



4 March - 11 April 2015

STEPHEN MUSHIN





It is with much excitement that we welcome Stephen Mushin to Abbotsleigh as our first artist to participate in the Artist in School program through the Grace Cossington Smith Gallery. His creative works will be a wonderful stimulus to launch discussion on solving problems using both science and design. As an environmental designer himself, Stephen is willing to expand the boundaries of what is possible in solving real world problems by 'intelligent dreaming'.

One of our main educational focus initiatives this year is to transition from STEM to STEAM in introducing the Arts into the Science, Technology, Engineering and Mathematics (STEM)

approach to innovation. We know that the world is complex and solutions to problems need to address a range of issues necessitating a multidisciplinary approach. STEAM education has a better resemblance to innovative problem solving as it promotes students to think in a non-linear fashion with divergent thinking combined with scientific system thinking for the best real world solutions.

We look forward to Stephen working with teachers and students to offer challenging learning experiences for students from Year 4 and Year 6 through to our senior girls. His creative design thinking practices will be explored through Geography, creative writing, Environmental Science, Mathematics and visual expression. Stephen's passion for innovative change with wild ideas will have him unleashing the imagination of both students and teachers.

I invite all visitors to join us on this journey of exploring scientific innovation and design.

Mrs Judith Poole
Headmistress

NOW IF WHAT THEN



Does the future really look that crazy?

Experiencing Stephen Mushin's work is an exercise in suspended disbelief of gigantic proportions. His ideas for addressing a myriad of earth's environmental challenges are extremely humorous and highly unconventional. Stephen tackles very serious issues in such an outlandish way that we are left wondering, 'is he serious?'

He is.

When I first came across Stephen's work, my colleagues and I were looking for a designer who was tackling environmental issues, but doing so without the usual earnest, bleak and guilt-ridden rhetoric. We were instantly attracted to Stephen's philosophy, but when we met him in the flesh, he was even funnier and more intense than we had imagined. As we started telling people about his prodigious talent, exuberant energy, and black humour, we adopted the short-hand explanation 'He's a cross between Dr Seuss, Roald Dahl and a mad professor.'

Unfazed by this description, Stephen often points out that if aliens dropped down to earth right now and saw what we were

doing to our environment; burning fossil fuels, generating excessive waste and destroying natural ecosystems, they would think that we were totally insane. And therein lies Stephen's point: is his proposed future really that crazy?

To bring his imagined future-world to life, in 2013 Stephen launched the long-term art project *Now If What Then*, a series of drawings of would-be mega ecological machines. Although the product of his wild imagination, these machines are all grounded in very real science, and to varying degrees, theoretically possible. Accompanying each drawing are detailed scientific explanations and complex calculations, to illustrate how these machines can address environmental issues. By showing his workings and incorporating workshops and interactive displays into his exhibitions, Stephen is also challenging us. We become active participants in this progressive, stream-of-consciousness line of inquiry. He wants us to push the boundaries and challenge the status quo; he rewards us for crazy ideas; and he judges us only by how big and brave our imaginations are.

But this is not escapism. Stephen's world, although full of fantasy, absurd ideas and wacky-looking machines, is not about fleeing from a harsh or dark reality. It is not a personal, lonely or isolated experience. It is about our whole community developing a stronger sense of ownership and belonging, and collectively making changes in our world. Stephen is all about embracing, with relentless optimism, the reality and the issues of our current lives.

In 2014, one year into the project, nowhere was this optimism more needed than in a country like Japan, where the dangers of nuclear power continue to be keenly felt, and fears for future energy procurement are real. But heated debate around environmental issues and ongoing efforts towards natural-disaster-proofing the country don't easily allow for crazy imaginations and wild creativity. So it was very exciting when a fellow curator at Tokyo's prestigious Spiral Gallery wanted

Japanese audiences to have a 'Mushin adventure'. Together, Stephen and I worked to develop Japan-specific projects and engage with local communities to understand and respond to the particular issues of their environment. To our delight, Japanese audiences were only temporarily shocked before they threw themselves into the challenges that Stephen posed. Many of the wonderful works inspired by this experience are on display here at the Grace Cossington Smith Gallery.

So now it is the Abbotsleigh community's turn to fasten their seatbelts and jump on board for this wonderful adventure, where the final destination all depends on our collective creativity.

Kathryn Hunyor
Director, Art Waku Waku and Abbotsleigh student 1986-91

www.artwakuwaku.com.au



Cows will fly. It's not just theoretically possible, it's also common sense. As we need to re-forest the whole world to suck up carbon, plus want to farm more cows than ever, it's simply a no-brainer. You can farm cows in the sky, but you can't easily grow trees in the sky.

Albert Einstein said, 'We can't solve problems by using the same kind of thinking we used when we created them.' This notion has never been more relevant than it is today. To re-think the human world, we need to think completely differently about how we interact with the non-human world that supports us.

Now If What Then is a collection of designs and back of napkin calculations for ideas that could save our skins. They're works in progress, early sketches from our design studio. We plan to build them all.

The project was first exhibited as part of CUSP: Designing for the next Decade, a touring design exhibition curated by Object, The Australian Design Centre, in 2013. In 2014 Now If What Then was exhibited in Tokyo as Now If What Then, Farming Tokyo at Spiral Contemporary Art Gallery in collaboration with Tokyo University of Agriculture and Art Waku Waku. Many of the works displayed here originate from that project, which set out to develop ideas for sustainably growing food within Tokyo, using only the city's organic waste.

