



# Dr. Patricia Broderick

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Educator, City University of New York (CUNY) - Bronx, NY

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Patricia Broderick was just a little girl and her sister Julia was just two years older than she. It was Christmas Eve 1946. The simple Christmas tree stood tall in the living room, at least in their eyes. They didn't have an abundance of gifts, yet all was peaceful and beautiful as Patricia, Julia, and their mother Margaret (Madge) placed their cheeks forward to receive their father's affectionate kiss as he called out, "bye for now... save the star for me". He was on his way to work. Patricia's mother was serving up breakfast while Julia and she were sitting at the kitchen table. Their father was a licensed oxyacetylene torch welder and some heating was needed elsewhere. It was an emergency call.

Patricia and Julia waited patiently, knowing that their father would come home soon. They wrapped presents and listened to Christmas music playing on the radio. They, at least Patricia, was not worried at all because their father, Paddy, always came home from work on time. He and their Uncle Johnny and Uncle Tommy would sometimes go to the pub after supper, and often her dad would take her, her sister, and Mom with him to dance and enjoy the Irish music and sing Irish songs. Pubs were different then. There was Irish music, dancing, and laughter. Patricia's sister and she were also competitive Caeli Irish dancers and they played Caeli and Classical music on the violin. They had a German professor, Professor Wadisch, who taught them classical music on the

violin and the piano accordion. Both of Paddy's children caught the love of music and dancing from their father. Patricia especially loved going dancing with her father and her uncles.

But this night was different. The feeling became ominous as they waited and waited. The tree was decorated, the presents were wrapped, and there was still no star on the tree! Patricia's mother took Julia and her (they were nicknamed Julie and Patsy as kids) into their parent's bedroom and huddled together. Though Patricia could not say that she felt her mother and sister were tense, she felt they were worried. She remembers clearly that she certainly wasn't tense or worried since her father would definitely never leave her. He would come home and everything would be alright. At about 2am, the harsh ringing of the phone startled all of them. Patricia had already fallen asleep but doesn't remember if the others did, though she doubted it. Julia always took care of her mother as the oldest child. Quickly, Patricia's mother answered the call, and then her sister Julia and she remembered hearing, to paraphrase, the words of the Old Testament, the "wailing and the gnashing of my mother's grief-stricken cries". Cries that live with Patricia to this very day. The call was from St. Elizabeth's hospital. Her father had been pinned under the boiler. He was in a coma. The prognosis was not good. Patricia's father died on Christmas Day.

It is quite understated to share with the world that this horrendous event was a milestone in Patricia's family's lives.

"Each Christmas season this distinct inner sense of abandonment abides," Patricia said.

Thus, Patricia named her inventive BRODERICK PROBE® biosensors after her father, Paddy Broderick, the oxyacetylene torch welder who was taken from her on Christmas day. The Foundation is named after her father's sister, her Aunt Lillian Broderick, who allowed Patricia to start the Broderick Brain Foundation with a small, but mighty inheritance from her hard work as a nanny. The Broderick Brain Foundation is the critical conduit between the manufacture of this biosensor and its implementation and application in human and mammalian brain.

This sleek biosensor, smaller than a human hair, is a diagnostic biomedical device, comprised of biologically compatible materials that image neurotransmitter signals selectively in real time from the brain during movement. It is translational to the clinical arena, enabling the study of treatments for neurodegenerative diseases and drug addiction. What this biosensor does, and this is the first biosensor to do so, is to see brain signaling in the natural state and compare with the diseased state on line. This biosensor sees each neurochemical interacting, video tracking electrochemical signaling continuously, enabling patterning of neurochemicals for diagnostic and therapeutic solutions. This BRODERICK PROBE® also allows molecular recognition. It is trainable to transduce specific molecules that are clinically relevant for the diagnoses and treatment specific to a human brain. Thus, this biosensor is poised to enable personalized medicine. The BRODERICK PROBE® has provided a novel sub-field for scientists and physicians, called Neuromolecular Imaging (NMI), and this biosensor respectfully delves into our everyday lives to study the daily use of the neuroprotective effects of the stimulant, caffeine.

As an experienced researcher and reviewer in The National Institutes of Health has stated early

on, "The NMI technique is very innovative and has many advantages over other methods of real time neurochemical sampling." Dr. Edwin Kolodny, MD, formerly of NYU Langone Medical Center said, "These are real time measurements over long periods of time in a living brain; the implications are awesome."

The Broderick Brain Foundation is dedicated to funding training for medical, doctoral, masters, undergraduate, and high school students, as well as professors, doctors, nurses, and healthcare workers in the unending quest to discover "how the brain works". Patricia has invented, developed, patented, and trademarked this series of biosensors as well as the electrical circuits to direct the sensing work of the biosensor. The patents are assigned equally to The City University of New York and New York University and the trademark is owned by Patricia.

