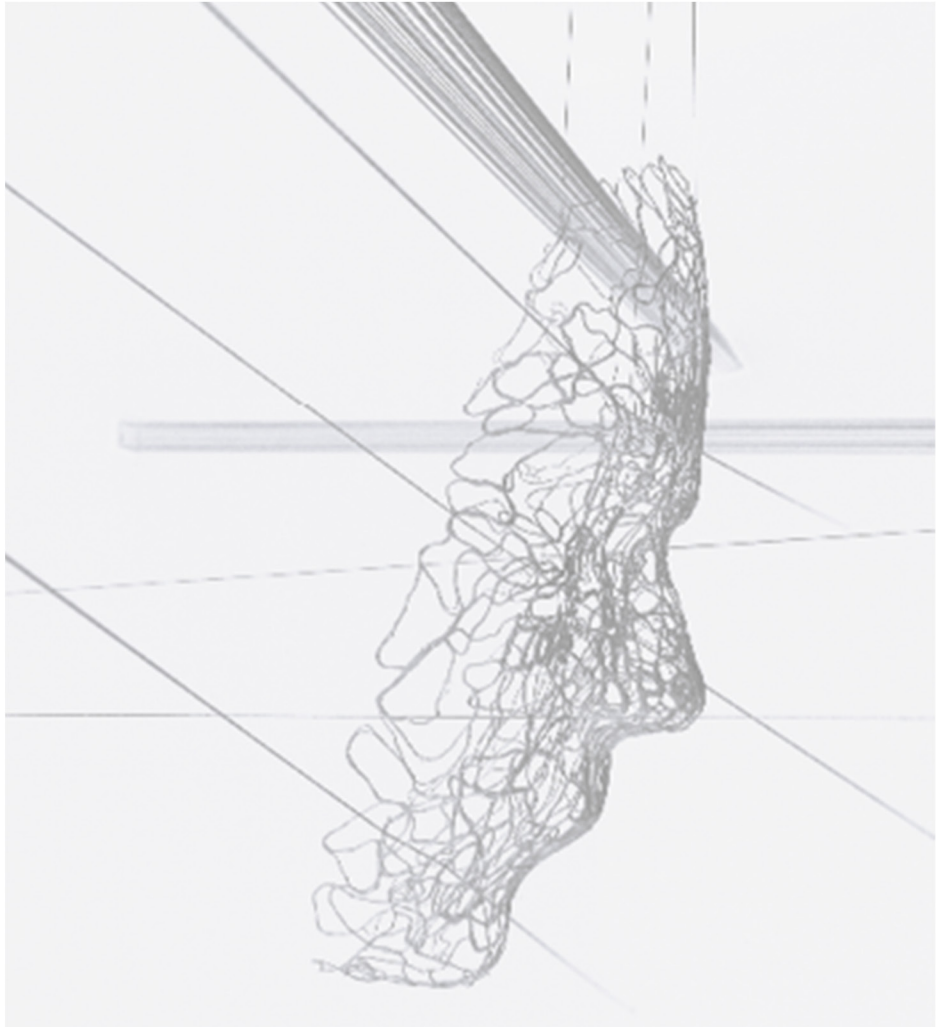


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Sergio Miranda-Bonilla

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Sergio Miranda-Bonilla*

*Interinstitutional Art and Culture Doctorate Program,
Universidad de Guanajuato
Guanajuato, México*

SPIRAL OUROBOROS: METASIMULACRUM IN ROCK AND METAL ELECTRIC GUITAR PROCESSING AND MODELING TECHNOLOGIES

Abstract: The article reviews Jean Baudrillard's concept of simulacrum and puts it in dialogue with the evolution of signal processing technologies for electric guitar, introducing the concept of *metasimulacrum*—a simulacrum of a simulacrum—to describe the historical trajectory from early electric guitar amplification to recent advances in digital signal processing, taking a critical stance on technological determinism.

Keywords: metasimulacrum, simulacra, electric guitar, processing, modeling, metal music, Baudrillard.

By Way of Preface

As a 45-year-old rock and metal guitar player, I find myself needing to lighten the burden of carrying around bulky amplifiers, cabinets, pedalboards, cabling, stands, and guitar cases. Instead, I get to the stage, set up my digital processing gear, and take part in the Baudrillardian hyperreality event that is a rock or metal performance.

All rock and metal guitarists face this choice these days: on one hand, carrying light digital equipment and sound processing systems which connect

* Author's contact information: s.mirandabonilla@ugto.mx.

quickly onstage is the practical option (Figure 1); on the other hand, showing off heavy and bulky analog valve or solid-state Marshall, Randall or Mesa Boogie full stacks has symbolic value within the traditional metal concerts aesthetics (Figure 2).



