

# Research News

by Jennifer Kennedy

## Researchers resolve eye-movement controversy

For more than 40 years, a scientific controversy has raged over whether microsaccades, rapid eye movements that occur when a person's gaze is fixated, are responsible for visibility.

Research conducted at Barrow Neurological Institute has recently resolved the debate, establishing that microsaccades are indeed responsible for driving 80 percent of our visual experience.

Even when eyes are fixated carefully on an object, they continue to make tiny movements called fixational eye movements. These movements cause nearly constant stimulation of the retina.

"If our eye was perfectly still during fixation, the world would quickly fade from view due to the fact that the neurons in our eyes and brain quickly adapt to non-changing stimulation," says lead researcher Susana Martinez-Conde, PhD.

There are three types of fixational eye movements: microsaccades, which are fast movements that travel in a straight line; drifts, which are slow curvy motions that occur between microsaccades; and tremors, which are very fast, extremely small oscillations of the eye superimposed on drifts.

"It is critical that we know which of these fixational eye movements is primarily responsible for keeping the world from fading because in normal visual conditions we fixate our gaze 80 percent of the time," says Dr. Martinez-Conde. Her lab

established the vital role of microsaccades in vision by measuring fixational eye movements in subjects whose gaze was concentrated on one object.

Not only does this new discovery resolve a scientific debate, it also brings new hope to patients who are blind much of the time due to fixational eye movement problems.

Dr. Martinez-Conde's research receives funding from Barrow Neurological Foundation.

## Discovery localizes visual awareness

How do you know when you see something? Barrow researchers have made a breakthrough discovery that puts scientists closer to understanding how visual awareness is generated.

Stephen Macknik, PhD, a researcher in the Neurosurgery and Neurobiology departments, and his colleagues have discovered that awareness of simple visual objects is generated in a small portion of the occipital lobes of the brain.

Previous studies had ruled out lower stages of the visual system, such as the retina, as capable of generating visual awareness. Those studies left most remaining areas of the brain as potential candidates. The present study places, for the first time, boundaries within the visual system to localize a small area in which visual awareness is generated.

"Visual awareness is the feeling that makes the world seem visible," Dr. Macknik says. "In contrast to a visual reflex, like when our eyes change their focus, visual awareness describes the conscious experience of recognizing a stimulus as visible, rather than invisible."

The year-long study utilized functional Magnetic Resonance Imaging (fMRI) technology to scan the brains of 17 volunteers while they were exposed to simple visual objects that appeared either more visible or less visible. Functional MRI measures the position of deoxygenated blood within the brain, which indicates areas where energy



Susana Martinez-Conde, PhD