

## Obituary

## Craig Emery Tenke, 1950–2017

Craig Emery Tenke, born October 19, 1950, passed away unexpectedly on December 19, 2017, at the age of 67. Craig, having worked as a senior neuroscientist and dedicated electrophysiologist at New York State Psychiatric Institute (NYSPI) and Columbia University for many years, was at the prime of his career and in keen pursuit of new challenges. He served as an *Associate Editor* for *Clinical Neurophysiology* from 2008 to 2016, and as a member of the Editorial Board from 2003 to 2008.

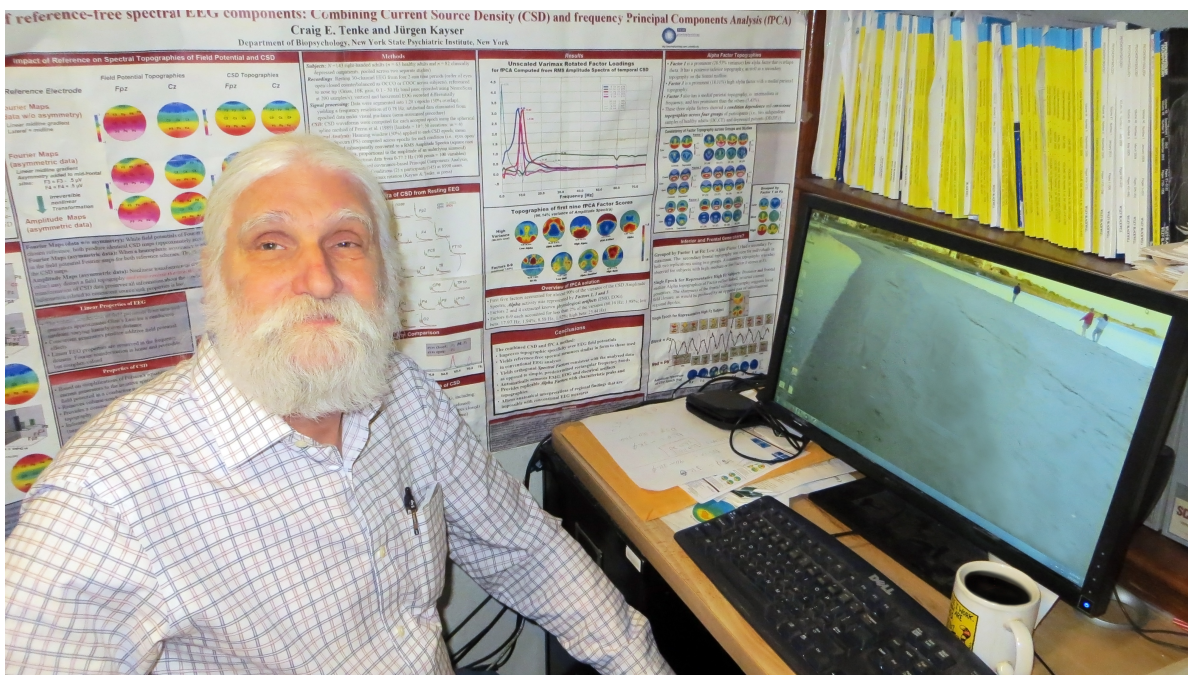
Craig earned an A.S. degree in Science from the Suffolk County Community College at The State University of New York (S.U.N.Y.) in 1971, a B.A. summa cum laude in Psychology from Stony Brook University at S.U.N.Y. in 1972, an M.A. in Neuropsychology from Queen's College at the City University of New York (C.U.N.Y.) in 1976, and a Ph.D. in Neuropsychology from C.U.N.Y. in 1983. From 1983 to 1987, Craig completed his post-doctoral training in Neuroscience at Albert Einstein College of Medicine ("Einstein"), and he continued to work with Joseph C. Arezzo, Herbert G. Vaughan, Jr., and Charles E. Schroeder as a *Research Associate* until 1988.

Throughout these early years, Craig was the recipient of several community and intramural scholarships. He supported his training by working as a *Laboratory Assistant* (S.U.N.Y. Stony Brook, 1971-1972), *Adjunct Lecturer* and *Grant Assitant* (C.U.N.Y. Queen's College, 1973-1981) and also as a *Scientific Programmer* (NYSPI, 1981-1984). By that time, he had developed significant hands-on experience with mainframes, emerging microprocessor systems, and relevant programming

languages, such as assembler, FORTRAN, and BASIC.

Craig's programming skills were supplemented by his first hand know-how in designing, building and repairing electronics. This blend established Craig's roots in the Psychophysiology Laboratory within the Department of Biopsychology at NYSPI. The Psychophysiology Laboratory was founded and directed by the (late) Sam Sutton, who is recognized for the groundbreaking discovery of the P300 component (Sutton et al., 1965). Working with Sutton and Gerard E. Bruder developed Craig's curiosity about both event-related brain potentials (ERPs) and applying EEG/ERP measures to clinical research in psychopathology, particularly depression. Together, this combination became an integral part of his own research; wherefore, after Sutton's death in 1986, Craig assumed the position of the principal electrophysiologist in the Psychophysiology Laboratory. In this role, he meticulously guided acquisition, analysis and interpretation of scalp-recorded human EEG and ERP throughout the remainder of his life.

