**Chapter 9**

**The gift of silence Towards an anthropology of jazz improvisation as neuro-resistance**

**Martin E. Rosenberg**

**Jazz improvisation as gift exchange**

This chapter examines how the complex cognitive processes within each improviser in a jazz ensemble enact behaviours distributed throughout the ensemble that resemble the logic of gift exchange as developed by anthropologist Marcel Mauss (1967) and others. Gift exchange struck a chord with cultural theorists because field researchers observing the circulation of wealth during life-cycle events within so-called primitive societies noticed that this circulation did not conform to Western political economics. The wealthy would give away all of their wealth (commodities, symbols) to the community during weddings and funerals, and yet soon find that wealth (and prestige) returned to them upon its circulation throughout the community (Mauss, 1967, pp. 17–45).

Anthropologists began to understand these exchanges in the context of a general rather than a political economy. As Mauss puts it: “We are concerned with ‘wholes’, with systems in their entirety” (Mauss, 1967, p. 77). But to think of jazz improvisation in terms of the general economy of gift exchange, to think of the performing jazz ensemble as a system, requires first identifying what grounds these circulatory logics within the musical system during a performance. One might bring to bear structural, sociological, political economical, deconstructive or even ethical analyses determining what constitutes gift exchange during the performance of jazz (Attali, 1985; Bourdieu, 1977, 1986; Bataille, 1985; Levi-Strauss, 1969; Levinas, 2004 [1969]). Yet, I would like to shift the focus from grounding this analysis of jazz improvisation with reference to language as symbolic action (which all of these approaches to The Gift require) to its grounding in embodied and distributed cognition, by which the flow of duration becomes the site for a gift of silence.1

Although jazz can be contextualized in terms of the general economic logic of gift exchange, I wish to dig deeper, to privilege the gift of silence, as immanent to the performance of jazz, in order to point towards an aesthetics of cognitive bifurcation that is simultaneously an aesthetics and micro-politics of neuro-resistance. By silence, I mean the embodied yet shared pure duration beyond what terms like “flow” (Csikszentmihalyi, 1990) and “groove” (Doffman, 2009, see also Cobussen et al., 2010) might imply with respect to the felt synchrony within an individual performer (flow), and amongst the members of an ensemble (groove). In other words, I would like to invoke not only John Cage’s (1961) deployment of the term, but also Jacques Derrida’s exploration of the gift of time itself,2 so to expand time’s purview from the aesthetics of musical performance in real time, to its micro-political implications.

By micro-political, I am referring to the realm of bio-power, where the embodied subject becomes a site for contending forces from within and from without. Whereas most scholarly work on bio-power has focused on how the social structures (Michel Foucault exemplifies this) and, more recently, global digital networks (“cognitive capitalism” exemplifies this) impinge on the subject from the outside, my use of bio-power refers to how a subject, and even an ensemble of subjectivities, may engage in resistance to those networks from the inside-out.3 So, while much has been written about jazz and democracy, theoretically as a model-exemplar for democratic practice, and historically as an ideological weapon in the context of The Cold War, this chapter focuses on one fundamental ground for democratic practice, the embodied (and distributed) capacity for freedom of thought and expression at the level of cognition.4

For jazz musicians, silence becomes the initial condition for processes of embodied cognitive bifurcation. For it is bifurcation (one might bring to bear the philosophical term individuation here) that attracts us to jazz in the first place. Bifurcation refers specifically to conditions in the physical sciences where instability in the behaviour of an open system will give rise to a range of possible alternative futures for that system (Prigogine, 1980; Prigogine and Stengers, 1984). Ilya Prigogine’s research underlies the many references to bifurcation and individuation by philosophers such as Gilbert Simondon, Gilles Deleuze, Félix Guattari, Emmanuel Levinas, Bernard Stiegler and others, especially Prigogine’s empirical research since World War II into the role of bifurcation in complex irreversible processes in the hard sciences (and eventually, in information and cognitive sciences). Prigogine’s deployment of the geometry of phase space, a way of representing the future possible histories of an entire (complex) system through time, proved crucial in modelling the behaviours of these emergent processes.5