Figure 1. Author's pedalboard within a suitcase-sized carrying bag: guitar modeling processor, IR cabinet emulator, MIDI controllers and DI box (Photograph by author, June 2024).



Figure 2. A 3 x 6 stack of Marshall guitar cabinets (the setup of Jeff Hanneman from Slayer) on the Tuska Open Air Metal Festival main stage in 2008. Note that only two cabinets are miked, pointing only one speaker within each cab (Date 29 June 2008. Source: super work. Author: Jaakonam. Creative Commons Attribution-Share Alike 3.0 Unported license).

In the following sections, we will review Jean Baudrillard's concepts of *simulacrum* and *hyperreality*. We will relate them to a diachronic review of electric guitar's processing technologies. Also, we'll discuss the acoustic problem posed by the timbral peculiarities of amplification within the context of distorted guitar music ensembles, mainly the heaviest rock forms that led to metal genres that rely heavily on distorted guitar sound. This will lay the foundation for extending Baudrillard's concept of simulacrum to *metasimulacrum*, which I use to critique claims of technological determinism in the history of the electric guitar. Other than forging a linear path toward new sounds, this traces a spiral ouroboros, a rather oxymoronic image which accounts for discovering new expressive tools in their recursive search for fidelity to an already surpassed original.

Simulacra and hyperreality according to Baudrillard

French social theorist and philosopher Jean Baudrillard (1994) addressed the concepts *simulacrum* within his critical theory of society and culture.² *Simulacrum* refers to a copy or reproduction in which the original fades. In Baudrillard's world, the simulacrum is a representation that has lost connection with reality. It is not simply a copy of the real, but a creation that precedes and determines reality itself, in a process he calls "the precession of simulacra" (Baudrillard 1994, 9): simulacra reveal how in postmodern society, representations have become more important and "real" than the objects or events they supposedly represent. An example of a simulacrum could be wearing a counterfeit T-shirt stamped with a prestigious clothing brand's visible logo: it is irrelevant whether we believe that a counterfeit T-shirt is authentic. The sign gains its own value while losing contact with the reality that is supposed to ground it.

To understand the precession of simulacra, Baudrillard organizes them into three different orders (Baudrillard 1994, 9):

- **First Order Simulacra:** They correspond to a pre-modern phase in which imitation seeks to faithfully represent reality. In this order, there is a clear distinction between the territory (reality) and the map (representation). First-order simulacra attempt to be reflections of reality, maintaining a

2 Although Baudrillard addresses the concepts of both simulation and simulacrum, his focus is not on detailing a philosophical distinction between them, but rather on understanding how the logic of hyperreality is based on successive orders of simulacra. Simulation, for Baudrillard, is the general concept that accounts for the process of generating the appearance of reality. In his words, "simulation threatens the difference between the 'true' and the 'false,' the 'real' and the 'imaginary'" (Baudrillard 1994, 11), while the different orders of simulacra are the ways it deploys in society.

direct and obvious relationship with their referent. That is, the simulacrum is a clear copy of an existing original. This order refers to the faithful copy or representation of reality. The sign (representation) and the real are distinct, and the sign reflects reality. A painting of a landscape can be a good example. The painting represents a real place, and there's a clear distinction between the painting as a sign and the actual real landscape.

- Second Order Simulacra: They emerged in the era of industrial production, characterized by the ability to reproduce objects on a large scale. In this order, the distinction between the original and the copy begins to blur. Second-order simulacra not only replicate reality, but also aim to improve or perfect it, introducing an element of *hyperreality*. Reproduction does not so much seek to imitate the original, but rather to replace it or improve its perception, generating versions of reality that can be considered even "more real than real". The sign starts to mask and distort reality, leading to a perception that mixes reality with representation. A photograph in a magazine that has been edited to make the model look flawless is a sign that distorts reality, the actual appearance of the model, making it hard to distinguish between the real person and the edited image.
- Third Order Simulacra: They represent the contemporary phase according to Baudrillard, marked by the digital age. In this order, reality and representation merge to the point that the original is no longer necessary and may not even exist. Third-order simulacra are characterized by generating completely new realities that have no link with the reality they supposedly represent. Here, the simulacrum is not just a copy, but creates its own referent. Not only does the map precede the territory, but the territory no longer exists independently of the map. We are, then, in the era of *hyperreality*, where the real and the imaginary intermingle in an indiscernible totality. The distinction between reality and representation disappears, and the simulacra becomes the new reality. In a virtual reality (VR) game, players interact with a fully simulated environment that has no direct connection to the real world. Simulacrum is experienced as a reality in its own right, laying the foundation for understanding phenomena such as flight simulator games that train military drone pilots (Raza et al. 2016, 17).

