellowship we ran community workshops at the City of Port Phillip EcoCentre. These workshops helped us further communicate our research to the wider community and helped us further explore the strength and durability of a variety of organic materials.

BIOPOLYMER AND MATERIALS EXPERIMENTS

Biopolymers, grasses, found objects and recycled materials.

CARBON CALCULATOR

EMMITED CARBON			
Agar Agar	Kg	0.5	4
Vinegar- White Spirit	Litre	0.95	5
Gelatin	kg	10	0.5
Glycerin	kg	4.14	0.15
Projector - Electricity (5kw projector in Eco Mode = .5kw/h)	kg/kw hour	0.81	300
Car Travel - Medium Car	km	0.22	50
Electricity and Gas Usage	kg/kw hour	0.06	100
Total KG Carbon Dioxide Emmited			
CAPTURED CARBON			
Composted plane tree leaves (@ 2.3 gm/av leaf)	kg	0.0023	2500
Composting of reclaimed coffee grounds (from local cafes)	kg	20	28.8
Total Carbon Saved			

CARBON CALCULATOR

	Measurement	Multiplier
MATERIALS		
Paint	Litre	2.7
Plaster	Square metre	2.4
Concrete	Cubic metre	263
Concrete	Kg	1.25
Copper	Kg	3.83
Aluminium	Kg	11.5
Steel	Kg	10.9
Plastic	Kg	6
Glass	Kg	1.2
Glue - Water based	Kg	3
Glue - Hot Melt	Kg	5
Glue- Solvent based	Kg	5
Glue - Reactive Adhesives	Kg	10
Cotton	Kg	8
Nylon	Kg	37
PET - eg Synthetic Fleece	Kg	19
Wool	Kg	7
Paper	Kg	2.42
Wood	Kg	2.61
Rubber	Kg	4
Fibreglass	Kg	2.6
Alcohol	Kg	1.47
TECHNOLOGY		
New Computer	Dell Laptop	350
New Monitor	19 inch	233
ENERGY		
Kiln Use - Electric	Per/hour	7.5
Electricty	kw/h. hours	0.91
VEHICLES		
Small Truck - Diesel	kg/km	0.26
Large Car	kg/km	0.3
Med Car	kg/km	0.22
Small Car	kg/km	0.18
TRAVEL		
Air Travel	km	0.49
Public Transport-Train	km	0.06

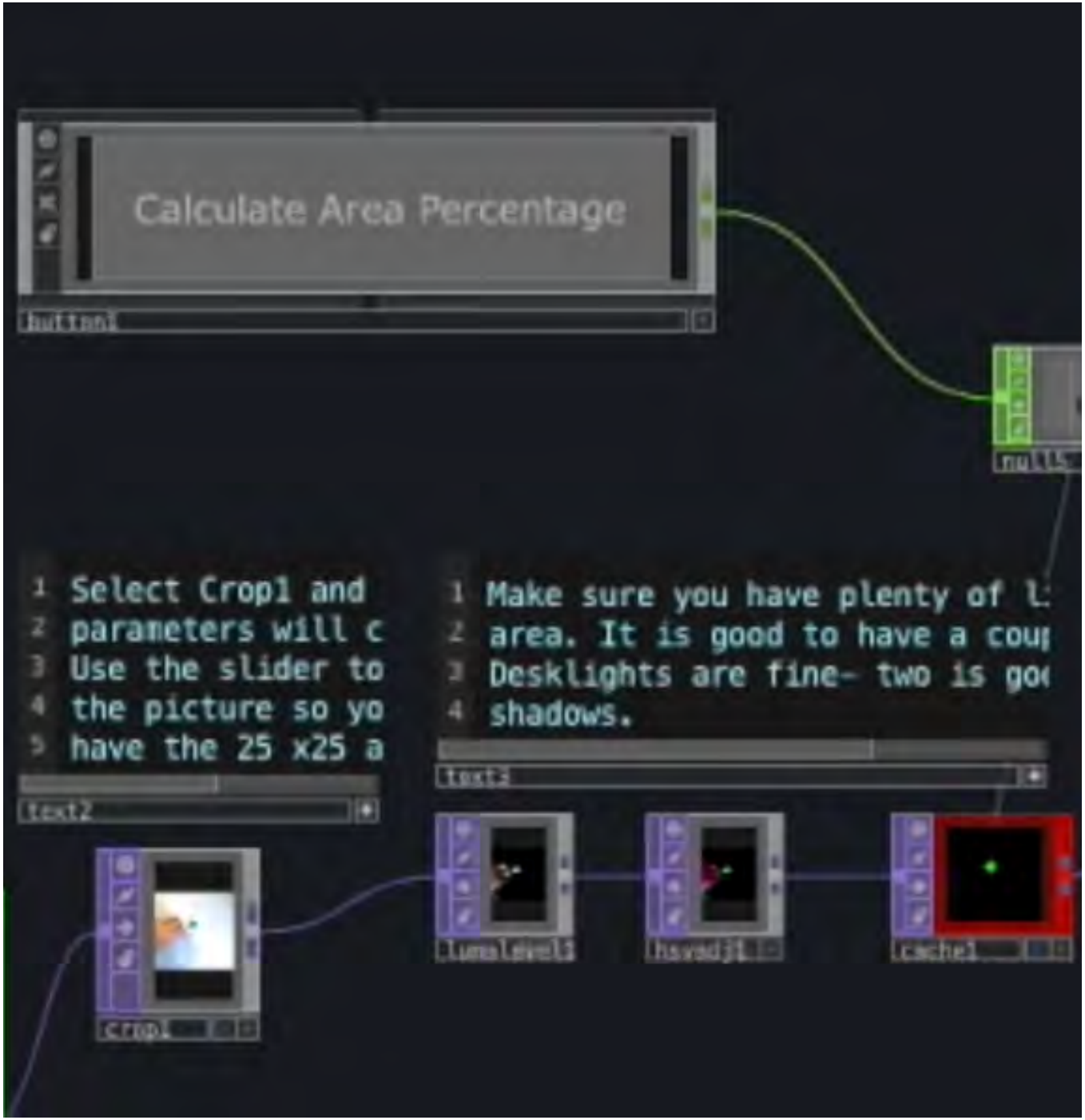
Our carbon calculator helped us track the carbon footprint of the project, taking into account materials, transport, electronics and the resources used over the course of the fellowship. We also developed our own carbon offsetting methods. We live and work in an area of Naarm (Melbourne, Australia) that features Platanus Trees (plane trees). Plane tree leaves do not easily decompose in domestic compost systems, so the huge quantity of leaves that are dropped by these trees every autumn mostly end up in landfill. Once in landfill, the leaves can release methane, a gas that is worse for the environment than carbon dioxide (CO2).

