Jazz and the Recording Process
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Introduction

One of the most obvious intersections of music and technology is the recording process.[i] As a sub-topic in the vast subject of jazz and technology, this includes the history of recording technology, together with its invention and evolution as an analog process through the move to digital recording. It also includes the roles of producer—whether it is the artist or a producer particularly hired for that role—and pre- and post-production work. In addition, the dissemination of music—both for sales and promotion—takes on many guises at this point. CDs, LPs, and streaming and downloads of audio file types such as mp3, FLAC, and AAC, as well as streaming video and social media, are now integral to the recording and dissemination process, as are terrestrial, streaming, and satellite radio. The question of how these various issues actually affect the content of the music, how musicians approach the creative process, and in what ways artists are finding to support themselves and their work are important areas to examine. I briefly discuss these issues as an entryway into the intersection of jazz and technology and conclude with a look at how they affect the artistic and business choices of three of today's most successful jazz artists.[ii]

There are, of course, numerous scholarly books and articles, textbooks, and journalistic approaches in regards to particular jazz artists and their recordings and about the relationship of technology to our consumption of music, again from a variety of viewpoints. Also, there is music scholarship specifically examining recording technology from many perspectives: general books on recording; more specific books on mixing, mastering, and digital audio workstations; sound design and synthesis; the history of electronic music; the role of the producer; the relationship of technology to our consumption of music; and computer music technology. In fact, it seems to be one of the most popular subjects in music today if the new textbooks I am sent on the subject at least twice a month are any indication. They all have interesting things to say, but few books dealing specifically with music and technology actually discuss jazz and its relationship to technology at any length. Perhaps this is because the recording ethos of jazz is generally perceived as a simple one: sonically capture the performance with as little interference with the music as possible, while also keeping it as close to the aesthetic of a live performance as the recording process will allow. This, however, is a gross oversimplification—to the point of being a stereotype—but it is also true in many respects.

Expectations of Jazz Recordings

Beginning in 1917 with the Original Dixieland Band ("Livery Stable Blues" and "Dixieland Jass Band One-Step")—and some believe even earlier with artists such as clarinetist-composer Wilbur Sweatman ("Down Home Rag") in 1916—jazz and jazz related music has been recorded through all of the various means available. Regardless of style, the documenting of music in the early days of recording had the same benefits and challenges. In acoustic recording—employing a single horn or array of horns—balance could only be accomplished through placement of musicians in relationship to the horns,

yet some say that this acoustic method created a particularly cherished realistic sound. The invention of the microphone—in wide use by 1925—brought electrical recording and more possibilities regarding how musicians could be recorded and balanced but put a new element between the artist and the recording. In relation to jazz, both of these methods went along well with the general expectations of jazz recording—capture a performance—but in many ways, contrary to much of what is written about jazz recordings, jazz artists, recording engineers, and producers have always, in one way or another, employed most of the latest in recording innovations. That said, the expectations of jazz recordings still, for the most part, have changed very little.

Orrin Keepnews—a legendary jazz producer and co-founder of Riverside Records, one of the iconic jazz record labels—sums up the feeling of many:

> Next week, I'm going to be in the studio editing and sequencing a CD. The fact that it was recorded digitally, which is very different from early LPs, does not impact my work in the studio. Technology changes but, with jazz, neither the product nor the vocabulary has changed that much.… The technologies are very different, but the reason why it's being done and the effect that we're trying to accomplish is exactly the same. As a record producer who, in 1956, was producing Thelonious Monk, I frankly don't think any challenge anybody can throw at me today is going to be any more demanding than that challenge was then. I am saying that the key element in jazz is, as it always has been, the artist. The key challenge to the producer is to establish a successful relationship with the artist. Technological differences between present and past are secondary to that (Jarrett 2016, 8-9).

