

WE CAN WORK IT OUT: METHODS IN FORENSIC MUSICOLOGY

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In most countries, musical works are protected by copyright. It follows, then, that in situations where musical borrowing is inappropriate (i.e., plagiarism), a copyright may be infringed, and litigation may follow. Music copyright infringement cases are preoccupied with a core question, which in its simplest layperson form might be expressed as “is Song B copied from Song A?”. In *Arnstein v Porter*¹, Judge Frank divided the question into two parts:

[there are] two separate elements essential to a plaintiff’s case [in a copyright infringement suit]: (a) that defendant copied from plaintiff’s copyrighted work and (b) that the copying (assuming it to be proved) went so far as to constitute improper appropriation [...] Each of these two issues — copying and improper appropriation — is an issue of fact.²

The so-called *Arnstein* test (or court practices derived from it) is still in use today, and has been much criticised, for demonstrating “skepticism towards rules, judges, and the law”³ and for revealing “issues surrounding the application, or even misapplication, of musical expert testimony”⁴. I suggest that it is speciously simplistic in artificially separating “copying” from “improper appropriation”. Innocent musical borrowing is ubiquitous in popular music, due to the widespread use of commonplace elements (for example, the back-beat snare drum, certain chord progressions⁵, genre-typical choices of instrumentation, and conventions of song form). Popular music is a constrained art form, featuring many common tropes and meta-characteristics⁶. So rather than simply identifying what Judge Frank called the “fact” of copying, the work of a forensic musicologist might be better expressed by incorporating both of the *Arnstein* elements into the more nuanced question: “is a substantial part of a protectable element of Song B copied from Song A?”⁷

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¹ *Arnstein v Porter* (1946) 154 F 2d 464. Songwriter Ira Arnstein famously sued Cole Porter for allegedly copying fragments of melodies from the former’s own songs.

² *ibid.*

³ Shyamkrishna Balganes, ‘The Questionable Origins of the Copyright Infringement Analysis’ (2016) 68 *Stanford Law Review* 791.

⁴ Katherine M Leo, *Forensic Musicology and the Blurred Lines of Federal Copyright History* (Lexington Books 2020) 90.

⁵ John Covach, ‘Form in Rock Music’ in Deborah Stein, *Engaging Music: Essays in Music Analysis* (OUP USA 2005); Marc Hirsch, ‘Striking a Chord’ *The Boston Globe* (31 December 2008)

<http://archive.boston.com/ae/music/articles/2008/12/31/striking_a_chord/> accessed 26 June 2022; *The Axis of Awesome: 4 Chords* (2011) <http://www.youtube.com/watch?v=oOIdewpCfZQ&feature=youtube_gdata_player> accessed 28 February 2013.

⁶ Joe Bennett, ‘Collaborative Songwriting – the Ontology of Negotiated Creativity in Popular Music Studio Practice’, *Journal of the Art of Record Production 2010* (Art of Record Production 2011)

<<https://www.arpjournal.com/asarpwp/collaborative-songwriting---the-ontology-of-negotiated-creativity-in-popular-music-studio-practice/>>.

⁷ Latman argues that courts have consistently misunderstood the adjective ‘substantial’, applying it to the first part of the *Arnstein* test (fact of copying) instead of the second (was the copying inappropriate). I take issue with this view, but only because I disagree with the false binary that the *Arnstein* test itself attempts to establish. Alan Latman, ‘“Probative Similarity” as Proof of Copying: Toward Dispelling Some Myths in Copyright Infringement’ (1990) 90 *Columbia Law Review* 1187.

In this chapter, I will argue that forensic musicology practice can answer this question by combining comparative musical analysis and repertoire research, contextualised within an understanding of how songwriters and composers create, and how listeners hear. In doing so, I shall identify the methodological and phenomenological traps into which courts and juries can fall, and suggest ways in which these can be anticipated and circumvented.

I. FORENSIC MUSICOLOGY PRACTICES

Scholarly discussion of forensic musicology (FM) has focused almost exclusively on historical music copyright infringement litigation cases⁸. This is understandable, because court records represent the only public record of the development of the field, and most musicologist reports beyond those quoted in court documents are unavailable to researchers, due to non-disclosure agreements. In reality, only a fraction of the work of a forensic musicologist consists of expert testimony for infringement litigation. Most FM analyses never reach a courtroom, but rather are simply confidential consultancies for a commercial client – either a potential plaintiff who has noticed similarity between their Song A and a more recent Song B, or a potential defendant who wishes to know whether their Song B might be considered plagiaristic of Song A (or any prior work).

Commissioning clients typically require their consultant musicologist to provide an opinion on two interdependent questions, which are subtly different from those posed in *Arnstein*: [a] is the similarity we hear likely ascribable to plagiarism, as opposed to Independent Creation (IC), and [b] are the similar elements unique to Song A, or are they commonplace? As I shall argue, these questions bring with them epistemological challenges, some of which can be addressed through robust analytical methodology, repertoire research, and professional integrity, and others that may remain problematic due to the nature of copyright law and the subjectivity of music listening.

In my own experience as a commercial forensic musicologist (2007-2022 and ongoing), projects fall into three main categories: *musical work comparison*, *audio sample analysis*, and *soundalike analysis*.⁹

A. Musical Work Comparison

A Musical Work (MW) comparison attempts to ascertain whether perceived similarity between Song A and Song B is more likely ascribable to improper copying (plagiarism), or else to coincidence (IC). These similarities often focus on the song's main vocal melody, or on prominent topline instrumental parts, as do most music copyright infringement cases since the 19th century¹⁰. The simplest form of analysis is a comparative transcription,

⁸ Leo (n 5); Jose Bellido, 'Forensic Technologies in British Music Copyright' in Sheryl Hamilton and others (eds), *Sensing the Law* (Canadian Initiative in Law, Culture, and Humanities 2014); Durand Begault, Heather Heise and Christopher Peltier, 'Forensic Musicology - an Overview', *Audio Engineering Society 54th International Conference* (Audio Engineering Society (AES) 2014).

⁹ These services are described, with variations of wording, in the websites and promotional materials of most professional forensic musicologists, e.g. forensicmusicologist.com (Alexander Stewart, USA), oxendale-music.co.uk/ (Peter Oxendale, UK), jfmusicervices.com/services/ (Judith Finell, USA), <https://www.musiodata.com/services-fees> (Sandy Wilbur, USA), and my own joebennett.net (Joe Bennett, USA).

¹⁰ Charles Cronin and others, 'Music Copyright Infringement Resource' (*Music Copyright Infringement Resource*, 2021) <<https://blogs.law.gwu.edu/mcir/>> accessed 15 June 2021; Mark Osteen and Paul K Saint-Amour, 'Rhythm Changes:

where the respective melodies are aligned vertically above each other, with highlighting of congruent pitches, rhythms, and underlying chords, aka harmony. This method has been in use in US infringement litigation since the mid-1800s, as Katherine Leo¹¹ attests:

By the middle of the [19th] century, courts had settled on similarity as the central inquiry for infringement cases as applied to all protectable works. Thus, a piece of music, or any other copyrightable work, was believed to have infringed on another work if the two pieces were sufficiently similar as to indicate copying.