Baudrillard sees these orders as stages in the evolution of society and its relationship with signs and representations. As he moves from one order to another, he argues that we move further and further away from reality, entering a world dominated by simulacra, where the real has become indistinguishable from its

imitation and, ultimately, irrelevant. Simulacra tend to be copies without originals, creations that define and precede reality, contributing to an era of *hyperreality* where distinctions between reality and representation fade.

Hyperreality (Baudrillard 1994, 17) is a concept that refers to a condition in which reality and simulacra are indistinguishable. We live, according to Baudrillard, in a “hyperrealism”, where simulacra dominate and shape our perception of reality, to the point that the distinction between reality and representation becomes irrelevant. In hyperreality, the boundary between what is real and what is a representation or a simulated reality blurs to the point where they merge, creating a new form of reality that is a mix of both. This new reality is constructed by media, technology, and symbols, and it can be more compelling or convincing than actual reality. Representations such as images, media, and virtual environments become more real and influential than the actual objects or experiences they depict. People begin to live within simulacra, treating them as more real or significant than their tangible experiences, as can be exemplified by the extensive use of Tiktok’s or Snapchat’s filters: the distinction between reality and illusion, original and copy, becomes meaningless as they blend into one seamless experience (Singh and Singh 2021, 288–304).

Baudrillard (1994, 10) himself gives Disneyland as an example, where visitors experience a highly controlled and idealized version of reality. The environments and interactions are meticulously designed to create a perfect, immersive experience that feels more real and enjoyable than everyday life, thus becoming the “real” experience for visitors, overshadowing the actual, less perfect reality outside the park.

In the rest of this article, I show that the development of guitar processing technology has been guided by a logic of recursive simulacra, to the point that it surpasses Baudrillard’s third order. First, we will survey the history of electric guitar amplification devices, which began with tube amplifiers in the mid 20th century and moved through the invention of spring reverb and tape echo effects, solid-state distortion, digital effects and modeling software, and arrived at impulse response processing (Light 2022, 55–59). This will provide background for a Baudrillardian analysis of the logic of current modeling technologies.

A Diachrony of Electric Guitar Sound Processing Technologies

During the first half of the 20th century, tube amplifiers were the standard for instrument amplification (Carrasco-Filisola 2021, 55–65). At the beginning, they came merely as a solution to the acoustic problem of making perceptible and discernible the sound of the guitar that was buried under the intense sonority of percussion and brass in jazz ensembles. Soon, musicians discovered

that by pushing the volume beyond its nominal capacity, i.e., saturating the electronic gain stages of the devices, the amplifiers produced a saturated or “distorted” sound that added a unique harmonic richness. This accidental “distortion” became a sought-after characteristic for genres like electric blues and early rock, and spawned a whole palette of saturation sound effects ranging from mild and creamy overdrive and thick valve crunch, to crackly solid-state transistorized fuzz and full out hard distortion, characteristic of hard rock and metal music.

At the same time, time-based effects such as reverb or echo were introduced, and some were included in guitar amplifiers (Carrasco-Filisola 2021, 66–68). Spring reverb used a set of springs to create a lingering echo effect, adding depth and space to the guitar sound. Concurrently, tape echo devices, like the famed Echoplex, used magnetic tapes to record and play back the guitar sound with a slight delay, creating echo and repetition effects that could vary in intensity and duration. Such processes were patterned after real sounds in the world: the sound of playing in specific rooms or ambiances. This opened the door to modulation effects such as chorus, phasers, and flangers, which were originally achieved by physically manipulating tape device motors and tape rollers.

As technology advanced, amplifiers and effects pedals began to use transistors instead of tubes. These devices were smaller, more reliable and cheaper. The digital revolution of the 1980s brought the first digital effects, which used digital signal processors (DSPs) to emulate or surpass traditional analog effects. This opened a plethora of sonic possibilities, from modulation and delay to complex reverberations and distortions, all with unprecedented precision and flexibility.

