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JAN-PETER HERBST
University of Huddersfield

Keeper of the Seven Keys: Audio heritage in metal music production

ABSTRACT

Audio heritage is a relatively unexplored area within popular music studies from a technical production perspective. This research raises awareness of the importance and challenges of audio preservation and provides insights into archiving practices of record labels and producers. Based on interviews with German metal music producers, the article examines the conflicting artistic, economic and legal forces in the recording industry that often result in the loss of master tapes and multi-track recordings, thus preventing significant remastering for new consumer media such as high-resolution streaming or remixes valuable to artists and their fans alike. The findings suggest that there is no archiving standard amongst record labels. It is often up to record producers to archive and preserve recorded artefacts, which they do voluntarily and at their own expense, either in the hope of future commercial exploitation or to preserve their work. Whilst established record producers who began in the analogue era seem to be reliable archivists, the modern metal music industry, with its shrinking budgets, semi-professional, digitally home-recorded productions and self-releasing artists, puts the genre's more recent audio heritage at risk.

KEYWORDS

heritage
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archive
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music business
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INTRODUCTION

Music listeners and hi-fi enthusiasts have been fortunate in recent years. Access to music has never been better; new and old albums are available in

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various formats, from CD and vinyl records to digital streaming. Some classic albums are re-released after remastering so that fans can enjoy older music with a contemporary sound. At other times, the bands remix their albums to make substantial changes to the original production. A reissue process may even involve re-recording to alter performances, lyrics or arrangements, or the release includes outtakes or alternative takes. From a technical point of view, audio quality can benefit from the introduction of media formats. As the first digital consumer medium for music listeners, the CD was introduced in 1982. Although limited in its frequency and dynamic range, it offers better linear frequency response across the spectrum. The older analogue vinyl record with its non-linear frequency response may not be the perfect medium either, but since there is no artificial frequency limiting as with a digital system, many hi-fi enthusiasts still prefer it over CDs. Newer digital music formats and streaming offer more in terms of high fidelity. While platforms like YouTube or SoundCloud have poor audio quality, Tidal and Apple provide high-resolution music that significantly surpasses CD and vinyl quality.

All these forms of release depend on the availability of two material objects: (1) the original master – analogue tape or digital file – for remastering and release on vinyl, CD and streaming, and (2) the multi-track recordings for any remixes and other related changes. However, these objects are at risk for various reasons, such as the physical degeneration of analogue and digital media artefacts and the lack of preservation by record companies.

This article, written from a record production perspective, aims to raise awareness of the value that lies in the original material artefacts. It describes the challenges and the importance of audio preservation before briefly discussing the practices of record companies regarding archiving and preservation. The main part of the research is an interview study with three known German rock and metal producers – Harris Johns, Siegfried Bemm and Karl Bauerfeind – who gave insights into their production practices and experiences in collaborating with internationally operating record companies. Further aspects such as opinions on remastering, remixing and other forms of re-releasing older material are considered. Since the 1980s, Germany has been a centre for metal music production, not only for German bands (see Herbst 2021b) but also on an international scale (Herbst 2019, 2021c). Therefore, the producers' experience should be comparable with the practice in Great Britain and the United States. Since technical, economic and legal issues around audio preservation are rarely discussed in the wider popular music discourse, the primary data is extended by interviews with other music professionals mainly found in professional and journalistic texts (Holland 1997a, 1997b, 1999a, 1999b, 1999c, 2004a, 2004b; Rumsey 2012; Casey 2015; Hepworth-Sawyer and Hodgson 2018; Producers & Engineers Wing 2018a, 2018b). With this wide range of sources, the transition from analogue to digital production can be captured as well as the often conflicting technical, creative, economic and legal conditions within metal music production. In particular, the questions this article seeks to address are:

- What are the challenges of audio preservation, and why is it important?
- How do metal music labels and producers preserve their material output, and has this changed with the transition from analogue to digital production?
- What are artistic, economic and legal considerations in the metal music production business regarding reissues such as remixes and remasters?

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For this study, I interviewed the same producers as in earlier studies that dealt with the emergence of the German power metal scene (Herbst 2019), recording studios as museums (Herbst 2021a) and the notion of a 'Teutonic' metal production style (Herbst 2020b, 2021c; Herbst and Bauerfeind 2021). New interviews lasting about six hours were conducted to gather more focused empirical knowledge about audio preservation and related practices such as remixing and remastering.

CHALLENGES OF AUDIO PRESERVATION

The risk of lost recorded audio is not widely discussed in the relevant disciplines surrounding metal music studies, such as cultural and media studies, musicology or the art of record production. Professional societies are more aware of the problems, for example, the Audio Engineering Society (AES), the International Association of Sound and Audiovisual Archives (IASA) and the Producers & Engineers Wing of the Recording Academy. Moreover, *Billboard* journalist Bill Holland (1997a, 1997b, 1999a, 1999b, 1999c, 2004a, 2004b) has repeatedly pointed to the problem of music heritage being at risk. According to Mike Casey:

Media preservation has reached a crisis point for content carried on physical audio and video formats as the world has transitioned to the digital age. [...] most media preservationists today believe that the potential peril is within less than a generation and that major risk lies in the near-to-mid-term.