**W**ith this biosensor, physicians and scientists can now look right inside the living brain in real time to determine why we behave the way we do in nature, and then it compares the normal/natural neurochemical profile for the animal or human with the profile that occurs when stricken with a brain and/or peripheral disorder. This carbon-based biosensor images neurotransmitter signals within seconds and milliseconds as natural and/or disordered movement happen. The BRODERICK PROBE® saves animal lives and is proven successful in cortical imaging of epilepsy patients intra-operatively. Therefore, this biosensor medley is poised to save many human lives as well.

"Some are tempted to call this biomedical device futuristic," Patricia said. "In fact, it is futuristic because it allows a revolutionary type of neuroimaging for the millennium and beyond". It is clear that the reliability and the usefulness of the BRODERICK PROBE® in the preclinical market, to diagnose and treat brain disease, is accepted worldwide. It is also clear that the clinical use of the BRODERICK PROBE® in the human epilepsy patient is accepted. The relevance of these tiny carbon particles lies in their ability to transduce clinically relevant signals in real time, in vivo, in life, in the brain of the human patient."

# Patricia Broderick

According to Dr. Steven V. Pacia, MD, NYU Langone and Director, Epilepsy, Lenox Hill Hospitals, neuromolecular imaging with this unique biosensor represents a significant shift in the way that physicians and scientists study the chemistry of the brain.

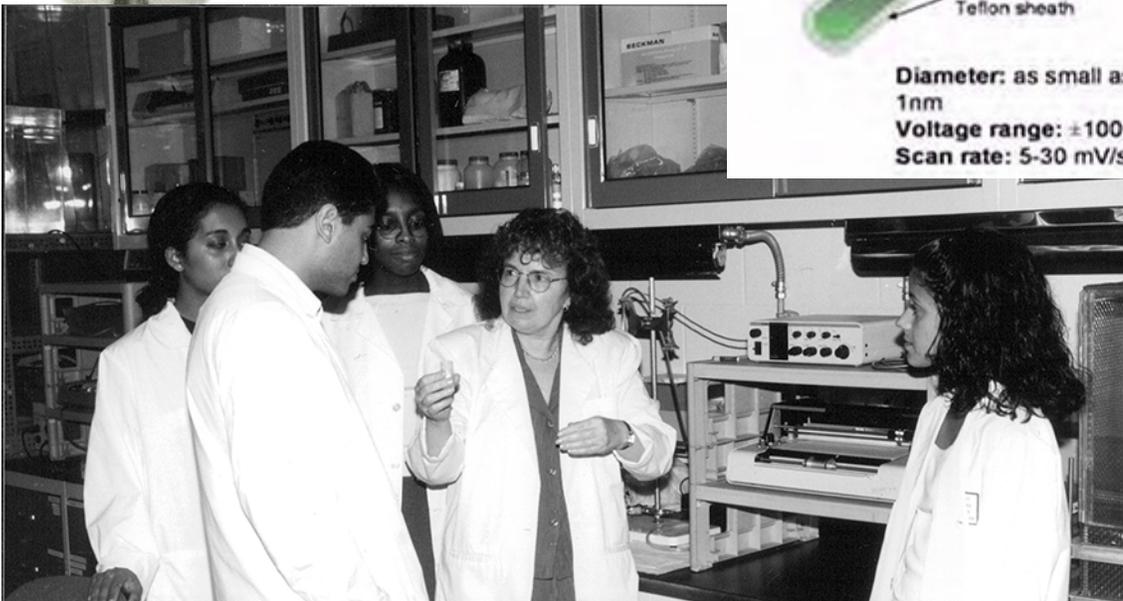
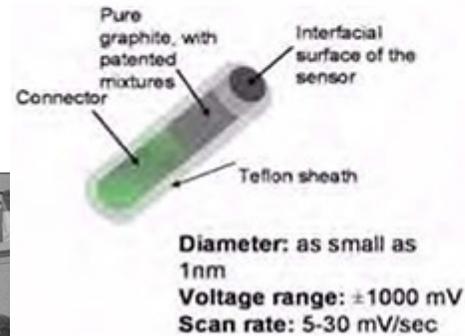
The Foundation is proud of its many successes.