I have compared the difference in the cognition of time between classical and jazz musicians as precisely analogous to that of the reversible determinism of calculus and the irreversible contingency of phase space, and have demonstrated in particular the central role of cognitive bifurcation in the aesthetic of Be Bop improvisation and composition from 1945 to 1960 (Rosenberg, 2010). Infinitesimal calculus accounts for the dynamical behaviour of physical objects with precision, utilizing both an algebra and geometry of striations marking time from one instant to the next. Phase space offers something different: an individual dot on a N-dimensional manifold models in smooth space one possible future for the entire complex system in time, so that phase space plots not individual entities, but the range of possibilities for that system into the future. An ensemble of dots, therefore, indicates the horizon of that range of futures.

Developed during the late 19th and early 20th centuries by Riemann, Poincaré, Einstein and Gibbs, phase space became deployed in modelling complex processes like entropy in machines and in nature. Originally focusing on equilibrium thermodynamics, phase space came into its own by its capacity to model “self-organizing systems” exhibiting emergent properties. Only able to measure discrete trajectories and interactions, calculus simply cannot visualize the complex macroscopic behaviour of large systems under the conditions of contingency, while the geometry of phase space can. Prigogine’s Nobel Prize work on the role of bifurcation in dissipative processes far-from-equilibrium depended upon the rigorous application of phase space in representing these processes of bifurcation, a central characteristic of emergent properties. Furthermore, the application of the principle of bifurcation in thermodynamics metaphorically to describe individuation or cognitive divergence has been a popular trope in the human sciences for understanding human creativity through philosophers like Gilles Deleuze and, before Deleuze, Gilbert Simondon (just now becoming accessible to an English-speaking audience), and before Simondon, the mathematician Henri Poincaré.6

As Guattari describes time-reversible and time-irreversible systems:

The same entitative multiplicities constitute virtual Universes and possible worlds: this potentiality of finite, sensible bifurcation inscribed in an irreversible temporality remains in an absolute, reciprocal presupposition with a temporal reversibility, the incorporeal eternal return of infinitude. (Guattari, 1995, p. 113)

Here, Guattari points to the intensive potentiality of an underlying field where reversible and irreversible systems coexist, in ways reminiscent of Simondon’s notion of the trans-individual, Deleuze’s plane of immanence, Brouwer’s Intuitionist mathematical concept of the pre-individual continuum, or even Spinoza’s “modes” of “substance”.7 There can be simple bifurcations which indicate systemic instability pointing to two possibilities for the future of that system, or cascading bifurcations, with every branch of a bifurcation also bifurcating in succession, creating a self-perpetuating and expanding cone of potential, trajectories for futurity.

By analogy to the physics of bifurcation, there are moments in cognition by which a range of possible futures for thought occur, with reference to a range of formal behaviours, such as the game of chess, computer programming, and jazz. Jazz differs from these other behaviours, however, because cognitive bifurcation during performance takes place in real time, whereas with these other behaviours, possibilities for bifurcation are thought through deliberately, outside of the duration of the activity involved, for example, in the silence between moves during a game of chess (Rosenberg, 1992; 1994). So, in opposition to posing a “timeless” zone for decision-making such as in chess, this chapter suggests that the silent flow of duration during jazz performance functions like a trans-individual continuum immanently embracing the entire ensemble. One way to model such a continuum is with phase space.

I have argued, furthermore, that the ways that jazz musicians cultivate cognitive bifurcation in both improvisation and composition constitutes one of the great innovations associated with the Be Bop movement (1945–1960). This movement marked a major transformation of jazz aesthetic, embracing the accelerating evolution of complexity and sophistication in musical expression. I have demonstrated that it is possible to visualize these forms of cognitive bifurcation during performance which appear in the distinct dimensions of melody, harmony, harmonic rhythm and percussive rhythm, using phase space (Rosenberg, 2010). Since these innovations of Be Bop, jazz training in performance and composition features the deliberate deployment of cognitive bifurcation for both improvising and composing.

