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TECHNOLOGY IN THE SERVICE OF FOREIGN LANGUAGE LEARNING: THE CASE OF THE LANGUAGE LABORATORY

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19.1 HISTORY

Foreign language learning lends itself naturally to the use of media. Linguists stress the primacy of speech over writing in language: children can listen and speak before they learn to read and write and all languages of the world are spoken, but not all have a writing system. Accordingly, foreign-language educators have been heavily involved in the use of audio equipment. They welcomed the first audio device, the phonograph, and have immediately adopted other advances in audio technology such as magnetic tape and digital media. (Delcoque, Annan, & Bramoullé, 2000). Unfortunately, the history of the use of technology to teach languages has not been duly noted by historians of educational technology. Paul Saettler, in his definitive *The Evolution of American Educational Technology,* only makes passing references to foreign-language teaching, and language laboratories are granted merely one paragraph (p. 187). It will be demonstrated that this disregard is startling in view of the extensive use and massive investment in instructional equipment by foreign-language educators. Moreover, it will be shown that the research that accompanied these commitments has not been appreciated by the larger educational technology community.

This chapter belongs in this handbook because the language laboratory represents a unique use of educational technology. It will be shown that language laboratories are discipline-specific equipment configurations. The focus is on specialized audio installations. The use of equipment in foreign language classroom teaching and the use of computers in language teaching are touched upon briefly. The discussion is largely confined to the language laboratory in the United States.

19.1.1 Forerunners to the Language Laboratory: 1877 to 1945

Léon (1962) and Peterson (1974) have documented the early use of audio recordings by foreign-language educators since the invention of the phonograph by Thomas Edison in 1877. By 1893 there were commercial record sets available for Spanish and English as a foreign language. The phonograph was used in regular classes and for self-study at home, but to what extent is difficult to ascertain. In their 340-page annotated bibliography of "modern" language methodology (the references commence in 1880s), Buchanan and MacPhee (1928) include only nine entries concerning the phonograph. Three of these are listings of recorded courses; none of the six articles is a controlled study of the merit of the phonograph. The 491-page Bagster-Collins et al. volume (1930) contains no mention of the phonograph. This paucity of references is surprising when one considers that in the 1880s the field of phonetics was born out of the effort to teach proper foreign-language pronunciation. The literature of the period is full of articles on phonetics, and many pronunciation textbooks and teaching materials were published. One would have expected greater enthusiasm in the language-teaching community for the equipment that could provide native speaker models.

According to a contemporary (Keating, 1936), initial use of the phonograph and other devices such as the stereopticon (an early slide projector) was haphazard, and interest waned because there was "no real absorption of modern inventions into the teaching program" (p. 678). The Depression may have prohibited a wider use of the phonograph in the 1930s. A definite discouragement to its use was the Carnegie-funded Coleman report of 1929, which stated that the reading skill should be emphasized (Parker, 1961). Nevertheless, it should be noted that the decade saw much interest in the use of radio for foreign-language instruction. From October 1935 (volume 20) through December 1946 (volume 30), the *Modern Language Journal* had a radio "department."

It is not until 1908 that there is any evidence of a laboratory arrangement of phonographic equipment (Léon, 1962). By this is meant a dedicated facility for foreign-language study. This lab was at the University of Grenoble in France. An American, Frank C. Chalfant, who studied there in the summer of 1909, appears to have been the one who brought the idea back to this country. He installed a "phonetics laboratory" at Washington State College in Pullman during the 1911–1912 academic year. Pictures of this installation in use show students listening via networked earphones. This lab also had a phonograph-recording machine so that students could compare their pronunciation with the native-speaker models.

Near the time that Chalfant established his phonetics laboratory, the U.S. Military and Naval Academy set aside rooms for listening to foreign-language records (Clarke, 1918). Another early facility was set up at the University of Utah in 1919 by Ralph Waltz (1930). He moved to Ohio State and built another lab about which he published several articles (Waltz, 1930, 1931, 1932). Waltz is usually credited with coining the term *language laboratory* in 1930 (Hocking, 1967). In fact, Chalfant had used it synonymously with phonetics laboratory as early as 1916 in the Washington State College yearbook, the *Chinook,* and probably in the regional foreign-language education circles of which he was a leader. In any event, it appears that the preferred term until after WWII was "phonetics laboratory." That is what Middlebury College called the lab it installed in 1928 (Marty, 1956). Also in use was "language studio" (Eddy, 1944) and "conversation laboratory" (Bottke, 1944). Whitehouse (1945) used the terms "workshop" and "language laboratory" together for the lab at Birmingham-Southern college. Bontempo (1946) also used "workshop" to describe the elaborate foreign language training program he created at the College of the City of New York in 1940. The use of audio-visual equipment was part of the "implementation (p. 325) phase. The "language discothèque" described by Gaudin (1946) was a carefully selected set of records used in class and presumably in some kind of lab because she went on to publish several articles about labs in the next few years.

In the 1930s and during the second world war many other institutions established labs (Gullette, 1932; Hocking, 1967), but, as in the case of the phonograph, discussions of their use did not loom large in the methodological literature. For example, the *Modern Language Journal's* annual annotated bibliography of monographs and articles only had four entries prior to 1945 besides the three articles by Waltz. The 105-item bibliography of the language laboratory for the years 1938–1958 compiled by Sanchez (1959) brought the total for the prewar period up to eight.

19.1.2 The First Language Laboratory Proper: 1946 to 1958

The year 1946 is considered to mark the beginning of the modern language laboratory movement (Hocking, 1967; Koekkoek, 1959). The labs at Louisiana State University (Hocking, 1967) and the University of Laval in Quebec City, Canada (Kelly, 1969), were built that year. By 1949 Cornell University had a lab thanks to a grant of $125,000 from the Rockefeller Foundation (Harvigurst, 1959). Whether these postwar labs owed anything to the previous phonetics labs is unclear, but probable. Claudel's (1968) use of "predecessor" (p. 221) expresses linkage. However, according to Koekkoek, "the beginning of the language laboratory movement was a new start, albeit with similar means and ends, rather than a direct expansion of the limited phonetics laboratory tradition" (1959, p. 4). Sanchez (1959) is ambiguous on the question. The earliest entry in his annotated bibliography of the "modern" language laboratory is a reference to a phonetics laboratory (Peebles, 1938), but he included the note "not related to the Modern Language lab, as such' (p. 231). The record at the universities of Iowa (Funke, 1949) and Tennessee (Stiefel, 1952) indicate continuity with phonetics labs. It thus appears that Koekkoek's statement must be tempered. Most institutions that built language labs after the war did so for the first time, whereas a few others updated their prewar phonetics labs. Clearly, "language laboratory" became the common term for labs after 1946, but the old terms were still in circulation (Funke, 1949) and new ones were introduced, such as "sound rooms" (Mazzara, 1954).

A point of difference between phonetics labs and language labs were individual booths or carrels. Although the lab at Ohio State had long tables divided into "compartments" (Waltz, 1930, p. 28) by 18-inch-tall boards, these did not provide sufficient acoustic isolation (Schenk, 1930). Levin (1931) suggested that the facility he described would be improved by the installation of soundproof booths. These became standard equipment in the postwar labs (MLA, 1956). Middlebury College had a more elaborate arrangement with seven feet by seven feet "roomlets" or "cabins" in which students worked individually (Marty, 1956, p. 53). Labs of the period were principally audio installations, but movie, slide, and filmstrip projectors were sometimes present as well (Hirsch, 1954; Marty, 1956; Newmark, 1948). A quaint description of the use of the Middlebury College lab is provided by a (then) 18-year-old coed who interviewed several students (Reed, 1958).

Also at issue is the impulse for the modern lab movement. It is certain that the military's success in language training during the war caught the attention of the foreign-language teaching profession at large. The technique was actually a wartime civilian creation: the Intensive Language Program of the American Council of Learned Societies, with Rockeller Foundation funding (Science comes to languages, 1944), was responsible for it (Lado, 1964). Nevertheless, the army got the credit in the public's eyes

and in 1945 the *Modern Language Journal's* annual bibliography began a separate category for the "Army" (Army Specialized Training Program, ASTP) method. It contained far more entries than any of the other 21 categories. Regarding labs specifically, Koekkoek maintained that 'The language laboratory and its spread is a postwar development, fostered by a climate of experimentation which was stimulated by the Army language teaching program during the war" (1959, p. 4). Pictures of labs in the 1950s certainly have a military air to them. Rows of students with eyes straight ahead suggest columns of soldiers at attention. The individual student in a booth wearing a headset is like unto a navigator or radar technician at his or her post on a ship or airplane.

Hocking, however, adamantly denied that the ASTP method drove the establishing of labs. He was echoed by Barrutia:

> . . . we have Elton Hocking to thank for almost single-handedly trying to keep the record straight about the fiction of the supposed extended use of recording equipment and aural-oral techniques in the A.S.T.P.. the Army Specialized Training Program did not, as is so widely believed, pioneer language laboratories. . . (1967, p. 890).

In fact, much nearer the war effort Gaudin claimed that the so-called Army method was "far from revolutionary" and that language teachers had been using phonograph records "for the past fifteen or twenty years" (1946, p. 27).

To what, then, did Hocking and Barrutia and others attribute the postwar interest in labs? They cite the availability of magnetic tape and tape-recording machines from 1946. Hitherto, labs were outfitted with phonographs or wire recorders. These had several problems: their sound fidelity was low, they were fragile, and they were difficult to edit. Plastic disc player/recorders such as the SoundScriber (first advertised in the *Modern Language Journal* in October 1946) were in use at Yale University (Harvigurst, 1949) and other schools. This was an improvement over wire mechanisms, but as Hocking could note in retrospect: "the superiority of the tape recorder-reproducer was immediately apparent" (1967, p. 18).

