Even in the steadiest of surgeons' hands, placing cochlear implants in patients can be tricky and the risks of trauma are high. Help is on the way for surgeons to implant such electronic devices, which provide a sense of sound to a person who is profoundly deaf or severely hard of hearing due to damaged neuroepithelial (hair) cells.

Assistant Professor Nabil Simaan and his team have developed a steerable, snake-like electrode array for implant surgery that helps surgeons install cochlear implants safely and trauma free. Otolaryngologists at the Columbia University Medical Center have taken an active interest in his lab’s development of a robot-assisted system for such surgeries.

Simaan says it will be a big step forward from the existing implantation procedure, in which surgeons must manually thread long, flimsy electrodes into the cochlea, carefully navigating its delicate passageways with extreme precision. The slightest wrong move or force can damage the delicate structures of the cochlea and may even cause additional hearing loss beyond what the surgery is trying to correct.

He is also developing other surgical robots, including one that will both filter a surgeon’s hand tremor as well as keep the surgeon from moving the surgical tool into the wrong area. This will be especially useful for minimally invasive surgery performed through the abdomen.

“Designing new mechanical architectures for robots geared for surgery is my passion,” Simaan says, “and my hope is that Columbia’s novel work in robotics finds its way into operating rooms everywhere.”

Simaan received his PhD from the Israel Institute of Technology and was a postdoctoral research scientist at Johns Hopkins University’s National Science Foundation (NSF) Engineering Research Center for Computer-Integrated Surgical Systems and Technology prior to coming to SEAS. He recently received an NSF CAREER Award to support his research.