[...] Most expert witnesses approached the similarity inquiry as locating the extent of musical congruence, predominantly through note-by-note melodic comparison usually conducted separately from the harmonic and formal dimensions of the song.

Comparative analysis is usually accompanied by repertoire research, in which the musicologist will investigate whether the similar elements from Song A were unique to it, or whether earlier works exist that contain the same musical elements. This additional repertoire can be used to counter any spurious accusation of plagiarism, because, in the words of prominent US musicologist Sandy Wilbur: “If the combination of similar elements can be found in prior art, the original elements cannot have originated in either of the works being compared.”¹²

Like the aforementioned two questions (plagiarism vs IC, and unique vs commonplace), the two methods are interdependent: comparative analysis identifies the extent of the objective similarities, and repertoire research subtracts the commonplace elements. When the commonplace elements are removed, the comparative analysis can be re-evaluated so that only copyright-protected similarities remain. This is simple enough conceptually, but can be challenging in practice, as I shall address later.

A notable recent example of Musical Work comparison in litigation is *Gray v Hudson*, in which pop singer Katy Perry’s hit “Dark Horse” was alleged to have been copied from a Christian rap song entitled “Joyful Noise”. The case was helpfully summarised in Judge Smith’s Opinion, at the conclusion of defendants’ successful appeal:

[Plaintiffs] claim that a repeating instrumental figure – in musical terms, an ostinato – in Hudson's song "Dark Horse" copied a similar ostinato in plaintiffs' song “Joyful Noise”. After a trial centering around the testimony of musical experts, a jury found defendants liable for copyright infringement and awarded \$2.8 million in damages. The district court vacated the jury award and granted judgment as a matter of law to defendants, concluding principally that the evidence at trial was legally insufficient to show that the Joyful Noise ostinato was copyrightable original expression.

We affirm. Copyright law protects "musical works" only to the extent that they are "original works of authorship." 17 U.S.C. § 102(a). The trial record compels us to conclude that the ostinatos at issue here consist entirely of commonplace musical elements, and that the similarities between them do not arise out of an

Contrafacts, Copyright, and Jazz Modernism’ [2010] *Modernism & Copyright* 98; Joseph P Fishman, ‘Music as a Matter of Law’ (2017) 131 *Harv. L. Rev.* 1861.

¹¹ Leo (n 5) 14.

¹² Sandy Wilbur, ‘Music & Musicology Services & Fees’ (Musiodata, 2021) <<https://www.musiodata.com/services-fees>> accessed 2 November 2021.

original combination of these elements. Consequently, the jury's verdict finding defendants liable for copyright infringement was unsupported by the evidence.¹³

Although defendants' musicologist's analysis is not in the public record, we can infer from their appeal that they successfully used prior art research to demonstrate that HORSE¹⁴ was created independently of NOISE, when they state:

The only claimed similarities between the two works are a small number of indisputably commonplace elements in the works' ostinatos and the undisputed evidence at trial established the many differences between both the ostinatos and the works as a whole.

The two alleged musical similarities at issue in *Gray* were the ostinato (fig.1 below) and the "beats" aka the underlying backing track. For this discussion, I shall dispense with beats similarities, as the court did. There are very few cases in US legal history whereby beat similarities alone¹⁵ have been enough to infer copyright infringement, because no two beats are exactly alike (except in cases of audio sampling), and also because many beats are similar in their rhythmic design.

Of more interest, for our discussion of listener phenomenology, are the pitch matches between the ostinatos. When HORSE and NOISE are played one after the other, the melodic congruence is obvious; the songs' respective 2-bar ostinatos (short melodic sections) share 6 exact-match pitches, with identical rhythmic values. The similarity is exacerbated by the (I would argue irrelevant) fact that they share similar synthesiser sounds, played staccato. We can easily imagine that a jury might have considered these similarities to be subjectively compelling.

Fig. 01: Gray v Hudson ostinato comparison¹⁶

The figure shows two musical staves in 4/4 time. The top staff is labeled 'Perry - Dark Horse' and the bottom staff is labeled 'Flame - Joyful Noise'. Both staves show a sequence of notes: quarter notes, followed by eighth notes, and then quarter notes. Two 2-bar sections are highlighted with red dashed boxes. The first section of the top staff has a note marked 'transposed -1 for comparison'. The notes in the two sections are nearly identical in pitch and rhythm, demonstrating the similarity between the two ostinatos.

In Fig. 01 above, we can see that 12 out of the 16 notes in HORSE are identical, in terms of pitch and rhythmic values, to the equivalent notes in NOISE. To a non-musician, perhaps even to a hopeful plaintiff, this might appear to be evidence of plagiarism. But to a songwriter, it is quickly obvious that such a simple idea (playing quarter-notes starting on the third note of the minor scale, repeating the same note for a whole bar, then playing an adjacent note on the keyboard and maintaining the same pulse) is such a simple compositional gesture that it could have easily been undertaken independently by two

¹³ *Gray v Hudson* (2022) 28 F 4th 87.

¹⁴ In my own reports, after initially identifying the respective works, I use the typographical convention of subsequently referencing them with an uppercase unique noun from the title e.g. HORSE. I prefer this for clarity; other common abbreviated title styles include a single word in quotes "Horse", in italics *Horse*, or full title in quotes "Dark Horse".

¹⁵ A notable rare exception is Jessie J's 'Price Tag' which allegedly copied the breakbeat one-bar drum part of an earlier work 'Kimba Ku'. *New Old Music Group, Inc v Gottwald* (2015) 122 F Supp 3d 78.

¹⁶ Dark Horse is originally in the key of Bb minor; in keeping with my use of key compensation, it is shown here transposed down one semitone (-1) aka one half-step, for clarity of comparison.

separate songwriting teams. This hypothesis is supported by a classroom exercise I use in my FM classes at Berklee College of Music, where most students have experience of songwriting, and some students are songwriting majors. On hearing the *Gray* ostinatos one after the other, a large majority of the class state confidently that they believe the similarity to be a coincidence i.e., the opposite inference to the jury's conclusion in the lower court's original verdict. Further, students often express amazement or outrage that *Gray* was ever litigated, because, to them, the accusation of plagiarism is so obviously musically unfounded. As relatively experienced songwriters, they are already able to subtract commonplace elements from protectable expression. This tacit knowledge is acquired over years of immersion in popular music creative practice. Juries, unfortunately, do not have access to this knowledge. All too often they infer, often incorrectly, that copying is the most likely explanation for the similarity they hear.¹⁷

As the Appellate Court in *Gray* eventually found, neither the beats nor the ostinatos were sufficiently original to be considered protectable expression. But the fact that the jury initially found for plaintiffs demonstrates the challenge of listener perception in music copyright infringement litigation: how can a non-expert listener separate the commonplace from the protectable?

