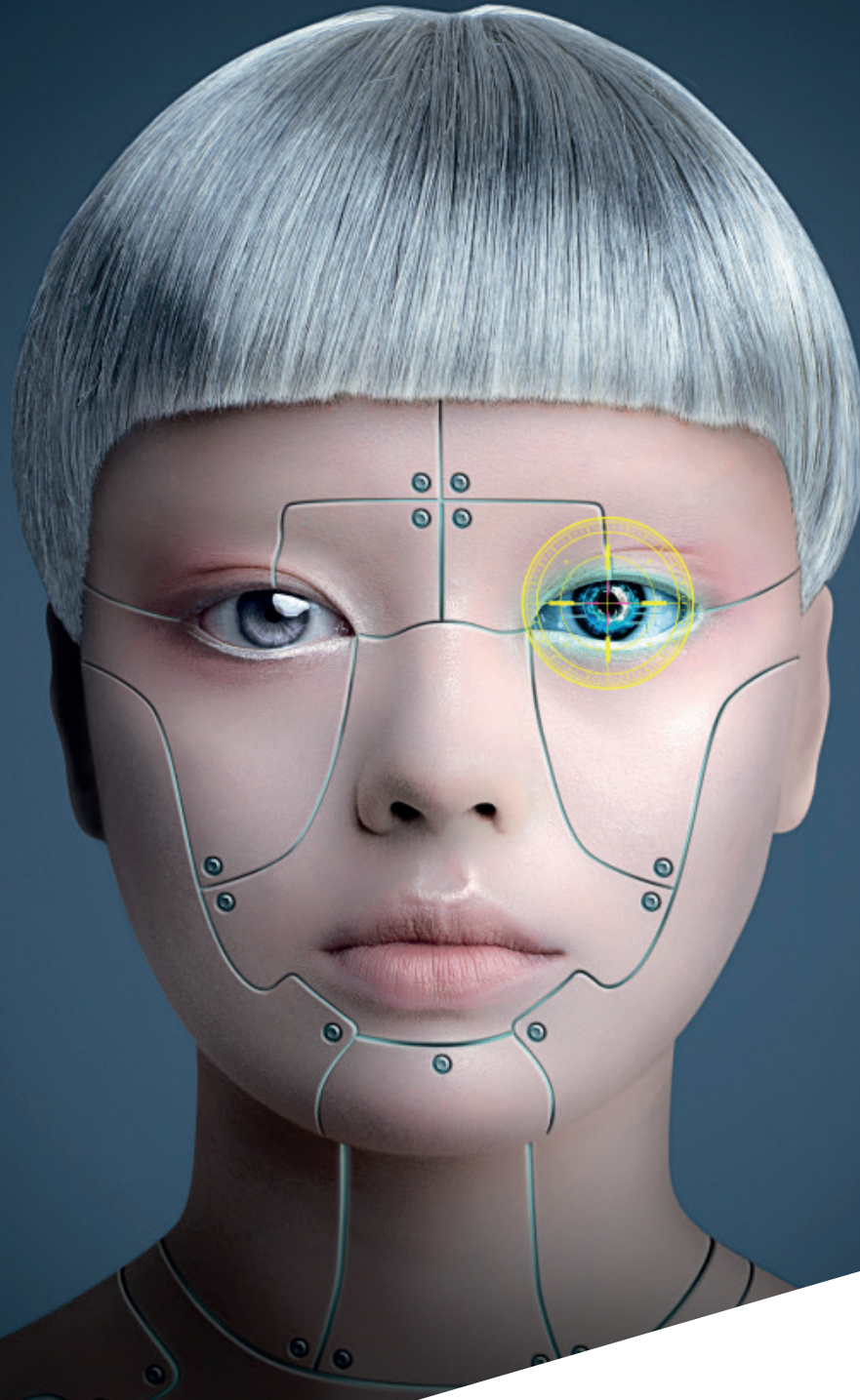


ARTSCIENCE MUSEUM™ PRESENTS

# HUMAN+

THE FUTURE OF OUR SPECIES

20 May 2017



EDUCATOR'S RESOURCE



ArtScience  
Museum  
MARINA BAY SANDS

## ABOUT

ArtScience Museum is dedicated to the exploration of the interconnection between art, science, technology and culture. We look forward to sharing the unique and fascinating world of genetic engineering, biotechnology and nanotechnology with both school groups and educators. We are sure it will be the starting point for many interesting conversations about art, science, design, technology, geography, history and ethics.

