

ABSTRACT Scientific claims to knowledge and the uses of technological artifacts are both inherently contestable, but both are not usually contested together. Consumers of 'specialty' audio equipment (known as the 'high end'), however, connect both forms of resistance. These 'audiophiles' construct their own universe of meaning around their equipment; they cultivate a distinctive vocabulary and set of attitudes. In this they resemble other groups of users dedicated to supposedly antiquated technology. But they also engage in controversy to defend themselves against knowledge-claims that would delegitimize their universe of meaning. These debates concern recording formats or media (the relative merits of the compact disk [CD] and long-playing record [LP]), user 'tweaks' of purchased equipment, and the supposed audibility of differences between different brands of amplifiers, cables, or CD players. In all of these cases, audiophiles resist the claims of audio engineering by privileging their personal experiences, and they argue against scientific methodologies that seem to expose those experiences as illusory. Some of these patterns of epistemic contestation resemble those in non-musical domains (such as biomedicine). But audiophiles also make epistemic use of values crucial to their identity as music-lovers. They appeal to a common understanding of music as an exemplary locus of subjectivity, emotion, and self-surrender, in order to ward off the criticisms directed at them from a science they construe as objective, detached, and dispassionate.

Keywords absolute sound, alternative medicine, digital versus analog, double-blind testing, experimenter's regress, listening

Golden Ears and Meter Readers: The Contest for Epistemic Authority in Audiophilia

Marc Perlman

Over the past 20 years, the dramatic growth of interest in the study of users and consumers has enriched our understanding of the variety of ways people employ artifacts (see for example: Cowan, 1987; Akrich, 1992; Kline & Pinch, 1996; Lie & Sorensen, 1996; Oudshoorn & Pinch, 2003). We now have a much more nuanced sense of the ways in which consumers can 'de-inscribe' a technology by putting it to unanticipated uses, or create their own world of meaning around it (often out of earshot of its designers and manufacturers).

Such interpretive autonomy does not usually imply epistemic autonomy; users may reject, resist, or reinterpret an artifact without questioning

the scientific knowledge that contributed to its production. However, there are also cases in which users defending the world of meanings that they have built around an artifact attempt to impugn the authority of the scientific knowledge-claims that underwrite the technology. In doing so, they may even recreate patterns of debate characteristic of experimental science, such as the experimenter's regress (Collins, 1985).

In this paper I describe one such contest for authoritative knowledge, played out within an elite group of consumers of 'high-end' audio equipment. Like other groups of users, these 'audiophiles' construct their own universe of meaning around their equipment; they cultivate a distinctive vocabulary and set of attitudes. But these mostly white, mostly male, mostly affluent and educated consumers also engage in controversy to defend themselves against knowledge-claims that would delegitimize that universe. They resist the scientifically authorized claims of audio engineering by privileging their personal experiences, and they argue against scientific methodologies that seem to expose those experiences as illusory. Some of these patterns of epistemic contestation are surprisingly similar to those in non-musical domains (such as biomedicine). But audiophiles also make epistemic use of values crucial to their identity as music-lovers. They appeal to a common understanding of music as an exemplary locus of subjectivity, emotion, and self-surrender, in order to ward off the criticisms directed at them from a science they construe as objective, detached, and dispassionate.

Users, Value Systems, and Epistemic Conflict

The interpretive flexibility with which users appropriate consumer technologies need not challenge underlying scientific knowledge. Consider, for example, Christina Lindsay's (2003) study of TRS-80 users. She shows us a dispersed community of hobbyists for whom this now outmoded computer represents both a sentimental attachment and an embodiment of moral values. Through the TRS-80 these men indulge their nostalgia for a past time when they were at the cutting edge of technology. But they also use it to uphold a particular moral order. This value system privileges activity over passivity; do-it-yourself over consumerism; skill over expediency; frugality, simplicity, and reliability over wasteful complication; and the pleasures of curiosity and involvement over the standardized goods corporate behemoths foist upon a mass market.¹ Its affirmation may function as a statement of self-identity or social critique, but not epistemic contention; TRS-80 hackers do not question the validity of computer science.

However, there are also users who contest the knowledge claims underlying the technologies with which they come into contact. Most of the reported cases do not involve tools like the personal computer, however, but biomedical questions about the safety of drugs, industrial chemicals, or radiation hazards. Often the laypersons who challenge the findings of experts do so on the basis of their own experiences. From the

bodybuilders who use steroids in defiance of their doctors' warnings (Monaghan, 1999) to the communities affected by chemical spills or radioactive contamination who take issue with official experts (Wynne, 1989: 36; Williams & Popay, 1994), laypersons insist on the truth of their own experience in the face of biomedical research. In the most striking of these cases, the people who are ordinarily the objects of epidemiological studies or clinical trials come to influence their design or conduct. Thus the 'popular epidemiology' of Woburn residents put pressure on official efforts to detect toxic waste contamination (Brown, 1992), and AIDS activists managed to redirect the development and testing of AIDS treatments (Epstein, 1995). In both cases, however, the lay groups could not simply appeal to the evidence of their experiences; they also had to translate their challenge into epistemic terms that were easily recognizable by the experts. These laypeople in effect pressed the experts to consider alternative answers to familiar methodological questions, such as the decision to err on the side of false positives or false negatives (Brown, 1992), or the biostatistical choice between 'fastidious' and 'pragmatic' clinical trials (Collins & Pinch, 1998: 146).

The users I describe later resemble both of these groups in certain respects. Their kinship with the TRS-80 hackers is perhaps to be expected, since they too transvalue a supposedly obsolescent technology and infuse it with their own meanings. It may be less obvious why they might resist the pronouncements of scientific specialists. But consumer audio technology, like biomedicine, is a point of contact between the layperson and the specialized artifacts and practices legitimated by scientific knowledge, and can likewise become an arena for epistemic conflict. Speakers, cables, amplifiers, and compact disk (CD) players are designed by engineers with specialized knowledge of electronics, acoustics, and psychoacoustics, and used by laypersons for their listening pleasure. Unlike biomedicine, audio engineering does not presume to control knowledge essential to life and health. But at least for music-lovers – who in our highly mediated society will most often experience music in recorded form – audio equipment provides the deeply meaningful emotional experiences they seek in listening. Audio engineering implicitly claims authority over listeners' access to the music they enjoy so intimately – an authority that remains invisible until it is called into question.

The consumers who do question it are a minority, but a relatively powerful one. These 'superusers', moreover, represent a type whose history is virtually coextensive with the technology itself. Since the beginning of the audio age, there have been people – usually men – whose fascination with consumer audio technology seemed excessive to their peers, men who spent an inordinate amount of money purchasing audio equipment, and an inordinate amount of time tinkering with it. This group of relatively privileged, well-educated men is not representative of all consumers, but it is of particular interest for the study of interpretive plurality among users. For time after time, audiophiles have resisted the judgments of audio

engineers, trusting their ears in the face of the dicta of scientific theories and engineering measurements.