(2015: 14)

Recorded audio is vulnerable to degradation that takes different forms for the various media. When the digitalization of music production began in the 1980s and 1990s, a considerable number of recordings still involved tape on traditional reels or digital audio tapes (DAT), which changed in the 2000s. Despite being an old technology, analogue tape belongs to the media formats best withstanding the effects of time. But not even tape is wholly safe from deterioration, and accessing the music stored on it is difficult and sometimes impossible. Magnetic tape is a thin plastic ribbon with randomly oriented microscopic magnetic particles made of metal oxide glued to the surface. During recording, the record head's magnetic field alters the polarization of the tiny particles so that they align their magnetic domains with the imposed field. When the magnetized medium is moved past a read head during playback, an electrical signal is generated that can be amplified and played back through a loudspeaker.

Due to its mechanical nature, tape technology is susceptible to degeneration over time. For example, the plastic tape and magnetic particles are held together by a binder, which can become moist and make the tape sticky. In such a case, the magnetic tape loses contact with its plastic backing or entirely rips off the oxide layer, deteriorating the audio quality sonically or leading to dropouts. It also contaminates the tape machine, which results in tapes being played back with a squealing sound, at a wrong tempo with pitch shift alterations, or not being played at all. In severe cases, playing a sticky tape may wreck it completely (Holland 1999b: 125; Kaltseis and Hubauer 2012: 41–42). This phenomenon is called 'hydrolysis', 'binder breakdown' or 'sticky shed syndrome' (Rumsey 2012: 82). According to Holland (2004a: 79), about 85 per cent of the tapes used in the 1970s and 1980s exhibit this syndrome.

1. Further information can be found in the chapter on basics of digital audio in Winer 2013 (pp. 233–56).
2. Recorded sound is digitally represented in waveforms that are bipolar. Twenty kilohertz are required for the positive phase and 20 kHz for the negative phase, making a total of 40 kHz.
3. When frequencies are present in the 'real' acoustic world that are not captured in the digital system, a phantom waveform, called an 'alias', is produced, which adds a signal in the digitally captured and human audible frequency range that causes inharmonic distortion (Producers & Engineers Wing 2018b: 8).

Tapes affected by sticky shed syndrome can be restored by baking them in a convection oven for about eight hours at a low temperature of 50–55°C for dehydration, stabilizing the binder again (Holland 1999b: 125). This treatment makes the tape playable for a few days and allows a copy to be made. Tapes can, however, only be baked a limited number of times before they are permanently ruined (Holland 1999b: 124; Kaltseis and Hubauer 2012: 45). If the oxide on the recording layer is destroyed, known as 'shedding oxide', the binder has lost its adhesion qualities, and no baking will restore it even temporarily (Holland 1999b: 125). Further related problems regard fungus or mould that can sometimes be removed (Wheeler 2002: 2). According to audio preservation experts, analogue recordings deteriorate beyond any temporal restoration within fifteen to twenty years (Casey 2015: 17).

Another problem affecting both analogue and digital media is obsolescence. Media require the right system to be played back and migrated to another medium: compatible playback machines; specialist tools and engineers; calibration machines; replacement parts (Holland 2004b: 56; Casey 2015: 15–16).

Rescuing analogue media normally involves migration to a digital medium. However, digital media are much less reliable than analogue media, whose physicality can be improved. Digital mediums do either function properly or not at all (Holland 2004b: 56). Older, tape-based digital media such as Sony's Digital Audio Tape (DAT) and U-Matic cannot be baked. They decay within five to ten years because they were not designed as archival mediums, yet in practice used as such (Holland 1999a: 125; Casey 2015: 17). Optical media like CDs and DVDs do not last much longer than about ten years (Rumsey 2012: 83), and they are inadequate for preserving audio for their low sonic quality (Wheeler 2002: 3). Hard Disk Drives (HDD) and Solid State Drives (SSD) have been most commonly used as storage media in recent years, but their estimated lifespan is not much longer than that of optical media (Hans and de Koster 2004: 3). Consequently, all digitized analogue material and all original digital music must regularly be copied to new digital storage media to avoid permanent loss (Casey 2015: 21).

