If it's important, you'll remember it for longer

William Wells

THE BRAIN puts memories into distinct categories of "shelf life", with the most important being kept for longest. This, at least, is the finding of researchers who have studied memory and forgetting in songbirds. Their birds forget songs only at set times after they first commit them to memory.

All of us forget some things and remember others every day. "Being able to cope in the real world means you have to filter things out," explains Fernando Nottebohm, who led the research at Rockefeller University, New York. Yet while researchers have tried hard to understand how information is committed to memory, they have devoted little effort, says Nottebohm, to finding out how long memories last.

Nottebohm, Sek Jin Chew and David Vicario studied the responses of zebra finches to sounds, including birdsong and human voices. Zebra finches use song to distinguish members of their own species from others, and to distinguish between relatives and strangers. The team recorded the firing patterns of neurons in the birds' brains as they listened. They varied the number of repetitions of each song, and the intervals between repetitions.

When a bird hears a new song, neurons in one specialised region of its brain fire intensely for a short period. If the bird hears the same song again soon afterwards, the firing of the neurons is decreased—suggesting that the bird remembers the song and has become used to it. But when the bird is tested with the song again after a long period, it reacts as if the song were new: its neurons fire as intensely as they did in the first experiment.

Tony Tilford/Oxford Scientific Films

Our song: zebra finches remember their own call longest

The amount of time it takes a bird to forget a song depends partly on how often it has heard it repeated. For example, a song heard 50 times is forgotten sooner than one heard 1000 times. The birds also retain information for longer when it matters to them. For a given number of repeats, unimportant information, such as a human voice, is more rapidly forgotten than the songs of zebra finches, which are remembered for longer than other species' songs.

Surprisingly, the duration of each memory always fell into one of several discrete categories (*Science*, vol 274, p 1909). For example, the memories with the shortest shelf life lasted between 6·5 and 7 hours, medium-life memories lasted between 17·5 and 18·5 hours, and long-life memories lasted for 47·5 hours.

Just how the memories are recorded is not clear. However, other researchers have found that the reinforcement of memory in mammals can be blocked by preventing the synthesis of all the proteins in nerve cells during critical periods. The team found that this was true of the zebra finches: if they blocked protein synthesis between 6·5 and 7 hours after training, a memory that would otherwise have lasted for 18 hours was lost there and then. By contrast, if the team blocked protein synthesis before or after this time, the memory was retained as normal.

Whether human memories also have discrete shelf lives is not clear, but Nottebohm is cautiously optimistic. "If the process we are dealing with is a basic one, we hope that it will turn up everywhere," he says. Tim Tully, who studies the formation of memory in fruit flies at Cold Spring Harbor Laboratory in New York, agrees. □