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What Makes It Sound '80s?

The Yamaha DX7 Electric Piano Sound

ABSTRACT Popular music of the 1980s is remembered today as having a "sound" that is somehow unified and generalizable. The '80s sound is tied to the electric piano preset of the Yamaha DX7 synthesizer. Not only was this preset (E. PIANO 1) astonishingly prevalent—heard in up to 61% of #1 hits on the pop, country, and R&B Billboard charts in 1986—but the timbre of E. PIANO 1 also encapsulates two crucial aspects of a distinctly '80s sound in microcosm: one, technological associations with digital FM synthesis and the Yamaha DX7 as a groundbreaking '80s synthesizer; and two, cultural positioning in a greater lineage of popular music history. This article analyzes the timbre of E. PIANO 1 by combining ethnographic study of musician language with visual analysis of spectrograms, a novel combination of techniques that links acoustic specificity with social context. The web of connections created by the use and re-use of DX7 presets like E. PIANO 1, among hundreds or maybe thousands of different tracks and across genres, is something that allows modern listeners to abstract a unified notion of the "'80s sound" from a diverse and eclectic repertoire of songs produced in the 1980s.
KEYWORDS: ethnography, timbre, acoustics

> Plus there's always something very distinct about '80s music.
> When you hear it you just know.
>
> —Jerry Shen

Despite the propagation of genres as diverse as punk, new wave, heavy metal, hip-hop, synth pop, and more, contemporary music culture is rife with language that generalizes the music of the 1980s into one "'80s sound." For example, one episode of the NPR podcast *All Songs Considered* titled "The '80s: Were They Really That Bad?" seems from its title to critique the music of the entire decade at once. Music critic Carles invokes a similar generalization when suggesting that the new pop genre of chillwave "is supposed to sound like something that was playing in the background of 'an old VHS cassette that u found in ur attic from the late 80s/early 90s.'"[1] Jerry Shen, perhaps better known by his YouTube

1. Carles, "Is WASHED OUT the next Neon Indian/Memory Cassette? | Hipster Runoff," Hipster Runoff, 27 July 2009, https://web.archive.org/web/20130717013018/http://hipsterrunoff.com/node/1780. Carles is a pseudonym for the otherwise-anonymous main writer at the blog Hipster Runoff. The blog is now defunct but used to be a popular site for music recommendations. A savvy critic like Carles certainly is aware of the many different '80s genres, and I do not at all suggest here that Carles would be ignorant of how to make a more genre-specific statement. Rather, I am drawing attention to the way this idea of "'80s music" is invoked in conversations. Also, note that the interior quotation marks are not actually showing someone else's words—frequent use of scare quotes is an idiosyncrasy of Carles's writing.

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moniker TRONICBOX, produces what he calls "'80s covers" of contemporary pop songs by artists like Rihanna, Ariana Grande, and Justin Bieber, which have their official backing tracks replaced with Shen's newly composed and synthesizer-laden reharmonizations. It's no wonder, then, that querying a search engine with the term "'80s sound" returns hundreds of forum posts from amateur producers and curious listeners, wondering, "What makes it sound '80s?"[2]

One potential response to this sort of language might be to critique or correct it, saying there is no '80s sound because the music of the 1980s (or, for that matter, any other decade) had a wide diversity of sounds. But the very proliferation of the term "'80s sound" and similar generalizing language attests to the validity in perceiving a "sound" within the '80s as a decade. I believe the idea of a generalized '80s sound is not motivated by ignorance, but rather represents significant observations about culture and musical timbre. In this article, I precisely define an aspect of the '80s sound by focusing on one of its most important timbral contributors: the pervasive use, across many different '80s genres, of the Yamaha DX7 FM digital synthesizer.[3] The DX7 was first distributed in 1983, and within two and a half years it took over the musical landscape of *Billboard*'s three main charts, engendering a sonic similarity among the Hot 100, Hot Country Songs, and Hot R&B Singles charts. The homogeneous sound associated with the DX7, and in turn many generalizations made about the '80s, stems from musicians' extensive reliance on the DX7's preset sounds, which came with the synthesizer when it was delivered from the factory.

In order to construct a definition of one aspect of the '80s sound, I analyze the timbre of one particularly important preset, E. PIANO 1, as an important representative of the DX7 more generally. E. PIANO 1, the DX7's vaguely Fender-Rhodes-like electric piano sound, was used in many iconic '80s ballads beginning soon after the DX7's release, such as "Careless Whisper" by George Michael, "What's Love Got to Do with It?" by Tina Turner, and "Hard Habit to Break" by Chicago, all three of which were released in 1984.[4] If one were to listen to each of the #1 hit singles on the *Billboard* charts in 1986, the saturation of E. PIANO 1 in the charts in this year in particular would be conspicuous. In 1986, E. PIANO 1 is present in 39% of the *Billboard* Hot 100 #1 hit singles, 40% of the country #1 singles, and a staggering 61% of the R&B hit singles (Table 1). Even in 1990, rather late in the life cycle of the DX7, E. PIANO 1 was still heard at the top of the charts in Michael Bolton's "How Am I Supposed to Live Without You," which

2. A few examples include "ELI5: What makes '80s music so recognizably '80s' and different from music from other decades?' from Reddit (https://www.reddit.com/r/explainlikeimfive/comments/3upahm/eli5_what_makes_80s_music_so_recognizably_80s_and/), "80s music - what makes it sound 80s?" on The Straight Dope message boards (http://boards.straightdope.com/sdmb/showthread.php?t=606381), and "What's the theory behind the '80s' sound of a song?" on StackExchange (http://music.stackexchange.com/questions/11429/whats-the-theory-behind-the-80s-sound-of-a-song).

3. Of course, there are dozens of factors that go into the '80s sound, including drum machines, sequencers, arpeggiators, loop-based compositions, the second British invasion, the visual new wave aesthetic, and so on. Covering each of these topics is well beyond the scope of this paper. I focus on the Yamaha DX7 as one particularly conspicuous thread that binds together a great deal of music.

4. "Careless Whisper" was released in the USA and elsewhere as a George Michael single, and only released as a Wham! single in the UK.

a)

First week at #1	Title	Artist
02 Jan	Faith	George Michael
09 Jan	So Emotional	Whitney Houston
16 Jan	Got My Mind Set On You	George Harrison
23 Jan	The Way You Make Me Feel	Michael Jackson
30 Jan	Need You Tonight	INXS
06 Feb	Could ve Been	Tiffany
20 Feb	**Seasons Change**	**Expose**
27 Feb	**Father Figure**	**George Michael**
12 Mar	**Never Gonna Give You Up**	**Rick Astley**
26 Mar	**Man In The Mirror**	**Michael Jackson**
09 Apr	Get Outta My Dreams, Get Into My Car	Billy Ocean
23 Apr	**Where Do Broken Hearts Go**	**Whitney Houston**
07 May	Wishing Well	Terence Trent D Arby
14 May	**Anything For You**	**Gloria Estefan & Miami Sound Machine**
28 May	One More Try	George Michael
18 Jun	**Together Forever**	**Rick Astley**
25 Jun	**Foolish Beat**	**Debbie Gibson**
02 Jul	**Dirty Diana**	**Michael Jackson**
09 Jul	The Flame	Cheap Trick
23 Jul	**Hold On To The Nights**	**Richard Marx**
30 Jul	Roll With It	Steve Winwood
27 Aug	Monkey	George Michael
10 Sep	Sweet Child O Mine	Guns N Roses
24 Sep	Don t Worry, Be Happy (From "Cocktail")	Bobby McFerrin
08 Oct	Love Bites	Def Leppard
15 Oct	Red Red Wine	UB40
22 Oct	**Groovy Kind Of Love**	**Phil Collins**
05 Nov	Kokomo (From The "Cocktail" Soundtrack)	The Beach Boys
12 Nov	Wild, Wild West	The Escape Club
19 Nov	Bad Medicine	Bon Jovi
03 Dec	**Baby, I Love Your Way/Freebird Medley**	**Will To Power**
10 Dec	**Look Away**	**Chicago**
24 Dec	Every Rose Has Its Thorn	Poison

b)