About the artist:

Based in Melbourne, Stephen Mushin is a New Zealand illustrator and designer. With a background in industrial design, Stephen has spent the last 15 years collaborating with engineers and scientists on projects dealing with ecologically-sustainability.

Recent projects have included designing and building a super water efficient urban agriculture system, and feasibility studies for biogas based urban waste processing and solar thermal powered kitchens. In 2012 Stephen won the British Council's Big Green Idea award for an open source, human powered aquaponics system for developing countries, which he is currently busy trialling in Melbourne with his engineer colleagues.

Please follow the project on Instagram:
@STEPHENMUSHIN



www.NowIfWhatThen.com
www.stephenmushin.com



Re-Wilding Tokyo

Tiger taxis for Tokyo, 2014

Silka deer taxis for Tokyo, 2014

I've recently been inspired by British writer George Monbiot's essays about 're-wilding' European landscapes. He talks about reintroducing elephants and even lions into Europe, because large herbivores enrich the soil and spread seeds with their manure, and large carnivores are important to control the numbers of herbivores.

In Tokyo, while working with The Tokyo University of Agriculture, I started thinking about what life would be like if there were once again Japanese silka deer and Japanese tigers (which are only known from fossil records) in downtown Tokyo. How could these animals be reintroduced in large numbers to live among cars and buildings, and be given a good life alongside humans?



The proposal is to develop augmented reality helmets for wild animals which enable humans to control what the animals see, hear and smell. Such a system would allow us to ride tigers and deer to school or work and control their journey by directing the creatures towards virtual food. In this way the future streets, which will have fewer roads and more trees, could be populated with large animals living harmoniously with humans.



The Ethical Polar Bear Burger and Hoodie Company

The Freezerberg, 2013

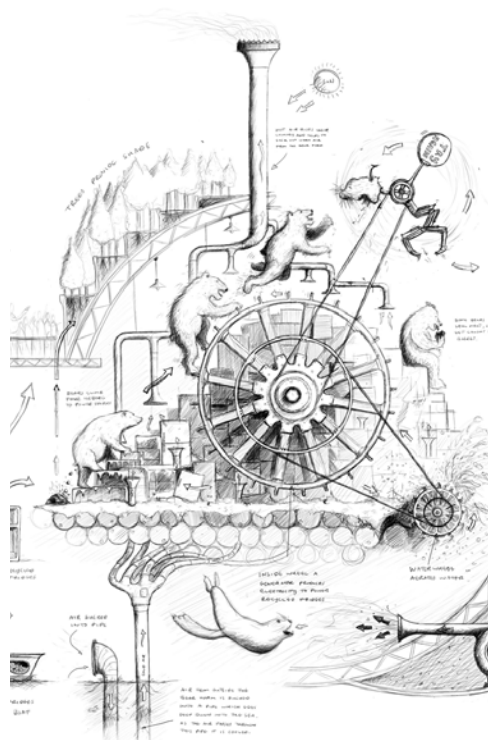
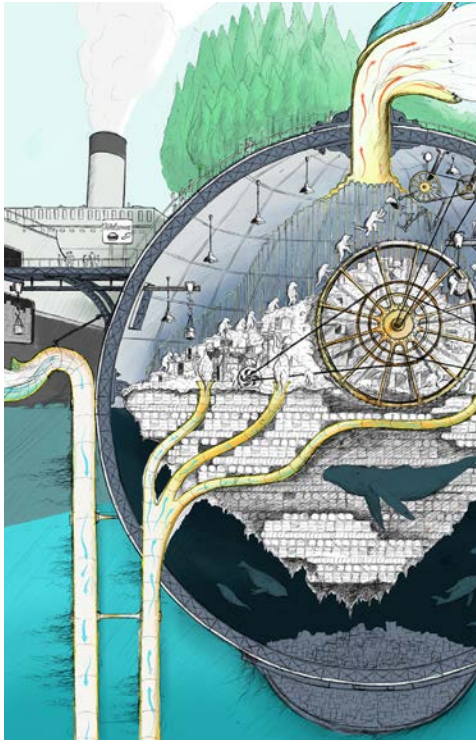
Bears on wheels, 2013

Polar bear hoodie prototype, 2015 (Made for the project by Colleen Burke)

Polar bears are being squeezed into a smaller and smaller habitat as the arctic melts. They could be extinct in the wild as soon as the year 2050.

The Ethical Polar Bear Burger and Hoodie Company is a sustainable back-up plan for a melting arctic. The proposal is to save polar bears by farming them, ethically of course, on vast artificial icebergs made of recycled freezers stacked inside insulated domes. Mechanical icebergs will be

established around the world before the arctic actually melts, allowing polar bears a smooth transition into farming, and aiming to meet huge existing consumer demand for UV reflective polar bear fur hoodies. The farms will be completely self-contained, arctic ecosystems powered by polar bears, and will offer habitat for whales, seals and migratory birds. The project will also provide arctic experiences for tourists, and according to growth forecasts has the potential to recycle all of the world's used domestic freezers.