Keepnews's statement echoes the sentiment of many producers, musicians, and music journalists and scholars, but it's deceptive in some ways. In this chapter I hope to raise some issues that suggest that this is an overly simplistic way to look at the recording of jazz, both past and present. After a quick glance at jazz's relationship to the evolution of recording media, I begin by examining the use of overdubbing and editing in jazz to debunk the notion of jazz as technologically non-interventionist that is often seen in the literature on jazz recording processes and jazz recordings. A discussion of three top contemporary musicians further illuminates how most contemporary jazz and jazz related artists are as up to date as anyone in this regard and deeply embrace technological advances both for artistic and business reasons.

78—33 1/3—700 MB—Downloads and Streaming

An obvious example of how recording technology has affected the presentation of jazz—or any musical style for that matter—is the amount of music that has been able to fit on the various media types used over the years. One side of a 10-inch 78-rpm disc could only hold approximately 3 minutes of music, meaning, in relation to jazz, fewer and shorter solos, say a chorus or part of a chorus (not necessarily a bad thing), making these recordings greatly truncated versions of what was being played live. In 1948, the move to LPs played at 33 1/3-rpm quickly became the standard—first in mono and eventually in stereo—and the two sides combined hold approximately 40-45 minutes of music.

Consequently, the three-minute limit on recording was gone and players could record longer solos that were more reflective of the concert experience as well as the spirit of improvisation so central to jazz. In the mid-1960s cassette tape cartridges were introduced, and by the mid-1980s they outsold LPs, but they mimicked album content, including the need to turn the cassette over to hear the second side. Compact Discs—CDs—were introduced in 1982 and again raised the bar regarding how much music can be fit on a disc, as a CD can hold approximately 80 minutes of music (700 MB of data).

At this point the CD also seems to be becoming a thing of the past with the advent of digital downloads and later the streaming services, though these challenges to the CD are creating interesting strategies that encourage physical sales.[iii] As a result, many musicians are either questioning the need for physical CDs at all or they are duplicating far fewer than in the past. Interestingly, for a variety of reasons, there has been a resurgence of sales of LPs.[iv] I think of this particular phenomenon as an analog reaction to the digital world as artists look back to older values, including questioning the "improvements" of digital audio and its distribution methods.[v] Even given this move by some, a case can easily be made that with the ascension of individual downloads and streaming services the concept of an album is no longer commercially viable for most of us, yet for the most part we as creators are still very much thinking of them as distinct objects to be heard as a whole in a particular order, another analog reaction reflecting the history of the LP, the media that allowed for this concept. That's quite a serious dichotomy between the intent of the creators and the reception of the consumers.

Overdubbing and Editing in Jazz

Along with the invention of magnetic tape and its editing capabilities, certainly one of the most important innovations was overdubbing through various means.[vi] Thomas Edison experimented with this as early as 1877, and as far back as 1941, soprano saxophonist Sidney Bechet was bouncing tracks from acetate disc to acetate disc to create two sides of a 78—"The Sheik of Araby" and "Blues of Bechet"—performing on multiple reed instruments, piano, bass, and drums, exhibiting his strength as a multi-instrumentalist.[vii] Guitarist-inventor Les Paul is the most famous for his early overdubbing and recording innovations (*sound on sound)*.[viii] He had been using this technique on acetate discs in the 1930s and recorded his breakthrough 1947 version of the standards "Lover" and "Brazil" using this technique, overdubbing eight guitar parts. Paul's 1951 hit version of "How High the Moon," with his wife, the singer Mary Ford is an example of his move to overdubbing using magnetic tape.

