P13.A **HEAD ACCELERATION SENSING WITH A MEMS EMBEDDED MOUTHGUARD: MEASURING CONCUSSION OR NOISE?**

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We have developed an instrumented mouthguard utilizing MEMs accelerometers and gyroscopes to measure concussive level head impact motions. Despite coupling to the upper dentition, the mouthguard can be perturbed by the lower jaw resulting in measurement errors.

P14.B **MICROFABRICATED EXTRACELLULAR MATRIX-BASED NEURAL ELECTRONICS FOR FLEXIBLE BIO-INTEGRATED ELECTRONICS**

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We developed a microfabrication method that enables microelectronics primarily comprised of natural protein materials. An extracellular matrix (ECM)-based implantable neural electrode (NE) was demonstrated as one mode of application. These ECM-NEs benefit from natural mechanical and biological compatibility of the ECM materials to provide superior neural tissue compatibility. Preliminary animal validation experiments showed recording capabilities of the ECM-NEs from rat motor cortex.

P15.A **MICRONEEDLE AND MICROPUMP BASED PRECISION DRUG DELIVERY SYSTEM**

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The goal of this study was to design, develop and test a peristaltic micropump and an array of hollow Stainless Steel (SS) microneedles for minimally invasive, continuous and precision delivery of insulin. A 4 x 4 SS microneedle array was fabricated using femto second laser micromachining. The fabricated microneedles are 300 µm high with 40 µm inner diameter and 110 µm outer diameters. The precision flow using a DC motor driven peristaltic pump was achieved by close-loop controlling.

P16.B **MULTI-LAYER STRONG REVERSIBLE BONDING VIA GECKO-INSPIRED GASKET ARCHITECTURE**

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We present a novel system for multi-layer reversible bonding of elastomer microfluidics that relies on improved contact geometry of channel sidewalls and supports to greatly enhance the achievable bonding strengths. The preferred structural materials are thermoplastic elastomers which have similar properties to PDMS but can be microstructured in less than a minute with thermo-compressive molding. A droplet generator and burst valve are highlighted as possible applications.

P17.A **ON-DEMAND POWER SOURCE FOR MEDICAL ELECTRONIC IMPLANTS: ACOUSTO-MECHANICAL VIBRATIONS FROM HUMAN VOCAL FOLDS**

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For use in vibration-driven power generation, we have quantitatively characterized the acousto-mechanical vibrations that propagate from the human vocal folds through the neck and head along the skeletal frames. We have used five MEMS accelerometers to characterize the acousto-mechanical vibrations present in various situations. The acousto-mechanical vibrations excite vibration-driven energy harvesters at their resonance frequencies between 90-300 Hz and generate up to 0.15 mW/cm3 on demand.