This pedagogy can be understood as a subversive antidote for processes of cultural determination diagnosed by post-structuralism, generally, and more recently by a new sub-discipline of cultural studies called “cognitive capitalism” associated with such figures as Warren Neidich and Maurizio Lazzarato in a series of recent publications.8 The focus of their diagnosis addresses how global processes emerging from material, familial, social and digital networks serve to collapse bifurcation within human cognition, with significant consequences.9 So, it will be useful to understand the role of gift exchange in jazz performance as a form of ritualized resistance to many forms of cognitive control coextensive with social as well as digital networks.

**Jazz as a symbolic exchange, silence as a consensual domain**

Grounding improvisation (as ritualized gift exchange) in recent research on embodied and distributed cognition, has phenomenological, ideological and ethical implications. But those implications will differ from the ways they have come to be understood in theories of The Gift, in particular from that proposed by Jacques Attali, who, while addressing jazz, cannot conceive of its existence beyond symbolic exchange and its entrapment in commodity-fetishism as with concerts and recordings (Attali, 1985). Now certainly, the musicological research on jazz improvisation has thus far assumed that music is like a language. Yet, it has not neglected the role that interactivity plays in performing improvisation as a form of exchange.10

Most accounts of interactivity in jazz improvisation involve conversation and commercial exchange metaphors, so that alternating improvised passages gets defined as: “call and response”, “trading fours” or “eights” [referring to measures of 3 or 4 beats], that are grounded in the symbolic dimension in order to mark time’s succession, during this gift of time itself. There are etiquette rules about giving other players “space” to contribute their own “voice” and “story”. Elaborate rituals exist that surround the obligation to allow others to play. New players must learn these behavioural guidelines to become an accepted member of an improvising ensemble, especially in jam sessions. Thus, references to the sociology and anthropology of improvised musical performance (focusing on symbolic exchange) can be a fruitful line of inquiry (Townsend, 2000; Dempsey, 2008; Higgins, 2012).

But something subtler goes on during jazz improvisation, which requires musicians to respond instinctively to each other beneath the threshold of conscious awareness, even while they may intend to draw on the musical resources of the song upon which they are improvising. They will have taken time to explore these resources off the bandstand, mastering the laws of music, the technical requirements of their instrument, as well as the specific musical problems posed by individual works of music, while they address the etiquette of performance. Yet, the most accomplished form of improvisation takes place when the players generate a consensual domain, an immanent collectivity, with each member of the ensemble reacting without forethought, viscerally interacting to each other from the bottom-up. This requires the musicians to begin with a pervasively felt sense of pulse or “groove”, even as they maintain awareness of the song form through time.

I would like to describe briefly the specific neuro-architectural grounds for how this visceral interactivity beneath conscious awareness happens, and why top-down control exemplified by executive function, with a central role during practice, has little to do with it. Jazz improvisation must begin with silence, which may appear to be a surrender of the ego, in an exchange that can be likened to the logic of giver/receiver reciprocity described early on by Marcel Mauss (1967, pp. 17–45), complicated by Bourdieu (1986, pp. 82–86), elaborated specifically with reference to music in terms of information theory by Attali (1985, pp. 57–65), or even reminiscent of the level of ethics implied by Levinas’ concepts of ‘heteronomy’ and ‘hospitality’ (Levinas, 2004).

Yet, many jazz musicians have made claims about collective awareness that recalls Mauss’ discussion of ‘magic’ in describing gift-exchange in so-called primitive societies (Mauss, 1967, pp. 19–20; see also Mauss, 1950). But I insist on the empirical rather than mystical grounds for this gift of silence.11 Recourse to silence is not just an ethical surrender of space to an Other. Silence is not simply a logic of reciprocity for performers who wish to exchange “riffs”. Silence constitutes an initial condition that performing jazz musicians experience viscerally, so that embodied cognition emerges as a distributed field of affect, a field of cultural production that, while containing melody, harmony and rhythmic elements, exists behind these elements, implicating the embodied individual within the ensuing feedback loops of the distributed ensemble.