The evolution continued with the development of amplifier and effects modeling software, allowing musicians and producers to accurately simulate the sound of specific amps, cabinets, and effects pedals within a digital audio workstation (DAW). This advance democratized access to sounds that previously required expensive and hard-to-obtain equipment, leading to the latest frontier in sound modeling by the use of impulse response technology, which captures and reproduces the acoustic footprint of physical spaces, amplifiers, and speaker cabinets. This allows musicians and producers to load these “impulses” into their DAW or compatible hardware, replicating the character and response of specific equipment and environments with astonishing accuracy.³

As the next section shows, distortion plays its own role in the development of the heavy sound of hard rock and metal music, while raising certain peculiarities and problems in the context of sound production.

3 “(...)It seems safe to say that the KPA is well able to produce a very good and totally sufficient sound for popular music. Our evidence shows that average listeners would never notice, much less complain about, a bad guitar sound if the guitarist used the KPA (Kemper Profiling Amp) in the right way” (Düvel et al. 2020, 12).

Sound and Distortion in a Rock and Metal Ensemble as Acoustic Problem

Heaviness in music has been discussed as a combination of perceptions of several elements such as weight itself, size, proximity, density, volume, power, aggression, energy, emotion and intensity, which are not exclusively but greatly provided by the harmonic distortion of guitar sound (Mynett 2017, 9–21). Other heavy sound traits are noisy textures, specific locations of energy in the frequency spectrum related to noise formants, sustain and high frequency harmonics (Berger and Fales 2005, 194), as well as compositional choices such as rhythmic difficulty that enact “metaphors for both the material and the expressive dimensions of ‘heaviness’” (Hannan 2018, 438). These qualities are transmitted through compositional choices as well as individual and collective performances:

Sound distortion acts as a fundamental stylistic element in this music and is nothing other than the result of brutally elevating electrical gain with an audio signal, which raises harmonics (secondary and higher vibrations than those of a fundamental musical note, which are already present in said signal but are not the protagonists) in the audible range. In other words, distortion does not modify, change or replace, but rather manifests what is hidden, what is not heard in normal hearing. The distortion also puts in dialogue the performer’s technical skill and a timbral character that is expressive in itself: “The flow of associations, (...) shaping a sound through electronic equalization to playing through a Marshall amplifier, says much about the ways in which technological developments have sought to fill in where the resourcefulness of the musician once had to suffice” (Waksman 2001, 117). Aesthetically, it can be stated that distortion acts as a device that raises the whisper to the range of the scream. Specifically, metal, as a form of art, is distortion; it is the cry of what is buried by energy.

The technical characteristics of tube amplifiers require rock and metal guitarists to maximize the gain in order to achieve the desired harmonic richness of distorted timbres; to put it simply, with tube amps, one has to play really loud to get the desired tone. Now, distortion produced by transistorized or digital gear can be more controlled and less dependent on volume variations, allowing musicians to access a broader range of distorted tones with ease, but always with reference to all-out tube amp gain: “In a real sense, then, the brutal sound of the death metal guitar is impossible without the right level of volume, whether real or simulated” (Wallmark 2018, 67).

For example, if to achieve the harmonically rich timbre of a tube amplifier it is necessary to raise its volume beyond what most stage situations allow, and which are only achievable in the context of massive concerts for thousands of

attendees, the technologies of solid-state transistors and digital processors allow musicians to get closer to this timbre without requiring extreme sound pressure levels that pose a problem both from the perspective of public address sound mixing and for the monitoring of the musicians on stage. Let's keep in mind that whereas the human voice reaches 70 dB SPL at *fortissimo* (Dadafarin, 2017) or 80–85 dB SPL for a shouted vocal performance and a kit's bass drum is measured at 106 dB SPL and, by nature of its around 80 Hz fundamental frequency (Mynett 2017, 13), can be perceived as quieter by human ear, guitar amps reach 120 dB SPL (Dadafarin 2017) and can easily go beyond 140 dB SPL.

Thus, unlike other music genres whose execution is independent of the means to balance its different instruments sounds and voices, such as early jazz, most classical music, many traditional genres, etc., hardest rock and metal performances require electronic amplification that go beyond the acoustic structure of the ensemble itself. One doesn't need PA or technical support other than the acoustic instruments themselves to properly listen to tango or bossanova. Hardest rock and metal sonority is materially linked to devices that function as prosthetics so that its sound is adequately perceived by an audience, regardless of whether it must be loud and strong for it to be considered metal.

With the arrival of devices such as distortion pedals and compact reverb systems, the meaning of these processing technologies begins to revolve around simulated sounds: distortion, in relation to amplifiers; reverberation, in relation to architectural spaces. This simulacra logic is key, and Baudrillardian theory helps to understand it.

