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"Black-Boxed Disc Jocks: An STS Approach to DJ Performance"

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Σας ευχαριστώ όλους.

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1. Introduction

Figure 1. Davvinci is the star of the show. From Saturday Night Live, 2014.

The 2014 Saturday Night Live (SNL) digital short "When Will The Bass Drop" opens with a wide shot of a packed nightclub. A dancefloor full of adoring fans packed shoulder-to-shoulder cheers as an obnoxiously-coiffed DJ named "Davvinci" emerges onto a huge platform stage, raised well over the audience. As an electro-house track builds in the background, tight shots profile audience members fawning over Davvinci, who preens around the stage, pumping his fists and basking in the crowd's love. "This is the best day of my life!" says one fan. "This is music!" insists a second. Both exhortations read as dubious.

Mirroring the track in the background, the skit builds tension through its central conceit: directly below Davvinci's right arm sits a cartoonishly large, glowing red "BASS" button, which the performer repeatedly teases but stubbornly refuses to press. Rather, as the song's energy continues to build, Davvinci pumps up the crowd by waving his hands over his fancy tech setup in an apparent manipulation of the audio. Meanwhile, shots from behind Davvinci reveal that– below his stage wall and out of the view of the audience–he is doing everything *except* mind the music. Each component of his digital DJ setup gets its own parody: Davvinci is varyingly playing a video game on his laptop, frying an egg on his CDJ (the digital equivalent of a turntable), and operating a model train kit running through his expensive-looking audio mixer.

Finally, just as entranced fans begin throwing cash and jewelry at Davvinci, he hits the BASS button and releases the track's feverishly pulsating "drop."[1] Heads in the audience literally explode, blood gushing over the dance floor. In the conventional style of SNL, it is an at turns brilliant and ridiculous sendup of the ecstasy (both the chemical substance and the felt emotion) that radiates through the club at pivotal moments in the night.

2. Summary

The questions suggested by "When Will The Bass Drop" seem clear. The DJ is the center of attention; his name shimmers across a massive video screen behind the stage. But what exactly is he doing up there, if anything? How do we know that he's actually using all that fancy gear to mix the music? And if we don't know, why are we (the collective we of the audience) throwing so much money in his direction?

These questions can be understood as fundamentally problematizing the authorship of the DJ. The audience has paid to see what has been presented to them as *a performance by Davvinci*. But to what degree is Davvinci really responsible for the show?

Indeed, authorship has arisen as a critical line of inquiry in contemporary theories of the creative arts. The seemingly simple concept has proven itself to be ripe for deconstruction; although authorship has been debated for hundreds if not thousands of years, the mass reproduction and distribution inherent to the modern age puts extreme pressure on conventional theories of the canonical, individual author.

Since at least the 1967 work by Roland Barthes "The Death of the Author" (1967/1977), the academic literature contains a spirited debate on how authorship should be understood, if it is to be seen as a meaningful concept at all. Significant contributions to the academic literature have been made by household-name theorists, including Foucault and Bourdieu, and their influence tends to hang over subsequent writing on the topic. More recently, this conversation has expanded to discuss the authorship (or lack thereof) of DJs (Herman, 2006), again focusing on frameworks proposed by Foucault and Bourdieu.

[1] "Drops" (or "bass drops") refers to a common tactic in electronic music production and performance, in which lower sound frequencies are eliminated from the audio output for a period before being "dropped" back in suddenly for dramatic effect. This technique is discussed in further detail in Section 6.

This existing literature on authorship provides a helpful framework for responding to the serious questions prompted by SNL's absurdist short, but it also contains some gaps. Following as it does in the footsteps of Foucault and Bourdieu, extant discussions of authorship in DJ practice have focused on "social forces"–the peculiar arrangements of power, incentives, and most of all agency concentrated in the "social" world, which is to say the human world. These accounts focus on DJs, promoters, record label executives, audiences, etc., all of whom surely exert powerful influence on the way authorship is conceived for DJs. But these analyses fail to consider another critical force: the technology that is so central to DJ performance. Looking at "When Will The Bass Drop" from a slightly skewed angle makes this component immediately obvious; the whole skit revolves around the looming use of the "bass button." *How did a digital switch modulating lower-register frequencies accumulate so much power?*

This thesis will attempt to fill this gap in the literature by providing an account of authorship in DJ'ing that is situated in the STS tradition–focused on the "black boxes" that obscure the inner workings of this corner of the musical world. The potential for this approach is obvious: contemporary DJs literally stand in front of an array of black boxes (mixers, speakers, etc.), with audiences aware of the inputs (the physical gesturing of the performer) and the outputs (the sound emerging onto the dancefloor), but generally in the dark as to what's happening in between. But I will argue that black-boxing in the world of DJ performance is not limited to material technology: rather, a complex network of actors has coalesced to black-box the very idea of what a DJ *is* as a performer, and as a potential author.

This text will attempt to open those black boxes, and in doing so reveal the ways in which authorship is constructed (or not) for DJs. Leveraging an STS approach, centered upon Bruno Latour's actor-network theory, I will argue that the technology used by DJs is not inevitable; that it arose out of a specific set of historical contingencies; and that this technology creates the human world as much as it is created by it. I will detail the specific actor-network that birthed the modern DJ's technology setup, and how this network created the conditions for DJs to become authors. Moreover, I will argue that contemporary DJ technology acts on the human world in a particular and consistent way: by centering attention on the narrow subset of a DJ's skills which are culturally understood as conveying authorship, specifically mixing two or more tracks together, and actively concealing the DJ's remaining skills, which–while equally critical on the dancefloor–have historically positioned the DJ in a less authorial role.

I will supplement this theoretical work with primary research which demonstrates the ways in which technology acts upon DJ culture today. I propose that this lens will provide a fuller understanding of the construction of authorship in the context of DJ'ing, and may potentially be profitably applied to other creative fields, particularly those which are heavily reliant upon modern technology.

3. Research Objective and Approach

My research objective is as follows. I am attempting to add to the understanding of how authorship is constructed in DJ culture, by applying frameworks pioneered in the field of Science and Technology Studies to analyze the social construction of various DJ technologies, and the ways in which differently-networked instantiations of those technologies result in different cultural outcomes. As this is an inherently cross-disciplinary topic, over the course of this thesis I will review literature from a wide variety of fields and sources.

First, I will discuss the concept of authorship in DJ performance. I will begin with a very brief overview of broader academic theories of authorship, focused on Barthes, Foucault and Bourdieu, and then review how these ideas have been applied to date in the context of DJ performance.

Next, I will describe the STS approach, with a focus on Latour's actor-network theory. I will review how Latour's theory differs from other social constructionists (a group including David Bloor as well as Bourdieu) in rejecting the pat category of "social forces," insisting on a more symmetrical and more flat ontology in which humans and non-human objects are placed on equal footing. I will also provide a brief overview of the literature regarding applications of actor-network theory in the field of creative arts.

Next, I will provide an STS-flavored account of the evolution of DJ performance, in an attempt to trace the broad strokes of the DJ's transformation from anonymous technician to superstar performer. This overview will focus specifically on the evolution of DJ *technology*, and the ways in which these technologies contribute to the construction of authorship. In "An STS Approach to DJ History, Part 1" I will zoom in on the technological developments that emerged in the early 1970s New York disco scene, the actor-network behind those developments, and the effects the new technology had on the DJ's claim to author status. In "An STS Approach to DJ History, Part 2" I will discuss how the very *definition* of a DJ became black-boxed (in a similar process to the

emergence of a scientific “fact”), and how this “standard model” smooths over the highly contingent history and emergent possibilities of DJ performance.

Finally, I will connect the ANT framework directly to the debate around authorship in DJ’ing, by combining the theory described above with original empirical work. Pointing to media representations of how to “become a DJ” (“DJ tutorials”), I will demonstrate that contemporary discourse accepts and promotes the black-boxed definition of the DJ, which reduces the art form to the single skill of mixing music using purpose-built technology. In my Conclusion I will leverage this finding to explore how the same networks of human and technological actors that helped DJs acquire authorship place heavy constraints on the current expression of DJ performance, leading to the type of absurd outcomes that are skewered in “When Will The Bass Drop.”

4. Authorship

The focus of this thesis is the construction of authorship in DJ practice. Rather surprisingly given its relevance in popular culture (as evidenced by *When Will The Bass Drop*), this topic has received relatively little academic attention. This section will thus begin with a brief overview of authorship as a notion throughout intellectual history, before proceeding to a summary of the recent academic debate on authorship among several prominent theorists. I will then review the one major published paper that takes on the specific question of authorship in the world of DJ’ing.

4.1 A History of Critical Approaches to Authorship

Debates over authorship–both what it means and to whom (if anyone) it should be granted–have persisted over much of recorded human history. In Hellenic culture, authorship was seen as alternatingly inspirational or imitative (Burke, 2008, p.5). In the inspirational view, poets were understood as mouthpieces or prophets, merely reflecting through their poetry that which originated from the Muse. In the imitative notion–put forward among other places in Plato’s *Republic*–the artist is seen as copying an objective reality, or following carefully delineated rules of established technical systems, more a craftsperson than an innovator. In both of these conceptions, authorship is meaningful, but in neither would the author be imbued with a sense of creative genius, or even necessarily original composition.

The rise of Christian culture brought a remix of sorts of the inspirational view: biblical texts were seen as directly reflecting the Scriptural truth from an all-knowing God, passed to the Evangelists through the Church Fathers (Burke, 2008, p.7). Once again, the authors were privileged with *auctoritas* (authority) from a divine God, but denied any credit for individual originality. This view prevailed in 12th-century medieval European academies; as God was seen as the provider of divine inspiration for all Scripture, the author (or *auctor*) was viewed as a sign of authority, not literary responsibility (Minnis, 2010, p.5). But by the thirteenth century, European scholars were becoming more interested in the human element of authorship. Inspired by Aristotle's philosophy of "four causes" (efficient, material, formal, and final; the human author was seen as the efficient cause of the text), these medieval academics took a more literal view of the Bible, which called for a more literary view of Biblical texts, and a more substantive role for the human author of those texts (Minnis, 2010).

By the eighteenth century, the British poet Edward Young was beginning to establish the notion of individual genius. In his *Conjectures on Original Composition*, Young argued for a genius that comes from within, an "inner God" in contrast to past conceptions of divine inspiration from above. Young contended that great works could only be achieved through the *negation* of technical systems, rebuking Plato's view of the artist as imitative craftsperson (Burke, 2008, p.8). This vision reached maturity in Freud, who "affirmed that the voice of the other is that of an individual unconscious built from buried childhood memories and repressed drives" (Burke, 2008). By locating authorial motivation within the author, and explaining this motivation purely through individual experience, Freud set the stage for today's lay vision of the canonical author operating as a creative genius.

That vision became subject to intense academic scrutiny in the post-war twentieth century, beginning in particular with Roland Barthes' *Death of the Author*. In this brief but highly influential 1967 essay, Barthes sets out to annihilate any meaningful conception of the author. Already in his first paragraph he makes his point very clear: "Writing is the destruction of every voice, of every point of origin. Writing is that neutral, composite, oblique space where our subject slips away, the negative where all identity is lost, starting with the very identity of the body writing" (Barthes, 1967/1977, p.142).

Barthes continues by drawing a direct line between the naive view of authorship and capitalist logic. Here Barthes portrays the notion of author as subject as essentially a rhetorical trick, an attempt to anthropomorphize creative work so as to generate humanist or capitalist value:

> The author is a modern figure, a product of our society…it is thus logical that in literature it should be this positivism, the epitome and culmination of capitalist ideology, which has attached the greatest importance to the 'person' of the author. The author still reigns…in the very consciousness of men of letters anxious to unite their person and their work. (Barthes, 1967/1977, p.143)

Barthes vehemently rejects this attempted sleight-of-hand, which would position the author as the direct cause of the work and thus the logical recipient of its fruits. He instead reverses the causal relations, framing the author as the result of the writing:

> The Author, when believed in, is always conceived of as the past of his own book: book and author stand automatically on a single line divided into a *before* and an *after*. The Author is thought to nourish the book…the same relation of antecedence to his work as a father to his child. In complete contrast, the modem scriptor is born simultaneously with the text…there is no other time than that of the enunciation and every text is eternally written *here* and *now.* (Barthes, 1967/1977, p.145)

In other words, for Barthes, there is no canonical author (a single person wholly responsible for a work) and presumably no canonical text (in the sense of something definitive and delimitable standing alone outside of any particular context), so there is no fixed intention and no readily available "meaning" in a text. Only writing (and reading) exist, as performances in the current moment, as opposed to stable artifacts persisting in eternal time.[2]

Barthes concludes with a brief section on the topic of originality, which he unsurprisingly rejects. Rather, he sees a text as a "tissue of quotations" drawn from "the innumerable centres of culture," and its writer as an "eternal copyist," whose only power "is to mix writings, to counter the ones with the others, in such a way as never to rest on any one of them" (Barthes, 1967/1977, p.146). Strikingly, Barthes portrays the writer as something very close to a DJ, collecting and mixing a pastiche of cultural experiences into a "set," and creating in the process the impression of a novel and unified whole.