In the introduction, it was highlighted that CDs are deficient in audio quality. When digitizing audio¹, from a microphone capture or transfer from an analogue to a digital medium, two main parameters determine the quality: sampling rate and bit depth. The frequency spectrum is determined by the sampling rate. Since the human hearing lies between 20 Hz and 20 kHz, a sampling rate of 40 kHz is essentially required to capture audio in the full hearing spectrum.² CD-quality is 44.1 kHz after the Nyquist-Shannon Theorem to avoid aliasing³ introduced by the arbitrary frequency filter, which causes distortion in the audible range. Higher sampling rates allow more detail through more measurement points and minimize aliasing distortion. Therefore, audio preservationists see 96 kHz as the new standard. The Recording Academy's Producers & Engineers Wing even advocate 192 kHz:

In most cases the differences between CD-quality and 192 [kHz]/24 [bit] are at least noticeable, and frequently, they are stark. Skillfully mixed and mastered music with a wide dynamic range benefits dramatically from a hi-res workflow. For recordings such as symphonic film scores, classical music, or other recordings that feature acoustic instruments, hi-res audio is a perfect fit – the increased audio quality can be appreciated by virtually anyone who hears it.

(2018b: 7)

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Music producers and mastering engineers agree that although 192kHz is still not as accurate as analogue tape, it is sufficient for the digital capture of music (Hepworth-Sawyer and Hodgson 2018: 92–93, 135–36, 169). The second parameter, bit depth, concerns the dynamic range of the audio programme. Due to the logarithmic nature, the 16-bit resolution of CDs offers a dynamic range of 96 dB, while the 24-bit resolution of other digital file formats allows 145 dB (Producers & Engineers Wing 2018b: 9–10).

Both vinyl and CD have limitations in dynamics and spectral range. However, digital streaming makes it possible to ‘provide the consumer with a studio quality listening experience that reflects what artists, producers, tracking engineers, mix engineers, and mastering engineers hear in the studio’ (Producers & Engineers Wing 2018b: 6). All three media formats require a different production process at the mastering level (Holland 2004b: 62). Music is either produced analogue without the limitations of digital systems or digitally with higher sampling rates and bit depths, resulting in a flat master not tailored to specific delivery formats (Holland 2004a: 79). The next step is to create production masters for vinyl, CD and streaming formats. To maintain quality, it must be possible at any time to fall back on the original artefact, the flat master (Rosen 2019). Remastering from CD, for example, will result in reduced frequency and dynamic range, as these can no longer be increased after having already been downgraded. The recent trend in the industry to market high-resolution music requires that the ‘file originated as hi-res and that conversions do not obscure or misrepresent the quality of the original source files’ (Producers & Engineers Wing 2008b: 28). Providers like Tidal or Apple intend to ‘deliver guaranteed master-quality recordings directly from the master source – an audio experience that the artist intended’ (Tidal 2019). Yet, there is evidence from industry professionals that not all products sold as ‘hi-res’ are such. For example, that may be when they are created from a CD production master because the original flat master was lost or destroyed (Rumsey 2012: 82; Hepworth-Sawyer and Hodgson 2018: 209–10).

If bands and their record labels wish to reissue classic recordings beyond mere remastering, for example with remixes, they must have access to the multi-tracks, the individual instruments and vocal tracks of a production. In the 1960s and 1970s, record companies commonly requested multi-track session tapes along with each master (Holland 1999b: 124). However, this practice waned in times of digital recording and modern production methods, with consequences for music publishing:

Some companies may not be able to remix and remaster some recent recordings, especially those not recorded in multitrack analog. Why? There may be no multitrack session tapes to pull from the shelves. Since the ‘80s, it has become standard industry practice for producers to hand in only a final 2-track digital stereo production master of new releases to companies. With the advent of digital recording, many times instrumental bed tracks are recorded in one city, overdubs in another, and lead vocalist tracks in yet another. These individual tapes may be difficult to find or may no longer exist. That means that the companies are stuck with only the regular 2-track, mixed-down stereo versions.

(Holland 1999c: 93)

Labels had to be content with the flat or production master that could not be remixed or had to preserve the multi-tracks at considerable storage costs.

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THE PRACTICE OF ARCHIVING

Record companies live from their right to market and sell copies of master recordings. They can either create these on their own at a higher economic risk or acquire the rights directly from smaller labels or artists (Hull et al. 2011: 193–94). Given the importance of master tapes, archiving is in the best interest of a record label. Not only may it be legally obliged to return the objects to the artists at the end of the contract, but the back catalogue is also one of the label's most important assets: 'all a record company has of value, really, are its artist contracts, its current release inventory, and its catalog. And a corollary of that means taking care of the catalog by keeping and archiving the best original source material' (Holland 1997a: 88). According to Holland (1999c: 92), one-third of the industry's annual income comes from catalogue material. Nevertheless, as Rosen claims, label managers have long failed to understand the importance of master tapes:

Most senior executives in the record business have no understanding of what masters are, why you need to store them, what the point of them is. Crucially, masters were not seen as capable of generating revenue. On the contrary: They were expensive to warehouse and therefore a drain on resources. To record-company accountants, a tape vault was inherently a cost center, not a profit center.

(2019: n.pag.)