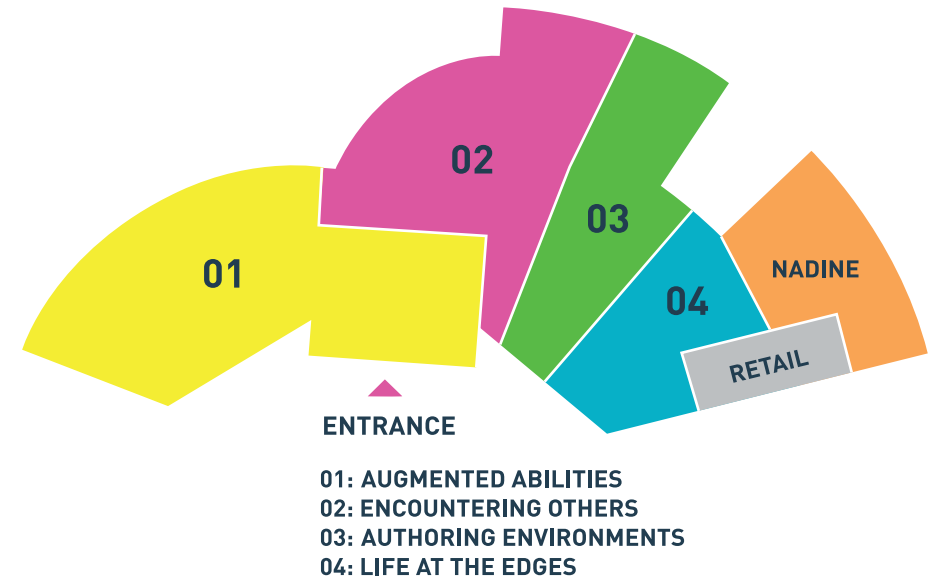
This Educator's Resource is intended to act as a guide prior and during your visit to ArtScience Museum. We hope this will help you plan your visit, and understand how a visit will fit into your teaching. Whether you choose to visit us guided by one of our trained facilitators or under your own steam with a self-guided tour, this guide will hopefully help you anticipate the main themes and concepts, should you wish to explore them with your group prior to the visit.

## EXHIBITION OVERVIEW

Our perception of what it means to be human has been transformed by science and technology. Advances in genetic engineering, biotechnology and nanotechnology that not long ago seemed purely science fiction are now real. Cyborgs, superhuman and clones are alive amongst us today. What does it mean to be human now? What will it feel like to be a human a hundred years from now? Should we continue to embrace modifications to our minds, bodies and daily lives, or are there boundaries we shouldn't overstep?

*HUMAN+* spans four themed galleries. Each explores the possible impending paths for the human race. It asks what it means to be human in a world of artificial intelligence, lifelike robots and genetic modification. The exhibition probes the social, ethical and environmental questions raised by using technology to modify ourselves. Along the way, visitors are directed to consider the evolution of our species and its future. Will virtual reality be the new reality? What would happen if a robot knew what we wanted before we knew ourselves? How might we modify ourselves to adapt to an environment that we are drastically transforming? Is longevity a noble aspiration or a terrible threat for the planet? In the future, who will have ownership of our genetic information?