[2] This notion of constant construction and reconstruction in the moment will be relevant to our later discussion of Actor-Network Theory.

The Death of the Author had a huge impact, becoming a central point of reference for a whole era of theory (Burke, 2008, p.100). Only two years after its release, Barthes' essay prompted a response from Michel Foucault, entitled *"What is an Author?"* (1969/1998) Where Barthes saw the concept of author as illusory, a ghost to be exorcized, Foucault takes a more circumspect view.

In *What is an Author*, Foucault opens with an observation that sounds like it could have come from Barthes. "Writing…is primarily concerned with creating an opening where the writing subject endlessly disappears" (Foucault, 1969/1998, p.301). But he quickly pivots; where Barthes contested the existence of the author, Foucault wants to problematize it:

> It is obviously insufficient to repeat empty slogans: the author has disappeared; God and man died a common death. Rather, we should reexamine the empty space left by the author's disappearance…In this context we can briefly consider the problems that arise in the use of an author's name. What is the name of an author? How does it function? (Foucault, 1969/1998, p.303)

Foucault's answer is that authorship is the result of *discourse*, situated in society. Reflecting on the author as a name, he observes that "a number of texts [attached] to a single name implies [relationships] of homogeneity, filiation, reciprocal explanation, authentification, or of common utilization…the author's name characterizes *a particular manner of existence of discourse*…regulated by the culture in which it circulates" (Foucault, 1969/1998, p. 304; emphasis added). Foucault notes several patterns that structure the discourse creating authorship in the culture he is analyzing. Most relevant to this thesis, he portrays this discourse as fundamentally appropriative; Foucault observes that authorship only came to be seen as the driving force behind literature when strict copyright rules were established, creating a financial incentive for a strict demarcation of authority.

Foucault's analysis received a direct response from Pierre Bourdieu, albeit over a decade later. In his 1983 essay *The Field of Cultural Production, or: The Economic World Reversed* (Bourdieu, 1983/1993a), Bourdieu notes that Foucault, in his focus on "the field of discourse … refuses to relate works in any way to their social conditions of production, i.e. positions occupied within the field of cultural production." (p. 33) Here Bourdieu agrees with Foucault's constructionist approach to cultural production (in this case authorship), but disputes the basis of that construction. For Bourdieu, authorship is not a matter simply of discourse (even if

Foucault acknowledges social forces acting on that discourse, for example in his claims about appropriation). He explains later in the essay:

> Given that works of art exist as symbolic objects only if they are known and recognized … as such, the sociology of art and literature has to take as its object not only … the direct producers of the work in its materiality (artist, writer, etc.) but also *the producers of the meaning and value of the work–critics, publishers, gallery directors and the whole set of agents* whose combined efforts produce consumers capable of knowing and recognizing the work of art as such. (p. 37, emphasis added)

Bourdieu frames authorship thus as a joint construction — not only a function of the behaviors of the individual artist or writer, but rather the result of the social conditions holding on the whole chain of actors working in the field of cultural production. Notably, while Bourdieu expands on Foucault's discourse-driven view of construction to include the roles of economic actors, he nonetheless limits his analysis solely to human agents; gallery directors must be assessed but not galleries, publishers but not printing presses.

Bourdieu expanded on this position in a second essay published three years later, entitled *The Production of Belief: Contribution to an Economy of Symbolic Goods* (Bourdieu, 1986/1993b). In this piece, he is even more explicit about how authorship is created: first and foremost, through the self-interested behaviors of the "cultural businessman" (p. 76). For Bourdieu, these dealers, publishers, and theater managers directly imbue more traditionally creative actors (i.e., writers and painters) with authority through a process of "symbolic banking," in which the businessperson's symbolic capital is invested in the rising artist for the purpose of establishing that artist's cultural legitimacy, which can later be exploited for economic gain (pp. 77-78). If the process is successful, the businessperson receives symbolic credit for "discovering" a transcendent talent, which can later be reinvested in the *next* round of artists, continuing the cycle of economic profit through exploitation of symbolic capital. Along with businesspeople, Bourdieu acknowledges critics and even the lay public as participating in this process of symbolic banking, but again does not acknowledge any role for non-human actors.

4.2 Authorship in DJ Practice

Of course, the academic literature contains a great deal more analysis of the concept and practice of authorship; however, for the purposes of this thesis we will conclude the general overview of authorship here. Next, we will move to a review of the academic discourse on authorship in the specific field of DJ practice. Here the literature is considerably more concise: in

fact, a comprehensive search returned only one article focused on the topic of authorship among DJs: *Scratching Out Authorship: Representations of the Electronic Music DJ at the Turn of the 21st Century* by Bill Herman (2006). This text will be my primary reference point in constructing my own STS-flavored account of authorship in DJ culture.

Herman begins his analysis by introducing the same influential works by Foucault and Bourdieu that were described earlier in this paper. He also summarizes Will Straw's (1999) essay on authorship in popular music, which details the complicating impact of disco on authorship in pop music: as disco tracks were often mixed one into another, and in any case were sonically more focused on a beat than a vocal performer, the genre placed pressure on the notion of an individual artist as the author of a musical work (Herman, 2006, p. 4; Straw, 1999, p. 205). Herman, who was an active participant in the early-2000s American rave scene, continues with an ethnographic account of 15 artifacts from that era, including flyers, mix CD's, magazines, and gear catalogs. He finds that DJs are clearly presented as original creators of the highest order– indeed, as "musical author-gods." (Herman, 2006, p. 8) Herman also notes that "the DJ is presented as the culmination of rapid technological development;" concert flyers describe DJ tech setups in detail, and catalogs "define the art of the DJ as virtually coextensive with purchasing the DJ's technological wares." (Herman, 2006, p. 9)

Herman leverages these artifacts to extend Foucault's analysis of authorship directly to DJ practice. Referencing Foucault's invocation of *discourse* as the prime mover of authorship, Herman notes that "the DJ gets his authorship largely via specific discursive mechanisms such as flyers and CD packaging" (p. 13). But ultimately Herman sides with Bourdieu, drawing an explicit parallel between the dealers that turn artists into authors, and the promoters and record companies[3] that do the same for DJs. Herman argues that the rise of the DJ can be best understood as the result of social forces, most of all capitalist profit motive. More specifically: in his view, labels and promoters stepped in to imbue DJs with authorship at the precise moment that disco was shifting the economic structure of pop music, de-emphasizing performers and leaving the aforementioned moneyed interests with no one to promote (p. 14). DJs slotted conveniently into this gap, were granted authorship by the capitalists, and rose to cultural prominence.

[3] It is notable that writing in 2006, Herman places significant emphasis on DJ-driven mix CD's, which were a viable source of income for record labels at the time. Within a decade this revenue stream would be almost completely gone, replaced by streaming DJ mixes (often hosted for free on sites such as SoundCloud and MixCloud), but the DJ's cultural ascension continued unabated.

Interestingly, Herman follows his theoretical affirmation of Bourdieu with a nod to the role of technology in the rise of the DJ: “Consider, for instance, the technologies and practices of the DJ…the increasingly sophisticated mixing deck and variable speed turntable, and the corresponding practice of sustained, complicated mixes” (p. 15). But for Herman these technologies remain passive objects; in his Bourdieuian worldview, there is no room for technology as a subject, capable of exerting its own impact. In the remaining text of this thesis, I will challenge this view, arguing instead for a more Latourian approach in which technology exists in a flat ontology with humans, acting on its own as part of complex networks to build the emergent material world.

5. STS, Actor-Network Theory and Applications in the Creative Arts

As a creative field, DJ’ing is a near-perfect encapsulation of our modern technological age. Perhaps more than any other form of mainstream artistic performance, DJ’ing is impossible to separate from technology: performers use complicated mechanical or digital hardware to play vinyl records or digital files, recorded in distant studios, mass-produced in distant warehouses or transmitted through online networks. These reproductions of past performances (“tracks”) are then mixed in real-time with yet more hardware which has been carefully designed to filter certain frequencies, change pitch and tempo, and apply effects, before finally being transmitted to listeners through sound systems that can be so sophisticated that they require their own team of engineers and technicians.

If DJ’ing stands out among the creative arts for its reliance on technology, it is quite at home in the broader fabric of our modern life. We live in a world that is undergirded at every step by extremely complex science and technology, the inner workings of which are utterly opaque to the average citizen: smartphones and social networks, vaccines and gene treatments, facial recognition and drone warfare. For those trying to make sense of this modern life, this opacity presents significant challenges. In order to understand today’s society, we must make the world of science and technology more transparent, which is to say that we must reveal in precise detail the *cultural* arrangements that lead to the production of these intellectual and material products.

Science and Technology Studies (STS) is an interdisciplinary field that arose in the 1960s and 1970s to attempt to add to this understanding. STS emerges from a core assumption: that

science and technology are fundamentally social activities (Sismondo, 2010, pp.10-11). In other words, the work of scientists and technologists–whether it be theoretical physics, cancer treatments, or audio equipment–is delimited by the properties of idiosyncratic and ever-evolving communities, which set the cultural standards and provide the ecosystem of resources for that work. This assumption cuts against many lay visions of science and technology: for example, that their outputs are derived entirely from "nature," that they move linearly over time in the direction of "progress," or that they are guided by stable scientific or technological "methods" that can reliably turn nature into knowledge and knowledge into artifacts. To the contrary, STS views science and technology as active processes that are continuously constructed (and re-constructed) in social settings (Sismondo, 2010, p.11). Exactly *how* those processes (and the resulting theories and artifacts) are constructed is STS' primary subject of inquiry.

5.1 A Brief History of STS

STS is a rich interdisciplinary practice with a wide range of theoretical and methodological approaches, and a full review of its history is not feasible here. However, a handful of theories have arisen as major touchpoints within the field; two of the most prominent such theories are Social Construction of Technology (SCOT) and Actor-Network Theory (ANT). I will briefly introduce both of these frameworks, each of which has obvious application to the question of authorship construction in DJ practice.

SCOT emerged out of an international workshop in 1984, but its intellectual foundations were rooted in the "Strong Programme" in the sociology of knowledge (often abbreviated as SSK), an early influence on the field of STS (Pinch & Bijker, 1984; Bijker, 2010; Sismondo, 2010; Amsterdamska, 2008). The Strong Programme, associated with the "Edinburgh School" and in particular David Bloor (Bloor, 1991), insisted on the principles of impartiality and symmetry in analyzing the production of scientific belief: "In investigating the *causes* of beliefs, sociologists should be impartial to the *truth or falsity* of [those] beliefs" (Pinch & Bijker, 1984, emphasis added). In other words, *accepted* scientific beliefs–those which we hold today to be true, like the theory of conservation of energy–should be understood as socially constructed just as much as theories that we've rejected, such as phrenology. The Strong Programme represented a radical departure from more traditional, realist notions of the philosophy of science, which explained discarded theories with social logic while assuming that accepted theories won out by virtue of their fundamental correctness.

SCOT applied the same symmetrical analysis to technological artifacts. By insisting on unraveling the social construction of both failed *and* successful technologies, SCOT rejected out of hand prevailing theories of technological determinism–the notion that certain technologies gain prominence or otherwise win in the marketplace because they are objectively superior (Mitcham & Waelbers, 2009). Rather, SCOT asks that we carefully investigate the social factors at play in the evolution of any given technology to understand why that technology ultimately emerged, and to whose benefit.

