

## History Committee

Support for the proposal “First Control of Physical Object (Robot) Using Signals From Human Brain, 1988.”

Please find my responses to questions asked by the Committee

- Is the suggested wording of the Plaque Citation accurate?
- Answer: In my opinion, the wording of the Plaque Citation is accurate and is based on findings communicated in a science paper published in an IEEE proceedings published in 1988. I support the proposal.
- Is the evidence presented in the proposal of sufficient substance and accuracy to support the Citation?
- Answer: The evidence presented is accurate. Before 1988, EEG was frequently studied. However, research conducted included areas of study such as: (i) training people to control alpha wave activity related to health disorders (like learning disabilities); (ii) epilepsy; (iii) interhemispheric relationships; (iv) cognition and EEG; (v) EEG and head injuries; (vi) brain waves and sleep, and (vii) brain waves and hypnosis. The findings in the article published by Bozinovski and colleagues in 1988 titled “Using EEG alpha rhythm to control a mobile robot” published in the Proceedings of the Annual International Conference of the IEEE Engineering in Medicine and Biology Society, do describe accurately for the first time, how scientists/engineers managed to use brain wave activity, in the alpha wave frequency, to control a machine without hands.
- Does the proposed milestone represent a significant technical achievement?
- Answer: I believe it does. I also agree it was ahead of its time. The finding of Bozinovski and colleagues that alpha wave reactivity associated with eye closure and opening could be a reliable phenomenon for activating a machine, was remarkable. No one before this date had thought of this approach using EEG. As an example of how it has helped science and health, we published results of my clinical trials using “hands-free” EEG control (based on eyes open/closed in the alpha wave frequency) in 2000 in which we reported findings of 10 severely disabled participants who learned to control an environmental control system with six options (*Applied Ergonomics*, 31, 377-382). In this 2000 paper, we cited the ground-breaking research of Bozinovski and colleagues research (1988). Furthermore, the 2000 paper led us to conduct a field trial of our environmental control system, using EEG and called the “Mind Switch”, in a 2002 paper (*Archives of Physical Medicine and Rehabilitation*, 83, 1455-1458). The 2002 paper described how the same 10 severely disabled participants (e.g. adults with quadriplegia, polio, muscular atrophy, multiple sclerosis or cerebral palsy) turned their television on and off in their house, changed sound level and switched channels, using the EEG brain waves (alpha range) all within minutes. The Bozinovski et al work was a milestone technical achievement that allowed my group to advance the area for the purposes of humanity. Post-1988, applications of EEG hands-free control continue to be explored and reported in the science literature.

Regards

Dr Ashley Craig

A handwritten signature in black ink that reads "ACraig". The letters are cursive and connected, with a large 'A' and 'C'.

Professor of Rehabilitation Studies  
Kolling Institute, Northern Clinical School, Faculty of Medicine and Health,  
The University of Sydney, Sydney, NSW, Australia  
John Walsh Centre for Rehabilitation Research, Northern Sydney Local Health District, St  
Leonards, Sydney, NSW, Australia  
Corner Reserve Road & First Avenue,  
Royal North Shore Hospital  
St Leonards NSW 2065, Australia