The answer, of course, is that they must rely on expert testimony. But as Leo and others¹⁸ have noted, since the 19th century it has been possible for plaintiffs and defendants alike to find 'hired guns', i.e. experts who are willing to manipulate methodology in their clients' favour¹⁹. The dueling experts issue remains common to this day, and cannot easily be addressed because there are no formal guidelines or professional organization for FM practitioners, as Fishman & Garcia observe:

[E]very expert with whom we spoke could think of no ... networking outlet: no formal professional organization, no annual conference, no series of happy hours or meet-ups²⁰

I agree with Fishman & Garcia's implication that such an organization would be helpful to the field. It could provide several possible benefits for copyright owners and courts, including the establishment and codification of agreed methodologies, the vetting and accreditation of members to ensure experts are suitably skilled and qualified, and a set of ethical standards of evidence-based objectivity that might go some way toward countering the hired gun issue.

Musical Work Comparison: typical musicologist workflow

- Client provides musicologist with access to Song A and Song B, and identifies the similarity at issue.

¹⁷ J Lund, 'An Empirical Examination of the Lay Listener Test in Music Composition Copyright Infringement' [2012] Available at SSRN 2030509 <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2030509> accessed 29 January 2013.

¹⁸ The Medico-legal Journal. Medico-Legal Journal Association, 1884. p.146. Cited in Leo (n 5) 16.

¹⁹ In *Gray*, plaintiff's expert had a Ph.D in musicology, but with specialisms in ragtime, musical theater, hammered dulcimer and Irish folk music – and no apparent experience of popular songwriting or the commercial music industry. A strange choice, perhaps, and arguably a demonstration of the need for a professional organization for FM experts.

²⁰ Joseph Fishman and Kristelia Garcia, 'Authoring Prior Art' [2022] *Vanderbilt Law Review*, Forthcoming <<https://www.ssrn.com/abstract=3966712>> accessed 30 May 2022.

- Musicologist undertakes comparative key-compensated²¹ topline and harmony transcription to highlight similarities and differences between Song A and Song B.
- Musicologist identifies elements common to both works, such as instrumentation/production, and melodic or lyric fragments.
- Musicologist researches repertoire (ideally that predates Song A), to identify the extent to which the similar elements between the works are commonplace, or else unique to Song A and Song B.
- If a large amount of similar repertoire is found – for example, if a melodic fragment is identified in numerous other works – this might be considered supportive of an IC hypothesis.
- Musicologist provides a report, which *either* states that the similarity is probably due to Independent Creation (no protectable elements of Song A appear identically in Song B) *or* that the similarity is likely evidence of plagiarism (Song B contains similarities of unique protectable elements that were originated by the composers of Song A, which is taken to be evidence of copying).

B. Audio Sample Analysis

Audio sample analysis is primarily concerned with the authentication of audio; that is to say, to detect whether the apparent audio sample in a Sound Recording (SR) is in fact taken from an earlier SR. It deals with a different copyright from MW analysis, because the MW and the SR are separately protected in copyright law.²²

Because infringement of a SR copyright requires that defendant has *mechanically* copied the audio from the original source, making a *re-recording* of the source material is a viable creative strategy for a samplista, because it is technically a new SR so cannot infringe the copyright of the earlier one (although any Musical Work similarities would need to be treated separately). This is a common practice²³ in the music industry since the 1990s, partly for economic reasons; pioneering hip-hop super-producer Dr Dre “re-recorded the majority of the samples he used with live musicians... [because] samples were becoming too expensive to clear”²⁴.

From the musicologist’s perspective, audio sample analysis culminates in a binary outcome – either the source of the sample in SR(B) is SR(A), or it is not. But although the expression of this opinion is simple, the methodologies to achieve it reliably can be highly technical and complicated, including visual waveform or spectrum analysis²⁵, audio phase

²¹ Key compensation is the practice of transcribing both works in the same musical key, regardless of the keys in which they were originally performed, notated, or recorded. It is a ubiquitous practice in musicologist reports, in and out of the courtroom (it appears in Arnstein and most other MW cases). A more recent equivalent approach uses the sound recordings – the musicologist manipulates digital audio in software so that both works play back in the same key (and sometimes at the same tempo). Although some commentators (e.g. Begault) have criticised audio manipulation on the grounds that it tampers with the evidence, I consider this practice to be defensible – indeed essential – because it enables nonexpert listeners to hear ‘like for like’ without the distraction of different keys making the works sound more subjectively different than they actually are.

²² Joe Bennett and Sean O’Connor, ‘Determining the Composition’, *Oxford Handbook of Music Law and Policy* (Oxford University Press US 2021)
<<https://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780190872243.001.0001/oxfordhb-9780190872243>>.

²³ Justin Morey, ‘Copyright Management and Its Effect on the Sampling Practice of UK Dance Music Producers’ (2013) 3 IASPM@ Journal 48.

²⁴ Jake Brown, *Dr. Dre in the Studio: From Compton, Death Row, Snoop Dogg, Eminem, 50 Cent, the Game, and Mad Money: The Life, Times, and Aftermath of the Notorious Record Producer, Dr. Dre* (Colossus Books 2006) 64.

²⁵ Begault, Heise and Peltier (n 9).

cancellation (alignment of the recordings to discover exact overlaps)²⁶, and intricate attempts to reverse-engineer the likely creative processes used by defendants²⁷. In some situations, it is possible to use anomalies in the earlier recording as a naturally occurring ‘copyright trap’; this method was used in *Naxos v Salmon*, a SR infringement case in which my own expert analysis was used to ascertain whether defendant’s recording of Vivaldi’s *Four Seasons* was a digital copy of plaintiff’s. Judge Lord Glennie summarised the process in his Opinion:

[the expert] proceeded to look at audible anomalies in the recordings, such as bowing scrapes and crunches in the string section, rattles from the harpsichord, unexplained random noises and disturbances within the recording venue, breathing sounds, clicks and other noises. ²⁸

For all its technical complexity, sample analysis is arguably the most straightforward aspect of FM practice, because it leads to a yes/no conclusion which, if reliably obtained, cannot be undone or challenged through lay listener perception, legal arguments, or reductive methodology.