In their seminal paper *The Social Construction of Facts and Artefacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other* (1984) Trevor Pinch and Wiebe Bijker (considered SCOT pioneers) use a detailed case study of the development of the bicycle to illustrate this theory.[4] Their analysis demonstrates that the modern bicycle did not emerge out of a linear "march towards progress" in which the technology incrementally improved through a stable process of problem-solving innovation. To the contrary, the history of the bicycle should be understood as social at every step, with its various designs following a windy and unpredictable road shaped by numerous cultural pressures, including gender roles, market forces, and patent disputes. The "standard" design of the bicycle that is familiar today is not then inevitable; rather, it is the result of a highly contingent set of historical factors that could well have produced an entirely different outcome with only a small change in circumstances.

The Strong Programme's commitment to the social construction of science in all circumstances, and SCOT's extension of this approach to technological artifacts, run parallel to Bourdieu's invocation of social forces in the production of authority in the creative arts. Just as Bourdieu traced the chain of art dealers, critics, and consumers who come together to manufacture an artist imbued with authority (always under the pressures of a capitalist system), Pinch and Bijker detail the various groups of engineers, consumers, and outside influences that weighed on the unstable and highly contingent development of the bicycle. In hindsight, with the matter settled, both processes appear neat, linear and obvious: a precociously brilliant artist is discovered by a dealer with an eye for talent, who propels the artist to fame; a number of early experiments with bicycles result in the best design being identified and selected as the standard model. But in reality, the final outcomes are not simply a matter of a superior talent or design rising to the top,

[4] This case study demonstrates that the bicycle went through many forms, each of which had its own advantages and disadvantages–for example, speed vs. safety. The "winning" model was not somehow objectively technologically superior, but rather more in line with prevailing cultural preferences.

but rather complex and contingent results guided by social forces, to the benefit of some and the detriment of others.

The Strong Programme, SCOT, and Bourdieu share another commonality: they both see the processes described above as existing fully in the human world. In explaining the acceptance of a scientific theory, or why a bicycle gained its current form, or the preeminence of an artist, we are asked to examine *social* forces–that is, the forces produced by the structure of the macro-level relationships holding in human societies. In analyzing a given technology or cultural production, one might point to different relevant social forces–class relations here, gender issues or racial discrimination or theological conflict there. But in all cases, the forces at play are assumed to be broadly applicable and relatively stable, and the actors that shape those forces are assumed to be human beings.

These assumptions were challenged by a subsequent school of thought emerging out of the STS discipline, Actor-Network Theory. Developed by Michel Callon, Bruno Latour and John Law in the late 1980s (Sismondo, 2010, pp. 81-82), ANT was revolutionary in taking the principle of symmetry one step further, by applying it directly to the Strong Programme and SCOT's concept of "social forces." To ANT's founders, these previous attempts at symmetrical analysis were in fact completely asymmetrical: they eliminated "nature" as the prime mover of science, but replaced it with "society"–only kicking the can down the road. If we explain science with social forces, how then do we explain social forces? (Latour, 1992)

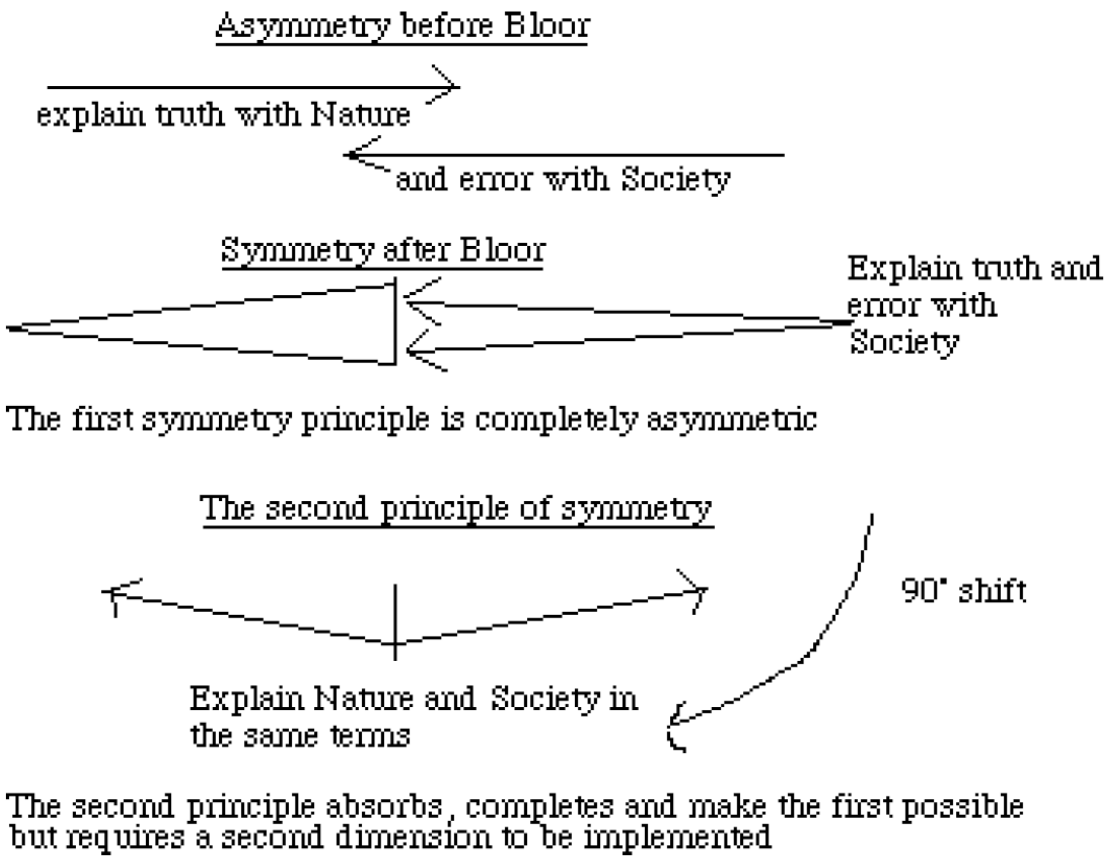

Figure 2. Bloor and Law's "Second Principle of Symmetry". From Latour, 1992.

ANT demanded that society itself be deconstructed, dispensing with notions of stable social forces that could reliably be used to explain scientific or technological outcomes. It envisioned a truly symmetrical analysis as describing the workings of a concrete network of actors, zooming in on micro-level relationships to better understand each specific situation–replacing the broad "social" with the vagaries of the narrow material world (Sismondo, 2010, p. 82). This "one more turn after the social" (Latour, 1992) proposed a radically flat ontology: it eliminated polarized notions of science as object, and nature (in the realist worldview) or social forces (in the Bloor/SCOT worldview) as subject. For ANT, there exists neither a stable nature nor society, neither a stable subject nor object. All that remains is a network of forces acting upon each other in a non-linear web of associations.

ANT proposed an additional revolutionary idea. The networks of actors that produced scientific and technological outcomes were not limited to humans: they could include effectively anything with the capability to act, including laboratories, microscopes, electrons, and so on (Sismondo

2010, p. 81). Indeed, Latour and his fellow theorists represented non-human actors as having "interests"–not conscious *intentions*, but simply some background force compelling them to act. For example, bacteria in a petri dish in a scientific laboratory might be considered actors in a network, with an interest in replicating–and depending on the arrangement of the network, the bacteria might "associate" with a chemist who places sugar in the dish. The resulting growth of the bacteria would not be *explained* in an ANT analysis as the result of broad social forces motivating the chemist or funding the lab. Rather, it would be *described* via an in-depth analysis of the particular set of circumstances in which the bacteria's interest in rapid replication was facilitated by the idiosyncratic interests of the chemist (mediated by the operating hours of the laboratory and so on), as well as the ways in which the bacteria's subsequent replication acted on the chemist and modified his or her interests. At various times the actors in the network may be seen as subjects, objects, or both simultaneously, and there is no meaningful distinction between humans and non-humans.

ANT's flat ontology and its associated methodology of in-depth network description has been highly controversial within the STS field, even generating a direct response from Bloor, bluntly titled *Anti-Latour* (1999). Nonetheless, since the release of Latour's *Science in Action* (1987), ANT has dominated theoretical discussions in STS, and is considered the discipline's best-known theoretical achievement (Sismondo, 2010, p. 92). *Science in Action* was also responsible for another major development in the history of STS–the coining of the term "black boxes." Latour introduced this term to refer to networks of actors that have crystallized in such a way that they become taken for granted, fading into the background fabric of daily life. In black-boxed systems the inputs and outputs are observable, creating predictable behavior, but the path from A to B is neither known nor considered, simply taken as a given. This combination of reliability and opacity creates an illusion of inevitability, as the system's complex and contingent history (and potential real-world alternatives) are obscured from view. Examples of black boxes can include artifacts, like Pinch and Wijber's "standard" bicycle or certain algorithms powering social networks, but also "facts" like accepted scientific theories or even the definition of the moment of death (Sismondo, 2010, p. 120). This terminology has become so widespread that STS practitioners now commonly use "opening black boxes" as a shorthand for their work.

5.2 STS Approaches to the Creative Arts

Outside of STS, ANT has generated significant interest and research attention, prompting thousands of published papers in fields as diverse as education (Fenwick & Edwards, 2010) and

accounting (Justesen & Mouritzen, 2011). A robust search turned up a small body of work attempting to apply ANT analysis to the creative arts, but only one published work to date applying ANT to the practice of DJ performance. I will briefly summarize two papers addressing ANT in the field of music scholarship, which are not intended to be representative, but merely relevant to the topic of this thesis. In addition, I will review the one existing ANT treatment of DJ culture.

In his article *From ANT To Pragmatism: A Journey with Bruno Latour at the CSI* in the journal *New Literary History*, noted sociologist of music Antoine Hennion (2016, translated by Stephen Muecke) traces a decades-long journey of applying his colleague Latour's ideas to culture more broadly, and music specifically. Opposing ANT with the Bourdieuian constructionism leveraged by Herman (2006), Hennion makes the case for music as an actor, not merely an object of human social forces:

> For anthropologists and sociologists, culture is defined as humans collectively projecting their social relations onto arbitrary objects. Durkheim propped up this view with a positive definition of society, Bourdieu repeated it by reversing the idea, turning it into a foundational mechanism for negating social domination: cultural objects are totems, pure signs pertaining to a code, which, on top of everything, doesn't know itself to be one . . . . We rejected this commonsensical notion. Music does something other than what the humans gathered around it would like it to do, something other than what they have programmed. This is why they listen to it; it is not their double, nor the mirror of their vanity. "Made" the way it is, it has its own capacity to act. It forges identities and sensibilities; it does not obey them. It does act (fait oeuvre) in this sense. (Hennion & Muecke, 2016, p.294)

Hennion takes Bourdieu to task for turning cultural objects–which would presumably include concepts such as authorship–into nothing more than "totems…inert symbol[s] of a purely social collective," comparing this move to turning "the social into a scientific object and attribut[ing] the study of it to himself" (Hennion & Muecke, 2016, p. 298). He proposes a different mode of analysis for music and culture, in line with the framework of ANT:

> "Why not treat the objects in question in the same way that Bourdieu constantly does with regard to bodies, collectives, or apparatuses…why not see them as beings in formation, open, resistant, that make each other, in a reciprocal fashion, acting reflexively on those who cause them to come into being?" (Hennion & Muecke, 2016, p.299)

Concluding, Hennion makes a subtle point that relates to the previously discussed debate on authorship. “Whether it is a popular song, a contemporary art installation, an opera aria, or a painting, once a work is created, it escapes from its author, it resists, it has effects or it doesn’t. These effects change according to circumstance; the work lives its life” (p. 302). Though he doesn’t go in this direction, Hennion’s observation could just as well be reversed: once an author has been created, it escapes from its work; it has effects or it doesn’t; it lives its life. I will return to this idea and its relevance to DJ performance later in this thesis.

The second work I will review here is Mads Krogh’s (2018) article *A Beat is a Hybrid: Mediation, ANT and Music as Material Practice*, published in a special double issue of *Contemporary Music Review* focused on questions of mediation in music. In this paper Krogh conducts a fascinating review of three parallel strands of theoretical research: the “micro-sociological re-conceptualisation of Adornian materialism” as put forward by Tia DeNora, the ANT approach to music of Hennion (discussed above), and perspectives on time and temporality developed by Georgia Born. Rather than summarize the entire article, I will focus on two elements that are of particular relevance to this thesis.

