

## Tree Opera project in collaboration with composer Oliver Farrow

### Preliminary thoughts and treatment

#### An introduction to the scientific background:

*This project was mostly inspired by the work of the scientists Suzanne Simard and Monica Gagliano (<https://www.monicaagliano.com/>) on the sentience of, network, and communication between trees through their root system. Susanne discovered, along with her colleagues, that in a forest the trees send signals through their roots and the mycorrhizal (fungal) networks underground. These signals are not just banal either - they use this system to transport food to each other, support new young trees and support trees of their same species or "family" and inform other trees of dangers. Within a forest there is an underground hierarchy and each forest will have "nodes" or "mother trees" which are key to the survival of the rest. These will send nutrients, water and anything needed to their surrounding members. These nodes are of such great importance that Peter Wohlleben noticed in his book "The Hidden Life of Trees", that even after being cut down the rest of the forest will then feed the stump of the node to keep it alive. In a sense it is as if the information held by this tree is too great to be let go of so easily. It has been hoped that a growing knowledge of this network, and the ways in which the roots communicate with each other, would help to push us towards more sustainable deforestation trends.*

*In Peter Wohlleben's book he notes that it is really unique to forests that these networks are able to be so social. Agricultural plantations and trees raised in a nursery, have less ability to communicate with their neighbours. This is due to the processes used in growing the plants from seed. Trees cultivated in a nursery will have their roots regularly cut to help develop a "root ball" which will make it easier to transplant. This causes problem for communication as when looking into the structure of the root we see that it is at the tip of the root that the synapse mechanism exists which is able to transmit and receive information. Monica Gagliano describes this point of the root as the location of the "brain" of the tree (if you can believe such a thing might exist). These plants grown with a root ball are therefore being constantly lobotomised and so their abilities to communicate with each other are limited. Alongside this agricultural plants do not need to communicate so much as they are provided with all the nutrients and water they need from the fertiliser sprayed into the soil, and through industrial farming practice. This makes their need for a collective far less.*

*There is plenty of research being done into the forests around Birmingham and UoB are actively researching how to involve communities in environmental science through story-telling and citizen science projects. This project is called NERC Community for Engaging Environments. They is also the Birmingham Institute of Forest Research (BIFoR) which is studying the dynamic response of forests to environmental change, including climate change. They are running an experiment where they have built a Free-Air Carbon Dioxide Enrichment (FACE) experiment in a mature woodland in Staffordshire. This will help scientists understand the impact of varying levels of CO<sub>2</sub> on forest growth and survival. The existence of this research in Birmingham makes this a great place and time to be developing work around this topic. It will be able to feed directly into the community level work, in terms of story telling, and help to connect people to the important research that is happening in the forests around the city.*

## Personal thoughts and motivations:

Whilst studying Environmental Technology at Imperial College London, I wrote a paper on the deforestation in Borneo, in aid of reforesting for palm oil plantation. At that time google earth had just released photos of the Malaysian parts of Borneo (Sabah and Sarawak) and it had become clear from these images that when the Malaysian government was claiming to be reforesting, they were in fact deforesting the rainforest and replacing it with the palm oil plantations. They were able to claim under the reforesting guidelines from the UN development goals that this was part of a reforestation plan. However reforesting for agriculture or timber is not carbon efficient in the way it is assumed. In an untouched forest, dead trees will fall to the floor, and be broken down by bacteria in the soil. The carbon trapped in them will be partly released (through respiration) into the atmosphere but also largely absorbed by bacteria into the soil. This means that taking the wood out of the forest to be used as fuel does not in fact provide the “carbon neutral” fuel source we first assume. On top of this farming practices themselves are often inefficient, energy intensive and polluting. Since then I have been interested in how it is possible to prove that these plantations cannot constitute forest and the definitions we should be using to distinguish between forest and agriculture. The research into the root networks in forests provides a clear distinction between the underground culture of a forest and a plantation.

