## CORRESPONDENCE

To all readers of the **ARSC Journal**:

The following is our critique of the article "Fifty Questions on Audio Restoration and Transfer Technology" by Tom Owen, which appeared in the **ARSC Journal**, Vol. XV Nos. 2/3, pp. 38-45.

We are in disagreement with certain aspects of this article which refer specifically to products that the undersigned have developed especially for the use of collectors and professionals concerned with optimum playback of recordings. Claiming our right to defend ourselves in print and to set the record straight as we see it, we offer this critique which, as a service to the readership of the **Journal**, has been extended to the entire article. To save space we have not repeated the questions or the original answers nor have we attempted to list a number of the more trivial and obvious typing, spelling, and editing errors.

Q/A 1: Mr. Owen, to the best of our knowledge, is not familiar with the Lane Audio & Records Record Cleaning Kit, which is preferred by several university archives.

Q/A 6: First we are informed that the "general groove diameter" (whatever a "general groove" may be) of "Early acoustic" is 8 mils, radius of 4 mils. Two lines down, the figures for a "Verticle [sic] acoustic (early)" are given as 3 mils diameter and three mils radius (?). One assumes a typographical error here as in the spelling of vertical, since the diameter and radius cannot be the same. Then, below that is "Lateral acoustic (early)" 6 mils and 3 mils. So we have a different set of dimensions for "Early acoustic" than we have for either "Verticle acoustic (early) or "Lateral acoustic (early)"! But this is all resolved, we are happy to observe, in Question 8, where recommended styli sizes and shapes are given and we find that early acoustics can range from 2.6 to 4.7 mils radius. We would presume that such a range of styli sizes would be necessitated by a range of groove diameters from 5.2 to 9.4 mils, so what was the utility of the figures in Question 6?

Q/A 10: Mr. Owen omitted to mention various anti-skating techniques and stylus/record geometry considerations which makes most of these "close to impossible to play" records quite playable.

Q/A 11: The wording of the question does not correspond with the answer. For the answer given, the question should have been: "What are historical stylus sizes, configurations and materials for playing back cylinders?"

Q/A 12: One must distinguish clearly between the two sides of the groove and the depth of the groove, and not lump these two together as "parts." A canting control is nothing more than the monophonic use of the balance control found on stereo preamplifiers and receivers. Its function is to monitor and acquire the best balance in sound quality and noise between the two sides of the groove. It does nothing to mon-

itor different groove depths. For this critical monitoring, essential to find the area of least wear, different-sized styli must be employed.

Q/A 14: Our "dream" turntable would also be provided with a suction or clamping device to hold warped records flat. We do not anticipate that any reader will venture to search for a turntable with matching tone arm that will play "records of up to 20 feet in diameter."

Q/A 16: Mr. Owen neglects to mention ARSC member Jeffrey Duboff's line of excellent turntables with digital readout of the speed settings.

Q/A 17: Cylinders have been played electrically with great success by employing a long, pivoted tonearm, perhaps made of wood, on which is mounted an electric cartridge. The horizontal tracking error of such a system is insignificant and it is considerably less expensive than tangential arms, such as the Rabco, and also avoids problems characteristic of tangential arms.

"Fly-reel" seems unreal. "Fly-wheel" may appeal.

Q/A 18: Electrical reproduction of cylinders makes it possible to filter transient noises within the "usable modulated frequencies" as well as above them.

Q/A 19: "6 db-per-octave cut"; relative to what? Or does Mr. Owen mean a 6 db-per-octave slope throughout the audio range starting, for example, at 20 Hz?

Q/A 20-25: The subject of equalization is not a simple one for the non-technically-trained reader, which, we presume, constitutes most of the readership of the **Journal.** Thus, how many will understand the reference to "reactive electrical elements"? For those wishing to read what we consider to be a more lucid treatment of the subject we recommend the article "Equalization and Equalizers" by Michael Lane (**ARSC Journal**, Vol XIV No. 2, pp. 29-36). The article explains the terms "inherent" and "user" equalization as employed in this critique, which we shall not take the space to define here.

Q/A 28: While a good many late electrics do have a 500 Hz turnover frequency, it is just not true that most electrics do. Turnover frequencies range from below 250 Hz to over 1000 Hz and cannot mostly be lumped at 500 Hz.