First, in his discussion of ANT, Krogh provides an example of black-boxing that directly relates to the question of authorship. He calls to our attention the periodic releases by record companies of products marketed as “The Complete Works” of composers such as J.S. Bach. Krogh uses an ANT approach to demonstrate that what is presented as a settled question, a fact–the authorship of Bach and the canon of works attributed to this author–is actually a highly contingent matter, mediated by a wide network of associations:

> While issues of authorship can be highlighted, for example, in liner notes, the very notion of The Complete Works elides the multitude of issues pertaining to whether Bach’s production may, in fact, be reasonably regarded as a collection of musical ‘works’ (in the modern, romantic sense of the word)...the vast, underlying network of music historiography (involving manuscripts, biographies, Bach Societies, scholars, and so on) is bracketed to support a coherent notion of Bach’s oeuvre—although from time to time or in certain contexts, the network may manifest itself in disputes over, for example, the extent to which Bach’s second wife, Anna Magdalena, contributed to his production. (Krogh, 2018, p. 537)

This example provides a helpful signpost for thinking about the black-boxing of authorship in other, less-stable corners of the musical world–namely DJ performance. Precisely this analysis is the intended contribution of this thesis.

For his part, Krogh concludes his paper with a case study, attempting to put the ANT methodology directly into practice. He profiles a Danish hip-hop musician known as DJ Static; although Static is a highly regarded DJ, Krogh's analysis is focused on his work as a beat producer. This work takes place in Static's home studio, which is the setting for Krogh's case study.

Through an ethnographic process, Krogh reveals how Static's beat-making is influenced by a network of mediators within his studio, largely composed of non-human actors: "Static's studio is teeming with stuff: furniture, instruments, computers, turntables, records, CDs and movies, posters, magazines, a vocal booth, and so forth" (Krogh, 2018, p. 541). Krogh describes how the aesthetic and functional design of the studio impacts Static's work: the record rack should feature visually interesting album covers to inspire creativity; the furniture should not block the way to the equipment. Then he details Static's use of technology in his production work:

> Static uses a digital sampler (a HALion) in connection with the music-editing software (Nuendo) in which he constructs his beats. When he 'put[s] it up', quite literally, he makes the sample appear as an object in the program's project editor interface. Here, with the aid of keyboards or other samples, metric and tonal paradigms are added—e.g. a track with a quaver hi-hat—allowing Static to locate the sample's pace and tonal material…However, this search is constitutive and relies again on a sort of attunement, as the sample is aligned with metric and tonal paradigms, i.e. the standards with which he 'measures'. (Krogh, 2018, p.544)

Krogh paints a picture of a musical work environment that is highly contingent, and continuously mediated by a multitude of small interconnected details. Static's beats might turn out quite differently depending on the album art he's facing, or the timbre of a particular sample selected almost at random, or the recent update (or lack thereof) to his production software. Broader social factors might still be at play; this analysis does not preclude the impact of economics or gender. But Krogh's ANT analysis attempts to describe the moments in which Static's work is conducted and re-conducted at a much more granular level of detail, enabling the analyst to observe the precarity of these associations, the ways in which the final product might end up differently than it ultimately does.

Finally, I will briefly summarize the one extant published work explicitly tying ANT to DJ performance: Jonathan Yu's (2013) chapter entitled *Electronic Dance Music and Technological*

Change: Lessons from Actor-Network Theory from the excellent handbook *DJ Culture In The Mix*. Yu's work is centered around interviews he conducted with seven DJs in Melbourne, Australia in 2011. The interviews primarily focus on the role of technology in DJ practice, and specifically how various types of emerging technology (laptops, auto-sync functions, etc.) contribute to controversies in the field–namely leading to more accusations of "cheating" (automating away beatmatching or other DJ skills) and "stealing" (borrowing a sample from a song or an entire set progression from a DJ without permission). The interviews also reveal pervasive "othering" of less experienced performers on the scene, who are more likely to be performing with newer technology.

Yu notes that the naive analyst might conclude that emerging technology is prompting a "redefinition of the concept of DJing" (Yu, 2013, p.164). But he is skeptical of this approach: "Instead I suggest that DJ/ producers are *constantly* redefining electronic dance musicianship through their practices and authenticating discourses; hence, there are no 'natural' practices that are intrinsically more legitimate than others" (Yu, 2013, p.165; emphasis added). Yu's invocation of ANT throughout the rest of his chapter is focused on disputing this notion of the natural–the assumption that some DJ practices are more "real" or authentic than others. To the contrary, he claims, the controversies around authenticity should be understood as "as part of a series of relationships between heterogeneous elements (people, technologies, practices)...manifest[ing] themselves in particular arrangements and…through specific points of reference" (p.170).

Yu makes a valuable contribution in that he suggests the presence of a black-box in what he refers to as the "technocultural norms" of DJ'ing. However, his chapter stops short of opening that black box; he does not conduct the type of in-depth analysis that would reveal the inner workings of these networks. In this thesis, I will attempt to build on the work of Yu–and Hennion and Krogs–by conducting this analysis, which I believe demonstrates that one primary outcome of contemporary actor-networks in DJ performance is the construction of authorship for certain types of DJs. I will then leverage this finding to connect the theoretical work of Latour to the long line of scholarship around authorship represented by Barthes, Foucault, Bourdieu, and in the world of DJ performance Herman. My intent is to demonstrate that ANT and the broader STS toolbox can be profitably applied to the creative arts and perhaps beyond, enabling higher-fidelity descriptions of social construction as an emergent phenomenon.

6. A Brief History of DJ Practice

Needless to say, time and space constraints do not allow here a full exploration of the history of DJ'ing. Nonetheless, in this section I will attempt to trace the early evolution of the DJ as a performer, hewing to two focal points. First, I will pay close attention to the various technologies used by DJs in the formative years of the practice, noting both the contexts in which these artifacts were developed, and the ways in which they impacted the medium. And second, I will describe the evolving public *understanding* of the DJ, particularly the degree to which they have been seen as authors, creative artists in their own right.

The origins of the term "disc jockey" are debated (Brewster & Broughton, 2014, p. 36), but the earliest known printed usage of the term came in a 1941 edition of *Variety* magazine, referring to radio hosts who spun shellac 78rpm records ("discs") (Fisher, 2007, pp. 9-11). In his comprehensive history of radio and radio DJs *Something in the Air: Radio, Rock, and the Revolution That Shaped a Generation*, Fisher (2007) notes that–foreshadowing the debates that were to come about liveness, authenticity and authorship in DJ culture–a prominent 1940's New York radio DJ named Martin Block would introduce recorded music with live vocal segments, misleadingly implying that the music from the record was being played live in studio. Fisher also notes that–again foreshadowing–for audiences, the liveness or lack thereof was hardly the point. Rather, listeners "connected" with the "fresh and personal" sound of Block's show, exemplified by his nightly signoff, "For you and you, and *especially* for you" (Fisher, 2007, p.12).

This form of DJ'ing, centered around hosts selecting (or giving the impression of selecting) "hot" records for the benefit of a radio audience, has its own long and storied history, with peaks and valleys in cultural relevance, and a variety of scandals (Fisher, 2007; Lee Cooper, 2007). But the DJ'ing explored in this thesis, while sharing the same name and certain similarities, is a different practice with its own history, centered not around the radio, but the dancefloor. This style of DJ'ing is notable in that it takes the form of a musical performance medium; radio DJs *introduce* tracks, but club DJs *perform* them (Brewster & Broughton, 2014, p. 17). How this notion of performance is constructed will be a primary topic of consideration for this thesis.

Brewster and Broughton (2014) trace the origins of the club DJ in their indispensable text, *Last Night a DJ Saved My Life: The History of the Disc Jockey*. They find the first such performer in World War II era Leeds, England:

> An eccentric young entrepreneur decided the public might pay money to hear recorded music. Why not, if it meant wartime West Yorkshire could swing to big American stars like Glenn Miller and Harry James?
>
> 'Today it's a startling admission,' says Jimmy Savile, 'but back then nobody even conceived of it. People just didn't think of dancing to records.' (Brewster & Broughton, 2014, p. 52)

Savile would later rise to prominence as one of, if not the most beloved music personality in Britain; in 1990 he was knighted (The London Gazette, 1990) after repeated lobbying by Margaret Thatcher (Brown, 2013). Later still he was revealed as a serial sexual predator "on a national scale" (BBC, 2012), astoundingly triggering over 400 lines of inquiry from Scotland Yard (Rayner, 2012). Unfortunately here too, the pioneers of DJ practice would foreshadow questions that still linger over the industry today, in this case significant issues ranging from gender discrimination (Gavanas & Reitsamer, 2013; Herman, 2006) to outright sexual abuse (Topping & Modin, 2022; Kreps, 2021).

But in 1943 Savile was foreshadowing a different question which would long hover over DJ practice: the role of technology. Savile powered his first show–which he dubbed the "Grand Record Dance" (Brewster & Broughton, 2014, p. 53)–with a jerry-rigged setup that connected a gramophone to a radio speaker. This arrangement allowed for more powerful amplification, but also ran extremely hot, at one point scalding the top of a piano it sat upon, and eventually melting down before the conclusion of the show. Nevertheless, six couples arrived to dance to big-band records. Savile reflected on the thrill of DJ'ing for a live audience, noting in particular the dynamic connection between the DJ as performer and the dancefloor as audience:

> As I played the records, and I stood there, I felt this amazing…power's the wrong word. There was this amazing *effect*; what I was doing was causing twelve people to do something. I can make them dance quick. Or slow. Or stop, or start. All this was very heady stuff. (Brewster & Broughton, 2014, p. 53)

Across the pond, American radio DJs began promoting live dance events centered around recorded music, known as "platter parties" or "sock hops" (Brewster & Broughton, 2014, p. 57). These parties, often held in high school gymnasiums, put radio DJs in a much more performance-oriented setting, in front of a crowd of teenagers eager to dance. Originally, the sock hops would feature a Savile-esque jerry-rigged tech setup, with a standard 45rpm record player amplified via microphone on the gym's PA system. The DJ would talk over his or her own microphone between songs, filling the gaps between tracks. This single-output arrangement with the DJ's voice serving transitions would become the default in the Jamaican soundsystem

scene that would soon emerge, and in fact is still the default in many such soundsystems today (Brewster & Broughton, 2014, p. 121).

Figure 3. Channel One Sound System's DJ (center) changes records between songs. Another member of the Jamaican crew (right) talks over the transition. A second turntable sits unused on the left. Photograph taken by the author at Dekmantel Festival in Amsterdam, August 2022.

However, technical innovations did occur. In 1956, Bob Casey's father, an engineer, developed a two-turntable sound system for use in a family religious ceremony in New York: he wanted to be able to play a recording of *Ave Maria* for a procession that would extend longer than the running time of one record, without interrupting the continuous flow of music (Fritzsch, 2013). Two years later, after a technical failure DJ'ing a sock hop with a traditional setup, Casey convinced his father to let him borrow his dual-turntable contraption. Though he didn't play two records over each other simultaneously–rather "crossfading" from the end of one track to the beginning of the other–Casey's father's innovation allowed for a more seamless stream of music on the dancefloor. If Casey's direct account is to be believed, this was an instant success; he claims that on the nights of future hops featuring his setup, rival promoters wouldn't even bother organizing parties (Fritzsch, 2013).

Figure 4. Bob Casey's dual-turntable setup. From Belman, 2013.

DJ-driven dance parties continued to increase in popularity throughout the 1950s and 1960s (Brewster & Broughton, 2014), but the technology powering the dance nights remained generally unprofessional and ad hoc. One exception came in 1965, when New York DJ Terry Noel redesigned the speaker system of the trendy club Manhattan club Arthur, introducing speakers that operated independently of each other, with separate volume controls (Brewster & Broughton, 2014, p. 76). Though his setup was still relatively basic, Noel (who played on two turntables) was known for creatively "mixing" music–introducing snippets of one song while another was still playing, sometimes maintaining an underlying beat between two tracks. Where Casey had merely guaranteed an uninterrupted flow from one song to the next, Noel was now actively inserting his own presence into the music heard by the audience–creatively (though only briefly) combining two songs at one time to create an audio output that diverged somewhat from either underlying recording. To perhaps the greatest degree seen at the time, Noel moved

the DJ along the spectrum from introducer of tracks to performer. But not all the way: Noel did not play from a stage, or a fancy DJ booth; he was still located directly on the dance floor (Brewster, 2016). Noel was an important part of the experience at Arthur, but not a headlining act.

