Mirror Neurons

Giacomo Rizzolatti is a neurophysiologist at the University of Parma in Italy. In 1995 he was leading a team of researchers as they mapped the activity of the F5 area of the brain in macaque monkeys. F5 is in the premotor cortex and contains millions of neurons that specialize in 'coding' for specific motor behaviors of the hand: Grasping, reaching, holding, and bringing objects (food) to mouth.

During a quiet break in monitoring, while the monkey was waiting for the next experiment to begin, one of the researchers was moving about in the lab and reached for something. The electrodes on the monkey's F5 were activated. The monkey was not moving his arm, but simply watching researcher's arm move.

At first it was considered a fluke, since scientists believed that the nerve cells for action were separate and distinct from the nerve cells for sensory observations. Repeated observation uncovered the existence of mirror neurons, as though the brain of the monkey and the brain of the researcher were somehow synchronized and overlapped, and the researcher's physical movement actually existed inside the monkey.

At that time, neuroscientists were deeply invested in the paradigm that various brain functions were separated in the brain. Perception was completely isolated from action, and cognition lay somewhat in between; allowing us to plan, to attend, to remember, and so on.

The Parma investigators were completely unprepared for a motor neuron that was also a perception neuron. Initially, scientists were not mentally ready to challenge the assumptions inherited from generations of researchers. Quite a few years passed before there was a paradigm shift that accepted the existence and importance of mirror neurons. Marco Iacoboni, a UCLA neuroscientist and investigator of mirror neurons, wrote that "Progress in science moves forward one funeral at a time."

In the past two decades research has confirmed that human brains also demonstrate a profound mirroring effect. We understand other people by performing an act of internal mimicry, by letting some of the actions and feelings of others into our own heads.

Instead of the existence of specific mirror neurons there is a brainwide mirroring system whose tasks are shared by a number of regions and pathways. The imitating effect occurs as nerves in the frontal and prefrontal cortex begin to fire along with neurons in the somatosensory cortex (responsible for bodily sensations.) Deep inside your brain, you are experiencing what you see.

The system that recruits neurons from other areas of the brain provides you with input not just about sensations and actions, but emotions as well. Mirror neurons provide a comprehensive, detailed imitation of what the other person is experiencing. You can almost instantly pick up on the emotion of another person.

If you ‘catch’ a smile on the face of a complete stranger, or experience the tension of your own heart as your partner silently, coldly enters the room, you’ve experienced the effects of the brainwide mirroring system through emotional contagion. Your neural pathways take in another person’s feelings and replicate them inside of your nervous system.

The mirroring system works on a profound level, activating even when another person gives only a hint that they are about to do something, providing a crucial element in the complex act of empathy. Vittorio Gallese, a neurophysiologist in the Parma lab, described the role of the mirroring system in human interactions this way, “The neural mechanism is involuntary, with it we don’t have to think about what other people are doing or feeling, we simply know.” From Marco Iacoboni, ” The mirroring system helps us in understanding our existential condition and our involvement with others. It shows that we are not alone, but are biologically wired and evolutionarily designed to be deeply interconnected with one another.”

The mirroring system can thrive only when it’s used repeatedly. In some people on the autism spectrum or dealing with other neurological challenges, it’s as though the mirrors might be broken, or at the very least, dormant. We believe that MeMoves uses audiovisual synchrony to to revive dormant mirror neurons.