R. Paget and Human Speech

Richard (Arthur Surtees) Paget studied formally at Eton and Magdalen College, Oxford, and entered law. His professional career holds limited interest to scientists, although it contributed to Sir Richard's administrative appointment to the Admiralty Board of Invention and Research in World War I. In this post his flair for avocational interests and his bent toward matters of science were rewarding. The interests that eventually led to major contributions included acoustics, phonetics, the sign language of the deaf, and, his avowed lack of information notwithstanding, linguistics.

The searching inquirer who pursues a hobby beyond the level of the dilettante has some advantages over his more formally trained colleagues who hold the unofficial rank of specialists. He can be more daring. Sir Richard exemplified this favorable position both in his quest for information about speech and language and in the theoretical views that he postulated. Frequently in his *Human Speech* (1930) he recounted the steps that led him to noteworthy observations only to discover subsequently that he had confirmed or was in disagreement with the earlier work of an expert.

Sir Richard's interest in speech was comprehensive, encompassing essentially the communication system: the speaker, the language, and the receiver. These segments, however, he explored unevenly, and only a few aspects will be singled out for mention here.

Spectral analyses of the acoustic patterns of speech were made many times by ear prior to the electronic era. Paget, unaware of the earlier results, made yet another ear-analysis and formulated a systematic set of results that showed dual formants or frequency bands as typifying each vowel sound. The motivation for this analysis may have had roots in some observations and speculations about voices during his youthful college period, and was reinforced by practical matters of acoustics during World War I, particularly in connection with the submarine. The analysis was realized during a period of confinement in 1921. These results anticipated the confirming description of the sounds of English speech yielded by well-equipped laboratories.

The investigator who takes apart the acoustic spectrum of speech is often moved to make the process work in reverse. Aside from applied considerations, success in synthesizing speech tends to confirm both the rational planning and correctness in the execution of the analytic steps. Any listing of "speech makers" from de Kempelen (1791) to a current generation of engineers in telephone and governmental laboratories and in universities would include Paget. His observations of two formants for each vowel led him to devise double-resonator models, and these proved capable of emitting vowellike sounds.

Russell (*Speech and Voice,* 1931) tabulated the correct identifications that American listeners made while naming the artificial vowels generated by Paget with his series of resonator models. This intelligibility test yielded a range of values from chance to 75 percent, with the errors clustering about vowel sounds that bore a close physiological correspondence to the intended ones. The production of synthesized sentences was more impressive than the production of isolated vowels, and Paget enlivened the meetings of several learned societies, including an International Congress of Phonetic Sciences (1932), by producing short sentences with little equipment, indeed, on some occasions, with no more than cupped hands and a reed.

The rationale that suited both the analyzing and synthesizing of the acoustic patterns of speech accommodated as well a theory for the origin and development of speech. Paget advocated the theory that the roots of speech lay in universal gestures. Eventually these postures and movements of the body and hands were copied in the mouth and became singular shapes of the oral cavity and of the ancillary bunched tongue. The incidental forming of front and back cavities (resonators) of varied sizes was fortuitous; they and the pipelike connector over the bunched tongue accommodated the formation of dual-formant vowels. A whispered accompaniment to the several positions of the mouth amounted to distinctive acoustic "signs" that came to replace the significance of the visual gestures. The mobility of the gesture-making parts of the mouth facilitated the development of successive and complicated signs: words. This whispered speech, the basis for at least the Indo-European language, became vocal when man learned of the greater distance that vocalized signs would carry relative to whispered ones.

Although Paget might have been content to let his stake in the gesture theory rest on internal evidence offered by the European languages, his friends bolstered his case for him considerably by providing confirming examples from Asiatic and Pacific languages. His "clincher" lay in a fabricated language. He conceived of an action or an object, tried to convey the essence of the "thought" by "hand and facial action." He then transferred the movements to the mouth and whispered while making the gesture. The phonetic accompaniment of the gesture was transcribed and given to students of primitive languages who reported that in nine of ten instances near relatives of the artificial symbols are found in current primitive languages and are associated with the meanings conjectured by Paget.

Paget's further range of topics included abnormal speech (including postlaryngectomy talking), speaking horns, and language reform. His description of the production of esophageal speech is penetrating. A reader today possibly finds the backward spanning of time too easy as he reads "modulated air stream" into automobile horns that were made to talk in the 1920's, and as he notes strong hints of information theory, sans *bits,* in a description of the evidences of inefficiency of the English language.

Sir Richard died in October 1955 at the age of 86. Two years earlier he was president of the British Deaf and Dumb Association, continuing a scholarly interest in the production and the identification of signs in human communication.

JOHN W. BLACK
Department of Speech,
Ohio State University, Columbus

There are no gains without pains.—BENJAMIN FRANKLIN.