## GALLERY MAP



# CURRICULUM LINKS

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## SECONDARY

Source: Ministry of Education Singapore Subject Syllabuses

### SCIENCE

- To understand the place of humanity in the natural world
- To understand the importance for man to understand and maintain the connections with living things and his environment

### SOCIAL STUDIES

- To show curiosity to learn more about the world they live in and make careful observations
- To appreciate the interdependent relationship between people and the environment

### DESIGN AND TECHNOLOGY

- Develop an awareness of design in the made-world
- Develop an appreciation of function, aesthetics and technology in design

### GEOGRAPHY

- To develop a concern for the environment and make informed judgments about human action/behaviour
- To develop an interest in, and the valuing of, the ways that the environment supports life

## INTERNATIONAL BACCALAUREATE (IB MIDDLE YEARS PROGRAMME)

Source: International Baccalaureate Website

### INDIVIDUALS & SOCIETIES (GEOGRAPHY & HISTORY)

- Develop an understanding of the interrelationships between people, places, spaces and the environment
- Appreciate the relevance of geography in analysing contemporary issues and challenges, and develop a global perspective of diversity and change

### SCIENCE

- To engage with the complexities, intricacies and beauty of science, which arouses their curiosity and heightens their learning
- To reflect on the ethical, social, economic, political, cultural and environmental implications of using science to solve specific problems and develop a personal, ethical stance on science-related issues.
- To encourage hands-on experience, inquiry, and critical thinking and to make informed and responsible decisions, not only in science but also in other areas of life.
- To appreciate the links between science and everyday life as well as the dynamic interactions between science and society.

### DESIGN

- Consider their responsibilities when making design decisions and taking action.

## JUNIOR COLLEGE CURRICULUM LINKS

Source: Ministry of Education Singapore Subject Syllabuses

### GENERAL PAPER

- Understand better the world in which they live by fostering a critical awareness of continuity and change in the human experience.
- Appreciate the interrelationship of ideas across disciplines.
- Broaden their global outlook while enabling them to remain mindful of shared historical, social and cultural experiences.

### GEOGRAPHY

- Develop an understanding of the evolution of landscapes and development of issues over time.
- Develop an understanding of different approaches to solve real-world problems and achieve sustainable development.

### SCIENCE (PHYSICS, BIOLOGY & CHEMISTRY)

- Develop their interest in science and build the knowledge, skills and attitudes necessary for further studies in related fields
- Recognise the usefulness, and limitations, of scientific method and to appreciate its applicability in other disciplines and in everyday life
- Develop in students the understanding, skills, ethics and attitudes relevant to the Practices of Science.
- Enable scientific literacy and preparedness for the challenges of the future.

# CONTENTS

Page	Works	Secondary				IB Middle Years			Junior College		
		Science	Social Studies	Design & Technology	Geography	Individuals & Societies	Science	Design	General Paper	Geography	Science
6	<i>Historical Prosthetic</i>		✓	✓		✓	✓	✓	✓		✓
7	<i>Law of Averages</i>	✓	✓	✓		✓	✓	✓	✓		✓
7	<i>Decelerator Helmet</i>	✓	✓	✓		✓	✓	✓	✓		✓
8	<i>Rewired / Remixed: Event For Dismembered Body</i>	✓		✓		✓	✓	✓	✓		✓
8	<i>Self-Hybridation Entre-deux</i>		✓			✓			✓		✓
9	<i>Seismic Arm and Sonochromatic Head</i>	✓		✓	✓	✓	✓	✓	✓		✓
10	<i>Optimization of Parenting, Part 2</i>		✓	✓		✓		✓	✓		✓
10	<i>True Love</i>	✓	✓			✓	✓		✓		✓
11	<i>A Guide to the Flora and Fauna of the World</i>	✓	✓		✓	✓	✓		✓	✓	✓
11	<i>Foragers</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
12	<i>Transfigurations</i>	✓	✓	✓		✓	✓	✓	✓		✓
12	<i>Semi-Living Worry Dolls</i>	✓	✓			✓	✓		✓		✓
13	<i>Nadine</i>	✓	✓	✓		✓	✓	✓	✓		✓