We collected large quantities of plane tree leaves. Research shows that these leaves are high in carbon and their slow decomposition rates may help slow the release of carbon from the leaves. We experimented with sealing large quantities of these leaves in our custom-made compostable biopolymers. Our intention was to further slow the decomposition rate helping to stabiles the carbon contained in the leaves. Our aim is to contain the carbon for the longest timeframe and for it to slowly release into composting soil.

CAPTURE was calculated to be a carbon negative project with a carbon negative measurement of 309.44 KG. As a point of reference, a previous PluginHUMAN project from 2019 in which we used recycled materials had a positive carbon footprint of 379 KG. Therefore, not only did CAPTURE have a carbon negative footprint, this project involved a 688.44 KG reduction in our carbon footprint when compared to a previous project.

We will continue to develop our Carbon Calculator over time, refining the calculation methods and adding to the list of materials included in the calculator. Most contemporary Carbon Calculators only calculate waste (ie items that are discarded). We will work to develop a calculator that accounts for the percentage usage of materials over their full life cycle. This is so that the carbon footprint of specific projects can be more accurately recorded. Further work will also be conducted to include the carbon footprint of delivery and packaging. We minimised the delivery of items during this project, using locally accessible materials wherever possible.

LEAF AREA CALCULATOR



LEAF AREA CALCULATOR

Carbon Content of Leaves

In order to determine how much carbon is stored in plane tree leaves we used a calculation method developed by Macquarie University (Professor Ian Wright). These figures showed that 80gm/sq metre of plane tree leaves contain 47 percent carbon content. This correlates with the results published in *Variations and Determinants of Carbon Content in Plants: A Global Synthesis* (GeoSciences 2018, pg 3: 'Broad Leaved Deciduous' https://bg.copernicus.org/articles/15/693/2018/bg-15-693-2018.pdf).

To complete this calculation we needed to know the size (area) of all of the leaves we had collected. The scanning technology that is commonly used for this type of leaf measurement is unaffordable for many projects and organisations. So we created our own 'Leaf Area Calculator'. We designed an innovative custom software system (using TouchDesigner) that measures the area of a leaf/leaves in an instant. Our method needs no specialist equipment. It involves a standard computer, a free software program and a webcam.

COLLABORATORS + PARTNERS

CAPTURE involved intensive research into carbon capture and storage. From 2019-2020 we collaborated with many international institutions and worked in the field alongside scientists and researchers including in the Amazon and Panama jungles. We would like to thank all of the organisations involved.

Thanks to the:

LabVerde Artist Immersion Program in the Amazon (Brazil),

INPA (The National Institute of Amazonian Research, Brazil),

Digital Naturalism Lab (Panama),

Exertion Games Lab Monash University (Australia),

Port Phillip EcoCentre (Australia),

and the contributing scientists from the
Smithsonian Tropical Research Institute (Panama).

This project was supported by the
City of Port Phillip: Rupert Bunny Foundation Visual Arts Fellowship.

ABOUT PluginHUMAN

PluginHUMAN is a multi-award-winning art duo led by Dr Betty Sargeant and Justin Dwyer. PluginHUMAN are at the progressive edge of their field, providing audiences with new cultural, environmental and scientific perspectives. Their artworks address the leading questions and concerns of our times.

PluginHUMAN's work centres around the art of illumination. They create projection mapping, video artworks and led immersive multi-sensory environments. They use the medium of light to translate complex data into meaningful audience experiences.

PluginHUMAN has created commissioned artworks for institutions such as the National Taiwan Museum of Fine Arts (Taiwan), the Asia Culture Centre (South Korea), Questacon (Australia's National Science and Technology Centre), the Melbourne Museum (White Night Festival, Australia) and Experimenta (Australian triennial touring media art exhibition). They have exhibited in Europe, North America, Asia and Australia. PluginHUMAN were awarded the Rupert Bunny Foundation Visual Art Fellowship (2019/20). They have also won Good Design Awards (2020 and 2018), and a Victorian Premier's Design Award (2017).

PluginHUMAN has an acute understanding of the role that technology plays in contemporary society. They reimagine new technologies to produce artistic innovations, creating meaningful large and small scale audience experiences for indoor spaces and outdoor public arenas.

For more details please visit: *https://pluginhuman.com/*
For breaking news follow: *https://www.instagram.com/pluginhuman/*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