



MIRROR NEURONS: HOW KIDS LEARN

Table of Contents

1

MIRROR NEURONS

- The Neuron
- What is a Mirror Neuron
- Research

2

LANGUAGE DEVELOPMENT

- Mimicry
- Mapping

3

ACTIONS AND INTENTIONS

- Understanding Intentions

4

VISION AND SOCIAL LEARNING

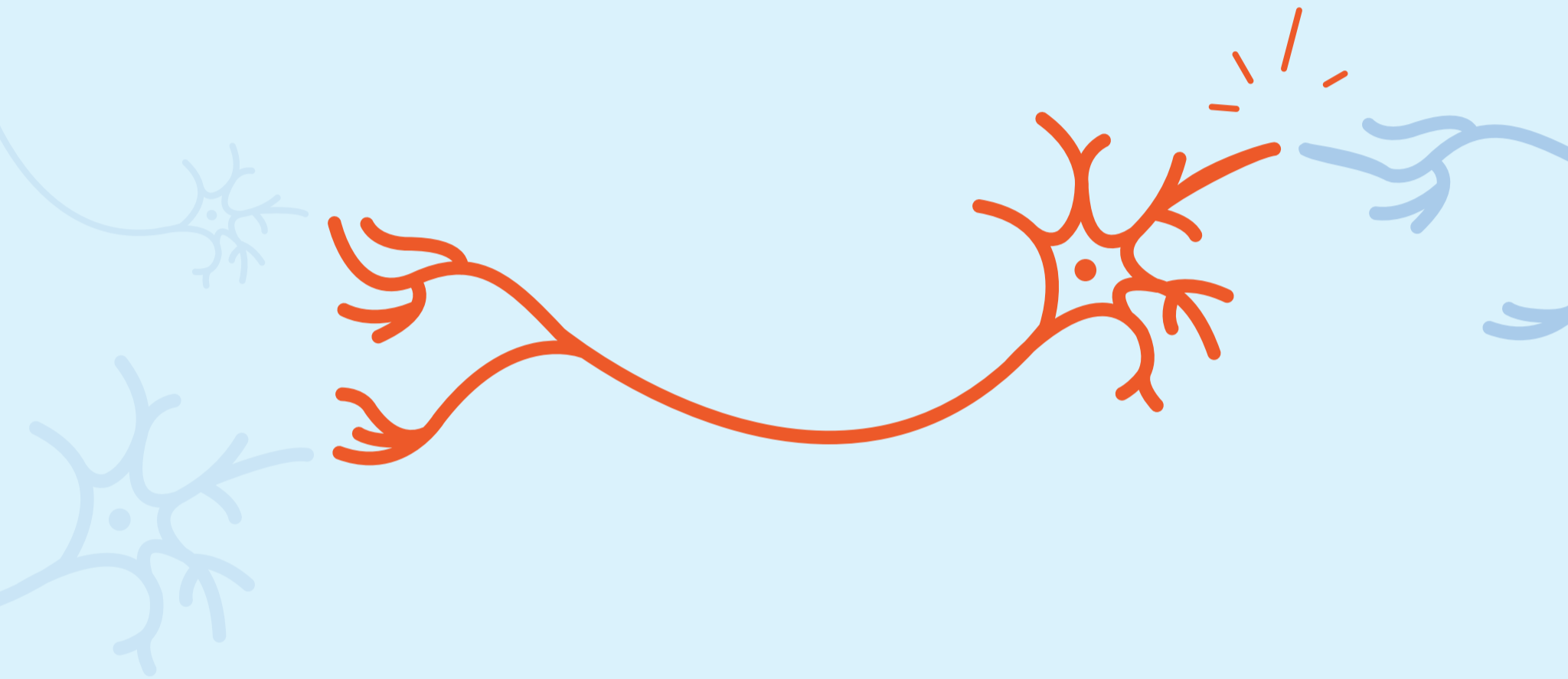
- Learning through Observation



1

MIRROR NEURONS

THE NEURON

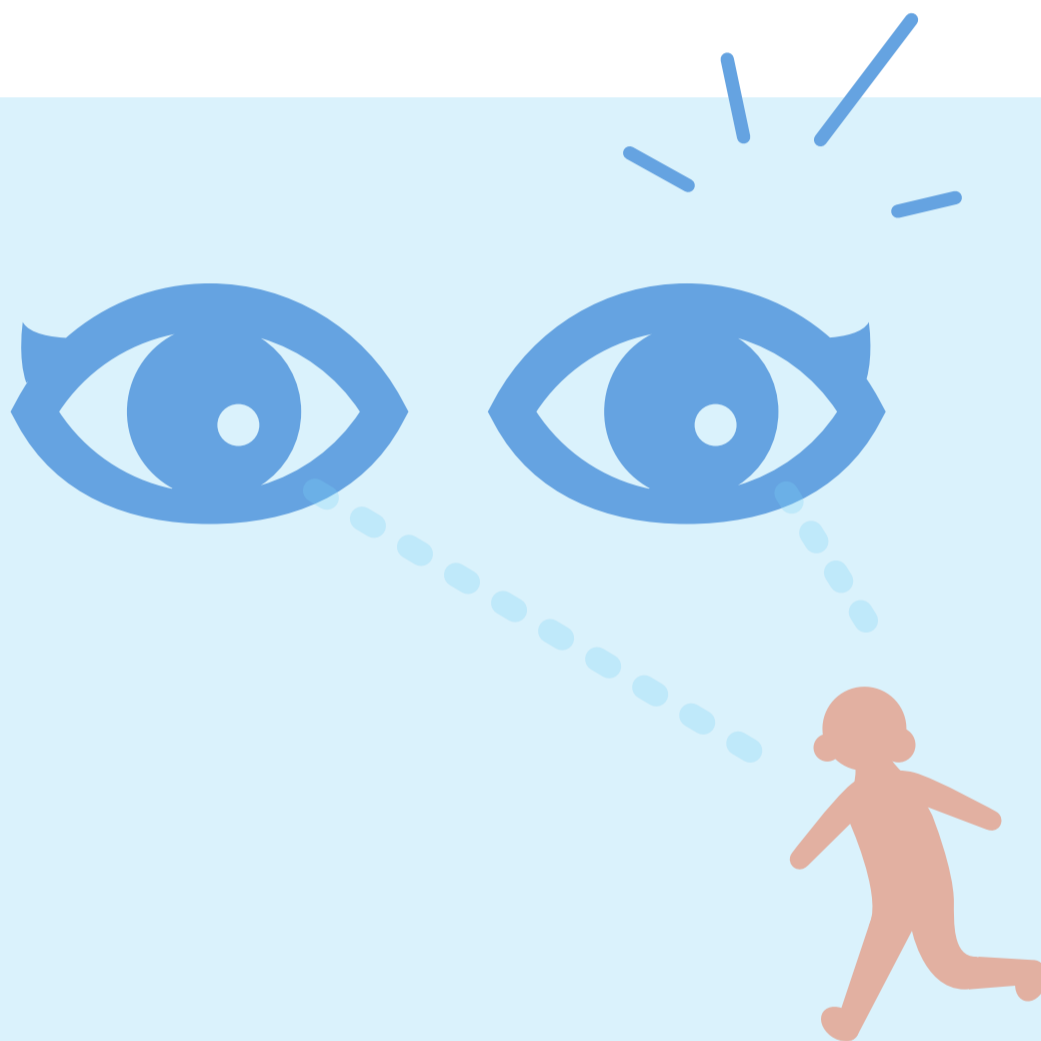


Neurons, or nerve cells, carry messages through the brain and body. There are different types of neurons such as mirror neurons.

