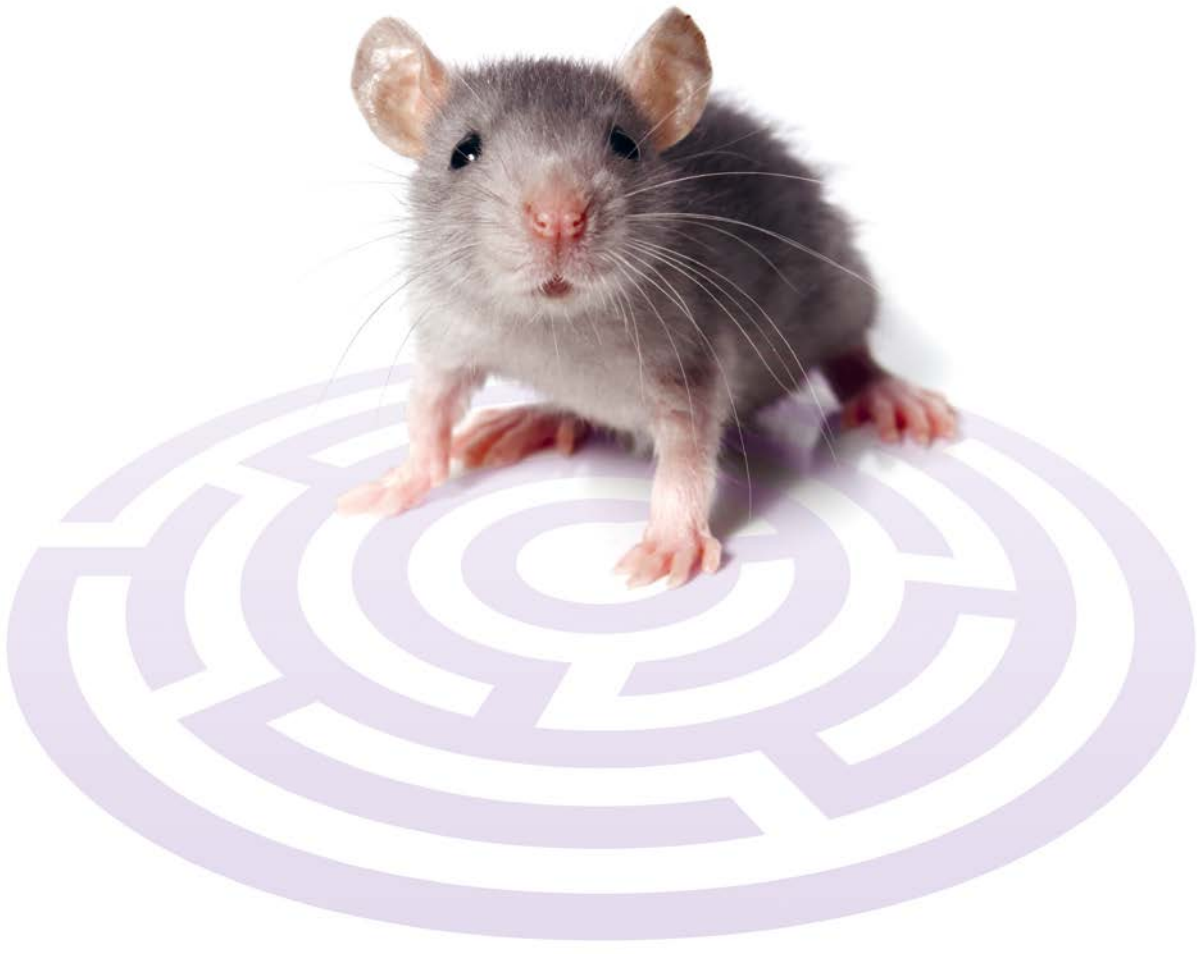
Tinkering mice

How clever are rodents? Knowing the answer can also improve the welfare of laboratory animals.

"Honestly, they are not always the brightest," says Professor Lars Lewejohann, when asked how intelligent mice are. There is some disillusionment involved because Lewejohann has spent a lot of time observing mice. Looking at them solving "lockboxes". These are little mechanically locked plastic boxes that hide rewards for rodents, such as oat flakes. Many of the small mammals need a certain amount of time to open the locks and reach their goal, as biologist Lewejohann discovered after many hours of waiting in front of the laboratory animal's enclosure.

Not all that bright? This assessment may be legitimate from the perspective of Homo sapiens, but it is not fair to the animals, says Lewejohann, limiting his statement. Like us, mice are creatures of evolution. Like us, they have made it to the present day. Their cunning was at least adequate for this. Human intelligence would not



have served them well. The ability to solve differential equations is not very helpful or even cumbersome when fleeing from foxes, snakes and hawks. To survive, mice need an intelligence tailored to their needs.

Intelligence from many perspectives

"Science of Intelligence" is the name of the research network (cluster of excellence) established in 2019. Lewejohann (German Centre for the Protection of Laboratory Animals, BfR) is working with Professor Christa Thöne-Reineke (Freie Universität Berlin) together with their respective teams. The joint project of Berlin's universities and other research partners aims to help understand the principles of intelligence from many different scientific perspectives. Researchers from very different domains have joined together here: from philosophy to robotics and educational science to biology and psychology.

But what exactly is intelligence? According to a provisional definition by the "Science of Intelligence" research group, an intelligent being is characterised by four properties: it adapts its behaviour to the situation, follows certain rules and acts in a goal-orientated and "economical" way (for instance, it does not waste energy unnecessarily). "This means that an intelligent animal understands, for example, how a lockbox works," says Lewejohann. "It has understood the principle."

Learning machines

The extent to which mice are intelligent based on this standard is being investigated by Lewejohann and his team in two projects. Firstly, the animals have to solve lockboxes and are closely observed and filmed while doing so. "Their behavioural patterns can be used as a blueprint for learning machines," hopes Lewejohann.

A second approach focuses on how social signals – for example, a certain facial expression – influence thinking and action. Mice have mimic muscles and can use them to communicate feelings to their companions, such as joy or frustration when opening a lockbox, therefore influencing their actions. If the mouse's body language signals disappointment, for example, an observing conspecific may conclude that they should take their paws off the lockbox and, in doing so, save time and energy. "Emotions can help with thinking and make learning easier," says Lewejohann.

How is the mouse doing?

What does this research have to do with the protection of laboratory animals, to which Lewejohann's team is dedicated? "A great deal," says the scientist. For one thing, there are the elaborate observation methods with high-resolution cameras and statistical evaluations of the animals' behaviour. "Hopefully, we can also figure out if the mouse is doing well or not in this way," explains Lewejohann.

Professor Paws.
A mouse has "cracked" a lockbox.

Secondly, the tricky lockboxes are an interesting challenge and distraction for the rodents. According to current research, the boxes are an "enrichment" in the everyday life of laboratory animals. This can counteract boredom. "You get the impression that they are excited when they get a new puzzle box", reports Lewejohann. "It is not – or not only – about the reward in the box; they also have fun playing with the lockbox."

The aim is, at the end of the "Science of Intelligence" project, to create something new; a piece of intelligent technology based on the research project's findings. How about a robot mouse? That would be pretty bright. ◘

More information:
www.scienceofintelligence.de