Brain structures and functions always fascinated Craig. At one point, he found himself in charge of a lab section on the gross dissection of human brain specimens for a medical school class. His early intracranial work in electrophysiology at Queen's College and Einstein – using both open and closed stereotactic techniques (Tenke, 1983) – involved a number of species, including rat, rabbit, cat and monkey (e.g., Schroeder et al., 1991). Out of respect for his animal research subjects, Craig chose to be a vegetarian, avoiding food from the same



branch or higher on the evolutionary tree.

It did not take long for Craig to recognize that enduring scientific progress via empirical research can only be accomplished by strict adherence to the scientific method. Accordingly, Craig emphasized relying on verifiable quality criteria (objectivity, reliability, validity) throughout his academic career, long before scientific rigor became a popular phrase. For example, interpreting treatment-related changes in EEG power spectra requires knowledge about their condition-dependent internal consistency (Tenke, 1986), identifying artifactual electrode bridges in EEG recordings is mandatory for faithfully interpreting their topographies (Tenke and Kayser, 2001), and a multisite study needs to establish adequate test-retest reliability of electrophysiological measures before embarking on a randomized-clinical trial (Tenke et al., 2017a).

These experiences and insights afforded Craig a unique set of neuroanatomical, mathematical, and (bio-)engineering skills that motivated an informed evaluation and study of the underlying generators of the EEG and ERP signal. His methods included dipole models and simulations (Tenke and Kayser, 2015), current source density (CSD) analysis spanning microscopic (intracranial) and macroscopic (scalp-recorded) scales (Tenke et al., 1993; Tenke and Kayser, 2012), and component identification and simplification using principal components analysis (PCA) across spectral and temporal domains (Tenke and Kayser, 2005; Tenke et al., 2008, 2010). I had the good fortune to begin working with Craig in the mid-90's. Our joint interest in systematically tackling common pitfalls of reference-dependent surface potentials that originate from principles of volume conduction and choice of EEG recording reference, combined with the need to define meaningful outcome measures (variance patterns), has produced a series of empirical, technical and theoretical papers on CSD and PCA (e.g., Kayser and Tenke, 2003, 2006a, 2006b), including a special issue on how reference-free surface Laplacian (CSD) methods render superior electrophysiological measures (Kayser and Tenke, 2015).

While applying these methods to human EEG research, Craig was simultaneously cognizant of their strengths, limitations and nuances, and although he operated almost entirely behind-the-scenes, he was truly restless in his efforts to raise the bar for the field and educate his peers if needed. These qualities were on display during his generous peer review efforts, not only for this journal but also as an ad-hoc reviewer for numerous scientific outlets and review committees. His guidance was sought after by scholars both locally and around the globe.

Throughout his life, Craig trained and mentored technicians, doctoral candidates, postdoctoral fellows and colleagues in the conduct of electrophysiological research, all the while being exceptionally unselfish with his time and often leaving

a lasting impression on his peers with his unique sharp intellect and quirky personality. During his academic career, Craig served as a principal investigator or co-investigator on multiple grants awarded by the National Institute of Mental Health, philanthropic foundations and the pharmaceutical industry to study cognitive and neurophysiological functions in mood disorders and psychosis, often with the goal of evaluating the suitability of these measures for characterizing symptom features or diagnostic subtypes of major depressive disorder or for the prediction of antidepressant treatment response (e.g., Bruder et al., 1997, 2008). For many highly productive collaborations within NYSPI/Columbia as well as on a national and international level, Craig represented the electrophysiological component of the project and personified a cornerstone of methodological excellence.

Craig loved his home in Center Moriches, New York, on Long Island, where he lived with his family for his entire life. He served his community as both a spiritual leader and informal educator: he was a Ruling Elder at the Presbyterian Church of the Moriches (1998-2011) and a Sunday Jr.-Sr. High School teacher (2007-2011). Craig was a (proudly) outspoken voice in his congregation regarding controversial issues such as *Intelligent Design* and *Sexual Minorities*. Craig's faith and science coexisted: he was ever conscientious about distinguishing between religious belief, moral values, ethical standards and scientific reasoning. He was also inquisitive about the interplay between these concepts and their possible relevance for mental health. As a result, Craig was instrumental in obtaining funding from the John F. Templeton foundation to help understand the role of religious or spiritual belief (R/S) in the resilience of families at risk for depression, given evidence suggesting a link between posterior EEG alpha at rest, a putative biomarker of antidepressant treatment response (Tenke et al., 2011), and the ontogenesis of R/S importance (Tenke et al., 2013, 2017b).

Craig's legacy can be found in the continuation of the research he initiated with his scientific rigor, curiosity and generosity. Although we have lost a valued colleague who is sorely missed in this mission, Craig E. Tenke inspired electrophysiological research, cognitive neuroscience and clinical neurophysiology for years to come.

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