This major technological improvement does not fully account for the language laboratory movement. Roughly concurrent with the invention of magnetic tape was the development of the audiolingual method. It is here that the ASTP can be given some deserved credit. It stressed the listening and speaking skills more than reading and writing—the priorities of prewar methods. The Army method relied much on small-group practice to develop the learners' aural and oral abilities. Another important feature of the ASTP was the preponderate use of native-speaker instructors. It was also known as the "mim–mem" method because of its emphasis on mimicry of target language models (whether live or recorded) and the memorization of dialogues. Stack connects these developments in equipment and methodology:

> The language laboratory owes its existence to the recognition that the spoken form of language is central to effective communication, and that it should have as large a share in instruction as do written forms. In order to implement this new orientation of language teaching, the textbook (which is essentially graphic) was supplemented by sound recordings of native speakers. The coincidental advent of the tape recorder created a fortuitous juncture of technology and pedagogy. (1971, p. 3)

By 1958, in the United States there were 64 labs in secondary schools and 240 in colleges and universities (Johnston & Seerley, 1960). Forty-nine universities responded to Mustard and Tudisco's (1959) survey of lab usage. They found that the lab was used mainly in first-year classes. A majority of the respondents judged that courses which involved lab work resulted in better listening and speaking skills on the part of students compared with classes that made no use of the lab. The Sanchez (1959) bibliography contains descriptions of at least 35 labs. The passage of the National Defense Education Act the previous year ushered in a new phase in language laboratory history.

19.1.3 The Language Laboratory Boom: 1959 to 1969

The Soviet Union's launching of Sputnik on October 4, 1957 represented a challenge to the preeminence of Yankee know-how and American ingenuity. In response Congress passed the National Defense Education Act (NDEA), which President Eisenhower signed into law on September 2, 1958. The act sought to strengthen the teaching of mathematics, science, and foreign languages in America's schools. The intent of the foreign-language provisions of this important legislation has been described by Derthick (1959). The history of the language laboratory in the first years following the NDEA has been written by Parker (1961), Diekhoff (1965), and Hocking (1967).

Unquestionably, the 1960s were the golden years of the language laboratory. There was an explosion in the number of facilities, thanks to generous federal support: $76 million in matching funds by 1963 (Diekhoff, 1965). It is difficult to quantify how many labs there were. According to Hocking (1967) by 1962 there were approximately 5,000 installations in secondary schools. Another 1,000 secondary schools had labs by 1964 (Diekhoff, 1965). If the figure of 6,000 is accurate, this represents a thousand-fold increase in the number of labs at the secondary level from 1958! Most of these were in medium-to-large school districts (Godfrey, 1967). Although colleges and universities were not eligible for equipment funds under the NDEA, they were caught up in the national enthusiasm for language study, and thus committed their own monies to labs. By 1962 there were 900 labs in higher education (Hocking, 1967). More postsecondary labs were built from 1965 when matching funds became available under Title VI-A of the Higher Education Act (Ek, 1974). Although they did not cite a source for their information, Keck and Smith claimed: "By mid-decade an estimated 10,000 language laboratories had been installed in secondary schools; 4,000 more could be found in institutions of higher learning" (1972, p. 5).

Those involved in these facilities felt an urgent need to gather and compare experiences. William Riley Parker wrote this about the motivation for the first of the Indiana and Purdue universities-sponsored language laboratory conferences in 1960 (the others were in 1961, 1962, and 1965):

> . . . foreign language teachers feel themselves suddenly involved in a technological revolution, suddenly chin-deep in a tide of new demands

upon their competencies, and they seek, some almost frantically, enlightenment and practical help. (1960, p. v)

In addition to the Indiana conferences, there were many lab-related presentations at meetings of the various professional associations to which language educators belonged: the Modern Language Association (MLA), the American Association of Teachers of French (AATF), the American Association of Teachers of German (AATG), and the American Association of Teachers of Spanish and Portuguese (AATSP). The sessions at these gatherings were principally for professors. Language laboratory directors held caucuses at the conventions of the MLA and the Department of Audiovisual Instruction of the National Education Association (NEA), but they soon felt the need for their own organization. The National Association of Language Laboratory Directors (NALLD) was founded in 1965. The NALLD began publishing a newsletter the following year. The inaugural issue reported that at the first NALLD meeting in Chicago in December 1965, there had been much discussion of the lab director's job description and the problem schools face in recruiting qualified applicants. Job openings were featured regularly from the start of this publication.

A spate of publications also accompanied the flow of money and the installation of many labs. Most of the entries in Davison's (1973) 780-item bibliography of the language laboratory from 1950 through 1972 are from the 1960s, and thus post-NDEA. The first edition of Edward Stack's textbook, *The Language Laboratory and Modern Language Teaching,* appeared in 1960. It should be consulted by those interested in the literature of the period, because it explains the terminology of installations and operations current at the time. Foreign language teacher-training textbooks of the decade included a chapter on the language laboratory (e.g., Brooks, 1960; Lado, 1964). Also appearing in the early 1960s were Hutchinson's monograph concerning labs in high schools (1961), and the technical guide to facilities by Hayes (1963). Leon's book *Laboratoire des Langues et Correction Phonétique* (1962), although written in French and published in France, circulated widely in this country, as evidenced by the numerous citations of it. The Scherer and Wertheimer (1964) book-length report of an experiment involving language labs will be discussed in the section on research.

As for articles, hundreds appeared in all ranges of periodicals from school district newsletters to long-established refereed journals such as *The Modern Language Journal, Language Learning, Hispania, The French Review,* and *The German Quarterly.* A publication that focused on language laboratories, *The Audio-Visual Language Journal,* was founded in Great Britain in 1962. Both *The International Review of Applied Linguistics* and *Foreign Language Annals* carried articles about the language laboratory from their inceptions in 1963 and 1967, respectively. The bibliographies compiled by Keck and Smith (1972), Davison (1973), and Charoenkul (n.d.) list many of these articles. The major research articles of the period will be noted in a later section.

B. F. Skinner spoke at the first of the Indiana/Purdue language laboratory meetings on January 22, 1960. His subject was the use of teaching machines for foreign language instruction. One of the respondents to Skinner's paper was Robert Glaser. Neither of these men were foreign-language educators by training, but both were already well-known in the educational technology community. Their presence at this conference is testimony to the willingness of foreign-language professionals to accept insights from other disciplines, notably psychology. In reciprocal fashion, the larger educational community of the day showed interest in foreign language education. The October, 1966 issue of *Audiovisual Instruction* (published by the forerunner of the AECT, the Department of Audiovisual Instruction of the NEA) was devoted entirely to foreign language learning, and two articles focused specifically on the language laboratory.

No discussion of instructional technology in the 1960s would be complete without a mention of programmed instruction. Both Skinner and Glaser were involved in this movement. A pioneer was Ralph Tyler, who was working at Ohio State University in the 1930s. The reader will recall that a pioneer of the phonetics lab movement was Ralph Waltz, who also was at Ohio State in the 1930s. One wonders whether the two may have shared ideas. Edgar Dale, also of Ohio State, provides an overt link between the educational technology field, the programmed instruction movement, and the foreign language profession. The author of a language teaching methodology book of the period under discussion, Ruth R. Cornfield, acknowledged in her preface "all the inspiration, philosophy, and ideas given me" (1966, p. vi) by Dale. The books by Carroll (1962), Marty (1962), and the pedagogy textbook of Grittner (1969) provide further evidence of the embrace of programmed instruction by foreign language educators who were also interested in the language laboratory.

The major technical development of note during the decade was the audiocassette (Dodge, 1968). The advantages of cassette were a lower price and that smaller, lighter machines could play it. However, it did have the drawbacks of lower fidelity and greater difficulty of editing by cutting and splicing. The quality of sound was eventually ameliorated, and the editing problem was not sufficient to prevent the cassette from replacing reel tape in language labs in the 1970s. Machines with a repeat or skip-back function came on the scene at this time as well. This feature permitted students to easily replay a tape segment, and thus was well suited to dictations and audio-lingual listen-and-repeat drills. The cassette *Canon Repeat-Corder L* was first advertised in the *NALLD Journal* in the October 1970 issue. Aikens and Ross (1977) wrote an article in the same journal describing a reel-to-reel machine they fabricated. By the end of the decade, the major manufacturers, such as Sony and Tandberg, were producing machines with skip-back capability.

Another technical advance was the speech compressor–expander. This device allowed a recording to be sped up (compressed) or slowed down (expanded). Articles on this technology were numerous in the general educational literature from the start of the decade. Sanford Couch (1973), a professor of Russian, advocated its use. Paradoxically, it was not until 1978 that anything on speech compression appeared in the NALLD Journal (Harvey, 1978). One would have expected a greater enthusiasm for this feature among language laboratory professionals. The ability to slow down a tape would seem to be a boon to students struggling with a difficult passage. Moreover, variable-speed technology was not unknown in foreign-language

teaching, for Hirsch (1954) had commended the use of the *sound stretcher (p.* 22) in the early 1950s.

Huebener, in his mid-decade (1965), *How to teach foreign languages effectively,* provides a helpful synthesis of all the above factors. By design a methodology textbook should present the state-of-the art so that the next generation of teachers can be inducted into the profession. In his section on "Recent Trends," he noted that "the entire philosophy . . . was completely changed." To what did he attribute this change? He said the ASTP was "influential in introducing the intensive method in the colleges and universities and in stressing the spoken aim." The result was the "'new key' or audio-lingual" method. The new method "received powerful support from three sides." He cited the federal government for financial and moral support and pointed to NDEA. He noted the technical support of tape recorders, teaching machines, language laboratories, films, and programmed courses. "There is a veritable *embarrass de richesses* in the field of audio-visual aids." The third source of support was theoretical: "the new method was based on the findings of the structural linguists, who developed a psychology and a philosophy of language learning quite different from the traditional" (p. 11). With so much undergirding it, audio-lingualism became the orthodoxy in the field:

> The audio-lingual approach, enjoying Federal sanction and financial support, was announced with the aura of authority of Moses delivering the Decalogue on Mt. Sinai. Anathema to anyone who dared oppose the new dispensation! (Huebener, 1963, p. 376)

The language laboratory was an integral, but not the only, article of the prevailing creed.

