

## **"TONED CASSETTES AND CUE-SENSITIVE HARDWARE"**

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### *Introduction*

The problem of locating items recorded on audio tape has long been a problem for the user. Some years ago Krones, Sawyer, and Grosjean<sup>1</sup> analyzed several common methods to signal the beginnings and ends of the different units of tape-recorded matter, methods that are still in use in some quarters today. It is the purpose of this paper to review their findings and recommendations in light of the trend toward the adoption of cassette tapes and cassette recorders to replace their reel-to-reel counterparts.

Krones and his associates described two basic techniques, one visual and one audio, for finding one's place on reel-to-reel tapes. The audio technique included the addition of metallic strips to the beginning and end of the tape, or segments thereof, a technique commonly used to stop, recycle, and start automatically repeating tape recorders. The authors noted that the sound of the metallic strips crossing the heads was readily perceived by the operator and served to orient him to given portions of the recording. Variations of the visual method included 1) inspection of the digital counter, 2) the use of adhesive tabs cemented to the tapes at an appropriate spot, 3) white leader-tape spliced in between the lessons.

Th authors rejected these audio-visual markings for various reasons, the most serious being the time consumed in removing them as tapes were reused for other lesson material. More inefficient, however, were the digital counters; they tended to be inaccurate for the rapid location of material. Human failure was also noted as contributing to teh overall inefficiency of visual techniques: Students often forgot to set the counters to zero at the beginning of each tape; laboratory aids, faced with the difficult job of placing or removing the leader-tape, tabs, or metallic strips from library copies, often missed a few, and, as new material was copied on the old reels, a confusing set of affairs was programmed for the student.

To alleviate the problems associated with visual markings, Krones and his colleagues described an alternative auditory technique similar to that used for slide-tape synchronization: the recording of tones as auditory cues at critical points throughout the tape, the major difference being that the auditory cues were very low-frequency (forty cy-

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<sup>1</sup>Robert Krones, Jesse O. Sawyer, and Glen Grosjean. "On the Use of Low-Frequency Tones for Marking Language Laboratory Tapes." *Language Learning* 14,i(1964):51-54.

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cles) and were recorded on the *master* track along with the subject-matter, rather than on an adjacent channel. Their method was visual, too, however, for it recommended the optional use of white or colored leader-tape spliced in such a way as to encompass an additional ten-second segment recorded with a low-frequency tone. The few inches of leader-tape would serve for penciled annotations. Threaded on a machine that would not cut off the sound in the so-called "search modes" of operation—fast-forward or rewind—the forty-cycle tones would be generated at higher frequencies and could be perceived as "beeps" or "entry-codes" marking the beginning or the end of a lesson, or a segment thereof. Thus, by cycling the tape and counting the appropriate number of "beeps," one could find given portions of a lesson. Played at normal speed, the tones, for all practical purposes, would be inaudible. The authors further noted that it would not be necessary for playback hardware to have "constant head-wipe" (that is, where the tape and the playback heads touch continuously in all functional modes, for constant-wipe would result in excessive wear and short head-life); rather, the equipment need only have two fundamental characteristics: 1) "tape-lifters" which would maintain a close but incomplete proximity of the tape and the heads in the search modes; and 2) constant playback amplification in fast-forward and rewind. These two features would obviate the problem of excessive head-wear, yet auditory cues would still be perceptible. The tape-lifters, in turn, would mute the program slightly, thus reducing the "chatter" while allowing the "beeps" to be clearly heard.

