

Journal of Neurotherapy: Investigations in Neuromodulation, Neurofeedback and Applied Neuroscience

Remembrances of Erwin Roy John August 14, 1924 to February 28, 2009

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Published online: 19 May 2009.

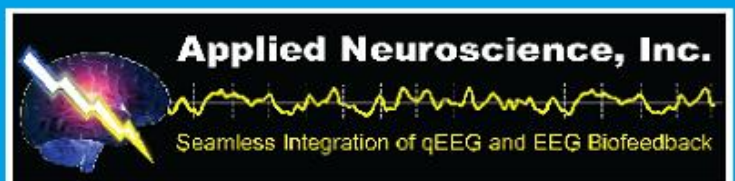
To cite this article: Robert W. Thatcher Director PhD (2009) Remembrances of Erwin Roy John August 14, 1924 to February 28, 2009, Journal of Neurotherapy: Investigations in Neuromodulation, Neurofeedback and Applied Neuroscience, 13:2, 97-99, DOI: [10.1080/10874200902886769](https://doi.org/10.1080/10874200902886769)

To link to this article: <http://dx.doi.org/10.1080/10874200902886769>

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IN MEMORIAM

Remembrances of Erwin Roy John August 14, 1924 to February 28, 2009

With the passing of Erwin Roy John, the field of clinical neuroscience has lost a great scientific mind and a lover of mankind. Roy positively impacted the lives of thousands of scientists and clinicians with his many penetrating ideas and global synthesis, which formed his unique contribution to science. I met Roy in 1971 while a postdoctoral fellow at Albert Einstein College of Medicine. My dissertation had examined memory retrieval in animals using an experimental design inspired by his 1967 book *Mechanisms of Memory*. When we met, Roy was actively pursuing his ideas on EEG and single-unit phase synchrony. He and Pilar Morgades had recently published their seminal papers on single unit and local field potential studies of memory retrieval, which was a culmination of Roy's earlier work with Keith Killam. Roy and Pilar Morgades were the first to report zero phase binding in multiple units, and in 1976 Alexes Ramos, Eric Schwartz, and Roy published a series of multiple-unit studies showing zero phase lag binding during stimulus generalization in cats.

People who knew Roy well were always amazed by his depth of thought and sheer intelligence. He spoke fluent Spanish and translated German during World War II, and he had a global international mindset that was both expansive and penetrating. I had the good fortune of assisting him on a grant application to the National Science Foundation (NSF) in 1971 in which we proposed quantitative EEG (QEEG) analyses

of learning disabilities and an age-based normative database. The 5-year grant was funded in 1972 and allowed me to join his laboratories at New York Medical College as an assistant professor in psychiatry. Our grant included a single sentence for eyes closed and eyes open continuous EEG and 50 pages dedicated to active-task evoked potentials because we believed that active tasks would tap particular functions and the resting EEG would best serve as a reference. In 1974 we received a notice that an NSF site-visit team would visit the laboratories the following week. We were in a bit of a panic and we ended up working 12- to 24-hr days analyzing the only data available, which was the eyes closed and eyes open EEG. We were all surprised when we obtained 97% discriminant accuracy between children with learning disabilities and age-matched controls. I vividly remember the presentation to the National Institutes of Health (NIH) visitors dressed in suit and ties while Roy sat on a table and lectured in his typical T-shirt and Levi's, painting broad and encompassing descriptions of our analyses. The site visitors were very impressed and wrote a glowing review. We continued to analyze about 20 different task evoked potentials over the next few years but failed to match the sensitivity and specificity obtained with just one minute of eyes closed EEG. The evoked potential analyses were published in our book *Neurometric Evaluation of Brain Function in Normal and*

Learning Disabled Children in 1989, and the NSF grant formed the foundation of “Neurometrics” and eventually gave rise to the first Neurometrics *Science* article in 1977, which inaugurated the field of large-scale QEEG assessment.

During this same period Roy and I co-authored the book *Functional Neuroscience: Foundations of Cognition, Volume I*, a joint effort in which Roy explored the topic of consciousness and mental states and I wrote chapters on basic neurophysiology of emotion and thalamocortical synchronization and zero phase lag binding, coherence, and perceptual frames. Roy integrated his earlier work on nonrandom coherence and consciousness and constructed a “hyperneuron” model of consciousness, which he later abandoned. Years later Roy would add a thalamocortical pacemaker and a perceptual frame mechanism to his model of consciousness based on binding at different frequencies. His scholarly mind continued to shape and hone his model until it culminated in the paper “From Synchronous Neuronal Discharges to Subjective Awareness” in 2005, a tour de force of intellectual brilliance.