To understand these debates, we will need first to become acquainted with the general contours of audiophilia. I will introduce these through a classic convention of ethnographic writing, using four excerpts from my field diary as exemplary anecdotes.² I will refer back to these scenes in my subsequent description of audiophilia as a social phenomenon, my account of its frameworks of valuation, and my analysis of the contest for epistemic authority within its universe of discourse. At the end I will relate audiophilia to the patterns of conflict and interpretive plurality found in other user groups, returning to the cases of the TRS-80 hackers and biomedicine to show how audiophilia employs common tools of contestation alongside its own unique resources.

Scenes of Audiophile Life

In the autumn of 1994, Jack, a middle-aged real estate agent, upgraded his stereo equipment. He invited his friends Mark and Len over to hear the difference the new preamp made in his audio system. Mark invited me along, and as I was not an audiophile Jack took the opportunity to put his equipment, and hobby, on display.

Jack's listening room was in the basement of his suburban house, with his record collection in the next room – hundreds, maybe thousands, of 33 $\frac{1}{3}$ rpm albums sitting in bins. The listening room itself – unfinished and unheated – was sparsely furnished, with miscellaneous objects strewn about (empty beer bottles, tennis balls). At the far end an old Naugahyde chair was precisely positioned in the best listening spot, with some folding chairs behind and on either side of it for Jack's friends. At the near end was a turntable and the new preamp, sitting on a table. A long cable connected the preamp to a tube amplifier sitting on the floor in the center of the room, where it sat flanked by two tall, thin speakers.

'So, you added some RoomTunes', Mark said, noticing the sheets of foam padding in the corners and cloth-covered wooden frame panels on the otherwise-bare side walls, positioned to absorb and reflect sound.

I ask Jack if he has a CD player as well as the turntable, and he says no. There's a debate whether tubes are better than solid-state, he tells me, but there's no debate whether analog is better than digital: it *is*. A cheap CD will beat a cheap turntable, but even a moderate turntable will blow away any CD. CDs are strident and flat; Jack can't listen to one for more than 15 minutes at a time. On a CD you can hear the pluck of a double bass, but on an LP [long-playing record] you can hear the body of the instrument, the wood.

Jack invites me to sit down, indicating the special chair. He turns off the lights, and sits with Mark and Len in the folding chairs behind me. In the darkness, illuminated only by the glow of the amplifier's tubes, we listen to some orchestral showpieces, jazz classics, Johnny Cash, and Joni Mitchell. In between the selections the three men trade remarks: 'only van Gelder could really record drums right, back then.' 'The voice is the hardest thing to record well.'

Apropos of the difficulties of recording the singing voice, Jack brings out his copy of the soundtrack album from the James Bond film, *Casino*

Royale. He tells me that Dusty Springfield's 'The Look of Love' is the finest vocal recording ever made, according to Harry Pearson. (Pearson is the founding editor of *The Absolute Sound*, a magazine Jack praises for single-handedly keeping the LP alive.) After we listen to 'The Look of Love', and Jack marvels at its 'natural' sound, I ask him if he isn't bothered by the hiss and surface noise on the album. No, he replies; after a minute you listen past it to the music. He emphasizes that sound is really secondary; music is what's important. 'If we were only interested in sound, we'd just listen to sound-effects records! No, it's the *music*'.



Jay was one of the system engineers at the campus computer center. I noticed a cartoon from an audiophile magazine on his office door when I went to apply for an E-mail account, and struck up a conversation. He told me he liked *The Absolute Sound* better than *Stereophile*, which he thought was less critical of the components it reviews. He admired Harry Pearson, editor of *The Absolute Sound*, because he was one of the first people who refused to accept engineers' claims about audio equipment, and trusted his ears instead.

Jay then told me about a little experiment he tried with his equipment. He had been reading about a company that makes small ebony disks which, when attached to audio components, improve the sound. The reviewer tried them on some high-end speakers and was amazed at the difference. Jay wanted to try it on his own speakers, but since they weren't as expensive as the ones the reviewer used, he thought he might not need fancy ebony disks, so he taped pennies on to the sides of the speaker cones. It made a difference! Jay was listening to a saxophone concerto (he used to play saxophone), and the pennies let him hear the sound of the reed. They improved the definition, they made it sound like there was a real instrument there, not like a watercolor. He couldn't understand how it could work. He didn't know all the physics of it. All he could imagine was that the wood sides of the speakers vibrate sympathetically at some frequency, and the pennies damp it. Though how thick, braced wood can be vibrating, he had no idea. If Jay told some engineer about this, he'd say Jay was on drugs!



Ben, the owner of a high-end audio store, was chatting with me in his showroom when Frank, a tall, muscular white-haired man, joined us. Frank told Ben how happy he was with his new CD player, and Ben asked him if it was mellow. 'No, it's not mellow. It's got tremendous definition and soundstage.' Ben admitted that, for [US]\$7500, you'd expect no less. Frank added that he felt he was 'listening *through*' like never before, listening through all the way to the microphones.

Ben asked: 'But do you want to be listening to the microphones, or to the music?'

Frank answered that he was just glad to be getting so much *information*.

Ben: 'But is it emotional?'

Frank: 'It's analytical.'

Ben: 'I can't listen to that stuff, it gives me a headache'. And then Ben told a little story. There was a night a while back when his system was packed up. He woke up in the middle of the night and turned on the television – an old set, with a little mono speaker built in. By chance the program was André Watts playing one of Ben's favorite pieces. Ben smiled and his eyes grew soft; he seemed to be cherishing the memory of that magical low-fi experience.

Frank shrugged. 'Well, what can I say? I'm too neurotic for that.'

After Frank leaves, Ben tells me Frank's a really nice guy, but a bit of an equipment freak – he upgrades his system every month.



The Audio Society's listening session at the Molybdenum Audio factory is about to begin. We are gathered in front of two enormous speakers: at first glance they seem to be 7 feet tall and each one looks like R2D2 sandwiched between two giant snails.

Before the demonstration starts, however, the President, a professional recording engineer, reports on the Consumer Electronics Show he recently attended. He then invites comments from the floor. One member recounts to the group how he was reading an issue of *The Absolute Sound* at the local Public Library (someone interjects: 'Is it still being published?', which raises a general chuckle). In it, a reviewer praised certain speakers, which he tested by recording the sound of his own voice and playing it back through them. But how could he judge the accuracy of reproduction, since our own idea of the sound of our own voice is influenced by the sound reaching the ear by bone conduction? The President agrees, and there are a few derisive snorts and head-shakings in the crowd.

Molybdenum Audio's spokesman introduces the company and the giant speakers. He recites a very long technical description, answering a few questions from the President along the way. He ends by asking if they have recordings they want to hear. The President gives him a CD and we listen to excerpts from Handel's *Messiah*, a few seconds from the *Rite of Spring*, a somewhat jazzy pop song, a harp solo, and several organ selections.

There is a tour of the factory, and the evening ends. On the way out I stop to graze over the remains of the crudités, and strike up a conversation with Dan, who runs a small speaker company. He praises the Audio Society as a counterbalance to all the 'craziness out there'. The Society can provide audio 'sanity' because it has a lot of scientifically minded people. He warns me of the power of the audiophile press. The magazines have tremendous influence: that's how a new company like Molybdenum Audio can do 60% of their business abroad – they got reviewed in *Stereophile*. In particular, Dan warns me against the reviews in *The Absolute Sound*: they can't be trusted, they're subjective.