Labels tended to restore and digitize tapes only if needed for a reissue project (Holland 1999c: 93) and often destroyed the analogue originals afterwards to make space in their vaults (Holland 2004b: 79). In the 1960s and 1970s, American major and especially independent labels had policies requiring professionals to 'reusing, scrapping or not storing multitrack session tapes, and just keeping mixed masters' (Holland 1997a: 90). Amongst the lost tapes are recordings by Elvis Presley from the 1970s (Holland 1997b: 98) or the debut album by Aerosmith (Hochberg 2013). Furthermore, catastrophes like fires have destroyed hundreds of thousands of tapes (Holland 1997a: 89; Rosen 2019), and bands have often not been informed about the loss of their music (Holson 2019). Incorrect labelling was a further archiving problem that caused material to be lost in the vaults (Holland 2004a: 79), or conversely, several versions were stored, making it difficult to identify the released version (Rumsey 2012: 81).

Since the turn of the millennium, the major labels have significantly improved their archiving and preservation practices by digitizing their artefacts at high resolution and storing the originals in various protected locations (Holland 1999c, 2004a, 2004b; Rumsey 2012). It seems, however, that smaller independent labels struggle to keep up with such practice:

although it is difficult to estimate, sources say that as many as 1 million more recordings from long-defunct or inactive small indie labels are lying unattended and gathering dust in storage rooms, basements, and garages all over the country – or have been destroyed or buried in landfills.

(Holland 1997a: 88)

This negligence is likely due to low budgets, limited storage space, or lacking awareness and expertise. Metal music labels have traditionally been

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independent (see Herbst 2021b), so similar problems can be expected. Whether this is right will be determined in the following interview study that will further uncover the web of technical, creative, economic and legal intentions and conditions.

CONTEXT AND SAMPLE OF THE STUDY

In order to be able to capture the transition from analogue to digital music production in metal music, it is necessary to have access to professionals involved from the very beginning. As Weinstein (2011), Elflein (2017) and Herbst (2019, 2021b) have argued, the Federal Republic of Germany was one of the countries where metal, formed and developed in the United Kingdom and the United States since the late 1960s, had been growing rapidly from the early 1980s. Record labels dedicated to metal began to emerge around 1980. The British labels Sanctuary Records (1979), Neat Records (1979), Music for Nations (1983) and Earache (1985) helped to boost the New Wave of British Heavy Metal and the extreme metal that followed. In the United States, Geffen (1980) and Shrapnel (1980) were succeeded by the three important labels Megaforce (1982), Metal Blade (1982) and Combat (1983). The development in metal's original countries also affected West Germany, whose metal industry began to grow through a gradual professionalization of metal music production. German metal labels initially distributed British and American records in Germany, which changed soon with them signing German and foreign artists alike (Herbst 2020a). The fact that Germany has quickly become an important country for metal music is reflected in the quality and quantity of metal labels: Noise/Modern Music (1983), SPV/Steamhammer (1984), Drakkar (1986), Aaarrg (1986), Nuclear Blast (1987), Century Media (1988), Hellhouse (1988), Massacre (1991), GUN (1992), InsideOut (1996) and AFM (1996), to name a few. These labels were independent, but many of them quickly gained considerable influence and power. With Roadrunner Records (1980) in Holland and Mausoleum (1982) in Belgium, other influential record companies were right on Germany's doorstep. Due to this high concentration of record labels and a relatively large number of recording studios, a high volume of metal music was produced in Germany since the 1980s, not only by German bands but also by bands from all over the world. Despite the number of labels and studios, most albums, at least of the internationally successful bands, were created by a relatively small proportion of record producers (see Herbst 2021b), including the three interviewed for this study.

Harris Johns (b. 1950) opened his Music Lab studio in 1978 in West Berlin after having assisted at Berlin's famous Hansa studio. As the main producer for the renowned record label Noise (Gehlke 2017), his work was significant for the early German speed metal scene, especially by producing well-known heavy and thrash bands. Johns closed his Music Lab in 2015 but is still working in various studios. Siegfried Bemm (b. 1956) had produced in rented studios in the early 1970s until he opened his Woodhouse Studio in Hagen in 1977. He was the main producer for the emerging Century Media label that predominantly signed international bands, and he still runs his studio. Karl Bauerfeind (b. 1963) started producing metal bands in the late 1980s in rented studios and for various record labels, including SPV/Steamhammer. Bauerfeind never operated his own studio but produced in studios throughout Europe, Great Britain and the United States (see also Herbst 2021a).

4. The history of German label Noise is documented in Gehlke (2017) and *of Century Media* by Krumm (2012).

EARLY METAL MUSIC PRODUCTION IN GERMANY

Historically, music production was a highly segregated and hierarchical process involving multiple technical roles such as recording, mixing and mastering engineers. In addition to creative roles like that of the record producer (Kealey 1979; Burgess 2013). In a metal music production, however, the executive producer increasingly takes on engineering and producing. Even mastering, which has traditionally been outsourced, is often carried out by the producer. That also applies to the interviewed professionals, who all exercised these tasks in most of their productions and were therefore responsible for delivering the contractually agreed musical artefacts to the record companies.

