SCIENCE By Liz Brown

The Power of Perception

How Human Echolocation Is Being Put Into Practice

When Daniel Kish was five years old, he wanted to ride a bike. Not an unusual activity for a young boy but, in this case, it wasn't so simple... Kish is blind. After deciding that he didn't want to give up without even trying, the innovative child quickly worked out some tricks that would allow him to hit the pavement on two wheels.

He found a bike at the home of a family friend and discovered a long wall to ride along. "At first, I used the wall to balance and just rode back and forth along it," he explains. But, after a while, Kish intuitively started making clicking noises with his tongue to determine his relationship to the wall. He began to ride farther and farther away from it, keeping track of where it was by the differences in the sounds bouncing back as he clicked.

Today, the California native, who now resides in England, enjoys mountain biking and relies on his auditory abilities to sense objects in his path. The technique he uses is known as "flash sonar" or "echolocation"—the ability to listen to how objects reflect sounds and then interpret those sounds to locate and identify things. Most people are aware that bats and dolphins use this skill to navigate, but fewer know that, with practice, humans are able to echolocate, too.

For people, echolocating entails using sounds such as tongue clicks, cane taps and foot stomps, and listening to how the sounds are reflected back. From these echoes, a person like Kish, who has become skilled at using the method, can gather information about his environment. Features such as overhangs, walls, doorways, poles and curbs all have distinct sounds.

Kish describes his ability as something akin to having a conversation with his environment. "The clicking is like asking two questions, 'What are you?' and 'Where are you?'" he says. According to Kish, echolocators hear distinct answers from different objects. For instance, "a wall gives a big answer that comes from high and wide, and is very strong, with a solid voice. Whereas, a pole may also have a solid voice and it may come from high," but not wide, and it has a smaller voice. With practice, a person can discern an object's shape, texture and size just by the sound that the object reflects.

Kish teaches students with vision disabilities how to mountain bike using echolocation.

The scientific community has been aware of human echolocation since the 1950s, and Kish, who is founder of World Access for the Blind (an organization that helps provide equal access to resources and opportunities around the world) believes that many people with vision disabilities have always instinctively used some form of echolocation, with cane taps or the sound of their voice.

"Echolocation can be divided into passive and active types," he explains. "I'd say about 50 percent of people who are blind use some form of passive echolocation, often unaware that they are doing it. Perhaps about 10 percent use some form of active echolocation [where the user is producing his or her own signal], but only a small percentage, maybe three percent, use it to an advanced degree."

While many people *use* echolocation, most have trouble articulating how they do it, so it's historically been difficult to teach it to others in a systematic fashion. According to Kish, that is beginning to change. "There is a growing interest among biosonar scientists who are trying to understand how sonar works in the animal kingdom, to now understand how it works with humans," he says. "Hitherto, it was believed that human biosonar was so crude as to not be worth studying. However, this is shown to be not true, so scientists are waking up to the interest."

In fact, Kish, who accidentally discovered echolocation as a child, has created the first comprehensive echolocation curriculum. With training, "functional improvements in echolocation can come about very quickly," he says. "When people begin actively using echolocation, they become much more aware of their surroundings."

Kish trains students one-on-one and in small groups. He often works directly with children and their families, and may actually stay with a family in their home for days or weeks. In the beginning, he