Steam Whale

Steam whale, cut-away, 2015

The oceans are filling with plastic. But unlike biodegradable organic debris, plastic disintegrates into increasingly small pieces, while still remaining a polymer – and unusable by living organisms. Plastic particles become suspended in the upper water column of the world's oceans, and concentrate in vast swirling gyres. The Great Pacific Garbage Patch is estimated to be 1-10 million square kilometres in size. The particles eventually become small enough to be ingested by aquatic organisms that reside near the ocean's surface. As a result, tiny, often toxic particles are now found in organisms all the way up the food chain, from zooplankton to humans. No one really knows the effects this will have, but it's unlikely to be good.

Even if we could stop using plastics tomorrow, we would still need a way to get these particles out of the water. We need a giant upper water column vacuum cleaner.

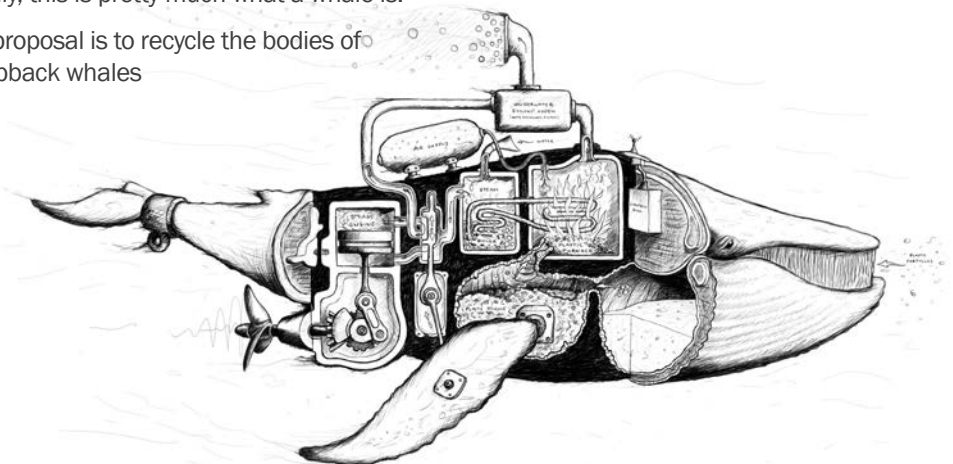
Luckily, this is pretty much what a whale is.

The proposal is to recycle the bodies of humpback whales

(which have recently died of natural causes) core out their insides, (dump these at sea to return valuable nutrients), and use the streamlined whale shell, once embalmed, as the basis of a water-filtering drone.

Humpback whales filter the water by taking vast gulps into their mouths, and then forcing that water back out through their baleen hairs. This traps their food. Mechanical, embalmed whales would use this same principle, filtering plastic particles from the water and then burning this plastic to generate steam for propulsion.

The final unresolved challenge in the project is ensuring that the Steam Whales capture plastics and not ocean creatures already battling for survival. Thus, the next design stage will focus on developing a living organism repelling system. This will be mounted on the whale's head, and will likely use pressurised waste gasses from the Steam Whale's plastic particle furnace as a low range toxic spray deterrent.



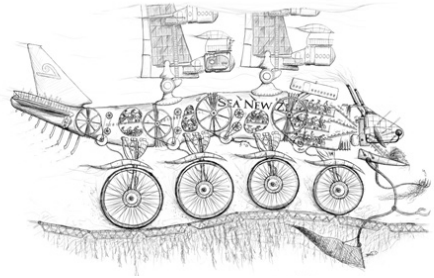
The 747 Seacycle: Pedal power will replace intercontinental jet travel

Pedaling on fried fish and seaweed 2013

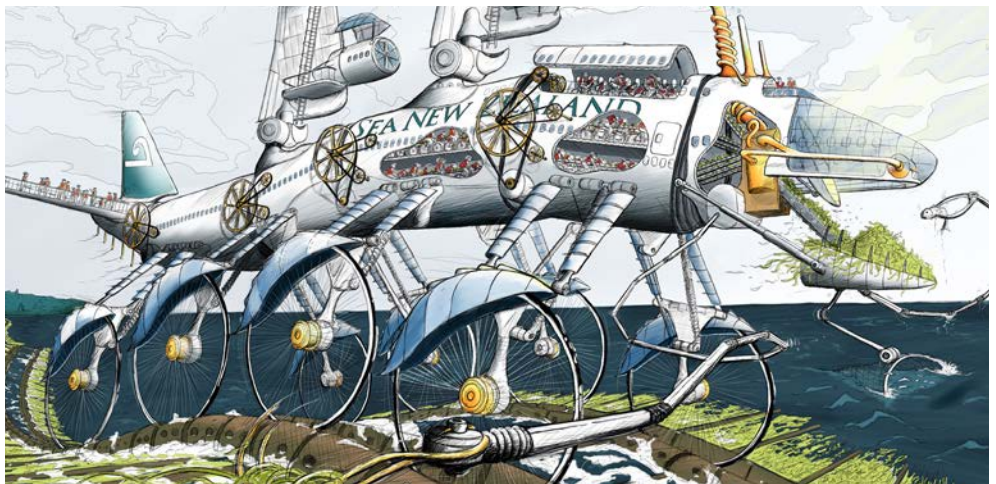
Diagram of the Seacycle 2013

A global price on carbon emissions will quickly make jet air travel prohibitively expensive. This is a good thing for the environment, but a bad thing for easy, long distance travel. Solar electric powered flight is possible, but only for very small aircraft. Quite simply, there is no known viable replacement for fossil fuels to power long distance flight. It just takes too much energy to lift hundreds of people into the air.

