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OBITUARIES

This section of the Journal publishes obituaries concerning the death of Fellows of the Society and other acousticians eminent in the world of acoustics. When notified, the Editor-in-Chief solicits a summary of the person's life and contributions from an ASA member thoroughly familiar with the details, if possible. If a promised obituary is never received, a brief obituary notice may be published later.

Franklin Seaney Cooper • 1908–1999

Franklin S. Cooper, pioneer and educator in the field of speech science, died 20 February 1999 at the age of 90 in Palo Alto, CA. He was a Fellow of the Acoustical Society of America and of the Institute of Electrical and Electronic Engineers (IEEE). He was born 29 April 1908 in Robinson, IL. He would sometimes tell us of his rural upbringing there. His first degree, a B.S. with honors in Engineering Physics, was awarded by the University of Illinois in 1931. His doctorate, a Ph.D. in Physics, was awarded by the Massachusetts Institute of Technology in 1936. His early career was spent as a research engineer at the General Electric Laboratories in Schenectady, NY. In 1935, while still there, he and Caryl P. Haskins founded the Haskins Laboratories as a private not-for-profit research group. That year he married Frances Edith Clem, who died in 1991.

Frank Cooper was a major force in promoting, organizing, and leading early contemporary research into the acoustics of speech production and perception, as well as, later, the study of underlying physiological mechanisms. This happened during the latter part of his stint as Associate Research Director of Haskins Laboratories, 1939–1955, and then as President and Research Director, 1955–1975. In his retirement, he continued to make himself available to the Haskins program as Associate Research Director until 1986, when he and his wife migrated westward. Frank Cooper's other role was that of educator. In the mid-1950s he started opening up the vistas of interdisciplinary speech research to generations of graduate students of linguistics and, later, psychology and speech and hearing.

With limited resources, Frank Cooper's technical originality and ingenuity came to the fore. The invention of the sound spectrograph at Bell Telephone Laboratories, when it became generally available after the Second World War, greatly facilitated acoustic studies of speech. The design was modified by Frank in order to build a photographic spectrograph that produced spectrograms as film transparencies that could be used with his speech synthesizer, the Pattern Playback. He designed the latter to accept either spectrographic patterns by transmission of light through such photographic spectrographs or by reflected light from painted patterns of simplified spectrograms. These patterns could be either derived from real speech or created systematically in steps along selected dimensions of the spectrum to test hypotheses about the information-bearing elements of the speech signal, what we fondly called the acoustic cues. Although other speech synthesizers existed or soon came into being, for example, DAVO of the Massachusetts Institute of Technology, PAT of the Signals Research and Development Establishment and the University of Edinburgh, and OVE II of the Royal Institute of Technology, Stockholm, Cooper's Pattern Playback turned out to be the first one to be used extensively for experiments in speech perception. Frank Cooper also designed other special-purpose synthesizers in the early days: Octopus, Voback, Intonator, and Alexander. Of these four, only the Voback and the Intonator were used extensively for perceptual experiments. They were, in a sense, "parasitic" on Homer Dudley's Vocoder. This was all before we had computers. For the execution of these plans, much help was given by the late John M. Borst.

Even in his relentless determination to push the program forward, Frank's benevolent presence and insightful management gave birth to a rich, heady, inspiring atmosphere of interdisciplinary research during the New York City years. Whether working as individuals or as groups of collaborators, the members of the research staff talked to each other quite easily and readily. There was daily interaction and consultation among physicists, engineers, psychologists, linguists, phoneticians, and physicians. This was bolstered by Frank's very selective drawing upon university faculties in the northeast for part-time associates who could meet under the same roof but still meld their work at Haskins with their academic programs on campus. There was, in addition, a small full-time professional staff together with indispensable support people.

Stimulated by earlier work at Haskins on guidance devices for the blind and by ongoing work on reading machines for the blind, Franklin Cooper, Alvin M. Liberman, and Pierre Delattre were the prime movers in groundbreaking speech research, including what I call the quest for the cues to speech intelligibility. The cues being hunted were mostly those of American English, but those of other languages soon engaged the group's attention. Others who came into the group very early were Louis J. Gerstman, Katherine S. Harris, and Leigh Lisker. Frank felt strongly that an important practical outcome of this line of research would be a contribution to the generally acknowledged need for a system of synthesis of speech by rule. One pressing need for this was in the domain of reading machines. Indeed, although the practical availability of such a machine for blind users was eventually achieved by others, the feasibility of such an idea was greatly aided by Frank's projects.