Also around this time Lennie Tristano overdubbed himself playing two piano parts on "Juju" and "Passtime" in 1951 and in 1955 overdubbed his piano parts on a trio recording. When working with the important producer George Avakian at Columbia Records in 1954 to record *Louis Armstrong Plays W.C. Handy*, Louis Armstrong "overdubbed both a trumpet solo and a scatted vocal obbligato onto the original tape of 'Atlanta Blues.' The released performance … permits him to conceive and execute the discrete roles of melodic interpreter and accompanimental obbligatist separately, rather than by a process of swift alternation in real time" (Givan 2004, 202). Avakian also used innovative editing techniques to splice various takes for Miles Davis's *Miles Ahead*

(1957). Other well known recordings have surprising overdubs as well, such as *Jazz at Massey Hall* (1953).[ix] The live recording originally had an inaudible bass part, so Charles Mingus overdubbed a new part at the studio of one the most renowned jazz recording engineers, Rudy Van Gelder. In 1954 Van Gelder recorded the eclectic Bobby Sherwood as a one-man big band bouncing tracks on two tape machines (Skea 2001, 63-64).[x]

Others took advantage of these early opportunities. Pianist-arranger-composer George Handy produced and arranged two records with saxophonist Zoot Sims overdubbing multiple saxophone parts—*Zoot Sims Plays Alto, Tenor, and Baritone* (1956) and *Zoot Sims Plays Four Altos* (1957). Jimmy Giuffre recorded an entire album, *The Four Brothers Sound/Jimmy Giuffre* (1958), by overdubbing four tenor saxophone parts to recreate the sound he was a part of with the Woody Herman Orchestra (the recording was engineered by the renowned Atlantic Records engineer, Tom Dowd). Pianist Bill Evans overdubbed himself playing three piano parts for *Conversations With Myself* (1964),[xi] and followed up with *Further Conversations With Myself* (1967) and *New Conversations* (1978).

Further, with the advent of magnetic tape recording, even in jazz, the producer's role expanded, largely because of the greatly increased editing capabilities, as well as an improved ability to overdub. In terms of editing, while the tropes of the first take artist, authenticity, and the importance of through takes in jazz are common, the splicing of takes, the splicing in of a solo from a different take, or an overdubbed solo to make the final master is a common occurrence, and has been since the invention of the tape recorder. Perhaps the most famous example of this includes the partnership of Miles Davis and his producer Teo Macero.

Macero's editing of Davis's later records ranged from simple splices from different takes to more intensive editing, such as extensive reordering and creating tape loops and effects, to such a degree that his involvement became more that of a compositional collaborator than a traditional producer on records such as *In a Silent* Way (1969), *Bitches Brew* (1970), *Jack Johnson* (1971), and *On the Corner* (1972). In a fascinating twist regarding the capturing of a live performance, some of the surprisingly abrupt cuts and edits created in the studio actually had an effect on the live performances of works from these records, as the post-production work preceded the live performances and influenced their direction.[xii] Granted, this is an unusual situation in jazz, but the ability to multi-track record, overdub, and edit certainly brought jazz recordings into the world of post-production.

These are just a few of the many early examples of overdubbing and editing in jazz, and by the mid-1950s overdubbing, and of course the editing of tape for all kinds of reasons, including practicality, allowing people to express themselves as multi-instrumentalists, and financial considerations, was an accepted fact in all of music. Given this ubiquity of overdubbing and editing in jazz, it essentially becomes a moot point to discuss its importance, but given non-jazz writers' tendency to ignore the use of technology in jazz it becomes important to note this fact.

Jazz in the Literature of Music Production

After being somewhat ignored in the literature, recent excellent scholarship and journalism examines the recording process from various perspectives, such as comprehensive histories of recording technology (Horning 2013; Burgess 2014);[xiii] the aesthetics of record production (Zak 2001; Moorefield 2005; Katz 2010); examinations of jazz record labels and particular record albums;[xiv] and journalistic-style interviews with producers (Massey 2000, 2009; Jarrett 2016).[xv] Few, however, deal with jazz record production or jazz producers at any length. When they do, jazz recording, and often jazz itself, is unfortunately often mischaracterized or misunderstood given the fact that overdubbing and editing of the records from the 1950s discussed above have been common knowledge for many years.