Asked about record labels' archiving practices, all producers agreed that there were no standards. Just like their international counterparts, such as American Metal Blade (Slagel 2017) and British Neat (Tucker 2015), German record companies⁴ were founded by enthusiastic metal fans without formal training in running such businesses (see Herbst 2021b). As Bemm remembered, Century Media was operated from the managers' bedrooms (Herbst 2019: 212). The labels grew, and with them, the budgets, facilities and size of staff, but the explosion of metal bands and productions (Kühnemund 1988) meant that priority was given to signing new artists and planning record production, promotion and tours rather than archiving the products created. Furthermore, as independents, the companies could not build on many years of experience like the established major labels, which existed since the early twentieth century.

Of the three producers, Johns' experience indicates that his main employer, the record company Noise, was relatively well organized. Until the early 2000s, Johns produced analogue in his Music Lab, which meant that it was impossible to save the mixing set-up like in today's computer-based production. Instead, the stereo output of the mixing console was recorded directly onto the master tape. The label received the master tape, and several months later, the unprocessed multi-tracks, which Johns kept in case alternative mixes were requested. Not knowing how record companies archived the finished productions prompted Johns to copy the master tapes. For an independent producer, however, it was too costly to store backups for record companies, so he did not keep all backups of the multi-tracks. The production budget was a weak point in this regard. Some budgets were so precarious that not even a backup copy of the master tape, costing 60 to 70 Deutschmarks, was affordable. Johns occasionally received requests for backup master tapes that he did not have anymore; those productions were irretrievably lost. In other cases, his personal copies were all that bands could rely on for reissues. Johns recalled American band Immolation asking for multi-tracks that they could not obtain from their label. These happened to still be in his studio vaults, but they had the 'sticky shed syndrome'. Baking the tapes made it possible to digitize and release remixes as a special for the band's anniversary.

Studios are not fixed to one place, and they sometimes move (see Herbst 2021a). Such relocations put archives at risk. Johns had studios in four different locations, and each time he moved, he asked his clients to collect the remaining tapes.

I sent most of it back to the record companies because the 24-track tapes, especially the 2-inch tapes, they are huge and heavy, and they take up a lot of space, and I either sent them all back or just destroyed them if someone wasn't interested or I couldn't find out where they

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went. But I digitized most of the master tapes before I destroyed them, in a form that nobody could use them anymore.

(Johns)

With the closure of his Music Lab in 2015, Johns digitized the remaining master tapes, not the multi-tracks. Bemm moved four times too, yet he took great care keeping the tapes in some form.

I still have a thousand tapes because people just didn't care. They said, 'Why should we put this in our office, leave it with Sigggi', and the stuff just remained here, and we put it in our studio archive. When we took it out eventually, it was a truckload, a big truckload. Some were collected when we moved the studio, some remained with us.

(Bemm)

He estimated that about 70 per cent of the tapes were collected; the remaining 30 per cent he stored in the basement of his house. Bauerfeind's situation required home archiving, too, because he never owned a studio. Storing sensitive production media at the producers' homes, however, is not a suitable solution. As the interviews demonstrate, the multi-tracks and master tapes are in danger of being irretrievably lost. While producers often do better than independent labels, the preserved production material is still at risk should studios relocate or close.

Bemm and Bauerfeind have archived original and backup multi-tracks, analogue 2-inch and digital DAT master tapes, and hard drives from most of their productions. That is a large amount of physical and digital data, most of which is barely labelled or categorized, as the producers admitted. The Producers & Engineers Wing (2018a) published a guideline for documentation of recorded music projects aiming to specify

the physical deliverables that are the culmination of the creative process, with the understanding that it is in the interest of all parties involved to make them accessible for both the short- and long-term. Thus, the document recommends reliable data management, backup, delivery and archiving methodologies for current audio technologies, which should ensure that music will be completely and reliably recoverable and protected from damage, obsolescence and loss.

(Producers & Engineers Wing 2018a: 2)

This guide recommends that 'Tracking sheets, engineer notes, set-up notes, sketches of microphone placement, and any other pertinent session or mixing data' be noted on paper and saved digitally. Further information to be documented includes 'all audio used' and the 'Use of outboard processors along with notes regarding relevant details about specific control settings, presets used, patch bay connections, signal routing, timings of necessary changes during the mix' (Producers & Engineers Wing 2018a: 19). Such careful documentation would ensure the best preservation and provide information on production practices that are valuable from the perspectives of cultural history and audio production (Man et al. 2014: 1). However, as the interviews suggest, practice deviates from these guidelines. For one thing, producers are not paid for this extra work, putting an even greater strain on already full production schedules and tight budgets. Moreover, documentation covering the entire

5. The original German terms are 'Künstlervertrag' (artist contract) and 'Bandübernahmevertrag' (tape transfer agreement), which are standardized contracts in the German recording industry (Beck 2017) but have no direct equivalent in the international system. However, they are similar to ownership vs. licensing form of contracts (Wells 2017).

production would be problematic, as it would reveal secrets of the individual's production techniques. 'In terms of intellectual property, some engineers feel that providing full processing and plug-in information with sessions is giving too much away about how they work' (Rumsey 2012: 83). This conflict of interest is a major problem, as the Producers & Engineers Wing (2018a: 12) admit themselves. Bauerfeind confirmed that he is not willing to share his production methods with anyone. Good documentation and preservation practices are therefore fundamentally at odds with the competitive commercial nature of the recording industry.