A mirror neuron is a neuron that fires both when we

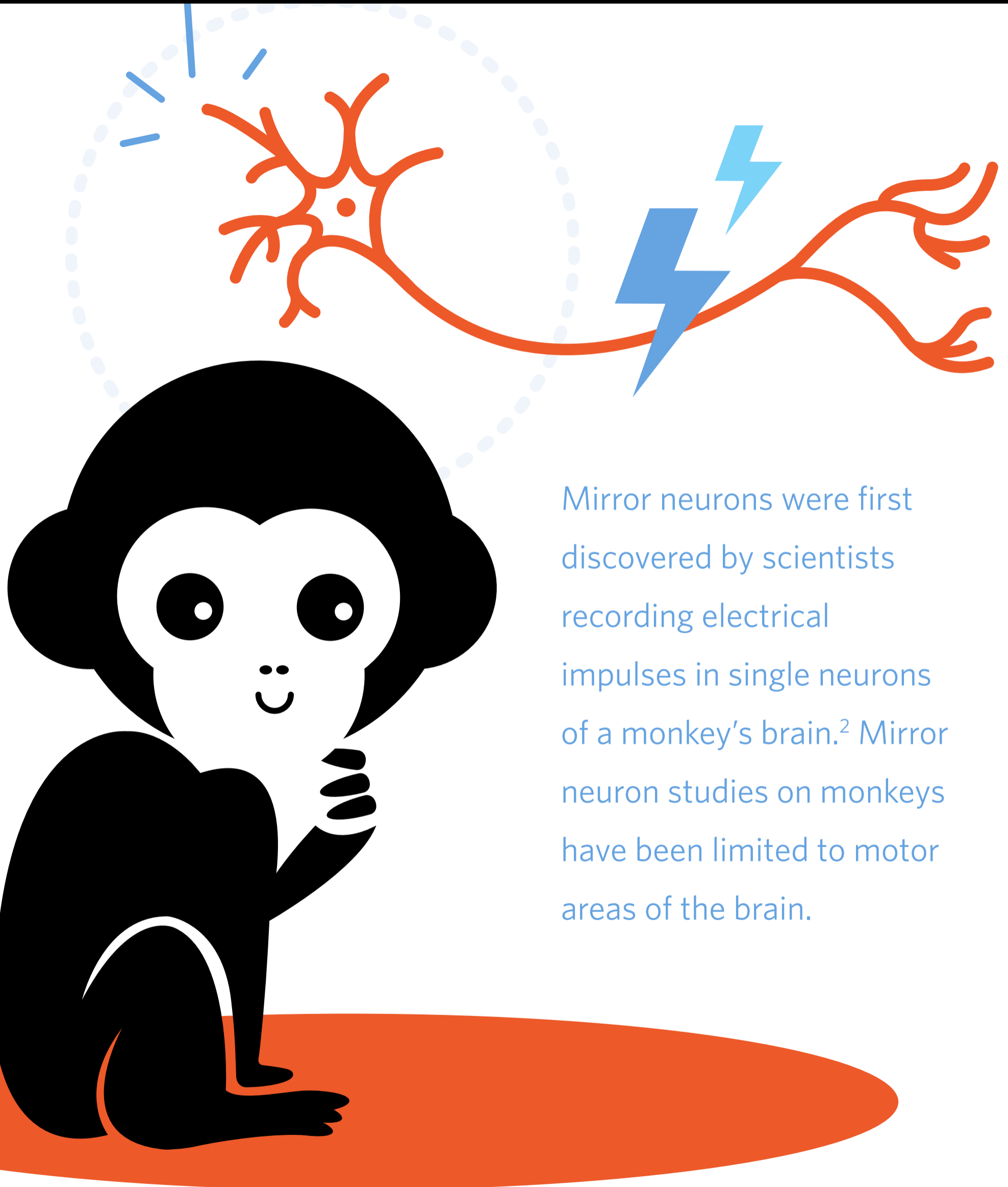


Move



Observe someone else's movement





Mirror neurons were first discovered by scientists recording electrical impulses in single neurons of a monkey's brain.² Mirror neuron studies on monkeys have been limited to motor areas of the brain.

Mirror neurons are important because they help lay the foundation for the **speed and accuracy of purposeful movement and problem solving.**

Purposeful movement is the foundation of our ability to learn through movement.

Our brains have multiple mirror neuron systems,

for copying body movements, face movements and speech movements, according to fMRI scans of human brains.²



Empathy

There are different hypotheses to explain the role of mirror neurons.

Imitation

Action Understanding

Intention Understanding

The Mirror Neuron system provides the physiological mechanism for linking perception and movement in the brain.⁴