Regarding developments in record production in jazz and classical music, Virgil Moorefield states: "These forms of music are generally recorded live, without overdubs, and with minimal, if any, post-performance enhancement. The idea is to capture the live performance in the tradition of 'realistic' recording, as it has existed since the 1870s" (Moorefield 2005, xiv). While he's correct that much of jazz production focuses on the concept of a live performance either in the studio or a concert, often a great deal of production went into creating that sound.[xvi]

Albin Zak, in *The Poetics of Rock*, a landmark book regarding the compositional element of production in pop and rock music, also touches briefly on jazz: "While records were extremely important in the development of the jazz tradition, the art of jazz recording up until the emergence of jazz-rock fusion was focused on the quality of the sonic presentation and on capturing a good—and complete—take" (Zak 2001, 7). Here, like Moorefield, Zak misses the fact that extensive production values were in use long before jazz-rock fusion in the 1960s and 1970s. Further, while Zak believes that "altering [the musical moment] after the fact challenges the traditional ideology of authenticity in jazz" (Zak 2001, 7), the history of jazz recording again proves that jazz musicians immediately embraced technology that allowed them to create or improve their recorded product with any technological means at their disposal.

Susan Schmidt Horning clearly has an appreciation for jazz and presents informative accounts of jazz recording sessions, yet at times she mischaracterizes jazz and jazz record production. Horning speaks of jazz's "unrestrained solo improvisations" (Horning 2013, 46), which is certainly a one-dimensional characterization while also harkening back to primitivist stereotypes regarding jazz. And while she correctly acknowledges that not all jazz musicians were concerned with the notion of the importance of the first take, her discussion of Miles Davis in this regard is lacking: "Miles Davis, for instance, used the recording studio to improve his performance not by electronic intervention but by playing and listening and by honing his interpretation of the music over successive takes until he had achieve what he wanted (Horning, 2013, 197)," ignoring the amount of technological manipulation that was involved in his recordings from the 1950s until the end of his career.

Richard James Burgess touches on jazz lightly throughout his history of record production but provides a more complete description of the collaboration between producer Teo Macero and Miles Davis: "Macero extended his creative integration of studio-manipulated compositional techniques based on improvised performance similar to those he had employed on Davis's preceding album, *In a Silent Way*. Paradigm shifting productions in any genre are worthy of respect but to make quantum creative leaps and create enduring music that sells is a consequential achievement" (Burgess 2014, 92-93).

Mark Katz's intriguing book, *Capturing Sound: How Technology Has Changed Music*, also avoids these stereotypes in his chapter on the 1917 recordings of The Original Dixieland Jazz Band. Chapter 3 "explores how the possibilities and the limitations of early recording technology shaped nearly every aspect of jazz performance and composition" (Katz 2010, 5), which is prescient and applies to jazz today as I later discuss in relation to contemporary jazz artists. Katz's book also highlights the difficulties inherent in writing about music and technology. Originally written in 2004, Katz revised it in 2010 by adding a chapter on contemporary technology, which is now quite out of date, and from my perspective the technological changes since then serve to directly challenge some of his main points. This is not just Katz's issue of course—as I wrote this chapter new articles constantly came to my attention that did something quite similar to my arguments, and I'm sure by the time this is published it will also be out of date.

Howard Massey's *Behind the Glass: Top Record Producers Tell How They Craft the Hits* (Massey, 2000) and its follow-up, *Behind the Glass, Volume II* (Massey 2009), are rare examples of books that provide intimate examinations of the record production process from many perspectives, though they largely bypass jazz records. Massey speaks of "the rarified world of jazz and classical recording" (Massey 2009, 101), and does, however, have an excellent profile of Steven Epstein, a top producer in those fields. Contrary to some of my main points, Epstein states: "There are some producers that might not have a problem recording jazz with a significant amount of overdubbing, but my feeling is that, since everyone is spontaneously supposed to play off everyone else and derive their inspiration at that moment—that, after all, is what makes jazz exciting and wonderful—it should all be recorded in real time and without overdubs" (Massey 2009, 101).

