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Leland Smith (1925–2013)

Leland Clayton Smith, a pioneer of music notation software, died on 17 December 2013 at the age of 88. As a child, from the age of eleven, he took a serious interest in music. After four years of piano and wind lessons, he benefited from the proximity of Darius Milhaud, a recent (1940) émigré who joined the music faculty at Mills College (at that time an all-female institution) near the Smith family home in Oakland, California. Leland studied counterpoint, orchestration, and composition privately with Milhaud from 1941 to 1943, when he turned 18 and joined the U.S. Navy. During his service, which continued into 1946, he was stationed mainly in Bremerton, Washington. Playing six instruments, Leland enriched the 13th Naval District Admiral's Band with his versatility.

After his discharge, Leland matriculated at the University of California, Berkeley. There he completed both a baccalaureate and a master's degree in composition in less than three years. The fabled harmony and composition seminars of Roger Sessions left lasting impressions, as did a strong cohort of fellow students, among them Leon Kirchner and also Jeanne Bamberger, who became a lifelong friend of both Leland and his wife Edith.

Leland studied composition with Olivier Messiaen at the Paris Conservatoire in 1948–1949. He initially settled in New York, working mainly as a bassoonist, but interleaved invitations from the San Francisco Opera Orchestra (1950) with engagements with the San Francisco Symphony and the New York City Ballet. He assisted Milhaud at Mills (1951–1952). These various activities were terminated by an offer from the University

of Chicago, where he taught from 1952 until, in 1958, he was hired by Stanford University. During his Chicago years, Leland worked with the Chicago Lyric Opera and the Chicago Symphony.

Throughout his tenure at Stanford (which continued officially until his retirement in 1992) Smith taught harmonic analysis and composition. In 1963, he developed his own textbook, which was not initially published. Countless Smith pupils (41 of whom received advanced degrees from Stanford) recall their teacher in superlatives. In 1979 the printed *Handbook of Harmonic Analysis* became the first book containing music to be entirely typeset by computer, using Leland's notation software. This achievement was facilitated by the software's auxiliary drawing program (inspired by Edith's needs as an artist), which enabled the user to interleave text, notation, and graphics.

After six years at Stanford, Leland was awarded a Fulbright Scholarship (1964–1965), which enabled him and his family (by then including three children) to spend a year in Paris. While he was gone, his student John Chowning immersed himself in the possibilities of computer music as described by Max Mathews at Bell Telephone Laboratories in New Jersey. Chowning recalls that Leland encouraged this deviation from the academic norm. "Do it," Leland said, "but promise that you will teach me all that you learn when I return."

Chowning did just that. Well steeped in Music IV, which he had learned under the guidance of Max Mathews and John Pierce, Chowning explained how the process of generating music electronically involved typing lists of data to feed parameters for unit generators into a computer. David Poole, a young researcher, had already rewritten Music IV in DEC PDP-10 assembly language and called the new version Music 10.

Leland learned how to use Music 10 within a few days. Chowning showed him the program and gave him a FORTRAN manual so that he could work on it. Leland mastered the principles of programming quickly but found typing lists of data cumbersome. In 1966 he devised a music-input language, SCORE, to take the drudgery out of the process. It represented "a great advance in 'computer music,' which is what we called our medium," says Chowning. At that time SCORE ran only on the DEC PDP-10s, but the availability of an input system attracted both composers and students.

The original SCORE served as a preprocessor for a sound-synthesis language, but Leland soon focused on an auxiliary system called MS for typesetting conventional scores. The first output from his notation program, which we now know as SCORE, appeared in 1970. An early example of plotter output (see Figure 1) shows a short passage from György Ligeti's *San Francisco Polyphony* (1973–1974).

Another early trial involved realizing a score for the performance of Henry Cowell's *Rhythmicana*. Smith described the complexity of Cowell's instructions for notation of the work in an article in the *Anuario interamericano de investigacion musical*, Vol. 9 (1973; available at http://www.jstor.org/stable/779909). This project was reincarnated for the celebration of Mathews's 80th birthday in April 2007, with the substitution of a Radio Baton (played by Mathews) for the rhythmicon (an instrument co-designed in 1930 by Cowell and Leon Theremin to generate multiple rhythmic patterns simultaneously).

