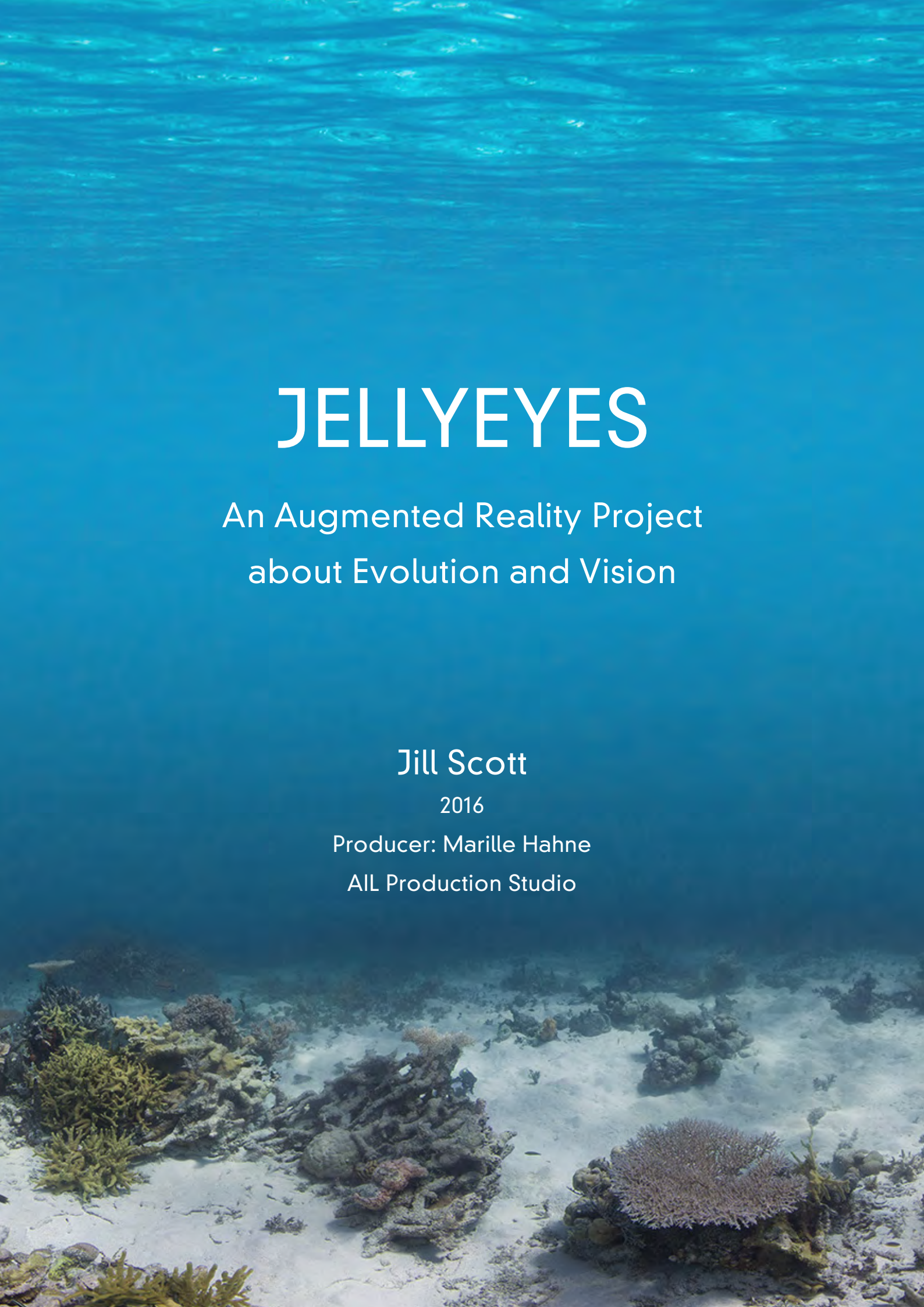


JELLYEYES

An Augmented Reality Project about Evolution and Vision

Jill Scott

2016

Producer: Marille Hahne

AIL Production Studio

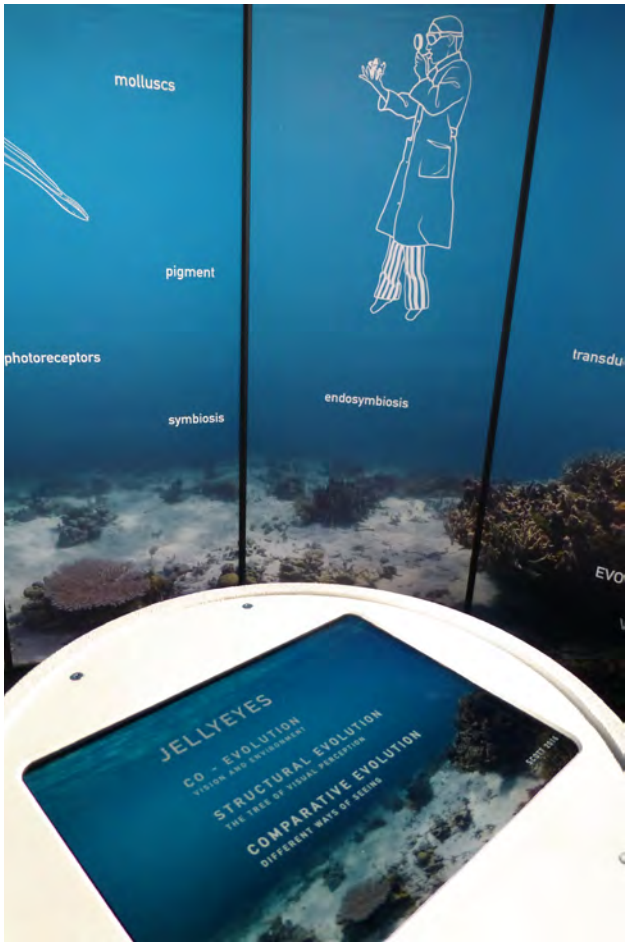


FIG. 1 & FIG. 2
The installation of JELLYEYES with the setup, main menu and viewer interaction. Creative Industries Precinct. QUT Brisbane, JELLYEYES 2016 Scott.

FIG. 3
The viewers can select 3 menues and uses a tethered ipad embedded in an interface that looks like an optic nerve and disc to navigate over the photograph.
JELLYEYES 2016 Scott.

JELLYEYES: EVOLUTION AND VISION

WE ARE MUCH CLOSER TO SEA ANIMALS THAN WE IMAGINE! JELLYEYES IS A COMBINATION OF INTERACTIVE ART, ECOLOGY AND NEUROSCIENCE. IT GIVES VIEWERS A NEW EXPERIENCE ABOUT THE EVOLUTION OF OUR OWN EYES AND OUR RELATIONSHIP TO THE ENVIRONMENT OF TWO UNDERWATER CREATURES: THE AUSTRALIAN BOX JELLYFISH AND THE SQUID (CALAMARI).

The main aim of JELLYEYES is to allow for immersive interactions with three concepts of evolution: co-evolution, structural evolution and comparitive evolution

In JELLYEYES, the viewer stands inside a semi-circular photograph of the Barrier Reef holding a tethered iPad whose camera can be used to see this underwater world in real time. By pointing the iPad to different parts of the photo wall, the viewer can connect words, images, films and sounds to reflect upon the evolution of vision and how it is related to symbiosis, movement, survival and the environment. JELLYEYES allows viewers to witness current symbiotic changes in this environment due to the warming of the oceans.

Also, the human eye can be compared to the way that the Australian Box Jellyfish and the squid see the world. This comparison is highlighted by the humorous interactions of two other characters swimming in the same sea: the unaware tourist (or hunter) and the evolutionary biologist (or collector).

AUGMENTED REALITY

The format is an augmented reality installation because this technology fits so well to communication with virtual vision. Under co-evolution, the viewer can "augment" the reality of the conditions for healthy co-habitation in the Barrier Reef environment, as well as discover symbiotic developments and essential ecological relationships. In structural evolution they can trace the evolution of the eyes of different species. In comparative evolution, they can "see through" the eyes of the other two species.