Having already read about and researched this area I have decided to set this story in Borneo on the boundary between a rainforest and a neighbouring palm plantation. These will provide two very different underground worlds. The sound of the opera will not obviously be that of forests as the story will be told from the root networks underground. So I will be working with the composer (Oliver Farrow) to develop a sound that is representative of the network, through building electronic patches with synthesisers. We will then use voice on top of this to tell the story. When building patches you are creating your own electronic networks. Through this we will be experimenting with how to generate a patch which is reflective of the network it is describing.

This piece will be able to be both performed live but also to be consumed as a film opera. The changing reality we now exist in has highlighted the importance to develop new ways for my work to be consumed by the public. Live performance may not always be an available option and so this work will be flexible to have the potential to be performed or consumed at home.

## The Two root worlds

1. Agricultural plantation
2. Connected plantation

### 1. Agricultural plants:

- A chorus of unison
- All doing the same thing without realising
- Oblivious to their neighbours
- Lost in their own development
- Struggling on their own for nutrients
- Maybe actually aware of the neighbours (*especially due to the recent research into introducing fungi to roots of seedlings to make their nutrient uptake more efficient*) but there is a huge barrier between them. They view each other as competition.
- Suspicious of the other plants who are just the same (*in fact they are clones*) as them.
- They are totally dependent on the farmers to provide sustenance for growth.
- They do not believe that they can create their own nutrition and fuel their own growth.

### 2. Forest plants:

- Are a polyphony - many different struggles happening at the same time.
- Have a hierarchy - from mother trees to loner trees.
- Work together - support their family and warn each other of dangers.
- Mourn the dead - they keep stumps alive for as long as possible.
- Feed the sick
- Have an overall collective voice and nodes which receive information and live in a cooperative network.
- The signals sent through root networks travel very slowly in comparison to the rate at which we receive and deliver information, this is reflective of the 100's - 1000's of years that trees have the capacity to live until.
- The collective will be like a flow of traffic with busses of information arriving at nodes in a semi regular basis. These, and the information they carry, will make up the sound of the collective.

## Palm and Rainforest Libretto:

### Scene 1: Trauma

This scene will introduce the world of the collective forest root network.

The scene starts just as news of a storm is being spread around the collective. There will be moving vehicles of voices telling stories and fears of the storm sent from different plants. Ultimately this will lead to a complete shutting off of all sound as the mother tree is struck by lightning, sending a shock throughout the network. We will then hear the network slowly start to talk again as it realises the trauma that has just occurred.

### Scene 2: The Plantation

This scene will introduce the sound of the plantation. It will be a track in which we meet the palm trees as a group of individuals, all singing to the same beat but all in their own world - a bit like watching a silent disco.

The palm trees have gone through some trauma when in the nursery as they regularly had their roots cut. This leads to them being much harder to effectively communicate with. They also get all they need from the humans so see them as a kind of god and believe that the point at which they get cut down, or the giving of their seeds away, is all towards a higher goal (think Logan's Run).

### Scene 3: The Decision

The rainforest network have lost a mother tree through the storm that was providing a lot of support to many of the young and ill trees in this community. The collective take a decision to seek help outside of their network. Remembering there used to be more networks towards the area that is now the plantation they decide to send a node out to seek help in this land. A node that is closest and from the strongest tree is chosen.

### Scene 4: Conversations

During this scene the rainforest node will make several attempts at conversations with palm tree roots. It will try three times and fail. Each time the palm tree will lead the rainforest node in a circular argument back to the point that the only way to get help for food is from above.

Through these three conversations the node will have developed an intelligence (along with the collective, with whom it is communicating) on how to talk to the palm trees. On the fourth try it will strike gold and manage to convince the palm roots to come back with it to the rainforest network.

### Scene 5: Palm Tree Exits the Cave

The palm tree root will be plugged into the network and see the whole way of life of the collective. It will see seeds grow to old trees, seeds be planted where they fall. Trees relying on other trees for help and guidance, a knowledge of the soil, how deep roots can grow, and death from natural cause (not being chopped down).

Having seen all this the palm tree cannot just go back.