Rock and Metal and its Musical Technology as *Metasimulacrum*

The change over time of effect devices for electric guitar reflects not only advancements in sound engineering and cultural and stylistic shifts in popular music, but also shows how music production has shifted towards Baudrillardian logics. Although digital processing technologies since the 1980s offered possibilities beyond what was done before, they were always marketed with references to the sound and performances of what was already known as the golden era of rock, which by then had occurred 10 to 15 years earlier (Herbst and Vallejo 2023, 19–22).

In Baudrillardian terms, the three simulacra orders within the guitar technology realm have preceded another: a simulacrum that has become *meta*—that is, *beyond*—simulacrum. Amplification and microphone modeling technology, thus, constitutes a *metasimulacrum*. To better understand this idea, let's focus on one aspect of the development of the electric guitar. As stated before, the electric guitar gave a solution to the problem of the relative low intensity of the acoustic

guitar sound compared to brass and percussion sections in jazz bands. This need for mere amplification led inadvertently to an element of expressiveness in the amplifier's distortion from gain stage saturation (Santos-Morales 2016, 94).

While distortion was originally linked to high intensity and electric gain, when it became an expressive feature, it became desirable to achieve said distortion at manageable levels for smaller spaces. Pedals and other processing devices were designed so that enormous amplitudes were no longer necessary to achieve the desired timbral quality. Distortion, originally a consequence of intensity, becomes severed from actual intensity, but still achievable by analog or digital means. Possession, display and use of large and heavy amplification equipment in metal culture (Carasco-Filisola 2021, 105) is put into a dialectical relationship with considerations of practicality, portability, price, accessibility and convenience. Something similar happens to what is illustrated by a well-known saying in Mexico: "*Cualquier pendejo toca el tololoche, pero no cualquier pendejo lo carga*" ("any dumbass can play a *tololoche*,⁴ but not just any dumbass can carry it"); the display of brute force that involves the physical presence of the instrument and the actual musical and interpretive ability.

Modelling technologies model not only amps and cabinets, but distortion pedals, cabinets and cab miking itself. It appears that more than forward sonic exploration, it is backwards nostalgia that fuels these endeavors. The simulated sounds refer to techniques that are no longer necessary per se for the production of heavy sound:

In the recording and subsequent listening sessions, we were surprised by most profiles matching the original so closely that in a blind test, they could not be distinguished. The sound and the dynamic response were authentic. Another observation concerned the interpretation of the original amplifier's sound. The distorted sounds produced with an additional boosting pedal sometimes were resonating whilst lacking intelligibility in the presence range. The profiles however were quite different from the original but more apt for real musical use since the problematic features were corrected, making the sound more transparent as for instance in the case of the Fender Super-Sonic (Herbst et al. 2018, 497).

Making an ellipsis of the development of those technologies, we find a *meta-simulacrum* of music production technologies: currently, there is hardware that runs software that emulates both physical microphone systems such as devices that simulated the sound of the distortion of the tube amplifiers of the mid-20th century, distortion that was initially considered an undesirable consequence of the amplification of its time, and that today is an indispensable element of hard rock and metal music aesthetics.

4 *Tololoche* is Mexican slang for "double bass".

The metasimulacrum, extending Baudrillard's logic, is as follows:

- Reality: the sound of an acoustic guitar
- First order simulacrum: tube amplification that seeks to faithfully simulate the sound of the guitar, but louder. Electric guitars do not make much sound unplugged; the “real” reference point no longer exists.
- Second order simulacrum: pedals and solid-state amplifiers that simulate (and enhance or exaggerate) the distortion of tube amps and the spaces they're in (reverb, echo); recursion of first order.
- Third order simulacrum: digital devices (multi effects pedals) that simulate second order devices such as distortion pedals, tape echo and flanger machines or spring reverbs; recursion of second order.
- Metasimulacrum: Digital Signal Processing and Impulse Response technologies (such as AXE FX, Kemper Profiler, Neural Quad Cortex, and other software) that simulate the whole electric guitar chain from guitar pickup emulation to pedals, amps, cabinet and voicings to microphone models and positions; recursion of third order (Figure 3).