These interactions can raise viewers' awareness about life and evolution but also about our role as humans in the future of existence.

Jellyeyes gives homage to the biologist Lynn Margulis (1938-2011), whose theory on "endosymbiosis" is now considered to be a seminal contribution to evolutionary biology.

SCIENTIFIC COLLABORATORS

Vision and evolution of the camera based eye: Prof. Dr. Stephan Neuhauss, Institute for Molecular and Cellular Research, Neurobiology, University of Zurich, Switzerland.

Water Quality: Christopher Robertson. Aquatic Research EAWAG. ETHZ Switzerland.

Interactions: The Australian Box Jellyfish: Dr. Lisa-Ann Girshwin, Australian Marine Stinger Advisory Services, Australia.

PRODUCTION CREDITS

AIL Production Studio am Wasser, Zürich
Dr. Jill Scott (Concept)
Marille Hahne (Production)
Natascha Jankovski (Animation)
Nikolaus Völzow (Programmer)

SUPPORT

Pro Helvetia, the Swiss Arts Council
University of Television and Film (HFF) Munich, Germany

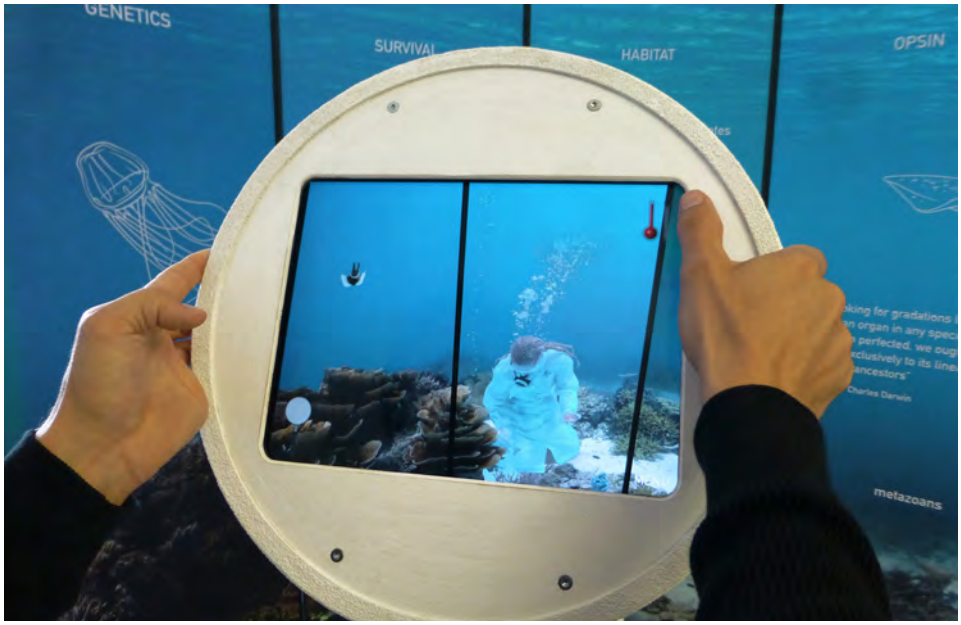


FIG. 4
Co-Evolution:
A marine biologist collects symbiotic specimens from coral under the water. When the viewer clicks on the temperature icon - the water warms and the symbiont bacteria are affected by the lack of disolved oxygen. The coral, algae, squid and jellyfish are also affected..