Language laboratories ended the 1960s on a sour note. Federal funding was diminished:

> . . . the amount of equipment funding in Title III-A of the National Defense Education Act (NDEA) and Title VI-A of the Higher Education Act (HEA), two large sources for equipment funds, dropped from an allotment in fiscal year 1968–69 of $91.24 million to nothing in fiscal year 1969–70. The portent of this budgetary reduction is not as black as it might seem: any program for which the federal government is still offering subsidy, e.g., bilingualism, poverty, etc., still has access to equipment funds, but the inflated years of the mid-sixties have come to a close. (Dodge, 1968, p. 331)

Based on his observations in several schools and with discussions he had at five NDEA summer institutes, Turner noted that labs were

> "electronic graveyards," sitting empty and unused, or perhaps somewhat glorified study halls to which students grudgingly repair to don headphones, turn down the volume, and prepare the next period's history or English lesson, unmolested by any member of the foreign language faculty. (1969, p. 1)

Smith (1970) did not view this decline in federal support as entirely negative, because he candidly acknowledged that "the recent years have seen much professional neglect and misuse of the language laboratory (p. 191). On the matter of misuse, earlier in the decade Charest had complained that students were being treated as "guinea pigs on whom pet ideas are tried out in the lab" and asked whether "experimentation has gotten a bit out of hand" (1962, p. 268). On the other hand, Smith sensed a positive development in the unanimous agreement that the laboratories should be used to "individualize instruction," in the university community and provide the corresponding "increase in expenditures for equipment and materials for tutorial and individualized instruction" (p. 192). Heinich (1968) also commented on the problems associated with labs and the insights that were gained by both language educators and instructional technologists:

> The *language laboratory* movement threw content and media specialists together in an intimate working relationship that produced very strange and startling experiences. For the first time, language teachers discovered that the mode and materials of instruction interact with instructional behavioral objectives and methods. Many language teachers did not understand that a language laboratory requires a different method of instruction: that print stimulus methods are not audio stimulus methods. On the other hand, the audiovisual specialist was shaken out of a comfortable bookkeeping-procurement function and introduced, often for the first time, to the rigors of developing curriculum materials to meet specific curricular objectives. The novelty of the roles played by both has caused so many difficulties that the language laboratory has not yet reached its potential value. One of the lessons learned by audiovisual directors in this encounter is the incredible quantity of materials required by technology when media are used for direct instruction. The classroom teacher, at the same time, was experiencing another instance of shared responsibility with media. (pp. 50–51)

19.1.4 The Evolution of the Language Laboratory: 1969 to Present

The 1970s and early 1980s were a period of malaise for the language laboratory. Coinciding with the drying up of funds was a sharp drop off in the number of articles published. An index of this change can be seen in the ACTFL yearbooks. The first two volumes contained the articles by Dodge (1968) and Smith (1970), with 84 and 95 citations, respectively. The 1971 volume had one paragraph about labs and two references! From then on until 1983, many volumes contained no mention of labs, and those that did accorded a page at most. Holmes (1980) was the last article on the language laboratory ever to be published by the leading organ of the field, the Modern Language Journal. Labs had their vocal defenders to be sure (Jarlett, 1971), and those who offered constructive suggestions (Couch, 1973), but frank avowals of their problems (Altamura, 1970; Racle, 1976) and their need for revitalization (Strei, 1977) were prominent. Stack's book on language laboratories did not go through any more editions after the third in 1971, but Dakin's *The Language Laboratory and Language Teaching* appeared in 1973. It was a very different kind of book in that it had almost no mention of lab equipment or lab management issues. It was focused on the pedagogical use of the lab and anticipated Ely's (1984) and Stone's (1988) books which will be discussed below.

A turnaround in the decline of the language lab could be seen from the early 1980s. A 3-day colloquium with the theme "A Renaissance for the Language Lab" was held at Concordia University in July of 1981 (Kenner, 1981). The next month

the Language Laboratory Association of Japan and the NALLD teamed up to sponsor the first Foreign Language Education And Technology (FLEAT) conference in Tokyo. McCoy and Weible maintained that the recent "revival of interest in language laboratories" was "directly attributable to the 'domestication' of the tape recorder, made possible through the invention of the audiocassette" (1983, p. 110). What this indicates is that it took nearly 2 decades for the audiocassette, from its invention in the mid 1960s, to fully work its way into the instructional mores of teachers.

The lab of the 1980s was not to be limited to audio technology. Nineteen eighty-three, the year after *Time* magazine named the computer the "machine of the year," saw the founding of the Computer Assisted Learning and Instruction Consortium (CALICO). This group was (and still is) dominated by language educators. It should not be thought that the invention of the personal computer in the late 1970s was solely responsible for the interest in computer-assisted language instruction. Mainframes had already been much used for this purpose, most notably in the PLATO system at the University of Illinois. Computers were welcomed for their potential, but cautions were issued about the need to avoid the unrealistic expectations associated with early language labs and the need to learn other lessons from language lab history (LeMon, 1986; Marty, 1981; McCoy & Weibel, 1983; Otto, 1989; Pederson, 1987).

Ely's *Bring the Lab Back to Life* was published in 1984. In 1985 the president of the International Association of Learning Laboratories (IALL, the new name for the NALLD as of November 1982), Glyn Holmes, could affirm that the professional group was showing new signs of vitality (Holmes, 1985). This rebirth was also indicated by volumes 18 and 19 of the ACTFL Foreign Language Education Series, which were devoted entirely to technology (Smith, 1987, 1989). With new life came a new look. In 1988 the reinvigorated IALL published the first of several monographs dealing with learning-center design and pedagogical use (Stone, 1988) and in 1989 started producing several "video tours" of facilities around the country. By 1989, Otto could write that "language laboratories have been redefined as multimedia learning centers that deliver computer and video services to faculty and students in addition to familiar audio resources" (1989, p. 38). A new name for facilities often went with the expanded media offerings: some variation containing the words *language, learning, media, resource,* and *center* became widespread (Lawrason, 1990).

A further sign of the broadening of focus of language laboratories in the 1980s was the new attention given to reading and writing. The reader will recall that the early labs were devoted solely to the "sound" skills of listening and speaking. Personal computers, which became popular in the 1980s, first made their entrance into the language laboratory because they could handle the "paper" skills of reading and writing. A prime example of reading software was the popular *Language Now!* series produced by the *Transparent Language* Company. The *Système-D* writing assistant program, winner of the 1988 EDUCOM/NCRIPTAL Higher Education Software Award (Garrett, 1991), of *Heinle & Heinle* Publishers came into extensive use and major research was done on its effectiveness (Bland et al., 1990).

Although there had been numerous foreign language film series produced from the 1950s, these were intended for classroom, not laboratory use. With the domestication of the VCR in the 1980s, the use of video became firmly established in language laboratory sessions. A prominent instance was the innovative first- and second-year French course that appeared in 1987, *French in Action*. Interestingly, an early leader in the post-NDEA labs, Pierre Capretz, was the driving force behind it. It received major funding from the Annenberg Foundation and was broadcast on many Public Broadcasting System stations. Video episodes form the core of *French in Action*. That is, the textbook was one of the ancillaries (along with audiocassettes and lab workbook). It was widely adopted in universities and high schools. Many language laboratory carrels that once housed audio equipment now had small TV/VCR combinations instead so that students could watch these excellent videos.

The momentum of the 1980s carried over into the early part of the next decade. This can be seen among lab professionals. The IALL gathered sponsorship from three educational technology companies to produce a monograph on "Designing the Learning Center of the Future" (Kennedy, 1990). The IALL produced more video tours of labs in 1990, 1991, and 1993. Lab directors and other language professionals interested in technology were able to share questions and keep in touch through the *Language Learning Technology International* (LLTI) listserv that began in 1991. This was cosponsored by the IALL and Dartmouth College. As an aid to those who were planning new labs, the IALL put together guidelines on language laboratory design in 1991. This organization teamed up again with the Language Laboratory Association of Japan to put on the FLEAT II conference in August, 1992. To help instructors make effective use of the lab, LeeAnn Stone edited a second volume on communicative activities (Stone, 1993). A valuable resource for lab directors appeared in 1995: *Administering the Learning Center: The IALL Management Manual* (Lawrason, 1995).

The use of technology in language learning and teaching appeared ready to increase because of several developments. New monies for the use of technology in foreign language instruction appeared. In 1990 the U.S. Department of Education funded the first National Foreign Language Resource Centers. Two centers, the University of Hawaii and San Diego State University, began offering workshops on the use of technology. With initial funding from IBM, the FLAME (Foreign Language Applications in Multimedia Environment) project was began at the University of Michigan in 1990. The success of *French in Action* in the late 1980s led to a similar video program for Spanish, *Destinos,* (1992). It benefited from Annenberg/CPB funding as did its predecessor and *Fokus Deutsch,* for German (1999). The amount of computer courseware grew steadily. Publishers began packaging textbook-specific software as standard components along with audio and video materials. With the explosive rise of the World Wide Web from 1993, companion web sites also became commonplace and many "third party" web sites concerning language learning started springing up.