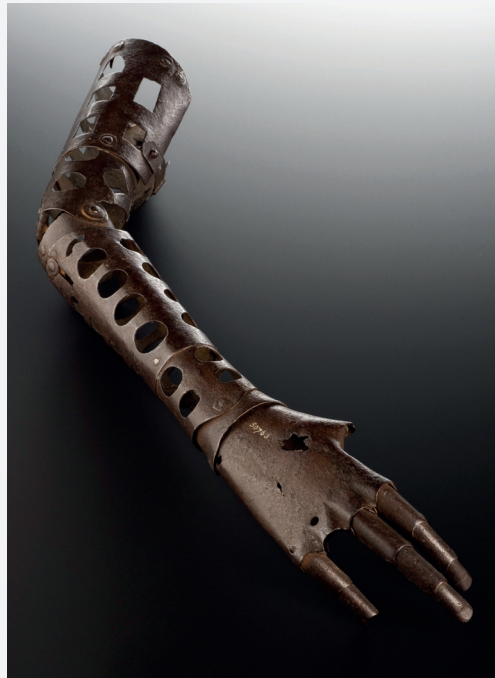
# SECTION 1: AUGMENTED ABILITIES

Humans have always developed tools to augment abilities. This chapter presents physical and biological ways in which we have augmented our minds and bodies. Over the course of time, the development of human enhancements has been motivated by either necessity or desire. From prosthetics that augment bodily functions to medical interventions that change how we think we have always been searching manners to improve ourselves. Taking into account historical and speculative examples, Augmented Abilities showcases a range of physical and biological methods for augmenting the mind and body, revealing how we are already cyborgs. Physical augmentations can offer radical and liberating effects on humanity, but can also be tools of oppression, further enforcing social norms and expectations.

## *Have A Closer Look:*

What do we mean when we speak about human enhancement? Encourage students to notice the variety of works in this section. Let them describe what they see. What is the difference with body modifications in the past compared to the present? Draw their attention to the changes that have taken place in this field since the use of prosthetics in early times. What about sensory enhancements? If permitted to enhance one of their senses, what will they choose to augment?

Remind students of the many people today who wear hearing-aids or have pace makers. Should they be considered cyborgs?



## Historical Prosthetic

Wang Zhiyuan  
Museum of Applied Arts & Sciences, Sydney

The historic prosthetic arm indicates the long history of replacing missing body parts and the craftsmanship involved. Two of the oldest prosthetic limbs that have been discovered are a 2,200-year-old wooden leg with a horse hoof foot from China, and wooden toes found on a female mummy in Egypt dating from between 950 to 710 BC. There are also a number of metal prosthetics dating from the 15th century and onwards. Only relatively recently have new developments in material science research influenced and dramatically changed the way prosthetic limbs are made and function.

This prosthetic arm demonstrates how both old and new materials were combined to create prosthetics in the early 1900s.

This is a full-length artificial arm which is operated from the shoulder by a leather cord. The upper arm is made of fiberglass lined with leather where the user's upper arm would fit. Straps made of fabric, leather and elastic with metal buckles enable the arm to be attached to the body at the shoulder. The elbow joint and forearm are metal and there are six attachments that can lock into the arm at the 'wrist'. These are a carved wooden, unjointed hand; a metal knife blade, fork, hook and ring; and a hinged, cylindrical metal clamp.



## Law of Averages

Addie Wagenknecht  
2014

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How do online image searches reinforce accepted norms? *Law of Averages* is a series of prints that are algorithmically computed. Using pixel averages from image search results, the pieces are then computed and compiled using eye tracking and RGB averages to create a "perfect average", generating a composite of the aggregated data.

The series was inspired by the observation of beauty ideals perpetuated by American beauty pageants. Struck by how similar all of the contestants looked, Wagenknecht wanted to find a way to compare them all at once, quantifying an ideal. In the resulting series, the chosen search terms – for example, "Miss America 2013", and "Selfie" – point to a range of social, political, personal and gender norms. The resulting prints appear as ghosts of these accepted norms.