The Social Location of Audiophilia

The category of the audiophile is neither sharply bounded nor internally homogeneous; there are grades of audiophilia, and much difference of opinion within its ranks. For my purposes it will suffice to define the audiophile as someone interested in what the industry calls 'specialty' audio, what is usually marketed as 'the high end'. In 1994, Richard, a

salesman in a specialty audio store, defined 'high end' for me as any system that costs US\$5000 or more (others would no doubt draw the line elsewhere). In monetary terms, the high end's upper limit is several orders of magnitude above this (as Molybdenum Audio's US\$175,000 speakers demonstrate).

High-end audio is closely associated with the demographic variables of gender, socioeconomic status, and education. Audiophiles are overwhelmingly male. In surveys conducted by *Stereophile* magazine in 1988 and 1991, men made up 99% of the respondents. This is unsurprising, given the historic identification of engineering in general with men, and audio technology's specific associations with masculinity over the past several decades (Keightley, 1996). Given the cost of high-end equipment, it is equally unsurprising that audiophiles inhabit disproportionately high-income brackets. In its 1988 survey, *Stereophile* magazine found that 47.4% of the 9000 respondents had salaries above US\$50,000; the average income reported was US\$58,900. In a smaller survey of 702 subscribers in 1991 the average income was US\$80,700. The readers of *Stereophile* also have educational capital to match their economic capital: of the 1988 respondents, 80.6% had at least an undergraduate degree, and 57.2% worked in professional or technical fields (Atkinson, 1988, 1992b).

But these highly educated, technically adept consumers do not necessarily think about audio equipment in the ways prescribed by audio engineering. Audiophilia has its own principles of valuation, and an ethic of listening, which in content or emphasis distinguish it from the scientific thought-world of engineering.

Fidelity, the Absolute Sound, and the Golden Ear

The valuing of accurate reproduction – fidelity to the original – as a supreme audio virtue dates from the earliest days of the phonograph, but it is upheld most vigorously by audiophiles. They hold quite explicitly not only that the standard by which all audio equipment is judged is accuracy, but that the touchstone of accuracy is the sound of live music. Their faith in the existence of an unconditional sonic truth is symbolized by the name Harry Pearson chose for his periodical, *The Absolute Sound*. 'The absolute sound is the sound of music itself' (Pearson, 1973: 4), which is usually defined to be 'the sound of live acoustic music being played in real space' (Nork, 1993: 6). The fervor with which audiophiles speak of sonic reality approaches the religious: 'truth to sound is a vital, almost sacred thing' (Greene, 1993: 194).

By conceiving of audio equipment as a conduit for the absolute sound, audiophiles define a standard of technical excellence that is also a standard of human excellence. In order to evaluate equipment, decide what to buy, and appreciate one's purchases, the audiophile must be able to *hear* the superior fidelity of superior components. He must therefore have a superior ear: as audiophiles say, a 'golden ear'.

The Ethics of Listening: 'Those Guys Will Never Tap Their Feet Again'

But for all their concern with sound reproduction, audiophiles frequently emphasize that their pursuit of fidelity is in the service of music and the emotional rewards of the listening experience. As Jack put it, 'If we were only interested in sound, we'd just listen to sound-effects records! No, it's the *music*.' I often heard audiophiles describe themselves as addicted to music. Jack told me that he sometimes stays up all night listening to his records. Richard, the high-end audio salesman, said: 'Once you get bitten by the bug, that's the end. . . . Music is such an emotional involvement, it pushes so many buttons for people.'

Thus audiophiles regard the concern for sonic reproduction for its own sake as pathological. Without a true love for music, audiophilia is a disease ('audiophilia nervosa'; cf. Glick, 1993). An advertisement in the June 1994 issue of *Stereophile* (17[6]: 146) asked:

ARE YOU AN AUDIO POMPASAURUS? Some audiophiles worship their audio equipment more than they love music. We can only feel sorry for such misguided behavior.

Indeed, the most potent put-down one audiophile can address to another is: 'I'm a music lover; you're only interested in hardware' (Atkinson, 1994: 3).

As Richard's comment suggests, the essence of music for many audiophiles is emotional response. The audiophile is defined by his fascination with technologically sophisticated devices that strain towards the ideal of perfectly accurate sound reproduction; but if he is not able to transcend this fascination by surrendering emotionally to the musical experience, he will be censured. As Stan told me, 'Some people are always tweaking, always adjusting things – they don't let the sound overwhelm them, they're always analyzing, listening for little nuances.' The temptation to analyze can distract the audiophile from proper emotional self-abandonment, as is clear from this confession in a letter to the audiophile press: 'As hard as I try to ignore the sonic quality when listening to an audiophile record, I can't help but sometimes lose the music (you call it the "emotional experience") because I'm focused on the sonics' (Cohen, 1993).

The idea that there are good and bad ways to listen to music is of course not unique to audiophilia, and throughout Western history there have been attempts to prescribe certain kinds of listening and proscribe others. But the audiophile ethic of listening is distinctive in that it is applied not only to humans but to artifacts. The moral distinction between music-lover and equipment freak is projected into the technological domain, to distinguish between varieties of equipment. Here is how Richard explained it to me:

There are two types of equipment, the 'musical' and the 'revealing'. The 'musical' type makes you tap your feet when you listen; the 'revealing' makes you analyze the sound, every little detail [*mimes a person listening*]

with eyes closed, face tense, stock still]. If you go too far in the ‘revealing’ direction you could get obsessive, like the guys who buy a new component and three weeks later they’re dissatisfied with it and want to upgrade. Those guys will never tap their feet again.

‘Musicality’ is the ability of a component to convey an emotional experience to the listener. Richard’s contrast between ‘musical’ and ‘revealing’ equipment is thus related to the contrast between ‘emotional’ and ‘analytical’ equipment we found in Ben and Frank’s discussion of Frank’s new CD player. For Ben as for Richard, the taste for ‘revealing’/‘analytical’ components was associated with the restlessness of a vicious cycle of consumption: to him, Frank was an equipment freak, upgrading his system every month.

The plurality of ultimate values in audiophilia – the coexistence of accuracy and musicality – is unproblematic in the human realm. It is easy to reconcile these values in a composite picture of the ideal audiophile, a person with exquisitely sensitive ears who is nevertheless able to direct his attention to the music’s emotional message rather than the quality of sound reproduction. But by positing a *technological* substrate for musicality, audiophilia flirts with paradox. For it is not at all clear how musicality can be a preeminent virtue of audio equipment without competing with accuracy. Assuming that nothing can be more musical than music, if the absolute sound is the sound of music itself, and if accuracy is fidelity to the absolute sound, then mustn’t musicality be the same thing as accuracy? Or is musicality a certain way of falling short of accuracy, a fortunate sonic adulteration? The former alternative renders the ‘musical’/‘revealing’ distinction otiose; the latter pits two types of audio excellence against each other.

