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Nonconscious Visual Attention System Identified In Humans

Science Daily — For our hunter-gatherer ancestors, wild animals generally represented either a food source or a potential danger. Detecting an animal's immediate presence and then monitoring its movements was vital to the physical safety, nutrition, and well-being of stone-age families.

Now a team of researchers at the University of California, Santa Barbara has identified a nonconscious attention system, which still exists in the human brain, that maintains awareness of non-human animals and tracks changes in their location, behavior, and trajectory.

The researchers present evidence that human visual attention includes a high-level, category-specialized system that monitors animals in an ongoing manner.

"This system is designed to attend to animals," said Leda Cosmides, a professor of psychology and co-director of the Center for Evolutionary Psychology at UCSB. She completed the study with John Tooby, a professor of anthropology and also co-director of the Center for Evolutionary Psychology, and Joshua New, lead author of the study and a former student at the center. He is now a postdoctoral researcher in the Department of Psychology at Yale University.

Using a common change-detection paradigm in which test subjects were exposed alternately to complex natural scenes and duplicate images that included a single change, the researchers found that participants detected changes involving animals more quickly and with greater accuracy than changes in all other tested categories of inanimate objects.

"This study shows that once the brain recognizes an animal, a monitoring system comes into play. The fact that animals so easily recruit attention and you can't help but monitor them means you're more likely to see something that could harm you or your child," said Cosmides.

Added Tooby: "Animals were also a major source of food for our ancestors. It was very useful to be designed in such a way that you would notice potential family meals that had strayed close enough for you to capture them."

According to the researchers, the attention system was shaped by ancestral selection pressures. It was built into visual attention because of its benefits over evolutionary time. The authors compare it to the human appendix--useful in the past, but unnecessary in our modern environment.

"There's a phenomenon in the brain called inhibition of return that prevents the eyes from returning too soon to objects they've already focused on," said Tooby. "Say your eyes jump to a doorknob across the room. Your eyes won't jump back there again for a while unless something specific draws their attention to it. The brain inhibits them from returning to the doorknob.

"When animals are involved, however, your eyes aren't inhibited from returning to the object. For example, if you catch sight of a rhino and see that it's grazing, your eyes will continue to jump back to it. Your brain is designed to monitor that rhino closely because, unlike the doorknob, at any time it could change position and pose a significant threat to you," Tooby said.

To demonstrate that these differences in inhibition of return represent a characteristic hardwired into the brain rather than a general learning process, the researchers included images of vehicles in the scenes they presented to test subjects.

"Over the course of their lives everyone is trained to watch cars and other vehicles for changes in direction and speed that could represent potentially life-threatening danger," Tooby said. "So what's surprising is that where vehicles are concerned the same inhibition of return exists as with other inanimate objects."

Two of the pictures used in the study showed different scenes of an African savannah: one featuring a tiny elephant standing in the distance and camouflaged against a backdrop of trees, and one with a bright red minivan in the foreground. Both objects appeared and disappeared as the pictures flipped back and forth. Subjects noticed changes to the elephant 100 percent of the time, but almost 30 percent of them missed entirely the changes to the high contrast, bright red minivan.

"You might think that could be attributed to the human mind being more interested in animals than in other objects," said Cosmides. "But we found that what predicted attention was whether or not the targets were animals or people."

Added Tooby: "Many people think that experience is the only thing that makes us what we are. What this tells us is that the evolved organization of the mind matters, even in determining what we pay attention to. And that's surprising to conventional thought."

These findings will be published the week of September 24 in the Early Online Edition of

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Note: This story has been adapted from a news release issued by University of California, Santa Barbara.