Note that Bob Casey's system had allowed technically for mixing tracks, at least to the degree exhibited by Terry Noel. Why didn't it occur to him to play two tracks simultaneously in his late-50's parties? Casey hints at a potential answer in an interview he gave the Smithsonian in 2013:

> "Mine was not mixing for synchronization…it was mixing only to get the music tight. Once the kids were on the floor you wanted to keep them on the floor…the thing is the kids wanted slow records, the priests running the dance wanted fast records. You had to mix it up constantly. The guys would come out on the floor to a slow record–usually the guys didn't want to dance to the fast records, they'd all sit in the corner, the girls would want to dance. Ah, but if the record ends at the end of that slow record, bam!, you hit it–he hasn't left the floor, the girl would say 'c'mon we can do this,' it would keep the guy out on the floor and the next thing you know, it was done." (Fritzsch, 2013)

In other words, although his father's technology allowed for the mixing technique that would eventually come to dominate DJ culture, the requirement for a diverse range of tempos at the Catholic high school sock hops he was playing rendered this method useless for Bob Casey. Later at Arthur in New York, a very different network of actors (more mature dancers, more intoxicants, zero religious interference) opened the door for Noel's early experiments with mixing.

Back in the UK, a different DJ-driven club culture was emerging in the 1960's British Midlands. Known as Northern Soul, this scene was famous for its fanatical focus on *rare* records, mostly obscure Detroit soul music, unearthed by obsessive crate-digging DJs. Hitting on a special track could make a career in the world of Northern Soul; dancers asked to take photos with rare 45s, and contemporary DJs reported their bookings and rates exploding upon tracking down hard-to-find records from American stars like Patti Austin (Brewster & Broughton, 2014, pp.107-110). Even as these DJs gained notoriety for their exclusive selections, they continued to play on rudimentary tech setups with only one turntable; most talked between records. Yet clearly they had sophisticated techniques that contributed to their popularity, as explained by a well-known Northern Soul DJ named Rob Bellars: "A lot of the DJs would play records in a certain order, because of the way that people danced…you'd build it up gradually, and then you'd play about

five fast records on the run. Then you'd slow it down because it was getting so manic" (Brewster & Broughton, 2014, pp. 93-94).

DJs in the Northern Soul scene can be seen as increasing their artistry and by extension authorship, as compared to their sock-hop forebears. Where past DJs had kept dancefloors hot by playing hits, more or less serving as human jukeboxes, Northern Soul DJs focused on unearthing rare records, building their perception as curators, almost "archaeologists" of music (Brewster & Broughton, 2014, p.107). And while Bob Casey changed tempo bluntly to avoid interference from watchful priests, Rob Bellars creatively structured his performances in terms of cohesive "sets," building and releasing tension through his choice of record order. The DJ's creative skillset was beginning to emerge.

This partial transference of authorship from the producers of recorded music to DJs was not lost on the jockeys themselves. In fact, Northern Soul DJs were notorious for protecting new discoveries by covering the label of hot records, or even coming up with false names for the performers or songs–actively concealing the authorship of the recording artist to enhance their own (Brewster & Broughton, 2014, p.110). Reflecting this increasing presence on the dancefloor, posters for dances began to advertise the DJs who would be playing–but also the specific records that they would be spinning, at least the ones they were willing to own up to (Brewster & Broughton, 2014, p. 88). In a far corner of the British Midlands, DJs were beginning to become authors, but they were still subservient to their records and their parties.

Back across the pond in New York, this transition to author was unraveling at a faster tempo. The early 70's Manhattan club scene is typically regarded as the genesis of the modern performer DJ, and in particular the birthplace of the DJ as the unquestioned focal point for an evening's entertainment. Brewster and Broughton recount in great detail the stories of the heroic DJs and hallowed clubs from this era in dance music history: Francis Grasso and Frankie Knuckles, David Mancuso's Loft and Nicky Siano's Gallery. Playing to largely gay, Black and Latino audiences at parties that often lasted well into the morning, these DJs were the first to clearly present themselves as artists–particularly Grasso, who is considered the first DJ in the modern mold:

> Other DJs still thought of themselves as the stand-in for a band; they still thought of a record as an imitation of a live performance. Francis, on the other hand, saw that records were the vital components of *his* performance.
>
> DJ Francis played music, the disc jockeys before him had just put records on. (Brewster & Broughton, 2014, p. 139)

But *why* were DJs from this era able to present themselves as such? *Last Night a DJ Saved My Life* focuses largely on the magnetic personalities and musical virtuosity of DJs like Grasso and Siano, whose creative flair behind the DJ booth far exceeded the more restrained theatrics of Terry Noel or Rob Bellars. Also noted but less remarked upon are a handful of technological changes introduced to the club at this time, which opened the door for new styles of performance. The first was the slip cue: a simple felt disc placed between the record and the turntable platter which lets the record be held stationary while the turntable spins underneath, allowing for easier "cueing" of the next track to be brought in by the DJ (Brewster & Broughton, 2014, p. 145). Already in use in radio, Francis Grasso is attributed with the first use of the slip cue to allow for more seamless mixing between two tracks, though Terry Noel also claims he used the technique in his earlier experiments with mixing (Brewster, 2016).

The second innovation was the cue function, which allowed the DJ to preview an incoming track on headphones without playing it for the audience–a revolutionary tool that again enabled much more sophisticated mixing of tracks, particularly when combined with the aforementioned slip cue. Interestingly, the cue function did not emerge based on demand from DJ practitioners for such a tool. Rather, it came attached as a side feature to the first stereophonic mixer, produced by noted audio engineer Alex Rosner for use in Francis Grasso's club Haven (Brewster & Broughton, 2014, p.149). In an interview with Red Bull Music Academy (Red Bull Music Academy, 2003), Rosner describes the origin of his innovation as simply "being in the right place at the right time;" he was more interested in high-fidelity sound reproduction than mixing technique.

The third innovation, introduced at Nicky Siano's club the Gallery, was far more intentional: a sound system that was precisely engineered to allow for isolation of bass, mid, and treble frequencies in a song (Brewster & Broughton, 2014, p. 162). An early precursor of the same functionality that would later become standard in DJ mixers, this soundsystem allowed the DJ to pull out low frequencies to build tension, then "drop" the bass back in to produce a frenetic rush

of energy on the dancefloor (the same tactic that would later become overused to the point of prompting the SNL parody discussed in the Introduction). Siano claimed (proudly) that the effect caused epileptic fits on the dancefloor (Brewster & Broughton, 2014, p.163); whether or not that was hyperbole, it surely gave Siano the ability to effectively remix songs on the fly from behind the booth, again shifting the balance of authorial power towards the DJ.

Each of these three innovations emerged in different ways–borrowed, thoughtlessly bolted on, and purpose-built. But they all contributed to the same pronounced shift in New York club culture: towards what was rapidly becoming an iron-clad expectation that the DJ would mix records together continuously, both in terms of mixing two tracks to keep a steady beat, and in the sense of remixing the audio "levels" to produce new versions of a recording for the dancefloor, in real time. By the end of the 1970s, mixing in club settings was simply taken for granted. In fact, the practice had become so widespread that it was exerting a powerful impact on the music business: labels found themselves unable to market disco recording artists whose identity was lost (or ignored) in an "unbroken sequence of musical selections," especially since DJs favored mix-friendly "extended, consistent instrumental sound(s)" over more recognizable but harder to mix vocal sections (Straw, 1999, p. 205). It's hard to overstate the importance of this shift: after decades of subservience, DJs had finally wrenched authority from the hands of record producers.

7. An STS Approach to DJ History

7.1 Part 1: Actor-Network Theory

The history detailed above makes clear that authorship was not a foregone conclusion for DJs, nor an inherent property of the performance medium; rather it was a contingent result that was constructed in particular social settings. In this section, I will use an ANT approach to further describe how and why DJs were imbued with authorship in certain networks and not in others.

Briefly revisiting the existing literature: in attempting to explain the DJ's rise to authorship, Herman (2006) utilizes a Bourdieuian lens to interpret Straw's (1999) observation about disco's impact on the music business. For Herman, the granting of authorship to DJs can best be understood as the result of social forces, namely capitalism, with labels and promoters strategically investing in DJs as author-stars to fill the gap left by their failed investment in disco (would-be) author-stars:

> This shift in the commercial discourse surrounding the DJ stands as a testament to Bourdieu's (1983/1993a) critique of Foucault.
>
> This shift would never have occurred unless investors were profiting from the DJ's authorship…Perhaps the most important causal factor in determining this shift is the corresponding shift in the economic structure of dance music. With the increasing anonymity of tracks, producers who are not DJs lose the ability to sustain long-term careers, big music labels retreat, and the corresponding authorship gap leaves promoters with nobody to promote. In the face of that authorship gap, the DJ becomes the means by which investors can sell music and customers can make informed purchasing decisions. (Herman, 2006, p.34)

I do not dispute this account, but in the Latourian tradition, I propose that it is still begging the question. In the Bourdieuian worldview put forward by Herman, DJs are granted authorship as a result of "social forces;" DJs became authors once it was to the benefit of relevant capitalist interests. But still we need one more turn for an effective description. After all, the very same capitalist interests invoked by Herman (music labels and promoters) had just attempted to soak disco producers with authorship–but failed miserably! How then is their profit motive a sufficient explanation when the same attempt proves successful for DJs?

I would like to argue that authorship cannot be reliably explained by broad social forces alone. Rather, it is a cultural product, akin to a scientific "fact," that must be contingently constructed and reconstructed, in complex webs of both human and non-human actors. Taking an ANT approach, I propose that authorship initially developed for DJs *on the dancefloor*, in certain mostly gay clubs in early 1970's New York, in which the specific network of actors came together in such a way that club-goers began to perceive the DJ as "single-handedly" manufacturing a thrillingly novel and powerful musical experience. Whether or not this perception was "true" is beyond the point; it was *felt* by the audience.[5] This, I claim, is how the DJ's authorship came to be constructed–*in situ*, on the dance floor in early-1970's New York.

In support of this argument, I would like to examine in greater detail the networks out of which emerged the three mixing-friendly technological innovations described at the end of the previous section. Note that all of this change occurred only a few years and a few hundred meters

[5] A contemporary of Larry Levan, perhaps the most legendary of the 1970s New York DJs, summarizes this perception nicely. "If you went to the club one week and a light bulb was red and the next week when you returned it was blue, people would say 'Larry changed the bulb this week.'" (Brewster & Broughton, 2014, p.299)

removed from Terry Noel's Arthur. Why did these technological innovations gain traction in the early 1970s, and not the late 1960s? Especially since none of the three changes relied on revolutionary science or breakthrough engineering?

Consider the broad network of actors at play in the disco era, versus the equivalent network at Arthur. Following closely after the Stonewall riots of 1969, the disco scene featured a largely gay dancefloor, newly (if obviously incompletely) sexually liberated. Francis Grasso's first club, the Sanctuary, was described as "the first totally uninhibited gay discotheque in America" (Brewster & Broughton, 2014, p. 143). In stark contrast, Arthur favored "good-looking working girls with lots of dates" (Brewster & Broughton, 2014, p.76).

At the Sanctuary, the dancefloor was packed beyond capacity: Grasso recalled that "even if anybody wanted to pass out, there was no room." A few years back at Arthur, the situation was quite different: a "velvet rope kept the undesirables at bay" in favor of celebrity guests (Brewster & Broughton, 2014, p.76). The intense conditions at the Sanctuary led to the loss of its liquor license, which only increased its hedonistic bent: free of the license's restrictions, the club stayed open well past daybreak on weekend nights. Alcohol was replaced with much stronger drugs including LSD and amphetamine, further enabling the never-ending party. The Sanctuary became known as a "drugs supermarket." Orgies in the toilets were not uncommon (Brewster & Broughton, 2014, p. 144), a development that might have been uncomfortable for celebrity Arthur regulars like Lauren Bacall (Brewster & Broughton, 2014, p.76).

ANT describes a stable network–a "successful piece of technoscience"–as the result of all the actors in a network coming together, consciously or unconsciously, to contribute towards a single goal (Sismondo, 2010, p.82). An ANT interpretation of the New York disco scene might thus imagine the actors described above–the dancers, the DJs, the drugs, the clubs, the music, the liquor licensing agency, and so on–all working together (though not necessarily with intent) towards the common goal of a euphoric, throbbing, and heavily sexually charged dancefloor that ran more or less unabated from Friday night to Sunday afternoon. In this context, technology that allowed for seamless transitions between tracks (favoring marathon dance sessions) and dramatic remixing on-the-fly (enabling DJs to use records like precision tools, tactically ratcheting up or down the energy of the dancefloor) fit right in to the common goals of the other actors. In other words, this version of DJ technology was neither obvious nor objectively superior; rather, it was more favorable to the stability of an actor network working towards the

objective of an elongated, orgiastic dance party. In another actor network, like the more restrained dancefloor of Arthur, mixing technology might have been less useful, or even actively counterproductive.