Did language laboratory traffic increase because of all these developments? It would appear that many teachers and learners were hesitant to use the lab and technology. Richards and Nunan (1992) judged that "technology at present is underexploited in

language leaming and teaching" (p. 1203). Nina Garrett, herself a veteran of the language laboratory, wrote an article (1991) "for teachers making little or no use of technology" (p. 74). She gave a detailed list of all the resources available at the start of the decade. Interestingly, she paid almost no attention to the language laboratory: "'Conventional' audio technology, that of the tape and the language lab, needs no explanation here." (p. 75). Yet she did cite the expertise of some lab personnel in the use of computers—the main subject of her article: "some major language laboratories have enough experience with computers in language teaching so that their staff members can field inquiries" (p. 78).

As regards learners Mullen (1992) noted that "Since their heyday in the 1960s, language laboratories have fallen under something of a cloud" (p. 54). It would appear that the language laboratory had "an image problem" that needed to be addressed before teachers and learners were ready to use it. Wiley (1990) depicts the image vividly:

> Many second language students shudder at the thought of entering into the bowels of the "language laboratory" to practice and perfect the acoustical aerobics of proper pronunciation skills. Visions of sterile white-walled, windowless rooms, filled with endless bolted-down rows of claustrophobic metal carrels, and overseen by a humorless, lab director, evoke fear in the hearts of even the most stout-hearted prospective second-language learners. (p. 44)

Despite a mixed start, as the decade progressed, the use of technology in language teaching and learning increased. It was clear, from articles such as Garrett's (1991) and other indications, that the movement of computers into the language laboratory, which as noted above, began in earnest in the 1980s, was bound to increase in the 1990s. Schwartz (1995) helped make the bridge between the history of the language laboratory and computer-assisted language learning:

> Without proper teacher-training, evaluation of CALL materials, and research on student use of computers, CALL is likely to meet the same fate as the language laboratory of the 50s and 60s. (p. 534)

It would appear that the foreign language teaching profession had indeed learned a lesson from the experience of the language laboratory. Research was promoted via a new refereed journal, *Language Learning & Technology, http://llt.msu.edu/* that was founded in 1997. The same year saw the publication of the Bush and Terry (1997) volume and a CALICO monograph (Murphy-Judy & Sanders, 1997), both of which sought to equip teachers and prompt research.

That computers were to occupy center stage in the language laboratory is not surprising. Afterall, computers are omnibus machines that can provide audio, video, text, and interactive written exercises. Moreover, the Internet now provides equivalents to the shortwave radio that language educators made some use of from the 1920s, and an approximation of the satellite television programming that became popular in the 1980s. There is a universal standard emerging: "there is one certainty: we know that all current technologies are converging into one digital environment" (Scinicariello, 1997, p. 186). There was speculation on LLTI and in professional gatherings that because so many students were buying computers and networking was installed on all university campuses, that perhaps the language laboratory should go "virtual" (Pankratz, 1993). Quinn (1990) describes the transition of the language laboratory brought about by the computer:

> Rather than say that audio laboratories have been abandoned, it might be more accurate to say these are no longer used in schools where they did not live up to the promise made for them, but have evolved beyond just being "audio labs" in others. Actually, schools still use "language labs," and technologically-advanced learning centers have recently been installed in numerous universities." (p. 303)

In the first two years of the 21st century, the LLTI listserv has carried announcements of language laboratory closings and offers of entire audio labs for sale. So it is certain that some schools have indeed decided to dispense with a dedicated facility for foreign language study. This could be because the problem of the language laboratory's image has not been resolved:

> Despite of (sic) their undoubted contribution to the development of language teaching and learning, the term "lab" nowadays also triggers memories about a place where students disappear behind technology, separated from each other, delving head first into the electronic environment and fighting a lone battle with linguistic requests from mysterious authorities. (Bräuer, 2001, p. 185)

What is the future of the language laboratory? Will it cease to exist? At least its name seems destined to change: "the term *language lab* is obsolescent, a form of shorthand that represents a variety of entities responsible for delivering technology-based language instruction. New names like 'language media center' or 'learning resource center' attempt to reflect new goals and new technologies" (Scinicariello, 1997, p. 186). Whatever they be called, it is probable that no two places will look alike: "There is no ideal language lab for the twenty-first century" (Scinicariello, 1997, p. 186).

19.1.5 Conclusion of Language Laboratory History

Surely language laboratories represent the single largest investment and installment of audio resources in education. It is no accident that the foreign-language teaching community has been heavily involved in using audio. Audio has face validity in foreign language instruction simply because much of language use is oral/aural. Granted, there has been concern that the reading and writing skills might be neglected in methodologies that make much use of recordings such as audio-lingualism. Nevertheless, for foreign-language educators it has never been an issue of whether to use audio technology; it has been a question of how.

19.2 RESEARCH ON THE EFFECTIVENESS OF THE LANGUAGE LABORATORY

The preceding historical account detailed the growth and extent of a particular application of audio technology, the language

laboratory. What has not yet been assessed is the effectiveness of this massive expenditure of effort and money. This is the task of research. This section will give the main currents of research for each period in the language laboratory's history. Details of each study will not be mentioned except insofar as they are crucial to interpreting the chief findings. The bibliography will permit the interested reader to locate and directly consult the reports cited for further information about the design and conditions of each study.

19.2.1 Research on the Forerunners to the Language Laboratory: 1877 to 1946

There appears to have been very little attempt to provide an empirical justification for the use of the phonograph and phonetics laboratories before World War II. This is not entirely surprising, given that before the 1960s very few foreign-language scholars had training in quantitative experimental techniques: They were humanists schooled in literary and philological research methods. There are, however, accounts of problems with the use of phonographs and phonetics labs which can perhaps be classified as observational research. These observations will be noted, for they raise issues that were to be examined more rigorously later. Moreover, these records demonstrate that there was some notion of accountability among those who used early audio resources. That is, the phonograph and phonetics labs were not accepted and used uncritically.

Based on his "long experimentation," C. C. Clarke (1918, p. 120) provided the first guidelines to appear in the scholarly literature on the proper use of the phonograph in teaching foreign languages. He granted that some teachers found the "mechanism" (p. 122) troublesome, time-consuming, and distracting. To this he countered that it afforded learners the opportunity to hear consistent native-speaker models that never suffered fatigue. He concluded that "the true success of the speech record is in teaching pronunciation and that nothing else should be expected of it" (p. 120). The emphasis on pronunciation training certainly became the hallmark of the phonetics laboratories. Waltz, the founder of the lab at Ohio State University, also cited the benefit of having tireless native-speaker models to imitate. By having the "constant control sounding in his ears" (p. 29), the student could exclude the imperfect approximations of his peers and gain confidence in his own speaking ability. However, a colleague of Waltz, Emma Schenk, complained that the earphones did not adequately keep out others' voices (1930). In addition, she deplored the poor audio quality and the lack of supervision in the Ohio State lab. She worried that students would "cultivate errors" (p. 30). She also noted much cheating on time slips and many students who were not on task while in the lab. Levin (1931) was sympathetic to labs and sought to offer constructive criticism of their use. He stressed the need for immediate feedback so as to avoid the problem Schenk had feared, namely, the development of bad speech habits. Gullette (1932) showed that this fear was justified. He noted with consternation that many students working alone in the lab reverted back to the poor pronunciation practices that earlier had been eradicated in class drill sessions. He stressed that imitation was not sufficient; what was needed was ear training such as was done in music classes. This would allow for self-diagnosis and correction.

Waltz's report (1932) of two studies he consulted on, but did not conduct himself, is the first record of an attempt to establish empirically the phonetic/language laboratory's effectiveness. It is ironic, in view of the identification of the language laboratory with foreign languages, that neither investigation involved their teaching! The first experiment had to do with the teaching of the Irish accent; the second was concerned with correct English diction. Both studies can be faulted for the low number of subjects (20 and 24), the apparent nonrandom assignment of subjects to treatments, and the lack of statistical analysis beyond a comparison of group means. Nevertheless, Waltz did note that the groups were equivalent by using scores on standardized tests of intelligence, hearing, and pitch discrimination. In the first study, the lab group's mean was 10. 1 (out of a possible 20 points). The control group's mean was 8.04. In the second study, both the lab and nonlab groups showed similar gains. Waltz argued that the comparable improvement was actually evidence in favor of the efficiency of the lab: Class and instructor time was saved by having students work independently in the lab.

For the sake of comprehensiveness, Peebles' master's thesis (1938) must be mentioned. It was included in the annotated bibliography compiled by Sanchez (1959). Students who volunteered to use the Phonetics Laboratory at the University of Colorado and who received one or two French pronunciation tutorial sessions were compared with students who did not avail themselves of these opportunities. Amazingly, she did not specify how much the volunteers used the lab. Neither were the total number of subjects, nor the number of subjects per group, specified. These omissions bespeak a blatant lack of control that invalidates any conclusions that might be drawn from her data, which in fact consisted only of mean numbers of pronunciation mistakes on a posttest.

19.2.1.1 Summary. Obviously, no firm conclusions can be drawn about the effectiveness of the phonograph and the prewar phonetics laboratory from these few observations and two cursory investigations. There appears to have been a consensus among practitioners that the best use of this equipment was for pronunciation training. All saw a potential benefit in untiring, consistent, native speaker models for students to imitate. However, complaints were raised about the sound quality of recordings, and it was observed that many learners lacked the self-monitoring ability to profit fully from them. Just as the next period of language laboratory history saw an increase in the number and sophistication of facilities, so there was similar growth in the inquiries concerning their value.

19.2.2 Research: 1946 to 1958

Language laboratory research of the postwar and pre-NDEA period may be described as nascent. Certain features of empirical research are seen; some are only partially present, and others are completely absent. For example, one sees the first use of standardized tests as criterion measures, and this use is universal. On

the other hand, only one study (Allen, 1960) randomly assigned subjects to treatments; intact classes were used otherwise. Only two-group designs and t tests were used. The number of subjects, when reported, was uniformly low. There certainly was not an agreed-upon research agenda. In fact, researchers of the day were either unaware of what their peers were doing (there is little citation of others' work) or they simply ignored it. With these limitations in view, the following discussion will list five studies of the period in chronological order and present their conclusions. According to Kelly (1969), more experiments were conducted than this number would suggest, "but we only know of those whose authors had the time and energy to write articles about them" (p. 245). This is corroborated by Johnson and Seerley (1960), who refer to studies done at a high school and two universities (all unnamed) and of research that was planned at the University of Massachusetts.