As jazz musicians interact, they must extend beyond their individual embodied condition into an emergent form of distributed cognition, which manifests as a contingent, yet evolving collective musical intelligence. In other words, the impetus to improvise does not descend top-down upon the improviser, but emerges contingently, bottom-up, from the emerging collective mind, in real time. Let’s situate this abstract discussion in an historical moment with real embodied jazz performers.

**Groove: Silence, irreversible time, and phase space**

Pittsburgh, PA is a city renowned for its jazz, especially its history, with dozens of world-famous jazz musicians that were born or began their careers here, as well as the deep talent pool that exists here, despite the current profound difficulties with making a living playing jazz anywhere. The Dean of the Pittsburgh jazz community, Hard Bop drummer Roger Humphries (Horace Silver, Ray Charles and others) has held court in many of Pittsburgh’s clubs on at least a weekly basis, and I got to hear his ensemble RH Factor at the James Street ballroom on one Thursday night. Bassist Dwayne Dolphin, keyboardist Max Leake, trumpeter James Moore, tenor saxophonist Lou Stellute are almost always present, with many other local and national luminaries sitting in on a regular basis.

It is instructive to watch how this ensemble engages with each other, as they perform each song over the course of an evening’s performance. Because he is the master of rhythm, as well as band leader, all players look to Roger Humphries, at the ready, with instruments in hand. Rhythm and time ground everything else that follows. In that silent moment, whether playing Horace Silver’s ballad “Peace”, Freddie Hubbard’s “The Crisis”, or the Bobby Timmons’ “Dat Dere”, Humphries may initiate a few strikes of his ride cymbal, a minimalist, percussively rhythmic gesture, which will set into motion the flow of time from within that silence. The performance emerges from that micro gesture. Using the analogy of phase space, when Humphries precipitates the flow of time into the smoothness of that silence, the ensemble engages the song form, represented by the lead sheet or arrangement (which I have elsewhere coined “the calculus of music notation”). But this engagement does not, in fact, restrict the experience of time to a succession of still moments represented by the song’s notation in marks on a graph. Whether by tapping a foot, simply moving a single large toe inside of a shoe, nodding the head, or tapping fingers on the chest (or clicking teeth together!), the other players instinctually and collectively embody that flow of time. At that moment, they co-exist, at the level of affect, in that silent, but multidimensional phase space that resonates with how Simondon (2020a, pp. 277–281) describes a trans-individual continuum.

Drawing on their musicianship involving both top-down and bottom-up forms of embodied cognition, they have already begun to process the different ways by which the rhythmic flow of that consensual domain can be subdivided: half time, double time, triple time; even the more difficult poly-rhythmic superimpositions that account for a continuum embracing all metric possibilities that characterize jazz improvisation: 3/4 against 4/4; 5/4 against 4/4; 7/4 against 4/4; subdividing a single beat into 3, 5, 7 parts. Each variant of time’s initial feel established by Humphries coexists virtually with it; the only restrictions to these virtually coexisting durational flows lie within the limits of the other players’ instrumental technique and musicianship, their ability to juggle a range of metrics, with the cognitive flexibility to shift, adapt to another introduced, shift again.

This rhythmic phase space of all possibilities must be established within each embodied performer before the song’s other features can be brought to bear. In fact, Humphries’ ensemble, like many jazz ensembles, will occasionally take the time necessary to establish the ‘groove’ of this continuum before allowing the song to proceed, rather than start ex nihilo. Once the song proceeds, then, any moment during the ensuing performance can generate a bifurcation point by which one or another rhythmic possibility might be explored, in succession, or in parallel, in the form of polyrhythms. As the song proceeds, the musicians begin adding to the phase space of durational flow further dimensions to include melody, harmony, and harmonic rhythm, even as it begins with percussive rhythm. Each of these dimensions coexist in the smooth space of the song’s duration. It speaks to the skill of these musicians that they all process the music simultaneously in each of these N-dimensions.

The complexity of this consensual domain captures what is distinctive about jazz performance from other forms of music, aside from differences in genre. It also offers a concrete example of how an embodied yet trans-individual continuum might function immanently, in real time.

