THE UNIVERSITY OF NEW SOUTH WALES

3 June, 2008

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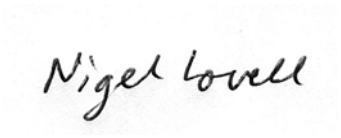
To Whom it May Concern:

Following is a brief project report describing the outcomes of our 2006 Retina Australia grant entitled “Functional optical imaging of the cat visual cortex in response to electrical stimulation of the retina” with Lovell, Suaning, Morley and Kerdraon as Chief Investigators.

We would like to sincerely thank Retina Australia for funding this research and for their role in assisting us in creating a vision neuroprosthesis as a medical device therapy for those suffering profound vision impairment.

Yours sincerely,



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Functional optical imaging of the cat visual cortex in response to electrical stimulation of the retina

The design work and animal testing of our vision prosthesis was successfully conducted in 2006 and 2007. Using both optical imaging of the visual cortex and recordings from a multi-channel electrode array we have demonstrated the ability of the device to consistently evoke cortical responses consistent with visual perception. More recently we have shown that with the surgical approach we have taken (suprachoriodal placement) and hexagonal electrode arrays used, we can provide localised phosphene responses consistent with the perception of multiple visual percepts.

In simple terms we have placed electrodes behind the retina and connected these to our neurostimulator. We have then recorded activity on the visual cortex of the animal (the part of the brain that processes visual inputs). Using either optical imaging responses (whereby we look at changes in blood flow associated with the brain becoming more active due to increased processing demands) or direct electrical recordings from the surface of the brain, we have successfully recorded activity which is consistent with the expected functioning of our electrode/electronics and their surgical placement.

The next stages of the research will focus on further animal testing including optimising surgical approaches and stimulation strategies, as well as very initial work on testing the efficacy of the vision prosthesis in an acute human preparation.

To summarise outcomes:

1. Design and construction of one of the most sophisticated neurostimulator electronics chip ever produced (either commercially or for research purposes).

2. Winning of design awards for the electronics chip and for a scientific paper detailing the animal experimentation using optical imaging of the visual cortex by Ph.D. students working on the project. These include in 2006 three students from the team who were selected as finalists and given travel support to present at the 28th Annual International conference of the IEEE Engineering in Medicine and Biology Society, New York that was held Aug 30th - Sep 3rd, 2006. In 2007 two students (Louis Jung and Yan Tat Wong) were selected as finalists and given travel support to present at the 29th Annual International conference of the IEEE Engineering in Medicine and Biology Society, Lyon, France that was held Aug 23rd - 26th, 2007. Yan Wong was awarded first prize of $1000 US in the student paper competition for his paper ‘Optical imaging of electrically evoked visual signals in cats: I. Responses to corneal and intravitreal electrical stimulation’.

3. In recognition of our work there have been a number of invited key note presentations given by two of the chief investigators (Lovell and Suaning) at two of the most recognised congresses for bionic eye research (Artificial Vision 2006: The Bonn Dialogue - International Symposium on Prosthetic Vision. 8th Sep, 2006, Bonn, Germany and Eye and Chip Congress, Detroit, USA, 15th - 17th June, 2006.). A similar invitation has been extended for 2008.

4. Integral to the research success has been collaborations between UNSW and the Centre for Eye Research Australia (CERA). Surgeons from Melbourne have flown up to Sydney on approximately half a dozen occasions. A signed MOU with Seoul National Hospital and the team there working on bionic eye experiments has given us insight into possible alternate surgical approaches based around subretinal insertion. A more recent collaboration with Prof Rob Shepherd’s team at the Bionic Ear Institute (BEI) in Melbourne is proving most useful with the BEI focussing on chronic animal testing and biocompatibility.