Moving beyond the stereotypes and tropes that can occur in books on record production, Michael Jarrett's *Pressed For All Time: Producing the Great Jazz Albums* presents an excellent and unique examination of the intricacies of jazz record production through extensive interviews with fifty-five high level jazz record producers. While Jarrett's interviews are invaluable and extremely informative, I take issue with one point of his when he states that "while the album shows no sign of disappearing, it also shows no sign of further development" (Jarrett 2016, xvi). The following discussion of three contemporary artists gives a more hopeful and wider perspective than Jarrett's regarding the future of records in the jazz world.

Contemporary issues in technology

Technological advances in music—and in any field—often have both good and less good ramifications. The fact that digital music is so easy to disseminate and distribute widely also means that people can easily steal music (and they do so in many ways), and the money paid for streams, the fastest rising method of consuming music, is paltry to say the least. The formulas regarding payment for streaming royalties are extremely complicated and details are beyond the scope of this chapter, but for example: artists receive different amounts depending on if a listener is a paid or free subscriber; how long the stream is activated is calculated to determine if payment will be made for the stream; and different services pay different royalties. In terms of monetization, in very rough terms, it takes approximately 1,000 streams to equal the payment to an artist for a single download and therefore approximately 10,000 to equal the payment for one album download of ten songs. Taking this one step further, this means that to equal the sale of 100 CDs that an independent artist could fairly easily sell at gigs and to family and friends they would need in the range of 1,000,000 streams of music from their CD, an unlikely number for an independent artist. Obviously this has radically changed the economy of the music business.

So while music is more easily available and we can hear any type of music we want at any second, it's also becoming extremely difficult to make money with recordings. Since jazz is commercially marginal anyway, this has indeed changed the ballgame for us. The classic artists we all listen to had record deals that actually paid them money and they received royalties (unless they had poor contracts, a common occurrence).[xvii] It wasn't their sole living, but it was part of it, and this is no longer true for most of us. In fact, outside of the three major music conglomerates' sales of top artists (Universal Music Group, Sony Music Entertainment, and Warner Music Group), neither the artists or the labels have a clue how best to approach the music business these days, either in terms of how to best distribute their creative work or to monetize it.

Many artists, however, are coming up with creative solutions that work for them as I discuss below, and certainly the democratization of distribution is a boon to independent artists and labels: what large distribution networks or labels do for artists for either a fee or a licensing deal we can now do quite cheaply and easily on our own through distribution service companies such as CD Baby, Bandcamp, Distrokid, and Tunecore. Given this situation, other than top selling artists, we are now essentially all independent artists on our own in a morass of a business climate. Fortunately, jazz musicians are actually quite tech-savvy and we are taking advantage of the economically viable home, project, and independent studios, while creating new opportunities for ourselves, for example, by self-producing and self-releasing or creating cooperative record labels. Examining three of today's most successful artists—each handling the technological and business issues of 2017 differently—provides a real world look at how artists are affected by technology and how they react to these issues, as well as how technologically savvy contemporary jazz musicians are.

Esperanza Spalding, Maria Schneider, and Nicholas Payton

One of today's most commercially successful jazz artists is Esperanza Spalding. Spalding took the music world by storm, including four Grammy Awards, has emerged as one of

jazz's biggest stars, and is currently signed by Concord Music Group. Her *Emily's D+ Evolution* (2016) sits more comfortably in a pop-oriented medium and consequently is more reliant on contemporary recording technology as seen by her collaboration with Tony Visconti, David Bowie's producer, as well as by the overall sound quality of the production. To those of us who have followed her meteoric career, this was a surprising record, though ideally artists are appreciated without particular expectations and allowed the freedom to be as broad as they choose to be.

Spalding's September 2017 project, *Exposure*, is a very interesting and even telling response to the musical experience of *Emily's D+ Evolution* as well as to the demands of her label, and provides us with the opportunity to look at new ways technology is allowing and encouraging music to be presented. Spalding spent 77 hours in a studio with a few musicians to compose and record an album of 10 songs, most with lyrics, and the entire process was broadcast as a live feed on Facebook, including her eating and sleeping in the studio. In other words, while essentially moving in reverse from a pop style recording process that entails a long and involved recording and production process to a more traditionally jazz-oriented style that entails doing an album quickly, she also used the latest technology of streaming video on social media to reach a potentially vast Facebook audience. It also seems as if she is trying to reclaim her independence—the record label in this case will not be able to have a say in what she records—that ironically, but not unusually, has been threatened by her success.