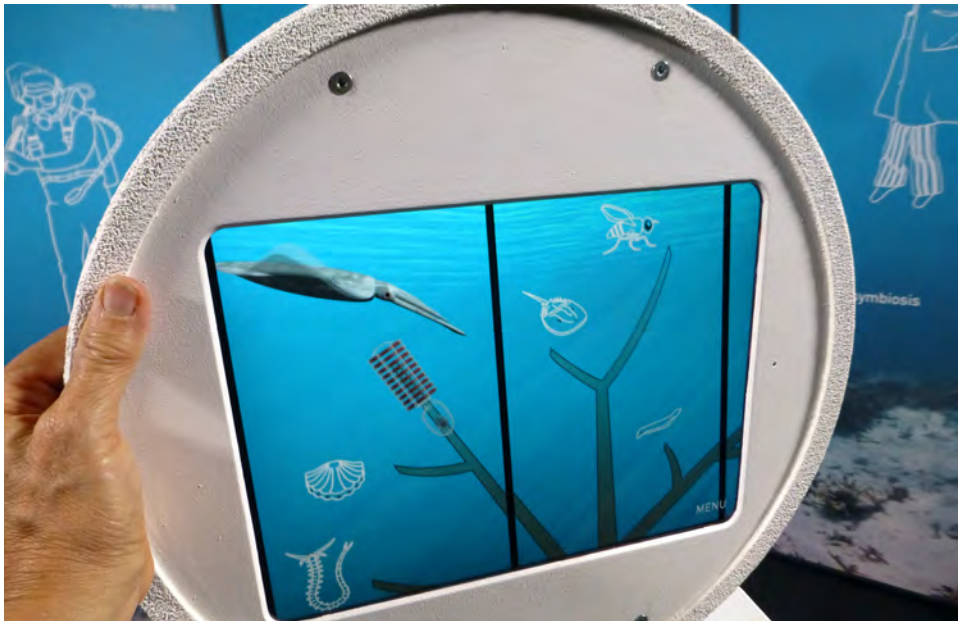


FIG. 5
Structural Evolution:
The viewer can trace the eyes of different species on an evolution-tree. Evolutionists debate about the structural development of cilia in the photoreceptors. Also, in all these years of evolution, why have only two types of eyes evolved: the camera based eye and the compound eye?

FIG. 6
Comparative Evolution:
The viewer can choose an eye and then "see through" this eye. Choices are visions through a jellyfish eye, a squid eye or a human eye. Then they see films about the predator-prey relationship of these species in such an environment.

SYMBIOSIS AND EVOLUTION

Bacteria are the agents of change
- Lynn Margulis

Lynn Margulis was an evolutionary biologist who claimed that symbiotic interactive behaviour was a primary cause of great changes in biological evolution. She posited that a major organizational event in the history of life probably involved the merging of two or more cell lines through symbiosis.

CO-EVOLUTION

In Jellyeyes, the scientist explores Margulis' concept of endosymbiosis: the phenomenon that eukaryotic cells were once invaded by protobacteria and cyanobacteria. These eventually evolved to become the essential powerhouse components of any cell: the chloroplasts and mitochondria. However, when viewers trigger the icon for warmer water, they discover how symbionts who live in barrier reef environments are essential for the survival of coral, algae, squid and jellyfish. Our own interventions are certianly affecting these interdependencies.

STRUCTURAL EVOLUTION

This second part of Jellyeyes was inspired by ideas about the evolution of the cilia in the photoreceptors of the retina. Margulis posited that the formation of these light-transductive cilia might also be attributed to the infiltration of spiral (spirochete) bacteria. Although this concept has since been disproven, here the viewer can discover these similarities and differences. New ways of seeing are also shown by the interaction of the actors (the hunter and the collector)

COMPARATIVE EVOLUTION

Margulis wrote a seminal book with Dorion Sagan entitled: *What Is Life?.* Here they state *that life is free to act and has played an unexpectedly large part in its own evolution*. In Jelleyes, the viewer can choose to "see through" the eyes of two other species, the squid and the jellyfish. In this way evolution and its relation to vision and to predator-prey-realtionships can be explored.

BACKGROUND INFORMATION

We were once otherwise and we still might become other - Donna Harraway

The aim of Jellyeyes is to combine specific didactic scientific visualizations with more poetic visual metaphores for the public. We believe that interactive media can "touch" science and trigger associative thought about the state of this environment in a more universal way: one that situates evolution in relation to climate change. This synthesis of ecology and neuroscience is "post reflective" and enhanced by the viewers own embodied experience of interaction.