Roy dreamed of transforming psychiatry into a quantitative and brain-focused science, and toward this end we taught medical students multivariate statistics and clinical neuroscience. In these courses we had an opportunity to integrate clinical symptoms with functional neuroanatomy as well as QEEG assessment. In 1973 we opened the world’s first QEEG evaluation clinic, relying on Matousek and Petersen’s normative database until we developed our own. We trained psychiatry residents in the science of EEG quantitative analysis and this process of education, in combination with a QEEG clinical service, was sustained by Roy throughout his lifetime.

Roy is the most intelligent and warm-hearted person that I have ever met, with a huge passion and depth of understanding about innumerable things. He was politically radical and opened his home to refugees from Chile after Allende was overthrown by the CIA. He frequently traveled to Cuba and befriended Fidel Castro, and over time

built the first psychiatric and neurosciences institute in Cuba. Roy attracted a large group of very bright and energetic people during his career including Eric Schwartz, Leslie Prichep, Bernie Karmel, Paul Easton, and many others. We use to have regular meetings with scientists and mathematicians with international reputations including Buszaki’s mentor Grastyan, and Americans Walter Freeman and John Tukey, co-author of the FFT algorithm. These were very exciting days with many new thoughts and much creativity.

In 1977 Roy moved to NYU School of Medicine and I became an associate professor and worked in his labs. We had several large grants and a team of about 50 people collecting and analyzing EEG and evoked potentials in different locations. Roy continued to travel to Cuba and spent a lot of time there while we struggled to meet deadlines in New York. We created several normative databases, and it was during this period that I learned what not to do and what is best to do when building a normative database. When I moved to the University of Maryland as a full professor in 1979, I continued to collaborate with Roy and moved the same 20 amplifiers used for the development of NxLink to the University of Maryland. This is one of the reasons that the Neuroguide database is so compatible with the NxLink database.

During this time Roy and I became interested in EEG biofeedback, influenced by Steven Fox and Alan Rudell’s work on operant conditioning of single units and evoked potentials. Roy asked me to write and direct the EEG biofeedback treatment section of a 1975 grant to the Department of Education. We began EEG biofeedback in only a few participants before the grant was prematurely terminated and priorities shifted in 1977; however, the idea of using neuropsychological assessment and QEEG to guide EEG biofeedback protocol design was included in the Department of Education study. In 1998 I wrote a paper in the *Journal of Neurotherapy* titled “EEG normative databases and EEG biofeedback,” which was largely a rehash of the ideas that we were kicking around in the early 1970s

with Roy John and this approach eventually evolved into z-score biofeedback in 2004.

Roy's compassion for others transcended national boundaries. In 1988 he asked me to help organize an international conference in Cuba. Fidel Castro had approved his proposal and funds were available to pay for travel and lodging. We compiled a list of outstanding scientists interested in consciousness and higher mental functioning, and I was fortunate to travel to Cuba, attend the conference, and meet Fidel Castro.

I again had the good fortune of collaborating with Roy in 1992–1993 when I was working at NIH and edited the volume *Functional Neuroimaging: Technical Foundations* in which there were 10 chapters on the integration of QEEG/MEG and PET and SPECT and MRI. In my chapter titled "Human Neural Network Dynamics Using Multimodal Registration of EEG, PET and MRI," we gave credit to E. Roy John for his early measures of neural "binding." Roy enthusiastically embraced modern advances in neuroimaging and published several papers on EEG co-registration with positron emission tomography data.

Roy was a natural born scientist, he loved experiments and creating new ideas, and he

was an immense thinker. Roy was well trained in mathematics and had the ability to cut to the heart of the matter and find solutions during moments of conflict and chaos. He would often suddenly conceive of an idea and, knowing it to be true, leave the details to others. At times his conceptual insights would take your breath away. Roy was gregarious and generous with his time and his ideas. He possessed a deep moral conviction and identified with the suffering in the world and wanted to help others. The development of neurometrics and his other contributions to clinical neuroscience were motivated by his moral perspectives and awareness of his ability to make a real difference in people's lives.

Roy had six children and was a dedicated father. I was always impressed with his dedication to his children and his depth of feeling and his love of mankind. We all owe a great debt of gratitude to Roy, and I will always miss him.

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