Stiefel's description (1952) of the language laboratory at the University of Tennessee and its usage is barely beyond the anecdotal level. Yet its mention of the University of Chicago language investigation tests and the cooperative tests (created by the forerunner of Educational Testing Services) does represent the first, inchoate desire of those involved in language labs to have an objective benchmark with which to compare groups of learners who used the lab with those who did not. In this case, Stiefel compared the scores of lab classes on these measures and on an in-house test with classes from previous years. Thus, this is an ex post facto study. He, noted higher scores for lab groups on the in-house tests, but he was hesitant to draw any strong conclusions from these. He found that both groups were comparable on the standardized tests. This he took as heartening evidence that the reading ability (as measured by the cooperative test) of the lab groups did not suffer because of their emphasis on the listening and speaking skills. This last point was of great concern to the scholarly community of the day, as further evidenced by the following study.

Supported by a grant from the Carnegie Foundation for the Advancement of Teaching, Brushwood and Polmantier (1953) at the University of Missouri sought to determine whether dialogue repetition and memorization in the language lab increased learners' aural skills. Although for administrative reasons they were unable to randomly assign subjects to treatments, these researchers did take the trouble to administer the Iowa Foreign Language Aptitude Test to the intact classes that constituted the treatment groups. Moreover, the researchers obtained access to the scores on two English proficiency tests that all the subjects had taken previously. All these tests revealed that the control and experimental groups were matched on these measures, as they were in age.

Four groups were formed: two groups of 19 subjects each who were enrolled in elementary Spanish, and two groups of 23 who were enrolled in elementary French. The control groups simply attended the standard 5-hour per week (1 hour daily) course as taught at the University of Missouri. The experimental groups covered the same material (grammar, reading, and composition) as the control groups, but did so in 4 hours instead of 5. The experimental groups also attended two 1-hour laboratory sessions during the first 4 days of the week. In these sessions, they worked with a dialogue written for the experiment that incorporated the grammar and vocabulary that had been studied that week. The work consisted of listening to the dialogue via earphones and chorally repeating until it was memorized. A graduate student or upperclassman lab attendant controlled the tape player and thus directed the sessions. His or her only other task was to correct gross pronunciation errors. The experimental group then had a fifth class session in which the regular instructor had the students review and act out the dialogues. The dialogue was then manipulated by changing number, person, tense, object, etc., as a transition to free conversation. This fifth hour was deemed "the crucial point in the achievement of the oral-aural objective" (p. 8).

At the end of the semester the groups were given the cooperative tests on reading, vocabulary, and grammar, and an aural comprehension test created for the experiment. For whatever reason, both *t* tests and *F* tests were calculated for the two Spanish and two French groups, but no tests were run on a combination of control and experimental groups across languages. The results showed that there were no significant differences on the cooperative measures. There were significant *t*s, but not *F*s, in favor of the experimental groups on the aural comprehension test.

This study can be faulted on several grounds, but perhaps the most serious flaw may be the lack of control for amount of instruction. Although the authors claimed that the 2 hours of lab practice for the experimental groups were in lieu of homework required of the students in the control groups, it must be noted that the lab sessions were scheduled and monitored. Whether students in the control sections did their work or not is unknown. Moreover, the significant difference between the groups on aural comprehension was measured by a nonstandardized test, the validity and reliability of which is open to question. All of these criticisms aside, Brushwood and Polmentier's study was certainly more rigorous than previous investigations of the use of audio resources in foreign-language teaching.

Next in chronological order are two ex post facto studies that are included here for the sake of completeness. The first is the description by Fotos (1955) of the use of the language laboratory at Purdue University. In direct opposition to the Brushwood and Polmentier study, the lab at Purdue was used for "*predrilling* [emphasis added] the student on the French text of the basic grammar or reading lesson" (p. 142) that was to be covered in class. Fotos reported that students in first-year French scored 60.1 on the cooperative tests; second-year students scored 71.3. The national averages were 56.7 and 68.8, respectively. Whether this was a significant difference cannot be ascertained.

Mueller and Borglum (1956) looked at correlations between lab attendance and course grade, final exam score, and cooperative test score at Wayne University. They noted that students who voluntarily attended the lab more than the minimum requirement of 30 minutes per week generally did better on these measures. They drew special attention to the heavy lab users' 10% increase on the cooperative reading test: "an unprecedented jump in 8 years of recorded scores" (p. 325). Moreover, they observed that even students who only attended the lab 30 minutes per week scored better than students from previous years who had no lab experience. They also noted a lower drop rate for heavy lab users. One can surmise that greater

time-on-task naturally produced greater learning. In their discussion, Mueller and Borglum also acknowledged a significant teacher effect: The lab's director "succeeded in getting the students of his sections to attend the laboratory 2 or 3 times more frequently than other instructors" (p. 322).

Allen (1960) conducted a study during the 1957–58 academic year which represents the last investigation of Language laboratories in the 1946–58 period. The 54 subjects were 15- and 16-year-old students in a high school operated by Ohio State University. Allen created eight groups based on level (elementary or intermediate), language (French or Spanish), and use of the lab (55 minutes per week or none). These divisions made for groups as small as five. He administered three standardized tests in order to have a basis for pairing subjects. Once the pairs were established, he used a random-choice technique to assign students to the lab or nonlab treatments.

The lab groups spent one classroom hour listening to instructor-made tapes of "humorous or suspenseful tales" (p. 355) and answering questions about them in the target language. They recorded their answers and then spent the rest of the period listening to commercially prepared recordings. There was absolutely no written material presented during the lab hour. The nonlab group read the same stories and answered the questions in writing. If any time remained, they did free reading from a collection of books at their level.

At the end of the school year, all groups were given three standardized tests (including the cooperative) that measured reading, vocabulary, grammar, speaking, and listening. Allen only reports means and standard deviations. In all cases except one, the laboratory groups scored identical to or higher than the nonlab groups. The exception was the Intermediate Spanish lab group ($n = 5$), which scored lower on the speaking test. In several cases, the differences between the means were large, but Allen did not compute any test of significance. In his brief conclusion, however, he claimed that the laboratory groups "achieved significantly higher scores in reading, vocabulary, and grammar" (p. 357), but that there were no differences in speaking or listening. The author of this chapter calculated a t test on the cooperative French test means for the largest groups, those in Elementary French ($n = 10$ each). The lab group had a mean of 57 (s.d. = 23); the nonlab group mean was 39.4 (s.d. = 20). This turned out to be significant at the 0.001 level.

It is fitting that the last of the studies of the 1946–58 period should be the one with the highest methodological standards. Yet the number of subjects was quite low for the design chosen, and it is baffling that Allen claimed to have found a significant difference in favor of the lab groups, but did not bother to report any data beyond means and standard deviations. Moreover, it is ironic that reading, grammar, and vocabulary scores were enhanced by listening in the language laboratory, whereas listening scores proper did not reveal any difference between the lab and nonlab groups. Thus, Allen's study gives weak but curious evidence of the language laboratory's contribution to foreign language learning.

19.2.2.1 Summary. Writing in the early 1960s, Carroll (1963) stated that virtually all previous foreign-language research "has only rarely been adequate with respect to research methodology" (p. 1094). For him, language laboratory research was not an exception to this rule. He briefly reviewed three studies concerning labs; these were not included in this section because they did not contain important results, were not widely circulated at the time (two were institutional reports), and were not cited by subsequent researchers. Therefore, what one can conclude from Carroll's review and this summary is that while the research during the 1946–1958 period did not firmly establish the positive value of language laboratories, it did provide circumstantial, and in one case (Allen, 1960) empirical, evidence in favor of this conclusion.

Writing at the close of the period under consideration, Koekkoek (1959) stated that labs were so "firmly established" in language teaching that "no teacher can remain today unaffected and disengaged" (p. 5). He went on to describe the ambivalence about them within the profession and closed his article with the hope that subsequent experience would resolve "basic questions to be expected from the use of laboratory machines and the best methods of obtaining the results" (p. 5). If the nascent body of research could only offer a cautious "thumbs-up" assessment, it also showed that those promoting labs were willing to be held responsible for their use. This was fortunate, for during the next phase of the lab's existence, a period of great growth because of major expenditures, the public would eventually demand an accounting.

19.2.3 Research on Language Laboratories: 1959 to present

The massive increase in the number of language laboratories, thanks to the NDEA, prompted a comparable increase in the amount of research concerning their effectiveness. In fact, some of the studies were funded by the NDEA under its Title VI provisions. The extent of this research is such that this section cannot detail every investigation that was undertaken. The several dissertations listed by Davison (1973) will not be treated. This discussion will focus on four large-scale studies of labs: three in high schools and one in a university. These all received much attention at the time. Moreover, those studies that have been thoroughly reviewed elsewhere will be only briefly described.

19.2.3.1 Major Studies. During the 1961–62 school year, Keating (1963) conducted a study of the use of the language laboratory in French classes in New York City high schools. He cited Allen's study (1960) as the "only exception" (he was evidently unaware of the Brushwood & Polmantier study) to the rule that "the literature abounds with articles that describe the benefits of using language laboratories" but " contains virtually no reports upon the empirical validation" (p. 8) of them. He called Allen's results "quite interesting" but noted a possible Hawthorne effect, which he felt "severely compromised" (p. 8) them. Keating knew of the research being simultaneously conducted in New York City by Lorge (to be described later).