In Jellyeyes we want the viewer to ask: *What might happen to our own eyes and these species in the future?* In the past, the evolution of the human eye, the eye of the squid and the eyes of the Australian Box Jellyfish have been linked. Their structural evolutions are related but the outcomes are quite different. Evolutionary change often follows a common pathway in two or more distantly related organisms because of similar environmental pressures. When this type of parallel evolution takes place, organs like the eye can be morphologically alike in overall appearance even though the species are very different from each other (convergent evolution).

For example, photoreceptors are similar nerve cells but their locations are different: they are found behind the retina at the back of the eye in humans, in the front of the retina in squid, and in basic ciliary pigment cells in the jellyfish eye. In all cases they are responsible for vision and light transduction and the definition of objects, but in our eyes they additionally help us to see in color. What we share with the box jellyfish and the squid is the formation of photosensitive visual pigment inherited from our common ancestors. In Jellyeyes, one can discover these differences and similarities in this environment. Jellyeyes also tries to raise awareness about how this environment is currently changing from the effects of our own carbon footprints. Could this influence the evolution of the eye itself?

FIG. 7
The two underwater research activities of the evolutionary marine biologist (played by Daniela Rodler).
Left: She re-proves the theory of endosymbiosis.
Right: She collects the corals symbiotic bacteria for analysis.
Credit: Jellyeyes 2016 Scott.

FIG. 8
Two interactions with the tourist (played by Jill Scott).
Left: The tourist is stung by the Australian Box Jellyfish.
Right: The tourist steals the specimen from the evolutionary biologist and is taught a lesson (played by Daniela Rodler).
Credit: Jellyeyes 2016 Scott.

FIG. 9
The eye of the Australian Box Jellyfish: a Cnidarian. This creature has no brain but 24 eyes that are networked togehter with axons to their poisonous tentacles. Each eye set has 4 clusters that see cones of light with different percentages which all make up one coherent parabolic vision.

FIG. 10
The eye of the squid. Squids are Molluscs. They have giant eyes similar to humans, but they have an everted retina. In contrast to humans they do not have a blind spot. Squid survive by the reflective help from flurescent bacteria: the Vibrio Fischeri, which can die from the lack of disolved oxygen in the water.

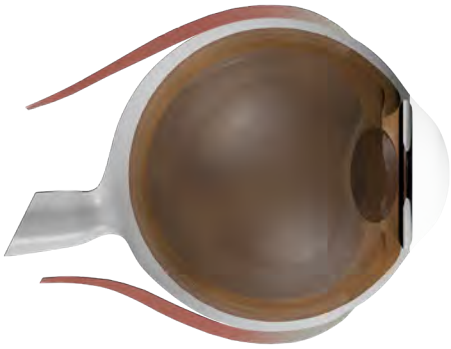


FIG. 11
The eye of the human and the iris and lens from the front. Humans are vertebrates. They have two forward looking eyes with corneas and lenses that focus light. Their retinas are direct extensions of their brains. The retina and the brain are connected via the optic nerve.

FIG. 12
Photoreceptor/Transduction
1. (Left) Jellyfish: (sunlight) pigment cells receptors are attached to each other and to stingers by fibrous tissues.
2. (Middle) Squid: (low light) receptors attached to a distributed brain.
3. (Right) Human: (low/high light) receptors are formed from neural tissues and directly attached to the brain.

EXHIBITION HISTORY AND INFORMATION

Jellyeyes: Evolution and Vision has already been shown at the following venues:

2016 | Femel_Fissions. The Block, Queensland University of Technology Brisbane, Australia.

A 6 week-exhibition that was also part of National Science Week.

2016 | The Long Night of Science in Berlin and Potsdam. Technical Information Centre of the German Patent and Trade Mark Office (DPMA-TIZ), Berlin Germany.

TECHNIQUE

Jellyeyes is a plug and play platform with little maintenance apart from the re-charging of the iPads batteries at night and someone to oversee the project. The iPad is tethered to the plinth via a strong cable and no damage or theft can occur to it. Another iPad is available as a spare unit. Headphones amplify the sound tracks of the underwater scenes. The programmer and the team members are on call through-out the exhibition should any problems arise.