Q/A 31: To correct just one of several errors in this answer, the AES curve, which Mr. Owen lists with a crossover of 500 Hz, actually has a crossover frequency of 400 Hz (see the **Radiotron Designer's Handbook**, fourth edition, p. 731, and Tremaine's **Audio Cyclopedia**, p. 666).

Q/A 32: "Audio restoration" seems to us to be a pretty high-falutin' term to be associated with a preamplifier that offers some elementary conveniences for playing back old records. As far as characterizing the products of Lane Audio and Packburn Electronics, Inc. as "limited function" devices, we are left to wonder what an unlimited function device is. Is it going to be the next invention after perpetual motion?

Our view is that, when you use the term "audio restoration," you imply that the equipment used and the standards to be applied to the finished product are state of the art, or something close to it. We evaluate the Owl 1 as an appropriate device for convenient playback of old records at a reasonable price, but we see no necessary role for it in a state-of-the-art system.

Q/A 34: Mr. Owen's answer would be correct if he had deleted the last seven words. A groove (mechanical modulation) does not contain voltage

(electromotive force) and if an unmodulated groove contains specific frequency information, then it would no longer be unmodulated, would it?

Q/A 36: Mr. Owen seems to be talking about new, unplayed records. But in the real world it is wear, scratches and other physical damage that cause a major portion of surface noise. Incidentally, we were not aware that shellac was considered to be an abrasive material. Rather, the fillers and abrasives added to the shellac cause most of the surface noise attributable to the disc material.

Q/A 37: Since Mr. Owen lists dynamic and static filtering separately, he seems to mean by "proper equalization"--proper inherent record equalization. Inherent equalization should be used to achieve proper frequency balance in playback. Some have employed inherent equalization as a crude type of static filter, but this degrades the high frequencies to an unacceptable extent as is painfully evident on numerous LP transfers from 78s. Mr. Owen also omits, in this context, reference to transient noise, which is a significant part of the overall surface noises.

Q/A 41: We consider that Mr. Owen's reply is not without an implication that all dynamic filters cause pumping. Judging by the number of such devices now being offered to both the professional and consumer markets, one must conclude that there exists a considerable number of satisfied users of modern dynamic noise suppressors.

We shall leave it up to the other manufacturers to defend their products. In regard to the Packburn Continuous Noise Suppressor, which was specially designed to cope with 78s as well as with modern analog records and tapes, the circuitry and controls provided make it possible, in our experience, for the device to perform without pumping when used as intended, i.e. after the Transient Noise Suppressors. We may also add that the Dynamic Rumble Filter in the Lane Audio and Records modified Phase Linear, Series II operates without audible pumping when properly adjusted, in our experience.

Such devices do not cause the drastic loss of treble or bass so commonly encountered with static filters.

Both static filters and dynamic filters can be very effective. But the key element is the skill of the operator, which is the crucially important human factor that Mr. Owen fails to mention even once in his article. We believe that the tools of sonic restoration are very important, but the other side of the coin is the skill, knowledge and dedication to use such tools to achieve valid and convincing artistic results.

Q/A 42: Rumble can extend from below 20 Hz to above 300 Hz.

Q/A 44-45: In our view an archival master dubbing (one that is to be stored as a permanent substitute for an original recording) should not be made using any irreversible electronic processing and should employ only correct inherent record equalization, if known. It should be a stereo recording of the two groove walls using the optimum stylus size and shape. The use of electronic processing should be reserved for tape copies of the archival master dubbing.

Q/A 49: Again, Mr. Owen fails to mention the significant work of another ARSC member: Steven Barr's excellent book, **The (Almost) Complete Record Dating Guide** (self-published, 1979). In Mr. Owen's last sentence, we

trust that it is the groove that has the 2-mil diameter--not the record.

For those who would like to read what we consider to be a more lucid and extensive exposition of the subject of sonic restoration, we recommend "Sonic Restoration of Historic Recordings" by Michael Lane, a three-part article that was published in **Mix (The Recording Industry Magazine)** in the issues of December 1982 and January and February 1983. A copy will be sent without charge or obligation to anyone who requests one from either of the undersigned.