First week at #1	Title	Artist
04 Jan	**Don't Say No Tonight**	**Eugene Wilde**
11 Jan	Say You, Say Me	Lionel Richie
25 Jan	**That's What Friends Are For**	**Dionne and Friends**
15 Feb	Do Me, Baby	Meli'sa Morgan
08 Mar	How Will I Know	Whitney Houston
15 Mar	**Your Smile**	**René & Angela**
22 Mar	What Have You Done for Me Lately	Janet Jackson
05 Apr	Kiss	Prince and the Revolution
03 May	**I Have Learned to Respect the Power of Love**	**Stephanie Mills**
17 May	**On My Own**	**Patti LaBelle and Michael McDonald**
14 Jun	Nasty	Janet Jackson
28 Jun	**There'll Be Sad Songs (To Make You Cry)**	**Billy Ocean**
12 Jul	Who's Johnny	El DeBarge
19 Jul	**Rumors**	**Timex Social Club**
02 Aug	**Closer Than Close**	**Jean Carne**
16 Aug	**Do You Get Enough Love**	**Shirley Jones**
30 Aug	**Love Zone**	**Billy Ocean**
06 Sep	Ain't Nothin' Goin' on But the Rent	Gwen Guthrie
13 Sep	**(Pop, Pop, Pop, Pop) Goes My Mind**	**LeVert**
20 Sep	The Rain	Oran "Juice" Jones
04 Oct	Word Up	Cameo
25 Oct	**Shake You Down**	**Gregory Abbott**
08 Nov	**A Little Bit More**	**Melba Moore with Freddie Jackson**
15 Nov	**Tasty Love**	**Freddie Jackson**
13 Dec	**Love You Down**	**Ready for the World**
27 Dec	**Girlfriend**	**Bobby Brown**

c)

First week at #1	Title	Artist
04 Jan	Have Mercy	The Judds
11 Jan	**Morning Desire**	**Kenny Rogers**
18 Jan	Bop	Dan Seals
25 Jan	Never Be You	Rosanne Cash
01 Feb	Just in Case	The Forester Sisters
08 Feb	**Hurt**	**Juice Newton**
15 Feb	**Makin' Up for Lost Time (The Dallas Lovers Song)**	**Gary Morris**
22 Feb	**There's No Stopping Your Heart**	**Marie Osmond**
01 Mar	**You Can Dream of Me**	**Steve Wariner**
08 Mar	**Think About Love**	**Dolly Parton**
15 Mar	**I Could Get Used to You**	**Exile**
22 Mar	What's a Memory Like You (Doing in a Love Like This)	John Schneider
29 Mar	**Don't Underestimate My Love for You**	**Lee Greenwood**
05 Apr	**100% Chance of Rain**	**Gary Morris**
12 Apr	She and I	Alabama
19 Apr	Cajun Moon	Ricky Skaggs
26 Apr	**Now and Forever (You and Me)**	**Anne Murray**
03 May	**Once in a Blue Moon**	**Earl Thomas Conley**
10 May	Grandpa (Tell Me 'Bout the Good Ol' Days)	The Judds
17 May	Ain't Misbehavin'	Hank Williams, Jr.
24 May	Tomb of the Unknown Love	Kenny Rogers
31 May	Whoever's in New England	Reba McEntire
07 Jun	Happy, Happy Birthday Baby	Ronnie Milsap
14 Jun	Life's Highway	Steve Wariner
21 Jun	**Mama's Never Seen Those Eyes**	**The Forester Sisters**
28 Jun	Living in the Promiseland	Willie Nelson
05 Jul	**Everything That Glitters (Is Not Gold)**	**Dan Seals**
12 Jul	Hearts Aren't Made to Break (They're Made to Love)	Lee Greenwood
19 Jul	Until I Met You	Judy Rodman
26 Jul	On the Other Hand	Randy Travis
02 Aug	Nobody in His Right Mind Would've Left Her	George Strait
09 Aug	Rockin' with the Rhythm of the Rain	The Judds
16 Aug	You're the Last Thing I Needed Tonight	John Schneider
23 Aug	**Strong Heart**	**T. G. Sheppard**
30 Aug	Heartbeat in the Darkness	Don Williams
06 Sep	Desperado Love	Conway Twitty
13 Sep	Little Rock	Reba McEntire
20 Sep	Got My Heart Set on You	John Conlee
27 Sep	**In Love**	**Ronnie Milsap**
04 Oct	Always Have, Always Will	Janie Fricke
11 Oct	**Both to Each Other (Friends and Lovers)**	**Eddie Rabbitt**
18 Oct	**Just Another Love**	**Tanya Tucker**
25 Oct	Cry	Crystal Gayle
01 Nov	**It'll Be Me**	**Exile**
08 Nov	Diggin' Up Bones	Randy Travis
15 Nov	**That Rock Won't Roll**	**Restless Heart**
22 Nov	**You're Still New to Me**	**Paul Davis**
29 Nov	**Touch Me When We're Dancing**	**Alabama**
06 Dec	It Ain't Cool to Be Crazy About You	George Strait
13 Dec	**Hell and High Water**	**T. Graham Brown**
20 Dec	Too Much Is Not Enough	The Bellamy Brothers
27 Dec	Mind Your Own Business	Hank Williams, Jr.

Table 1. #1 hit singles from the year 1986 on the *Billboard* a) pop (Hot 100), b) country, and c) R&B charts. Bolded tracks use the E. PIANO 1 preset.

reached #1 on the *Billboard* Hot 100 in January of 1990 and #3 in the UK one month later. There are other presets that an average consumer of 1980s music might be able to recall: BASS 1 mimics a funky slap bass, and frequently opens a track with an aggressive riff, as in "Danger Zone" by Kenny Loggins (1986); the DX7 flute sounds, such as FLUTE 1, CALIOPE (sic), and VOICE 1 can be heard across Tina Turner's *Private Dancer* album.[5] Many DX7 presets quickly became ubiquitous in the music industry, but none more so than E. PIANO 1.

My methodology for analysis of the timbre of E. PIANO 1 has two equally important parts: first, I examine musicians' and consumers' casual and qualitative language used to describe the timbre of music of the 1980s; then, I proceed to a visual analysis of spectrograms to compare the acoustics of '80s sounds to those verbal descriptors. My combination of ethnographic study of language use with spectrogram analysis is one way of

5. Colloquially, CALIOPE is frequently called a "pan flute" sound, but this should not be confused with the actual preset PAN FLUTE, a sound that was only available on the American ROM #4A.

getting to the more ineffable properties of timbre.[6] Isabella van Elferen critiques a survey of approaches to timbre analysis by identifying two camps into which they fall: "a materialist approach studying the circumstances of sound production on the one hand, and, on the other, an idealist approach studying the effects it has on the listening experience while leaving timbre 'in-itself' at a distance."[7] But, as van Elferen says next, neither one of these provides a complete picture of the human experience of timbre—whereas acoustic analyses, like spectrograms, illuminate the physical attributes of timbres and sound signals that vibrate our auditory organs, cultural context informing our brain's perception of these timbres is just as important to consider. I view my approach to timbre, in which I combine visual spectrogram analysis with ethnographic study, to be one method of accounting for both perceptualization and acoustics; materialism and idealism; the ineffable and the tangible. Through my own reflection on the timbre of the DX7 and the Rhodes, I detail here one answer to the question, "What makes it sound '80s?"

