

2012

## New Tools in Improvised Music Performance.

Seán Mac Erlaine

Technological University Dublin, seanmacerlaine@gmail.com

Follow this and additional works at: <https://arrow.tudublin.ie/aacomusart>



Part of the [Musicology Commons](#), and the [Music Performance Commons](#)

---

### Recommended Citation

Mac Erlaine, Seán, "New Tools in Improvised Music Performance." (2012). *Articles*. 20.  
<https://arrow.tudublin.ie/aacomusart/20>

This Article is brought to you for free and open access by the Conservatory of Music and Drama at ARROW@TU Dublin. It has been accepted for inclusion in Articles by an authorized administrator of ARROW@TU Dublin. For more information, please contact [arrow.admin@tudublin.ie](mailto:arrow.admin@tudublin.ie), [aisling.coyne@tudublin.ie](mailto:aisling.coyne@tudublin.ie).



This work is licensed under a [Creative Commons Attribution-NonCommercial-Share Alike 4.0 License](#)

# New Tools in Improvised Music Performance.

Seán Mac Erlaine

## Introduction

This paper starts by looking at the nature of the use of new technology in artistic practice. The general nature of tools – their application and design – is discussed. More specifically, then, this article concerns itself with the emerging field of practice of musicians working in improvised music using computer technology in real-time applications. I present the argument that the new tools of digital technology play a powerful role in shaping a new sense of aesthetics among this body of musicians.

There is a sense in the field of computer music (and digital technology applications more generally) that we are still in the embryonic stage of development.<sup>1</sup> This, of course, engenders a sense of the unknown, of excitement and exploration in this new musical pursuit. Another persistent pattern is the fascination and fetishisation of technology as an end in itself – this will be sidestepped throughout this dissertation with the emphasis firmly on applicable uses of new technologies and the resulting musical outcome. It is the nature of the new to attract a wide cross-section of practitioners working in many diverse fields. This paper will necessarily narrow its focus to instrumentalists working in improvised music who use digital technologies as an extension of an existing instrumental practice.

## Technology as a Tool

The notion of technology presents itself today as the very essence of contemporary western culture. ‘Technology’ is an everyday signifier as a driver of commerce, an essential ingredient of communication and an unlimited agent of creativity and advancement.<sup>2</sup> With such a broad usage of the term across so many sectors of society it behoves us to define this term for our purposes here.

---

<sup>1</sup> Nick Collins, *Introduction to Computer Music*, (Chichester: John Wiley and Sons Ltd, 2010), 36.

<sup>2</sup> See Frank Webster, *Theories of the Information Society*, 3<sup>rd</sup> edn (London: Routledge, 2006), 10.

Technology – from the Greek *technē* (art) plus *logos* (word or discourse) – is the sum total of ways by which practical and aesthetic goals are realized. New technology allows new goals to be defined. Because technology constantly modifies what goals are possible, it provides a vital and dynamic link between human imagination and reality.<sup>3</sup>

Moore's contribution goes beyond mere statement to suggest that technology acts as a tool to expand, and test, creative limits and expectations.

In appraising the new role of the computer and digital technology in music, writers have come out with hugely ambitious claims about the importance of this new form of technology, with writers characteristically heralding it as “the most fundamental change in the history of Western music since the invention of music notation in the ninth century.”<sup>4</sup> With the revolution of digital technology less than 35 years in the past, it is perilous to quantify just how important it will be seen to be. However, it is unarguable that digital technology has caused a paradigm shift in musical practice since the availability of affordable hardware in the 1980s.

[The computer] has revolutionized the ways in which musicians think, or indeed can think, about sound and sonic expression, and married to the principles of electroacoustic music – or to music in general – forms a mighty alliance which will create the music of the future and transform the understanding of music of the past, will change the ways in which music is performed, and the uses to which music is put.<sup>5</sup>

Richard Orton attributes this seismic shift in musical possibilities to the fact that for the first time in human history we have a means which, through its plasticity and time-based capabilities, can model the features of human thought.<sup>6</sup> The implication here being that the computer can create, organize, reproduce and perform music in a manner which is closest (thus far in our evolution) to our inner creative imagination.

