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Case Study: Reliability of Multi-Electrode array in the Knob area of Human Motor Cortex intended for a Neuromotor Prosthesis Application

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Abstract— **Extracellular recordings of motor cortex (MI) neurons, using a chronically implanted multi-electrode array, promise to yield a high dimensional input signal to external devices such as a computer, exoskeleton or prosthetic arm. For the multi-electrode array to be used as a sensor for a neuromotor prosthesis (NMP), it is important that it continually record movement-related signals over long time periods. Recent studies have demonstrated that it is possible to continually record for up to 1.5 years from a sufficient number of MI neurons in monkeys to enable neural decoding of arm movement. Cyberkinetics Neurotechnology Systems Inc. has initiated an investigational device exemption (IDE) study investigating the safety and efficacy of the BrainGate™ Neural Interface System, a medical device that combines this sensor with data acquisition and processing devices to decode movement intent. This device is currently being investigated as a means for a quadriplegic person to operate a range of assistive technologies. Preliminary results from this case study provide evidence that (1) MI neurons remain active more than 3 years after spinal cord injury, (2) units can be recorded 6 months after surgery. This technology may benefit quadriplegic people by providing a new output pathway from the cortex, to control their muscles.**

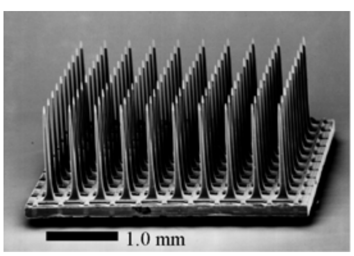

Fig. 1. Silicon-based electrode array chronically implanted in knob area of motor cortex. Electrode length is 1mm and each electrode is separated from its neighbor by a glass dielectric.

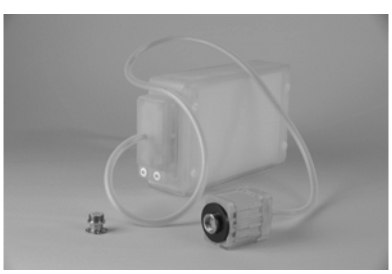

Fig. 2. Neuroport pedestal, cable and front end amplifier.

Fig. 3. BrainGate™ cart