THE DX7 IN SYNTHESIZER HISTORY

A handful of synthesizers dominated the sound of the 1980s. The Roland Jupiter-8, released in 1981, is an analog synthesizer so immensely powerful that it can seem like the teleological goal of all prior analog synthesizer development. It is responsible for many iconic '80s sounds, appearing on Michael Jackson's "Thriller" (1982) and the soundtrack of *The NeverEnding Story* (1984). While analog synthesis never completely disappeared from the sound of popular music, most other quintessential '80s synthesizers used newer methods of sound synthesis, all of which were made possible by digital computing and microprocessors. The Fairlight CMI, first released in 1979, and the E-MU Emulator, first released in 1981, are two of the first keyboards to use digital sampling, but were prohibitively expensive for the average keyboardist, with list prices in the tens of thousands of dollars at their release (1979 and 1981, respectively). Also new in the 1980s was wavetable synthesis, famously deployed in the PPG Wave synthesizers. Both sampling and wavetable synthesis represent a merging of analog and digital technologies: the source of the sound is an analog source—a recorded analog sample in the case of the sampler, and an analog waveform in the case of wavetable synthesis—but the sound is processed and delivered digitally. The other classic '80s synths were purely digital, using frequency modulation (FM) synthesis technology first developed by John Chowning at Stanford University in the 1960s. The New England Digital Synclavier, introduced in 1977, was the first commercial instrument to solely use digital FM synthesis. Yamaha's

6. For other recent work that has considered the language used to describe timbre from this sort of ethnographic standpoint, see Rebecca Flore, "The Social Life of Timbre: Discussing Sound Color in Online Guitar Communities" (Timbre is a Many-Splendored Thing, Montréal, Québec, Canada, 2018); and Caroline Traube and Nicolas D'Alessandro, "Vocal Synthesis and Graphical Representation of the Phonetic Gestures Underlying Guitar Timbre Description," in *8th International Conference on Digital Audio Effects (DAFx'05)*, 2005, 104–109.

7. Isabella van Elferen, "Timbrality: The Vibrant Aesthetics of Tone Color," in *The Oxford Handbook of Timbre*, ed. Emily I. Dolan and Alexander Rehding (New York: Oxford University Press, forthcoming), page numbers not available.

first digital keyboard was the Yamaha GS-1, released in 1981—technically not a synthesizer at all, because it consisted entirely of stored sounds from the factory.

Digital FM synthesis was less popular than other formats until one pivotal moment: the unveiling of the DX7 at the National Association of Music Merchants show in Summer 1983. The DX7 was produced only from 1983 to 1986, and in this short period, Yamaha sold approximately 150,000 units; the DX7 today remains one of the best-selling synthesizers of all time.[8] Keyboardists across Europe, North America, and Asia were enamored with the DX7, so much so that it was seen as a replacement for antecedent workhorse synthesizers. Many musicians were smitten with the possibilities, and not only because they were dazzled by a brand-new technology. Two years after the release of the DX7, when the newness would already have worn off, jazz and R&B keyboardist Patrice Rushen said, "[The DX7] is such a great instrument, such a versatile instrument. I think we're still at the tip of the iceberg of what it's capable of."[9] Some musicians even insinuated the DX7 would make other synthesizers obsolete. Roy Bittan, a keyboardist for Bruce Springsteen's 1986 tour, put this into practice when he transferred all the synthesizer sounds that he could from the older Yamaha CS-80 analog synthesizer to the DX7: "I realized at once that [the DX7] was going to be very valuable in the future. . . . [T]he CS-80 is harder to control, and the sound is not as clean."[10] Film composer Jerry Goldsmith gushes, "The Yamaha DX7 is amazing; some people feel that if you have a rack of three or four of them, you don't need anything else."[11] E. PIANO 1 was one preset that was particularly influential in this regard: it was widely considered a substitute for—and by some accounts "utterly phased out"—the Fender Rhodes.[12] Jimmy Jam (Timmy Harris), a songwriter and producer for Janet Jackson and other singers, said he never used a real Fender Rhodes anymore after the DX7 and other synthesizers began providing similar electric piano sounds: "No [I never use a real Rhodes sound], I just go direct into the board with a Rhodes synth sound. With all the companies having Rhodes patches, it's easier to use the variations."[13] In the eyes of many musicians, using one flexible DX7 was simply more practical than deploying an array of other synthesizers.

"The Synth that Changed Everything"—a title bestowed upon the DX7 in a thirtieth anniversary retrospective in *Keyboard*—made use of several cutting-edge technologies. For one, as already mentioned, the DX7 was a digital synthesizer, using the recently developed FM digital synthesis process. Without going into excessive mathematical detail, FM synthesis on the DX7 relies on six "operators," which can be arranged into thirty-two different

8. After 1986, Yamaha produced successors to the DX7, the DX7II and the DX7II FD. There were no further DX7II FDs produced after 1989, which likely solidifies the role of the DX7 as a quintessentially '80s synthesizer. See Mark Vail, "Yamaha DX7 6-operator synthesizer," *Keyboard* (June 2002), 130.

9. Quoted in David Frederick, "Patrice Rushen: A Child Prodigy Comes Home to Jazz," *Keyboard*, March 1986, 46. As the interview title insinuates, Rushen played piano from a very young age. She was classically trained before she released her jazz albums, which used the DX7 and other synthesizers.

10. Quoted in Bob Doerschuk, "Roy Bittan: Rocking America with the Boss," *Keyboard*, December 1986, 72.

11. Quoted in Tom Darter, "Jerry Goldsmith: A Top Film Composer Explores the World of Synthesizers," *Keyboard*, February 1985, 24.

12. Mark Vail, "Yamaha's FM Synths: Frequency Modulation or Fabulous Marketing?," *Keyboard*, July 2003, 46.

13. Quoted in Bob Doerschuk, "Jam & Lewis: Grammy-Winning Keyboardists/Producers," *Keyboard*, May 1987, 85.

Synthesizer name (year)	*List price (USD)*	*Adjusted for inflation (2019)*
Fairlight CMI (1979)	$25,000	$88,200
New England Digital Synclavier II, 8-voice (1979)	$13,750	$48,500
Yamaha GS1 (1981)	$11,850	$33,400
PPG Wave 2.2 (1982)	$8,800	$23,350
E-MU Emulator II (1984)	$7,995	$19,700
Roland Jupiter-8 (1981)	$5,295	$14,900
Yamaha DX7 (1983)	$1,995	$5,150

Table 2. List prices in USD of various 1980s synthesizers.

algorithms, thus giving the operators various properties that alter pitch and timbre.[14] The DX7 also replaced the standard ADSR amplitude envelope generator, common to older synthesizers, with a more flexible eight-step envelope generator.[15] Each of the six operators in the tone-generation process may be assigned its own unique amplitude envelope, once again multiplying the number of the DX7's potential sounds, and allowing for a dynamism in the timbral profiles of these sounds that was never before possible. If desired, this same envelope generator can also be used to control the pitch, through an additional seventh envelope called the pitch EG. Factoring all these variables together, the number of possible sounds the DX7 can create is immense—to the point that many users were completely flabbergasted at the prospect of creating sounds themselves. Rather than wrestle with the unforgiving programming interface, most players of the DX7, and even many experienced session musicians, relied solely on the factory presets that were distributed by Yamaha along with the DX7, stored in the internal memory or cartridges. This common practice resulted in the homogenized sound audible across most tracks that used the DX7.

What clinched the DX7's place in synthesizer history was not just its offering all these revolutionary features, but that it offered them at a significantly lower price (Table 2). Other comparably priced synthesizers, such as the Korg PolySix, used more derivative technologies already familiar from older analog synthesizers, yet the DX7 offered cutting-edge technical specifications without significant additional cost. Dave Formula, a keyboardist for the bands Magazine and Visage, raved in April 1984 shortly after the release of the DX7, "... [the DX7] gives you so much for the price. You can compare it with things that cost six times as much, and I don't see that much difference."[16] Bob Moog, the inventor of the Moog synthesizer, spoke of the revolution in synthesizer pricing that the DX7 precipitated as a "democratization" of the synthesizer.