That technology acts as an agent between musician and music further categorizes it as a tool. In these discussions, it is usually quickly pointed out that the tool is merely just that: it does not

---

<sup>3</sup> F. Richard Moore, ‘A Technological Approach to Music’ in *Companion to Contemporary Musical Thought: Volume 1*, John Paytner, Tim Howell, Richard Orton and Peter Seymour (eds.), (London: Routledge, 1992), 329.

<sup>4</sup> T. D. Taylor, *Strange Sounds: Music, Technology & Culture*, (New York, London: Routledge, 2001), 3.

<sup>5</sup> Richard Orton, ‘Musical, Cultural and Educational Implications of Digital Technology,’ in *Companion to Contemporary Musical Thought*, Vole .1., Paytner, 320.

<sup>6</sup> Richard Orton, ‘Musical, Cultural and Educational Implications of Digital Technology’ in *Companion to Contemporary Musical Thought: Volume 1*, John Paytner, Tim Howell, Richard Orton and Peter Seymour (eds.), (London: Routledge, 1992), 321.

represent the underlying intention of the art work, but acts as a medium through which these intentions are communicated.<sup>7</sup> Yet the characteristics of the tools adopted will greatly shape and influence the music presented, as we will see throughout this research.

The computer is in this sense a tool. Like any other tool (or musical instrument) it is a device which extends the capability of the human body. If we look closely at the full import of what can be done with a tool, whether we are considering a hammer or a computer, we see in the tool the embodiment of the *conception* of the task; and yet the very conception of the task is both illuminated and obscured by the nature of the tool<sup>8</sup>

An interesting question, particularly in contemporary uses of computers in music, as practitioners are today influenced by the legacy of 50 years of electronics in music is: are musicians choosing to use computers as a tool to realize their compositional intent or are they choosing to use the digital medium for its own set of aesthetic qualities?

The use of tools involves interposing another factor between the subject and this object, a factor that occupies an intermediate position not only in terms of space and time but also in terms of its content. For on the one hand a tool is a mere object which is mechanically effective, but on the other hand it is also an object that we not merely operate *upon*, but operate *with*, as with our own hands [...] By using tools we deliberately add a new link to the chain of purposeful action, thus showing that the straight road is not always the shortest. The tool is typical of what we might call our creations in the external world; on one hand it is formed exclusively by our own powers, and on the other it is devoted entirely to our own purposes.<sup>9</sup>

## Technology in Charge

Technology precedes artistic invention (as much as we artists would like to think it's the other way around!). First came the electric guitar and *then* came rock and roll.<sup>10</sup>

The binary choice often presented in the question as to which comes first, new technology or artistic invention doesn't reflect the co-

---

<sup>7</sup> Marshall McLuhan's celebrated idea 'the medium is the message' opposes this dominant idea. When applied to instrumental music this is particularly apt, where texture and the sonic fabric itself are the salient constituents. See McLuhan, Marshall. *Understanding Media: The Extensions of Man*

<sup>8</sup> Keane, *Threshold of an Aesthetic*, 116.

<sup>9</sup> Georg Simmel, *Philosophy of Money*, David Frisby (trans.), 3<sup>rd</sup> edn (Routledge, 2004), 224.

<sup>10</sup> John Adams quoted in *Audio Culture: Readings in Modern Music*, 111.

dependant nature of the relationship between these two forces.<sup>11</sup> For our purposes, it will prove impossible to divorce the influence of electronic music aesthetics from the tools of its creation. On one extreme, computer technology provides “the only musical instrument available which is capable of providing them with a means of expression appropriate to their needs.”<sup>12</sup> But to suggest that a musician chooses a computer as a tool to create music without taking into account the aesthetic traditions of electroacoustic, electronica, techno or musique concrete music’s could occur only in specialized and isolated circumstances.

