

Goodbye Google Glass, Hello Smart Earphones

By Fan-Gang Zeng, PhD

Google Glass made a big splash when it was first unveiled as one of the “Best Inventions of 2012” by *TIME Magazine*. Plagued by design and technical issues, as well as privacy and safety concerns, Google stopped the production of Google Glass last year, with no clear plans on its re-introduction in the near future. Instead, there have been strong signs indicating the dawn of smart earphones, a more natural and ready-to-go man-machine interface that will soon be available not only to the hearing health care industry, but also to the wider wearable technology market.

Contrary to last year’s report on consumer electronics companies entering the hearing health care market, hearing aid companies are now pushing back, with all of the “Big Six” manufacturers introducing their hearing aids’ wireless connectivity to smartphones, TVs, and other digital products for everyday use (*Hearing Journal*. 2015;68[12]:6). Starkey Hearing Technologies, for example, introduced hearing aids with features such as music enhancement and streaming to broaden their appeal to the general public. With over 100 years of history in customized evaluation and fitting, the hearing aid industry has an advantage

over the consumer electronics industry in both understanding and developing personalized hearable technology.

Compared with eyes, the ear is a place where a device can not only be totally and comfortably concealed, but it can also record biological signals and stimulate the nervous system. Researchers from Imperial College in the U.K. presented an earphone with integrated mini-sensors that can reliably record vital signs from heart rate and blood pressure to muscle activities and brain waves. Research has also shown that electrodes placed in the ear canal can electrically stimulate auditory, vestibular, and other cranial nerves to potentially treat a wide range of chronic neurological diseases from tinnitus to depression (*Curr Opin Otolaryngol Head Neck Surg*. 2015; 23[5]:382).

Smart earphones can be used to process input from other senses, the brain, and the body to enhance the hearing experience. Using an eye-glasses-mounted eye-tracker, Kidd and colleagues at Boston University are developing a visually guided hearing aid that selectively increases sound signal-to-noise ratios in the direction of gaze, presumably the target of interest (*J Acoust Soc Am*. 2013;133[3]:EL202).

In a recent workshop, Ervin Hafter, PhD, from the University of California in Berkeley, and Simon Carlile, PhD, of the University of Sydney, brought together 40 researchers to discuss advances in and applications of listening technology into 2030 (<http://www.listeninginto2030.org>). A future smart earphone will be not only be a listening device, but a natural interface to the brain, the machine, and environment. You may imagine an invisible and body-powered earphone that will sense and analyze multi-modal signals from the environment, monitor your vital signs, attention, or even mood, and seamlessly connect to phones and the internet while delivering real or virtual stimuli to meet your personal needs, from compensating or enhancing sensory and cognitive functions to treating diseases.

2016 may mark the beginning of a new era for smart earphones. 



Dr. Zeng is chairman of *The Hearing Journal* Editorial Advisory Board, as well as director of the Center for Hearing Research and professor of Anatomy and Neurobiology, Biomedical Engineering, Cognitive Sciences, and Otolaryngology

at the University of California, Irvine.