For audio preservation, one of the most important tasks is the digitization of analogue tapes. Bemm recalls that there was a time when record companies asked him to digitize older productions, but as he suggests, digitization did not necessarily guarantee long-term preservation.

Sometimes artists have called and asked for the digitized data. I think it was Mille from Kreator: 'We did digitalize this album some time ago'. Yes, I say, we digitized everything, your company should have it. 'The company doesn't exist anymore'. Where is the data now? 'I can't tell you. I don't know'. I have always made several versions. First, one was sent, and when it arrived, the backups were sent. This means that the client always got the original and two safety copies. That was important because drives are not indestructible; something can happen to them. That's why we had two of them.

(Bemm)

This quote indicates that not even digitization for a record label does ensure preservation because data can still be lost, degenerated or destroyed if labels do not take care of it, are disorganized or go out of business. Furthermore, the acquisition of record labels by other companies bears risks, too; if the archived material is not deemed valuable enough, it may be destroyed during the transition or accidentally lost (Rosen 2019).

Since hard drives have been affordable for quite some time, it is surprising that bands are not particularly keen on keeping personal digital copies of their recordings. As Bemm confirmed, hardly any band requests the data. They do not even want a copy when they are asked directly. In his experience, musicians cannot use the material, and if they needed an alternative mix or tracks for a remix, they would ask the producer.

According to Bauerfeind, lacking interest in the production material, equally by bands, management and record labels, is not only due to laziness or lacking technical skills but rather to other legal and economic details. He explained, 'the legal constellation between artist and record label determines the interest in the audio material'. There are basically two types of contracts that determine the use-value of the material. Bauerfeind recalled that comprehensive 'artist contracts'⁵ were more common in the mid-1980s and earlier. This practice included signing contracts with bands that created a demo, which had to be converted into a high-quality album with only minor deviation from the label-approved demo. The bands received the money for the production in advance, and everything that was recorded, even if not used on the released album, belonged to the record company. The label thus had ultimate control over the creative direction of its artists (Stuart 2017). Few labels realized this more consistently than Motown, which had their own production facilities and teams that wrote and produced songs exclusively for their artists (Smith 1999;

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Fitzgerald 2007; Weissman 2017: 40). The reason why most of the recorded media, including the multi-tracks, are still available today is that everything was produced and owned by one company; hence there is an extraordinary number of Motown re-releases with original and alternative versions (Holland 1997a: 89; Rumsey 2012: 81; Hepworth-Sawyer and Hodgson 2018: 27–28).

In the late 1980s, most German metal labels switched to ‘tape transfer agreements’, according to Bauerfeind. It meant for bands to sell a licence for the commercial exploitation of the finished album to a company for a fixed period of time without giving up ownership of the product itself (Wells 2017: 195–96). The labels can demand technically or musically acceptable quality, which is only vaguely defined and hardly legally enforceable (Hull et al. 2011: 218; Passman 2014: 119–20). The creative decisions remain almost entirely with the artists (Wells 2017: 186). Once the label has accepted the finished album, the original master is handed over in a contractually specified format – formerly analogue or digital (DAT) tape, later CD-R or DPD (digital phonorecord delivery) master – for the duration of the contract (Wells 2017: 195–96). Thus, the production material remains in a legal loophole: The record company buys only the rights to exploit the finished product, while the bands lose their exploitation rights for other commercial use of the recorded material. Due to this practice, the artefacts created in the production become useless for both sides. A complicating factor was that if the producers did not charge any party for the storage media, they owned the media but could not use the data commercially. Bauerfeind usually did not charge for the storage medium to reinsure payment, and his artists did not object, as they could not use their music one way or the other during the contract period with the label. Ownership of the medium and access to the music stored on it allowed Bauerfeind to remix the material and offer it to the rights holders in the future for additional commercial exploitation. This economic interest motivated Bauerfeind to archive and preserve all production data regardless of agreements with artists or labels.

Both types of record contracts, Bauerfeind explained, are commonly limited in time, often to ten or fifteen years (Wells 2017: 196). During this time, neither the original productions nor remixes, remasters, re-recordings or even live albums could be created by the band without their label’s consent (Passman 2014: 182). When the rights and original master tapes are returned to the artists, the record company stops distributing the music, and the artists may re-release the originals or remixed and remastered versions themselves or via another label. For a successful band, the back catalogue can be lucrative (Weissman 2017: 15). German Blind Guardian, for example, spent five years with Bauerfeind in the studio to remix and remaster early albums to release them when they changed their record company. As Bauerfeind pointed out, such reissues of the back catalogue are profitable even for bands with only moderate sales. Preserving production data as much as possible is therefore economically valuable for all parties involved – artists, labels and producers.

