

**University of Rochester  
Department of Electrical and Computer Engineering**

**FM Synthesis: 50 Years in Art and Industry**

**John Chowning  
Professor of Music Emeritus  
Stanford University**

**Wednesday, November 15th  
12:00PM – 1:00PM  
Wegmans Hall 1400**

Abstract: It was in 1957, 60 years ago, that Max Mathews at Bell Telephone Laboratories wrote the first sound synthesis program, Music I that he developed and released as Music IV in 1963. Running on mainframe computers at large institutions, the production of music was slow and costly. My naive discovery in 1967 of frequency modulation synthesis was computationally efficient, with few but perceptually salient controls, and time-varying spectra. This led to a rapid increase in music synthesized by computers. We learned much about the perception of sound as we wrapped our aural skills around the technology and discovered how to create music from fundamental units. Then in 1983, under license from Stanford University, Yamaha released its famous DX7 synthesizer. Coupled with a personal computer through the development of MIDI, computer music “hit the streets” resulting in the widespread use of computers in music production. The presentation will include sound-synchronous animations that demonstrate my development of FM synthesis from the first experiments 50 years ago, the breakthroughs in 1971 and 1978, to my most recent compositions.

Bio: Chowning was born in Salem, New Jersey in 1934. Following military service and four years at Wittenberg University, he studied composition in Paris with Nadia Boulanger. He received the doctorate in composition (DMA) from Stanford University in 1966, where he studied with Leland Smith. In 1964, with the help of Max Mathews of Bell Telephone Laboratories and David Poole of Stanford University, he set up a computer music program using the computer system of Stanford's Artificial Intelligence Laboratory. Beginning the same year he began the research that led to the first generalized surround sound localization algorithm. Chowning discovered the frequency modulation synthesis (FM) algorithm in 1967. This breakthrough in the synthesis of timbres allowed a very simple yet elegant way of creating and controlling time-varying spectra. Inspired by the perceptual research of Jean-Claude Risset, he worked toward turning this discovery into a system of musical importance, using it extensively in his compositions. In 1973 Stanford University licensed the FM synthesis patent to Yamaha in Japan, leading to the most successful synthesis engine in the history of electronic musical instruments. [interview about FM synthesis Jun 17, 2015, Barcelona <http://rwm.macba.cat/en/sonia/john-chowning-/capsula>] Chowning was elected to the American Academy of Arts and Sciences in 1988. He was awarded the Honorary Doctor of Music by Wittenberg University in 1990. The French Ministre de la Culture awarded him the Diplôme d'Officier dans l'Ordre des Arts et Lettres in 1995 and he was awarded the Doctorat Honoris Causa in 2002 by the Université de la Méditerranée and in 2010 by Queen's University, Belfast. He taught computer-sound synthesis and composition at Stanford University's Department of Music. In 1974, with John Grey, James (Andy) Moorer, Loren Rush and Leland Smith, he founded the Center for Computer Research in Music and Acoustics (CCRMA), which remains one of the leading centers for computer music and related research.

Pizza and soda provided