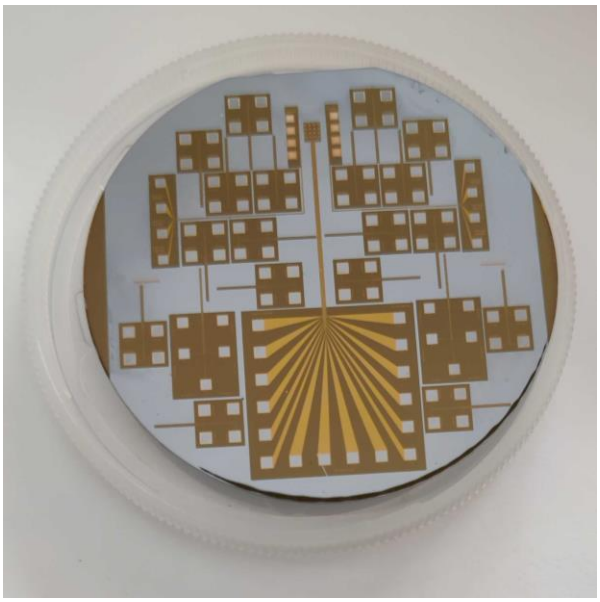
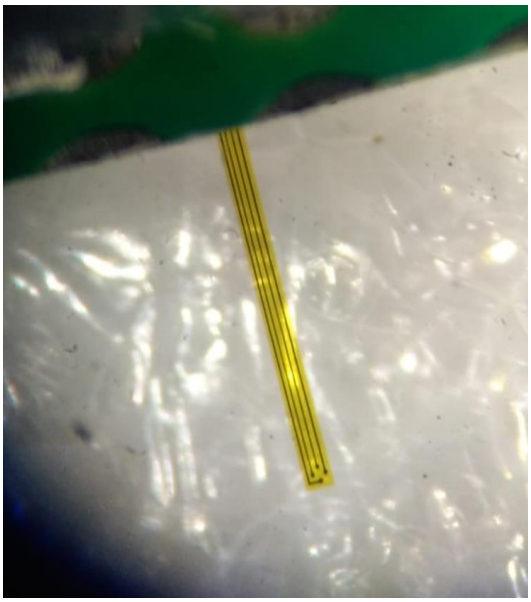
India's First Commercial Sub-15um Intra-Cortical Neural Microelectrodes Fabricated at IIT Bombay Nanofabrication Facility

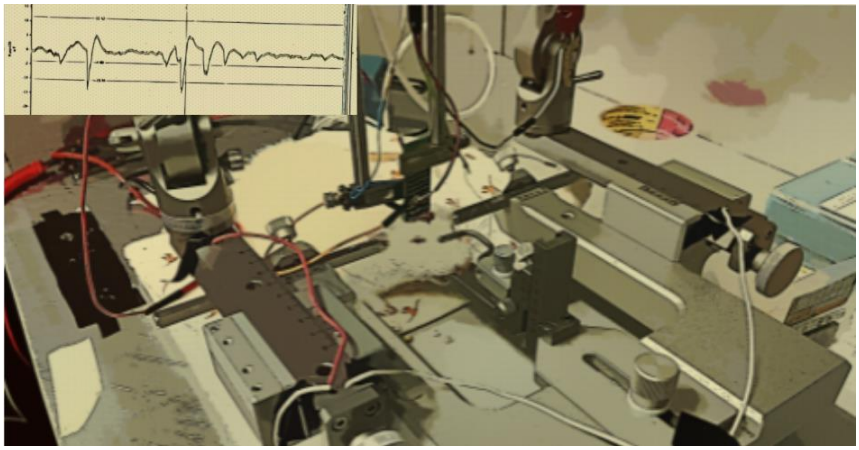
Eywa Neuro, India's first commercial invasive neurotechnology company, in collaboration with IIT Bombay Nanofabrication Facility has successfully manufactured India's first commercial sub-15-micron, invasive brain implant that can record from and stimulate individual neurons in the brain. Using thin-films MEMS technology, and the lithography, deposition, and plasma etching tools available at IITBNF, Eywa Neuro has developed thin-film polyimide-based brain implants that are not only biocompatible but also allow recording from a large number of neurons. The technology with which these probes are built rivals those made by Elon Musk's Brain-Computer Interface Company, Neuralink, and promises to be a key Indian invention that can help in neurosurgical intervention and neuroscience research.





Started by Kaustubh Deshpande, a Sr. MEMS Engineer and a former research engineer at Neuralink, and Dr. Arjun Ramakrishnan, Asst. Prof. in the Biological Sciences and Bioengineering Dept at IIT Kanpur, Eywa Neuro has developed two key technologies which lend themselves to easy translation into chronic settings. Their polyimide precursor is synthesized for having a low-moisture uptake and has the ability to allow neuronal regeneration on its surface. The second complementary technology built by them is their Tert-FP adhesive technology, which allows them to attach these, probes onto a cannula for implantation, without increasing the implant thickness significantly- a shortcoming for most flexible probes out in the market. In this cross-field collaborative effort, the microelectrodes are being fabricated at IITBNF cleanroom by Kaustubh and research on electrode electrochemical behavior and benchtop studies are being done by Dr. Srinivasan Ramakrishnan (Asst. Prof., Chemistry Dept., IITB). Finally, long-term

in-vivo studies in rodents and primates are being undertaken by Dr. Arjun Ramakrishnan at IIT Kanpur.



"Our vision is to build upon and grow the electrophysiology research in India, and eventually help translate these devices into humans. The ability of BCIs and invasive brain implants to improve lives is more than evident, and the technology we've built has immense potential to revolutionize this field. Today Facebook, Google, Amazon, Elon Musk, Peter Thiel, and various Governments (Defense) across the world have poured tremendous amounts of money and resources into this technology. Through Eywa Neuro, we hope to leverage the engineering and neuroscience expertise in India and be the first Indian startup to help leap-frog this technology to the potential it holds." adds Kaustubh enthusiastically.

The key to manufacturing invasive BCIs is to have them be flexible and scalable. By ensuring that the probes are soft and flexible, the damage done by the brain to the implant, from the ensuing foreign body response, is minimized. Using polyimide, a biocompatible and flexible material, the ability of these implants to record chronically is significantly better than traditional silicon-based devices made in the mid-90s. Furthermore, the MEMS tools available at IITB-NF further allow the fabrication of features down to 100nm, thereby exponentially increasing the ability of these probes to host a large number of recording/stimulation channels and minimize surgical trauma.

While invasive BCI technology is still in its nascent stages, it will be exciting to see how India can pioneer research in neuroscience and allow us to solve one of the last remaining mysteries of the body - the human brain.

For more information, please visit www.eywaneuro.com

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