The balance between these two forces of engineering and artistic pursuit necessarily remains a fluid one in this particular field as jazz musician Miles Davis comments:

A lot of people ask me where music is going today. [...] Music is always changing. It changes because of the times and the technology that’s available, the material that things are made of [...] Musicians pick up sounds and incorporate that into their playing, so the music that they make will be different.<sup>13</sup>

## The Technological Legacy

When we look to contemporary uses of digital technology among improvisers today it is clear that what a musician can achieve technically is hugely dependant on the tools he/she is using. These tools, be they computer based software or hardware digital signal processors, are the result of decades of evolution from within the musical technology industry.

The music technology industry has more than one historical starting point. Max Mathews’s first coaxing of a musical tone from a mainframe computer in 1957 is cited regularly as the pioneering moment when engineers and composers began to direct their attention to the use of computers in music.<sup>14</sup> These early pioneers worked almost exclusively within university research centres across North America and western Europe, developing music which, on the whole, was seen as an esoteric offshoot of serious art music.

---

<sup>11</sup> This is analogous to the chicken and egg problem, where the cause and effect model doesn’t represent the complex relationships at play. The truism ‘correlation does not imply causation’ is apt here.

<sup>12</sup> Michael McNabb, ‘Computer Music: Some Aesthetic Considerations’, in *The Language of Electroacoustic Music* (ed. Simon Emmerson), (London: Macmillan Press, 1986), 143.

<sup>13</sup> Miles Davis, *Miles: The Autobiography*, (London: Picador, 1990), 393.

<sup>14</sup> Nick Collins, *Introduction to Computer Music*, (Chichester: John Wiley and Sons Ltd, 2010), 37.

Not until the digital revolution, of the 1980s, when major corporate interest saw production line development of MIDI technology and personal computers, music software and notation software. The accessibility of these new developments and, in particular, the capabilities of real-time processing encouraged many musicians to engage with digital music.

## The Studio

Originally conceived of as a tool of music reproduction, the rapid development of tape and subsequently, digital technologies bestowed new creative role to studio engineers and producers.

The results of this widening of the technology's original *raison d'être* quickly moved beyond art music into popular music forms once the economics permitted. The rapid establishment of home record players in the 1950s meant that commercial pop music was put in a position to engage with the emerging studio technologies of the time. At the same time, the concept of using the music studio as a compositional tool was introduced in rock and roll music. Producer Brian Eno points to Elvis Presley's unusual slapback echo effect on the vocals in *Heartbreak Hotel* as "the first synthetic use of the studio" and asserts that, by the late 1960s, the producer "becomes a re-composer of the piece."<sup>15</sup> The 1960s saw high level studio production values moving into popular music as much of the drive of the music technology sector came from the pop and rock markets which remains the case today.<sup>16</sup> Influential rock performers like Jimi Hendrix, Pink Floyd and The Beatles used both electric instrumentation and live processing on stage, while their studio releases used sophisticated editing techniques, expanding the concept of the recorded artefact.

The jazz mainstream continued to use recording strictly as a means to represent actual performance throughout the 1950s and 60s. In fact, the advent and consuming popularity of rock music in the 1960s was seen by many jazz commentators as a threat to the continuation of jazz as a viable artform, a viewpoint which slowed down the jazz community's adoption of new studio techniques. A more fundamental tacit implication here being that jazz was an acoustic improvised music and that tampering with the musicians' work was anathema to jazz's core values.<sup>17</sup>

---

<sup>15</sup> Elvis Presley, 1956 *Heartbreak Hotel*. RCA Victor

Brian Eno interviewed by Charles Amirkhonian on KPFA's Ode to Gravity, 1980 (February 2, 1980). <http://www.archive.org/details/BrianEno> accessed 26/01/2011