**Bifurcation as the relationship between immanence and emergence**

I have discussed the role that bifurcation plays in jazz improvisation and composition, as one of several laws of ‘emergence’ that can be said to govern jazz performance, and which are visible even in music notation (Rosenberg, 2010). Bifurcations occur in the separate domains of melody, harmony, harmonic rhythm and percussive rhythm. Having discussed the phase space of percussive rhythm, let’s now look at melody and harmony.

We can state briefly that the range of possible scales and modes (pentatonic, major, melodic minor and so forth) that a single chord can suggest, constitutes an unlimited field of possibilities for melodic expression. At any moment, over any individual chord implying harmony, there are, practically speaking, an infinite number of bifurcations by which an improviser might draw from the range of resources against a single chord. If one adds these possibilities for each succeeding chord in a song, then we can sense how complex are the creative processes for melodic improvisation, and the prodigious knowledge necessary to master those processes in real time. Over the last 100 years, jazz has absorbed practically all the complexities of Western (and, increasingly, non-Western) rhythms, harmonies and scale resources.

In particular, the Be Bop era began to exploit harmonies capable of bifurcating, beginning with chords containing more than one dissonant tri-tone or augmented 4th interval seeking harmonic resolution. The dissonance of a single tri-tone in a chord has harmonic instability which compels resolution to the target tonic. To illustrate: a simple bifurcation occurs, involving one dissonant tri-tone (B and F of a G7 chord in the key of C). Yet, this tri-tone is contained in both G7 (V7) and Db7 (bII7) dominant chords, with both capable of resolving to the tonic C Major, but also implying, temporarily, the distant tonal centre of Gb and its available modes. If one adds a #11 (Db) to the G7, and a #11 (G) to the Db7, then hints are made to the tonal centres of D Melodic Minor and Gb Melodic Minor, pointing virtually even further afield, tonically, by adding other altered notes.

Even in mainstream jazz performance, distinct harmonies may be juxtaposed, poly-tonally, prior to resolution towards any chord. Furthermore, in the more complex bifurcation of a Dominant V7b9 chord (which also contains two tri-tones), each note of the four-note chord (which is also a diminished chord) can serve as the b9 (1/2 step above the root) for another Dominant V7 chord pointing simultaneously to four distinct tonic targets to exploit harmonic instability, drawing temporarily on the virtual melodic resources of each of these possible chords. Within these moments of harmonic instability, improvisers can explore, temporarily, multiple possible future trajectories through coexisting harmonic centres for improvisation, implying cascades of bifurcations.

This embrace of harmonic (and rhythmic) ambiguity and instability accelerated the complexity and sophistication of both individually improvised melodies, and musical compositions as vehicles for improvisation. Tunes such as “I’ve Got Rhythm”, the Charlie Parker tune “Confirmation”, or even John Coltrane’s “Giant Steps” could undergo 2, 3, 4 or even more iterations (cycles of improvisation, recording and transcription, analysis and re-composition) until they barely resemble the original tune (Rosenberg, 2010). Compared to the period identified as the Swing Era (from 1920 to 1945), the musical system of jazz from the beginnings of Be Bop underwent an astonishing and bewildering evolution, which continues to this day, especially in the incorporation on non-western principles of harmony and rhythm. Training to improvise in these increasingly ambiguous harmonic contexts such as double tri-tones in triadic harmony, followed by even more sophisticated forms of ambiguity with quaternal harmony or chordal voicings in 4ths, and juxtaposed poly-tonal triads merged into hexatonic scales (such as C major AND D major, or Eb major and F Augmented), enabled jazz musicians to cognitively process perpetually contingent, cascading melodic, harmonic, harmonic rhythmic, and percussive rhythmic bifurcations in real time without a pre-existing road map – which describes Free Jazz beginning 1960.