14. For a detailed explanation of FM synthesis, see John M. Chowning, "The synthesis of complex audio spectra by means of frequency modulation," *Journal of the Audio Engineering Society*, 21/7 (1973), 526–34.

15. The attack-decay-sustain-release (ADSR) envelope allowed for control of the rate of the attack (but not its level), the rate of decay, the level of the sustain, and the rate of the release (the level of which was always 0). The DX7 introduced the eight-step envelope, which enables the user to define four different levels, as well as the rates of change between each of those levels, totaling eight steps in the definition of the envelope. This opened possibilities the creation of all sorts of unusual envelopes. For more information, see Megan Lavengood, "A New Approach to the Analysis of Timbre" (Ph.D. diss., City University of New York, 2017).

16. Quoted in Alan diPerna, "Dave Formula: From Punk to Techno-Rock with Magazine & Visage," *Keyboard*, April 1984, 40.

> The first microprocessor-controlled synthesizers were strictly professional instruments, with price tags of $5,000 and up. . . . [Today], no matter how much or how little money you have in your pocket, you can almost certainly find a synthesizer that will give you some musical satisfaction.
>
> As a result the number of musicians who own these instruments has increased dramatically. Early last year I went to catch a Korg clinic which was put on by Chuck Leavell at a local music store in Asheville, North Carolina. As his final demo, Chuck played the Korg Poly 800 and blew the audience away. Here was a portable 8-voice keyboard with programmability and MIDI that cost less than a plane trip to the Coast!
>
> The fact that the event took place in North Carolina should not be overlooked. . . . Before then, you couldn't really buy a synthesizer in Asheville. You had to travel three hours to Charlotte, North Carolina's largest city. But by 1984, the salesman knew his way around keyboard synthesizers, Chuck Leavell demoed to a hundred or so musicians, and suddenly synthesizers were a musical presence in North Carolina. That's what I mean by "democratization."[17]

This dominance of a singular technology, like the DX7 with its presets, is exactly what leads to the sonic homogeneity that enables listeners to perceive an '80s sound across disparate genres. Technology certainly influences the sound of popular music in every decade—Kevin Holm-Hudson's article on this linkage provides musical examples from the 1960s to the 1990s.[18] But the technologies that came of age in the '80s had a particularly unifying effect. This can be observed in, for example, industrial music, a genre which was once avant garde but, as S. Alexander Reed explains, began to sonically resemble mainstream pop as "the technology of music making locked in a set of aesthetics in [the 1980s] that shaped pop as a whole."[19]

Writing in 2003, the editors of *Keyboard* magazine make special note of one DX7 sound in particular: "Anyone remember . . . the amazing expressiveness of the Rhodes patch that was subsequently so overused that today it makes us cringe?"[20] What the *Keyboard* editors here call the "Rhodes patch" is E. PIANO 1, a paragon of the '80s sound and, as one of the most-used sounds of the DX7, a recurring motif in discussions about the DX7. Essential timbral aspects of the '80s sound are encapsulated within the timbre of E. PIANO 1—namely, brightness and clarity. These two qualities were considered particularly emblematic of digitally synthesized sounds among musicians of the 1980s. Put another way, the timbral qualities of E. PIANO 1 sonically signify the *new* technology of digital synthesis, as opposed to older electric pianos like the Fender Rhodes. Dozens of things combine to form what people refer to as the "'80s sound," and E. PIANO 1 is only one of them, but the seeming omnipresence of E. PIANO 1 across so much of 1980s pop music makes this Yamaha DX7 preset particularly well-poised to function as a symbolic representative of the "sound" of popular music in the 1980s as a whole.

17. Bob Moog, "The Keyboard Explosion: Ten Amazing Years in Music Technology," *Keyboard*, October 1985, 42.

18. Kevin Holm-Hudson, "The Future Is Now. . . and Then: Sonic Historiography in Post-1960s Rock," *Genre* 34, no. 3–4 (2001): 243–64.

19. S. Alexander Reed, "The Tyranny of the Beat: Dance Music and Identity Crisis," in Assimilate: A Critical History of Industrial Music (New York: Oxford University Press, 2013), 134.

20. *Keyboard* editors, "DX7 Redux? 20 Years Later, the DX7 Still Resonates," *Keyboard* (July 2003), 40.

E. PIANO 1 AND THE FENDER RHODES

Verbal descriptions of the timbre of E. PIANO 1 help give some indication of what listeners perceive as its most distinctive timbral features. E. PIANO 1's sound, while quite similar to the sound of a Rhodes, is in no way a reproduction of it; aurally distinguishing the two is easy. Yet a verbal characterization of the difference between these two sounds can be elusive. Jazz keyboardist Mitchel Forman said the DX7 "doesn't have the same depth, warmth, or expressiveness" as the Rhodes, a sentiment which reflects that of many keyboardists and producers.[21] But what does Forman mean by these words, particularly "warmth"? Situating this description within a broader cultural context aids in understanding the effect of E. PIANO 1 and the DX7 on the '80s sound.

Musicians of the '80s often compared the DX7 to older, analog synthesizers, as in this statement from keyboardist and songwriter Jim Eshleman: "The DX7 I mostly use for bell-type sounds. It doesn't really have as thick a sound as the analog oscillator."[22] It is in these analog-vs.-digital comparisons that references to "warmth" seem most common. For example, Mark Kelly, keyboardist for the neo-progressive group Marillion, says in an interview that he added a Roland Juno, an analog synthesizer, to his equipment because "when it comes to warm string sounds, the DX7 just can't get it."[23] Understanding precisely what is meant by the "warm" descriptor lets the bright, digital, '80s sound stand out in relief.

Many who think analog synthesizers have a warmer sound argue the warmth comes from the sound's generation with physical vibrations.[24] Physicality is involved in the tone generation of an analog synthesizer: a vibrating column of air generates the sound, just as in an acoustic instrument like a trumpet, only the vibrations happen in vacuum tubes instead of brass tubes. The sound created by an analog synthesizer inherently has imprecisions, flaws, and microfluctuations, peculiar to each synthesizer and its auxiliary equipment, and furthermore dependent on the environment. These variations generate a tiny amount of randomness in an analog synthesizer's tone, which accounts for its perceived warmth. The DX7, an FM digital synthesizer, was a departure from prior analog synthesis, and became symbolic of the sound of digital technology more broadly. Digital synthesizers generate sounds without involving any physical vibrations (prior to the amplification of the sound). A digital synthesizer is basically a computer: the signals are processed through computer chips. As digital technologies gained prominence, this contrast between digital and analog became a motif in discussions in the audio world, and the binary view of these

21. Quoted in Russ Summers, "Mitchel Forman Rides the Train of Thought," *Keyboard*, February 1986, 20.

22. Quoted in Bob Doerschuk, "Jim Eshleman Probes the Expanding Universe of Planetarium Music," *Keyboard*, October 1984, 14.