Patricia's technology bridges the gap to link diverse sciences that were previously thought of as unattainable. Through Patricia's inventions the electrochemist can talk with the neurochemist, the biologist can talk with the chemist, and the biophysicist can meet together in the laboratory of biomedical engineering. Patricia's legacy lies in her ability to integrate across diverse disciplines. She has a particular genius in making complex concepts simple. She is the first to link biotechnology with the human and mammalian brain and is a widely recognized expert agent in both education and science. Students of hers are in successful public and professional life. Students of her biosensor technologies are now practicing physicians.



## About The Foundation

The Broderick Brain Foundation is named in honor of Patrick Broderick, father of Dr. Patricia A Broderick.





by and on your side, what you really have is pure, unconditional love as expressed in the Greek Agape, where all else will fall into place”, Patricia said.

As Patricia mentioned in one of her writings for the Thomist and cited from an Asian philosopher, “One of the treasures of a man is his ability to live in the wide house of the world”. This is what her unexpected calling to religious, scholarly, academic, and industrial life has done for her. She has had the opportunity to work and have true friendships with so many in the wide house of the world. It is her belief that the spiritual and technological aspects of life take their course hand in hand. It is synergy in symmetry, as publisher and dear friend Don Odom Jr. has said of Patricia’s life.

“I am reminded of Frost’s work, The Road Not Taken,” Patricia explained. “What would have happened if these calls were not answered? Given the caveat of the existence of free will and being cognizant of the laws of probability, anything can happen at any time”.

Citing Frost, Patricia said about her own choice:

*I shall be telling this with a sigh  
Somewhere ages and ages hence:  
Two roads diverged  
in a wood, and I —  
I took the one less traveled by,  
And that has made all the difference.*

“Perhaps this story may be a stimulus to nourish humanity to see the elegance of a simple scholarly life because inspiring others is an incredible gift,” she said. “I sincerely express gratitude to NADP for giving me the opportunity to detail all the beautifully diverse vocational elements of my life”.

*What is your technology?*

Biosensors and their application to diagnose and treat brain disease.

*What is a biosensor?*

A biosensor is an analytical device that converts biophysical, chemical, or biologic information into an electrical signal.

*What is the BRODERICK PROBE®?*

The BRODERICK PROBE® is a unique series of inventions using organic formulas inserted molecularly into a miniature biosensor that enables imaging of neurotransmitters directly in the living human and mammalian brain in real time, on line, and in vivo within a time period of seconds and milliseconds.

*How big is this biosensor? What does this biosensor image?*

The biosensor is smaller than a human hair and it images neurotransmitters that are neurochemicals that cross the synapse of the neuron.

*What does the neurotransmitter do as it crosses the synapse from neuron to neuron?*

Neurotransmitters, like dopamine, help in movement and play a role in Parkinson’s Disease. Neurotransmitters, like serotonin, help in mood disorders and play a role in depression.

*What is this biosensor made of?*

Carbon. Enter the fascinating world of carbon and the exciting field of nano-biotechnology. This is a field that is revolutionizing science and medicine. These tiny particles play a significant role in imaging how the brain works and how each movement of the body knows what to do.

*Are these biosensors similar to the ones that can keep an elevator door closed or can open a door such as one sees in an elevator?*

No. The BRODERICK PROBE® is much more

complex and works on transducing chemical signals in the brain to electrochemical signals via an electrical circuit, also designed by the author. The signals are imaged on a computer screen in the form of current in milliamperes, nanoamperes, and picoamperes.

*Where does your biosensor fit in relationship to the scientific progress for the millennium?*

The BRODERICK PROBE® biosensor and its many aspects of nano-biotechnology defines the scientific progress for and into the millennium. It is the first translational device made in the laboratory that has already met with success in the diagnosis of the epilepsy patient. The studies are done intraoperatively, another means of discovering new types of brain surgery for epilepsy. Intraoperative studies helpful to Parkinson's patients will advance treatment for Parkinson's dramatically with the use of this biosensor and its related biotechnologies.

*How does your biosensor fit into moving the economy forward? Is there a market for these biosensors?*

Yes, there is a market for biosensors. As I wrote in an editorial for the J. Biochips and Tissue Chips as editor-in chief, market growth for biosensors is virtually exploding. Market growth for biosensors is predicted to reach \$8.5 billion in US dollars by 2018. Indeed, licensees for our biosensors have already come forth and we welcome others for discussion.

*What does your business bring to society, to the layperson? Will the lay person and society benefit from your business of biosensors?*

Psychiatric disorders and neurodegenerative diseases are in the forefront of our work and this field is in need of being understood in a way not imagined previously. In fact, I have found that the lay person really enjoys learning how the brain works and what devices are used to study the way the brain interacts with behavior. I was speaker at Community Service Seminars at the American Turners Assn. for the lay person. The room was crowded with people wanting to learn. I found that people were sincerely hungry for this knowledge of my technology.

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