Since the early 1990s, when the practice of sampling became more common in popular music – particularly hip-hop – there has been an attendant rise in sample detection expert practices in SR-related infringement litigation; notable cases include *Grand Upright Music v Warner Bros Records Inc*²⁹, *Salsoul v Chiccone*³⁰, and *Bridgeport Music vs Dimension Films*³¹. Sampling case law is at an interesting point at the time of writing (2022). *Bridgeport* held that a sample of any length was copyright infringement, effectively reducing the *de minimis* sample-length threshold to zero for creators with Judge Guy’s famous words “Get a license or do not sample”; the *Salsoul* verdict allowed for a very short (0.23s) horn sample to be considered *de minimis*, although Judge Silverman’s dissent, quoting *Bridgeport*, stated “I would hold that the *de minimis* exception does not apply to the sampling, copying, stealing, pirating, misappropriation – call it what you will – of copyrighted fixed sound recordings”. Given that *Bridgeport* was in the Sixth circuit and *Salsoul* in the Ninth, the US currently has a circuit split in this matter, leaving the very real possibility that the hallowed halls of the US Supreme Court may one day ring out to the sounds of Funkadelic, Madonna, and N.W.A., to decide once and for all the extent to which musicians can sample audio.

Sample authentication: typical musicologist workflow

- Client provides musicologist with access to the Sound Recordings, and identifies the timestamp of SR(A) and SR(B) where the alleged similarity occurs.

²⁶ Musicologist Alexander Stewart provides a brief overview of some of the technical methods used in sample detection. Alexander Stewart, ‘Been Caught Stealing: A Musicologist’s Perspective on Unlicensed Sampling Disputes’ (2014) 83 UMKC L. Rev. 339.

²⁷ For a recent example of my own work in this area, see Judge Oetken’s description of my sample detection methods, cited in *Hines v. W Chappell Music Corp.* (2021).

²⁸ *Naxos Rights International Limited v Project Management (Borders) Limited + Keith Joseph Salmon* (Outer House, Court of Session (Scottish Courts, 2012)).

²⁹ *Grand Upright Music v Warner Bros Records, Inc* (1991) 780 F Supp 182. Rapper Biz Markie sampled 4 bars of piano/bass/drums from Gilbert O’Sullivan’s song ‘Alone Again (Naturally)’.

³⁰ *Vmg Salsoul, LLC v Ciccone* (2016) 824 F 3d 871. Madonna’s ‘Vogue’ sampled a single 0.23s horn hit from an earlier work ‘Love Break’.

³¹ *Bridgeport Music, Inc v Dimension Films* (2005) 410 F 3d 792. N.W.A. sampled a two-second excerpt of a guitar riff from Funkadelic’s ‘Get Off Your Ass and Jam’.

- Musicologist imports both SRs into software for comparative analysis. If the samples are at different pitches/tempo, digital time-stretching and pitch-shifting may be used to compare like with like.
- Musicologist applies various comparative technical methods to establish the provenance of the sample in SR(B), such as phase cancellation, visual waveform or spectrogram analysis, anomaly-spotting, and reverse-engineering possible processes used by the alleged samplist.
- Musicologist provides a report, which states whether the source of the audio sample in SR(B) is SR(A).

C. Soundalike Comparison

A soundalike is an intentional attempt by a composer to make a musical allusion to a song, artist, or style, whilst creating a sufficiently original composition to avoid accusations of copyright infringement. They are common in film & TV, and particularly advertising, where the director may have briefed a composer to create the ‘feel’ of a pre-existing track to accompany moving images (this is known as a “reference track” in the industry). In their least controversial form, soundalikes are simply genre-pieces, combining production, instrumentation and arrangement in such a way as to evoke a cultural trope – think honky-tonk up-tempo piano for a comedy chase scene, twanging mouth-harp, slow human whistling, and reverbed rubato claves for a Western’s gunfight showdown, the soaring unison strings of lovers reunited, or the urgent root-5th trumpet fanfare of a news anchor’s theme tune. These compositional ideas are undoubtedly based on (maybe even “borrowed from”) earlier works, but they are not copyright-infringing because they are not unique to any *single* work. It follows, then, that as the number of works alluded to diminishes, so the possibility of copyright infringement increases. A soundalike is at its most problematic when it intentionally and identifiably alludes only to a single work – usually the reference track.

In a soundalike comparison, musicologists are often hired towards the end of the media production process, before the soundalike is made available to the public, though occasionally they can be used after the media are released, should a dispute arise. The purpose of such a pre-emptive analysis is to highlight any inappropriate similarities between the soundalike and the reference track/s, and if any are found, to recommend that the composer make changes.

The methodology here is in two parts, and is similar to the approach used in MW analyses; indeed, it could be seen as modeling a courtroom scenario, to demonstrate or test how a jury might perceive a particular similarity. First, the new track and reference track are compared note-for-note for congruence, typically using just the vocal or instrumental topline and underlying harmony. Usually there is no issue here, because most professional media composers know not to copy melodic and harmonic material from earlier works – it is an unwritten rule that has held fast in the industry for many decades. The second part of the analysis is to situate the soundalike in its cultural context through repertoire research, usually with the aim of demonstrating that it is truly a *scènes à faire* genre piece that uses commonplace musical ideas found in more than one work. To expand on the earlier movie trope example, a scene for a TV ad featuring a cowboy bar fight might

include honky-tonk piano music, created by a professional media composer to the director's brief. The musicologist's role would be to demonstrate that the piano part was dissimilar to any *specific* work (comparative melodic analysis), but rather featured genre-based characteristics broadly similar to a *number* of works (repertoire research).

In one recent project (2022), I was commissioned by a media production company to undertake a comparative analysis of a custom-composed rock track that had been used in TV advertisements. The company had been approached by a well-known rock artist, who believed that the TV ads represented unauthorised use of one of their compositions. My musicologist's report provided a comparative analysis of the works, which found no melodic or harmonic congruence. The report then used repertoire research to demonstrate that the works only sounded similar because they featured genre-typical uses of instrumentation, tempo, rhythmic feel, and guitar techniques – elements that appear in many works. My conclusion suggested that the complaining party would be unlikely to be able to demonstrate plagiarism, because the similar elements are commonplace (and therefore not individually protectable by copyright). The musicologist's report was then used to enable the client to refute the spurious claims of the rock artist.

Musicologists' analyses of soundalikes, or any pre-release works, are common practice in the media production process, and in my own experience represent the most common type of activity for FM practitioners; clients treat it as a form of due diligence or insurance, whereby a comparatively small cost that can risk-manage the possibility of future litigation. I speculate that this practice is partly responsible for the relative scarcity of soundalike-related case law, such disputes having been pre-subtracted from court action due to what some law scholars call the selection effect³². A rare but significant recent example of media music in litigation can be found in *Eight Mile Style v. New Zealand National Party, et al*³³, in which a media composer had created an alleged soundalike of Eminem's "Lose Yourself" for a TV advertising campaign (and, perhaps foolishly, had entitled their soundalike "Eminem Esque").³⁴ The respective musicologists used different approaches; plaintiff's expert (a Dr Ford) used an holistic methodology, suggesting that a combination of individually non-protectable elements had contributed to 'striking similarity' between the works. Defendant's expert (a Dr Zemke) used repertoire research to demonstrate that the similar musical elements were musical tropes that appeared in many prior works. The tendency of (some) expert musicologists to select methodologies – or, worse, to cherry-pick evidence – to help bolster a client's case is a manifestation of the hired-gun phenomenon³⁵, and is so common in the commercial world that I now include an objectivity clause in my own client contracts.