### Scene 6: Recruiting

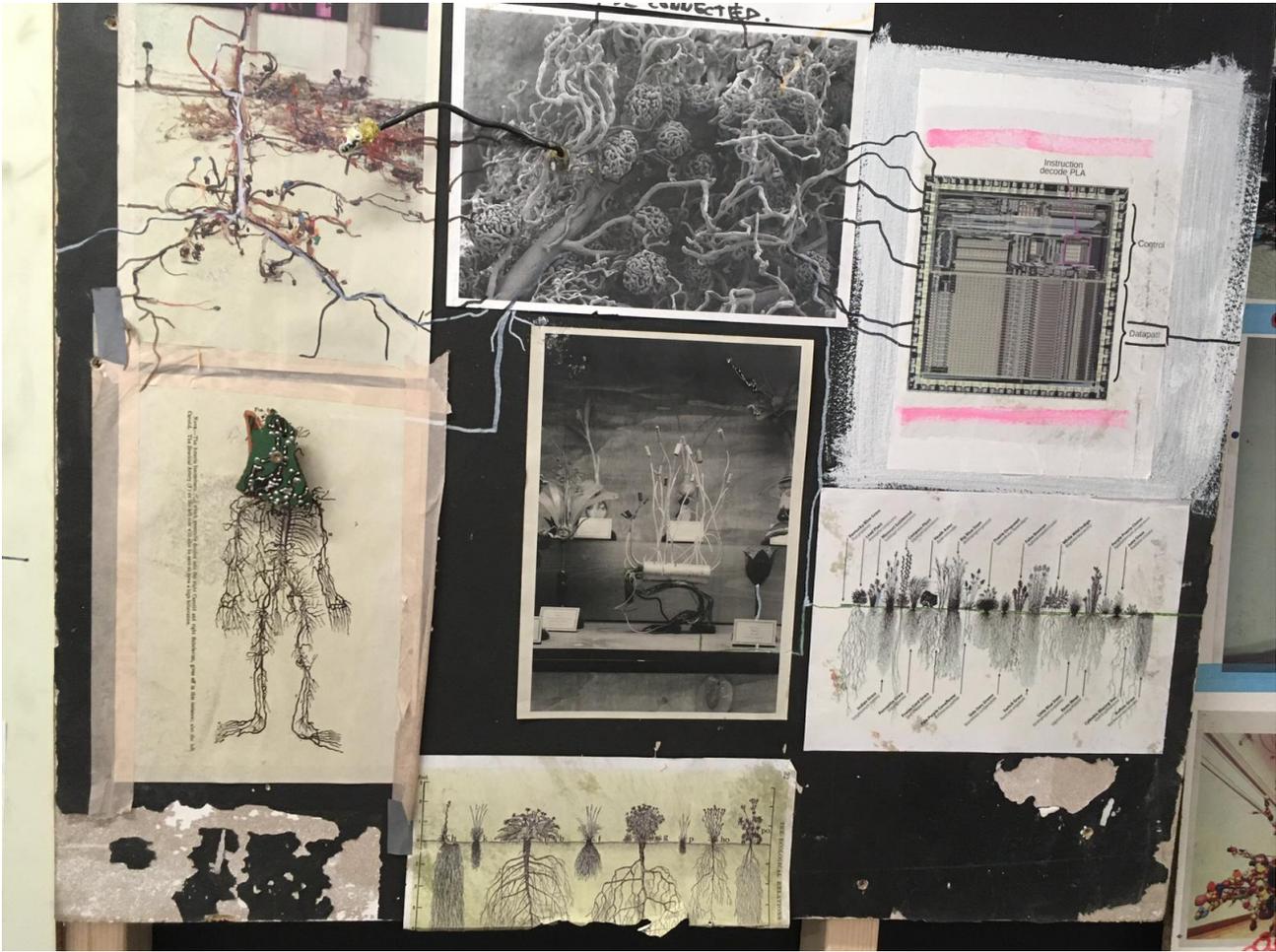
The palm tree root returns to its plantation and seeks to recruit other plants to go with it to the main network. It encounters the same problems that the network did, however it manages to persuade at least one through the knowledge it has gained.