Audiophiles are aware of this apparent contradiction, which Atkinson (1992a: 11) terms the ‘semantic swamp of musicality versus euphony versus accuracy’, and some have attempted to define musicality in such a way that it is consistent with accuracy without being identical to it (Miller, 1993). We need not consider the details of such analyses here. The coexistence of accuracy and musicality in the universe of audiophile values is important to us because of its implications for the struggles over audio authority. While accuracy can plausibly be defined and measured in engineering terms, musicality cannot. As we shall see, the appeal to musicality can function as a rhetorical resource in the conflict between two ways of thinking about audio, which I will call *golden-earism* and *meter-readism*.

Golden-Earism and Meter-Readism: ‘This Obstinate Quirk in the Nature of Things’

What we hear and what we measure are not the same thing. Of course, there are close and useful correlations, but subjective impressions and objective measurements never quite tally. This obstinate quirk in the

nature of things, as much as less mysterious but equally obstinate commercial motives, accounts for the sometimes doubtful character of numbers in audio. (Fantel, 1986b)

Since audio components are the products of electronic engineering, it should be possible to gauge their accuracy of reproduction without recourse to the ear: by measuring their performance in laboratory tests. This is of course a standard feature of equipment reviews in the mainstream audio press, and is highly valued by scientifically inclined audiophiles. But audiophiles are not universally willing to judge audio components 'by the numbers'. Indeed, the role of engineering measurements in the evaluation of audio equipment is crucial to the debates I wish to examine here.

When one of the Audio Society members held up a review in *The Absolute Sound* for ridicule, he made visible a fault line that divides the community centered around specialty audio. Dan warned me away from the equipment reviews in *The Absolute Sound* by calling them 'subjective', but for that journal and others subjectivity is a point of pride. So-called 'subjective reviewing' – the evaluation of audio equipment by ear rather than by measurements such as frequency response, harmonic distortion, and so on (Holt, 1993) – is practiced by *Stereophile* as well, and in the UK by *HiFi News* (at least since 1976; Self, 1988: 693). These journals maintain a consistent skepticism regarding 'objective' engineering tests, and indeed they routinely advocate positions that engineers declare to be completely unsupported by fact.

Most of the terms used by audiophiles to describe the positions on each side of this fault line are tinged with invective, and it is thus hard to refer to them in neutral ways that yet remain close to audiophile vocabulary. For want of better terminology, I will adapt two expressions: 'golden ears' (to refer to the audiophiles derisively called the 'crazies') and 'meter readers' (to refer to people who would consider themselves to be 'rational' or 'scientifically minded'). Since I wish to describe attitudes rather than groups of people, and I wish to make no assumptions at this point about the social distribution of these attitudes, I will derive from these terms the ungainly abstract nouns *golden-earism* and *meter-readism*.

The distrust of engineering measurements in audiophilia is a mark of golden-earism. Golden-earism privileges the audiophile's intimate, embodied, personal, inalienable, charismatic superiority of aural discrimination. It vests authority in individual experience. By contrast, meter-readism privileges the rationalized, public, impersonal procedures dictated by socially certified experts, and relies on scientific authority. To some extent these attitudes can be identified with distinct social groups. Many of the self-described 'sane', 'scientifically-minded' members of the Audio Society are professional audio engineers, whereas many golden-earists are laymen with respect to engineering. Jack, it will be recalled, is a real-estate agent. J. Gordon Holt, the founder of *Stereophile*, abandoned his plans to take an engineering degree when he found he lacked the necessary aptitude for mathematics, and became a journalist instead (Holt, 1992). Before publishing *The Absolute Sound*, Harry Pearson was an environmental reporter

for *Newsday* (Rothstein, 1985). But as we shall see, it would be a mistake to equate the ideological distinction between these two attitudes with the social division between these groups.

The origins of golden-earism's distrust of measurements are obscure. The discrepancy between measured numbers and subjective perception is a problem familiar to audio engineers: 'The meter says it's good but my ears say it's bad' (Trumbull, 1974). Historically, this issue has tended to surface when new technologies begin to displace old ones. It may also be especially likely to arise in boundary zones such as the recording studio, where recording engineers have to negotiate between the equipment (built to specifications by electrical engineers) and the musicians, who usually lack engineering training.

One of the earliest documented examples of this kind of conflict concerned amplifiers. Musicians and producers felt they could hear differences between the new transistor amplifiers and the older tube amplifiers, which they could describe only impressionistically: 'Tube records have more bass . . . transistor recordings are very clean but they lack the "air" of a good tube recording. . . . Transistor records sound restricted like they're under a blanket. Tube records jump out of the speaker at you' (Hamm, 1973: 268).

Some electrical engineers, pointing to the specification sheets, felt they could prove that these differences were nonexistent. If our ears seem to detect a 'transistor' sound, it must mean that they were conditioned to marginal distortion effects produced by tubes; we need only accustom ourselves to the 'clean' transistor sound (Hamm, 1973: 267–68). Others, however, were willing to entertain the idea that the conventional specifications might be incomplete.

The legacy of this debate persists today among audiophiles; as we saw, Jack admitted that the question of the superiority of tubes over transistors is still unsettled. But the conflict between golden-earism and meter-readism is a broad one, and encompasses several topics. I will survey these under two large headings: debates over recording formats or media, and debates over non-technical tweaks. (A third arena of conflict – the supposed audibility of differences between different brands of amplifiers, cables, or CD players – will be mentioned as well, but not treated at length.)

Golden-Earist Views of the Compact Disk and of Non-Technical Tweaks

Already during the transition from acoustic to electrical recordings in the 1920s there were some audiophiles who contested the majority opinion of the superiority of electrical recordings (Hirsch, 1992). But the most famous example of a debate over recording formats is certainly the dispute over the relative merits of the LP versus the CD. The CD medium measures better than the LP in such engineering terms as signal-to-noise

ratio and frequency response, but golden-earists have insisted that the LP nevertheless sounds better.

Criticism of digital sound predates the CD's commercial triumph. It began almost immediately after the first professional Pulse Code Modulation (PCM) units were made available for studio use in 1977. Here is an irate audiophile writing in 1978 about an LP produced from a digital master:

what one hears on these discs through the digital process is not really music, but an estimation, an approximation. . . . I don't care how many samples are taken per second, in between those samples in those infinitesimal moments, the real music is only guessed at and filled in, and, I can hear this! (Lami Panken on PCM records in *The Absolute Sound* [1978, no. 13: 9])

Digital provides only an *approximation*: that is, it is considered to be inherently inaccurate. But it is also faulted for being 'patently unmusical' (Rothstein, 1985), for being 'cold' where the LP is 'warm' (Strauss, 1994). Jack refused to listen to CDs, which he called strident and flat; he preferred his second-hand LPs, which enabled him to hear the 'body' of the sound, the wood of the double bass. This topic has called forth some of audio-philia's most strident and colorful rhetoric. Here is Harry Pearson:

Digital is simply a human disaster. . . . When sound is cut off too quickly, some primitive mechanism is tripped in our minds. . . . Think of the forest, filled with life; it goes dead silent only in the presence of some horrible threat – a predator. That treasured CD 'silence' – its deadness between tones; its complete absence of any ambient sound, of the gentle, sustained decay of the violin . . . affects our limbic system in a profound way. Each time that silence occurs, our whole system panics, looking for the predator. No wonder bad digital sound is so horribly exhausting to listen to. After I listen to one of those CDs, I usually have to go and take a nap. (Anonymous, 1990)

Another area of disagreement between meter-readists and golden-earists concerns the effectiveness of non-technical tweaks. Tweaking – modifying purchased equipment – is an old practice, but it has taken different forms as audio technology has evolved. The mechanical interfaces of phonograph-based systems are especially receptive to user modification; electronic components, lacking such interfaces, do not allow user adjustments to the same extent. However, since at least the 1970s consumers have devised non-electronic tweaks for electronic components such as amplifiers and preamps: for example, placing bricks or bags of sand on top of them (Lofft, 1982: 65–66). The CD player provided fertile ground for such non-technical tweaks, which as a result became rapidly more prominent in the 1980s (Denby, 1990). A great variety of CD tweaks proliferated: applying magic marker to the edge of CDs, or rubber rings to their upper surface; spraying them with Armor All® protectant, or putting them in the freezer. New tweaks for other components continued to emerge: resting speakers on tennis balls, for example (Kessler, 1991). (The tennis balls I noticed in Jack's listening room were probably left over from one such experiment.)