We can think of these cognitive bifurcations as adaptive micro-decisions, contingently instinctual responses to a sonic field-of-all-possibilities, with many distinct possibilities initially explored conceptually and then embodied systematically (using top-down cognition to explore pathways then laboriously captured in proprioception) during practice. Having examined these manifestations of emergence in both jazz improvisation and composition at the level of music notation, and the way that bifurcation diagrams in phase space help model those processes, I have focused more recently on the distinct neuro-architectures of practice and performance “in the moment” (Peters, 2010; see especially Varela, 1999a) that enable cognitive bifurcation; and, the roles that distinct, and competing forms of time cognition play that enable these micro-decisions (Rosenberg, 2019). While I cannot discuss here my research on the neuro-science of improvisation in any detail, let me introduce two basic forms of musical cognition in jazz, which I call projective apprehension, and proprio-sentience.

**From projective apprehension to proprio-sentience:**

**Shifting cognitive architecture from top to bottom**

I define the distinction between preparing to perform through study and practice, and anticipating possible pathways for improvisation during performance, as projective apprehension. I call the viscerally reactive experience of improvisation whilst interacting with other jazz musicians in real time, as proprio-sentience (Rosenberg, 2019). By projective apprehension, I mean to distinguish four distinct processes: 1. conceptualizing and recognizing aurally the laws of music as they are brought to bear on a given piece of music; 2. visualizing on a given instrument the melodic, harmonic and rhythmic “pathways” (Sudnow, 1978, p. 22) according to those laws; then 3. memorizing these pathways as internal cognitive schema; and finally, 4. capturing those pathways in proprioception, through repeated enactment of those pathways on the instrument and then having these pathways memorized by large and small muscles, sinews, tendons, nerves, and skeleton.

Projective apprehension involves the ongoing (and rigorous) processes of internalizing, embodying and then channelling musical thought through the physiological activation of instruments (including the voice), during practice, and while performing in real time. Projective apprehension also enables sustaining, while interacting with the other musicians, the narrative “schema” of the song form represented by the lead sheet. Proprio-sentience refers to the contingent enactment of musical knowledge through aurally triggered proprioceptive actions, when knowledge is no longer conceptual, but embodied, so that the body responds to the sounds emanating from the other musicians without deliberate thought.

In the recent paradigm of emergent, embodied cognition, the mind is understood to be distributed throughout the body, not just in the brain (Varela, Thompson and Rosch, 1991). In an earlier account, phenomenologist David Sudnow presciently describes his fingers spontaneously “grasping” the “pathways” for musical expression in real time (Sudnow 1978, p. 44). In this sense, musical knowledge lies in the body, arms, hands, fingers, embouchure (lips, tongue, mouth, jaw and surrounding muscles) responding to the other improvisers. As distinct from the fore-thought required to map, capture and then initiate proprioceptively the myriad possible pathways for expression, proprio-sentience occurs mainly in a hair-trigger reactive mode, an immediate visceral response to sounds produced by the other performers beneath the threshold of conscious awareness. Through long practice of the chord progressions, as well as the scales and arpeggios that capture the “flavour” of each chord in that progression, the player comes to associate the sounds of that scale, and the relationships among the notes of the scale, with that specific chord. Then, when hearing that chord, a musician responds by instinctively grasping one of any number of possible pathways associated with the melodic resources for that chord.

The most experienced jazz musicians seek to rely as much as possible on instinctively responding to what the other jazz musicians are doing, having taken the time, during the stage of projective apprehension, to map and then proprioceptively embody the myriad possibilities for adaptation of the song being performed. In this sense, we can conceptualize how jazz musicians trigger cognitive bifurcation in each other during performance, how the performance of a jazz ensemble involves multiple, self-perpetuating feedback loops capable of self-organizing at higher levels of complexity. Even in mainstream jazz, with the durational flow of the song established and elaborated in various ways by the drummer, and with all the musicians then sharing the narrative of the jazz “standard” represented by “the calculus of music notation” in real time, these jazz musicians experience the durational field of the performance as an embodied and distributed continuum of all possibilities.