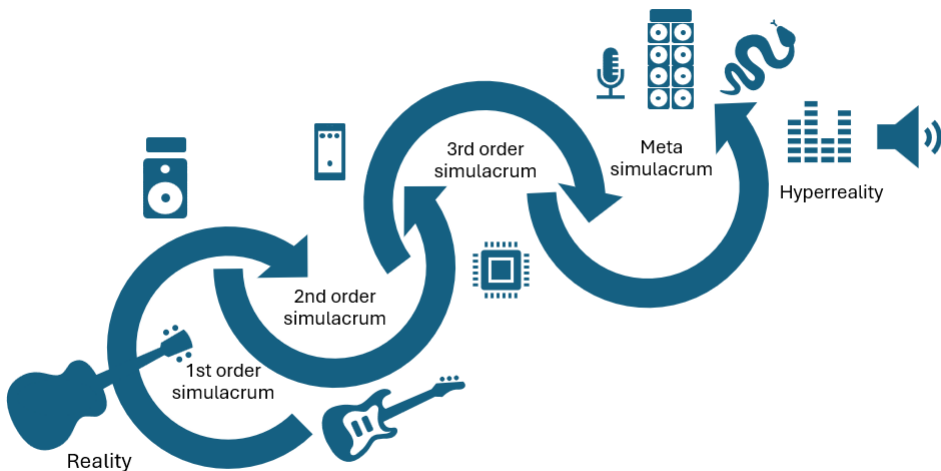


Figure 3. Metasimulacrum logic (figure by author).

In a concert or live performance situation with a minimum professional setup, it is essential that all voices and instrumentation used by a band are present in the sound mix that is directed to the audience through a PA (public address) systems, full-range speaker cabinets that are capable of reproducing the entire frequency spectrum produced by the band. Thus, what the audience hears is not just louder voices, guitars, bass or drums, but rather a represented, mediated,

and (hopefully) improved image of the sound on stage, part of which is already produced by third-order simulacrum techniques.

It is also worth mentioning that for guitarists, the desirable timbral characteristics of their sound depend not only on the guitar itself, the electronic signal processing line or the role of electrical gain in its amplification, but also largely (although not exclusively) on the specific loudspeaker cabinet voicing used as the end of the acoustic chain. In that sense, the electric guitar, understood as a chain of devices, serves as an acoustic instrument whose sound is captured through microphones, at least according to pre-modelling logic:

A standard trope in any serious discussion of electric guitar tone is an imaginative trip through one of these networks, the ‘signal chain’ that runs from the player’s fingers to the listener’s ears. As the various nodes— guitar, amps, cables, and effects— are painstakingly enumerated, one understands ‘tone’ emerging from the polling of various sonic factions, each representing a different region of the signal chain (Fink et al. 2018, 5).

The idea that an electric guitar chain behaves as an acoustic instrument may seem counterintuitive, but it is necessary to consider that, to the extent that the timbral character of the electric guitar sound finds its ultimate conditioning in the physical speakers and the physical cabinet itself, it is necessary to use microphone techniques that capture said sound, its acoustic character.⁵

Cabinet microphone modeling breaks said “acousticality” of the electric guitar chain, permeated by the metasimulacral logic. Nowadays, for reasons of cost, practicality, and portability, it is possible for an electric guitar to only make use of a processing system that digitally emulates not only the amplification cabinet, with its particular tone or voice, but the type, model, position and angle of any desired microphone. Current modeling technologies make it possible to satisfy rock and metal timbral needs while solving the associated intensive problems. The heavy sound, with the help of today’s modelers, can comfortably do without a heavy, expensive, bulky and difficult to maintain tube amplifier, to find its way into earbuds at bedroom volume.

Advertising claims for some of the modeling products offered on the market exemplify the idea:

5 Also, at the signal chain beginning, electric guitar pickups don’t capture sound waves but rather magnetic waves. On the opposite pole, keyboards, samplers, and synthesizers do not usually depend on any microphone stage, but rather their signal is injected directly into the mix. By this criteria, the signal produced by a piezoelectric pickup on an electroacoustic guitar may or may not be considered acoustic per se, unless there is a diaphragm microphone signal injected into the guitar’s preamp.

- AxeFX: “The original Axe-Fx upended the industry by being the first device for musicians to put a military/industrial-grade DSP into a consumer product. Leveraging the power of this DSP allowed detail and realism that no other product had previously achieved.”⁶
- Kemper Profiler: “Playing live is where the PROFILER really comes into its own – just spend a little time making PROFILES in the studio, and you can play live with the exact same sound that you used on your blockbuster hit, only without the need for multiple amp setups on stage. You will sound better than ever before through the PA.”⁷
- Neural DSP Quad Cortex: “Capture, share and download your favorite rigs’ sounds. Equipped with our unique biomimetic AI technology, Quad Cortex can learn and replicate the sonic characteristics of any physical amplifier, overdrive, and cabinet with unprecedented accuracy. Unlike any other, our sophisticated neural network algorithm perceives sound akin to human perception, making it the most natural-sounding capture solution on the planet.”⁸

In other words, in the logic of metasimulacrum, digital modeling devices make a recursive sign of what is originally no more than an attempt to bring to the audience the acoustic character of an electric guitar chain. This chain was intended for that very same purpose, but now modeling tech is assuming vintage microphone non-linearities as a desirable feature of what 40 or 50 years ago was no more than an imperfect pursuit of fidelity.