## Scene 7: Revolution

The two palm tree roots begin their own network as well as plugging into the rainforest's network. They make a deal with the rain forest to support it when it needs help (such as right now) by passing nutrients from the soil fertilised by humans. In return when a palm seed falls in the forest the rainforest network will nurture it until it is full adult. In this way palm trees will become a flourishing part of the rainforest network as well.

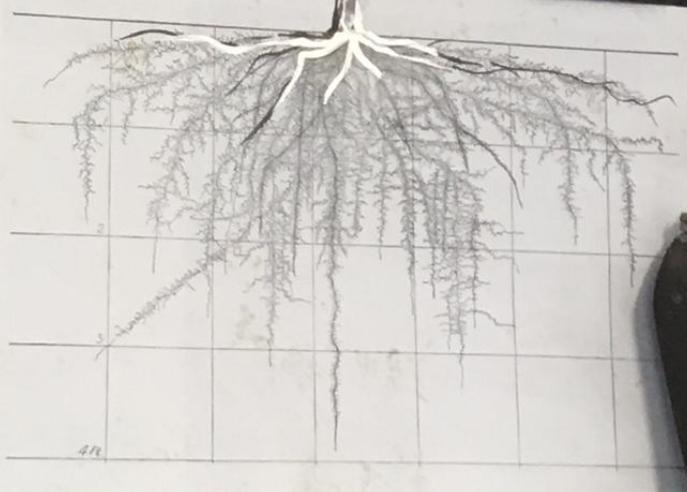
Palm trees pledge to set up initiative to connect as many of the plantation roots as possible to the network to strengthen both groups. Revolution has begun.

The images below are from exhibition of Kristof Kintera at IKON 2020. These works resonate strongly with the concepts behind the tree opera.



DECIDE!  
ST CULTURE !)

Copper has extraordinary material properties. It is an excellent thermal and electrical conductor, and it is corrosion-resistant, meaning that it doesn't weather. Copper is a relatively soft and ductile, but also resistant, metal that is easy to work. Used in many applications, from...



...the roots of the plant are the primary source of water and nutrients for the plant. The roots also play a role in the plant's ability to anchor itself in the soil. In some cases, roots can also be used for propagation, as they can be cut and planted in a new location to grow a new plant. The roots of a plant are also important for its ability to survive in dry conditions, as they can store water and nutrients for use during periods of drought. The roots of a plant are also important for its ability to survive in acidic soil, as they can release enzymes that help to break down the soil and make the nutrients more available to the plant. The roots of a plant are also important for its ability to survive in alkaline soil, as they can release enzymes that help to break down the soil and make the nutrients more available to the plant. The roots of a plant are also important for its ability to survive in saline soil, as they can release enzymes that help to break down the soil and make the nutrients more available to the plant. The roots of a plant are also important for its ability to survive in nutrient-poor soil, as they can release enzymes that help to break down the soil and make the nutrients more available to the plant. The roots of a plant are also important for its ability to survive in nutrient-rich soil, as they can release enzymes that help to break down the soil and make the nutrients more available to the plant. The roots of a plant are also important for its ability to survive in nutrient-deficient soil, as they can release enzymes that help to break down the soil and make the nutrients more available to the plant. The roots of a plant are also important for its ability to survive in nutrient-abundant soil, as they can release enzymes that help to break down the soil and make the nutrients more available to the plant. The roots of a plant are also important for its ability to survive in nutrient-limited soil, as they can release enzymes that help to break down the soil and make the nutrients more available to the plant. The roots of a plant are also important for its ability to survive in nutrient-rich soil, as they can release enzymes that help to break down the soil and make the nutrients more available to the plant. The roots of a plant are also important for its ability to survive in nutrient-poor soil, as they can release enzymes that help to break down the soil and make the nutrients more available to the plant. The roots of a plant are also important for its ability to survive in nutrient-deficient soil, as they can release enzymes that help to break down the soil and make the nutrients more available to the plant. The roots of a plant are also important for its ability to survive in nutrient-abundant soil, as they can release enzymes that help to break down the soil and make the nutrients more available to the plant. The roots of a plant are also important for its ability to survive in nutrient-limited soil, as they can release enzymes that help to break down the soil and make the nutrients more available to the plant.