³² 'Because straightforward or easy applications of legal rules are rarely litigated, the cases that come to a court are predominantly and disproportionately ones that are in some way hard. The litigated hard cases thus represent a biased sample of all legal events, a phenomenon typically referred to as the selection effect.' Frederick F Schauer, *Thinking like a Lawyer: A New Introduction to Legal Reasoning* (Harvard University Press 2009) 13.

³³ 'Eight Mile Style v. New Zealand National Party, et al. | Music Copyright Infringement Resource' <<https://blogs.law.gwu.edu/mcir/case/eight-mile-style-v-new-zealand-national-party-et-al/>> accessed 30 May 2022.

³⁴ Plaintiffs prevailed, with their solicitor Adam Simpson describing the decision as "a warning to sound-alike music producers and their clients everywhere. Reuters, 'Music Rights Specialist Backs National over "Eminem Esque"' (RNZ, 26 October 2017) <<https://www.rnz.co.nz/news/national/342383/music-rights-specialist-backs-national-over-eminem-esque>> accessed 15 July 2022.

³⁵ Leo (n 5).

Soundalike comparison: typical musicologist workflow

- Client provides the pre-release media music (Song B) as an audio file, and audio recordings of any reference work/s (Song A) used by the composers.
- Musicologist undertakes comparative key-compensated topline and harmony transcription to highlight similarities and differences between Song B and reference works.
- Musicologist identifies elements common to both works (elements of instrumentation/production, and melodic or lyric fragments)
- Musicologist researches repertoire that predates Song A, to identify the extent to which the similar elements between the works are commonplace, or else unique to Song A and Song B.
- Musicologist provides a report, which *either* states that no action is needed (no protectable elements of Song A appear in Song B) *or* recommends compositional changes before release (Song B contains similarities of protectable elements)

Although all three categories of similarity (musical work, sampling, and soundalikes) appear in historic and current litigated cases, the majority are MW disputes, and most commonly involve fragments of vocal melodies, or ‘toplines’. I suggest that there are several reasons for this. First, partial melodic similarity is difficult to prove or disprove, meaning that these cases are more likely to reach litigation due to the selection effect. Second, melodies are among the lowest time-bandwidth data we can perceive in a pop song, with melodic pitch events occurring around 3-8 times per second; by contrast, we can perceive high frequency timbral (tonal) characteristics in music at up to 20,000 cycles per second, and can identify sound recordings within 0.2 seconds³⁶, meaning that coincidental partial exact-match similarities are possible in melodies, but mathematically impossible in SRs. Third, melodic copying is uncommon (actually, frowned upon) in the songwriting community. It is something of a truism that coincidental melodic similarity is much *more* common than many people believe, whereas songwriters plagiarising melodic fragments is much *less* common than many people believe.

As stated previously, most of the work of musicologists is preemptive to, or preventative of, actual litigation.³⁷ Commercial clients want to seek confirmation of whether a similarity is indicative of copying, either to inform them of whether litigation is likely/advisable, or else to try to prevent it. A soundalike composer may want reassurance that their composition is, in fact, a genre piece, and does not copy protectable elements from the reference track/s; if the similarity is deemed by the musicologist to be ‘too close’, the composer can make changes to the soundalike before it is released. A songwriter who notices a topline similarity between their own song and a later one may require the musicologist to comment on the extent to which the similarity is ascribable to copying (of a protectable element), to inform them of whether litigation is viable. Conversely, a songwriter who finds themselves unfairly accused of plagiarism may ask a musicologist to undertake repertoire research to demonstrate that the similarity between

³⁶ Daniel J Levitin and Perry R Cook, ‘Memory for Musical Tempo: Additional Evidence That Auditory Memory Is Absolute’ (1996) 58 *Perception & Psychophysics* 927.

³⁷ Leo (n 5) 22.

the works is due to shared commonplace elements and Independent Creation – showing that the works are simply stylistically similar, and/or that the melodic similarity is a coincidence. Even the simple yes-no outcome of a sample analysis is more often used to inform commercial negotiations between the parties, without necessarily proceeding to litigation. A client whose work has been sampled by a well-known artist is usually very pleased to receive a musicologist’s report authenticating the sample, because it gives them powerful leverage in the business negotiations that may follow, especially when the later work has already been commercially successful. All the scenarios I describe here are workaday activities for forensic musicologists, and in my own experience represent the majority of client commissions.

II. METHODOLOGIES AND EPISTEMOLOGIES

Following the logic of *Arnstein*, if the first question in any music copyright dispute is *did copying occur?*, then it is also the first question – possibly the most important question – in forensic musicology. But how can we know whether copying has taken place? Only on very rare occasions in infringement litigation is there an admission of copying by the defendant. One notable such outlier is *Bridgeport Music, Inc. v. Dimension Films*³⁸, where defendants N.W.A. cheerfully admitted sampling two seconds of audio from Funkadelic’s “Get Off Your Ass and Jam” in their later song “100 Miles and Runnin’”. But *Bridgeport* was a sample-based infringement case, and sampling is almost always simpler to demonstrate/disprove than other forms of musical plagiarism, because it is a binary – the sampling occurred, or it didn’t. Given that SR cases are the only scenarios in which such a binary can be so starkly drawn, this is another area in which *Arnstein*’s simplistic emphasis on the “fact” of copying fails to account for the full complexity of musical authorship, especially today, when many composers deal with elements of timbre and production, conflating the MW and the SR as creative objects³⁹.

But in most situations, in fact in almost every music copyright litigation case in history, defendants deny that the subjective similarity between the works is the result of plagiarism, instead arguing that it is due to Independent Creation (IC). How, then, might we use music analysis to differentiate between coincidental similarity and plagiarism?

A. *The first step: the Similarity Proxy*

In the following section, I will address the epistemological difficulties in with answering the Copying/IC question definitively (as all musicologist’s clients would prefer). As philosophers and behavioural psychologists have long held, we cannot know the mind of another person, and can only infer others’ knowledge or intentions by observing their behaviours. It is rarely possible to identify from the works alone exactly how any creative gesture was achieved, still less the intent behind it. We can only observe the similarity evident in the works, and use extent-of-similarity (what Leo calls “musical congruence” and Latman calls “probative similarity”⁴⁰) as a proxy for likelihood-of-copying. I shall refer

³⁸ *Bridgeport Music, Inc. v. Dimension Films* (n 32).

³⁹ Bennett and O’Connor (n 23).