ALL COMPONENTS SUPPLIED BY AIL PRODUCTIONS (JILL SCOTT)

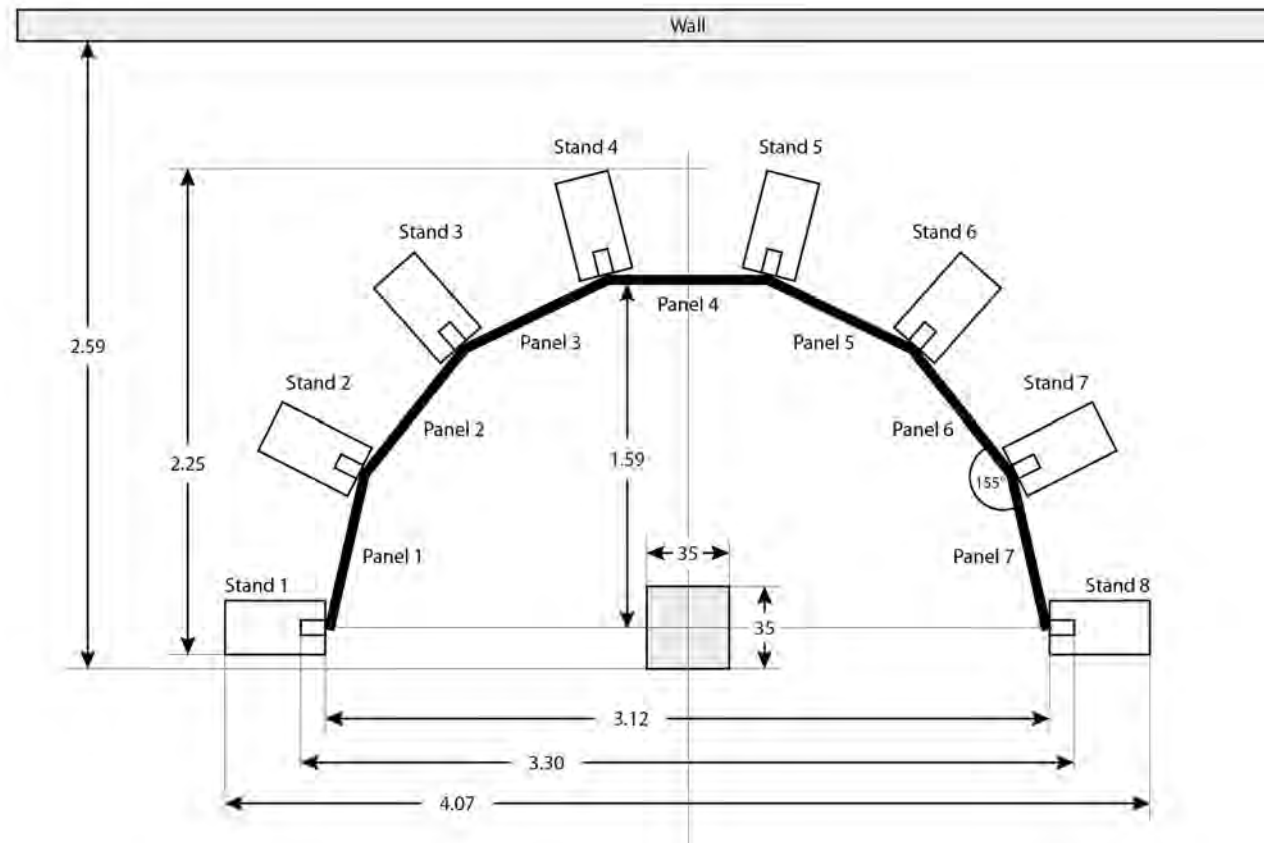
- 2 iPads (Retina Versions)
- 7 framed photos, each 210cmx70 cm
- 7 metal stands, ea. 2.30cm (h) 6cm (w)
- 1 interface cover for the iPad (Plastic coated)
- 1 plinth 35cmx35cmx90cm high with hole
- 1 extension power cable
- 2 lights with stands

SIZE OF SPACE AND PLAN

Jellyeyes needs a space of:
450cm x 450cm square with
a ceiling height of at least 250cm.