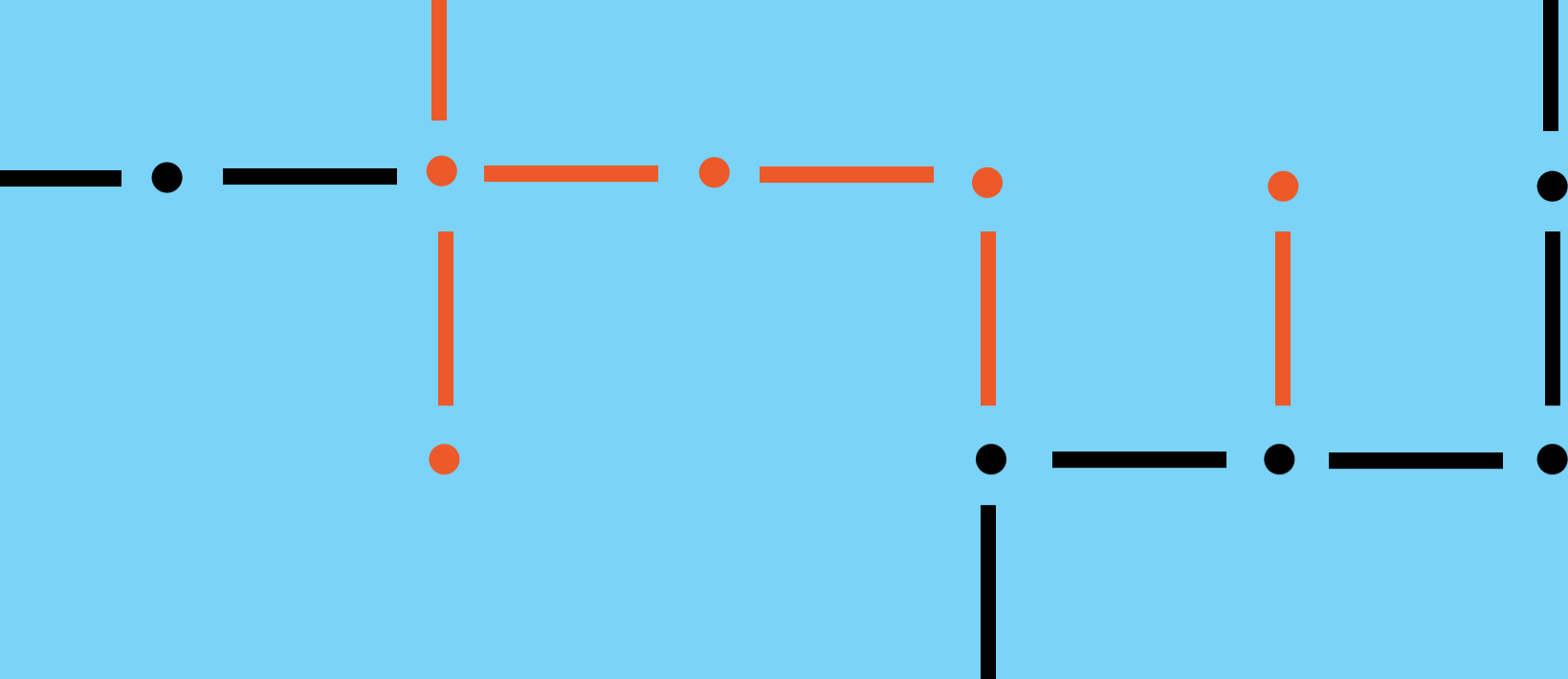


PERCEPTION

MOVEMENT

**Thus, the neuron
mirrors the
behavior of the
other, as though
the observer
were itself acting.**



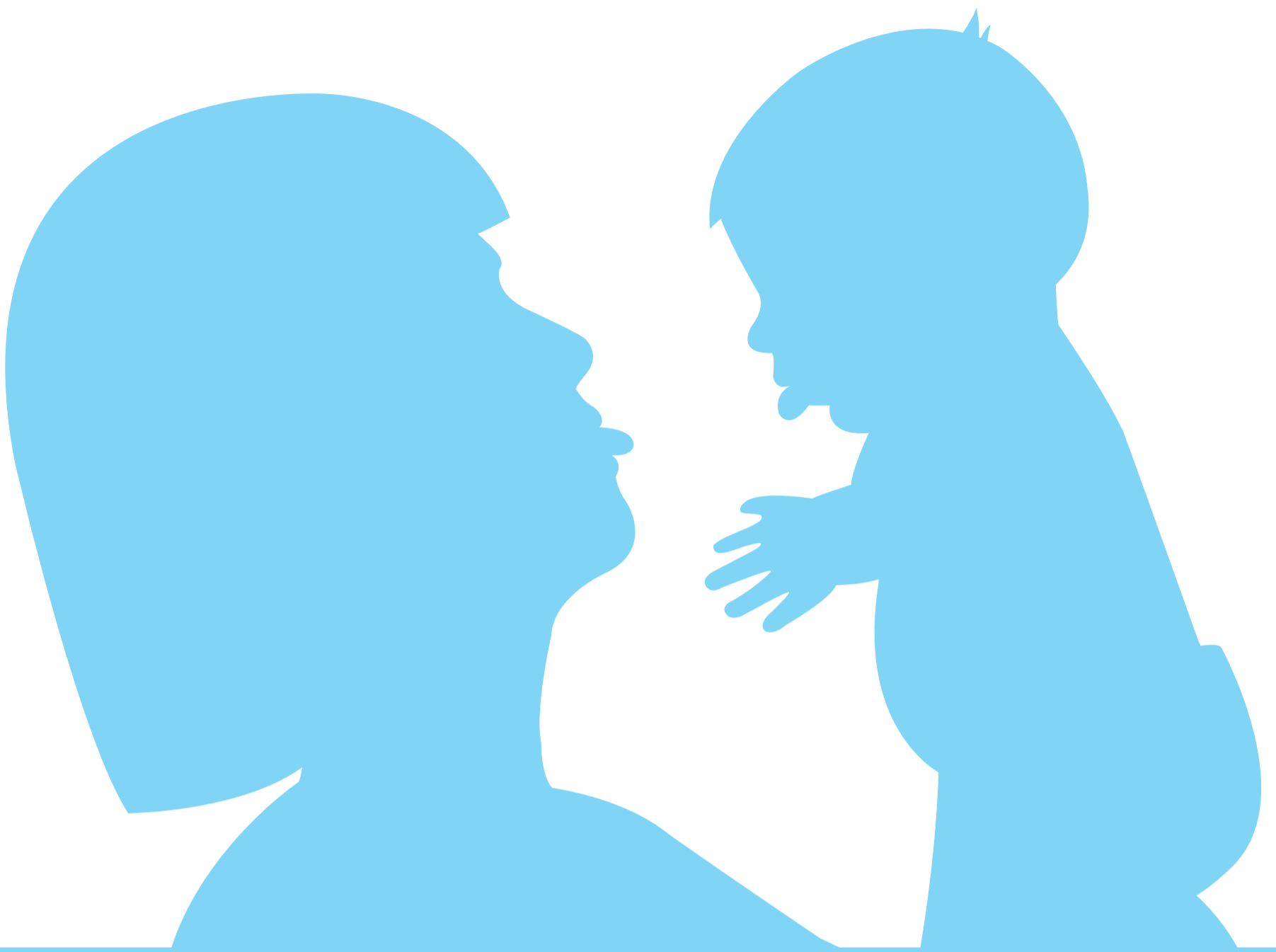


2

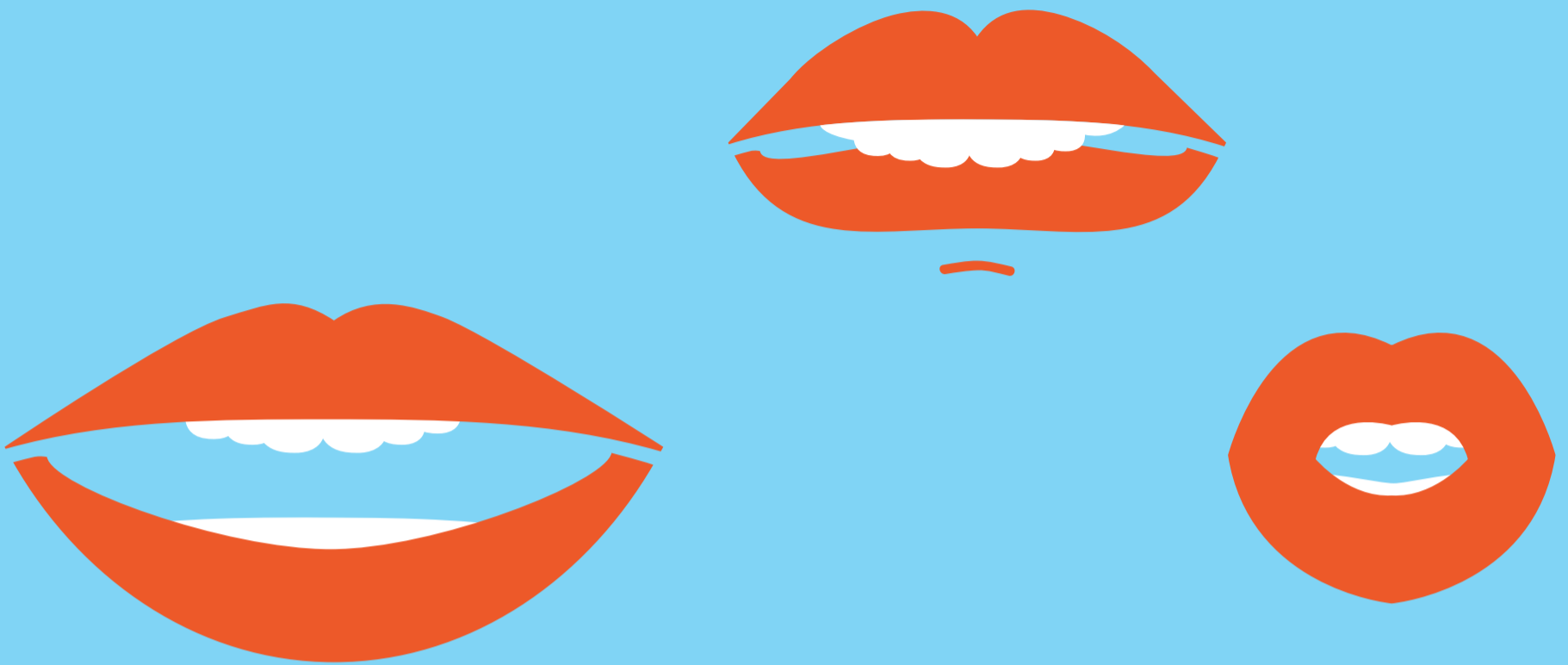
LANGUAGE DEVELOPMENT

The Mirror Neuron system enables us to say what we hear, and to do what we see. This system represents the basic neural mechanism from which language evolved.

Mirror neurons enable us to mimic—and possibly understand—the lip and tongue movements of other people as they talk to us.