23. Bob Doerschuk and Ted Greenwald, "Q: Are We Not Progressive? A: We Are Marillion!," *Keyboard*, July 1986, 19.

24. Examples of such sentiments can be found in Mark Vail, "A Conversation with Bob Moog: Analog vs. Digital Sound Generation," *Keyboard*, January 2005, and in a post on Reddit titled "ELI5: Analog Synthesizer vs. Digital Synthesizer" (https://www.reddit.com/r/WeAreTheMusicMakers/comments/300103/eli5_analog_ synthesizer_vs_digital_synthesizer/, accessed 2 February 2016). The same argument is often made in regard to recording technology (see Hugh Robjohns, "Analogue Warmth: The Sound of Tubes, Tape & Transformers," *Sound on Sound*, February 2010, https://www.soundonsound.com/techniques/analogue-warmth.). People who maintain a vinyl collection insist that the sound from this analog media is warmer and richer than the sound from digital CDs.

technologies still seems to exist even from a more modern perspective. Keyboardist and music journalist Craig Anderton, writing in 2003, recalled that in the '80s, the "bright, digital sound stood in stark contrast to [the DX7's] analog ancestors," and that "the DX7's clarity was a fine complement to the warmth of analog tape."[25]

In the 1980s, the world was becoming increasingly digital—a trend that certainly has not slowed as of the writing of this article. As more of human experience becomes digital, a nostalgia for analog is growing. As Trevor Pinch and Frank Trocco state in the introduction to their book, *Analog Days,* "Today in the digital world, there is a longing to get back to what was lost; an 'analog revival' is taking place."[26] Alongside this nostalgia for analog, a broader notion of what the term "analog" might mean has also developed. Musicologist Elizabeth Newton presents a vignette wherein "analog" is used to describe coffee:

> Chicago-based coffee roaster Intelligentsia offers an "Analog" espresso blend, comparing their coffee's "true" taste to the "real" sound of the pre-digital. What enthusiasts love about analog technology—the weight of those buttons, the tug of that tape—would seem to have little to do with the berry notes of a breakfast roast, but the ideal of fidelity is flexible, applicable across the senses.[27]

As Newton implies, marketing something as "analog" can be persuasive, even when, from a literal view, the appeal of analog sound has nothing to do with the actual product being marketed. From the analog vs. digital divide, the term "analog" essentially gained a new meaning, referring not necessarily to analog technologies per se, but rather to anything that was not digital. This cultural phenomenon is described by Jonathan Sterne:

> Sometime in the 1980s, the terms *analog* and *analogue* began to wildly proliferate . . . the proliferation of *analog*'s meaning as "not-digital" or "separate from computers" emerges more from a set of reactions to digital technology than from the engineering field itself. Put another way, an expanded notion of *the analog* as a condition, which now approaches common sense in a whole range of fields—engineering, computer science, media studies, journalism, music fandom, various media arts and humanities—became a useful rhetorical tool for both promotional and critical discussions of digital technology.[28]

While the opposition between analog and digital may seem overly reductive, this is exactly the kind of positioning that takes place in discussions of the DX7. Many of the quotes presented here follow a pattern, where the DX7's timbral qualities are attributed to its status as a digital instrument, and then contrasted with something analog (where "analog" means "not-digital," in Sterne's terms).

25. Craig Anderton, "Tracking FM Synths: 20-Year-Old Tips Still Give Modern Tracks Punch," *Keyboard*, July 2003, 114. Anderton also supposes in this article that digital synthesis does not sound good on digital recordings such as .mp3s: "perhaps digital+digital was just too much."

26. Trevor Pinch and Frank Trocco, "Introduction: Sculpting Sound," in *Analog Days: The Invention and Impact of the Moog Synthesizer* (Cambridge, MA: Harvard University Press, 2009), 9.

27. Elizabeth Newton, "The Lossless Self," *The New Inquiry*, 21 September 2015. Newton argues that the appeal of hi-fi recording is mostly emotional rather than empirical.

28. Jonathan Sterne, "Analog," in *Digital Keywords: A Vocabulary of Information Society and Culture*, ed. Benjamin Peters (Princeton, NJ: Princeton University Press, 2016), 31–32.

If "warmth" is the key word when describing analog sounds, then "bright" or "clear" are its opposites in discourse surrounding digital sounds. The warm sound of analog synthesizers seems to have attained a degree of universal likability, but opinion is more divided on the bright and clear timbres of the digital DX7.[29] A BBC documentary series called *The Shape of Things that Hum* aired an episode dedicated to the DX7, the opening of which foregrounds the public's love-hate relationship with the synthesizer. Talking to the camera, producer and musician Stuart Price states, "The DX7: the greatest instrument ever created by man"; immediately following is a cut to Barry Smith of the electronic group Add N to (X) who says, "It's the worst synthesizer known to mankind. It's a disgusting piece of shit."[30] Such starkly contrasting opinions on clear and bright digital sounds are everywhere. For example, while songwriter Holly Knight said, "I like the fact that the DX7 piano sound is a little bit synthetic," Nick Rhodes, keyboardist of Duran Duran, said, "It sounded a little boring. . . . [The DX7] is quite a limiting synthesizer."[31] Ian Boddy, a keyboardist, also used the word "bright" in explicit connection to digital sound when describing the DX7 in an ambivalent comment: "That instrument gave the music a harder, more 'digital' feel, and that, combined with the final mixdown to digital master, produced a harsh-sounding record. It's not unpleasant to listen to, it just has a bright and hard quality."[32] (Notice that Boddy even uses the word "harsh," which has a clearly negative connotation, while simultaneously insisting this is not necessarily a bad thing.) Or, as Nick Rhodes summarized, "You either like the sound of it or you don't."[33]

The battle between these competing views comes to a head in discussion around the DX7's electric piano sound. E. PIANO 1 was considered a substitute for the Fender Rhodes. The Rhodes is not an analog synthesizer; it's an electrically amplified instrument, like the electric guitar. Sound is produced when the player strikes a key, and a hammer strikes a metal tine, which makes a very soft bell-like sound that is then amplified and projected through speakers. I use Mitchel Forman's assertion that "[the DX7] doesn't have the same depth, warmth, or expressiveness [as the Rhodes]" as a touchstone for my argument

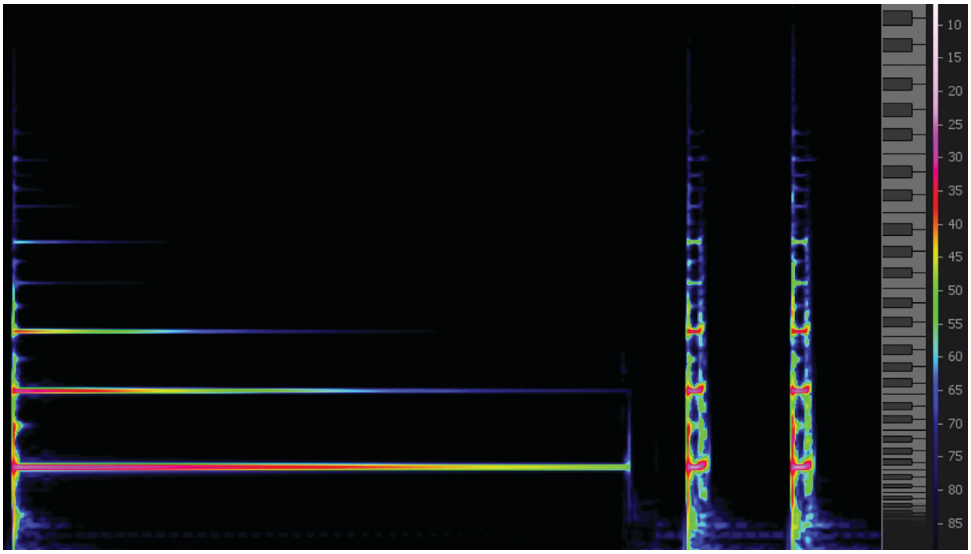
29. The generally positive opinion of the analog is, crucially, one that seems most clear when digital is available as its binary opposite. This is also discussed by Sterne: "The claim that analog media are closer to nature proposes an approximately hundred-year period in human history—roughly from the last quarter of the nineteenth century to the last quarter of the twentieth—when the senses and the world were somehow in more harmonious alignment with the workings of media than at any time before or since. The premise behind this is that analog technologies were both preceded and succeeded by technologies of writing—writing and scores in the nineteenth century, and computer code in the twentieth century. That periodization is the philosophical kernel of analog nostalgia" (Sterne, 2016, 40).