SETUP

- 2 days setup by AIL Production members
- 2 assistants from the venue (2 Days)



ABOUT THE MAKERS

Director: Jill Scott is lecturer, writer, professor and context provider with years of experience in the unique field of Art and Science research. She is professor emerita at the Institute for Cultural Studies in the Arts, at the Zurich University of the Arts (ZhdK) in Zürich She founded the Artists-in-Labs Program in 2000. Currently, she co-directs the LASER Salon in Zurich for Leonardo Society USA. She was the Vice Director of the Z-Node program, Planetary Collegium at the University of Plymouth, UK (2000 to 2016). Her own artwork spans 38 years of production about the human body, behaviour and body politics. In the last 10 years, she has focused on media art experiments about neuroscience, ecology and sensory perception resulting in a series called Neuromedia.

http://www.jillscott.org

http://www.laserzurich.com

http://www.artistsinlabs.ch

PASTWORK: NEUROMEDIA

For an overview of the selection of art and science artworks from Scott see the related publication: "Neuromedia - Art and Science Research", Eds. J. Scott and E. Stoeckli (Springer Press). (2013)

Producer: Marille Hahne has been a documentary filmmaker since 1983. She is professor emerita in the Film and Theater Department at the Zurich Academy of the Arts, Switzerland. Through the medium of film, she examines art and science (see The Swiss Artists-in-Labs project http://artistsinlabs.ch/). She also taught at the HFF filmschool in Munich, the University of Applied Arts in Dortmund and the German Goethe Institute in Bangladesh, India, New Zealand and Australia and as well at the National University in Singapore. She was head of international exchange projects (Building Bridges with 3 European and 2 US theatre and film schools). She founded and chaired the ZHdK's Degree for the Master of Arts in Film.

http://www.marillehahne.com

http://vimeo.com/user15871999 (Neuromedia)

Animator and Illustrator: Natascha Jankovski has a Master and Bachelor of Arts in Design with a specialization in Scientific Illustration from the Zurich University of the Arts. Natascha specializes in 2D and 3D sketching, modelling and animation design.

http://nataschajankovski.com

Programmer: Nikolaus Völzow is a programmer with a degree in Computer Science from the University of Karlsruhe, Germany. He has worked for many years at the Center of Art and Media (ZKM) in Germany with many different artist and media groups, and has programmed a number of *Neuromedia* interactive works for Jill Scott, including *eskin*, *Somabook*, *The Electric Retina*, *Auralroots* and *Dermaland.* His research focus is on software, hardware, electronics and programming for interactive displays, installations and real-time performance.

http://voelzow.de/nv/Projekte

PROGRAMMING

In all three menues of Jellyeyes, the viewer uses AR to relate the position of the tethered iPad or another iPhone device to the photowall. The viewer has to point at the light areas of the photograph to trigger the underwater films. AR also uses a magnifying glass icon as a button to overlay essential scientific information.

>Co-Evolution uses AR to show how marine biologists conduct experiments and what happens when ocean warming is activated.

>Structural Evolution uses AR and an interactive tree to help the viewers explore evolutionary pathways about vision and compare the evolution of the photoreceptors.

>Comparative Evolution uses AR to display various simulated views on top of the "real" photograph.

The above applications are developed in Objective-C for iOS devices for the installation version. The program is also submitted to the Apple AppStore. This can allow visitors to install the app. on their own devices and use it in the installation as well as at home. For this purpose, users can also download the color Barrier Reef photograph of Jellyeyes from Scott's website.