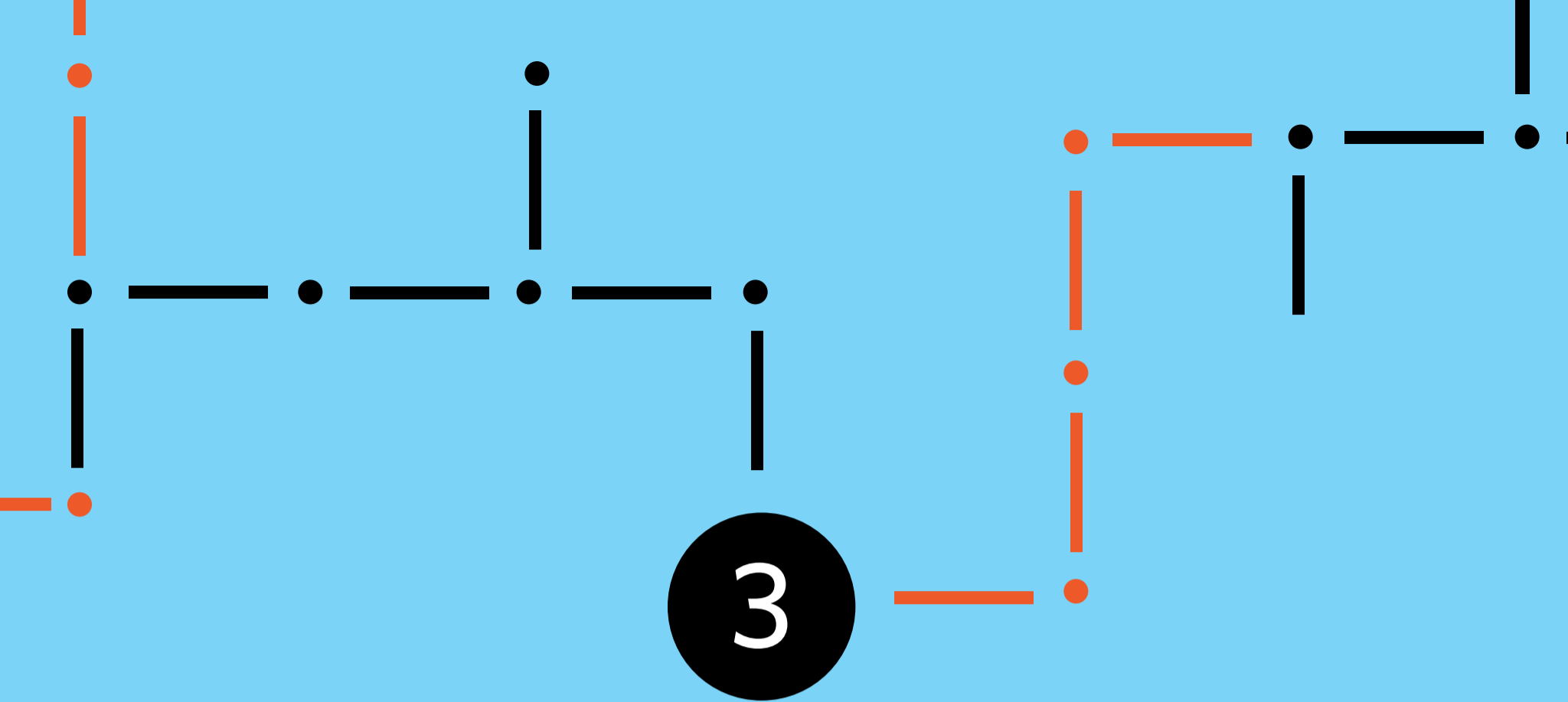


Even when you stick your tongue out at a new born baby, the baby will reciprocate by sticking his tongue out at you.

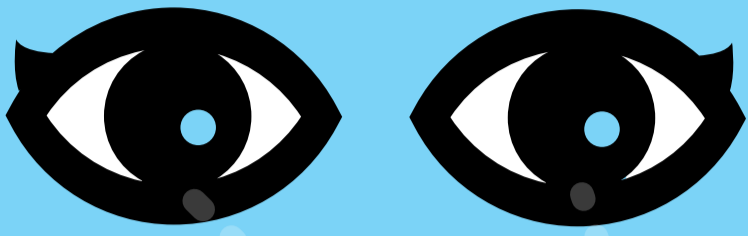


Research indicates that infants map vowels to mouth size based on their experience in seeing mouths open to different extents when humans produce different vowels.