Bauerfeind’s experience with multi-track deliveries differs from that of the other two producers. Normally, Johns and Bemm passed the multi-tracks on to the labels regardless of the type of contract, but Bemm knew that other producers working in his studio had similar practices to Bauerfeind. If the production was considered worth preserving, Bemm and Johns also kept copies of the production material, more so in the digital than analogue days. Hence archiving practices seem to be random, and as there is no common standard, problems arise.

The main agenda of the Producers & Engineers Wing (2018a) is to provide guidance on delivering standardized practices that ensure long-term preservation. Objects to be delivered to the label include everything created during the entire production process:

Masters for delivery include (but are not limited to) all open reel tapes, hard disk drives (HDD), Solid State drives (SSD), and incremental backups made during the recording process. They include all original components of the recording process for a given production, each in their originally recorded formats. There should be no deletions of useful material from the Masters, such as outtakes, artist talking, incomplete or unreleased recordings, etc.

(Producers & Engineers Wing 2018a: 7)

However, most producers will be reluctant to supply all these objects, especially given the prevalence of inferior 'band transfer agreements'. Regarding master tapes, which must be delivered regardless of the type of contract, the Producers & Engineers Wing (2018a: 7) recommend a minimum delivery consisting of the master in the originally recorded format and two secondary safety masters, one of which being on a different medium. Their preferred delivery further includes the consolidated multi-tracks with and without ancillary processing (Producers & Engineers Wing 2018a: 9). However, the interviews leave no doubt that neither the preferred nor the minimum delivery guidelines tend to be followed in metal music production for economic, legal and artistic reasons.

Archiving alone is not sufficient for preservation, as data must be migrated regularly and production systems kept available to ensure access. Bauerfeind explained that while he regularly moved data from older hard drives to new drives until the early 2000s, he has resolved to migrate his files to newer storage to reduce the risk of degeneration. Obsolescence is a problem Johns and Bauerfeind are familiar with, and thus they have systematically kept digital production hardware, software and adapters since the mid-1990s. But even with all systems available, some projects cannot be retrieved. For example, one of the oldest digital productions in Bauerfeind's discography, Brazilian Angra's *Holy Land* (1996), was lost because the computer's battery expired, causing the memory to be reset and the licence for the digital audio workstation to be deleted. For him personally, the band and some of their fans, this defect is a loss that prevents the album's re-release in any form other than a simple remaster, as the record company can no longer provide the multi-tracks.

On the industry practice of re-releasing older albums in a remastered or remixed form, the producers interviewed had slightly different opinions. Those who saw sense in remastering were not in favour of remixing and vice versa. On the one hand, Johns was completely against remixing and re-recording.

I don't really like it that much because somehow time is part of the songs. At that time, the band made up the songs, at that time they were stylistically at a certain point in their career, and if they want to re-release it, then let them make a good live recording instead, a good live record, because going back to the studio and recording the same thing, I don't like that.

(Johns)

Johns, seeing an album as a product of a certain time, a historical document, with all its characteristics and potential imperfections part of its

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charm, has never done remixes. But, on the other hand, he has no issues with remastering.

I have nothing against remasters because today the listening habits are different, and you can adjust the music a bit. In the past, things weren't so extremely limited [in dynamic range]. Some people like those old things because they're not so limited or not so sharply equalised, but I can understand when people like remasters and say 'Oh, now it sounds really fat and loud and so on'. But I always say the most important thing is the music, and if people have listening habits, you should try to meet them, it's still the same music. [...] But a new interpretation on a new recording would be different, and without the whole original context, that would be a pity.

As the quote suggests, Johns distinguishes between the aesthetics of production and the recorded performances; new recordings change the musical artefact too much, whereas modernizing the sound through remastering makes sense if it allows younger listeners to enjoy older music better. This view aligns with that of Songworks, a British label specializing in reissuing deleted albums and unreleased material of indie rock. The company motto 'We re-master, we don't remix [...] I think remixing is tampering with history' (Bennett 2009: 485) summarizes the common aims within the 'heritage rock' scene (Bennett 2009) to preserve and appreciate the original work as intended by its creators.

While Bauerfeind agrees with this fundamental premise, he holds the opinion, other than Johns and members of the 'heritage rock' scene, that remastering alters the artistic intention too drastically:

The original already exists, why do you want to remaster it? I don't think much of remasters because, at that time, mastering was a process that corresponded to the creative wishes of the artist. So why should I stand up now and say, 'No, I'm going to do it all different now'. It would lose so much of its charm. 'There are more highs on it etc.', that doesn't matter because there are other things that come to the fore, which were not intended to be in the foreground. For example, when I raise treble, I suddenly hear a lot more hi-hat, but actually, the groove works much better when the hi-hat is as quiet as it was intended to be and not louder, just because I can put more treble on it now because the CD plays more treble. That doesn't really make sense.