30. "The Yamaha DX7," *The Shape of Things that Hum,* produced by Jacques Peretti, Channel 4, 29 January 2001. Both Price and Add N to (X) were active in the late 1990s, rather than the 1980s; they belong to a younger generation of musicians. In the documentary Price is referred to as Jacques lu Cont, a pseudonym.

31. Bob Doerschuk, "Hit Songwriter Holly Knight Unleashes Her Keyboard Chops on Device's *22b3*," *Keyboard*, April 1986, 16; Bob Doerschuk, "Idylls in Arcadia," *Keyboard*, 1986, 76. Rhodes is not a particularly technically skilled keyboardist, so he relied heavily on the arpeggiator function built into some early '80s analog synthesizers (such as the Roland Jupiter 8), and on the sampling technology of keyboards like the Fairlight CMI. The DX7 has no arpeggiator or sampler, so perhaps this is actually what makes the DX7 'boring' to Rhodes, rather than its digital sound.

32. Quoted in Paul Gilby, "Ian Boddy: Phoenix," *Sound on Sound*, December 1986, 40. Boddy is not only a pop musician, but also an electronic music composer, which perhaps accounts for his fascination with all kinds of electronic sound, even "harsh" sounds that might not be broadly appealing.

33. Doerschuk, "Idylls," 76.



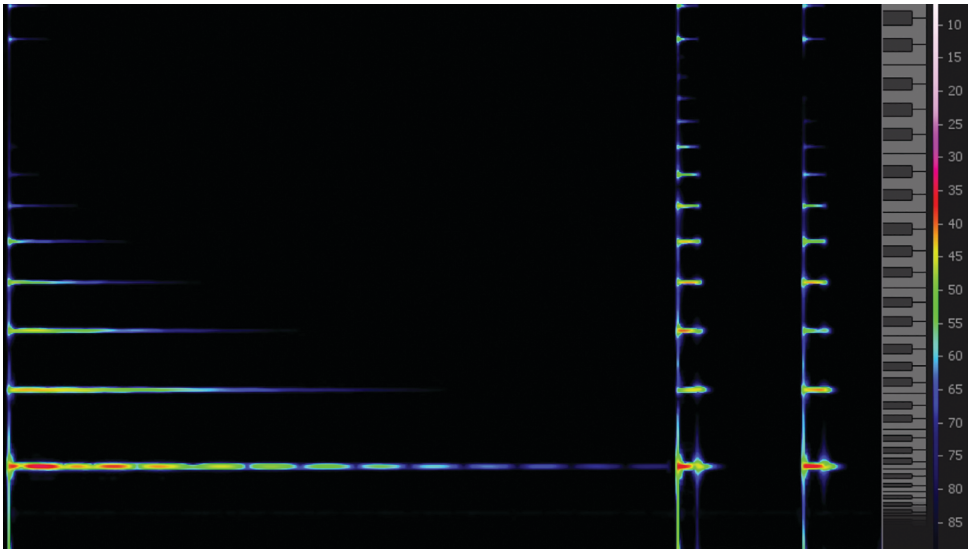
Example 1. Spectrogram image for E. PIANO 1. See the online version of the journal to view the video of Example 1.

that the 1980s sound was defined through this opposition between "warmth" and "clarity." What exactly does Forman mean by warmth here? The Rhodes is probably not considered a "warm" sound in other contexts—it's a metallic sound. How can we define "warmth" in the Rhodes sound, both in the spectrogram and elsewhere?

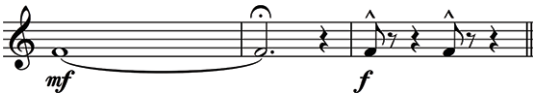
Warmth—or, more accurately, a lack of warmth—is one of the central components of an '80s sound. With this in mind, I examine the timbre of E. PIANO 1 and the notion of timbral warmth, in order to demonstrate the relationship between the sound of the '80s and timbre, reception history, aesthetics, and culture. To attempt a clear definition of what Forman might have meant by "warmth" in relation to the timbre of the DX7 E. PIANO 1 and the Fender Rhodes, I turn to spectrogram analysis. Identifying the visible differences in the spectrograms between the DX7 and the Rhodes clarifies what Forman may have heard and described as "warmth." Although I proceed from a technical analysis of spectrogram images, I will show that what listeners describe as "warmth" is sensed not only through the observable acoustic phenomena, but also through culturally contingent metaphors and perception.

Examples 1 and 2 are video examples, in which a cursor moves across the spectrogram image to align with the sound signal from recorded samples of a Fender Rhodes Stage 88 Mark II and a Yamaha DX7 on the E. PIANO 1 preset, respectively; Example 3 is a representation in musical notation of what is sounded in both videos.[34] There are three

34. The spectrograms throughout this article have been created with iZotope RX4 software. Settings for the spectrograms are as follows. The frequency scale is the Mel scale, which reflects listener perception of pitch space (cf. Pedersen 1965). The amplitude range goes from -92.8 dB (low) to 0 dB (high). The software automatically varies the time and frequency resolution of the Fourier transform to achieve what Izotope's manual calls the "best spectrogram sharpness in every area of the time-frequency plane." The fast Fourier transform size is set to 2048. The window is set



Example 2. Spectrogram image for Fender Rhodes Stage 88 Mark 2 electric piano. See the online version of the journal to view the video of Example 2.



Example 3. Sound signal of 1 and 2 rendered in music notation.

– / + opposition	*Fender Rhodes*	*E. PIANO 1*
dark / bright (range of partials)	–	+
full / hollow (density of partials)	–	+
harmonic / inharmonic	+	–

Example 4. Opposition table for E. PIANO 1 and Fender Rhodes.

principal acoustic qualities that strongly distinguish the Rhodes from the DX7: the range of the partials, the density of the partials, and approximation of the harmonic series (harmonic vs. inharmonic partials). These differences are summarized in Example 4.

One way in which the timbres of the DX7 and the Rhodes may be distinguished from one another is through the distance between the fundamental frequency and the highest sounding partial. The DX7 has 3.9 octaves between its fundamental F1 and its highest partial, approximately an E5. The Rhodes has only 3.09 octaves from F1 to its highest

to cos3. The frequency and time overlap are both set to 4x. For more information, see the iZotope RX user's manual on Spectrogram Settings.

partial, approximately F♯4. The DX7 sound is more differentiated and more complex by having this wider range between its partials, whereas the Rhodes sound by contrast is more centered and unified. A wide range represents a bright sound, and a narrow range a dark sound. Darkness is often understood also to correlate to warmth—that is, a darker sound is a warmer sound, and a brighter sound is a colder sound.[35] The expanded range between the fundamental and the highest partial of E. PIANO 1 may be another timbral characteristic to which Forman is responding when he calls the Rhodes a "warm" sound.