The advantages of the method of placing auditory cues initiated by Krones and his associates, is still a good one today: 1) copying tapes for library use is accomplished with ease. No manual operations are involved; the cues are copied automatically and electronically every time the lesson is reproduced. 2) Correspondingly, the removal of cues is easy and accomplished simultaneously with bulk-erasing or rerecording of the tape. 3) The method is compatible with all speeds of duplication and with one or multiple copies. 4) The tone is perceptible to the ear, as described above, and to the eye, since the level of output will rise and remain constant during the playback of the tone and may be seen on a VU meter.<sup>2</sup>

Happily, over the latter part of the 1960's, and largely through support from professionals<sup>3</sup> and the National Association of Language

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<sup>2</sup>*Ibid.*

<sup>3</sup>See for example, Glenn M. Grosjean, and Jesse O. Sawyer. "Format Preferences in Publishers' Recordings." *NAALD Journal* 4,i(1969):68-71, and Arthur J. Gionet, and Gene H. Franks. "The Texas Report on Format Preferences in Publishers' Recordings." *NAALD Journal* V, i(1970):13-18.

Laboratory Directors, most publishers' recordings which accompany beginning and intermediate textbooks for foreign-language instruction have incorporated the Krones-Sawyer-Grosjean low-frequency, auditory-cues on the master track as a normal extension of their reel-to-reel format. "Toned tapes" are available in both 3.75 and 7.5 ips configuration. However, publishers do not separate different lessons on the same reel with leader-tape; intervening colored tape still must be added by the consumer if he desires it.

The audio "entry-codes" have greatly facilitated use of the reel-to-reel materials by students and by teachers. Teachers can locate quickly subject-matter dealing with the same concept on different sets of tapes; they can access relevant segments easily and efficiently so that taped practice sessions can include a variety of homogeneous exercises from several sets of materials. Students studying independently with tapes at home or in the library laboratory are able to skip over an entire exercise, or portions thereof, as they progress through a lesson; they can also review sections of the tape at will, fully confident of being able to find quickly and accurately the beginning and end of each segment of the lesson.

### *The Cassette Anomaly*

While a happy state of affairs exists for language laboratories using the reel-to-reel format exclusively, all is not well where cassette tapes and recorders are used, and herein lies a great problem for the profession.

Manufacturers of cassette hardware for the language laboratory (and teachers who use cassette equipment in general) have overlooked a basic requirement for the software in tape-guided instruction: The "tone-technique" to code taped exercises has gone unnoticed. The value of auditory cues to guide the consumer as he uses instructional materials has been largely ignored.<sup>4</sup> Cassette machines with "cue sensitivity" as a routine extension of *normal* operational functions have not been built.<sup>5</sup> For modern languages a large portion of

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<sup>4</sup>The recent conference entitled *Audio in the 1970's: Role and Potential in Language Training*. (Washington, D. C.: Defense Language Institute, 1971), paid lip-service to toned-tapes and cue-sensitivity. While recommending the identification of material on tape via low-frequency tones, the technical criteria for cassette tape recorders omitted entirely any mention of machine sensitivity to such cues.

<sup>5</sup>Apparent single exceptions are the Telex series models 87528-87530 and the Sony TC-90 and TC-95. A number of other brands (e.g., Wollensak 2525AV) have the capability for cue sensitivity within their basic design. Modification could be effected easily and with little or no added cost to the consumer.

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the auditory exercises currently on reel-masters cannot be efficiently used on cassettes, for although the low-frequency codes are copied from reel to cassette as part of the duplication process, the playback equipment cannot "hear" these tones. In virtually all of the home-entertainment and professional cassette equipment available, the heads and the tape are separated by too large a distance for the playback amplification of the "beeps" to be perceived in the search modes. Since the student cannot "hear" these cues as he works with the cassette tape, he must rely upon trial-and-error as he seeks to find an appropriate entry-point or familiar context. Even when provided with a tape script he is discouraged from easily working with the material, for he cannot be sure that the tape and the script will correspond perfectly.