<sup>16</sup> Tschmuck, P. 2006. *Creativity and Innovation in the Music Industry*. Springer-Verlag New York Inc. New York

<sup>17</sup> Nicholson, *Is Jazz Dead?*

Although at odds with the by-then solidified jazz aesthetic, Miles Davis's release of the long player *Bitches Brew* in 1970, brought about a new public awareness of the integration of new technologies with experimental jazz music. Although Davis, and others, had released earlier electric experiments, *Bitches Brew* became an iconic and controversial release, selling over half a million units.<sup>18</sup> While the use of signal processing was sparse (predominantly some echo effects on the trumpet), the use of electric instruments including Fender Rhodes Piano and John McLaughlin's electric guitar saw the sounds of 1960s rock music being introduced into an improvised setting. However, the more subtle post-production techniques are what, ultimately, prove to be the innovative legacy of this work. Producer Teo Macero, heavily influenced by Schaeffer's *musique concrete* work, made liberal editing decisions far beyond the accepted norms of jazz production values, which up to that point held as sacrosanct the notions of authenticity and accurate portrayal of the performance.<sup>19</sup> Macero used tape loops and editing techniques, which transformed the recorded performance into a product of the studio. Speaking of their previous collaboration *In A Silent Way*, Macero states: "There must have been hundreds of edits, if you listen to it very carefully you will hear the repeats. It was very creative for me because I had *carte blanche* to do whatever I wanted to do with Miles' tapes."<sup>20</sup>

## Live electronics: an emerging field

The multiple cross-currents of influences between contemporary music, free improvisation and jazz found a comfortable home in new electronic music which attracted improvising musicians initially in the 1960s, who worked with embryonic technology which often required the performer to sideline in circuit bending and circuit building. A number of composers outside the western art music tradition were working in the field of electro-acoustic experimentation engaging with tape, circuit building and electronic manipulation of acoustic instruments. This new movement found its early expression in the United States of America among clusters of key practitioners. In terms

---

<sup>18</sup> Eddie Harris's 1968 release *The Electrifying Eddie Harris* is an important document in the saxophonist's oeuvre. This recording features his use of the ill-fated Selmer Varitone Saxophone, an internally amplified instruments with basic tone controls and sub-octave pitch shift designed in 1965. Miles Davis's releases *Filles de Kilimanjaro* (1969) and *In a Silent Way* (1969) both make use of electric instruments and advanced use of studio post-production technology.

<sup>19</sup> For an in-depth analysis of Macero's production work with Davis in this period see Jeremy Allen Smith, 'Sound, Meditation and Meaning in Miles Davis's *A Tribute to Jack Johnson*' (Ph.D. diss., Duke University, 2008).

<sup>20</sup> In interview with Olana Digirolamo for *Play That, Teo* Film Documentary. [www.playthatteo.com](http://www.playthatteo.com)

of developing new working techniques with tape, Californian composer Terry Riley is a pivotal figure.

Riley's innovation was the use of tape loops, essentially a circular 'closed circuit' piece of magnetic tape. In 1963, an uncredited engineer created Riley's Time Lag Accumulator:

He got it by stringing the tape between two tape recorders and feeding the signal from the second machine back to the first to recycle along with the new incoming signals. By varying the intensity of the feedback you could form the sound either into a single image without any delay or increase the intensity until it became a dense chaotic kind of sound. I enjoy the interplay between the two extremes. This engineer was the first to create this technique that I know of, this began my obsession with time-lag accumulation feed-back.<sup>21</sup>

The significance of this innovation stretched beyond the immediate phenomena of long delay lines which slowly morphed over time, but rather, that the medium of tape itself "was reinvented as a performance instrument."<sup>22</sup> In working with tape delay, both Riley and accordionist Pauline Oliveros created music far removed from either the angular avant-garde or the nascent rock music of the time. The process of recording and rerecording in a circular fashion dictated many parameters of the music leading to a situation where the technology heavily shaped the outcome of the work.