## Decelerator Helmet

Lorenz Potthast  
2014

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*Decelerator Helmet* offers the wearer a perception of the world in slow motion. Decoupling personal perception from natural timing enables users to become aware of their own relationship with time.

A small computer processes the signals from an externally-mounted video camera and microphone, showing slowed-down images of the external environment on a head-mounted display inside the helmet, and on a monitor on the exterior of the helmet.

The time lapse can be set to three different modes by a remote control.

In "Auto Mode", time is slowed down automatically and re-accelerated after a defined interval. "Press Mode" allows the wearer to choose a specific deceleration of time, and in "Scroll Mode" the wearer can effectively scroll through time, completely controlling the speed of the visual inputs.

A physical bubble, the helmet offers a space for reflection. A place where the wearer can think about the flow of time and the relationship between sensory perception, environments and corporality, in our increasingly fast moving society. Imagine a shift to "personalized perception" – could it eventually lead to a detachment from a universal perception of time?



## Rewired / Remixed : Event For Dismembered Body

2016  
Stelarc

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Over the course of his career, Stelarc has carried out multiple performances where his body has been involuntarily controlled by networked systems. His most recent internet enabled performance explored the physiological and aesthetic experience of a fragmented, de-synchronised, distracted and involuntary body – wired and under surveillance.

For five days, six hours a day, wearing a video headset and sound cancelling earphones, the artist could only see with the “eyes” of someone in London, whilst only hearing with the “ears” of someone in New York. The body was also augmented by a 7 degree-of-freedom exoskeleton enabling anyone anywhere to program involuntary movement of his right arm, using an online interface. In the gallery space itself, the choreography could be generated via a large touch-screen. The artist’s vision was disconnected from his hearing whilst his arm was disconnected from his body.



## Self-Hybridation Entre-deux

1994  
ORLAN

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Internationally acclaimed artist ORLAN created artworks as manifestos often referencing masterpieces of art history. In her series Self Hybridation ORLAN overlays her own image with Botticelli’s famous masterpiece the Birth of Venus in an attempt to draw attention to the relativism and subjectivity of our aesthetic canon. The artist melds and hybridises her own image with that of Venus, the goddess of beauty, simultaneously presenting conventional beauty with the less conventional, the classic and the modern, mythological and the tangible to challenge our limited views of the canon of beauty. Creating a hybrid of juxtapositions ORLAN creates a complex narrative, simultaneously subscribing to and undermining conventional western standards of beauty. The viewer is forced to confront the limitations of the western aesthetic canon, and open their mind to the other as they are faced by beauty in an un-idealised state. Her artwork is an interrogation on the status of the body, the aesthetic canons imposed on women through time and cultures, and their related pressures.

ORLAN is famously known for her work around “carnal art”: self-portraits in the classical form yet using means of modern technology. She uses her own body as an artistic canvas, defiguring while at the same time reconfiguring it through body surgeries, performances, photography or numeric technology.





## Seismic Arm and Sonochromatic Head

Cyborg Arts, Neil Harbisson and Moon Ribas  
1994

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The Cyborg Foundation was co-founded by Neil Harbisson and Moon Ribas as an international organisation that aims to help humans become cyborgs, defend cyborg rights and promote cyborgism as a social and artistic movement.

These artists no longer use technology as a tool for creation: it constitutes part of their body as an extension of their capacities for sensation and perception.

The two life-size cybernetic sculptures imitate classical sculptures in appearance, but contain sensors that allow the sculpture to connect to certain data in real time and to the body and mind of the artists.

By touching the *Seismic Arm*, visitors can feel how Moon Ribas experiences earthquakes in real-time. Visitors can communicate with Neil Harbisson by showing different colours to the sensor in the *Sonomatic Head*, which is directly linked to the antenna in his head.

## SECTION 2: ENCOUNTERING OTHERS

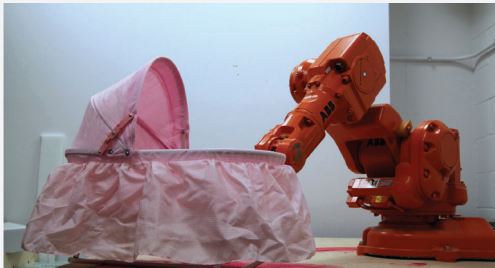
The second part of the exhibition explores the changing nature of social relationships, due to advances in technology.