This is a serious oversight on the part of the manufacturers. Moreover, cassette equipment which incorporates slide-synchronization capabilities does nothing to solve the problem. Machines of this type at present are unsatisfactory for language practice. They are exclusively audio-passive. Furthermore, cue tones for slide-synchronization are usually placed on a track adjacent to that containing the subject-matter of the lesson, and, as a result, the full width of the tape is utilized in playback. For the language laboratory this means that the *student channel* rather than the master channel is used to sense the tones, a practice which obviates the recording and playing-back of responses for comparison. More seriously, however, the tape and the heads maintain "constant wipe" in all functional modes, thus increasing the potential of excessive headwear. Finally, slide-synchronization machines incorporate more complex electronics and mechanics and are more costly.

One is equally frustrated by the visual cueing methods available for cassettes. Inspection of the window on the cassette shell allows only a gross estimation of how much tape remains on the supply and take-up hubs and provides little help in finding a specific segment of a program. The physical characteristics of the shell make the imposition of adhesive tabs or leader-tape impractical. First, the tape itself is encapsulated and hidden from view, and second, there is the very real danger of the splices or tabs hanging-up on the shell liners, rollers, or pressure pad, or being captured by the playback mechanism's pinch-roller or capstan, especially during high-speed duplication. The revolution counters are similarly inaccurate and serve primarily as indicators that the tape is in motion; they are even less reliable for finding one's place in a lesson, given the compressed surface-area for information storage imposed by the 1 $\frac{7}{8}$  ips standard and subtle dis-

parities between tapes and transport mechanisms. Battery-operated, portable models fare no better. Only about one in four is equipped with a digital read-out; almost none manifest cue sensitivity. Yet these are the very machines students will use as they study with tapes at home or in a school's listening center.

Clearly, there is a need for cassette equipment that is sensitive to auditory cues as a by-product of its normal operation.

### *Tones and Teacher-Made Tapes*

As tape-guided language practice gained in popularity during the early 1960's, teacher-made lessons predominated in classrooms and in language laboratories. This practice diminished, however, when professional, quality recordings began to appear as integral parts of instructional packages. Language teachers continued to use original practice tapes in their classes, but in tape-guided laboratory sessions they relied primarily upon textbook tapes which had been prepared elsewhere. With few exceptions this practice continues in most schools and colleges.

Interestingly, today, more teacher-made tapes are found in disciplines other than modern languages. The explanation is straightforward: the current interest in audio-tutorial and tape-guided individualized instruction had its rebirth in the sciences and has proliferated there as the primary means by which information is transmitted to the student. These tutorial tapes contain expository material, directions for learning, exercises to be carried out with materials in the student's carrel or in the learning center proper, and even commentary to follow as experiments and realia are manipulated. Based upon behavioral and performance objectives, teacher-made audio-tutorial lessons have been instrumental in providing the learner with a well-organized environment.

Language teaching is witnessing a profound interest in tutorial and individualized instruction within its own boundaries.<sup>6</sup> One outcome of this interest is a return to teacher-made tapes; tapes used by students as they work individually and/or independently through an in-

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<sup>6</sup>For an overview of the method see Dale L. Lange, ed. *The Britanica Review of Foreign Language Education*, Volume 2, New York: MLA/ACTFL, 1971. (The theme of the volume is Individualized Instruction); for a review of the state of the art, see Howard B. Altman, and Robert L. Politzer, eds. *Individualizing Foreign Language Instruction: The Proceedings of the Stanford Conference*. Rowly, Mass.: Newbury House, 1971.

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structional unit; tapes complemented by the more common practice variety; tapes which generally follow the tutorial model and include the exposition of grammar or cultural concepts, and multiple activities.<sup>7</sup>

Auditory cues to demarcate entry points on tapes following a tutorial format are as important as those which delineate pattern or transformation exercises on language practice tapes. In both cases the student must be able to find his place in the instructional sequence quickly and precisely. As an example, an audio-tutorial language tape might incorporate the following six steps, each a sub-section of the overall lesson, each corresponding to a specific segment of the tape:

- Part 1* Instructions to the student, including a statement of objectives and an indication of the number and sequence of suggested learning experiences to reach the criterion.
- Part 2* A pre-test to establish entry performance; that is, what the student is expected to know beforehand, and to ascertain if perhaps he already can perform the criterion task.
- Part 3* A brief lecture or exposition of a given concept—commentary with or without associated illustrations, or realia.
- Part 4* A practice-test to establish whether the fundamental concepts and principles of the exposition in (3) have been comprehended.
- Part 5* Practice exercises including patterns, transformations, and real language.
- Part 6* A comprehensive criterion test to assess whether the learner has achieved the specific levels of performance specified in (1).

