Obituary
James W. Beauchamp
1937–2022

James W. (Jim) Beauchamp, a Fellow of the Acoustical Society of America and of the Audio Engineering Society and professor emeritus of music and electrical engineering at the University of Illinois Urbana-Champaign (UIUC), died on May 5, 2022, at the age of 84.

Jim grew up in Michigan. He studied and played jazz trumpet at Albion College, Albion, Michigan (1955–1957) and went on to earn his BS (1960) and MS (1961) in electrical engineering from the University of Michigan, Ann Arbor. He pursued doctoral research at the University of Illinois, earning his PhD in electrical engineering in 1965.

Jim's doctoral dissertation, *Electronic Music Instrumentation for the Synthesis, Control, and Analysis of Harmonic Musical Tones*, was highly influenced by composition faculty member Lejaren A. Hiller Jr., and other members of the UIUC Experimental Music Studios. The dissertation described one of the first practical additive voltage-controlled electronic music synthesizers, known as the Harmonic Tone Generator (HTG). The HTG synthesized six exact harmonics with variable fundamental frequency and independent amplitude control. Jim's voltage-controlled synthesis work was contemporary with that of Robert Moog. In fact, Beauchamp and Moog independently presented their first analog synthesis papers at the Audio Engineering Society Convention in 1964, but unlike Moog, Beauchamp's muse was academic research and collaboration, not commercialization. His work with the HTG resulted in a flexible platform for studio experimentation, providing sounds for influential electronic music compositions such as Salvatore Martirano's piece "Underworld." The HTG is now preserved in the UIUC Library's Sousa Archives and Center for American Music.

When Jim joined the UIUC electrical engineering faculty in 1965, his technical focus moved from analog electronics to digital audio software. In 1968, he spent a year working on automatic speech recognition at the Artificial Intelligence Laboratory at Stanford University, Stanford, California, using formant-tracing software he developed. Returning to UIUC in 1969, Jim began a unique joint appointment between the schools of music and electrical engineering, attracting students interested in cross-disciplinary work between the two programs.

Jim's research soon encompassed time-varying spectral analysis and synthesis of musical sounds via computer. One of his key technical contributions was experimental software to calculate the time-varying spectral centroid, or *brightness*, of musical instrument tones played at different volume levels. He utilized these empirical observations to control additive synthesis techniques mimicking the natural spectral evolution of brass instruments with a variety of musical timbres.

In the 1980s, Jim and his students developed an extensive set of digital audio and music signal-processing software routines, the sound analysis package (SNDAN). During his years leading the UIUC Computer Music Project (1984–1993), he also led the development of Music 4C (M4C), a comprehensive computer music synthesis package. Moreover, Jim's music analysis/synthesis research contributed vital technical insights for fundamental frequency tracking algorithms, musical vibrato models, and nonlinear audio processing.

Jim retired from the UIUC faculty in 1997 but remained active in the musical acoustics field, including organizing sessions at many meetings of the Acoustical Society of America.

Jim is survived by his wife of 40 years, Karen; his children Nathan, Kara, Warren, and Bryan Beauchamp; and several grandchildren.

Selected Publications by James W. Beauchamp

Beauchamp, J. W. (1966). Additive synthesis of harmonic musical tones. *The Journal of the Audio Engineering Society* 14, 332-342.

Beauchamp, J. W. (1982). Synthesis by spectral amplitude and "brightness" matching of analyzed musical instrument tones. *The Journal of the Audio Engineering Society* 30, 396-406.

Beauchamp, J. W. (2007). Analysis and synthesis of musical instrument sounds. In Beauchamp, J. W. (Ed.), *Analysis, Synthesis, and Perception of Musical Sounds*. Springer Science+Business Media, New York, NY, pp. 1-89.

Maher, R. C., and Beauchamp, J. W. (1994). Fundamental frequency estimation of musical signals using a two-way mismatch procedure. *The Journal of the Acoustical Society of America* 95, 2254-2263.

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