⁴⁰ Leo (n 5); Latman (n 8).

to this as the *Similarity Proxy*, and it is used to answer the first step in FM's process: *is the extent of similarity between the works likely to be evidence of copying?*

The Similarity Proxy is based on the conceptual principle that the greater the extent of the similarity, the lesser the likelihood that it could have arisen through Independent Creation. And this makes mathematical sense. If we toss a coin once, the probability that it will land on tails is 0.5 (50%, or one in two). But if we toss a coin three times, the probability of tossing heads, then tails, then heads again is 0.125 (12.5%, or one in eight). And in music, as a time-based art form, the choices available to composers between any consecutive musical events are much greater than two. It follows, then, that any very long melody that is *exactly* identical to any pre-existing very long melody is likely to be evidence of plagiarism, especially if the underlying harmony is identical. Ergo, the likelihood of any similarity between long melodies being ascribable to Independent Creation decreases exponentially with every added note in the melodic chain⁴¹. And the exponential mathematics need not be limited to a single linear domain such as melody. Any musical arrangement that uses the exact same parameters as an earlier work in terms of instrumentation, musical form, musical key, or tempo, for example, provides increasingly strong circumstantial evidence of copying as more similarities are added, even if such elements are themselves not protectable by copyright.

The principles of the Similarity Proxy are instinctively understood by musicians, and may be even tacitly assumed by courts and lay listeners. This is perhaps the reason why many songwriters believe the urban myth that there is a legally-defined *de minimis* number of consecutive pitches that can legitimately be copied before the copyright police knock at one's door. A rare example of this common musicians' fallacy being publicly aired is the following interview with *Wicked* composer Stephen Schwartz, where he describes the melodic content of the 'Unlimited Theme' that underpins several of the songs in the stage musical (my italics):

What I thought was amusing (and I wondered if people would get it, and of course people did), is that it's the first seven notes of 'Over the Rainbow.' [...] The reason that that's a joke is because *according to copyright law, when you get to the eighth note, then people can come and say, 'Oh you stole our tune.'* And of course obviously it's also disguised in that it's completely different rhythmically. And it's also harmonised completely differently [...] but still it's the first seven notes of 'Somewhere Over the Rainbow'.⁴²

But notwithstanding any such misunderstandings of copyright's principles, the Similarity Proxy has always been the main method by which musicologists, courts and musicians address the copying/IC binary. And although it is arguably defensible as an approach, it does not take account of the fact that *not all copying is plagiarism* and *not all plagiarism is copyright infringement*.

⁴¹ Eleanor Selfridge-Field, 'Substantial Musical Similarity In Sound And Notation: Perspectives From Digital Musicology' (2015) 16 36.

⁴² Carol de Giere, Interview with Stephen Schwartz, 'Wicked's Musical Themes' (c 2004) <<http://www.musicalschwartz.com/wicked-musical-themes.htm>> accessed 12 September 2013.

III. THE SECOND STEP : COMMONPLACE ELEMENTS

The copyright doctrine of *scènes à faire* holds that certain elements of a creative work may not be protected by copyright, because they are commonplace. FM does not necessarily concern itself with this doctrine in its pure form, i.e. genre tropes. Rather, it investigates *scènes à faire* in a less literal sense – comparing the works to commonplace rhythms, chords, and (particularly) melodic fragments. If, for example, the writer of Song B hears an Electronic Dance Music (EDM) Song A that opens with a ‘four-on-the-floor kick drum’⁴³ (a bass drum, playing beats one, two, three and four of each bar, like a metronome), they can legitimately copy this drum element in their own Song B, and even admit to doing so, because the four-on-the-floor expression was not created by the composer of Song A. It is a staple element of genre in Disco and EDM, and is commonplace in popular music.

This raises the next methodological step for FM; *once we have established the extent of the similarity, we must subtract the commonplace elements*. From my conversations with other forensic musicologists, it appears that all of us have experienced many approaches by hopeful potential plaintiffs, convinced that a musical element of their Song A (for example, a chord loop, a drum part, a lyric fragment, and *particularly* a short melodic fragment) has been wilfully copied by a later songwriter in the successful hit Song B. The client’s position, in many cases, is quite sincere; they genuinely believe, like many juries, that plagiarism is the only explanation for the subjective similarity between Song B and Song A. In most such cases, the analysis demonstrates to the disappointed client that the similar elements in question are common to many works, and that there is no copyright to protect. Some musicologists (including myself) try to avoid taking on such projects, because they are usually without merit, and because clients are rarely comforted by the fact that the analysis has helped them to avoid expensive and fruitless litigation.

IV. REPERTOIRE RESEARCH, PRIOR ART AND THE IC HYPOTHESIS

Even though musicologists are expert listeners with a wide knowledge of repertoire, we cannot simply state that we believe an element is commonplace or unique - to do so would clearly be *argumentum ab auctoritate* (the Argument From Authority fallacy⁴⁴). To demonstrate to others (e.g. clients, courts, juries) that any similarity between Song A and Song B is coincidental, we must produce evidence that the relevant similar elements do, in fact, appear in other works: ideally but not essentially, works that predate Song A. I shall call this the *Prior Art Proxy*, where the existence of a musical element in many works demonstrates that it is something that composers might create independently of each other. In my experience, it is most useful when applied to short melodic fragments - typically one to four bars of music.

⁴³ *Four-on-the-Floor - That Disco Beat!* (Directed by Auckland Philharmonia Orchestra, 2018) <https://www.youtube.com/watch?v=8_NiMAEsP14> accessed 28 July 2022.

⁴⁴ Douglas Walton, ‘Appeals to Authority’, *Informal Logic: A Pragmatic Approach* (2nd edn, Cambridge University Press 2008) <<https://www.cambridge.org/core/books/informal-logic/appeals-to-authority/F455E1D4279677917F379D9464A76060>>.

Much of the history of music copyright litigation in the USA consists of disputes over such fragmentary melodic similarity⁴⁵. In these scenarios, plaintiff has noticed that part of their melody of their Song A is similar to part of defendant's Song B. Such similarities are almost never exact, and very rarely are the melodic chains more than four bars in length. In *Arnstein* itself, the accusations against Porter all related to fragmentary non-exact melodic similarity; most of the fragments consisted of only a few consecutive pitches, none of which aligned exactly in terms of rhythmic values, harmonic context, and bar placement. It is not difficult to see why the district court initially dismissed the case.

Fig. 02 - A Modern Messiah vs Don't Fence Me In - melodic fragment similarity

The figure shows two musical staves in 6/8 time, both in the key of F major. The top staff is for 'A Modern Messiah' and the bottom for 'Don't Fence Me In'. Red dashed boxes highlight a 5-note melodic fragment in each. In 'A Modern Messiah', the fragment is on the notes G4, A4, B4, C5, and B4. In 'Don't Fence Me In', the fragment is on the notes G4, A4, B4, C5, and B4. The two fragments are not aligned in time or pitch, illustrating the lack of congruence between the two works.