The student listening to a copy of the lesson would have the option of entering the program at any one of six points provided that during the recording process low-frequency tones had been incorporated on the master tape in between each of the respective segments. For example, consonant with his background and performance on the pre-test, he might elect to skip the intervening lecture and/or practice sequences, and attempt the post-test. He would fast wind the tape to the sixth "beep" and undertake the portion of the lesson which followed. If he failed to reach criterion performance, he could recycle the tape selectively to the entry points or "beeps" signifying "lecture" or "practice sequence" and study their respective content before attempting the post-test for a second time. Alternatively, he might be

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<sup>7</sup>Agatstein, Michael. "Individualization of Language Learning Through the Cassette Recorder." *NAALD Journal* 6,ii(1971):27-32.

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directed to a remedial segment on another tape, the location of which could also be cued as heretofore described. Lacking "codes" of some kind and "cue-sensitive" equipment he would be unable to carry out these operations.

### ***Toning The Tape***

Given circumstances whereby cue-sensitive hardware is available to the students, the teacher is still faced with the problem of how to impose tones on the tapes he makes himself, especially if he uses a cassette recorder to make them. The most efficient method is to mix low-frequency signals from an audio-oscillator with a microphone input; tones can be generated by pressing a button at the various critical junctures of the lesson. The use of an audio oscillator, while more expensive, is the more practical in the long run for schools where a large number of teacher-made tapes are authored; this technique will work regardless of the hardware—reel-to-reel or cassette—on which the master recording is made, and it is quick and efficient. The same oscillator which produces the low-frequencies can be set to generate high-frequency tones which the student can hear while operating the tape at *normal* speed. Thus, tutorial tapes can be made which involve the manual cueing of slides, filmstrips, or other visuals. Finally, the same operator can also produce audio cues for automatic slide synchronization.

The second-best method, one available to almost everyone, is to purchase or have made an entire tape of forty-cycle tones. One can then copy the auditory cues on a tutorial lesson by feeding the low-frequency signals from the tone-tape to the master-tape as each section of the lesson is recorded. Copying from one tape to another is a viable technique for cassette-to-cassette, reel-to-cassette, or reel-to-reel duplication. With no access to an audio oscillator or two tape recorders, the teacher's only recourse is to manually splic-in the toned-segments where needed. The splicing technique is only practical, however, for open-reel tapes, for while toned-cassette tapes are easily duplicated from reels, the sealed shell of many brands and the delicacy of the tape itself makes splicing next to impossible.

### ***Conclusion***

Publishers' practice tapes and the single-concept, teacher-made tape with multiple learning activities remain potentially strong vehicles for individualized and tutorial instruction in all disciplines. The addition of audible cues at critical entry points on tapes of both kinds goes a long way toward realizing that potential. Unfortunately, the

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wherewithall is lacking for consumers of cassette equipment interested in improving their teaching. Cassette manufacturers have failed to provide equipment with cue sensitivity. Practitioners still ignore the method. Teachers need to be made aware of the various techniques to code sections of audio tapes for efficient information retrieval. Standards and guidelines for cassette hardware must be established as was done for reel-to-reel equipment. Cue sensitivity should be a fundamental consideration of such standards. Until cassette mechanisms capable of the full range of instructional techniques are available, the consumer must remain skeptical as to what real benefits a cassette operation will afford him.