This welter of activity in which MS played such a big role contributed to motives for the establishment in 1975 of the Center for Computer Research in Music and Acoustics

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Figure 1. MS plotter output (sample) showing a small excerpt from György Ligeti's San Francisco Polyphony (1973–1974). (Photograph by Craig Sapp.)
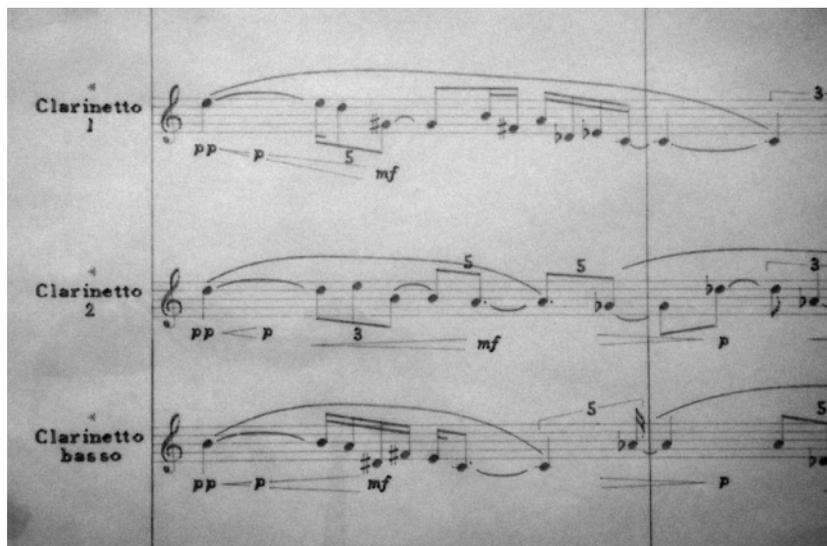
Figure 2. Cofounders of CCRMA (1975). Seated: James (Andy) Moorer. Standing (left to right): Leland Smith, John Grey, John Chowning, Loren Rush. (Photograph: Stanford Publicity Department.)

Figure 3. Leon Theremin with Leland Smith at a presentation (with Max V. Mathews, not shown) on the origins of computer music during Stanford University's centenary celebration (1991). (Photograph by Patte Wood.)
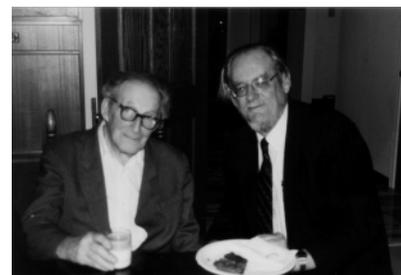

Figure 1

Figure 2

(CCRMA), of which Leland, with colleagues, was a co-founder (see Figure 2). CCRMA was housed until 1986 in Stanford's artificial intelligence building (the D. C. Power Lab), high on a hill two miles west of the main campus.

Lectures and demonstrations over the balance of the 1970s and 1980s drew many noted figures—among them Pierre Boulez, Luciano Berio, John Cage, and Theremin (see Figure 3)—to CCRMA to see the miracles of computer-generated sound

and computer typography. According to those who worked with him, Leland would bend over the plotter to watch as each musical system emerged. Aborting print jobs was forbidden (MS was so notorious for its consumption of resources that most jobs were run after midnight), so Leland would store in his head a running list of errors and their conjectural solutions. The ease with which Leland immersed himself in the world of code "was an extension of his love of music," observed Gareth Loy, in one of several reminiscences at a CCRMA memorial on 18 January 2014.

Leland's notation software was able to notate music of arbitrary complexity and to incorporate a seemingly infinite range of user-defined symbols. Guitar tablature and a wide range of other instrument-specific markup won it many friends. See Figure 4 for an example of its flexibility.

Once MS moved to the DOS platform under the name SCORE, in 1984, publishing houses took note. In Germany in 1988, Schott adopted SCORE as its preferred software for critical editions of classical music, and others soon followed. Long series of volumes of complete works (e.g., of Verdi, Wagner, Weber, Webern, Schoenberg, and Ives) have been undertaken in SCORE. The more complex the score, the more SCORE shows itself to occupy a class of its own. For the Verdi edition Leland

Figure 4. Excerpt from Hyo-shin Na's Rain Study *(2000), a composition that Craig Sapp typeset in 2000 using SCORE. Rhythm is implied by spatial position rather than by standard notational conventions.*

created dotted slurs (to replicate what is in the composer's manuscripts). He cared deeply about the aesthetics of traditional notation and never privileged efficiency over appearance and legibility.

When Leland retired in 1992, a two-day symposium on music printing by computer, complemented by classics of electronic and electro-acoustic music facilitated by one or another version of SCORE, was held at Stanford. Elements of SCORE are still taught today at Stanford (see http://wiki.ccarh.org/wiki/Music_253/CS_275a_Syllabus).

Throughout its personal-computer years SCORE has been available through the San Andreas Press, based in Leland's home in Palo Alto. Users recall the help line being answered on occasion by grandchildren, as Leland sought to balance his domestic life (which included interactions with many animals, including donkeys pastured nearby) with his determination to keep service personal.

According to Chowning, "SCORE . . . became, and remains, the benchmark by which all new music publications are judged. Leland Smith led music publishing into the digital age."

[Editor's note: We thank Eleanor Selfridge-Field of Stanford University's Center for Computer Assisted Research in the Humanities for kindly writing this obituary.]

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