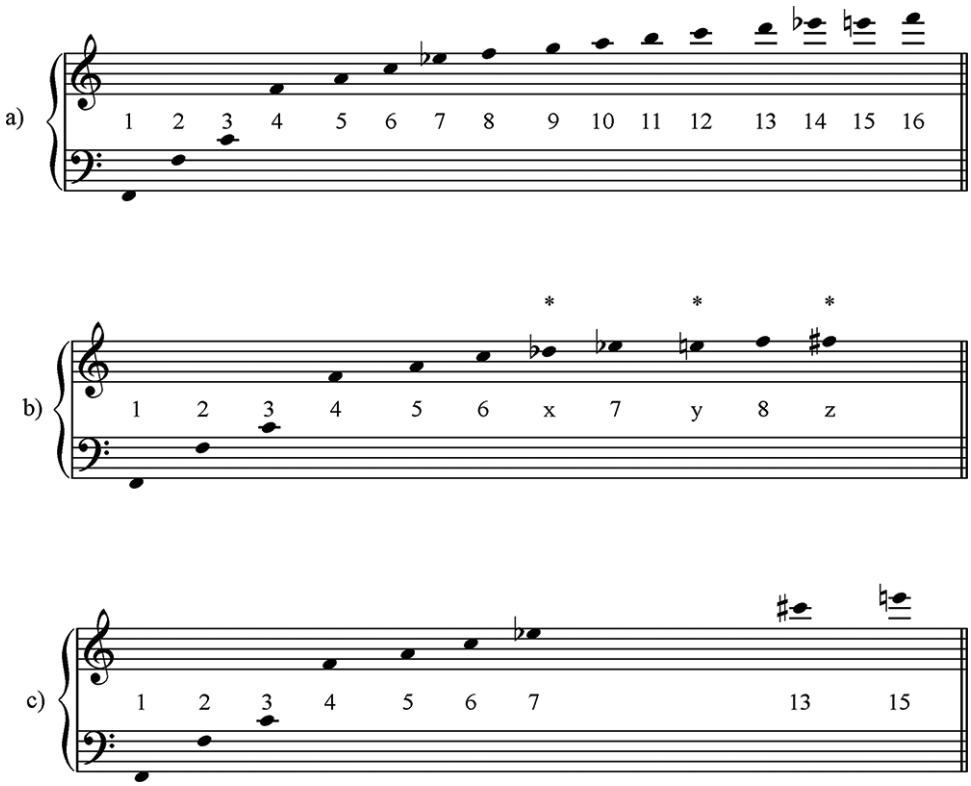
The partials of many pitched synthesized instruments will approximate the partials of an ideal, a perfectly vibrating string or column of air: that is, partials that follow the harmonic series. The harmonic series is thus a useful standard of comparison when analyzing spectrograms. For reference, Example 5a approximates in traditional notation the first 16 partials in the harmonic series with a fundamental of F and numbers each partial 1 through 16. Examples 5b and 5c approximate the partials of the Rhodes and DX7, respectively, in traditional notation, written down two octaves for easier reading. The partials of the DX7 and the Rhodes both deviate from the harmonic series and from one another.

The DX7 has a large gap in its partials, omitting partials 8 through 12, and finally sounding partials 13 and 15 (partial 14 is also omitted). This gives the sound a hollow timbre, like that of a clarinet. By contrast, the Fender Rhodes has a full timbre: each of the partials of the harmonic series is present in sequence.

The Rhodes has a different sort of deviation from the harmonic series, however. The Rhodes sound follows the harmonic series for its first six partials but then it adds an inharmonic partial (i.e., a partial that is not within the harmonic series) between each regular harmonic. These inharmonic partials are marked with a star in Example 5b. This inharmonicity is an artifact of the physical attack that generates the sound on the Rhodes. Recall that, when the player strikes a key on the Rhodes, a hammer hits one of the metal bars (called "tines") in the Rhodes. The physical striking causes additional variables in the tone creation, which, in terms of the spectrogram visualization, results in inharmonic nubs protruding out of the attack of each note. Perceptually speaking, this inharmonicity creates a small amount of roughness and discord in the tone, which may be perceived as warmth, similar to the way microfluctuations in tuning generate the warmth in an analog synthesizer. The Rhodes also makes a sound when the tine is dampened at the end of the note, visible in the spectrogram as thick vertical lines at the end of the two short notes. By contrast, there are no inharmonic partials present in the DX7 sound, in the attack or anywhere else.

In an aural experiment to demonstrate what these two timbral features achieve, I have artificially created two new samples of the Rhodes and E. PIANO 1 that remove these distinguishing features by cutting out all spectral energy above approximately 3000 Hertz, and the energy occurring at inharmonic ratios (Example 6). Listening to these two samples

35. This is supported by perception studies, such as those of Michel Bernays and Caroline Traube, "Verbal Expression of Piano Timbre: Multidimensional Semantic Space of Adjectival Descriptors," in *Proceedings of the International Symposium on Performance Science 2011*, ed. Aaron Williamon, Darryl Edwards, and Lee Bartel (Utrecht: Ass. Européenne des Conservatoires, Académies de Musique et Musikhochschulen (AEC), 2011), which states that brightness correlates to the presence of high frequencies, and that warmth correlates with low- to mid-range frequencies (302).



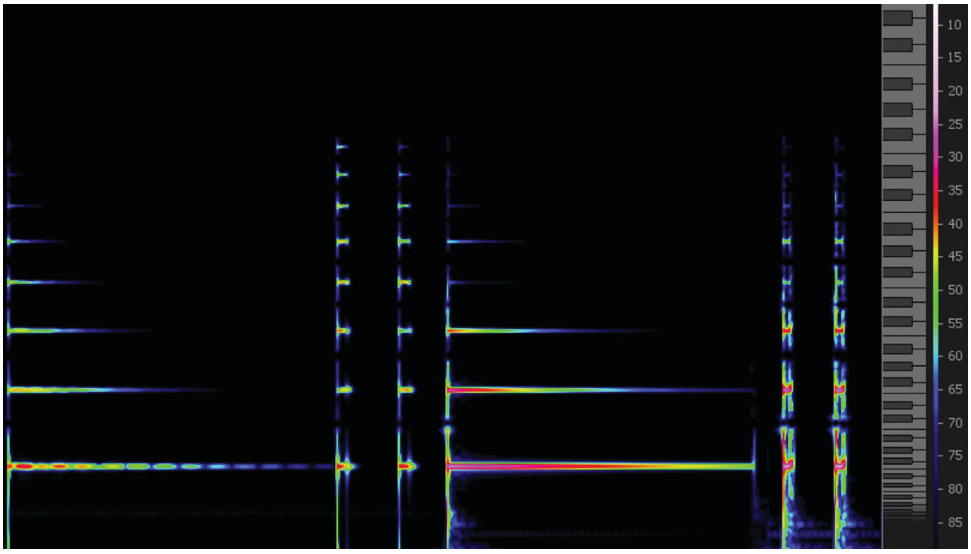
Example 5. Approximation of the harmonic series in music notation (a), compared to approximations of the partials of the Rhodes (b) and the DX7 (c).

side-by-side, I imagine one will likely still hear a difference between E. PIANO 1 and the Rhodes, but the distinction will be much more subtle.

THE PARADOX OF TIMBRE

This spectrogram analysis of the two sound signals is illuminating of the physical, acoustic differences between them, yet spectrogram analysis cannot give the complete picture of a timbral experience because the non-acoustic associations that humans create are never shown in a spectrogram. Cornelia Fales, in a foundational article on timbre analysis titled "The Paradox of Timbre," notes that while a person might perceive an entirely different sound source than what the spectrogram shows the source to have actually been, ultimately, the real source might not even matter to the listener, as long as nothing ends up contradicting this information.[36] Although the analysis above does not refer to sound-source identification but instead to qualitative evaluation of the timbre of a known sound source, the "paradox" indicated in the title refers to a broader implication: that while ostensibly timbre is a physical, acoustical phenomenon, timbre as perceived in the

36. Cornelia Fales, "The Paradox of Timbre," *Ethnomusicology* 46, no. 1 (2002): 56–95, https://doi.org/10.2307/852808.



Example 6. An edited spectrogram that removes distinguishing features from E. PIANO 1 (left) and Rhodes (right). See the online version of the journal to view the video of Example 6.

brain might in fact have very little to do with its source within the physical world. Fales introduces the term "perceptualization" as a term which refers to "any cognitive operation or feature that contributes to the perceptual outcome of a signal beyond the actual acoustic elements of the signal."[37] A listener's brain is not passively calculating timbres in the same way that a computer does when it produces a spectrogram. The brain takes quite an active role in determining how listeners experience those timbres and is susceptible to ignoring or creating timbral attributes that may or may not be present. In Fales's view, then, the usage of the word "warmth" need not be explainable by spectrograms at all.