David Behrman's early work with simple homemade electronics, in an era where access to mainframe computers and studio technology was the preserve of select radio studios and university research centres, presaged much of the musical applications of the technological revolution of the 1980s. His seminal piece *Wave Train* (1966) is a key work in terms of blending new technologies with established instrumentation in new ways.

*Wave Train* linked an old thing – the resonant characteristics of a grand piano – and a new thing, feedback. The score consisted of a description, with diagrams, of how to set up and do the piece. In performance one places guitar microphones at various locations on a piano's strings, then slowly raises the gain on the microphones' amplification systems until feedback growls forth and excites the strings [...] By modulating gain controls and repositioning the microphones in intervals when the gain is off one tries to shape the raw feedback force into large, resonant, overlapping waves.<sup>23</sup>

Behrman along with fellow composers Alvin Lucier, Robert Ashley and Gordon Mumma formed the Sonic Arts Union in 1966. This

---

<sup>21</sup> Riley quoted in Holmes, T 2008. *Electronic and experimental music: technology, music, and culture*. Taylor & Francis. P132.

<sup>22</sup> Collins, N., 2007. Live electronic music. In: Collins N. & d'Esquiván J., eds., 2007. *The Cambridge Companion to Electronic Music*. Cambridge: Cambridge University Press, p45.

<sup>23</sup> David Behrman, *Wave Train* (music from 1959 to 1968), CD liner notes 1998



small cell of experimental American composers dedicated itself to the performance of new compositions which used live electronics. These electronics were often built by the composers themselves for specific compositions. Many of these compositions were open-ended and relied heavily on the improvisational skills of the performer.

David Behrman and Gordon Mumma, implicitly advanced the radical idea of a musical composition that could exist purely and entirely in hardware. In this period, scores by the two composers, where they existed at all, often consisted only of a circuit diagram, accompanied by a set of sketchy instructions.<sup>24</sup>

The Sonic Arts Union's existence spanned the decade between 1966 and 1976, a period which witnessed a marked increase in the use of live electronics in performance across both the USA and Europe. Within this dynamic new area of performance practice the Sonic Arts Union produced many innovative compositions such as Behrman's *Cello With Melody Driven Electronics* (1975) which, Collins writes, "was a harbinger of the interactive computer music of the next decade. For the cellist and audience alike it was utterly unexpected to hear electronic sounds react so directly to acoustic ones in an era when a fixed tape was the default method for adding electronics to a solo instrumental composition."<sup>25</sup>

## The Digital Revolution

As the electronic technologies became integrated into performance practice in a number of contemporary genres throughout the 1960s and 1970s, the advent of integrated circuit boards and the rise of microprocessors would initiate radical changes in music production both on the stage and in the studio. Composer David Behrman asserts that, by 1977, the availability of the relatively cheap and vastly more powerful micro-computers re-invented live electronic performance practice.<sup>26</sup> When the technologies of the digital revolution were married to the emerging electronic music field, the landscape of computer music was altered radically with lasting implications. Timothy D. Taylor declares that "the advent of digital technology in the early 1980s marks the beginning of what may be the most fundamental change in the history of Western music since the invention of music notation in the

---

<sup>24</sup> Lewis, G. E. *Live Algorithms and The Future of Music*. Cyberinfrastructure Technology Watch, May 2007. <http://www.ctwatch.org/quarterly/print.php%3Fp=74.html> [accessed 30/12/2011]

<sup>25</sup> Collins, N., 2007. Live electronic music. In: Collins N. & d'Esquiván J., eds., 2007. *The Cambridge Companion to Electronic Music*. Cambridge: Cambridge University Press, p42.

