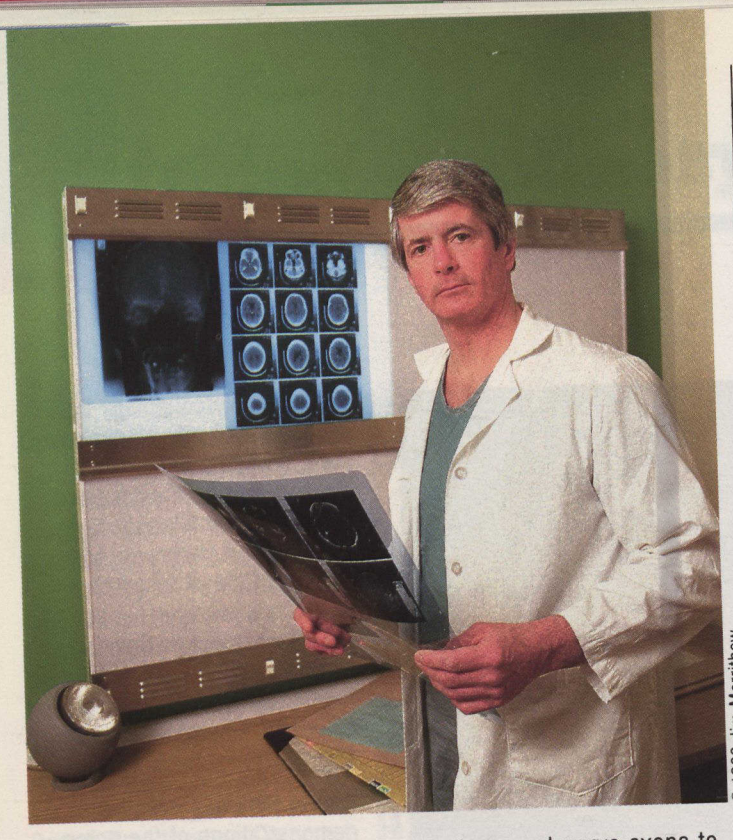

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Dr. Brien Benoit: working to understand the brain's mysteries.

Gusella's pioneering work has set off a wave of studies which are taking scientists steadily closer to the genetic roots of many neurological diseases. For example, in 1987 another Canadian doctor working in Gusella's laboratory, Peter St. George Hyslop, isolated the site of the Alzheimer's gene. Said St. George Hyslop, "We're in a race because the quicker we can isolate the gene, the more likely it will be that we can find preventive, palliative and even curative treatments for this disease," which causes fatal physical and mental degeneration.

Canadian researchers also reported a breakthrough last year in battling multiple sclerosis (MS), which causes creeping paralysis. John Roder, a neurobiologist at Toronto's Mount Sinai Hospital, and Robert Dunn, a professor of neurobiology at the University of Toronto, studied the process of myelination in which certain cells form a sheath around nerve axons to speed the transmission of electrical signals.

In MS the myelin sheath breaks down, cutting off communications from parts of the brain and central nervous system to various parts of the body. Roder and Dunn successfully cloned the gene for myelin-associated glycoprotein, a substance which they say may be critical in the myelination process. "Once we understand how the system develops," noted Roder, "we may have a better understanding of how to get myelination started again once it's broken down."

The rapid pace of new discoveries continues. In March 1988, scientists at the University of Toronto reported that, with the help of California researchers, they had located the gene responsible for producing a brain protein called S100 which likely plays a role in causing Down's syndrome.

Clues to Mental Illness

Genetic engineering is also providing a new direction for research into mental illnesses with clues that such serious disorders as schizophrenia and manic-depressive illness may be genetic in origin.

Only last year, Canadian psychiatrist Anne Bassett made an important discovery after a clue alerted her to the possibility that schizophrenia might be inherited — a fact researchers had suspected. But after Bassett had a geneticist examine two related patients, researchers found they both had an extra copy of part of one chromosome — a one-in-a-million coincidence.

Working from this initial clue, Bassett (currently on a two-year fellowship at New York Psychiatric Institute) has launched a joint project with Canadian researchers. They are searching for large families in eastern Canada, with a history of schizophrenia, from whom they hope to extract blood samples to be examined for recurring genetic patterns.

Bassett believes that her findings may lead to a fundamental breakthrough in understanding schizophrenia. "We have techniques to work with now that weren't even available a few years ago," she says.

Revolutionary Surgery

In a historic four-hour operation, Canadian surgeons at Ottawa's Civic Hospital worked quickly and skilfully under the bright lights of an operating room, removing one adrenal gland from a Parkinson's patient and then implanting seven pieces of its tissue into his brain. Less than a month later, James Keogh, who had been almost immobilized by the debilitating disease prior to the surgery, walked unassisted to a press conference and thanked the doctors for his new lease on life.

Keogh had just had the first adrenal gland implant performed in Canada — a surgical technique developed only three years earlier. Leading the surgical team were neurologist David Grimes and neurosurgeon Brien Benoit, who has improved the still experimental surgery. Benoit's technique minimizes the amount of surgery necessary and uses a greater number of tissue implants, secured by staples to the part of the brain that controls body movement.

Doctors are not certain whether such implants help to reduce the symptoms of Parkinson's because the adrenal cells secrete the chemical dopamine lacking in Parkinson's victims or because they supply a substance called nerve growth factor which helps patients' dying dopamine cells recover. Whatever the reason, the surgery has a 70 per cent success rate with patients enjoying improved speech, movement and balance, although most still experience some symptoms of the disease and require continued medication. As Benoit explains: "We wondered if we should wait longer, until more is known. But then we would be potentially denying patients something that might help them." In Keogh's case, Benoit notes that doctors are "very pleased with his post-operative recovery and there has been a sustained, general improvement."

Towards the Future

The revolution in neuroscience has really just begun and the field remains rich in mysteries. The future, however, promises new treatments for brain disorders unimaginable only two decades ago. It seems that one day, perhaps, the human brain will ultimately succeed in mastering itself.

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