

How to give voice to the speechless

Of the many memorable things about Stephen Hawking, perhaps the most memorable of all was his conversation. The **amyotrophic lateral** sclerosis that **confined** him to a wheelchair also stopped him talking, so instead a computer synthesised what became a world-famous voice. It was, though, a **laborious** process.

amyotrophic 肌萎缩的

lateral 侧面的

confine 限制

laborious 勤劳的；艰苦的

A better way to communicate would be to read the brain of a **paralysed** person directly and then translate those readings into synthetic speech. A study published in Nature this week, by Edward Chang, a neurosurgeon at the University of California, San Francisco, describes just such a technique. By measuring the brain signals that control vocal-**tract** muscles, Dr Chang has been able to use a computer to synthesise speech accurately.

paralyzed 瘫痪的；麻痹的

epilepsy 癫痫

The volunteers for Dr Chang's study were five people with **epilepsy** who had **electrodes implanted** into their brains as part of their treatment. He and his colleagues used these electrodes to record the volunteers' brain activity while those volunteers spoke several hundred sentences out loud.

electrode 电极

implant 植入；移植

To convert those signals into speech they did two things. First, they trained a computer program to recognise what the signals meant. Then, when the program had learned the relevant associations, they used it to translate electrode signals into vocal-tract configurations, and thus into sound.

The principle proved, Dr Chang and his team went on to show that their system could synthesise speech even when a volunteer **mimed** sentences, rather than speaking them out loud.

mime 哑剧

So far, Dr Chang has worked with people able to speak normally. The next stage will be to ask whether his system can work for those who cannot speak.