

NeuroMedia

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In this paper I make a number of claims which (given time) might help to situate media art inside the subject of neuroscience. The influences for these claims are derived from my own residency inside the Neurobiology Lab at the University of Zurich¹ combined with a long-term interest in designing electronic sensory interfaces for users. Firstly, from this experience I claim that there is a real need for artists to gain a deeper understanding about scientific research inside neuroscience labs, and that this can easily be made by engaging in an experiential immersive “hands on” experiments alongside the researchers themselves. Secondly, attempting to understand the complexity behind the perceptive neuromorphology of all our sensory systems is not only inspiring but learning about it might be necessary for the future of en-active knowledge. Thirdly, the experience to engage in pertinent debates about the relation between the basic research conducted in the laboratory and humanitarian medical applications is very revealing and finally, the construction of novel metaphorical media art interpretations that can attempt to raise public awareness about sensory problems is an extremely challenging role. I call the results, the process and the future potentials of such a daring journey: *Neuromedia*.

Neuromedia promotes a trans-disciplinary venture with a number of aims. Some of these might be to generate a higher level of aesthetic and representational discourse within the scientific community itself, to open up the relations between *artists*, *clinical analyzers* and *basic researchers* in neurobiology and to create a transitional catalyst between the methodologies of science and the general public based on more scientifically robust knowledge. In relation to media art, *Neuromedia* may also have the added task of developing more responsive HCI interfaces which incorporate a clearer understanding of neural behaviour or contribute to more creative sensory technologies for the disabled or visually impaired. However, *Neuromedia* should not be seen as art therapy nor scientific education. Instead it should become a poetic hybrid of artistic interpretation and scientific research; a grey zone, which actually alludes to the essential components of neural behaviour

of translation, contraction, adhesion, expansion and retraction embodied in the emetic analysis of vertebrate neural system development and function. In other words it should be about human response!

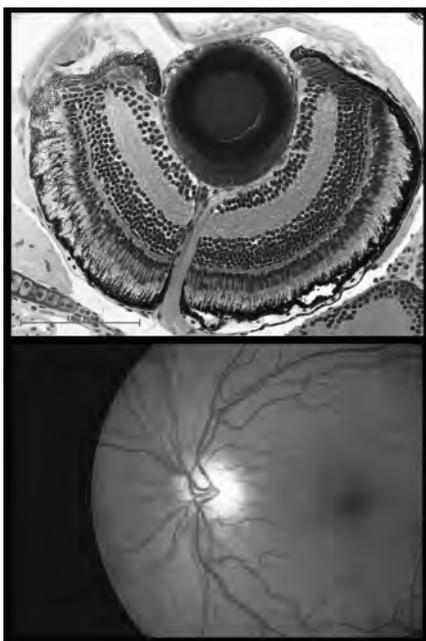
For the purpose of elucidation, three particular examples from these disciplines may be used to illustrate how *Neuromedia* can open up new discourses between *artists*, *clinical analyzers* and *basic researchers*. The representative of these groups are (1) a Swiss-based basic researcher in Neuromorphology, (2) a case study on the human eye of Glaucoma, conducted by Department of Ophthalmology, National University of Singapore, and (3) finally my own production of the media artwork entitled “The Electric Retina (2008)”

(1) Like her colleagues, Corinne Hodel is a Neurobiological researcher who wishes to gain a deeper insight into the genetic control of visual system development and function she makes all her analysis with zebra fish mutants. The zebra fish is preferred because they are diurnal animals and their photoreceptor retinal activity resembles the neurological function of the human eye. The zebra fish is popular among geneticists and embryologist for its easy maintenance, high fecundity, transparent embryos, and rapid embryological development. Since Hodel is interested in visual system performance, she is using a behavioural assay to test for vision. Therefore she breeds genetic mutants in order to understand how genetic disease is inherited, and her focus is on light adaptation of the retina- the levels of which are often affected by many diseases. Usually, she is confronted with quite a lack of understanding when she attempts to explain her research to the public.