For additional reading we recommend Howard M. Tremaine's **Audio Cyclopedia**, first edition (Indianapolis: Howard W. Sams, 1952) or second edition (Indianapolis: Sams, 1969) and also two out-of-print books dating from the early years of long-playing records: Oliver Reed, **The Recording and Reproduction of Sound**, especially the revised and enlarged second edition (Indianapolis: Sams, 1952), and Fritz Langford-Smith, ed., **Radiotron Designer's Handbook**, fourth edition (Sydney: Wireless Press, 1953; reproduced and distributed by RCA Victor Division, Radio Corporation of America, 1953, and Tube Division, Radio Corporation of America, 1956), especially Chapter 17, "Reproduction from Records."

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Mr. Owen replies:

For the readers' convenience I repeat the relevant questions from my article, but to save space I have omitted the original answers.

1. What is the best method of cleaning discs?

At the Rodgers and Hammerstein Archive of Recorded Sound I receive samples of most record care products, and literature on the machines; so far I've seen nothing on the Lane Audio & Records Record Cleaning Kit, but I'd like to. If Mr. Lane will send me a sample, I will be happy to have it tested (at my own expense) at an independent laboratory and to share the results with ARSC in the **Journal**.

I have personally tested the washing machines and found that the Monks works best for all Archive formats (i.e. not only 78s and LPs but also 16" acetates, glass- and aluminum-base recordings, and so on). My preference for the Monks machine is based on washing several thousand discs over the last five years and inspecting the results using the scanning electron microscope.

6. What is the general groove diameter of records from 78s to LPs?

Let me try this one again. The typical groove diameter, or width of the groove at the record's surface (from ridge to ridge), is still given in the column next to the relevant type of record. My original right-

hand column was mislabeled--it actually contained the theoretically best stylus diameter for playing each width of groove. I repeat it here, though my answer to Question 8 offers more precise suggestions for stylus choice. The term "Early acoustic" was not clear and has been replaced by "Lateral acoustic (early)--wide groove." Note that in a vertical-cut record, the full width of the groove is playable and the stylus should be about that width.

| Type | Groove | Stylus |
|---|---|---|
| Vertical Acoustic | 3 mils | 3 mils |
| Lateral Acoustic (early)--wide groove | 8 mils | 4 mils |
| Lateral Acoustic (early)--narrow groove | 6 mils | 3 mils |
| Lateral Acoustic (late) | 4-6 mils | 2-3 mils |
| Electrical 78 | 6 mils | 3 mils |
| Early LP | 3 mils | 1.5 mils |
| Later LP | 2 mils | 0.7-1 mil |

10. How are these not-so-common discs played back?

Mea culpa, mea culpa. Incidentally, the category "Early Acoustics (to 1925)" should of course be just "Acoustics."

11. How can cylinders and vertically recorded discs be played back?

Possibly so. Incidentally, nobody caught the "Pathé (large)" typo--it's 18 mils, not 1.8 mils.

12. How do I monitor the different parts of a groove?

By "parts" I mean simply the left wall, right wall, and bottom of the groove. The Mode switch of the OWL 1 allows you to listen to sound from just the left groove wall, just the right, the sum of the two walls, or just the vertical component (e.g. the full contact area of a vertical-cut record). The balance or channel selection controls of a standard stereo preamp do not allow you to monitor the vertical component. (Question 12 does not have to do with stylus selection.)

17. How can cylinders be played electrically?

The long, pivoted arm does work in the reproduction of cylinders, though it is cumbersome. (As a matter of fact, I myself invited George Blacker to demonstrate it at the Syracuse annual meeting.) I should have said, "The two best ways are..."

The easiest thing for most people to use is an Edison 2-4 minute player with an appropriate cylinder reproduction device, then feed the signal into a preamplifier using linear or "flat" equalization to reproduce the signal properly.

19. What sort of curve should be used to play cylinders?

As I said in my original answer, I think cylinders should be played with linear or flat equalization--that is, with no equalization at all, because of course no equalization was applied when the record was made. (This is true of acoustic discs as well.) If you want to use the 6 db per octave cut, you should set your reference level at the lower end of the frequency band, say 20 Hz, and cut 6 db per octave to 20 KHz, thereby creating the slope that Messrs. Lane and Burns refer to.