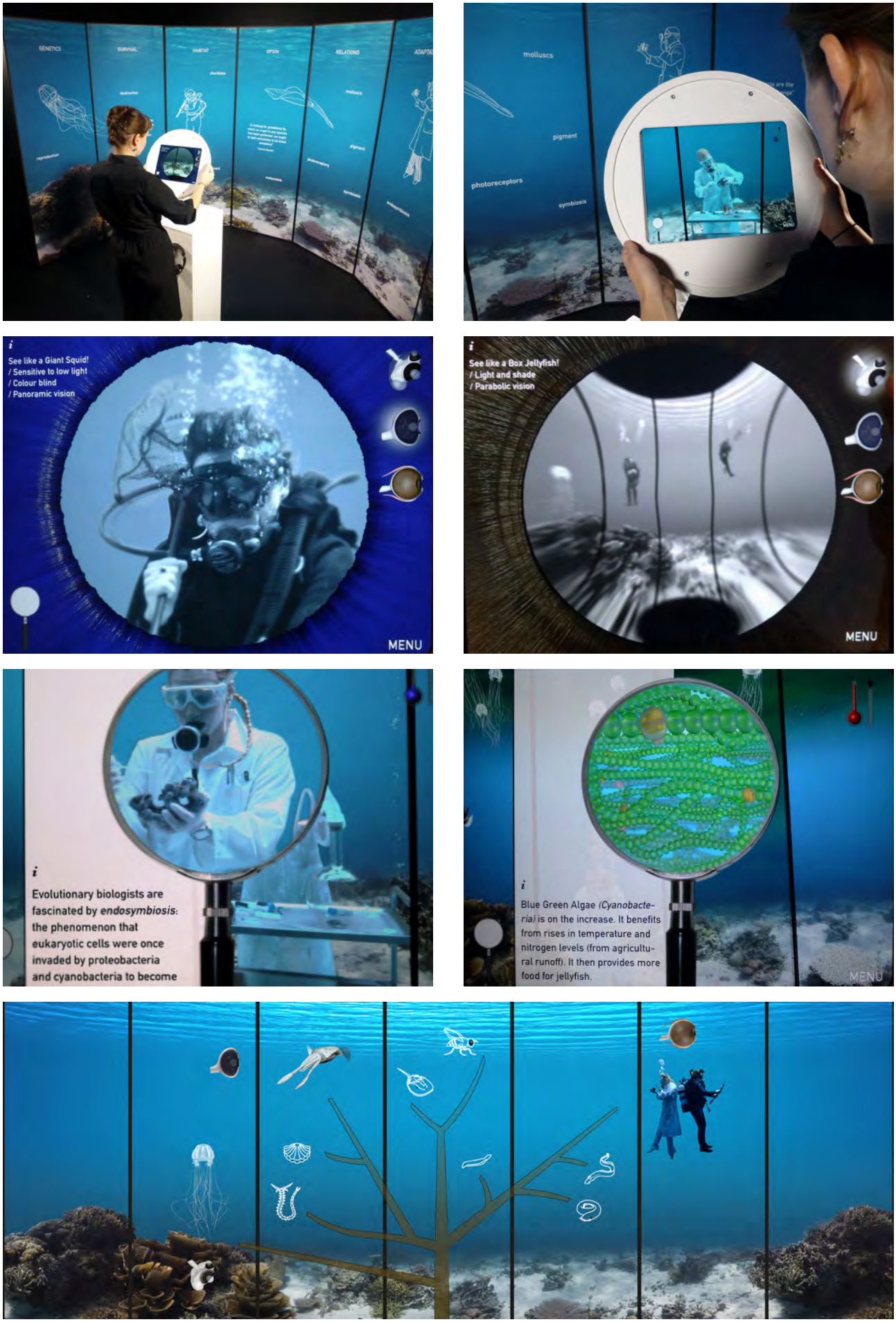


FIG. 13-19 Photos from the exhibition of Jellyeyes. Femel_Fissions, QUT, Brisbane, Australia. 2016. Scott.

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swiss arts council
prohelvetia

In looking for gradations by which an organ in any species has been perfected, we ought to look exclusively to its lineal ancestors

CHARLES DARWIN

Bacteria are the agents of change

LYNN MARGULIS

Life creates the conditions for its own existence

JAMES LOVELOCK