(2) The clinical case study is related to a world survey which shows a high incidence of glaucoma in the world²—there are over 67 million glaucoma sufferers—and the developing countries of East Asia account for almost half of this world-estimate. This study, conducted by the Department of Ophthalmology, National University of Singapore, also concluded that incidence of glaucoma in the Chinese community of

Singapore itself is also on the increase and improved methods of screening and therapy for glaucoma are urgently needed.³ Glaucoma is a group of diseases of the optic nerve involving loss of retinal ganglion cells in a characteristic pattern of optic neuropathy. Although raised intraocular pressure is a significant risk factor for developing glaucoma, there is no set threshold for intraocular pressure that causes glaucoma. One person may develop nerve damage at a relatively low pressure, while another person may have high eye pressures for years and yet never develop damage. Untreated glaucoma leads to permanent damage of the optic nerve and resultant visual field loss, but according to the ophthalmologists, the real problem is catch the disease early and encourage people to make tests so that the disease can be treated.

(3) “The Electric Retina” is the name of the interactive media sculpture, which was based on the visual system research and its relation to human disease. The aim of the “Electric Retina”, was to produce a sculpture that could raise public awareness about the problems of genetically inherited diseases like Glaucoma. Could the sculpture demystify the complexity of neural behaviour but also remain true to a level of self-reflection often inherent in the art process. Therefore, after the unsettling experience of being diagnosed with Glaucoma myself, I also incorporated my clinical analysis (MRI scans, Visual field tests, etc) into the project. The sculpture uses a combination of tactile response and interactive film to open up three-way discourse between the



(top) Neural Retina of the Zebra Fish (Wild Type). University of Zurich 2008
 (bottom) Human Fundus: distorted Optic Nerve Disk /Glaucoma 2008

researchers, the clinical analyzers and the public. The main metaphor for the tactile response for the user was inspired by the tangential cut of the photoreceptor in the retina, scanned with the researchers under the Scanning Electron Microscope (SEM). Thus the black and white nano-scale was enlarged and constructed in 3D-reality so that the rods and cones could constitute the surface of the sculpture. Using this structure as an interface, the users can trigger the content of the films, which emit from the interior of the sculpture. In the ocular side, the viewer can trigger a set of interactive films which trace the evidence of scientific research, and on the other side, one can manipulated a set of projected films by twisting an electronic lens. These projected films interpret neural behaviour from the point of view of the mutated fish and they attempt to displays how visual impairments can affect its behaviour. Through interaction the viewers can trigger associated sets of films from scientific research, which appear in the sculptures oculars. The diseases are Genetic Deficiency, Visual Impairment (including Glaucoma), Light Adaptation and the Fish Mutants of Noir and Belladonna (Congenital Nyastagmus). Typical of a media artist, I was also busy with communication questions such as: How can I represent these behavioural results and what might the mutant actually see or do? How can I demystify the complexity of visual perception so that the clinical ophthalmologists also see my interpretation as having potentials to encouraging public interest?

Finally some answers to all of our questions from the different disciplines came from the exhibition of the sculpture in two contexts — the first was a popular science event called the “Brain Fair: Parcours des Wissens” in 2008⁴ and the second was at the Zurich main train station. In both events, over 40,000 people explored the Electric Retina. The scientists and I used the methodology of random video and audio interviews as analysis in order to gather the responses from the users.⁵ In both cases, the scientists from the lab actually stood next to the sculpture in order to talk to the public. Many viewers commented that *Neuromedia* helped them to understand the relationship between basic research and the potentials of curing human disease. The scientists were surprised how little the public knew about eye disease and they realized that scientific research often exists in a hidden vacuum, quite a problem seeing that the public largely funds scientific research! As scientists Corinne Hodel suggested⁶ the process of collaborating on a *Neuromedia* work, was beneficial to the scientists. Working alongside a media artist also revealed a different point of view about her own research and gave her the ability to see an experiment or problem from another perspective. “We received a lot of training in answering why questions from the artist and also from the public

and we all realized that media art could be a catalyst for the opening up of more discourses in the future.” *Neuromedia* seemed to be a gift for the scientists, and in return I learnt a great deal about neuroscience. Certainly, the process of creating *Neuromedia* promoted unexpected discourses between these three disciplines.