If distortion devices are the consequence of simulating the addition of great electrical power applied to guitar signal, for its part reverb effects are also metasimulacra: reverb is the sound of an instrument in a specific room, analog reverb effects are simulacra of these, and digital signal processors are iterations of these simulacra. From actual acoustical spaces to imperfect spring reverb boxes to solid-state reverb units to spring reverb modelers that capture all vintage nuances and nonlinearities, metasimulacrum ensues. In other words, reverb devices not only simulate acoustical spaces, but the very vintage spring boxes are used to simulate space, with all their glitches and noises.

Another example lies in echo or delay effects. Today there are everything from software emulations to reissues of magnetic echo effects that at the time induced noises and errors in the signal: “the alchemical combination of vacu-

6 Fractal Audio Systems, n.d., “Axe-Fx III Preamp – Effects Processor – Fractal Audio Systems,” <https://www.fractalaudio.com/iii/>. Accessed June 1, 2024.

7 Kemper GmbH, “Kemper Amps,” n.d., <https://www.kemper-amps.com/profiler/overview#a-applications>. Accessed June 1, 2024.

8 Neural DSP, n.d., “Neural DSP - Quad Cortex,” <https://neuraldsp.com/quad-cortex>. Accessed June 1, 2024.

um tubes, resistors, capacitors, and transistors that could transmute timbral lead into tonal gold” (Fink et al. 2018, 4). Noises and errors that formed a canonical aesthetic (Lotman 2013, 373; Herbst and Vallejo 2023, 7) that reduces the precision and cleanliness of digital delays down to just another flavor in the ample delay menu, on the path from first-order simulacrum to metasimulacrum: from physical sound wave bounces and repetitions, to glitchy analog delay pedal repetitions, to clean and pristine delay, to digital emulation of analog devices. Thus, the practicality and economy of a digital compact effect does not replace the timbral qualities of a rotating magnetic drum echo, although it implies greater disadvantages in terms of manufacturing, transportation, operation and maintenance.

Prospective: Beyond Technological Determinism

Technological determinism, as a belief that technology is the primary driving force behind social and cultural change, offers a straightforward way to address the relationship of culture and technology, but simplifies it by erasing non-linear phenomena. Proponents of technological determinism, such as Thorstein Veblen, Jacques Ellul, John Kenneth Galbraith, Martin Heidegger or Marshall McLuhan (Smith and Marx 1994) suggest that technological advancements create new possibilities and constraints, which shape social structures and cultural values. For instance, it states that digitalization in contemporary media has transformed how information is disseminated and consumed, leading to shifts in cultural norms and communication practices.

Although, as has been seen, there is no doubt that technology accompanies the cultural significance of sound production in rock and metal, as Carrasco-Filisola points out (2021, 117), it is not technology itself that drives cultural change, but rather it reflects the zeitgeist, as well as the desires for the past and the horizons of nostalgia of its users.

One argument against technological determinism is that it reduces the active role that societies, cultures and economies play in the development and adoption of technologies. Human decisions, cultural values, political structures, and economic conditions significantly influence how technology is developed, adopted, and used. A position of technological determinism ignores how the social and political context can shape and limit technological development. Technologies neither emerge nor are applied in a vacuum; they are deeply rooted in specific contexts that affect their design, implementation, and use.

The deterministic perspective tends to simplify the causal relationship between technology and society, assuming a unidirectional path in which technology determines social change. However, reality is more complex, with technol-

ogy and society influencing each other in a dynamic and bidirectional process. Such a position does not take into account how different cultures, social groups and individuals can adopt, adapt and resist technologies in diverse ways. The same technology can have very different effects in different social and cultural contexts.