Exposure is being released as a limited edition of 7,777 CD packages that include a piece of manuscript paper from the process. Interestingly, it won't be available for streaming or download—again a return to an earlier period of means of distribution—and, even though it is still in the digital domain, I see this, and her time limitations in the studio, as other examples of an analog reaction to the digital revolution**.** Certainly Spalding's success at selling records allowed her the power to negotiate with her label to pay for this unique recording circumstance and puts a sharp focus on the difference between her and the rest of us in terms of star power, even including one of jazz's most successful composers, Maria Schneider.

Schneider has had to find a different route to fund her creative work through her participation with ArtistShare, an established and organized vehicle for fundraising and crowd sourcing, and many artists use a version of this method if they cannot afford to fund projects themselves. You can essentially only get her CDs through their website, she doesn't put her music on streaming services or YouTube, and she spends a great amount of effort to protect her work and her ownership rights. In fact, to do so she has become a major activist in this area in the U.S., and this brings up some of the most important areas regarding intellectual property rights today.

On her own and through the MusicAnswers organization (musicanswers.org) Schneider is fighting battles on several fronts. For one example, she is a leading spokesperson for radically changing the Digital Millennium Copyright Act (DMCA) that is currently destroying the power of copyright. This includes the notion of "take down leave it down," which entails getting rid of the safe harbor provision that makes it so difficult to keep our

work off of YouTube if we so choose. She is also promoting the Fair Pay Fair Play Act to pay performers for radio play in the same way that composers and publishers are currently receiving compensation. And in an open letter, Schneider protested the Recording Industry Association of America's recent stand on "moral rights" regarding rights of attribution and the importance of accurate metadata to protect ownership rights.

So here Schneider is, a leading composer in the jazz field and beyond, yet to protect her ability to make money off of her work, as well as help her fellow content creators, she has essentially been forced to become an activist regarding rights issues. I find it an interesting development that while Schneider is decidedly an acoustic instrumental composer, seemingly with little interest in digital music creation beyond the recording process, she is still smack in the middle of technological issues and advances and their various positive and negative ramifications. Someone who *has* taken great advantage of current music technology on many levels is trumpeter Nicholas Payton.

Payton brings up different yet related issues. He's been quite prolific over many years and his work is incredibly varied, including straight-ahead small group albums with varied themes, a re-creation of the Miles Davis-Gil Evans collaboration *Sketches of Spain*, and his *#BAM: Live at Bohemian Caverns (BMF)* on which he plays both trumpet and Fender Rhodes keyboard, often at the same time. Two recent albums get to some of the points I am exploring here regarding music technology, including business decisions he has made and his expression of himself as a multi-instrumentalist. He is also an outspoken person who uses social media effectively— in particular his blog (nicholaspayton.wordpress.com)—and to some controversially.

Payton alternately speaks of his 2011 CD, *Bitches*, as a blues album and an R&B album, both of which make sense to me. His lyrics tell a story of an affair from start to finish, and he refers to it as a semi-autobiographical break up album from an adult point of view. On first listen it might seem very different from other things he's done, but if you look at the totality of his output it's something his music has been leading up to for a while. He wrote the music and lyrics, plays all of the instruments, sings, and did the drum programming, and has guest jazz and pop vocalists including Cassandra Wilson and Esperanza Spalding. Contemporary recording technology and the high quality that is available at relatively low cost, allows Payton to express himself as a multi-instrumentalist much more easily than in the past.

Concord Records declined to release *Bitches* so Payton licensed it—a very common arrangement these days even for well-known artists—to the German label, In + Out Records. *Bitches* was originally released for streaming and download and on CD and he also released it as a limited edition of 999 numbered LPs, an example of the resurgence of vinyl LPs and similar to Spalding's limited release of *Exposure*.