Pedal power? The bicycle is the most efficient form of transport in terms of energy use/km travelled. Could floating bicycle paths allow people to cheaply travel across oceans and around the world? Building floating bike paths should be no problem, but surviving rough seas on a bicycle travelling on these paths is another thing. The answer is to build large pedal powered



vehicles which carry lots of people and have enormous suspension to deal with large swells. The perfect rigid and aerodynamic structures to make these from are the recycled fuselages of aeroplanes, which will likely be cheaply available as the jet industry goes into decline, and to float the bike paths, highly buoyant seaweed. This seaweed will be farmed to provide income for maintaining the tracks and as a food source for passengers – fried fish and seaweed being the maritime substitute for fish and chips.



Bee Lights

Bee lights, 2014

Global bee numbers are dropping due to toxicity in our environment, disease and a lack of available food. We desperately need bees to grow food for humans. For all the amazing work they do for us, we owe them some help.

In most cities we provide very little food for bees, but there is a lot of surface area on rooftops that could be used to grow wild flowers. A less obvious rooftop opportunity for growing wild flowers is to use the roofs of cars. They are easier to access for gardening, strong enough to support a shallow garden bed and provide the added benefits of shade and visual character to the car.

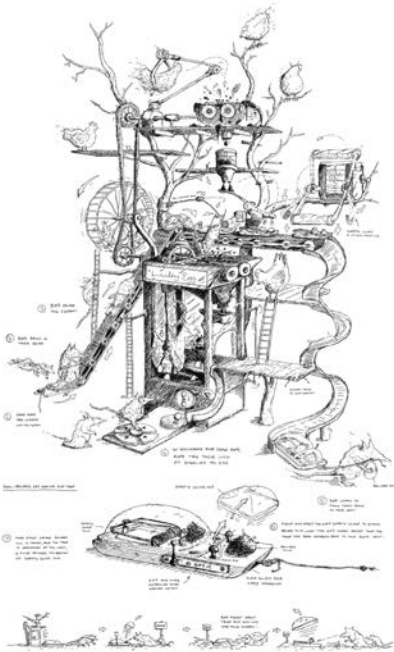
In Tokyo there are more than six million cars, and with each car roof at least one square metre in size, this would provide more than six million square metres of wildflower gardens for bees to harvest.

Assuming every car carries a rooftop wild flower garden in the future, I began thinking about where the new large populations of inner-city bees could live, and how they would harvest nectar from fast-moving car-gardens.

The solution is to install Bee Lights, which house bee populations, and use cameras and visual mapping software to detect



when an oncoming car has a roof covered with viable flowers. A red light stops cars so the resident bees can harvest the car's flowers. Then the orange 'honey light' comes on, allowing the driver to take a little honey in exchange for their flowers. The green light signals they can continue on their way.



Happy rat, happy hen, 2014

Humans kill rats because they can quickly multiply in cities. This is because they have few natural predators, but also because they are so good at what they do – scavenging food waste. They are highly successful recyclers. I think we envy their cunning.

Rats would be a kind of nutrient collection system if they could be easily farmed in cities. This led me to wonder if we could work together by offering them a little more respect and making better use of their skills.

So an idea developed for a perfect food waste collection and recycling partnership, between rats, chickens and humans. Rats are really smart and can

learn complex systems to get the food they love – like eggs and chicken meat. Likewise, chickens love to eat rat meat, although they're too slow to catch rats themselves. Humans love to invent new ways of effortlessly looking after chickens, killing rats, and also like chicken stew.

To facilitate collaboration, the design proposal is in two parts. Firstly, a dual reward, GPS enabled mousetrap, which rats want to take home to their families, and secondly, a free-range habitat for chickens with a built-in egg gambling machine. The rats power this machine and try their luck at stealing an egg by dancing to control a robot arm. The machine will encourage rats to return the traps along with their dead, feed the chickens and will automate the process of rat trap reloading and distribution.

All going well, the chickens get rats, the humans get chicken stew, and the rats that survive get eggs. Everyone wins.

Note: A much simpler version of the system was initially proposed where rats would arrive at the machine to gamble for an egg and be catapulted into the grinder to feed chickens if they fail. However an intractable problem arose: This machine would reward the smartest rats, and kill the rest, thus, over time creating a super race of dancing, egg stealing rats.

The Body Cannon

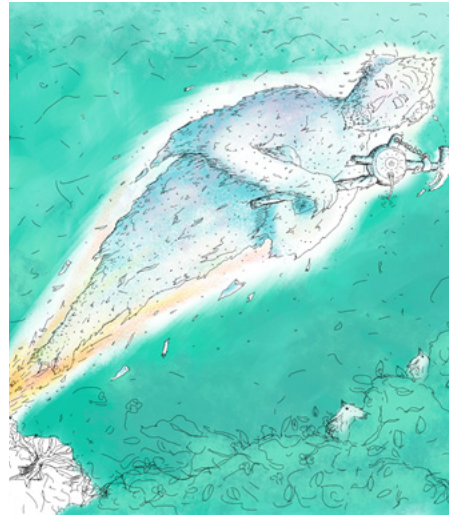
The final flight 2014

The Body Canon process of fermenting and blasting a body, 2014

It's amazing to think that when any organism dies, the nutrients which make up its body go back into the ecosystem to quickly become part of other life forms.