The new technologies that facilitated mixing may not have been objectively superior, but they did more than extend the length and intensity of club nights: they led directly to the emergence of the DJ as a full-fledged author, the star of the show. By enabling the DJ to manipulate records as tools, raw materials in a musical bricolage that was manufactured from scratch on any given night, mixing allowed *dancers* (the paying customers of the club) to understand the DJ as the artist of relevance, the original producer of the sound they came to dance to; anyone could play hit records, but no one could construct a set like Francis Grasso or Nicky Siano. Armed with powerful technology and playing marathon sessions in hedonistic, sexually charged settings, these DJs were no longer seen as human jukeboxes like Bob Casey, nor archaeologists like the Northern Soul legends. They were instead understood as *performing* the music. Brewster and Broughton make clear that the emergence of this first batch of "legendary" disco DJs was no coincidence; the new mixing technologies, in conjunction with the other network actors that facilitated them, firmly changed the perception of the DJ within the club, among those on the dancefloor:

> In many ways, the club DJ [of this era] was as fully accomplished as he is today. He had become far removed from his original role–a musical waiter serving whatever the diners requested–and was now almost as exalted as some of our current well-marketed DJ stars. Some, at least to their regular crowd, in their own clubs, had god-like powers. (Brewster & Broughton, 2014, p. 172)

Once it emerged, why was mixing so effective at generating authorship for DJs? I propose four explanations, acting in concert. First, because mixing shifts attention away from individual tracks, which are understood to have their own author or authors, and centers an extended musical "set," which is understood as being produced by the DJ. Second, because the practice of mixing live allows DJs to create novel auditory experiences that have never before been heard and cannot be purchased or otherwise obtained elsewhere, increasing the perception among the audience that they are witnessing an original creative performance. Third, because the presence of sophisticated technology used for mixing (and the skill required to use that technology effectively, particularly beatmatching[6]) conveys a sense of perceived "musicality"

[6] Beatmatching is the process of aligning the tempos and beats of two tracks such that they can be mixed together cleanly without the sounds of one track "clashing" with those of the other. Prior to the

and even “genius” that more closely aligns with traditional notions of music performance (i.e. skillfully playing an instrument), which audiences are pre-conditioned to associate with authority. And fourth, because–unlike other DJ skills such as music curation, set pacing, and intuitive “feel” for the demands of a dancefloor, any of which might require a life’s work to cultivate–mixing presents as a physical performance via the DJ’s tactical interaction with the turntables and mixer, allowing the audience to *visually* witness the DJ creating the performance.

ANT thus helps us understand why the technology that enabled mixing developed, and why this technology was so effective at generating authorship for DJs. This network analysis does not preclude the impact of capitalist interests like music labels, or social forces more broadly; rather, it simply suggests that these factors are *insufficient* for describing the emergence of the cultural “fact” that DJs are authors. And in the context of 1970s New York, it’s easier to understand ANT’s insistence that non-humans can act as much as they are acted on. The all-night parties that birthed star DJs were not simply the result of humans following their own interests; to the contrary, the mixing technology (to say nothing of the drugs) actively shaped the contours of this scene, often in ways that no human intended or could even predict.

7.2 Part 2: Black-Boxing

In the previous section, I described the actor-network that led to the emergence of authorship for certain DJs. In this section, I will use the STS concept of the black box to explain how once authorship emerged in favorable networks, the messy, divergent history of DJ practice came to be replaced in the marketplace with a single “standard model,” based on a narrow definition of the DJ as someone who mixes music using sophisticated technology.

Note that in spite of its effectiveness at conveying authorship, mixing did not immediately displace all other techniques for DJ performance. Foreign DJs visiting England as late as the early 80s expressed shock that local DJs could not or would not mix; instead they got on the microphone between tracks to introduce songs by name (Brewster & Broughton, 2014, p. 402). There was a logic to this apparent Luddism: the popular club music of the time in the UK was primarily jazz and funk, which often featured changing tempos and complex time signatures not conducive to beatmatching. Mixing was seen not only as unnecessary, but unseemly, even dangerous (Brewster & Broughton, 2014, pp. 403-405). “Growing controversy is developing over

introduction of digital turntable equivalents, this was a painstaking manual skill; today the process has largely been automated by software, though this automation remains highly controversial within the field.

the introduction of American-style mixing techniques in Britain," reported a DJ trade magazine in 1979. A well known contemporary DJ noted that "American bad habits are not going to catch on here. People in the UK don't want to hear three solid hours of identical music." Another English DJ from this period explained that "there was no way you could have just started mixing because people would see it as being lazy: 'why aren't you talking?'" Only with the arrival and explosive popularity of house music–a good ten years after disco–did the preponderance of British DJs convert to mixing.

But while other forms persisted, once the mixer-author was birthed, this species of DJ enjoyed a huge advantage in the marketplace. Author-DJs leveraged the notoriety they earned as star performers on the local scene into remixing and production gigs, giving them access to a more scalable form of marketing. Rave destinations such as Ibiza emerged (Brewster & Broughton, 2014, pp. 375-394), further privileging author DJs known by name, and further allowing them to build international reputations. By the late 1990s, well-known American mixer-author DJs like Todd Terry and Frankie Knuckles were making £7-10,000 a night playing in the UK (Brewster & Broughton, 2014, p. 530); by 2021 Russian-German DJ Zedd was reputed to earn a quarter-million dollars for a two-hour DJ set in Las Vegas (Heffler, 2021).

So while DJs continued to perform in a variety of styles, with a variety of technologies, the archetype of the DJ using two turntables and a mixer to construct seamless, never-ending sets came to dominate in the public consciousness. Recall that, writing in 2006, Herman claimed as a settled matter that club DJs are "hired to mix records…using variable-speed turntables…manipulating the volume and equalizer of each track" (p. 25). I would like to use an STS approach to argue that while Herman was (and remains) correct in this assessment, this particular definition of a DJ is not inevitable, but rather a historically contingent black-boxing.

Recall that STS appropriates the engineering term "black box" to refer to predictable input-output devices, facts or artifacts that are taken for granted, concealing both the inner workings of their operations and the messiness of their histories (Sismondo, 2010, p. 120). I propose that the very definition of DJ is an example of a black-boxed "fact," a result of the commercial success of the mixing author-DJ, as described above. Early in its history, the idea of a "DJ" manifests as a vague, highly flexible concept with "interpretive flexibility" (Sismondo, 2010, p. 133): a DJ is simply someone who plays recorded music for people to dance to (much like a bicycle was, originally, simply a transportation device with two wheels). The DJ as a performer

goes through a complicated history, intertwined with a technological evolution that is far from predictable; for example, Bob Casey's dual turntable is largely ignored for the better part of a decade before being re-established as the "obvious" standard much later. Eventually, like the bicycle, the DJ itself comes to be represented by one "standard model," the black box: a person who uses sophisticated technology to mix records in real time.

Consider how Herman's black-boxed definition of a DJ neatly converts inputs to outputs. "I want to go see a DJ," says an attendee at a multi-stage music festival. Her friend scans the horizon, searching for a performer standing in front of "variable speed turntables," twisting knobs to "manipulate the volume and equalizer of each track." The logic is iron-clad but unquestioned: anyone mixing records with turntables or the equivalent is understood as a DJ; anyone who does not use this particular technological setup is some other type of performer.

To the users of the black box, this may all seem obvious, even inevitable. A DJ who doesn't mix tracks, who doesn't strategically manipulate the bass and treble, who just stands there "pushing play" on one record after another–well, that doesn't seem like much of a DJ at all. But for much of the practice's history, that was indeed exactly what the DJ did, and it worked to great effect from the perspective of dancefloors. By all accounts, the teenagers at the sock hops and the hipsters at the Northern Soul joints were satisfied by the experience provided by jockeys who simply talked over the space between records, even ecstatic about it. Few people at the time would have felt that anything was missing from the party.

As Pinch and Bijker might argue, it could have been another way; DJs could have continued playing to raucous dancefloors, never thinking to maintain a steady beat between tracks. As we saw in England, some DJs persisted with the older technique, and in Jamaica some continue to this day. But once the actor network coalesced in 1970s Manhattan to allow for the evolution of the mixing DJ, the authority attached to that combination of technology and technique created a huge marketplace advantage for these practitioners, even outside of their natural ecological niche. Mixing may only have been able to evolve in sweaty gay clubs, but having evolved there, it quickly took over the broader DJ world.

Note that black boxes do more than obscure contingent histories. They also conceal the inner workings of the input-output machine. What is being concealed by this definition of a DJ as someone who uses complex technology to mix records?

I propose that this “fact” hides two important realities about the practice of DJ performance. The first is that while the DJ does absolutely contribute to an original creative act, nonetheless the underlying records are a critical (if not the single most important) part of the performance. This is why earlier DJs were able to throw extremely successful dance parties without mixing: because first and foremost, dancers want to hear great songs. No amount of technical skill as a DJ can compensate for mediocre music. But of course a focus on individual records shifts authority away from the DJ, and as we’ve seen DJs emerged as stars only after they were able to win that authority. So the black-boxing of the DJ as a master of mixing technology conceals the reality that the DJ’s authorship is partially appropriated (often without recognition) from the producers of the records they play.

Second, this black-boxing conceals the fact that talented DJs rely on a wide variety of skills beyond mixing records to create a great performance. A talented DJ has curated an impressive music collection with a mix of new tracks, well-known hits, and obscure rarities. They have prepared diligently for their performance; they are aware of the musical preferences of the crowd that is likely to be present. Once the show starts, they are highly adept at reading the energy of the dancefloor and reacting appropriately to keep the audience engaged. Independent of beatmatching or mixing, they know how to sequence songs in the correct order to create an atmosphere and “vibe” that builds over the course of the set. They may be adept at “pumping up” the crowd by dancing along or even speaking or rapping on the mic. And they can do all of this under pressure, for hours at a time. In short, a good DJ, whether or not they are mixing records, performs a variety of complex and highly creative skills–skills that are all concealed by the black box that reduces the entire art form to simply mixing records.

Note that the first concealed reality overstates the creative talent of the DJ, while the second does the opposite. There are reasons for both skeptics and true believers of the DJ’s authority to resist this oversimplification. But as we shall see in the empirical analysis to follow, this black box remains firmly entrenched and rarely questioned.

7.3 DJ Technological Evolution Since The Disco Era

By the 1970s, the template for the modern author-DJ was essentially set. This was a person who “performed” extended sets of music by mixing together tracks using two turntables and a mixer, carefully manipulating pace, phrasing, and audio levels to direct the energy on the

dancefloor. Though other DJ archetypes existed then and continue to exist, this basic model for the DJ as author-performer remains remarkably intact on today's dancefloors, whether they be sweaty nightclubs, illegal raves, or massive corporate-run festivals.

Of course, the specific technologies powering these performances have continuously evolved. Francis Grasso managed to beat-match on belt-driven turntables with extremely rough control of the records, but by 1979 the Technics SL-1200 MK2 had become the industry standard, with its direct-drive motor allowing near-immediate stops and starts, and a large, easy-to-use tempo slider (Rothlein, 2013/A). And Nicky Siano could manipulate his in-house speaker system to drop the bass mid-set, but an ever-evolving line of mixers from later in the 1970s to today[7] gave the DJ increasing power to independently tweak frequencies on each track, apply elegant high-pass and low-pass filters, and even layer in a wide range of effects like reverb and phase, on command, without moving from the turntables.

More recently, turntables and vinyl records have largely (though not completely) been replaced by digital media players, most notably the Pioneer CDJ series, which originally played CDs but today typically plays digital media files (e.g. WAV, MP3, etc.). In addition to allowing DJs to bring thousands of tracks to the booth on a single USB stick the size of a keychain, CDJs include a number of features that would be impossible to recreate with analog media. These include looping (allowing the DJ to endlessly repeat, or "loop" one section of a song with the push of a button) and, very controversially, an auto-sync feature, which essentially pitch-matches and beatmatches two tracks automatically[8], keeping them in perfect lockstep without any attention from the DJ (Rothlein, 2013/B). For those who can't afford the club-standard CDJs–a pair of which can cost several thousand dollars–relatively inexpensive[9] DJ software like Traktor and Serato provide essentially the exact same functionality when combined with a MIDI controller and any home laptop.