Certainly, the range of possibilities in mainstream jazz is constrained by the initial song form, whereas, in free jazz, the emphasis lies with the celebration of cascading bifurcations, without any pre-existing schema or ‘narrative’. With the first, cognitive bifurcations are constrained by the pre-existing song form; with the second, we find musicians have the capacity to adapt contingently to perpetually cascading bifurcations in all dimensions of the music. Whether in mainstream jazz or in free jazz, proprio-sentience refers to the micro-decisions made by each performer during the performance emerging spontaneously during the contingencies of the open performance in real time. At this advanced level of improvisation, micro-decisions occur beneath the threshold of conscious awareness, and the aesthetic organization of the ensemble exemplifies a working democracy of palpable, co-existing dimensions, with no single voice dominating. This distinction between top-down projective apprehension and bottom-up proprio-sentience can be explained further by reference to the theoretical models of embodied and enactive cognition, and to empirical studies of the neuroscience of jazz improvisation, which has been the focus of my recent research (Rosenberg, 2019).

**Cognitive bifurcation and cognitive capitalism**

The jazz musician’s expertise in the contingent triggering of cognitive bifurcations in real time can be understood as a tactic of resistance to cultural forces of determination which philosophers like Deleuze, Guattari and Foucault call “control societies”, which embed individual subjectivities in collectivities designed to restrict rather than foster possible alternative individual and collective futures. Maurizio Lazzarato (among others) has opened up new arenas for research in the role of control in collectivities, beginning with the role of parents in the (benevolent) suppression of the massive bifurcations of childhood neural activity, and then the increasing appearance of direct and mediated processes of suppression from the socius into adulthood.

In particular, Deborah Hauptmann and Warren Neidich (2010) have documented how the phenomenal growth in global digitalization requires a shift in our understanding of control societies, beginning with Lazzarato’s (2002) description of a shift from “biopolitics” to “noopolitics”, and then extending from a noopolitics to a “neuropolitics” in order to account for this movement of control emanating from the socius to the embodied cognition of individuals as computer technology has increasingly mediated that relationship. Pervasive digitalized networks mark a systemic infiltration, top-down, from the virtual realm of the noosphere, to the individual and embodied processes of the individually embodied neurosphere.

As Warren Neidich follows Lazzarato’s analysis of the continuity of sovereignty from childhood, despite the shift in the systemic sources of control, he points out: “Repetition and constancy are powerful tools of the neural sculpting and are part of the institutional tools communicated first by the empathic gaze and nurturing touch of the parents as agents of understanding that shape this difference into regularity” (Neidich, 2010, p. 546). Neidich goes on to discuss how neuroplasticity in these processes occurs well into adulthood by which the noosphere sculpts the neurosphere to accept regulation, repetition, from the manifestations of sovereignty as top-down control that implicate themselves from hierarchies of human beings in society to institutions and networks that seem transversal yet which are anything but.

So, we can see, from the perspective of both aesthetics and politics, how one could become interested in processes which specifically evolve the capacity to embrace cognitive bifurcation, a skill set specific to engaging the neuro-field of all possibilities onto a distributed continuum (the performing jazz ensemble), bypassing suppression by a censor from within or without, a censor which correlates in the cognitive architecture as the top-down inhibitions or constraints by Executive Function on lower-order emergent processes (see Rosenberg, 2019, pp. 346–355). I contend that the rigorous preparations of jazz musicians train them to think difference spontaneously, enabling the multiple processes of cognitive bifurcation in ways that could transfer to other forms of aesthetic, conceptual, and ethical behaviours, and thus bears careful study, and extrapolation into new arenas, as a pedagogy for cognitive resistance and liberation.

We have seen the influence of the role of cognitive bifurcation in jazz improvisation on comedy (Robin Williams; Second City), and dance (Merce Cunningham; Twyla Tharp, Pilobolus, Savion Glover). Why not in the more deliberating and forensic realms of conceptual thinking, within the disciplinary formations of the academy, as well as institutional organization in the public and private spheres?

In the late 1980s, I created (with Thomas I. Ellis) educational software ***The RHIZOME Project*** (Rosenberg and Ellis, 1989–1992) designed to model processes of cognitive bifurcation for both creative and analytic invention for novice (and at-risk) first year college writing students. This design drew deliberately on the improvisation and composition practices of Be Bop jazz musicians, as well as on the laws of bifurcation in the self-organizing systems described by Ilya Prigogine and others, that was the subject of my 1990 dissertation on the polemics of “emergence” found in avant-garde philosophers, and artists across all artistic media during the 20th century.