To illustrate the IC hypothesis in litigation, fig. 02 above is my transcription of one example from *Arnstein*, where Porter is accused of copying a 5-note melodic fragment from plaintiff's "A Modern Messiah" (1934) in his hit song "Don't Fence Me In" (1934). In preference to the rather chaotic and selective comparative methodology employed by *Arnstein* himself, I have aligned the melodies in proper context here, so that we can see that the 5-note fragment in question comes at a different point in the musical phrase, and in a different harmonic context, meaning that there are no congruent pitches anywhere between the works - not even the certainly-coincidental 5 pitches that *Arnstein* identifies. I have been rather generous to *Arnstein's* argument here, by transcribing both examples in 6/8 time (*FENCE* is originally notated in 4/4), in the same key, and removing the piano accompaniment, so we are left only with the simple topline on which plaintiff's argument was based.

In my view, *Arnstein's* approach, in all his lawsuits, represents outrageous methodological bias – he manipulates the musicology to support his complaint, rather than applying objective comparative analysis to test the likelihood of plagiarism vs IC. *Arnstein's* selective transcriptions are perhaps the most egregious examples of what *Leo* calls "a melocentric approach that privileged pitch and interval relationships over rhythmic context"⁴⁶. When comparative transcription is applied reductively enough, it is easy to find coincidentally similar short fragments of melody.⁴⁷

⁴⁵ "We found that courts' interest in prior art typically comes up where the plaintiff's claim centers on a short fragment, rather than on similarities that permeate the entire work." *Fishman and Garcia* (n 21) 25.
⁴⁶ *Leo* (n 5). I would like to thank Dr *Leo* for providing me with scans of the original *Arnstein* court documents, including the composer's own notes and comparative transcriptions.
⁴⁷ The level of reductiveness used in a court analysis is an acknowledged issue in copyright infringement suits; verdicts can turn on the extent to which the works are separated into their constituent elements, because "[to] dissect the works at issue into separate components and compare only the copyrightable elements... would result in almost nothing being copyrightable because original works broken down into their composite parts would usually be little more than basic unprotectable elements". *Boisson v. American County Quilts and Linens, Inc* (2001) 273 F 3d.

If such an obviously meritless case as *Arnstein* were to occur today (and the equally illegitimate claims against Katy Perry in *Gray* demonstrate that this is possible), I argue that defendants' musicologist would simply need to find the short melodic fragments from plaintiff's work in other works (ideally but not necessarily prior works) to demonstrate Independent Creation via the Prior Art Proxy. With such a simple pitch sequence as mi-re-do-re-mi found in Arnstein's "A Modern Messiah", this would be a simple matter. I offer the first five notes of the nursery rhyme "Merrily We Roll Along", for example.

Fishman & Garcia⁴⁸ provide an unprecedentedly detailed discussion of the development of prior art usage in music copyright litigation, including interviews with several currently active musicologists, and analysis of over 50 musicologist reports used in litigation. They posit that the use of prior art research is a relatively new practice, partly driven by the small number of forensic musicologists in the field, noting that: "Generally, it was the defendant's expert who defined the universe of prior art at issue. Plaintiff-side experts, by contrast, tended not to mention specific prior art references except to rebut what the opposing expert had argued."⁴⁹ I agree with their speculation about the reasons for the increased focus on repertoire research among defendants, the most important of which is that they serve to "evaluate whether [a musical] element is creative or mundane".

In the case of MW analysis, I posit that a prior art search is essential in evaluating whether a given similarity is due to IC or plagiarism. This is not simply to modulate substantiality, nor even to eliminate *scènes à faire* (which are often considered genre-specific)⁵⁰, but rather to test – and demonstrate – the extent to which IC is probable. If Song A contains a melodic fragment that appears in many prior works, this either supports a hypothesis that Songwriter A copied it from a prior source, or (more likely) that the fragment is *just the kind of thing songwriters do*, otherwise known as Independent Creation. And, of course, in either scenario, Song B would not infringe a copyright. To address the *scènes à faire* genre issue from the opposite perspective, if melodically similar ideas are found in several works in *unrelated* genres, we might reasonably infer that the similarity is coincidental precisely *because* these composers are unlikely to have had access to each other's work. I am aware that my view contradicts the oft-expressed view in copyright scholarship that prior art is irrelevant and unnecessary because of the high bar for infringement, but I suggest that melodic similarity is a special case, due to the prevalence of coincidental fragmentary similarity in music composition, particularly in pop songs. When coincidental similarity occurs through IC, prior art research is, I suggest, the most robust methodology for rebutting spurious accusations of infringement.

For a recent example of the effectiveness of prior art in support of an IC hypothesis, let us look at opposing views from two of the most popular music analysis YouTube channels – Rick Beato and Adam Neely – as they respond to the announcement of a lawsuit⁵¹ against pop songwriter Dua Lipa alleging that her song "Levitating" copied four

⁴⁸ (n 21).

⁴⁹ *ibid* 31.

⁵⁰ *ibid* 14.

⁵¹ *Christopher Edward Cope et al v Warner Records, Inc et al* [2022] District Court for the Central District of California, Western Division 2:22-cv-01384-SSS-AS.

bars of melody from an earlier song “Live Your Life”. Both YouTubers are accomplished musicians and songwriters, with comprehensive knowledge of music theory and pop repertoire. Beato does not mention any earlier works, and simply states “they’re virtually identical... what are the chances?”⁵²; Neely finds a number of antecedent equally similar melodies, and takes the opposite position: “Levitating did not come from Live Your Life [and] both songs draw on prior art... things that other musicians had done beforehand”.⁵³ The division could not be clearer; one analysis does not use prior art, and finds the melodic similarity to be clear evidence of plagiarism; the other finds the melodic fragment in prior art, and draws the opposite conclusion.

The Beato/Neely example demonstrates that plaintiff’s case can appear strong based on similarity alone, unless and until prior art demonstrates that the IC hypothesis is a more likely explanation for the similarity. A recent example of this scenario in litigation can be found in *Smith v. The Weeknd*⁵⁴, where defendant’s song “I Need To Love” was alleged to have copied a 3-bar melodic fragment from an earlier work “A Lonely Night”.

Fig. 03 - excerpt from musicologist report in *Smith v Weeknd*

Need To Love 0:18 G-7 C-

It's clear to me, get that fun-ny feel - ing when you're next to me_

Lonely Night 0:50 G-7 Ebmaj7

A lone-ly night, ba - by girl_ I loved you on a lone-ly night, oh_

In the initial complaint, plaintiff’s musicologist boldly stated [my italics] “In this investigation and analysis I have found substantial similarities that *in my opinion can only be the result of copying.*”

Given the subjectively surprising extent of the pitch-rhythm-harmony similarity in *Smith*, melodic plagiarism seems entirely plausible *until the prior art is considered*. One prior art example given by defendants for the non-originality of the phrase in bar 1 is the opening melody of Bond theme “The World Is Not Enough”⁵⁵ (“clear to me” vs “not enough”); an even more compelling example for the entire phrase is the bridge section of Blondie’s “Heart of Glass”, which apart from its major-key tonality, is otherwise almost identical to plaintiff’s “A Lonely Night” in pitch and rhythm.