<sup>26</sup> <http://www.furious.com/perfect/behрман.html>

ninth century.”<sup>27</sup> The digital revolution brought all the computer music developments since the 1950s into the realm of consumer electronics and software. The limitations and demands of earlier tape technologies were emulated in digital environments, which proved extremely labour-saving and more cost effective.<sup>28</sup>

The major music industry manufacturers were quick to adopt the state of the art digital systems. Synthesisers, like the ground-breaking and hugely popular Yamaha DX-7, released in 1983, used frequency modulation to produce tone, ushering in a new generation of digital musical instruments (Schedel 2007).<sup>29</sup> Musicians also turned to the new personal computers produced in the 1980s by Macintosh, Atari and others. In an effort to achieve compatibility between rival American and Japanese instrument companies a new far-reaching digital communication system, MIDI (Musical Instrument Digital Interface) was released in 1983. MIDI appeared on subsequent synthesisers and offered a way of digitally connecting keyboard instruments to computers for the first time.<sup>30</sup> The MIDI protocol immediately became the industry standard for interfacing computers and synthesisers and remains so today. After the initial success of new MIDI keyboard instruments released by Korg, Yamaha and Roland, musicians sought to develop non-keyboard based MIDI controllers. The Studio for Electro-Instrumental Music (STEIM) in Amsterdam (co-founded in 1969 by pianist Misha Mengelberg) has proved a key centre for overseeing the development of an ever-expanding range of instruments and software controllers without recourse to the traditional instrument paradigm.<sup>31</sup>

---

<sup>27</sup> Taylor, T. D., 2001. *Strange Sounds: Music, Technology & Culture*. New York, London: Routledge.

<sup>28</sup> Since their introduction in the 1980s, digital audio technologies have attracted much controversy over audio quality of analogue versus digital systems. Audio engineer Glen Ballou writes “In spite of the rapid growth of digital technologies in audio, analog recording is by no means dead... Digital emulation *plug-ins* do not fully duplicate the original, regardless of what the marketing hype may tell you.” Ballou, G. M. 2005 *Handbook for Sound Engineers*. Elsevier Science & Technology. Oxford. P903

<sup>29</sup> “The tipping point in the accessibility of digital music technology came in 1983 with the release of the Yamaha DX-7, a programmable digital music synthesizer. Takayuki Rai believes: ‘It was a revolution in the digital music world... starting up computer music studios and keeping them became much cheaper and we didn’t need to rely on the huge subsidy from the government any more... the number of people and institutions doing digital work increased almost overnight’” Schedel, Margaret, 2007. Live electronic music. In: Collins N. & d’Escriván J., eds., 2007. *The Cambridge Companion to Electronic Music*. Cambridge: Cambridge University Press, p29.

<sup>30</sup> MIDI Manufacturers Association Incorporated. [http://www.midi.org/aboutmidi/tut\\_history.php](http://www.midi.org/aboutmidi/tut_history.php) accessed 07/01/2011.

<sup>31</sup> STEIM develops touch sensitive digital interfaces, thereby subverting the hegemony of “instruments that continued in the tradition of the church organ”. <http://www.steim.org/steim/texts.php?id=1> accessed 10/01/2011

## Free Improvisation Meets Digital Processing.

The work of pre-digital electro-acoustic improviser/composer/performers such as AMM, David Behrman, Terry Riley and David Tudor provided a wealth of influential music and approaches to music making for the subsequent digital generations of musicians. Where this initial generation of pioneers laboured with circuit boards and soldering irons, today's electronic musicians are more likely to engage with commercial software programmes running on laptop computers tailored for digital music production.

By the 1990s, the instances of free improvisation musicians working with live digital processing was becoming more widespread. 1996 was a significant date in this field with the formation of the Evan Parker Electro Acoustic Ensemble.<sup>32</sup> Saxophonist Evan Parker, an important voice in contemporary improvised music, configured the group as a meeting of master improvisers and computer music 'technicians.' The predominant *modus operandi* being that the musicians improvise while their signals are processed by a group of computer performers. To date the group has released five albums. Parker's ensemble is typical of collaborations between traditional instrumentalists and technologists – a trend that has become an important part of the development of this new music.