The term "warm," like most words we use to describe timbre, is an analogy—a *tactile* analogy. Timbral warmth is thus inherently related to touch in some way. Perhaps, consciously or unconsciously, timbres that music makers describe as "warm" may be timbres produced with a certain kind of touch; specifically, warmth, as a pleasurable sensation, may relate to instruments with physical sound production technologies, which provide more tactile sensations than synthesizers or other electronic instruments. Perhaps Forman's sense of warmth can be attributed just as much to the Rhodes's touch as to any acoustic phenomena. Mechanical action—the hammer hitting the metal tine—produces sound in the Rhodes, so the act of playing a Rhodes will feel more connected to the resulting sound for the person playing the instrument. The velocity-sensitive action of the DX7, though quite good, cannot have the same connectedness with the performer as an instrument with mechanical action—a connectedness that likewise informs many pianists' preference for acoustic pianos, or organists' preference for tracker organs, versus electronic pianos and organs. Forman is a keyboardist himself,

37. Fales 2002, 63.

so his perspective is a performer's perspective. The corporeal feedback of mechanical action vs. digital action undoubtedly corresponds to and influences his feelings about the lack of warmth in the DX7 timbre.

I do not think that spectrogram analysis needs to be entirely disregarded, however, even considering the undeniable impact of perceptualization articulated by Fales. Instead, I argue for the integration of spectrogram analysis with the descriptions of timbral warmth as the best way of approaching timbre analysis. I echo van Elferen in urging analysts to view timbre as residing on a continuum somewhere between a totally materialist approach and a totally idealist approach. This tactile analogy of warmth as it applies to the sounds of the Rhodes and the DX7 is an apt case study for viewing timbre as the "gap between" timbral idealism and timbral materialism identified by van Elferen.[38] Indeed, van Elferen references the related phenomenon of analog nostalgia culture as an "idealist attachment to a timbral thing-in-itself," to which the notion of analog warmth is clearly related. Perhaps when '80s musicians use the word "warmth" as a way of contrasting other instruments like the Rhodes with the DX7, the word "warmth" is really meant as an icon for this idealist attachment, and ultimately refers only a little to the materials of the sound signal. After all, as van Elferen suggests, "Paradoxical entanglement is the key characteristic of the event that is tone color, and so timbral reflection should return to that event." The combination of material and immaterial aspects of timbre described throughout this essay show, in sum, that the Rhodes attack and release sounds therefore contribute to the sense of warmth in multiple dimensions: the mechanical technology of the Fender Rhodes directly contributes to a sensation of timbral warmth through touch, and furthermore, the mechanical sound generation with metal tines introduces inharmonicity and a unique release sound; in contrast, the wider timbral range and unmuddled sound of E. PIANO 1, created through clean, precise digital sound production rather than mechanical action directly connected to the keyboardist's hand, eliminates timbral qualities of warmth entirely.

CONCLUSION

E. PIANO 1 summarizes sonically the issues that contribute to the broader '80s sound. In terms of acoustics, E. PIANO 1 is distinct from older electric pianos like the Fender Rhodes (and other earlier electric pianos like the Wurlitzer and the Hohner Pianet) through the timbral characteristics of hollowness and a wider range of partials. These two characteristics add a new, '80s sheen to the E. PIANO 1 sound, which might be described colloquially as "bright." The brightness of E. PIANO 1, and the DX7 more generally, distinguishes this new technology from synthesizers and electric instruments of the '60s and '70s, whose defining timbral characteristic, by comparison, is warmth. Timbrally, the characteristics of brightness and clarity are the signature of a digital sound and, as I have shown, E. PIANO 1 strongly demonstrates these characteristics. The web of connections created by the use and re-use of DX7 presets like E. PIANO 1 among hundreds or maybe thousands of different tracks, across genres, is what

38. Van Elferen 2018, 13.

enables modern listeners to abstract a unified notion of a bright "'80s sound" from a diverse and eclectic repertoire of songs produced in the 1980s. In other words, E. PIANO 1's timbral profile, combined with its pervasiveness, allows E. PIANO 1 to function as a shorthand for the '80s sound as a whole.

I now wish to offer up ideas I have about the '80s sound that would be fertile ground for future work—namely, that the '80s sound is actually an '80s *genre*. This understanding of the term "genre" is unabashedly presentist and retrospective: it does not represent what musicians in the 1980s may themselves have thought about their musical milieu, but rather speaks to the ways that the '80s are discussed today. This understanding of genre has become more common in the past decade or so. Gjerdingen and Perrott's 2008 study on genre identification proceeded from the basis that we must not declare people's understandings of genre as right or wrong except "in reference to group norms," a default stance which the authors cleverly termed "The Customer Is Always Right."[39] More recently, writings by Eric Drott (2013), Robin James (2017), and Thomas Johnson (2018) have also approached genre in this way.[40] Perhaps the most precise definition of this approach to genre is articulated in David Brackett's 2016 book *Categorizing Music*, in which he proposes that a body of music is a genre as long as it can be cited—i.e., quoted, parodied, or referenced—out of context.[41]

Shen's '80s covers are a good case study for how "'80s music" might be quoted out of context. Shen (TRONICBOX) remixes current hit singles (that is, from 2015 to '18) and arranges them with new instrumentation. When the remixes are uploaded to YouTube, he accompanies the remixes with simple videos, featuring a still image of the original artist, edited to have hair and clothing typical of the 1980s. The video is further filtered through simulated distortion effects that mimic a damaged VHS tape, such as wavy image distortion and black or white bars that periodically cross the screen. The visual cues help clue the listener in to the theme, but above all, it is Shen's choice of timbres that makes these '80s-sounding covers successful. For example, in the video "80s Remix: Love Yourself - Good Audio," Justin Bieber's vocals for his single "Love Yourself" (2015) are underlaid with a DX7-like slap bass sound, and, of course, E. PIANO 1.

The purpose of E. PIANO 1, like many other production decisions made by Shen in these tracks, must be specifically to call forth the '80s as an intertextual reference. The particular quotable '80s sound enables Shen to make these covers. Shen's '80s covers, in turn, are exactly the type of "citation" Brackett is referencing: in the same sense as there is a disco sound or a psychedelic rock sound that can be quoted out of context, the '80s sound, even in its over-generalized conception, can also be quoted.

39. Robert O. Gjerdingen and David Perrott, "Scanning the Dial: The Rapid Recognition of Music Genres," *Journal of New Music Research* 37, no. 2 (2008): 93–100.

40. Eric Drott, "The End(s) of Genre," *Journal of Music Theory*, 57/1 (2013), 1–45; Robin James, "Songs of Myself," *Real Life*, 31 May 2017; Thomas Johnson, "A Music-Theoretical Approach to Genre in Post-Millennial Popular Music" (Ph.D. diss., City University of New York, 2018).

41. David Brackett, *Categorizing Sound: Genre and Twentieth-Century Popular Music*, (Oakland, CA: University of California Press, 2016), 12.

The '80s sound, or the '80s genre, is a constellation of shifting interrelations, between an aesthetic of artificiality, a culture rapidly adapting to swift advances in computing technology, and the technologies themselves. Of course, E. PIANO 1 cannot function as the source of the entire concept of an '80s sound, as drum machines, arpeggiators, lyric content, and dozens of other signifiers also come into play. In genre recognition broadly speaking, however, it is timbre that proves to be the strongest signifier.[42] The '80s sound is likewise recognizable through its overall timbral trend of brightness and clarity—the brightness and clarity that the timbre of E. PIANO 1 epitomizes. ■

42. In Gjerdingen and Perrott, "Scanning the Dial," 2008, the authors were surprised to find that listeners were able to identify the genre of a song within only 250 milliseconds, which they say, for a song with a tempo of 110 beats per minute, would be only enough time to hear a couple of notes and perhaps one hit of percussion. Thus, it seems that things like notes, rhythms, and lyrics would not be the most immediately perceptible signifier of genre, since these elements are nearly entirely removed in such a brief audio sample.

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