Keating's was a large-scale study involving approximately 5,000 subjects in 21 school districts. Schools were divided between laboratory and nonlaboratory users based on a questionnaire filled out by each district's foreign-language coordinator.

Besides this factor, groups were formed according to year of study (first through fourth years) and IQ scores (five levels). The dependent measures were reading comprehension, listening comprehension, and speech production. The cooperative test was used to test the first two skills; however, first-year students were not given the listening portion because it was designed for intermediate and advanced students. The French speech production test was used to evaluate speaking. This instrument was constructed specifically for the study. Of note is that it was not administered to all subjects: only 519 students from 12 of the participating school districts were given it. The results showed a sole significant finding in favor of the lab groups, on speaking among first-year students. Otherwise, there were several cases of the nonlab groups scoring significantly higher.

Keating's findings were promptly and vehemently disputed. The April 1964 issue of the *Modern Language Journal* included four rebuttals (by Anderson, Grittner, Porter & Porter, and Stack). The criticisms showed much overlap. Keating was taken to task for numerous methodological flaws: failure to define what was meant by language laboratory and the activities that went on there, failure to control for amount of time spent in the lab, failure to control for the socioeconomic level of the schools and the quality of their lab installations, use of *t* tests when ANOVAs were called for, and sloppy reporting of results (the number of subjects per group was not consistent). Keating was also criticized for using several different IQ tests, rather than one, to group subjects. The validity of his speaking test was challenged for being in fact only a pronunciation measure. Keating was shown no mercy: Despite the disclaimers he gave about the generalizibility of his results, he was accused of spreading anti-lab propaganda by Grittner.

Because the literature of the period contains no defense of Keating's study, it can be concluded that it was dismissed by the scholarly community of the day. Unfortunately, the public was of another mind. It seized on the notion that if language laboratories are not useful, then the massive investment of tax dollars in facilities was a waste. An example of this attitude was a newspaper editorial about the Keating study entitled "Backwards Via 'Aid" that was reprinted in the *Modern Language Journal* issue containing the four rebuttals. Such a response gives credence to the propaganda charge made by Grittner. He and Stack and Anderson pointed out, with great dismay, that the Institute of Administrative Research of Columbia Teacher's College, which had sponsored Keating's study, mailed out a five-page preliminary report to school administrators across the country. They viewed such an action as unprofessional; it was clearly inflammatory in its impact.

Lorge (1964) conducted two experiments in New York City high schools. The first took place during the 1961–62 school year, and the second was done the following year. Thus, the first study coincided with Keating's investigation. Whether there was any overlap of subjects between the two studies is unknown, but could hardly be problematic given that only two schools were involved in Lorge's first inquiry; Keating's entailed 21 districts. Lorge described the purpose of her study thus:

> The object of the study was not to compare what a student learns from a teacher alone as opposed to what he learns from laboratory work alone. The question was whether the teacher improves the teaching-learning situation by using the laboratory as a teaching aid. The research was intended not to give the laboratory a passing or failing mark-if it passes, use it; if it fails, rip it out—but rather to determine in which areas it had proved to be successful, and how its use could be made more effective. (p. 409)

The first study compared first-, second-, and third-year French classes. Unfortunately, the number of classes and subjects is not specified in the article, and the full report of the study is not available for consultation; by 1965 it was already out of print (Lorge, 1965). All that is known is that the classes were determined to be comparable based on the Stanford reading test and the Gallup–Thorndike vocabulary test. Half of the classes had 60 minutes a week of supervised lab practice in lieu of a fifth class period. The other half had five class meetings. The course content was the same for both groups. At the end of the school year, all classes were given the cooperative French test to gauge reading, vocabulary, and grammar skills. A speaking test and a listening test, both written by the experimenters, were also administered. All the tests contained subtests for which separate statistics were calculated. There were no differences between the groups on the cooperative test. The first and second-year laboratory groups tested significantly higher than the control groups on the fluency component of the speaking test. The second-year laboratory group also scored significantly higher on the intonation component. The third-year laboratory group was significantly superior in listening.

The second experiment compared two types of laboratory equipment: audio-active and recording-playback. The first was a headset with earphones and a microphone; the second was an identical headset plus a tape recorder for each student. The other factor was time. Daily usage of 20 minutes was compared to a once-a-week 60-minute session. Five groups of second-year French students were formed. It should be stressed that none of the subjects had previous laboratory experience. Moreover, during the study, the control group did not use any equipment. The other four groups were formed by crossing equipment type and usage time. The dependent measures were the same as in the first study, with the addition of a mimicry test.

The t test results from the 14 components are difficult to interpret. Some differences are reported at a .01 level of significance, others at a .05 level, but it is impossible to determine whether one group was significantly higher than all the other groups or only some of them. The rankings that were also reported are more helpful, for they allow trends to be detected. On measures of enunciation, the order was thus: (1) daily record-playback, (2) daily audio-active, (3) weekly record-playback, (4) weekly audio-active, and (5) control. Thus greater time, frequency, and more elaborate equipment favor one aspect of the speaking skill. However, as regards lexical and syntactic features of speech, the control group was ranked first, with the daily record-playback group coming in second. This finding should be considered along with the result from the composite score on the cooperative test. Here, the daily record-playback group ranked first and the control group was second. The difference between the two groups was not significant, but both groups were significantly higher than the other

three groups. What emerges is this: The daily record-playback group and the control group scored similarly, and significantly better than the other groups, on both oral and written measures of vocabulary and grammar.

From the above findings, one is tempted to draw an "all or nothing" conclusion: Either use a fully equipped lab daily or dispense with it altogether. It seems that certain outcomes will be the same in either case. The corollary is that infrequent usage of a modest lab actually appears to be detrimental to the lexical and syntactic aspects of language learning! However, Lorge does not make such a counterintuitive deduction. She noted that in the first study, there were no differences between the lab and nonlab groups on the vocabulary and grammar tests. In the second study, she maintained that any measure showing statistically significant differences showed at least one laboratory group that equaled or exceeded the gains made by the control group. This appears to indicate that time spent in the laboratory contributes to conventional learnings as well as to listening and speaking skills (p. 419).

The last sentence is crucial. Taken together, these studies indicated an overall advantage for the language lab. Lorge also noted that a higher percentage of students in lab sections continued studying French beyond the 3 years required for high school graduation and college admission.

Lorge's study appears to have been well received by the scholarly community. Stack (1964) praised Lorge's work in his critique of the Keating study. Only Green (1965) ventured criticisms. Some of his complaints had to do with the manner in which the results were reported. He was more concerned with the apparent addition of another group after the study was underway. Lorge (1965) answered these objections easily in her rebuttal, which was included in the same issue of the *Modern Language Journal* as Green's piece.

In 1966, Philip D. Smith began an investigation of beginning high school French and German teaching and learning, which lasted through 1969. It was sponsored by the Federal Office of Education under Titles VI and VII of the NDEA and is commonly referred to in the literature as the Pennsylvania project because all the participating schools were in that state. Smith summarized his findings in 1969 articles in *Foreign Language Annals* (Smith, 1969a) and the *French Review* (Smith, 1969b), which are more accessible than the technical reports he submitted as part of the grant's requirements. The October 1969 issue (volume 53, number 6) of the *Modern Language Journal* contained six articles critiquing the Pennsylvania studies. The December 1969 issue (volume 3, number 2) of *Foreign Language Annals* contained the summary article by Smith and two review articles. Contemporary synopses of the project and its reviews by D. L. Lange (1968) and W. F. Smith (1970) will be relied on for this discussion.

In the first year of the study, 2,171 students participated. Three teaching strategies and three language laboratory systems were compared. The strategies were: traditional, functional skills, and functional skills with grammar. By *traditional* was meant that an emphasis was placed on vocabulary acquisition, reading and writing skills, translation, and grammatical analysis. *Functional skills* was a synonym for the audio lingual method; the command of a core vocabulary and key syntactic patterns was emphasized, as were the speaking and listening skills. *Functional skills with grammar* was, as the name indicates, the addition of grammatical explanations to the audio lingual method. The three language laboratory systems were: audio-active, audio-active record, and tape recorder in the classroom. The first consisted of two, 25-minute practice sessions each week in which a 10-minute drill tape was played twice. The second arrangement differed from the first in that the students recorded their first practice with the tape and then listened to their own responses. Both of the audio-active groups also practiced in the classroom with a tape recorder each day under the supervision of the instructor for one-fifth of the period. The tape recorder in the classroom group did no lab practice. What they did was at least 10 minutes of guided practice with the tape each day in class.

The results from the first year indicated no significant differences between the teaching strategies, except for reading, where the traditional group outperformed the two audio-active groups. There were no significant differences detected between laboratory systems. During the second year of the project, 639 first-year students participated in a replication study, and 1,090 of the original 2,171 subjects were observed in their second year of language study. The results from this second year of the investigation were in line with those of the first. In the third year the number of subjects (third-year students) dropped to 277, and by the fourth year it was down to 144 fourth-year students. The findings from these last 2 years showed the traditional students faring significantly better than the audio-active students in both reading and listening. In none of the 4 years of the study was a significant difference in outcomes found according to the laboratory system.

Although the Pennsylvania project generally received higher marks for its methodology than did the Keating report with which it was often compared, there were nevertheless several critiques leveled and questions raised. Some of these involved control issues, such as the degree of teacher adherence to experimental guideline, the consistency of laboratory installations and maintenance between schools, and the lack of data as to the amount of time the labs where actually used. Carroll (1969b) detected stowaway variables and practice effects. Perhaps the most serious criticism was the claim (Valette, 1969) that the cooperative test was an inappropriate measure of listening achievement. It was maintained that the vocabulary in this test was closer to what was in the textbook used by traditional groups than the one used by the lab groups. Moreover, evidence from other sources was cited which indicated that the cooperative test was simply too difficult for students in their first 3 years of foreign-language study. This second criticism had broad implications: It cast doubt on the instrument that had been used in all previous language laboratory studies and in many other studies of foreign-language teaching.