⁵² *DUA LIPA VS REGGAE BAND LAWSUIT: Let's Compare!* (Directed by Rick Beato, 2022) <<https://www.youtube.com/watch?v=XT3DghWbk2A>> accessed 30 June 2022.

⁵³ Neely also speculates that “[plaintiff] probably couldn’t find a musicologist to go to bat for them”.

⁵⁴ *Smith v WEEKND* [2020] Dist Court, CD California CV 19-2507 PA (MRWx).

⁵⁵ I would also offer the opening 3-note melodic phrase from the verse of Delaney & Bonnie’s “Groupie (Superstar)” (1969), which uses the same pitches, rhythmic values, and underlying harmony in the first bar.

Fig. 04 - additional works cited in Smith v Weeknd (my transcription)

NEED
 It's clear to me_ get that fun - ny feel - ing when you're next to me_

LONELY
 A lone - ly night_ ba - by girl_ I loved you on a lone - ly night_ oh_

HEART
 In be - tween_ what I find_ is pleas - ing and I'm feel - ing fine_

WORLD
 The world is not en - ough but it is such a per - fect place to start my_

In fig. 04 above, I have transcribed⁵⁶ all four works mentioned in the case to show how defendants used prior art to demonstrate that the apparently striking similarity between plaintiff’s NEED and defendant’s LONELY was due to Independent Creation, and/or that both works could have used HEART or WORLD as inspiration. We can see that the similar line in bar 2 “get that funny...”/ “baby girl I...” is almost identical to the equivalent line in HEART (“what I find is...”).

Defendants admonish plaintiff’s expert for bad methodology: “Plaintiffs and their expert simply ignored the prior art that has the same or similar melody...”, and go on to assert that their own prior art search is evidence of IC: “Because the claimed similar melody appears in hugely popular songs before... I Need to Love, it very well also could arise [in I Need to Love and A Lonely Night] if the two works had been created independently.”

V. MUSIC PERCEPTION, FORMAL FALLACIES AND SOLUTIONS

I would argue that there are four reasons that the use of juries creates a finding-of-facts problem in music copyright infringement litigation. First, nonexpert listeners cannot easily distinguish between protectable and commonplace musical elements. Second, non-copyrightable musical characteristics – particularly key, tempo, and instrumentation –

⁵⁶ Transcription notes: In this transcription I have used plaintiff’s musicologist’s apparent methodology, of allowing for one-sixteenth note worth of leeway as the threshold for rhythmic congruence. I suggest his approach was rather generous to plaintiff; my own method would have been to identify only exact rhythmic matches (which would have resulted in a lower level of apparent similarity in the notation). As in plaintiff’s filing, my highlighted notes in red represent rhythmic and pitch matches with plaintiff’s song NEED. In the transcription of HEART (the earliest work of the four), I have also coloured one note in pink to represent the diatonically different pitch on the second syllable of “pleas-ing”, which is a semitone higher than that found in NEED due to HEART being in a major key and NEED being minor.

can affect the perceived similarity of two pieces of music⁵⁷. Third, when considering melodic similarity, it is all too easy to combine the base rate fallacy⁵⁸ with the prosecutor's fallacy⁵⁹ by underestimating how much music is generated⁶⁰, and therefore to misjudge how common a particular melodic fragment may be in music generally. And fourth, melody represents the lowest-bandwidth data in musical composition, meaning it is statistically prone to coincidental similarity and therefore IC.⁶¹ In each case, there is the risk that poor practices by expert musicologists – whether applied through bad methodology, or worse, deliberately manipulated in a hired-gun scenario – can sway a jury incorrectly in plaintiff's favour.

To counter these issues, the most important practical step that could be taken is a set of agreed replicable FM methodologies, combining objective comparison with prior art contextualisation, possibly managed by some sort of membership organization for FM practitioners. Such an organization could publish an ethics code, where musicologists would agree in advance with their clients (as some already do⁶²) to provide objective analysis, rather than support their clients' positions regardless. Most usefully, a raising of the *de minimis* threshold for melodic plagiarism (whether enshrined in copyright law, or more likely evolved through case law) would enable courts to avoid wasting time and money litigating specious complaints, particularly for the mostly meritless fragmentary melodic similarity cases that are so problematic for juries and defendants. Taken together, these steps would enable the courts to get back to preventing genuine music copyright infringement and would help creators to make new work, free of the ever-present threat of litigation. This worthy goal was recently summarised by Ed Sheeran⁶³, shortly after he prevailed against an opportunistic melodic-fragment plaintiff⁶⁴ in the UK's High Court in 2022. "It's really damaging to the songwriting industry. There's only so many notes, and very few chords used in pop music. Coincidences are bound to happen... and I hope that this ruling means in the future baseless claims like this can be avoided... Hopefully we can all get back to writing songs, rather than having to prove that we can write them." If Sheeran's wish is granted, this might result in more songs, less litigation, and fewer work opportunities for forensic musicologists like myself. I say this is a price worth paying.

⁵⁷ Lund (n 18).

⁵⁸ i.e. 'Failure to consider background information in situations in which it is actually very relevant'. Maya Bar-Hillel, 'The Base-Rate Fallacy in Probability Judgments' (1980) 44 *Acta Psychologica* 211.

⁵⁹ 'The prosecutor's fallacy occurs when someone incorrectly believes that the probability of a random scientific match is equal to the probability that the defendant is innocent.' Michael Conklin, 'The Effectiveness of Bayesian Jury Instructions in Mitigating the Defense Attorney's Fallacy' (2018) 9 *HLRe: Off Rec.* 73.

⁶⁰ Tim Ingham, 'Over 60,000 Tracks Are Now Uploaded to Spotify Every Day. That's Nearly One per Second.' (*Music Business Worldwide*, 24 February 2021) <<https://www.musicbusinessworldwide.com/over-60000-tracks-are-now-uploaded-to-spotify-daily-thats-nearly-one-per-second/>> accessed 7 July 2022.

⁶¹ It is interesting to observe that in more than 150 years of US case law, only a handful of plaintiffs have ever identified an exact-match melodic similarity of more than two bars of music.

⁶² 'As an expert witness, my charge is not to take sides in these debates, but rather to offer unbiased and objective analyses that attempt to keep these analytical strands separate and clear.' Stewart (n 27).

⁶³ *Ed Sheeran Statement in Response to His Victory in the UK High Court* (Directed by Ed Sheeran) <<https://www.instagram.com/p/CcANzfjjaHL/>>.

⁶⁴ *Sheeran, et al v Chokri, et al* [2022] UK High Court of Justice EWHC 827 (Ch.) (England).

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