Tweaks like these involve cheap, readily available materials. But manufacturers soon recognized in tweaking a market they could exploit, and started producing tweaking devices – some of them quite costly – such as electrical units to demagnetize a CD before playing it (Scull, 1996). They also marketed devices to tweak the listening space, to modify its architectural acoustics; Jack, it will be recalled, had some of these panels in his basement listening room.

It was one such specially designed tweak that gave Jay the idea of taping pennies to his speaker cabinets. While Jay did not tell me the exact brand of product that inspired this experiment, it was probably the ‘Mpingo Disk’ marketed by Shun Mook as a ‘resonance-control’ device. Made of ebony, about $1\frac{1}{4}$ inches in diameter and $\frac{1}{4}$ inch thick, the disks cost US\$50 each. They can be applied to turntables, CD players, or preamps. They were devised by Dr Yu Wah Tan, who gave the following rationale for his decision to make them from African ebony:

... most fine instruments, like the cello or double bass, use ebony in the finger boards. The *right* resonance! Resonance is energy, so you can’t eliminate it, you can only *transform* it.

As Scull explains, ‘The basic idea is to preserve and tune these resonances rather than damage the sound by trying to eliminate them. ... Good resonances are like the ones in a violin. ... Bad resonances are the mechanical ones found in preamps, for instance, that are outside the musical spectrum. ... [T]he Shun Mook products attempt to preserve the “good” resonances and evacuate harsh, mechanical, non-musical resonances ...’ (Scull, 1994: 119).

There is also a third area of disagreement between golden-earism and meter-readism, centering around the possibility of distinguishing between different brands of amplifiers, speaker cables, interconnects, or other components. Golden-earists claim to hear differences between different makes of all of these products, but I will not try to illustrate these claims here, so as to avoid a detailed discussion of product lines and models. What is of interest to us in all of these cases is the golden-earist resistance to meter-readist criticisms.

Meter-Readist Criticisms

Meter-readists oppose all of the positions set out earlier. They uphold the superiority of the CD format; they regard non-technical tweaks to be absurdities devoid of either ‘solid theory’ or ‘empirical evidence’ (Weaver, 1994); and they dismiss golden-earist claims to hear differences between different makes of (certain kinds of) equipment, arguing instead that well-made amplifiers, CD players, and speaker wire are essentially indistinguishable.³

Meter-readists legitimate these criticisms in two ways, one focused on the equipment and one focused on the golden-earists’ perceptual judgments. First, they subject the components to standard engineering tests.

For example, in 1990 rumors circulated that the sound of a CD could be improved by painting the edge of the disk with green magic marker. An engineer, David Ranada, tested this tweak by measuring the output of treated versus untreated disks; he found no change. Mainstream audio reviewers then spread the word that this tweak was ineffective and even dangerous (see for example, Fantel, 1990).

Second, to distinguish truly audible differences from imaginary ones, meter-readists employ double-blind comparison tests known as ABX tests. In an ABX comparison test, a computer-controlled switching box plays the output of two components, A and B. Then the listener is played the output of a component called X. It is either A or B, and the listener must decide which. (Sometimes the subject can manually replay samples of A and B, or else the computer does so.) This process is repeated many times, with the computer randomly choosing A or B for the X sample. If, over a number of trials, the listener has correctly identified X at a statistically significant level above that of chance, he or she is assumed to have heard a genuine difference between the components. These tests typically show that most people who claim to hear differences between components cannot do so under double-blind conditions (O'Connell, 1992: 14).

If there are no differences to be heard, how do meter-readists account for the golden-earists' claims to hear them? Meter-readists sometimes dismiss such claims as due to placebo effects. They cite the suggestibility of perception, and the impossibility of isolating hearing from desire. For them, golden-earist claims to distinguish aurally between brands of amplifier or speaker cable simply illustrate 'a propensity (is compulsion too strong a word?) on the part of aficionados to hear differences' (Sanford, 1989).

Meter-readists explain this propensity in various ways. Some explain the differences golden-earists hear as psychological salve for the anxiety of expenditure, reassuring themselves that their money was well-spent: 'If I spent [US]\$1,000 on audio cables, I might hear a difference too' (Rosner, 1990: 21). Others believe audiophiles think they hear differences where none exist because they feel they should be able to. For example, a writer for one mainstream audio magazine, addressing *The Absolute Sound's* reviewers, suggested that their 'ability' to hear non-existent differences served only their golden-eared self-images: 'Unlike probably all of your reviewers, I have no emotional interest in either hearing or *not* hearing differences in components. My self esteem as a critical listener does not depend on my being able to detect, describe, and place a relative value upon a difference in the sound quality of *every* audio component that comes my way' (Klein, 1978).

Somewhat more charitably, other meter-readists attribute golden-earist claims to ordinary perceptual illusions. Dan used this type of argument to explain away the apparent effectiveness of non-technical tweaks. At one Audio Society meeting, he told me a story of the time Michael Fremen from *The Absolute Sound* addressed the Society. Fremen had had some consultants improve the sound in his listening room by

putting small disks at various points on the walls and poking holes with an ice pick in the acoustic ceiling. The reason this seems to work, Dan said, is because it draws your attention to what was always there. It's like the apparent greater smoothness in the way your car rides after you wash it: it's just that you're suddenly conscious of it now. He told me a story about a woman who was famous for her cherry pies. She always left some pits in it, to make people eat more slowly and thus savor it more.

Meter-readists also argue that golden-earists are susceptible to such illusions because they can't understand the operation of audio equipment in technical or mathematical terms, but can only grasp it through metaphors. This is a common theme in meter-readists' defense of digital audio. The champions of analog, they say, are enthralled by an image:

Their complaint about the digital encoding and recording of music is basically poetic in character. They see the digital process as a gruesome metaphor and envision Mozart being hacked into digital bits. The image is that of a hatchet. . . . They say that the digital process is 'unnatural'. They object to music being parceled out in separate numerical packets for shipment through time and space by way of recording. Music to them is sensation and emotion, and, as such, organic and indivisible. (Fantel, 1986a)

Golden-Earist Rejoinders

Golden-earists respond to the charge that their claims are incompatible with accepted scientific theory, to the failure of engineering tests to substantiate their claims, and to the negative results of the ABX tests. They reply to the first two charges by pointing to their own perceptions as a form of empirical evidence. If scientific theory is unable to account for it, that shows only that current theory is incomplete. If engineering tests fail to uncover a measurable basis for it, that shows only that current tests are insensitive to the full range of parameters that determine quality of sound reproduction.