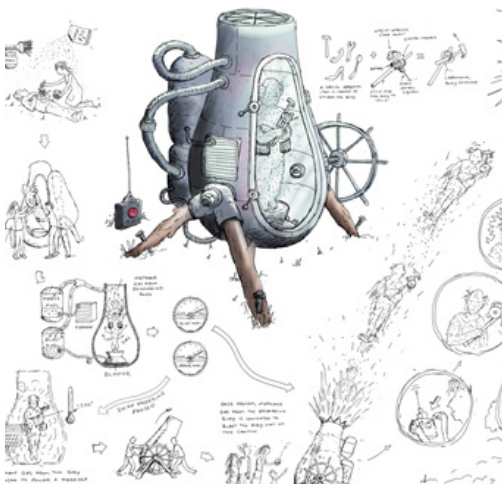
I started looking into the best ways to recycle all of the nutrients in human bodies in cities, and read about a Swedish system of freezing human bodies and then shattering them into tiny pieces no larger than grains of sand. These are then scattered in the forest to feed trees. I liked the idea of my body being fed to a forest. How could we do this to feed trees in cities?

When our bodies decompose they produce methane, and if this process takes place inside a sealed container, we can capture the gas and use it as a fuel. My proposal is to use some of this gas to power a freezer



to deeply freeze our bodies, and the rest as an explosive to shoot our frozen bodies high above parks and forests to best distribute the nutrients.

In my system, human bodies will be painted with honey then covered with plant and tree seeds. After this the bodies will be left to partly decompose inside the Body Cannon until enough gas is collected to power the freezing and the blasting process. When the gas is ready, the relatives of the dead will gather for the blasting and shattering ceremony. High above the forest the body is shattered by a personal item of the dead – an object that is being taken with them to the afterlife.



Cockroach Battle Suit



The Cockroach battle suit, 2014 Battle vision, 2014

Insects are often considered pests, but they are vital to our ecosystems. Insects eat dead leaves and animals; birds eat these insects and in turn fertilise plants with their droppings; we eat these plants and produce waste, which is eaten by bacteria; which are eaten by insects, and so on. Everything is connected.

To help us develop a greater respect for how amazing insects are, I started thinking about augmented reality systems which allow us to see the world as an insect does, using tiny cameras at ground level. This got me thinking about how we could also engage directly with insects via miniature insect drones. From here I designed a suit that would allow me to battle an insect one-on-one when it is annoying me, rather than simply squashing it with my foot.

This design sketch is for a unicycle-based cockroach battle drone with a tiny wheel which allows them to move and turn in a small space like a real cockroach. The unicycle pedals drive both the tiny wheel very, very slowly, and spin a gyroscope very fast, which helps them maintain balance. The rider sees the world through the drone cockroach camera and controls its jaws and one fighting leg with hand controls.

To offer a realistic and fair fight, the system has to have high risks and also potential rewards for the rider. If the rider wins a fight and kills an insect they get a chocolate coated banana. Being hard on the outside and soft on the inside, this has the same feel and sound when broken as an insect leg.

If the real cockroach inflicts damage on the cockroach drone, electro-magnets mounted on the rider snap together to disable the corresponding human limb. The rider loses the ability to use their arms or legs one by one, until they crash to the floor.

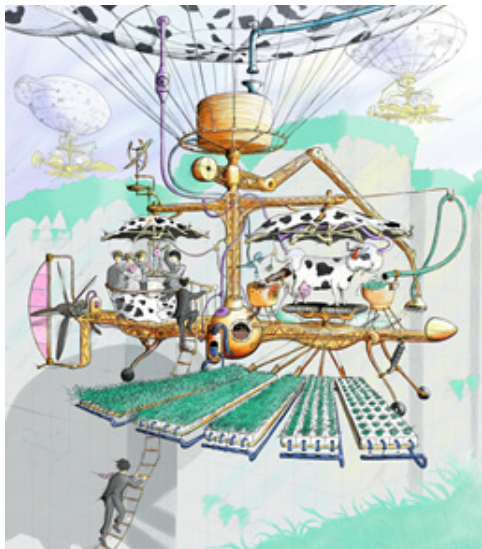


Cowship: Cows will fly

The Cowship, 2013

Scale model Cowship V2, 2014

Cows are really handy. But cows fart and belch vast amounts of methane, a dangerous greenhouse gas that has twenty times the effect per kg on our atmosphere than carbon dioxide. They also use a lot of land, which could otherwise be forested or used to grow food, and produce a lot of manure, which often ends up polluting rivers. However, methane is a valuable fuel, and it's also lighter than air. Theoretically it could be used to make things float, just like helium. If we captured methane from cows and used it to float them in the sky, could we then reforest much of the world's farmland? Probably, but cows need food and probably don't like flying. The solution to this is to float not just the cow, but the cow inside a Cowship as the biological engine.



Cowships are floating dairy farm airships that will one day fill our skies, make cows happy and cancel their impact on the environment. Cows powering Cowships with their gas walk on treadmills and through a virtual reality headset. They happily believe they are on the ground in a lush meadow rather than in the sky. The cow's manure is fed into a spherical tank where it is stirred and mixed with water in an oxygen-free environment to ferment and produce more methane, or biogas. This gas in addition to the methane from the two ends of the cow fills the balloon to make the Cowship float, and powers the Cowship's engines. The by-product of fermenting the manure to produce gas is a rich liquid fertiliser, which is used to grow grass on board the Cowship in Hydroponic grow beds.