Carroll (1969b) and Smith (1970) assessed the implications of the Pennsylvania project. For them, the supposed findings in favor of the traditional groups did not warrant a return to former means of teaching. Rather, they viewed the report, despite its faults, as a credible demonstration that the enthusiastic adoption of new approaches and accompanying materiel does not guarantee success. "The Pennsylvania studies have removed us from

our tower of false security" (Smith, 1970, p. 208). For Carroll, the specific lessons to be learned were that audio lingual textbooks needed more linguistic content and that less emphasis should be placed on drills and other "habit formation" activities (1969; p. 235). Smith ended his review on an upbeat note: "It is time to meet the challenge of a new decade" (1970, p. 208). But such a positive attitude did not prevail. As was noted in the historical section above, language laboratories were in the doldrums in the 1970s and early 1980s. Davies (1982) singled out the Pennsylvania project for making complete the growing disillusionment of the period with labs. Moreover, it appears that the study discouraged other research, for it was the last of the large scale inquiries into the language laboratory's effectiveness.

The only major inquiry of the language laboratory involving postsecondary students will now be discussed. Scherer and Wertheimer (1964) described in a 246-page book, *A psycholinguistic experiment in foreign-language teaching,* the 2-year NDEA-sponsored investigation they conducted from September 1960. Their goal was to compare the audio-lingual approach to the traditional grammar-reading method. Thus, this was not an examination of the language laboratory per se; rather, it was an inquiry similar to the Pennsylvania project (not yet conducted), which was interested in the language lab because of its intimate connection to the audio-lingual method. The subjects were beginning German students at the University of Colorado. Intact classes were used, and these were determined to be similar on measures of general academic ability, language learning aptitude, and motivation, as well as sex, age, and year in school. It should be noted that Wertheimer was a psychologist and this study was published in a psychology series. This reinforces what was noted in the previous *History* section, namely, that the general educational community in the 1960s was very interested in the language laboratory and that the foreign language community looked outside of itself for guidance in implementing and evaluating the language laboratory.

All of the teaching staff received a week of training in the respective methods prior to the start of the experiment. In addition, there were weekly meetings and frequent observations by the principal investigators and outside consultants to ensure that the instructors adhered to the experiment's guidelines. The traditional approach is only scantily described, but the audio-lingual procedures are elaborately detailed in Scherer and Wertheimer's book. The essence of the latter was dialogue memorization and related drill and practice in class. The frequency and duration of the lab sessions were unfortunately not specified; they were for "overlearning" (p. 83) the material presented in class. It is stated that the lab sessions were unmonitored and were of the "library-type" (p. 83), which presumably means the students attended at their convenience. Of note is the postponement of reading for the audio-lingual group until the 12th week of the semester. To be specific, the audio-lingual group saw absolutely no written German until that point. When reading began, it consisted of the dialogues that had been previously memorized and recombinations of the vocabulary contained in them.

The investigators claimed that they conducted a "persistent and continuous search" (p. 108) for standardized tests to use to measure the outcomes of the two teaching approaches. They were not satisfied with what they found, because "nothing that the major test distributors had to offer seemed to meet the requirements of our situation" (p. 108). They therefore constructed tests of the four language skills and two for translation: German-to-English and vice versa. The t test statistic was used for comparisons. At the end of the first year, the audio-lingual students were significantly superior to the traditional students in speaking and listening. The superiority in speaking was maintained in the second year, but the advantage for listening was not. On the other hand, the traditional students significantly outperformed the audio-lingual students on reading and writing during the first year, and maintained their edge on the latter skill during the second year. The traditional students also were higher in German-to-English translation during both years, and better in English-to-German translation in the first year.

In addition to these measures of linguistic proficiency, Scherer and Wertheimer also used standardized scales and questionnaires they constructed to evaluate the subjects' motivation to study German and their attitude to it and its speakers. They were also concerned with "habituated direct association." By this was meant the ability of the students to think in German, their inclination to translate or not, and their sensitivity to semantic nuances between the two languages. Numerous intercorrelations between these and measures of affective constructs such as anomie, social inhibition, and desire for further German study were calculated. The researchers summarized their work thus:

> The experiment has demonstrated that the two methods, while yielding occasionally strong and persisting differences in various aspects of proficiency in German, result in comparable overall proficiency. But the audio-lingual method, whether its results are measured objectively or estimated by the students themselves, appears to produce more desirable attitudes and better habituated direct association. (p. 245)

John B. Carroll (1969a) characterized the Scherer and Wertheimer study as "ambitious" (p. 869) and more rigorously designed than any previous examination of the audio-lingual approach. He accepted the investigators' conclusions as valid, but offered the following:

> The conclusion that emerges from this experiment is that the differences between the audio-lingual and traditional methods are primarily differences of objectives; not surprisingly, students learn whatever skills are emphasized in the instruction. (pp. 869–870)

19.2.3.2 Minor Studies. Besides the large-scale and well-publicized studies of Keating, Lorge, Smith, and Scherer and Wertheimer, there have been many smaller investigations since 1959. Eight studies that appeared in major journals have been selected for inclusion here according to chronological order. Only their main findings will be given, since these studies in general did not generate the interest of the larger studies that were described above.

Bauer (1964) found that university students who used the language laboratory in a supervised group-practice condition performed significantly better on oral and dictation measures, but not on a writing measure, than students who studied individually and were not supervised. Two drawbacks to the study were

the low number of subjects ($N = 24$) and the use of nonstandardized tests. Moreover, a close examination of the data reveals that the supervised subjects as a group used the lab 125 minutes more over a 3.5-week period than the unsupervised subjects, so the observed differences could possibly be attributed to greater time-on-task.

Young and Choquette's NDEA-sponsored study (1965) was a series of seven experiments that sought to determine whether any of four language laboratory equipment configurations made a difference in the subjects' abilities to self-monitor their pronunciation. The systems were characterized by the feedback options they presented: (1) passive, (2) active, (3) long-delayed comparison, and (4) short-delayed comparison. The first three systems were standard options for language laboratory installations at the time. An apparatus for the fourth condition was specially fashioned for the study by the investigators. In the passive arrangement, the subjects repeated after taped prompts, but they could not clearly hear their responses because the headsets muffled their voices. In the active arrangement, subjects could bear their responses amplified through their headsets as they spoke. In the third option, subjects could record their answers for later comparison. In the fourth setup, the students could hear their recorded response within 1.5 seconds of making them. Subjects in the active feedback configuration were found to have slightly superior pronunciation than subjects in the other arrangements. However, the authors qualified this finding on several grounds. Of note was the lower sound quality of the fabricated equipment used in the short-delay condition. The authors admitted that this hampered a true comparison with the other three conditions.

Buka, Freeman, and Locke (1962) and Freeman and Buka (1965) conducted experiments that sought to establish psychoacoustic parameters for language laboratory equipment. The first study determined that a high-frequency cutoff of less than 7,300 cps hindered subjects (high school students) from perceiving certain phonemic contrasts in German and French. The second study found that a low-frequency cutoff of 500 cps caused subjects (again high school students) to make significantly more errors in German phoneme discrimination than a 50-cps cutoff. However, no significant differences were found between these two levels for French phoneme discrimination. It was also found that consonant distinctions were more affected than vowel distinctions by the degradation of sound quality brought on by filtering.

Benathy and Jordan (1969) reported on a post hoc comparison of achievement scores in Bulgarian courses at the Defense Language Institute. The scores of 13 classes (87 students) that completed the course between August 1959 and September 1963 were compared to the scores of 15 classes (103 students) that finished between November 1963 and July 1967. The difference between these classes was the introduction in the fall of 1963 of the Classroom Laboratory Instructional System (CLIS): CLIS is a designed interaction of live instruction and a set of different kinds of learning experiences that make use of prepared and recorded instructional materials, delivered through the electronic media (p. 473).

The authors stressed that the CLIS system kept the learners on task much more than in a typical classroom. This was because the earphones both isolated each learner from the erroneous responses and pronunciations of others and provided quality native-speaker models. Moreover, the learner did not wait to be called on as in a regular class; it was always his or her "turn." The equipment used appeared to be that of a typical audio-active language laboratory, although the authors do not use the term in their article. Curiously, they do not cite any language laboratory literature in their discussion, yet their description and justification for CLIS are identical to those commonly found in language laboratory writings.

The two groups were found to be very similar in ages and scores on the Army Language Aptitude Test. Class sizes were nearly identical, and the same textbooks and proficiency test were used throughout the 8-year period. It was found that the CLIS classes scored significantly higher than the pre-CLIS classes on the two skills measured by the test, namely, reading and listening. The differences were especially pronounced in the case of the latter skill.

Despite the many experimental controls and the marked differences between the groups, there are three questions that may be raised about this study. First of all, as no mention of instructors is made, one wonders whether teacher effects were held constant. Secondly, the generalizability of the results to high school and university students is doubtful, given that the subjects were all adults studying for specific career purposes at the Defense Language Institute. A third consideration is a question: Why did Benathy and Jordan not more fully report on the synchronous study that Preceded the longitudinal one? They claimed similar significant results from it in favor of the CLIS. More information (i.e., number of subjects, a showing t values) about it would give greater credibility to their overall conclusion.

The Chomei and Houlihan (1970) study compared three language laboratory systems: instant playback, long-delay playback, and audio-active. The instant playback option allowed the subjects to have their recorded response to the program stimulus echoed back within half a second. The long-delay group had to rewind the tape to hear their recordings. The audio-active group did not record their responses. It can thus be seen that this study closely resembled what had been done by Young and Choquette (1965), but, surprisingly, this earlier work was not cited. The subjects in the Chomei and Houlihan investigation were 140 Japanese l0th-graders, who were all taught by the same instructor. It was found that the instant-playback group performed significantly better than the other groups on one out of five translation tests and on four out of five speaking tests that had been specially created for the experiment.

