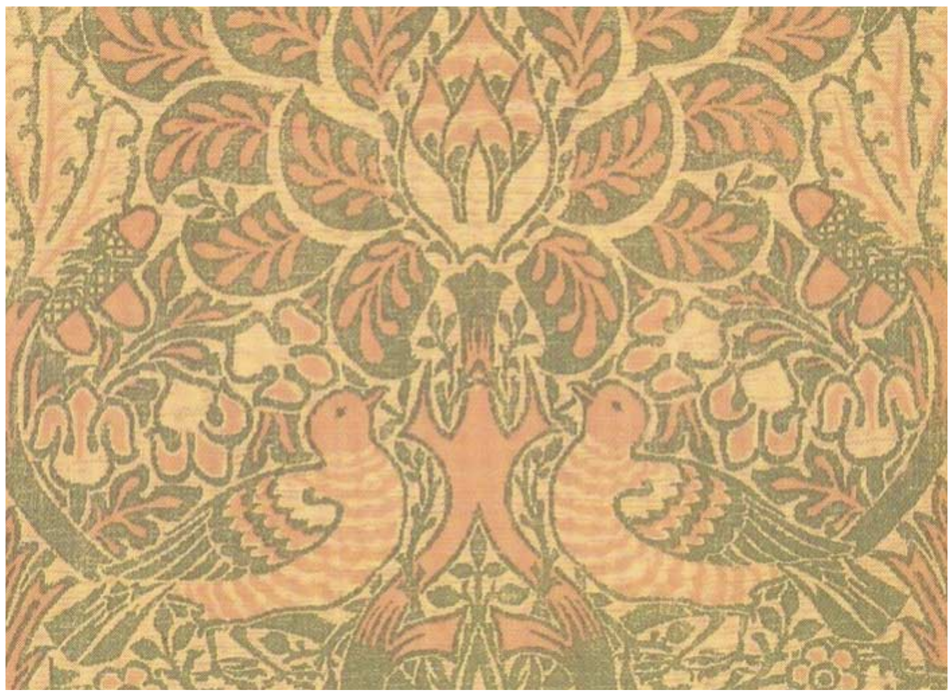
# What We Learned From Songbirds

## The Adult Brain Can Generate New Nerve Cells

Once, neuroscientists believed that our complement of nerve cells was created prenatally and during the first years of life, and that no new neurons could be generated. Now we know that this belief was wrong. It had been thought that unlike other bodily organ systems, such as skin which continuously generates cells to replace those that die or are injured, neurons that were lost due to trauma, stroke or disease were irreplaceable. Recent research has shown that the brain can add nerve cells during adult life. This process is called neurogenesis. These findings and their implications for therapeutic interventions are currently under investigation.



The first solid evidence that adult brains may be able to add nerve cells emerged several years ago from basic animal research involving songbirds. Researchers showed that increases and decreases in the number of neurons in certain brain areas occurred in conjunction with the mating season.[1] Previous research had indicated that a *low* level of neurogenesis occurs in certain regions of the rodent brain, including the hippocampus (a brain region required for the formation of certain types of memory) during the adolescent period, long after the generation of neurons in most brain areas had ceased.[2] But the songbird research yielded such dramatic evidence of neurogenesis that interest in higher animal models was rekindled. Animal investigators went on to show that not only does the rodent brain continue to generate neurons during late adolescence, but that this process continues even into adulthood.[3,4]

With interest spurred by new technical developments in imaging, numerous laboratories are developing a clearer and encouraging picture of neurogenesis. In 1998 and 1999, NIMH-supported investigators showed that the hippocampus in adult monkeys also generates neurons.[5,6] Within a few months of these reports, other researchers demonstrated the phenomenon of neurogenesis in the adult human brain![7]

Ongoing work in laboratories nationwide is finding that the rate at which the new nerve cells are generated can be influenced by environmental factors. For example, stress inhibits the formation of new neurons.[8] These findings are changing the way neuroscientists think about the nervous system, and about possible future interventions to address nerve cell loss due to trauma, stroke or, eventually, diseases like schizophrenia or autism. Information gained to date about neurogenesis also fits well with data from brain imaging studies that reveal a relative decrease in hippocampal volume in patients suffering from recurrent depressive illness with its accompanying increase in circulating levels of stress hormones.[9] It also offers hope that if the rate of generation of new neurons is open to outside influences, perhaps therapeutic interventions may be developed that are capable of actively and precisely repairing the damage wreaked on brains by severe, protracted mental illnesses.

## For More Information

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