Golden-earists proudly privilege the evidence of their own senses over the findings of the officially accredited authorities on technology, with their elaborate equipment. For example, one writer defends non-technical tweaks in the following terms:

The proponents of the various tweaks are not claiming that the improvements will show up in measurements. Yet every music lover I know has heard the differences. Obviously, there are improvements as well as degradations in digital sound that aren't measurable. Digital has its unsolved mysteries. (Denby, 1990)

These arguments do not reject the authority of science, but they do depend on a certain view of the scientific enterprise, one that distinguishes sharply between theory and observation. Theory is corrigible and ever changing; it is open-ended, in that its future shapes are impossible to predict. By contrast, observation is conceived of as the bedrock of scientific knowledge and the foundation of scientific progress.

One audiophile, commenting on the debate over the effectiveness of non-technical tweaks, pointed out the open-ended nature of science by quoting science-fiction novelist Arthur C. Clarke: 'the science fiction and magic of today are the science and technology of tomorrow' (Pae, 1996). He identified the testimony of the audiophile's ear with the results of scientific observation:

Had Copernicus not valued his empirical findings above the accepted science of his day, the sun would still have been circling the earth in 1543. In the big picture, whether certain tweaks work or not is less important than the fact that J[onathan] S[cull] tells it the way he *hears* it, regardless of the condemnation or ridicule he gets. He does what many of us only *say* we do – he trusts his ears above all else.⁴

Insofar as golden-earist arguments depend crucially on the evidence of their ears, they would appear to be vulnerable to the ABX tests that purport to show that golden-earists do not in fact hear what they think they hear. Yet ABX tests have not put this controversy to rest; indeed, they became the focus of what one audio engineer called the 'Great Debate': 'the *presumed audibility* of differences between electronics and the *in-audibility* of the same differences when subjected to double-blind tests' (Eargle, 1990: 26).

Golden-earism rejects the ABX testing methodology itself (Harley, 1990: 11–12; Hodges, 1990). Golden-earists argue that the ABX test situation obscures differences heard clearly under normal, extended listening conditions over a period of days or weeks (Klein, 1992). One engineer (Nousaine, 1997: 26), complaining about the currency of 'open, uncontrolled listening comparisons' in audio, notes:

An attitude shared by many reviewers, professionals, and audiophiles is that experimental controls are both intrusive and unnecessary – that open, extended listening ... is mandatory to uncover subtle aspects of sonic performance. ... The standard advice calls for the listener to relax, put up his feet, open his mind, listen over an extended interval, and trust his ears. He is often warned that switching components or making direct comparisons of different audio gear during the session will interfere with his connection to the product, thereby generating stress and reducing hearing sensitivity.

The rejection of ABX testing relies on a form of argument common to many scientific controversies, articulated within a value-system specific to audiophilia. The argumentative pattern involves a projection problem; the value invoked is the core golden-earist value of musicality.

We wish to know how a certain device will perform under real-life conditions, and to that end we test it (or a model thereof) in carefully controlled circumstances (a laboratory or wind tunnel; with control groups, and so on). We assume that the device's behavior under test conditions can predict its real-life behavior. In other words, we *project* from the test case to the conditions of use. Naturally, this act of projection assumes that the test conditions, *in all significant respects*, are similar to the

real-life conditions. It is not always obvious, however, which similarities are significant and which irrelevant in such cases (Pinch, 1993).

The projection problem is a technological cognate of the experimenter's regress (Collins, 1985). Scientists demand of experimental results that they be replicable: a second experiment, duplicating the first in all relevant respects, should produce the same results. But the notion of replication is open-ended, in that there can be no exhaustive *ex ante* specification of what it means to reproduce all relevant aspects of a previous experiment. Similarly, in testing a device – where one aims to reproduce in a controlled environment all relevant aspects of the device's real-world conditions of use – there can be no exhaustive *ex ante* specification of all of the relevant aspects, or of what it means to reproduce them. Hence test results can always be contested by claiming that the test conditions differ from real-life ones in crucial respects, invalidating the desired projection.

The golden-earist attack on ABX testing takes advantage of this permanent possibility of criticism. Thus Harley (1990: 11) argues, in effect, that the ABX testing situation is so different from real-life listening conditions that its results cannot be projected into the real world. After all, we do not normally listen to recordings in an unfamiliar environment, in the company of strangers, switching every few minutes between one piece of audio equipment and another, feeling all the while that our self-respect is at stake.

But besides faulting ABX tests for being unrepresentative of the normal listening experience, Harley also claimed that they are 'fundamentally flawed in that they seek to turn an emotional experience – listening to music – into an intellectual exercise. . . . This intellectualization of the musical experience obliterates the emotional responses where the real differences between components are revealed' (Harley, 1990: 12–13). This criticism is much more radical, in that it transfers the debate into the discursive field of 'musicality', where the key criteria are emotional response, meaning, and involvement: 'Dissecting the music to characterize specific sonic attributes, as in A/B comparisons, destroys our receptivity to the music's meaning. Involvement comes only when we consider music as a whole, not as a collection of sonic parts' (Harley, 1994: 77).

This orientation to holism and the unmediated musical experience would seem to be fundamentally at odds with the design of ABX tests. Indeed, if 'the very nature of comparison prevents real absorption' (Zeugin, 1993: 8), the idea of objective listening tests becomes incoherent. If the acts of judgment and of enjoyment are thought to be incompatible, the critical attitude – identifying oneself with a fixed standard which one holds up implacably against the equipment – introduces an emotional distance which desensitizes one to the true power of the equipment, which after all is its power to produce musical experiences.

Thus Harley (1990: 9) identifies audio engineering and scientific method with measurement, objectivity, quantification, and replicability ('the scientist must be detached from the event, a passive observer . . .'). By

contrast, he describes the audiophile's subjective experience of music as something that eludes measurement, as a matter of involvement, immersion, delight, elation, exhilaration, and bodily response ('an uncontrollable urge to tap my foot' [Harley, 1990: 8]). He calls on the 'meter readers' to put less faith in their numbers and more in their ears.⁵

David Clark, inventor of the ABX switch, took up this challenge in true meter-readist fashion, by devising a test of the ABX methodology itself. He asked two groups of audiophiles to compare a test signal with the same signal into which 2.5% harmonic distortion had been injected. One group used the ABX box, the other listened at home for as long as they felt necessary. The results were favorable to Clark's ABX box. The group using the ABX box learned to identify the distorted signal within 45 minutes, while the home-listening group could not reliably distinguish the two signals, even after extended periods of listening (Klein, 1992).

Clark's experiment illustrates a strategy sometimes used by scientists attempting to break the experimenter's regress: calibration (Collins, 1985: 100–06). Calibration uses a surrogate signal to measure the sensitivity or reliability of an experimental apparatus. In Clark's case, the 'apparatus' was the listener's ears (aided or not by the ABX box), and his 'test of a test' seemed to show that the box considerably improved the sensitivity of the audiophile's ears.