The Cowship project proposes that all of world's ruminant animals should be flown in the sky above cities as zero emission farms and milkshake cafés.

The 1:10 scale model presented here illustrates our most recent design for the Cowship V2 system and includes redesigned propellers, fuel tank and upper deck area. The propellers tilt to move the Cowship up and down in the sky and are operated individually to steer the ship from left to right.

This project has been developed with engineering assistance from Neil Faragher, 3D visualisation by Jarod Pak, 3D printing by Christopher Langton and model making assistance from Duncan Murray, Lachlan Major, Joseph Wang and Elise Joseph.

BURPING AND FARTING COWS:

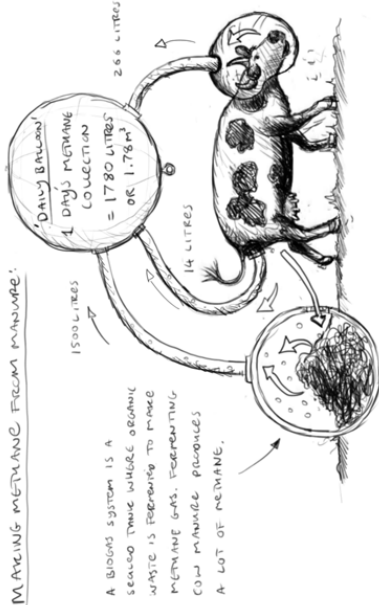


FAECES:
14 LITRES / DAY
OF METHANE GAS

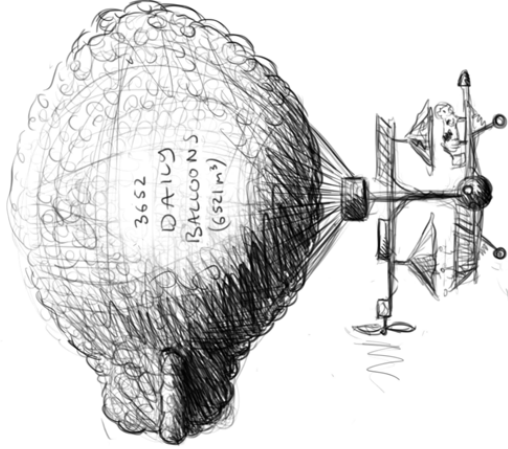
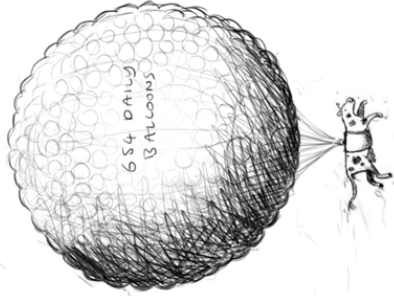
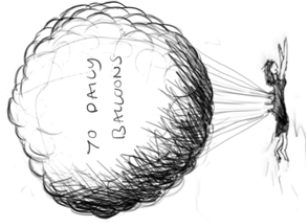


COWS HAVE A LONG AND COMPLEX DIGESTION PROCESS WHERE GRASS IS FERMENTED TO BREAK IT DOWN. THIS PRODUCES A LOT OF METHANE GAS.

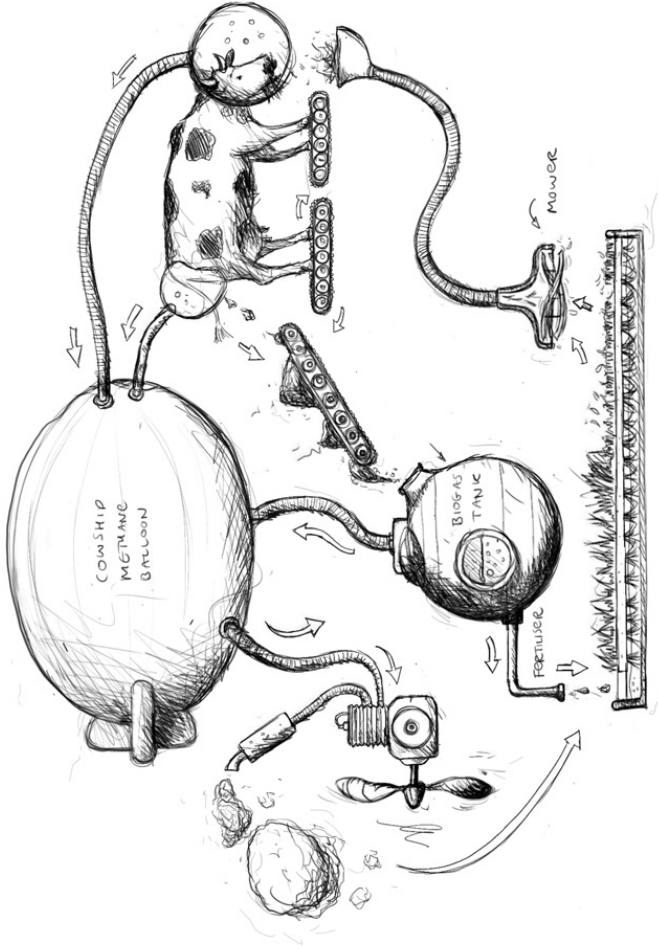
MAKING METHANE FROM MANURE:



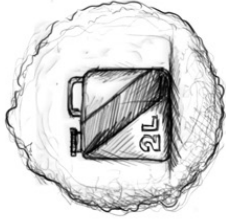
FLOATING THINGS WITH METHANE BALLOONS:



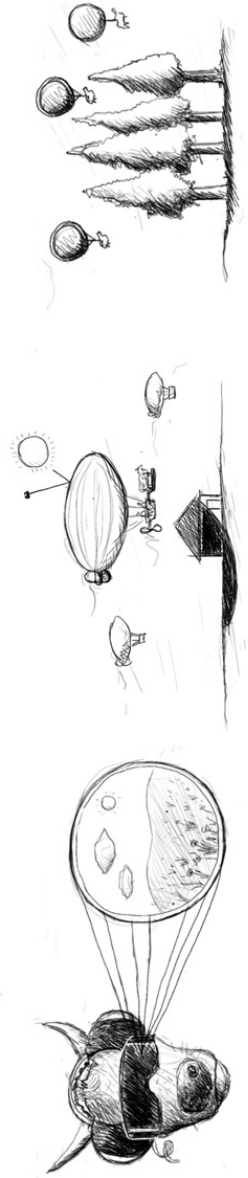
THE COWSHIP SYSTEM:



FUEL:



ONCE A COWSHIP IS FLOATING, ALL METHANE PRODUCED BY THE COW IS USED FOR FUEL TO MOVE THE COWSHIP. THE 1780 LITRES OF METHANE ARE EQUIVALENT TO 2 LITRES OF PETROL.



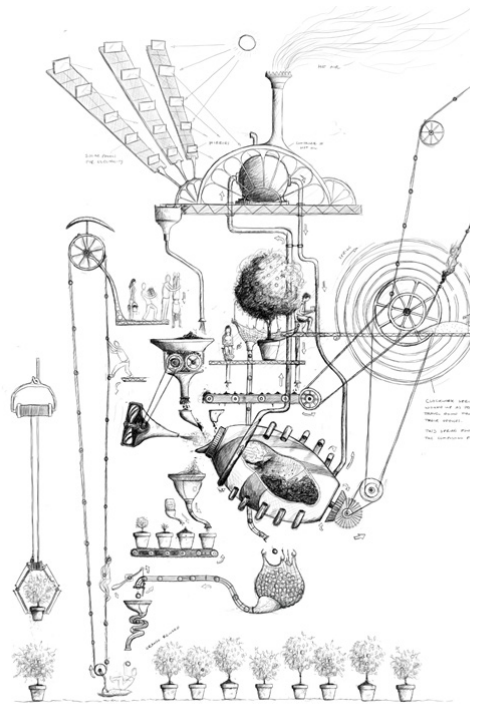
The Compostasaurus: Walking toilets will reforest our cities

Compostasauri 2013

Diagram of the Compostasaurus process, 2013

Massive amounts of energy and water are used to move human waste out of cities. But this isn't waste at all – it's nutrient-rich organic material. If we want to grow food in cities we need to keep these valuable nutrients to make our soils fertile. Composting human waste is the best way to reuse it, but composting toilet systems require a lot of space in buildings as well as heat, air, mechanical mixing and a garden to use the final compost. Adapting office buildings to do all of this will be expensive.

The Compostasaurus plan proposes that all toilets are mobile walking machines which come to us when we need them.



We call a Compostasaurus by using a smartphone app. They appear at the window of our office for us to climb inside. They are walking glasshouses full of fruit trees, making going to the toilet a pleasant and inspiring interaction with nature. The fruit trees, grown using our nutrients, are planted around the city. Visitors power the Compostasaurus with their kinetic energy and they hold onto a long rope and drop into the machine. The spring powers the composting processes. Compostasauruses also have mirrors to heat their compost systems and solar panels to power their electric legs.