The systematic mapping between vowels and mouth size appears to be grounded on observable physical relationships between the pitch of vowels and the size of objects.⁵



ACTIONS AND INTENTIONS

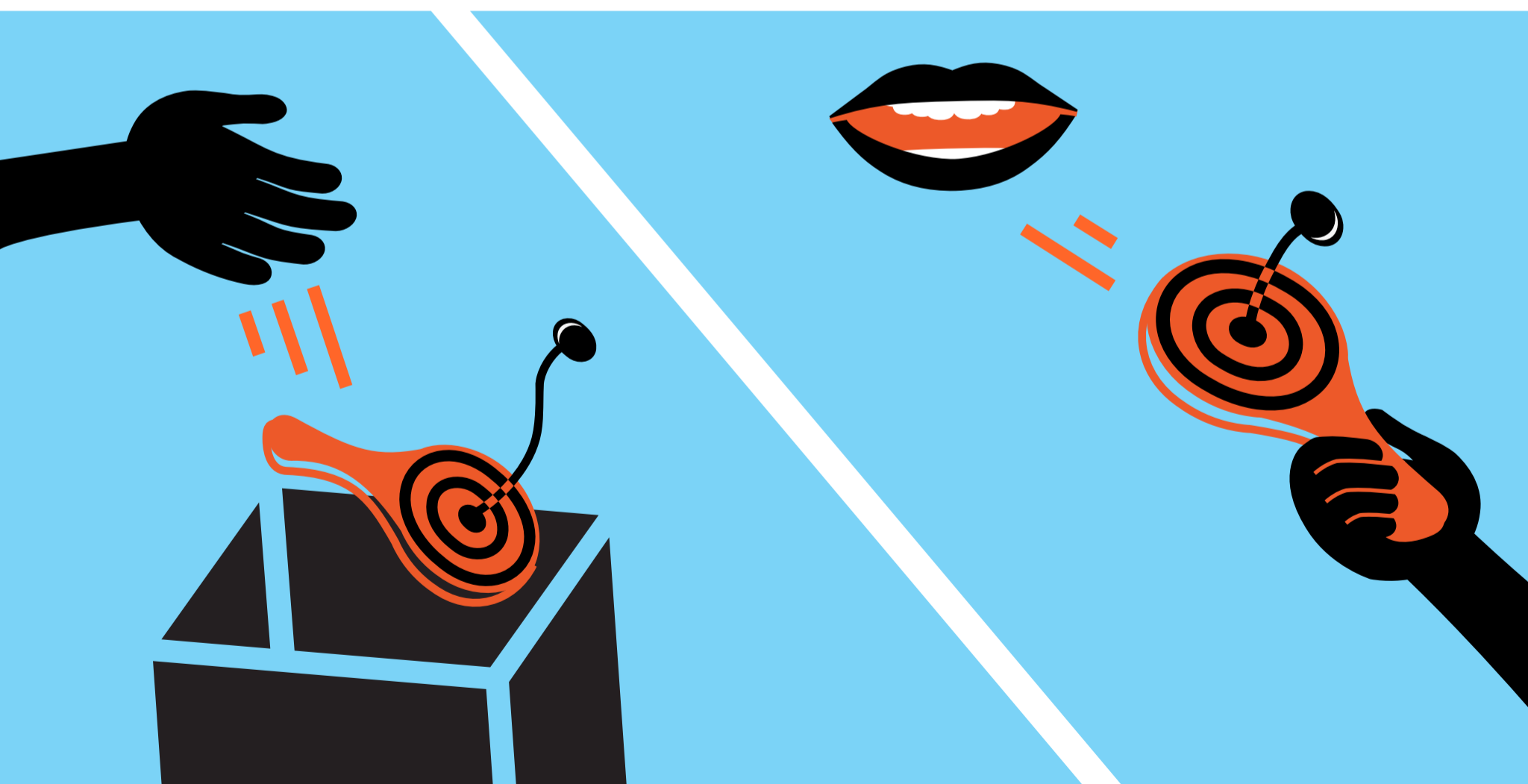


Human infant data using eye-tracking measures suggest that the mirror neuron system develops before 12 months of age, and that this system helps human infants understand other people's actions.⁶



Mirror neurons not only code the goal of an action—such as picking up a toy—but also the overall action intention.

The neurons fire differently when the baby picks up a toy and plans to put it in his mouth or plans to put it in a box.