In conclusion, *Neuromedia* may be a new process, which involves more than the construction of a media sculpture, it is the art of combining knowledge from neurobiology and the clinical field with interactive media and tactile en-action in situ. It attempts to allow not only the experts, but the also the general public to visualize and experience how sensory perception in is affected by genetics, disease and degeneration. It may even enlarge the knowledge of afferent and efferent systems of neural cortical feedback or help others to gain a deeper insight into the process of neural systems. Perhaps the next question for *Neuromedia* will be: How can more creative metaphorical interpretations be incorporated into the actual process of neuroscience discovery instead of mainly being inspired by the scientific research results?



(top) The Electric Retina at the Brain Fair. Zurich. Scott. 2008
(bottom) Examples of two sided-Interaction by the Public.

- 1 The Neurobiology Group - https://www.uzh.ch/cmsssl/zool/Research/Neurobiology/Neuhauss/Researchgroups_en.html
- 2 Quigley HA. Number of people with glaucoma worldwide. <http://www.ncbi.nlm.nih.gov/pubmed/8695555>
- 3 Case Study in Singapore: Department of Ophthalmology. NUS. <http://archophth.ama-assn.org/cgi/content/full/118/8/1105?ck=nck>
- 4 The Brain Fair <http://www.175jahre.uzh.ch/veranstaltungen/parcours-des-wissens/forschungsprojekte/artists.html>
- 5 Video documents on user response of The Electric Retina: Archive in the hands of the author.
- 6 See proceedings of the conference: “Artists in Labs: Puzzles in Process: Interfacing Art & Science. <http://www.digitalartweeks.ethz.ch/web/DAW/Symposium07>

References

- The Neurobiology Group - https://www.uzh.ch/cmsssl/zool/Research/Neurobiology/Neuhauss/Researchgroups_en.html
- Quigley HA. Number of people with glaucoma worldwide. <http://www.ncbi.nlm.nih.gov/pubmed/8695555>
- Case Study in Singapore: Department of Ophthalmology. NUS. <http://archophth.ama-assn.org/cgi/content/full/118/8/1105?ck=nck>
- The Brain Fair <http://www.175jahre.uzh.ch/veranstaltungen/parcours-des-wissens/forschungsprojekte/artists.html>
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Credits

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Biography

Jill Scott was born in 1952, in Melbourne, Australia and has been working and living in Switzerland since 2003. Currently she is Professor for Research in the Institute Cultural Studies in Art, Media and Design at the Zurich University of the Arts (ZHDK) in Zürich and Co-Director of the Artists-in-Labs Program (a collaboration with the Ministry for Culture, Switzerland) which places artists from all disciplines into physics, computer, engineering and life science labs to learn about scientific research and make creative interpretations. She is also Vice Director of the Z-Node PHD program on art and science at the University of Plymouth, UK. Her recent publications include: *Artists-in-labs Processes of Inquiry*: 2006 Springer/ Vienna/New York, and *Coded Characters* Hatje Cantz 2002, Ed. Marille Hahne. Her education includes: PhD, University of Wales (UK) MA USF, San Francisco, as well as a Degree in Education (Uni Melbourne) and a Degree in Art and Design (Victoria College of the Arts). She has been an artist-in-residence at the ZKM, Karlsruhe, Professor of Interactive Environments- Bauhaus University, Weimar and Media lecturer and Director of the Australian Video Festival at the University of New South Wales Sydney. Since 1975, she has exhibited many video artworks, conceptual performances and interactive environments in USA, Japan, Australia and Europe. Her most recent works involve the construction of interactive media and electronic sculptures based on studies she has conducted in neuroscience- particularly in somatic response and artificial skin (e-skin from 2003) and in retinal neuro-morphology. Currently, she is also artist-in-residence with the Stefan Neuhauss Neurobiology group: Institute for Zoology. University of Zurich).