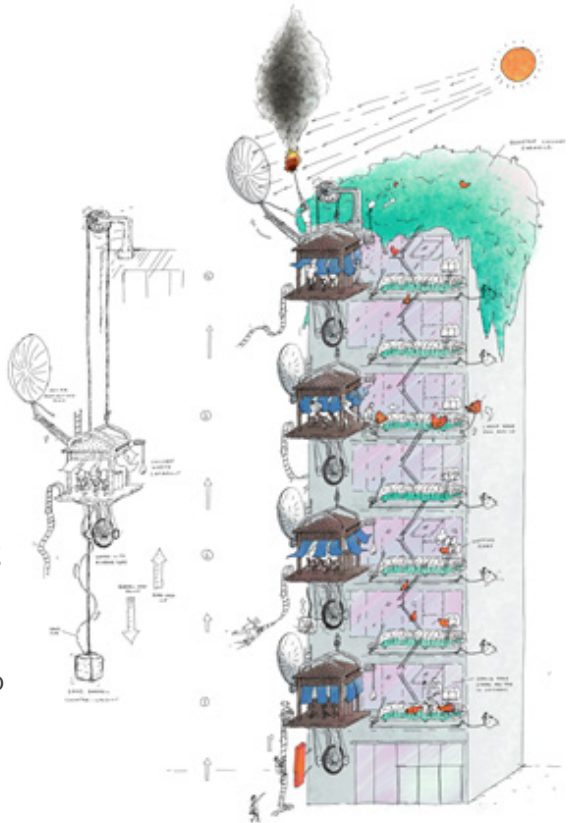
Vertical Solar Yakitori Bar

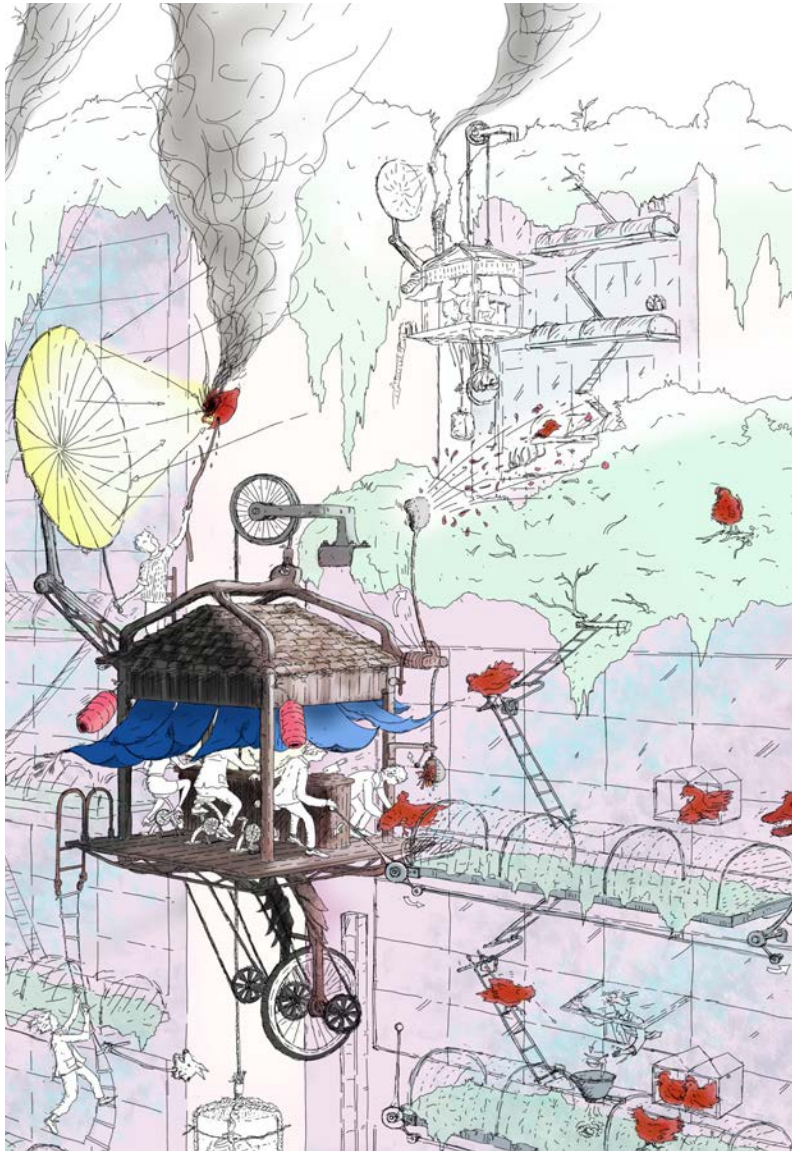


How to catch an office chicken, 2014 Climbing and frying, 2014

A lot of chicken is eaten in Tokyo, and often at simple wooden 'Yakitori' bars – lightweight sheds with a few seats and a gas burner. Yakitori translates to 'burnt chicken'. When visiting a Yakitori bar recently, I started thinking about the possibility of farming free-range chickens in the centre of the city, and frying them with the sun. This could eliminate the need to transport chicken from far away, provide a use for food waste from offices, and save a lot of gas. To do this we would need to create extensive inner-city gardens – vertical chicken paradises.

The proposal is to attach lightweight chicken runs beneath the office building windows. This would allow chickens to live freely on building facades, climbing between floors to find food, laying eggs for office workers, and supplying meat to Yakitori bars. Each building would have its own mobile Yakitori bar that would climb the building to harvest chickens and best access the sun. On a sunny day, a 2m² solar reflecting dish could provide the equivalent cooking power of a roaring gas burner.





In *Now If What Then* we are privileged to be working with Stephen Mushin. Stephen is the first artist in residence to work collaboratively with Abbotsleigh and the Grace Cossington Smith gallery. Stephen is an artist with a remarkable mind, somewhat of a Renaissance man in the breadth of his interests. It is this diversity that facilitates the engagement of students from Science, Maths, English, Technology, Art, Geography and Junior School with the exhibition and with Stephen's ideas about creativity and design.

The GCS gallery aims to research the outcomes that occur when learning takes precedence in the curation of exhibitions.

In *Now If What Then* learning is a prior consideration, not an afterthought, and this enables the gallery to function as an extra classroom. With student interest in mind, and the provision of an engaging exhibition, workshops and residency, it is anticipated there will be wide public appeal for all ages.

Thank you to Kathryn Hunyor and Annette Mauer for their work and support with this exhibition.

Mary Faith

**Director Grace Cossington Smith Gallery,
March 2015**



Gallery hours Monday to Saturday 10 am-5 pm **FREE ENTRY** | Gate 7, 1666 Pacific Highway, Wahroonga | 02 9473 7878
gcsgallery@abbotsleigh.nsw.edu.au | www.gcsgallery.com.au | An Anglican Pre K-12 Day and Boarding School for Girls