This extremely brief review of the last fifty years of technological upheaval makes one thing clear: almost all of the evolution of a DJ's gear has been directed towards facilitating easier and

[7] No one brand or product has achieved dominance in the mixer market in the manner of the Technics SL-1200 or Pioneer CDJ.
[8] Like so much other AI, the software powering the sync feature on CDJs and other digital music setups does not work perfectly; it is particularly poor at beatmatching songs that feature live drummers.
[9] At time of writing, Traktor retails for approximately $99, and entry-level MIDI controllers start at around the same price.

more powerful mixing of records. As discussed in the previous section, successful DJs rely on a wide range of skills beyond mixing to perform their fundamental duty of keeping the dancefloor moving. But today's DJs do not use innovative digital tools to help them read the vibe of a dancefloor. CDJs do not have a function that recommends the right time to "slow things down." There is no widespread AI tool that uses collaborative filtering to estimate the "heat" a given record might generate at a given club on a given night. Certainly curating music is easier today given the wide range of digital distribution channels available to DJs, but none of the other tools in the DJ's skillset have been altered considerably by new technology. Fundamentally, nearly all the innovation in the field has been directed towards mixing–the skill most associated with authorship.

I would propose that this is further evidence of my hypothesis above: beginning in 1970s New York and continuing over the following decades, the idea of DJ as performer became "black-boxed" as a person who mixes music using sophisticated technology. Once this black box has been established, technology is then socially constructed against these assumptions: DJs don't adopt the set of technologies that are inherently superior for their creative practices, but rather we label the set of people who use a specific set of technological tools (those which allow them to mix records) as DJs. In this context, it should come as no surprise that the wind of technological change would blow towards the center of gravity in the commercial world of DJ'ing–towards the black-boxed DJ as professional live mixer.

8. Empirical Analysis: Black-Boxing in Action

One way to demonstrate that mixing technology has become essentially inseparable from the practice of DJ'ing is to examine the ways in which DJ'ing is introduced to aspiring entrants to the field. For this analysis, I conducted a detailed review of the top results for the search term "DJ tutorial" on YouTube[10]. Because YouTube is known to tailor results based on a complicated and evolving algorithm (Davidson et al., 2010), I accessed the site in June of 2022 using an "Incognito" browser with no browsing history and selected the top 5 videos returned in the search for analysis. The fifth-ranked video was in German; as I am not a German speaker, for the sake of simplicity I excluded this result and replaced it with the sixth-ranked result. All other results returned were in English.

[10] YouTube is well-known as a primary destination for "informal learning." See Lange (2019) and Bhatia (2018).

As a check, I also searched for other relevant keywords, such as “how to DJ” and “DJing for beginners.” The vast majority of the top videos for each keyword search were the same, likely a reflection of YouTube’s sophisticated search algorithm. Although the methodology used here is not precise and other methodologies might produce slightly different results, my personal experience of more than a decade as an “amateur DJ” suggests that the videos selected for close analysis are indeed representative.

The table below details the top five English-language DJ tutorials on YouTube, in their order of appearance.

Video Name	**Video Creator**	**Upload Date**	**Video Views (at time accessed)**
How to DJ for Beginners (2022)	DJ Carlo Atendido	Jan 10, 2020	4,568,752
5 Mixing Ideas for DJs–Transition Techniques	Crossfader	Apr 27, 2018	1,552,446
7 Mixing Techniques Used by PRO DJs!	Crossfader	Nov 20, 2020	336,314
How To DJ On The DDJ-400! Absolute Beginners Guide	DJ Phil Harris	Mar 26, 2021	382,274
How to DJ for absolute beginners | Complete Guide to DJing on Pioneer DDJ-400 & Rekordbox in 2021	Ben Rainey	Dec 14, 2020	902,893

The five videos selected for analysis were uploaded by four different channels, providing a fairly wide range of content perspectives. Of the four channels, three are run by independent creators, and one (Crossfader) is the YouTube outlet of an online DJ school. Tellingly, the DJ school is named after a dial (a “fader”) present on most DJ mixers (or controller equivalents).

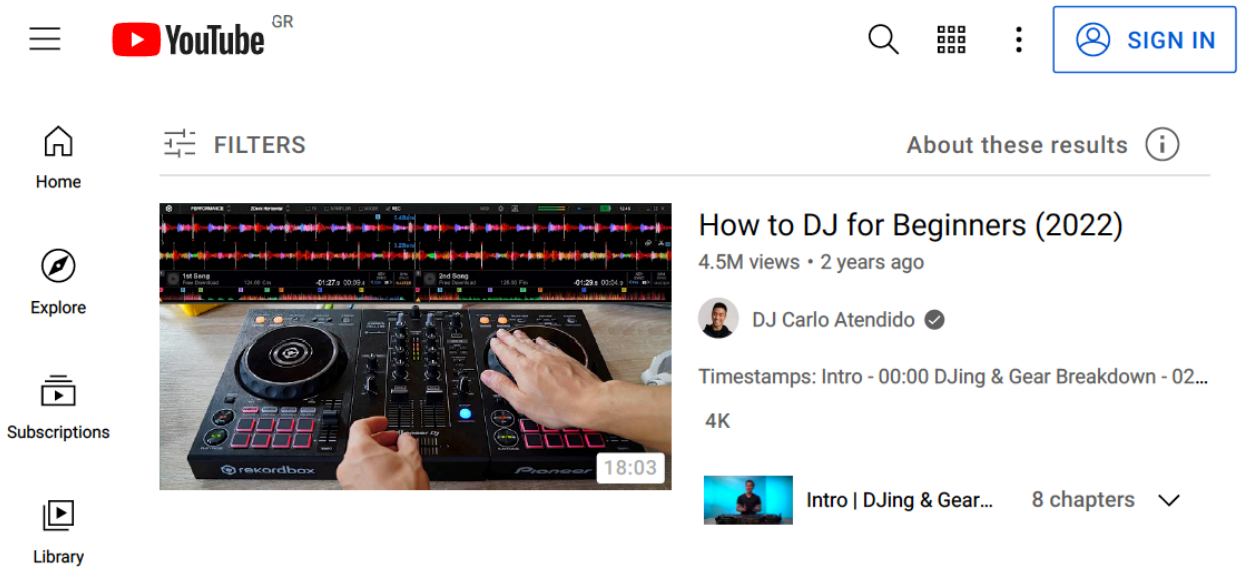

Figure 5. The first result returned by YouTube for the search "DJ Tutorial".

First, I analyzed the "headline image" for each of the five videos–the still image that is shown by YouTube when it returns search results. This image is chosen directly by the video creator, and is by far the largest and most attention-grabbing element in each search result. As such, we can assume that the video creator has carefully tailored their headline image to what they think will garner the most interest from potential viewers.

All five headline images prominently feature DJ technology setups, all complicated-looking black boxes with glowing colorful buttons. Interestingly, all five images show MIDI controllers, never expensive CDJ or turntable and mixer setups, evidence that these videos are oriented towards beginners who are working with low-cost, entry-level products. Two of the images feature the "teacher" of the tutorial holding or gesturing towards their tech setup. Another two do not display the video's host, but rather show disembodied hands hovering over the controller. The final headline image contains no human element whatsoever: it's simply a photo of a controller, with the video's title text superimposed over it. The overall message delivered by the headline images, individually and in concert, is strikingly clear: to become a DJ, one must obtain and master the right technology. No visual reference is made to the selection of music.

Analyzing the titles of the tutorials reinforces this message unequivocally. Two of the five videos offer training for *one specific* black box: the Pioneer DDJ-400. This MIDI controller is highly regarded as a "training wheels" device for aspiring DJs, because its design closely resembles

that of a CDJ setup (also manufactured by Pioneer), the industry standard hardware in use by most contemporary professionals. Another two videos propose to teach multiple “mixing” techniques–technical tricks that leverage the power of the hardware and software to help the DJ gracefully transition between two tracks. The fifth title is more general–simply a “how-to DJ” tutorial for beginners.

Finally, the full content of the videos again conveys the same impression, namely that technology is at the heart of DJ practice, and that this technology is most important for its use in facilitating fancy mixing. For the sake of brevity, I will conduct a “deep dive” review here of only the first video result, DJ Carlo Atenido’s “How to DJ for Beginners (2022).” This tutorial begins with Atenido defining the job of a DJ: “to play and mix music to appease a crowd.” In the very next sentence he adds a qualifier: “When you see a DJ DJ (sic), one is technically mixing two songs together, and the tools that enable that to happen, most of the time, are two DJ decks and a mixer.” In less than five seconds, Atenido has pivoted from appeasing a crowd to talking about a specific technological solution–the exact technological solution that emerged in the disco era before being black-boxed as the very definition of DJ’ing. In the remaining 17 minutes of the tutorial, Atenido never again refers to pleasing an audience. Nor does he mention music selection–how to go about curating a record collection, or how to think about arranging a set to elicit the desired emotional response from a crowd.

Rather, Atenido spends the first half of the tutorial introducing the various functions of his controller; this part of the video, while well-produced and highly educational, feels largely like an instruction manual that might have been released by the device’s manufacturer. In the tutorial’s second half, Atenido introduces some basic transition techniques. Again, no reference is made to *what* songs are being played, or how the DJ might identify the right ordering of tracks. The focus is completely on aligning two songs to produce a seamless mix, almost as an abstract technical skill. Atenido closes with another technical note on mixing. Having learned the technical operations of a $250 technological solution, and a handful of basic transition techniques, the viewer is now presumably a DJ. Music has not entered the conversation.

9. Conclusion

As this thesis attempts to cross disciplinary boundaries, I have presented a wide variety of theoretical and empirical material in the preceding pages. Thus I would like to conclude with a more linear summary of the argument I am trying to make in this work.

1. Authorship has been understood in very different ways at different points in time. As a concept, authorship should be regarded as a culturally constructed product, rather than an objective fact.
2. Many DJs today are widely granted author status. This was generally not the case prior to the 1970s.
3. Broad social forces such as capitalist interests are generally insufficient for describing how DJs gained authorship at this time. These same interests failed at generating authorship for disco producers, and in any case many DJs working in the same social systems were *not* granted authorship, long after it was granted to the 1970s disco pioneers.
4. Taking an ANT approach, we can see that authorship was first granted to DJs not by promoters or record labels, but by dancefloors. This was the result of a highly idiosyncratic network of actors that resulted in DJs being understood as the star of the show, centered around technological changes that allowed for more seamless mixing, but including countless other factors including: disco production techniques that favored instrumental sections over recognizable vocalists, a wide proliferation of drugs that enabled all-night parties, and a largely gay audience which was interested in unabated dancing during those marathon sessions.
5. This understanding of the technically empowered mixing DJ as author was not inevitable, nor was it obviously the "best" method of DJ performance; alternative models of DJ'ing continued and continue, as witnessed in England, Jamaica, and elsewhere.
6. However, this model of the author-DJ did have advantages in the marketplace: it allowed for a brand to be built against the DJ's name, which led both to production and touring opportunities, to the benefit of the DJ but also promoters, clubs, record labels, etc.
7. As such, both cultural capital and technological development tended to flow towards the notion of the DJ as a performer who uses complex technology to seamlessly mix music.
8. As technology and economic opportunity continued to develop in this direction, this specific instantiation of the DJ–a person who uses complex technology to mix music–became a black box for the cultural understanding of the whole profession. Anyone who used technology to mix records was deemed a DJ, and anyone who did not use technology to mix records was deemed "not a DJ," regardless of their other skills or lack thereof. Evidence for this is found in the DJ tutorials referenced above.

This analysis can help make sense of the scene parodied so brutally in *When Will The Bass Drop*. The video demonstrates a club environment that would be quite foreign to a 70s-era dancefloor denizen: it opens with fans chanting DaVinnci's name, waiting for him to appear…but not dancing to any music. Once DaVinnci appears and the music starts, the audience gets moving, but everyone is jumping up and down individually, more focused on watching the DJ than taking part in a communal dancefloor. Everything about DaVincci suggests the presence of a heavily marketed, thoroughly pop superstar, as opposed to a musical wizard and community lynchpin in the mold of Francis Grasso or Larry Levan.