Emerging technologies are changing the ways we encounter others: family, friends, co-workers and even pets. Are the personalities we interact with on our devices living, artificial, or some combination of the two? While some humans yearn for a future of robotic companions that can predict and respond to their every desire, others fear to get run over by a self-driving car or accidentally killed by an unmanned aerial vehicle. Social technologies can be creative, expressive and facilitate our connection to others, but they can also replicate and even strengthen the violence and inequalities in our society.

### Have A Closer Look:

Ask students to observe the technological developments in this gallery. How significant or beneficial would robotics and artificial intelligence be in our lives? Will they be comfortable with robot acquaintances living amongst them? Do new technologies appear to be a double edged sword, extending certain powers while eroding some skills in our lifestyles?

What about Artificial Intelligence? Discuss with students if there are any major advancements in the field of AI, and if the human race will eventually become obsolete because of it.

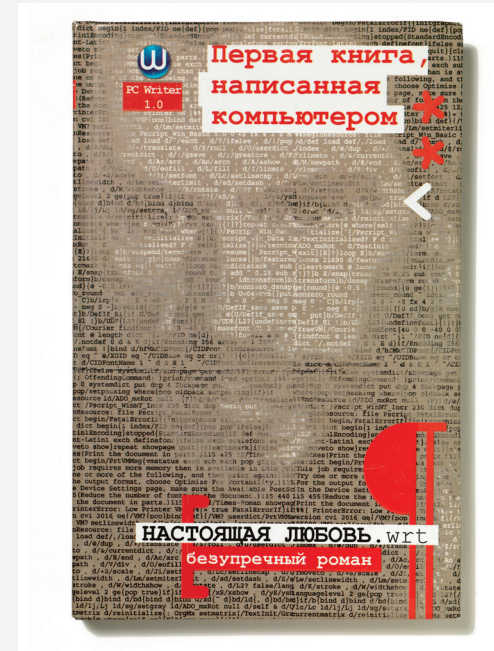


### Optimization of Parenting, Part 2

Addie Wagenknecht  
2014

*Optimization of Parenting, Part 2* is a robot arm that gently rocks a bassinet whenever the baby inside cries or awakes from sleep. As an artist and a mother, Addie Wagenknecht developed this artwork imagining ways to balance her creative practice with motherhood. Mothers are socially expected to be full-time parents. This is sometimes due to a lack of options, the cost of childcare or a lack of family support. As a result, female artists who become mothers often lose the creative practice they have spent an entire life building.

Can some automatic repetitive tasks be transferred to robotic devices without affecting the development of the baby? There have been many technologies that have claimed to make domestic work easier, from vacuum cleaners to refrigerators, but the role of the mother is still considered sacred. Suggesting that a robot take over some of the parental tasks is a provocative gesture that highlights the difficulties of mothers who are always struggling to find a life/work balance.



### True Love

Alexander Prokopovich  
2008

In 2008, headlines were made when Russian publishing house Astrel SPb claimed they were releasing a book written by a computer. The book is called *True Love* and is a variation of the classic novel *Anna Karenina* written in the style of Haruki Murakami. The publisher states that a group of developers and philologists collaborated to create a computer program that generated the manuscript. Once compiled, the text went through editorial corrections like any other novel. The book has not yet been lauded by critics as a literary masterpiece, and the nature of its conception has been called into question.

However, the project points to the changes we might expect to see in the cultural landscape. Can a computer ever know, or accurately represent through language an expression of "True Love"? The implications of cultural artefacts being authored by artificial intelligence (AI) are wide-ranging, and shake up some fundamental questions about how we define ourselves as humans. Great advances in the field of AI are currently underway.