I hasten to add that Frank was equally interested in the theoretical implications of this early work on speech perception. What can we learn about the transmission of linguistic information through the articulatory modulation of sound from excitation sources? Is speech perception constrained simply by auditory, that is, psychoacoustic limitations, or is there a much more abstract level that enables us to transmit and process information from speech signals at such high rates? How might children learning their first language establish boundaries in production and perception between phonologically relevant categories? Are motor control and perception separate domains, or are they intimately and systematically linked?

Work on that last question, with much momentum from the thinking of our late colleague Alvin M. Liberman, led to the famous—or in the minds of some, infamous—motor theory of speech perception. While deeply involved in research and the resulting articles on the topic, Frank Cooper never promoted a party line at Haskins Laboratories, even when one seemed to exist in the eyes of some beholders. At our frequent afternoon tea gatherings, there was much lively discussion of these theoretical issues. From those early forms of the motor theory has emerged a revision commonly known as the gestural theory of speech perception. Even so, at Haskins this appears in two versions, the one espoused by Alvin Liberman and Ignatius G. Mattingly, and the other, differing in significant ways, the one espoused by Carol Fowler. Some of the rest of us, without necessarily being advocates of one view or the other, have tried to shed light on the matter by running experiments on possible links between the production and perception of speech. Frank did not have it in his temperament to demand a party line, nor do we have one to this day.

In any event, this theoretical direction led Frank to advocate a program in electromyography to look "upstream" in the musculature, as he said, at the control of motor activity in speech. Perhaps there we would find the unity of the phoneme and the links with perception. Although his hopes in this regard were not realized, a great deal of important work on physiological mechanisms underlying the production of speech was carried out under the leadership of Katherine S. Harris. To this one should add the several fiberoptic studies on laryngeal and velopharyngeal behavior and x-ray motion pictures with sound stretched threefold to match the slow motion of the film.

On a number of occasions, for example, at IEEE meetings, Frank sought to convince communications engineers that these kinds of research provided an indirect but vital approach to problems of speech compression and processing. It should also be mentioned that Frank, together with other distinguished people in our field, played an important role in reporting on two trying public issues, the controversy over voiceprints and the mysterious 18-minute gap in the Nixon audio tapes.

At the instigation of the late Professor John Lotz, Frank Cooper ac-

cepted an appointment as Adjunct Professor of Linguistics at Columbia University in the fall of 1955, an unusual step for a man whose degrees were in engineering and physics. Thus he became a pioneer in introducing graduate students of linguistics, most of them with not much background in physics and advanced mathematics, to an acoustic approach to study and research in phonetics. As a member of that first class, I was indelibly marked by Frank's teaching and guidance. Each week, about seven of us took the subway train down to Grand Central Station to walk over to Haskins Laboratories in its old factory building on the three floors above a necktie factory, where we spent three or four hours listening to Frank's lectures, which were typically accompanied by revealing demonstrations. Anyone who got deeply involved in a research project was encouraged to spend extra time there.

It must be said that even in those days and before, there existed courses in speech science in departments of speech and hearing, but I believe that Frank's course in Acoustic Phonetics, named after the landmark book by Martin Joos, was one of the first, if not *the* first, to lay before students of language a new philosophy, a new outlook on how to design experiments that might answer linguistically and psychologically relevant questions about the production and perception of speech. With nothing much in print that could serve as a textbook for such a course, he led us by the hand through the reading of primary sources, the work of outstanding scientists of the day, people we have been accustomed to seeing and hearing at meetings of the Society.

In those years, a few students of psychology brought down one by one from Connecticut by Al Liberman, one from linguistics at Columbia, and one from the University of Pennsylvania did much or all of their doctoral dissertation work at Haskins with the way cleared by Frank. Indeed, for one of them, me, Frank was the principal adviser. With the move of the laboratories to New Haven, Frank, who then became Adjunct Professor of Linguistics at the University of Connecticut and Senior Research Associate in Linguistics at Yale University, put great emphasis, as soon as he could, on getting research assistantships within our grants for graduate students of Haskins staff members from those two institutions, as well as the City University of New York and the University of Pennsylvania, where we also had research associates.

Clearly, Frank Cooper was one of the luminaries in the postwar period whose impetus caused the great upsurge in research into the production and perception of speech that, happily, is still with us today. Much of the increase in this momentum should be attributed to his being a significant force in drawing into the stimulating arena of interdisciplinary research, graduate students in a variety of programs concerned with an understanding of language and speech.

I hope that I may be forgiven for ending on a personal note. Both as a scientist and an admirable human being, Frank Cooper strongly influenced my career and my life. He was my teacher, my dissertation adviser, my boss, my colleague, and my friend. I miss him very much. He is survived by his sons Alan Kent Cooper of Palo Alto, CA, and Robert Craig Cooper of Amherst, VA, four grandchildren, and two great-grandchildren.

ARTHUR S. ABRAMSON