I have not seen any golden-earist responses to this test, but I can imagine the forms they might take. Like scientists involved in calibration disputes, golden-earists might question the appropriateness of the surrogate signal (Collins, 1985: 103): perhaps extended listening is better at detecting other sorts of subtle audio colorations, unlike the harmonic distortion used in Clark's experiment. Or they might accept the results of the ABX tests, admitting that the audible improvements apparently produced by non-technical tweaks are due to placebo effects, but argue that, from the point of view of the user, placebo effects are as real as any other sort of effect:

Belief and perception are two mutually dependent interactive variables – they feed and influence each other. ... If a baseball player believes that not washing his 'lucky socks' will improve his batting average, then it will. ... The power of an audiophile's degaussed and cryogenically treated CD is just as real as the ballplayer's lucky socks, and just as dependent on his belief to work its wonders. (Willis, 1994: 49)⁶

Golden-Earism, Scientific Authority, and Audio Engineers

The debates over digital sound, non-technical tweaks, and ABX testing show that the contrast between golden-earism and meter-readism is not a simple contrast between pro- and anti-scientific attitudes. While golden-earism privileges the user's experiences and sometimes questions measurement and objectivity, it does not reject scientific authority in general. Though often enough it celebrates the mysteries of audio and rhapsodizes about musical emotion, it does not embrace wholesale anti-scientific mysticism. Indeed, contrarian golden-earist claims are often advanced

within a quasi-scientific discourse register. Dr Tan, for example, described his Mpingo disks as tools for modifying resonance frequencies, Jay tried to explain the success of his experiment with the pennies in terms of sympathetic vibration, and one audiophile defended the Mpingo disks by appealing to Copernicus. Similarly, Harry Pearson denigrated digital sound by using the vocabulary of evolutionary biology.⁷

Thus golden-earism, though it deprecates particular opinions of certain accredited experts, does not disdain scientific respectability in general. Hence it should not be surprising that the social distribution of scientific credentials does not perfectly predict the location of the golden-earism/meter-readism divide. Though golden-earists sometimes identify meter-readism with the profession of audio engineering – recall that Jay praised Harry Pearson for refusing to accept *engineers'* claims about audio equipment – the two are not perfectly coextensive. Of course, one does not need to be an engineer to be a 'sane, scientifically-minded' audiophile. But more interestingly, the converse is also true: some forms of golden-earism claim adherents even within the audio engineering community.

There are engineers of great professional accomplishment and intellectual prominence who embrace positions normally associated with golden-earism. As one engineer complained to me:

There are plenty of people in the professional world who have excellent ears, who have certifiably excellent ears, who can hear very, very subtle things, who also believe a lot of this stuff, who have complete and implicit trust in what they hear and would never think of questioning themselves or testing themselves. So that's a kind of hard thing, you know, it's hard to get in the face of somebody who has sixteen Grammys to his credit and say 'You're fooling yourself [about the 24-bit, 96kHz digital format], the old 16/44 processor is just as good as you will ever need'. But he's saying 'But this one sounds better!' ... Most of the things they are hearing are there, and a few of them aren't, and they have no idea of how to draw the line or tell the difference. I mean, that's what blind testing does for you, it tells you when you're fooling yourself. (Interview, 22 July 1998)

At least one engineer has tried to find a scientifically respectable basis for golden-earism. Richard Heyser (1931–87), an engineer at Pasadena's Jet Propulsion Laboratories, had a 'personal interest in the mysteries of human subjective perception' (1988: 207). He wanted to build a bridge between measurement and hearing; he wished to understand why 'what we hear does not always correlate with what we measure' (1974: 674).

Heyser (1977: 60) saw himself as attempting to validate golden-earist skepticism regarding engineering measurements: 'You out there, Golden Ears, the person who couldn't care less about present technical measurements but thinks of sound in gestalt terms as a holistic experience. You're right, you know.' Although Heyser had the engineering credentials necessary to publish in the *Journal of the Audio Engineering Society*, his papers drew upon intellectual sources quite foreign to audio engineering's research traditions (Chomsky's transformational grammar, Heisenberg's uncertainty principle, catastrophe theory, the philosophy of quantum

mechanics). His speculations aroused little interest in the engineering establishment: even by his own account, his approach was seen as lying 'in far left field . . . if not outside the ball park altogether' (Heyser, 1977: 52). He was described to me by one audio engineer as an 'audio mystic'.⁸

Patterns of Conflict

Both as users who give autonomous meaning to artifacts and as controversialists, audiophiles display patterns of interpretive plurality and conflict also found outside the world of audio, and I will end by describing these in more detail. I have focused on the epistemic aspects of audiophilia, and so the following analysis will highlight patterns of epistemic controversy. However, audiophiles also imbue consumer audio components with distinctive meanings, which bear comparison with those of the users of other artifacts. Although a full description of the golden-earist universe of meaning would require a broader ethnographic account than I have been able to provide here, it is worth pointing out a few respects in which golden-earist concerns echo those we noted among Lindsay's TRS-80 hackers: they both suggest a desire to defend a moral order privileging activity and independence, one dominated by the image of the autonomous individual maintaining his uniqueness against corporate mediocrity.

I have argued elsewhere (Perlman, 2003) that non-technical tweaks continue the practices audio consumers had always used to 'appropriate' audio components, to convert them from commodities to possessions by investing personal labor in them. The industry's migration to integrated circuitry increasingly sealed off the equipment, making it difficult for the user to modify the operation of the components in ways that audio engineering would regard as effective. When in the 1980s the triumph of the CD player replaced the phonograph – the component most welcoming of user intervention – with yet another black box, consumers found new ways to invest themselves in their purchases. Non-technical tweaks allowed the audiophile to take the same active stance toward his CD player as he had taken toward his record player, though this activity no longer made sense to engineers.

The golden-earist insistence on the audibility of differences between different brands of components emphasizes the individuality of the equipment makers and of audio reviewers (who function in this respect as exemplary listeners). High-end brand names have auratic qualities, derived in part from their association with designers who are thought of as creative geniuses and rugged individualists; Harry Pearson described them as 'dreamers who don't like the 9 to 5 mega-corporate world', who 'express themselves in almost a unique wedding of creativity and mechanical instinct' (Metaxas, 1991). The radical quiddities of different brands are affirmed by – and echoed in – the charismatic verve of audio reviewers, who also project their individual personalities (as one reader wrote of *The*

Absolute Sound's reviewers, 'I feel almost as if I know them personally' [Scheiner, 1974]).

The epistemic conflicts between golden-earism and meter-readism similarly exemplify certain common patterns. I remarked earlier how the appeal to personal experience to controvert scientific authority is also found in biomedicine. The resemblance in fact runs much deeper; for not only do individuals in both situations rely on the authority of their experience to call scientific knowledge into question, but the defensive reactions of the guardians of expert knowledge, and the subsequent counterattacks by the heterodox, employ similar strategies as well.