28. How are 78s recorded?

I still maintain that a majority of electrically recorded 78s have a turnover frequency of 500 Hz, though it's true that other turnover points have been used.

31. What are some common curves?

There were two AES curves. The "old" curve had a turnover frequency of 400 Hz, but this was replaced at some point by a "new" curve with turnover at 500 Hz, and I believe "new AES" equalization was used for most commercial records cut using the AES curve. I have written to the AES Board of Governors on this question and am awaiting their reply.

32. Are there any devices on the market for the proper playback of old recordings?

I referred to the Lane and Packburn preamps as "limited function devices" because neither has the linear or flat equalization setting needed for the proper playback of acoustic discs and cylinders, which were mastered without the use of recording (or "inherent") equalization. That still seems to me an important point, though unfortunately I didn't spell it out in "Fifty Questions." The OWL 1 does have a flat equalization setting, as well as the others needed to equalize electrical 78s and LPs. Before inventing the OWL 1 I used the Packburn preamp for three years and found it suitable for many kinds of 78s but not for acoustics.

It would have been better if I hadn't originally answered, "The only device manufactured solely for audio restoration is the OWL 1." As far as I know the statement is true: the Lane and Packburn preamps are both originally manufactured by other companies (Hafler and PSI respectively), and are then modified by Messrs. Lane and Burns. But though true, the point is irrelevant. What counts is what the equipment does and how well it works, not how it was designed and manufactured.

34. What is the signal-to-noise ratio?

My original answer did not so much define the signal-to-noise ratio as describe a method for measuring it. Here is a good definition from Tremaine's **Audio Cyclopedia**, first edition, p. 428 (item 13.85): "It is the ratio of the residual noise in the recording system and the recording medium [i.e. material] compared to 100% modulation of the record."

36. What causes surface noise?

I <u>am</u> talking about new, unplayed records. My answer to Question 35 defines surface noise as "The amount of ambient noise in an unmodulated groove." Noise caused by groove wear during playback, mistreatment of the record, or deterioration of its materials is what I call "transient noise." The distinction is important because it relates to the use of equalization and filters to remove noise.

Shellac is not a very abrasive material, but it's not perfectly smooth either--the stylus and groove still cause wear to each other.

37. Can surface noise be filtered out?

Proper equalization does help get rid of surface noise. Indeed, reducing surface noise as I have defined it--that is, the ambient noise of unplayed records (especially 78s)--was one of the reasons that

various "curves" were devised when electrical recording was introduced. Acoustic recordings have no inherent equalization, so there is no proper playback equalization for them; to deal with their surface noise I use filtering instead.

Otherwise, dynamic and static filters are mainly useful in reducing what we now seem to agree should be called transient noise, as opposed to surface noise. I agree with Messrs. Lane and Burns that it's wrong to use an incorrect equalization curve for this purpose--say, playing back a 78 using the RIAA setting. My first answer to this question never said anything else but probably should have been more specific.

41. What kind of filtering causes that "pumping" so often heard on transfers?

All dynamic filters do cause "pumping"--that's unavoidable from the way they work, by cutting in when the signal falls below a preset dynamic level and cutting out when the signal rises above that level. One of the things that makes one unit better than another is how fast it does this. (Old recordings give special problems in this respect because of their low signal-to-noise ratios.) During three years of using the Packburn noise suppressor I found that it does pump, even under the best conditions, and I will be happy to illustrate this to interested parties.

Messrs. Lane and Burns are obviously right to say that the skill of the operator is crucially important to getting good results with either kind of filter, or for that matter with any other piece of equipment. I "failed to mention" this point simply because it was beyond the scope of "Fifty Questions," which is about technology, not users' experience, 'ear,' or 'touch' in using their equipment.

42. At what frequency does the "rumble" of old records occur?

I've certainly never heard any rumble as high as 300 Hz--that's above middle C! Rumble is mechanically induced noise, usually from the recording machine's motor or bearings, and in my experience it is audible only below 100 Hz.

44. To make a proper archival (objective) recording what kind of filtering is used?

45. What kind of equalization should be used for archival recording?

This is certainly a reasonable approach to archival recording, though not the only one.

49. How can the date of a recording be found?

I did not know Mr. Barr's book.

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