As is true for so many artists now, Payton is self-releasing his work on his own label on bandcamp—a streaming and downloading site for independent artists that offers great flexibility for both the artist and consumer—which fits in with the sometimes anti-establishment attitudes we see on his blog. This is also something that contemporary

music technology has not only allowed but actually encourages. While he has always been prolific, it's interesting to note that now that he is self-releasing, his output has greatly increased and has become even more varied. For example, for his 2016 *Textures* project he set up his keyboard and laptop with the visual artist Anastasia Pelias and her blank canvasses and created what he refers to as "off the cuff tracks done in real time with an artist that paints" (Payton accessed 11-11-17, http://www.nicholaspayton.com/projects/). His most recent 2017 release, *Afro Caribbean Mixtape*, is a double CD. It features his working band, a cellist also playing sound effects and samples, and a DJ on turntable and sampler. It has elements of *musique concrète* and electro-acoustic music and is a rich mix of extremely varied music that at times superimposes numerous samples of people speaking over the music, including Duke Ellington, Dizzy Gillespie, and Max Roach. The whole CD seems to be more about flow as an entity than traditional tunes and solos, though that element is there as well. Finally, *Bitches*, *Afro Caribbean Mixtape* and Spalding's *Emily's D+ Evolution* are clear examples of artists continuing to create albums meant to be considered as an entity, as opposed to tracks independent of each other, even with the proliferation of individual downloads and streaming. In addition, it's fascinating and illustrative that each artist has taken control of their artistic output and careers in a unique manner.

Conclusion

This chapter only begins to touch on issues regarding jazz record production and jazz in today's marketplace, and these are just small parts of the much larger topic of jazz and technology, a topic that is ripe for deeper investigation. To mention a few important areas, a thorough examination of artists that embrace technology as part of broadening concepts of jazz or cross-genre work that embrace popular styles such as R&B, rap, and hip hop—including pianist-composer Herbie Hancock, pianist-producer Robert Glasper, and trumpeter-bandleader Christian Scott aTunde Adjuah—is a particularly timely subject. Intellectual property concerns such as those Maria Schneider, guitarist-activist Marc Ribot, and others are pursuing is crucial to the future of jazz and music in general, as is a more in depth examination of new and innovative business models. Instrument technology, both acoustic and electronic, and their effect on contemporary jazz would be a fascinating study, and how jazz musicians are using home studio technology is an important and closely related topic. Finally, an investigation of methods that contemporary jazz scholars are using to examine jazz and technology would be a valuable endeavor. In some ways, jazz and technology might be the most pressing area in jazz studies for continued investigation as at this point it essentially impacts all aspects of jazz and jazz musicians today in one way or another. I find it inspiring to think that as we continue to examine this topic we will always be out of date. It's an exciting time.

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[i] While recording technology is the most obvious, issues of instrument technology, both acoustic and electronic, are perhaps the most crucial and this is certainly an area ripe for continued examination.

[ii] To give the reader a better view of my perspective, my involvement in the topic of jazz and technology is multi-faceted. I am a composer, trumpet player, and multi-instrumentalist; I have a home studio and self-produce my music as well as the music of other artists; I am a jazz scholar, lately primarily investigating jazz composition and jazz composers; and I initiated a music technology program at my school, John Jay College, City University of New York, and teach all of the courses in it. Consequently, I'm keenly observing this crucial and ever-changing area that fascinates me and confounds me at the same time.

[iii] For example, during the first week of November 2017, country artist Kenny Chesney's release, *Live in No Shoes Nation*, reached No. 1 on the Billboard album chart with only 1.6 million streams. This is compared to three other albums in the Top five that each had over 50 million streams. In this case a purchase of the physical CD was bundled with concert tickets, clearly a winning strategy and a new approach to encourage the more profitable physical sales (Sisario 2017).