## SECTION 3: AUTHOURING ENVIRONMENTS

When imagining the future of our species, we must consider the context in which we live. Humans cannot exist in isolation, but are reliant on complex and disordered ecosystems that support Life on Earth.

This segment showcases how we have always manipulated environments and organisms, for better or for worse, to satisfy our needs and desires. The scope of these interventions is now planetary in scale, defined as the Anthropocene: a measurable geological era caused by human activity. The future of human species relies on maintaining the complex environments, natural and built, that enable human life on our planet. We are authors of our environment, whether we want to acknowledge it or not. So how should we author the environments we inhabit more thoughtfully using far-reaching advances in science and technology?



### A Guide to the Flora and Fauna of the World

Robert Zhao  
2013

*A Guide to the Flora and Fauna of the World* by Singapore based artist, Robert Zhao Renhui, seeks to document and reflect on the myriad ways in which human action and intervention are slowly altering the natural world. The guide presents a catalogue of curious creatures and life-forms that have evolved in often unexpected ways to cope with the stresses and pressures of a changed world. Other organisms documented in the series are the results of human intervention, mutations engineered to serve various interests and purposes ranging from scientific research to the desire for ornamentation.

### Have A Closer Look:

Ask students to pay close attention to the various artefacts in this section. How have we developed technologies to improve human livelihoods? With the projected increase of human population to 9.6 billion in 2050, will there be sufficient resources to go around? Is it a necessity to develop even more advanced technologies to aid the human species to adapt to the changes? What are their thoughts on genetically modified food and organisms? Do they think it is ethically justifiable to produce genetically modified foods to meet the growing demand of humans? Prompt students to propose an idea of a genetically modified organism which could help humans in some way or another. Encourage students to choose any one artwork and examine what possible environmental conditions may influence the future of our species. Have we infringed on the rights and fragility of other species in our quest?

Discuss with students if there is an urgent need to change our lifestyles and adapt to nature rather than the other way around.



### Foragers

Anthony Dunne & Fiona Raby  
2009

The world is running out of food – we need to produce 70% more food in the next 40 years according to the UN. Yet we continue to overpopulate the planet, use up resources and ignore all the warning signs. It is completely unsustainable. So far we have not really embraced the power to modify ourselves.

What if we could extract nutritional value from non-human foods using a combination of synthetic biology and new digestive devices inspired by the digestive systems of other mammals, birds, fish, and insects?

Through speculative objects and images, *Foragers* imagines a group of people who take their fate into their own hands and start building DIY devices. They use synthetic biology to create “microbial stomach bacteria”, along with electronic and mechanical devices, to maximise the nutritional value of the urban environment, making up for any shortcomings in the commercially available but increasingly limited diet. These people are the new urban foragers. *Foragers* builds on existing cultures currently working on the edges of society, who may initially appear extreme and specialist – guerrilla gardeners, garage biologists, freegan gleaners, etc. By adapting and expanding these strategies, they become models for speculating on what might happen in the future.

## SECTION 4: LIFE AT THE EDGES

This final part of the exhibition will explore the limits of human life and longevity and focus on changing definitions, highlighting our endless fascination with birth, death and immortality.

The start and end points of human life on Earth are well known, but with the help of new technologies and changing cultures, the edges of life are becoming more blurred. What does it mean to create life, or extend a person's lifespan?

Assisted reproductive technologies are redefining fertility, pregnancy and childbirth, raising challenging ethical, social and technological questions whereas the human life span is also a shifting threshold, thanks to biomedical advances and life-support machines. Through our technological devices, we will even remain visible online, comforting or haunting our friends and family long after our passing. Radically extended lifetimes and demographic changes are forcing a reconsideration of the social norms and rituals that emerged when life was short and families large.



### Transfigurations

Agatha Haines  
2013

Agatha Haines studied Design Interactions at the Royal College of Art in London, and focuses on the design of the human body. Her project, *Transfigurations*, consists of sculptures representing five babies, each with a surgically implemented body modification. Each modification is designed to solve a potential future problem for the baby, ranging from medical or environmental issues to social mobility issues. How far might parents go to give their child an advantage? What circumstances justify modifying a child's body?