(Bauerfeind)

For Bauerfeind, mastering is part of the larger production concept aiming to convey a distinct musical message to the audience. He believes it is not right to change this message only because the various transmission media have different sonic characteristics. In this respect, he agrees with Johns that a record is a cultural artefact that should not be changed. But unlike Johns, he does not accept any changes, not even if the work would become more attractive to a younger audience or correspond better to modern listening habits. This more purist view accords with Bemm's opinion,

I'm not into remastering [...] because at that time, people thought about it and created something that was a special event for many people, and it should be left as it is. [...] to go to an old project and put in more bass or something else, I think that's nonsense.

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Even though Bemm refuses to work on re-releases, he can understand artists who want to rework their albums starting from scratch to convey a different message. This view corresponds to that of Bauerfeind. As described before, Bauerfeind keeps multi-track recordings of his productions so that a new version of the album can be created later. Aside from economic motivations, he is convinced that bands and their fans might appreciate alternative versions of their favourite albums. Two crucial considerations for him are whether remixes would have any creative value for the artist and whether their fans would enjoy the reissued version. Reality is often quite different from the mythical notion of what happens behind studio doors (Thompson and Lashua 2016), so changes can be motivated by very banal things. 'When you talk to artists, you learn things like "I always hated the solo. At that time, I was drunk, and I know for sure I could have played it much better"' (Bauerfeind). Bauerfeind experienced musicians using various stimulants during the production process, and whilst many of them contributed to the artistic output, others did not. Therefore, he can understand musicians wishing to correct their output for various reasons: unsatisfying performances, changing the arrangement, melodies, lyrics or vocal lines. Rather than remastering, which has limited means to change the production sound, he supports more substantial remixes that include re-amping, re-recording or other enhancements using the possibilities of modern production technology (Mynett 2017). If all production artefacts are archived, including the guitar and bass direct injection (DI) tracks, sounds can be significantly altered by recording other amplifiers. Also, as the standards and aesthetics of drum production have changed over time (Thomas 2015; Williams 2015: 44), extra samples can be used to improve the punch and sonic weight of the original drum kit (Mynett 2017: 177–91). Such modifications go beyond mere remixing and remastering and create a sufficiently different version from the original, likely valuable for artists and fans alike. In the end, it

is rather the question what it is worth to the fan, if he [*sic!*] says, 'cool, now I have another solo on it, so I buy the CD again'. But if it sounds just a little bit different now, if it's mastered differently, it's, of course, really pointless. Then many people say, I just don't buy this rubbish. You notice that pretty fast in the sales.

(Bauerfeind)

Two of the three producers firmly believe that a re-release must represent a significant change to justify it. A mere remaster does not bring new value but deteriorates the work of art (Benjamin 1935). Contemplating the producers' opinions on remastering, one could easily conclude that they are shaped by nostalgia (Boym 2001), as they might associate the released work with the time of production, a fulfilling time in the studio, and accolades received from the media. On closer inspection, however, the producers' opinions rather seem shaped by artistic reasons that consider the output as musical heritage they wish to preserve (see also Herbst 2021a).

CONCLUSION

The produced record is one of the most important material artefacts of (metal) music. From the original production, as much material as possible must be preserved to make releases available on different media and

in different versions in the future. This article has demonstrated some of the challenges of preserving audio heritage in general and of metal music, a genre required to cope with shrinking budgets for production and preservation. The findings demonstrate how the impact of such financial constraints puts many artefacts at risk. As the research further suggests, much depends on the goodwill of producers to store the music privately so that it remains available when record labels fail. The interviewed producers have been in business for more than 30 years and offer a consistency that can hardly be guaranteed in today's industry. Apart from a limited number of top-class producers, most metal music is created by semi-professionals and released by small record companies or involve no label at all (Weissman 2017: 49–68; Wells 2017: 192). Under such production circumstances, the audio heritage of more recent metal music is more at risk than ever before. This research, written from the perspective of record production rather than cultural and media studies, intends to raise awareness of the practical problems outlined, hoping that more attention will be paid to preserving production artefacts in the future.

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CONTRIBUTOR DETAILS

Jan-Peter Herbst is reader in music production at the University of Huddersfield (United Kingdom), where he is director of the Research Centre for Music, Culture and Identity (CMCI). His primary research area is popular music culture, particularly rock music and the electric guitar, on which he has published widely. Currently, he is undertaking a funded three-year project that explores how heaviness is created and controlled in metal music production. Herbst's editorial roles include *IASPM Journal* and *Metal Music Studies*, and he currently edits the *Cambridge Companion to Metal Music* and the *Cambridge Companion to the Electric Guitar*.

Contact: School of Arts & Humanities, University of Huddersfield, Huddersfield HD1 3DH, UK.

E-mail: j.herbst@hud.ac.uk

 <https://orcid.org/0000-0001-7453-0141>

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