[iv] Vinyl sales continue to rise. Nielsen Music's 2017 Q3 report states that 16% of all physical sales were vinyl LPs, the highest percentage since the CD was introduced. Also, jazz record buyers tend towards physical sales. Newvelle Records (newvelle-records.com) is a company that exemplifies this interest. For $400 dollars a year subscribers receive six high quality jazz vinyl LPs a year. Artists on the label retain all rights but commit to two years of exclusive vinyl release with Newvelle.

[v] The relative sonic quality of analog versus digital is a broad and divisive topic and beyond the scope of this chapter. Two recent books provide fascinating insights surrounding this issue: David Sax's *The Revenge of Analog: Real Things and Why They Matter* (2016); and Damon Krokowski's *The New Analog* (2017).

[vi] I would like to extend my thanks to Benjamin Givan for sharing his unpublished 2002 paper with me, "The Rise of Overdubbing in the American Recording Studio," as well as for his thoughtful insights and suggestions as I muddle through my various projects, including this one. Thanks also to John Wriggle, Benjamin Lapidus, and Kwami Coleman for their comments on this chapter.

[vii] Vocalist-guitarist-multi-instrumentalist Slim Gaillard was doing this in 1951 as well, as were numerous others.

[viii] Paul's work is discussed throughout Burgess 2014 and Horning 2013, and in great detail in Mary Alice Shaughnessy's *Les Paul: An American Original* (1993).

[ix] This recording documents the only time Dizzy Gillespie, Charlie Parker, Bud Powell, Charles Mingus, and Max Roach recorded together.

[x] Sherwood recorded four trumpet parts, trombone, mellophone, vibraphone, piano, guitar, bass, drums, and four vocal parts.

[xi] For this recording Evans performed on pianist Glenn Gould's piano, and Gould's heavily edited and iconic version of J.S. Bach's *Goldberg Variations* is one of the most famous examples of in-studio editing in the classical world.

[xii] The innovative producer Bill Laswell points out this issue (Jarrett 2016, 133).

[xiii] Andre Millard's *America on Record: A History of Recorded Sound* (1995) and Mark Cunningham's *Good Vibrations: A History of Record Production*, 2e (1996) are older valuable surveys of record production.

[xiv] Some books on jazz record labels are: Ashley Kahn's *The House That Trane Built: The Story of Impulse Records* (2006), Rick Kennedy's *Jelly Roll, Bix, and Hoagy, Gennett Records and the Rise of America's Musical Grassroots* (2013), and Jason Weiss's *Always in Trouble: An Oral History of ESP-Disk, the Most Outrageous Record Label in America* (2012). The Oxford Studies in Recorded Jazz series (Oxford University Press) includes books that examine individual record albums, including: Keith Waters's *The Studio Recordings of the Miles Davis Quintet, 1965-68* (2011); Catherine Tackley's *Benny Goodman's Famous 1938 Carnegie Hall Jazz Concert* (2012); and Gabriel Solis's *Thelonious Monk Quartet with John Coltrane at Carnegie Hall* (2013). Tony Whyton examines *A Love Supreme* in *Beyond A Love Supreme: John Coltrane and the Legacy of an Album* (2013).

[xv] Ted Fox's *In the Groove: The People Behind the Music* (1986) also has insightful interviews with a variety of record producers.

[xvi] Chapter 2 of Darren Mueller's uniquely thorough examination of the LP in jazz details the intense post-production that went into the classic 1956 LP, *Ellington at Newport* (Mueller 2015, 105-147).

[xvii] As an example, drummer Jack DeJohnettte, one of jazz's most important musicians, in an open letter to the 2016 New York State gubernatorial candidate Zephyr Teachout states: "Since downloads and YouTube started, my recording music royalties have declined by over 90%. I am all over YouTube, [and] everyone but me gets an income from this" (https://thetrichordist.com/2016/06/27/4-questions-for-zephyrteachout-jack-and-lydia-dejohnette-letter/, accessed 11-15-17).