### Have A Closer Look:

Ask students to examine what is showcased in this section. Will science ultimately take over the reproduction of the human species? Are there any boundaries for parents if they want to augment their child so it has an added advantage over its peers? Longevity is prized by most humans. Is living to 150 years old more important than having a quality and fulfilling life? Will longevity be a wonderful aspiration or a dire prospect for the world? What will happen to our society if everyone chooses to live to 150 years old?

Discuss with students on how acceptable these technologies and possibilities are to them. Who should be the decision makers in regards to any type of intervention be it for life or death?



### Semi-Living Worry Dolls

Tissue Culture and Art Project  
(Oron Catts and Ionat Zurr)  
2000

The *Semi-Living Worry Dolls* were the first tissue engineered sculptures to be presented alive in a gallery in 2000.

Inspired by the Guatemalan worry dolls given to children to whisper their worries and concerns to, the *Semi-Living Worry Dolls* were handcrafted out of degradable polymers and surgical sutures. The dolls were then seeded with living cells that gradually replace the polymers.

Neither alive, nor dead the *Semi-Living Worry Dolls* challenge our concept of life, consisting of animal cells sustained by a life-support machine.

The Tissue Culture and Art Project was set up by artists Oron Catts and Ionat Zurr, working within a lab environment to explore questions arising from the use of living tissues to create/grow "semi-living objects".

## SECTION: NADINE

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*Nadine* is a cutting edge example of current research into assistive technologies that are being developed for people with special needs. She can be a companion who assists people who need extra support. She can read stories, show images, begin Skype sessions, send emails, and communicate with a user's family.

The Institute for Media Innovation (IMI) is a world-class research institute in Interactive New Media, an incubator of cutting-edge and interdisciplinary new media-related research. The institute provides opportunities for researchers and experts to collaborate on a wide array of multidisciplinary research projects. IMI was launched in 2008 by Professor Bertil Andersson, President of NTU.



### ***Have A Closer Look:***

Let students interact with the humanoid. This will be a time to observe reactions and listen for comments when they are engaged with a non-human. How do they feel when they are interacting with the humanoid? In the near future when humanoids become sufficiently intelligent, should humanoids be granted basic human rights? What happens if humanoids are inappropriately used? Is there a need to have regulations for humanoid development?

### **Nadine**

Nadia Magnenat Thalmann,  
Director of Institute for Media Innovation (IMI)  
at Nanyang Technological University (NTU),  
Singapore

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With a realistic human appearance, apparently natural skin and hair, and highly realistic hands, *Nadine* looks incredibly lifelike. She is also a socially intelligent robot who is friendly, greets people she meets, makes eye contact, and remembers all the nice chats she has had with people. This humanoid is able to answer questions in several languages, including English, French and German, and engage in flowing conversation and can also show emotions both in her gestures and in her face. She is fitted with a personality. This means her mood can sour depending on what is said to her.

*Nadine* has a total of 27 degrees of freedom for facial expressions and upper body movements, and can recognise anybody she has met, and remembers facts and events related to each person.

# ACTIVITIES

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## **Guided Tour: 45 Mins**

Guided by our trained facilitators, students can enjoy a tour of the exhibition which, through questioning, sharing and discussion, aims to introduce our place in a world with increased questions around evolution and extinction, and the real meaning of being human today. This is a current issue, and of profound interest for many. Students will also be engaged to focus on the views on life and ethics in an age of rapid technological advancements and scientific feats. With the progresses of the many disciplines, they will be encouraged to reconsider the development of genetic engineering, artificial intelligence, etc. In conclusion, students will be invited to consider the shape and form of modern civilisation, and how it provides new perspectives on a wide range of speculative possibilities, allowing each one of us to imagine and consider many potential paths for the future of our species. A printed resource will be provided for all students, which include engaging activities that present the intersection of art and science in our aim to understand the universe.