Guided by Light

Microswimmers can be precisely guided to targets

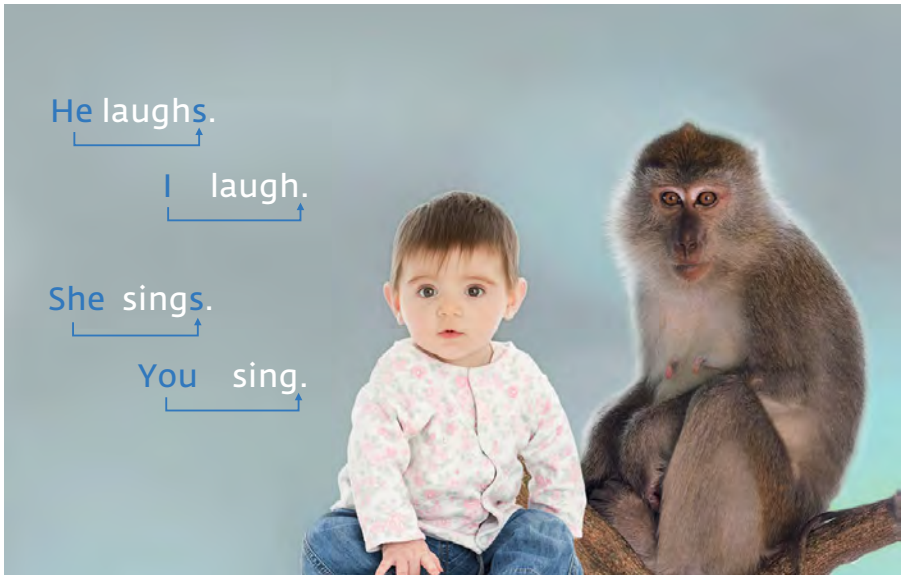
Tiny swimming objects can now mimic an ability that many microorganisms possess: in water containing a dissolved organic substance, they are able to move toward a light source or away from it, as required. To endow microswimmers with this ability, known as phototaxis, researchers at the Max Planck Institute for Intelligent Systems in Stuttgart and the University of Stuttgart use glass microbeads coated with carbon on one side. Upon exposure to light, the carbon layer and the liquid surrounding it warm up. As a result, the water and organic substance partially separate. This gives rise to a gradient in the solute concentration between the uncoated side of the bead and the carbon-coated side. To compensate for the concentration differential, water flows from one side of the microswimmer to the other, propelling it away from the light source. This orientation mechanism makes it possible to use a light source to guide microswimmers through liquids. (www.mpg.de/10756646)

Traveling toward the darkness: Glass beads coated on one side with carbon navigate autonomously away from a light source.

Monkeys with a Knack for Language

Macaques process complex sequences of syllables in a manner similar to babies

Even babies have a sense of grammar: three-month-old infants already recognize the rules for combining syllables and notice when a rule is violated. Scientists at the Max Planck Institute for Human Cognitive and Brain Sciences in Leipzig have now discovered that monkeys also possess at least the rudiments of this ability. The researchers measured electrical brain activity on the scalp of macaques while the animals listened to meaningless but rule-compliant strings of syllables. They discovered that the electrical activity pattern of the animals' brain is similar to that of a three-month-old baby. They could also tell from the macaques' brain patterns that the animals notice when a syllable string is incorrect. This ability must therefore have arisen before the human evolutionary line split off from that of other primates. However, even humans lose this ability as adults: they no longer recognize language patterns by merely listening, like babies or macaques, and have to actively search for the rules. (www.mpg.de/10821435, only in German)



In many languages, syllables follow specific rules. In English, for example, the initial syllables "he" and "she" are followed – at variable distances – by an "s", whereas "I" and "you" aren't. Macaques and three-month-old babies recognize these rules, though the monkeys learn them more slowly than humans.

Graphic: Celia Lozano/MPI for Intelligent Systems/University of Stuttgart (top), photo: MPI for Human Cognitive and Brain Sciences (bottom)