By focusing on technology as the primary force of change, technological determinism ignores how power and access inequalities affect the development and distribution of technologies. Who controls technological resources, who has access to them, and who benefits from their use are crucial questions that this perspective overlooks. This perspective minimizes the potential for collective action and human agency in shaping the technological future. Statements such as Virilio's *The Art of the Motor* have proposed more nuanced approaches that recognize the complex interplay between technology and society, emphasizing how both shape and define each other: "information comes to the fore as an entirely separate form of energy: sound and image energy, the energy of long-distance touch and contact" (Virilio 1995, 147). Reflecting on musical technology, authors like Mark Katz advocate for a subtle view that puts social change and its technologies in dialogue:

Although we often respond to technology within a context of limited options not of our own making, we must remember that, in the end, recording's influence manifests itself in human actions. Put another way, it is not the technology but the relationship between the technology and its users that determines the impact of recording. It is important to add, too, that the influence I describe does not flow in one direction only, from technology to user (Katz 2010, 3).

Metasimulacrum, in this way, has been canonized in the artistic field (Herbst and Vallejo 2023, 8) of pop music in general, and in rock and metal in particular, and its canonization has gone through successive layers of distribution. As Iuri Lotman points out, *canonization* of cultural elements marks a border beyond what is not known as culture, and helps consolidate the central culture realm in a spheric metaphor of culture as biosphere, in which external layers tend to counterculture or not culture at all.⁹ In Weberian terms, the rationalization of music "could occur in a completely extra-musical form, and in part it has actually occurred that way" (Weber 1964, 1167).

9 For Iuri Lotman, there are four layers in the culture understood as semiosphere or concentric spheres of meaning array: central culture, peripheral culture, counterculture and non-culture. Cultural change is understood as the translation of communication codes between the different spheres. What for some time can be threatening or alien (countercultural) or not even known (non-cultural), at another time it can take its place in the peripheral sphere of the not completely accepted around the central ones, or play a leading role in the central culture (Lotman 2013, 375).

In that sense, *metasimulacrum* doesn't only emerge from a recursive *simulacra* dynamic, but is also loaded with a whole era logic whose only actual current presence is no more than a sonic footprint. State of the art technology that in the vast majority of cases is only relevant as a window to the past, to a past filled with acoustic technology non-linearities.

Currently, the possibilities of digital sound processing tend to infinity, and certainly there are musicians who are creatively exploding these capabilities: "digital amplifier situations were adopted by progressive metal guitarists out of necessity and for aesthetic reasons. Djent guitarists has chosen freeware plugins for sonic or workflow reasons" (Herbst and Vallejo 2023, 47). Nevertheless, the market for processing technologies, as shown by modeling products advertising claims, continues to focus on the emulation of a production logic that, in strictly technical terms, has been far surpassed. *Metasimulacrum* is a spiral *ourobos*: not simply a snake biting its own tail, but a non-linear advance that, despite apparently returning to itself, breaks into musical hyperreality and adds successive layers of complexity to the aesthetic experience.¹⁰

10 A possible route for the subsequent development of the ideas presented here could be to discuss the decision-making flow of rock and metal musicians regarding their stage gear options, in a gradient between the visual aesthetic values of displaying powerful cabinet walls and amplifiers on stage as a scenic resource against the criteria of portability, practicality, price and reliability of modeling equipment.

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SPIRAL OUBOROS: METASIMULACRUM IN ROCK AND METAL ELECTRIC GUITAR PROCESSING AND MODELING TECHNOLOGIES

(summary)

The development of the electric guitar has been fundamental in the evolution of international popular music, particularly rock and metal. Originating as a solution to the weak sound intensity of acoustic guitars in jazz bands, the electric guitar found a new element of expressiveness in the limitations of the amplifiers of that era: distortion, born from the saturation in the gain stage of these amplifiers. This distorted sound, initially an unintended byproduct, became a distinctive feature of rock and metal.

However, a tension arose between the use of large amplification equipment in rock and metal music and practical considerations such as portability and cost. The market responded by offering analog amplification equipment that facilitated the generation of distortion, later evolving to devices such as pedals, which allowed achieving this timbral quality without the need for high volumes.

Before modelling technology, the electric guitar had been handled as an acoustic instrument, with its amplification, cabinets and particular timbres and voicings. However, current digital processing technologies allow emulating not just the amplifier and its sound character, but also any desired microphone configuration, thus offering advantages in terms of cost, practicality, and portability.

Nowadays, hardware that runs software designed to emulate both the physical microphones and 20th-century tube amplifiers is available in the musical industry. This phenomenon represents an additional order of simulacra, as what was initially a technical flaw has become an essential stylistic element. Modelling devices for electric guitar have evolved into what can be described as a *metasimulacrum*.

This metasimulacrum has been canonized in rock and metal music and has come through successive layers of simulacra. The market offers emulating production logics that are strictly technically outdated, although opening the path to the exploration of nearly infinite timbral possibilities on current modelling technologies.

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