Sisson (1970) did a study that was sponsored by the U.S. Office of Education. Its aim was to settle the controversy among language educators as to the benefit (or lack thereof) of delayed comparison on students' ability to perceive and produce the phonemes of another language. Thus, this study shared the same goal as the work of Young and Choquette (1965) and Chomei and Houlihan (1970). That Sisson did not cite the latter is understandable, since it was contemporary to his own. What is surprising is that he ignored the former, yet did cite 39 other articles. In this oversight he followed Chomei and Houlihan, as pointed out before. Why a major study published in a leading journal was so ignored is an unanswered question in the record.

Sisson claimed that "the variables of learning environment were controlled as closely as possible with respect to identity of instructors, scheduling of laboratory lessons, and use of classroom and laboratory materials" (p. 82). The special equipment used in the study, the Plurilingua language laboratory, was thoroughly described. The subjects were 24 students of English as a second language at the University of Michigan. They were in three intact classes of eight students each. The classes were matched on the basis of a modified version of the test of Aural Perception for Latin American Students. This instrument had a phoneme discrimination section and two phoneme production portions.

Two conditions were compared. Half of the students (four from each of the three classes) listened to a taped stimulus and recorded their answer. On completion of an exercise, these subjects rewound the tape and repeated the exercise in the same manner. These subjects formed the "active group." The other group of subjects recorded their responses, as did the active group. However, at the completion of the exercise, these subjects rewound their tape and listened to their first responses rather than record them a second time. This was the "delayed-comparison group." Both groups spent 1 hour per week in the language laboratory during the 8-week term. The modified version of the test of Aural Perception for Latin American Students, which had been used as the pretest was also used as the posttest. Sisson found no significant difference between the two groups on either discrimination or production.

Morin (1971) compared three types of laboratory equipment: (1) an instructor-supervised lab with listening and recording functions, (2) a cassette recorder with "minimal supervision" (p. 65), and (3) an audio-active lab with no recording capability. At the outset 80 students were given the Modern Language Aptitude Test (MLAT) and the LA form of the MLA Cooperative speaking test as pretests. The students were then assigned at random to 8 classes which contained 10 students each. This resulted in two classes per treatment condition (there was also a control group). The *Voix et Images de France* textbook and tapes were used. After three days of instruction, the classes were further divided into "fast" and "slow" groups. What was meant by these terms and the basis for assignment to groups is not explained. Nor is there mention of teacher assignment. A total of 16 groups/cells of 5 students each resulted. After a total of 120 hours of instruction over a three-week period, Form LB of the MLA Cooperative test was administered. The results were analyzed by ANCOVA, although which of the pretests was used for the covariant was not given. No significant differences were found. Morin concluded that "inexpensive equipment produces results comparable to more sophisticated ones" and then suggested that "further study should bear mainly on improving ways and means of utilizing present equipment rather than on equipment proper" (p. 67). The conclusions of this study are suspect because of the low N and the apparent lack of control for teacher effect.

Smith (1980) conducted a study to determine whether the slowing down of recorded material had a beneficial effect on listening comprehension. The reader will recall from the *History* section that during the 1960s equipment became available which was capable of slowing down (expanding) or speeding up (compressing) recordings without distortion. Smith claimed that his search of the literature turned up no reference to studies addressing the specific application of this technology to foreign-language instruction. This claim was incorrect: Driscoll (1981) listed two such studies which predated Smith's by several years and three that were done at about the same time as Smith's (i.e., the late 1970s). However, in fairness, it should be pointed out that Driscoll was also guilty of oversight; he omitted Smith's study even though it was in the same outlet, the *NALLD Journal,* as his own article.

Smith's subjects were second-semester students of French at West Chester State College in Pennsylvania. The control group had 11 members, and the experimental, 12. The cooperative test was administered as a pretest, and the control group was found to be significantly better in reading ability than the experimental group, but both groups were equal in listening comprehension, the skill at issue in the investigation. The study stretched over the fall 1978 semester. The control group covered 12 audio lessons that were recorded at normal speed. The experimental group listened to four lessons that were slowed by 20 percent, four that were slowed by 10 percent, and four that were at normal speed. At the end of semester, the students were again given the cooperative tests. Contrary to expectations, the ANCOVA and Finney *t* test procedures showed that the control group scored significantly higher on listening comprehension than the experimental group who listened to expanded material.

Despite such a clear-cut albeit counterintuitive finding, Smith cautioned that the study needed to be replicated with a larger number of subjects and for other languages before it could be reasonably concluded that expanded speech was not beneficial, or perhaps even harmful, for the acquiring of listening proficiency in a foreign language. Unfortunately, there is no record of replications by Smith or others. Whether the magnitude of Smith's findings squelched any other initiatives can only be conjectured. Driscoll (1980) concluded from his review of the studies that the results "do not add up to much more than implication" (p. 49) that either expanded or compressed speech is a boon to foreign language study. Nevertheless, language laboratory manufacturers continued to include expansion and compression capabilities in the "deluxe" models of their equipment. It can only be concluded that many practitioners appreciated these features and purchased them, although they had no independent, empirical confirmation of their effectiveness.

19.2.3.3 Summary of Research. Twelve studies conducted since the passage of the NDEA in 1958 were discussed in this section. They differed considerably in scale, populations, and methodology. Although all concerned language laboratories in some way, they did not all seek to answer the same questions other than the general one of effectiveness. For these reasons, it is difficult to draw conclusions. This body of research does not offer clear-cut confirmation of the utility of language laboratories, yet neither does it suggest that they are detrimental to language learning. Perhaps the inconclusiveness of the record is because the investigations that were conducted were not following an agreed-upon agenda. The larger educational technology community began the period with such an agenda (Allen,

1959; Meierhenry, 1962). This lack of focus was costly: Pederson (1987) claimed that it was the lack of solid research concerning courseware that led to the decline of language laboratories.

It would be hasty, however, to dismiss all language laboratory research. It can readily be determined that the use of audio resources within the foreign-language community has differed significantly from that of the larger educational technology community. Not surprisingly, this different use fostered different research. What was unique to the utilization and study of audio resources within foreign-language circles? One can first note the interest in psychophysics and the acoustic parameters of equipment. Besides Buka et al. (1962) and Freeman and Buka (1965), who were discussed previously, Hayes (1963) should be mentioned. He culled a wide range of human factors literature in order to offer standards to be used in laboratory purchase specifications. At this time, the broader educational technology community was more concerned with visual rather than auditory perception. A clear example of this pictorial bias is the fifth issue of volume 10 of the *Audio-Visual Communication Review* (1962), which was entitled "Perception Theory and AV Education." It contained no mention of the aural sense. Such a slanting of interest belies the "audio" component in the name of the flagship journal of the educational technology field at the time. More recently, Saettler's *The Evolution of American Educational Technology* (1990) shows that this inclination persists; visual media are accorded much more attention than are audio media. Related to acoustic and perceptual matters are equipment features. Some of the studies reviewed in this section of the chapter (e.g., Chomei & Houlihan, 1970; Young & Choquette, 1965) were concerned with this issue. This is also unique to the body of language laboratory research. Only the studies of compressed and expanded speech showed an interest in machine capabilities.

At the outset of this portion of the chapter, it was stated that the larger educational technology community has not fully appreciated the history of the language laboratory. The scant attention paid to them in Saettler's *The Evolution of American Educational Technology* was cited to support this point. Nor has the research that accompanied the language laboratory been acknowledged heretofore. The proof of this contention can be seen in Allen's (1971) review of past educational technology research. This essay in the *AVCR* by its longtime editor contained no mention of the many studies done in the 1960s concerning the language laboratory. This is startling when one recognized that some of the studies had attracted much attention in the popular press. It is hoped that this chapter has filled in the glaring gap in the record.

19.3 CONCLUSION

Within the field of education, the language laboratory must be seen as a singular phenomenon. By virtue of its unique equipment and its specific pedagogy, it stands alone. There is nothing quite like it in any other discipline. At least in its golden age, the language laboratory was known and valued. The April, 1962 issue of the *Review of Educational Research* (Volume 32) was devoted to "Educational Media and Technology." It contained seven articles that summarized the literature since the publication of Volume 26 in April, 1956. Foreign language education was the only academic discipline to get its own review, namely Mathieu's (1962) piece on the language laboratory. This chapter has traced the history and summarized the research surrounding the language laboratory phenomenon with the intent of securing the lab's deserved recognition in history.

According to Last, "language teachers as a body have been more ready than most to accept and explore the pedagogical potential of new technologies as they have emerged" (1989, p. 15). No better embodiment of Last's contention can be found than the language laboratory. According to a leader of the language laboratory movement, Elton Hocking, its justification was because "Sound brings language to life, and life to language" (in Huebener, 1965, p. 140). This author was a student who used the language laboratory in the 1960s. He recalls fondly and clearly sitting in the language laboratory in 1965–66 school year as a seventh grader, listening to dialogues, repeating them, and being corrected by his teacher. A special treat was going to the lab and viewing his Spanish instructor's slides of a trip to Mexico. For him, the lab was an exotic place he enjoyed visiting. He senses that among the millions of students who passed through the language laboratory over the years, he was not alone in his appreciation. Indeed, sound brought language to many lives. Thus the huge sums expended on the language laboratory and the thousands of educators' hours devoted to its use were not in vain, even though the research did not determine the optimal lab configuration and pedagogical program. If the language laboratory as it was known during its "heyday" is now gone, it has not died. Its descendant, a computer lab equipped with foreign language software, is alive and well. The computer now fulfills all the desiderata of language educators and gives life to language for many learners.

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