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Neuropsychology is a branch of science that combines psychology and neurology. The approach of neuropsychology is to understand how structure and function relate to behavior and skills. Specifically, neuropsychologists may evaluate intellect, learning and memory, motor and sensory skills, and or language skills to name a few (*1*). As appealing as the field may seem, it has been overly dominant with male neuropsychologists. For this reason, it is important to recognize and give credit to the leading women in neuroscience.

Dr. Brenda Milner is a neuropsychologist who works for the Montreal Neurological Institute and has made incredible discoveries within the field of neuropsychology. She was born in Manchester, England in July 1918. During her college years, she studied mathematics but realized it was not her passion. Persuaded by some older students she decided to enter the field of psychology because she was told her interest in philosophy would not earn her a living. As a result, she soon began her work in psychology, which was a relatively new field at the time (*4*).

At this time no one would have predicted that years later she would contribute to the field of neuroscience by making landmark discoveries. She did influential work in the study of the memory and temporal lobes, lateralization of hemispheric function in language, and the role of the frontal lobes in problem-solving (*2*). Most notably was her work with H.M. Studies on H.M. have lead to vast advances into understanding memory and disorders.

At the start of her career, before her work with HM, her initial research was on interhemispheric specialization. Her preliminary goal was to study the functions of the temporal lobes. However once she was asked to study Dr. Penfield's patients during her Graduate program, her work became focused on interhemispheric specialization. Dr. Penfield's patients had one side of their temporal lobe removed and, as a result, she was left to study the remaining half. During this time she read a paper by a famous neurologist who claimed that the left hemisphere was language dominant while completely ignoring the role of the right hemisphere (*2*). Her curiosity and contrasting views from her initial temporal lobe studies caused her to dive deeper into this research.

Based on studies with monkeys she found an area of the temporal lobe involved in complex visual memory (*2*). She then applied these research results to her own study and discovered after looking at patient with right-temporal lesions, that he had difficulty with visual perception and memory (*2*). Her conclusions to these results were that the two sides of the brain have hemispheric specialization. This discovery was one of her many important contributions to neuroscience.

Following her interhemispheric research with doctor Penfield, the two began work on treating epilepsy through surgical procedures. After Dr. Penfield performed a temporal lobectomy on a patient with severe epilepsy, he found that the patient developed serve amnesia. At first they did not know the cause. After another patient developed the same complications post temporal lobectomy the two proposed that there must have been a bilateral lesion on the opposite hemisphere, or the non-operated side. Therefore, once the surgery was performed the patient was effectively given a bilateral lesion. Their discovery was then presented at an American Neurological Association meeting (*2*). Later, Dr. Brenda Milner received a call to come observe a fellow doctors patient who experienced the same complications she has discussed during her presentation. This invitation was to study HM.

HM was a patient who had at 29 underwent an experimental brain operation in order to correct the seizure disorder he had lived with since he was about 10. His seizures would occur without warning and would induce unresponsiveness, convulsions, tongue biting, and possible urinary incontinence (*3*). His severe responses still persisted even when heavily medicated, and so he consented to a bilateral medial temporal-lobe resection that extended posteriorly for 8 cm (*3*). After his operation, HM developed amnesia as he lost the ability to form new memories. However, he showed no deficit in speech or social behavior (*4*) and he was also able to remember events before the surgery (*5*). Due to these large deficits and lack of knowledge as to why they were occurring, H.M. was the focus of many neurologists' studies. For this reason, Dr. Milner was privileged to be a part of such grounding breaking research.

Specifically, Dr. Milner used H.M. and his condition to help her understand learning and memory. Through her research and observations she discovered that H.M. still had part of his memory intact (*6*). Not only did he have the ability to remember experiences before the operation, but also he was also able to perform certain tasks. For example, after practice on a mirror-drawing task H.M. successfully, without even knowing that he had done the task before,

completed it (*4*). His increased learning performance allowed Dr. Milner to propose that certain types of learning did not require the cognitive memory system. This knowledge allowed her to conclude that there were two systems in the brain responsible for creating memories: declarative and motor learning. The division of these two networks provided insight into the different functions of the organs in the brain. The hippocampus was important for declarative memory, which stores names, faces, and new experiences, while motor learning is dependent on other brain systems and is a part of the subconscious (*6*).

The studies done on H.M. were considered by many of Brenda's colleagues to be one of the greatest milestones in the history of neuroscience. It was said to expand the field to the study of human memory and its disorders (*6*). These initial contributions from the pioneers of the 1940's have grown into more complex mechanisms for understanding. Currently, neuroscience has made progress in understanding concepts such as neuronal and synaptic signaling, visualizing of ion channels and receptors, vesicle transport, and development of the nervous system (*5*). There have also been significant increases in the availability and use of functional brain imaging and devices in order to study what is going on within the brain. With all of these advances we may soon be able to start addressing degenerative diseases of the brain just like Dr. Milner scratched the surface of with her work.

That's why, as Dr. Brenda Miller says, curiosity must keep us going. She claims science is not a romantic notion where you make discoveries all the time (*2*). She believes that you must put in the time and effort just like you would at any other job to see the positive results in the end. Her contributions to the field of neuroscience shadow this motto and prove her legitimacy as a prominent woman in neuroscience.

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