Another significant model of practice is instrumentalists who have also mastered live digital processing as an instrumental extension. Typically the instrumentalist spends a number of years learning their chosen instrument and subsequently in their search to expand and add to their musical palette they encounter digital technologies whereupon a new skill set is developed and they try to incorporate the two distinct disciplines into a new voice. Pauline Oliveros says

I still work with a hybrid kind of thing. I'm using Max, I'm using the computer as a programming and processing environment, but I'm still playing the accordion, which is a nineteenth-century instrument. All the sound is derived from acoustics rather than from electronics, but I use the computer system to process the sound.<sup>33</sup>

Jazz musicians in select, but increasing, numbers also were using electronics. One common (and easy) method to reimagine their practice was through collaborating with turntablists.<sup>34</sup> Norwegian

---

<sup>32</sup> Debut release: Evan Parker Electro-Acoustic Ensemble *Toward the Margins* (ECM 1996).

<sup>33</sup> Oliveros, P., in *Pink Noises*, 29.

<sup>34</sup> Stuart Nicholson writes "DJs were seized upon by jazz players to create new sonic environments in which to function as a musician and reconceptualise their music." Nicholson, *Is Jazz Dead?*, 136.

pianist, Bugge Wesseltoft released a landmark album *New Conception of Jazz* in 1995, signalling an assimilation of electronic dance genres which resituated jazz subtly yet irrevocably, presenting itself as “a classic for modern contemporary jazz, combining a fresh blend of genres that would not seem too unfamiliar to listeners of deep house, techno, ambient, as well as traditional and experimental forms of jazz.”<sup>35</sup> By the end of the decade an emergent pattern of live electronics among contemporary jazz practice was firmly established.

By the end of the 1990s, almost unnoticed and largely unreported, the sound of jazz at the margins of the mainstream had begun to change. Initially, what began as a trickle had become, if not a flood, then a small but noticeable flow of ensembles that included a musician handling “electronics” in their lineup [...] Now the improviser’s art could be played out against new sonic backdrops colored by fragments of electronic sounds, rhythms, and samples swimming through the music, while digital computer editing [...] allowed for juxtapositions never dreamed of in Charlie Parker’s day.<sup>36</sup>

By the late 1990s labels such as Wesseltoft’s Jazzland in Norway and Thirsty Ear in the USA were releasing recordings by jazz musicians working with new digital technologies sometimes referred to as Nu Jazz, jazztronica or Future Jazz. Artists such as Jaga Jazzist, Nils Petter Molvær, Mathew Shipp, Craig Taborn, Jamie Saft and Erik Truffaz are representative of this ongoing practice. Many of these artists, aside from using new digital technology, were heavily influenced by the free improvisation movement, so that timbral concerns and open forms met with signal processing and computer music within the loose remit of contemporary jazz.

## Conclusion:

The current affordability of consumer hardware and software coupled with internet information exchange has created opportunities for musicians across all genres to use DSP in live performance situations. Today, in the second decade of the twenty first century, live digital signal processing has become a firmly established practice. Education policy has responded to this with universities programme internationally offering interactive computer music courses while the international recording industry has fully assimilated digital technologies. More specifically then, there is an identifiable approach today by musicians trained through jazz, contemporary classical or free improvisation to engage with digital technologies in live performance. The presence of these technologies can be traced

---

<sup>35</sup> Jazzland Records promotional material  
[http://www.jazzlandrec.com/index.php?option=com\\_content&task=view&id=12&Itemid=418&ed=5](http://www.jazzlandrec.com/index.php?option=com_content&task=view&id=12&Itemid=418&ed=5) [accessed 19/01/2012]

<sup>36</sup> Nicholson, *Is Jazz Dead?*, 129-130.