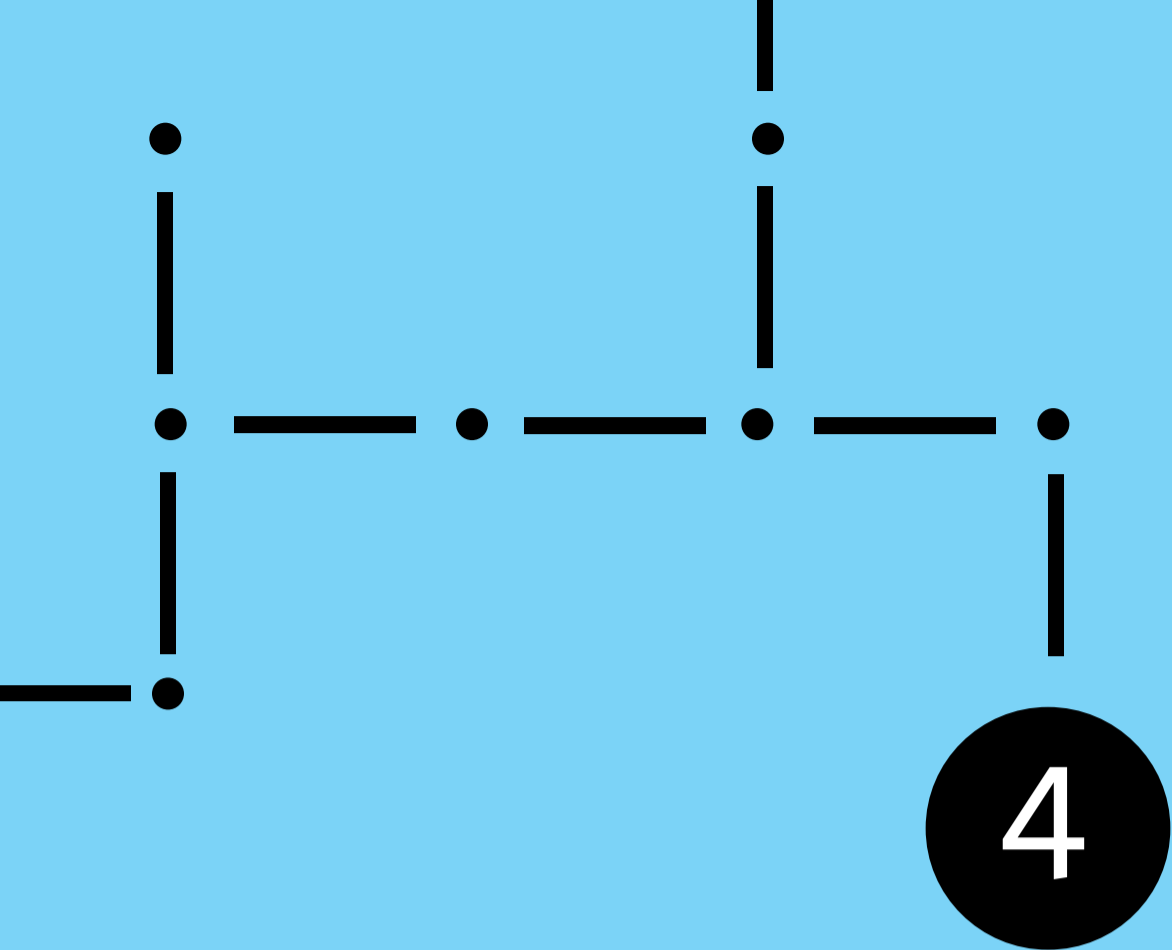
Even though the hand action (grasping) is the same, the **intention** (in the box or in the mouth) requires a different set of neurons, one which encodes both the **action** and the intention.⁶



Mirror neurons are activated more strongly when we are observing familiar behaviors.



When a subject observes a familiar behavioral sequence, his logically related mirror neurons fire in expectation of a certain behavioral event.



VISION AND SOCIAL LEARNING



Vision, language and action

form a closely integrated and highly dynamic system that is tuned to the limits of body movement—speed and accuracy—and to the kind of perceptual information coming from the world with which a person interacts through vision, hearing, smell, touch and balance.⁵

Eye movements during visually guided actions help us understand the close relationship between vision, action and language.⁵

As children develop they watch and imitate people in their environment which helps them develop motor skills and language processing.

NeuroNet helps children develop the mirror neuron system by engaging children in activities that require learning through movement.





Children watch, exercise and talk along with a character model.



The activities are designed to develop motor skills and language processing.



Read our Free Brochure

NeuroNet has condensed more than thirty years of neuroscience research into a practical movement based learning program for students from Pre-K through 2nd grade. Request a brochure to learn more about bringing NeuroNet to your school or Pre-K program.

References

- 1 Rizzolatti, Giacomo, and Laila Craighero. 2004. "The Mirror-Neuron System." *Annual Review of Neuroscience* 27(1):169-92.
- 2 Spaulding, Shannon. 2013. "Mirror Neurons and Social Cognition." *Mind & Language* 28(2):233-57.
- 3 Catmur, Caroline. 2013. "Sensorimotor Learning and the Ontogeny of the Mirror Neuron System." *Neuroscience Letters* 540:21-27.
- 4 Keysers, Christian. 2011. *The Empathic Brain: How the Discovery of Mirror Neurons Changes Our Understanding of Human Nature*. Lexington, Ky.: Social Brain Press.
- 5 Caligiore, Daniele, and Martin H. Fischer. 2013. "Vision, Action and Language Unified through Embodiment." *Psychological Research* 77(1):1-6.
- 6 Falck-Ytter, Terje, Gustaf Gredebäck, and Claes von Hofsten. 2006. "Infants Predict Other People's Action Goals." *Nature Neuroscience* 9(7):878-79.