And indeed, today's superstar DJs *are* heavily marketed, internationally touring pop stars. They may also be musical wizards, but as is the case for any pop star, the music is only a part of the equation, and often a small part. DaVinnci and the real-life EDM (electronic dance music) superstars he's a parody of do not play marathon sessions each weekend as residents in sweaty gay clubs; rather, they tour incessantly, like famed American DJ Diplo (born Thomas Westley Pentz), whose own press guide describes him as "as much an international brand as he is a musician/DJ/producer," noting that he plays as many as 300 shows a year[11] (Insomniac). Club gigs for these DJs will usually be 2-3 hours; festival sets may be as short as forty-five minutes.

Ironically, these conditions are arguably closer to Bob Casey's sock hops than Francis Grasso's nightclub. DaVinnci (or Diplo) will typically play to a mixed-gender group for a fairly short period of time, with the expectation of hearing recognizable hits. A significant portion of the audience may not be present for the music at all; their interest is simply in being able to say that they were in the same room as an A-level pop star. All together, the performance is less about seamlessly mixing music to maintain a steady beat for a grooving dancefloor, and more about the ongoing promotion of a pop lifestyle brand.

But DaVinnci is not just any pop star–he is a star *DJ*. And, as we've seen from the tutorials described above, humans become DJs only when they mix music using specially crafted technology. That black-boxed definition is firmly planted in the minds of the audience members, whether or not they actually prefer to hear the various tracks in a set mixed together. A DJ who

[11] Insomniac, https://www.insomniac.com/music/artists/diplo/

doesn't stand in front of expensive-looking technology turning knobs is not a DJ. And so DaVinnci must stand in front of his black boxes and turn knobs.

In this context, the absurdity of the skit begins to look more reasonable. Why is DaVinnci playing model trains on his mixer? Because he doesn't actually need to mix; he needs to do something that looks like mixing, because that's what DJs do. Why is he so insistent on centering the audience's attention on the "bass button," when the track's drop will be mind-blowingly thunderous regardless of his EQ leveling? Because DJs mix music live; if he isn't perceived as mixing music live, he won't be seen as a DJ. The technology that once empowered DJs to create magical musical experiences, and turned them into authors in the process, now enslaves them to a ritualistic performance of mixing that is often irrelevant to or at cross odds with their actual performance. No human would have planned it this way; the cold black boxes are active participants in the outcome.

This is the core idea that I hope to have demonstrated with this thesis. STS is an instrumental discipline in our current age: its set of tools is invaluable for shedding light on the construction and black-boxing of scientific facts and technological artifacts. By leveraging these same frameworks, I propose that cultural values such as authorship can be understood as constructed and black-boxed in largely the same manner. And this black-boxing, which has the power to shape the future of not only technological innovation but a whole mass of cultural practices, is not simply a result of broad social forces acting on the culture. Rather, it is the result of very specific networks of actors (many of which are non-human) coming together to produce specific outcomes, which may crystallize if the conditions are right over a long period of time. But it could always be a different way, and often *is* a different way even in the present moment, if you know where to look.

I have focused here on a very small cultural niche: the construction of authorship in DJ performance. But I propose that this STS approach–identifying and deconstructing black boxes–might be of interest in many other corners of the humanities. If the popular notion of "DJ" can be understood as a black box, formed in a particular network of actors and maintained (or not) in other networks of actors–and persisting to the point of absurdity–might we apply a similar analysis to notions such as "music," or even "the economy"? And when we attempt to open these black boxes, describing the conditions that led to their formation and ongoing relevance,

can we stay open to the agency of non-human actors, and the ways in which they act on us as much as we act on them?

10. References

Amsterdamska, O. (2008). *The handbook of science and technology studies*. E. J. Hackett, M. Lynch, & J. Wajcman (Eds.). Cambridge, MA: MIT Press.

Barthes, R. (1977). The Death of the Author. In S. Heath (Trans.), *Image, music, text* (pp. 142–148). essay, Fontana/Collins. (Original work published 1967)

BBC. (2012, October 9). *Jimmy Savile abuse claims: Police pursue 120 lines of inquiry*. BBC News. Retrieved May 24, 2022, from https://www.bbc.com/news/uk-19887019

Belman, L. (2013, July 25). Bob Casey: Beyond the podcast. Lemelson Center for the Study of Invention and Innovation. Retrieved April 24, 2022, from https://invention.si.edu/bob-casey-beyond-podcast

Bhatia, A. (2018). Interdiscursive performance in digital professions: The case of YouTube tutorials. *Journal of Pragmatics, 124*, 106-120. https://doi.org/10.1016/j.pragma.2017.11.001

Bijker, W. E. (2010). How is technology made?—That is the question!. *Cambridge journal of economics*, *34*(1), 63-76. https://doi.org/10.1093/cje/bep068

Bloor, D. (1991). *Knowledge and social imagery*. University of Chicago Press.

Bloor, D. (1999). Anti-latour. *Studies in History and Philosophy of Science Part A, 30*(1), 81-112. https://doi.org/10.1016/S0039-3681(98)00038-7

Bourdieu, P. (1993a). The field of cultural production, or: The economic world reversed. In R. Johnson (Ed. & Trans.), *The field of cultural production: Essays on art and literature* (pp. 29–73). Columbia, MD: Columbia University. (Original work published 1983)

Bourdieu, P. (1993b). The production of belief: Contribution to an economy of symbolic goods. In R. Johnson (Ed. & Trans.), *The field of cultural production: Essays on art and literature* (pp. 74–111). Columbia, MD: Columbia University. (Original work published 1986)

Brewster, B. (2016, March 31). *Interview: Terry Noel*. Red Bull Music Academy Daily. Retrieved May 18, 2022, from https://daily.redbullmusicacademy.com/2016/03/terry-noel-interview (Original interview conducted in October 1998)

Brewster, B., & Broughton, F. (2014). *Last night a DJ saved my life: The history of the disc jockey*. Open Road+ Grove/Atlantic.

Brown, J. (2013, July 17). *Margaret Thatcher made repeated attempts to get Jimmy Savile knighted*. The Independent. Retrieved April 30, 2022, from https://www.independent.co.uk/news/uk/politics/margaret-thatcher-made-repeated-attempts-to-get-jimmy-savile-knighted-despite-pleas-from-concerned-aides-8713407.html

Burke, S. (2008). *Authorship: From plato to postmodernism: A reader*. Edinburgh University Press.

Davidson, J., et al. (2010, September). The YouTube video recommendation system. In *Proceedings of the fourth ACM conference on Recommender systems* (pp. 293-296). https://doi.org/10.1145/1864708.1864770

Fenwick, T., & Edwards, R. (2010). *Actor-network theory in education*. Routledge. https://doi.org/10.4324/9780203849088

Fisher, Marc. *Something in the air: Radio, rock, and the revolution that shaped a generation.* Marc Fisher, 2007.

Fritzsch, L. (2013, July 25). *Podcast: Bob Casey Spins double disks*. Lemelson Center for the Study of Invention and Innovation. Retrieved April 24, 2022, from https://invention.si.edu/podcast-bob-casey-spins-double-disks

Foucault, M. (1998). What is an author? In D. Preziosi (Ed.), *The art of art history: A critical anthology* (pp. 299–314). Oxford University Press. (Original work published 1969)

Gavanas, A., & Reitsamer, R. (2013). DJ technologies, social networks and gendered

trajectories in European DJ cultures. *DJ culture in the mix: power, technology and social change in electronic dance music*, 51-78.

Heffler, J. (2021, April 16). *New Las Vegas residencies will pay Tiësto and Zedd $250,000 for each DJ set*. EDM.com–The Latest Electronic Dance Music News, Reviews & Artists. Retrieved July 3, 2022, from https://edm.com/news/tiesto-zedd-las-vegas-residencies-250000-per-dj-set

Hennion, A., & Muecke, S. (2016). From ANT to pragmatism: a journey with Bruno Latour at the CSI. *New Literary History, 47*(2), 289-308. https://doi.org/10.1353/nlh.2016.0015

Herman, B. D. (2006). Scratching out authorship: Representations of the electronic music DJ at the turn of the 21st Century. *Popular Communication*, *4*(1), 21–38. https://doi.org/10.1207/s15405710pc0401_3

Insomniac. (n.d.). *Diplo–DJ/Producer.* Diplo–Artists. Retrieved August 1, 2022, from https://www.insomniac.com/music/artists/diplo/

Justesen, L., & Mouritsen, J. (2011). Effects of actor-network theory in accounting research. *Accounting, Auditing & Accountability Journal.* https://doi.org/10.1108/09513571111100672

Kreps, D. (2021, May 8). *Two more women sue Bassnectar for sexual abuse, human trafficking*. Rolling Stone. Retrieved May 24, 2022, from https://www.rollingstone.com/music/music-news/bassnectar-lawsuit-sexual-abuse-human-trafficking-1167059/

Krogh, M. (2018). A beat is a hybrid: Mediation, ANT and music as material practice. *Contemporary Music Review, 37*(5-6), 529-553. https://doi.org/10.1080/07494467.2018.1575125

Lange, P. G. (2019). Informal learning on YouTube. *The international encyclopedia of media literacy*, 1-11. https://doi.org/10.1002/9781118978238.ieml0090

Latour, B. (1987). *Science in action: How to follow scientists and engineers through society.* Harvard university press.

Latour, B. (1992). One more turn after the social turn: Easing science studies into the non-modern world. *The social dimensions of science*, 292, 272-94.

Lee Cooper, B. "American Disc Jockeys, 1945–1975: A Bibliographic and Discographic Survey." *Popular Music and Society 30*, no. 3 (2007): 401-423. https://doi.org/10.1080/03007760600836403

The London Gazette of Friday, 15th June 1990, issue 52713, pp. B1-B2. (1990, June 15). https://www.thegazette.co.uk/London/issue/52173/page/2 (Retrieved on June 22, 2022)

Minnis, A. (2010). *Medieval theory of authorship scholastic literary attitudes in the later Middle Ages*. University of Pennsylvania Press.

Mitcham, C., & Waelbers, K. (2009). Technology and ethics: Overview. In Friis et al. *A Companion to the Philosophy of Technology*, 392. Blackwell.

Pinch, T. J., & Bijker, W. E. (1984). The social construction of facts and artefacts: Or how the sociology of science and the sociology of technology might benefit each other. *Social studies of science*, *14*(3), 399-441. https://doi.org/10.1177%2F030631284014003004

Rayner, G. (2012, October 19). *Jimmy Savile: Police launch criminal investigation after victims claim some abusers are still alive*. The Telegraph. Retrieved May 24, 2022, from https://www.telegraph.co.uk/news/uknews/crime/jimmy-savile/9620149/Jimmy-Savile-police-launch-criminal-investigation-after-victims-claim-some-abusers-are-still-alive.html

Red Bull Music Academy. (2003). *Alex Rosner*. Red Bull Music Academy. Retrieved May 7, 2022, from https://www.redbullmusicacademy.com/lectures/alex-rosner-systematic-sound

Rothlein, J. (2013, August 21). *Industry standards: Technics SL-1200*. Industry standards: Technics SL-1200 · Feature / RA. Retrieved June 8, 2022, from https://ra.co/features/1909

Rothlein, J. (2013, October 3). *Industry standards: Pioneer CDJ*. Industry standards: Pioneer CDJ · Feature / RA. Retrieved June 8, 2022, from https://ra.co/features/1910

Saturday Night Live. (2014, May 18). *SNL Digital Short: When Will the Bass Drop?–SNL* [Video]. YouTube. https://youtu.be/DoUV7Q1C1SU

Sismondo, S. (2010). *An Introduction in Science and Technology Studies*. Blackwell.

Straw, W. (1999). Authorship. In B. Horner & T. Swiss (Eds.), *Key terms in popular music and culture* (pp. 199–208). Malden, MA: Blackwell.

Topping, A., & Modin, A. (2022, April 26). *DJ Tim Westwood accused of sexual misconduct by multiple women*. The Guardian. Retrieved May 24, 2022, from https://www.theguardian.com/media/2022/apr/26/dj-tim-westwood-accused-of-sexual-misconduct-by-multiple-women

Yu, J. (2013). Electronic dance music and technological change: Lessons from Actor-Network Theory. *DJ culture in the mix: Power, technology, and social change in electronic dance music*, 151-72.