

## STARTUP

## CLEAR CALLS

Audience markets noise-canceling chip for cell phones

IN 1989, Lloyd Watts headed to Caltech to get his PhD in electrical engineering and join microelectronics pioneer Carver Mead's effort to understand the human brain. Watts's task: studying the mechanics of the human auditory pathway.

Over the next two decades, Watts's work morphed into a startup called Audience, which amassed \$45 million in venture funding. This year, it rolled out its first product: a chip for mobile phones that cancels out a wide range of background noises—even loud public-address systems in airports. The technology could also improve the performance of voice-recognition systems. Today's customer-service and voice-command systems are increasingly sophisticated, but they can still be defeated by background noise.

Working first at Caltech and later at Microsoft cofounder Paul Allen's now-defunct Interval Research, Watts and other researchers built computer models of the inner ear, or cochlea, including the fine hair cells that detect different frequencies of sound (some detect high frequencies, others low).

At Audience, Watts and his team were able to distill these models into algorithms that could be wired into a chip. The system models the frequency, duration, and volume of sounds coming into a cell-phone microphone. Then it uses that information to group sounds together according to source. Finally, it deletes the audio streams that it has identified as noise, leaving only the sound of a speaker's voice.

The technology "literally replicates the human hearing system," Watts says. "We directly studied the biology, working with auditory neuro-

## Audience

**URL:** [www.audience.com](http://www.audience.com)

**Location:** Mountain View, CA

**Product:** Voice-processor chip that sharpens voice quality and filters out noise in cell-phone calls

**Founder:** Lloyd Watts

**CEO:** Peter Santos

**Number of employees:** 50

**Funding amount:** \$45 million

**Funders:** Vulcan Capital, NEA, Tallwood Venture Capital, and VentureTech Alliance

scientists and doing simulations of the cochlea." The company says that its system can suppress 25 decibels of noise, versus 6 to 12 decibels

with conventional methods. Audience is now selling voice-processor sample chips, for \$5 to \$7, to makers of cell phones. Its first customer, Sharp, is using them in an NTT DoCoMo phone in Japan.

Stephen Ohr, an analyst at market research firm Gartner, says that companies including AMI Semiconductor, Qualcomm, and NXP are all developing similar technologies. While Audience has a head start, he says, the market battle will ultimately be decided by questions such as price and manufacturing quality. —Dean Takahashi