In both audiophilia and medicine, the accredited scientific authorities dismiss challenges based on individual experience by attributing them to the placebo effect (the 'power of suggestion'). In both domains the scientific authorities use similar double-blind testing methodologies as they attempt to discount these challenges: meter-readism depends on ABX tests; biomedicine uses controlled clinical trials. And both golden-earists and proponents of alternative medicine respond by questioning the validity of double-blind testing. For example, homeopaths claim that their practice is a therapeutics of individualization, addressing the uniqueness of the patient rather than viewing her as one instance of a common pathology (Coulter, 1984). Hence they question the ability of controlled clinical trials to establish the efficacy of homeopathic treatments (Saks, 1994: 96). Indeed, when West Germany attempted to pass laws regulating drugs, homeopathic practitioners successfully objected to the privileging of controlled clinical trials to determine drug efficacy (Bodewitz et al., 1987: 251).

Further, there is even a position in the medical debates cognate to Willis's position on the placebo effect in audio. As was explained earlier, Willis was ready to accept the possibility that the audible effects of non-technical tweaks were placebo effects, but insisted that placebo effects are as real as any other sort of effect. Similarly, for many practitioners of alternative medicine, 'the placebo effect is to be exploited constructively in the healing relationship, rather than eliminated from consideration in pursuit of scientific rigour' (Saks, 1994: 96; cf. Pietroni, 1991: 39).

Thus projection problems in both domains have called forth similar patterns of argument. There are also similarities to be observed at the social level. Just as in audio the socially accredited representatives of scientific knowledge – audio engineers – do not unanimously shun golden-earism, and one engineer even tried to formulate a scientifically respectable justification for it, there have always been biomedical practitioners favorably disposed to alternative therapies. This has been the case despite legal safeguards, and explicit sanctions written into the professional codes of the medical authorities (Saks, 1994: 88; Kaptchuk & Eisenberg, 2001: 190). When biomedicine does incorporate alternative therapies, often the terms of incorporation are such that the practices are separated from their original explanatory frameworks and new biomedical justifications are devised for them (as for example when mainstream medicine admitted

acupuncture for its analgesic effectiveness, but replaced the Chinese theory of meridians with a theory of endorphin release; Saks, 1992: 188).

The scenario of contestation in audiophilia is thus in many ways a generic one, but it is staged in a setting with unique features. In their focus on a technology largely abandoned by the recording industry, their devotion to the active involvement of tinkering, and their suspicion of the mass market, audiophiles affirm a set of values much like those of some other hobbyist groups. Similarly, many of the conceptual resources used by golden-earists to contest the authority of scientific knowledge serve similar functions in controversies over biomedicine. Audiophilia is interesting in part because it enacts both of these scenarios at once. But it also inflects these common resources with its idiosyncratic, specifically musical ethic. Golden-earists can rely on a widespread cultural understanding of music as a locus of emotion, release, and subjectivity, in order to claim exemption from the authority of science (seen contrastively as a locus of reason, control, and objectivity). We have seen how easily golden-earist criticism of the ABX box slips from the rhetoric of the projection problem to the rhetoric of musicality. By defining the function of audio equipment as the production of emotional experiences, and by stressing the incompatibility of emotional self-abandonment with the distanced, detached attitude supposedly required by the canons of scientific testing, golden-earists can use music as a shield against epistemic delegitimation: the authority of double-blind testing becomes powerless in the presence of that uncontrollable urge to tap your foot.

Notes

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1. See, for example, Lindsay's (2003: 44–47) quotations from TRS-80 users about commercial software ('useless and wasteful faddishness'; 'prepackaged consumer tools'; 'Today's software is large and fat and wastes huge amounts of memory, CPU [central processing unit] and disks'), the people who write it ('Today's programmers are not the same caliber of people we had in my day'), the corporations that market it ('just because Microsoft does things one way . . .'), and the people who use it ('A very very high percentage of all [TRS-80] owners learned to program. . . . Practically no one who buys a PC [personal computer] ever learns to write programs on it'). By contrast, TRS-80 users identified their computer with 'exploration', praised its software as 'simple, extremely reliable', showing 'what REAL programming looks like', and lauded the exacting discipline of TRS-80 programming that tolerates no 'kludges'.
2. The field research was conducted 1994–98 in New England and the Middle Atlantic states, and via telephone conversations and e-mail correspondence with audiophiles in other parts of the USA. While I did conduct a few formal interviews, most of my conversations took place in informal settings such as home listening rooms, used record stores, and high-end audio stores, where I chatted with the owners, salesmen, and

customers. I also attended meetings of some of the many Audio Societies that dot the country. I drew upon the wealth of journalistic writing by, and about, audiophiles in the mainstream and specialty press. The extensive section of letters to the editor in magazines like *Stereophile* and *The Absolute Sound* was especially helpful. I also spoke with three professional or semi-professional audio engineers. I have used pseudonyms for all of these individuals.

3. Most people agree that loudspeakers vary a great deal in sound.
4. This writer does not document his potted history of astronomy. What is most striking about it is the reference to Copernicus's 'empirical findings'. In fact, Copernicus did not conduct any new observations of the heavens (Kuhn, 1957: 172, 184, 200).
5. Harley (1990: 13) does not in fact rule out the possibility of an improved ABX testing methodology, but for him the guarantee of validity can only be subjective: 'The subject would need to be aware of the trap of trying to intellectualize and quantify his reaction to the music, a feat that requires great mental discipline in a test environment'.
6. It is possible to imagine further stages to this debate. Meter-readists could attack Willis' position by calling into question the efficacy of the placebo effect. Willis gives no evidence that beliefs in 'lucky socks' are really effective in improving batting averages; possibly he was relying on an unspoken analogy with placebos in medical treatments. There is an oft-repeated finding in medical research, to the effect that some patients will improve if given a pharmacologically inert pill, as long as they believe it to have real curative power. (The power of this placebo effect has perhaps been exaggerated in the popular consciousness; researchers have never expected a placebo to work for more than an average of 35% of the participants in an experiment.) If this is indeed the evidence Willis has in mind, then his argument depends implicitly on the scientific evidence for the physical effects of placebo treatments of disease. This evidence has been called into question (Hróbjartsson & Gøtzsche, 2001). Still, it is interesting to note that the placebo's defenders have responded that its effects may be obscured by the intensive observation and measurement required by the research process itself (Bailar, 2001). This argument – parallel in trajectory to the dispute between Clark and the golden-earists – is, of course, another illustration of the projection problem.
7. Thanks to Karin Bijsterveld and Michael Lynch for insisting on the importance of this point.
8. The overlap in the social distribution of engineering expertise and golden-earist attitudes is also crucial in understanding an aspect of audiophilia I have not dealt with in this paper: the role of the *designers* of controversial products such as tweaking devices or specialty speaker cable.

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Marc Perlman is Associate Professor of Music at Brown University. He is the author of *Unplayed Melodies: Javanese Gamelan and the Genesis of Music Theory* (University of California Press, 2004). His current research projects examine the history of the idea of the invertible triad as a case study in music-theoretic cognition, and popular attitudes toward peer-to-peer Internet sharing of MP3 files.

Address: Department of Music, Box 1924, Brown University, Providence, RI 02912, USA; fax: +1 401 863 1256; email: Marc_Perlman@Brown.edu