In one heuristic application among others in the project, “JAZZ WRITING” offered a real-time free-writing template that would flash a word or phrase, and that user would be instructed beforehand to respond in a spontaneous, associative way to that verbal stimulus, at which point the user could then highlight a word or phrase from the spontaneous response, re-enter it into the application, to be flashed and the responded to in turn. This could repeat, generating endlessly exfoliating ideation; or, the user could be guided to highlight and then paste passages inside other software applications in the program used to help exfoliate these associations into a range of other rhetorical heuristics for further evolution, leading to creative writing or an analytic argument. This software helped the user to deploy these cognitive bifurcations to generate ideas in text. Thus, a range of pedagogies might emerge from this insight into the deliberate enculturation of the embodied processes of cognitive bifurcation.

**Conclusion: Jazz improvisation as the gift of silence**

Jazz performance is largely a bottom-up, emergent aesthetic that exists in agonistic as well as complicitous relationship with the predominantly top-down nature of Western Civilization’s intellectual traditions, theologies, and formal as well as informal thinking processes. I am not arguing simplistically to valorise bottom-up cognitive processes at the expense of top-down cognitive processes. The sophisticated and laborious conceptual and proprioceptive behaviours (projective apprehension) required for preparing a musician for improvised performance do require strong top-down procedures involving sensory training, conceptual understanding, establishing and embodying cognitive schema (or Sudnow’s “pathways”) through long and arduous practice. But in the face of the relentlessly top-down nature of Western culture and its cognitive practices, it is instructive to examine jazz improvisation as a welcome contrast.

These top-down preparations help enable contingently creative bifurcations to emerge through these conceptualized and embodied musical structures, lending coherence, enabling bifurcating flows to evolve spontaneously within the laws of music, even as musicians react viscerally in real time to the musical bifurcations of others. To the point: jazz musicians practice the relinquishment of cognitive control; they surrender self-conscious awareness to liberate cognitive bifurcation, and their methodologies for surrender are highly sophisticated, rigorous, require development over a lifetime, and worthy of replication in other domains. One motive for examining the philosophical implications for the cognitive neuroscience of jazz musical performance, would be to embrace Francisco Varela’s concept of “ethical expertise” (Varela, 1999b). I first addressed the aesthetic and political implications of an “ethics of cognition” over twenty years ago (Rosenberg, 1994). Nothing exemplifies this ethics more than emergence, and the most significant feature of emergent systems is bifurcation. Yet, these bifurcations can only emerge in what David Roden (2015, pp. 85–96) has coined “the dark phenomenology” of silence.

The skills necessary for jazz performance, in fact, have become a special case for the investigation into the brain’s neuro-plasticity. As Daniel Levitin (2006) demonstrates, scientific research on music and the brain has made it possible to conceptualize and visualize how both listening to and performing music affects the brain in measurable ways. I would push Levitin’s observations further, highlighting his speculation about the aesthetic conversion of the hard wiring between the cochlea and motor regions of the brain identified as “flight or fight” and “startle” reflexes, suggesting that this capacity for neuro-resistance demonstrates kinds of neuroplasticity that might reverse the forms of neurosphere “sculpting” described by Lazzarato and Neidich.

A jazz musician’s contingently emergent decisions, enabling a cascade of transforming “forks-in-the-road” to emerge at any given moment in the song’s performance, in response to the cascading bifurcations of other musicians, constitutes a mastery of how cognition happens, that is rare in most other domains. While the training to become a jazz musician is arduous, the most salient characteristic of the accomplished musician is the willingness not to play. In other words, freedom of thought depends upon freedom from thought, as an initial condition. Even though a musician’s intentions are cultivated painstakingly in the practice room, the surrender of intentionality in that silence makes possible spontaneous deviations from those pathways cultivated, enables those intensive moments which generate musical forks-in-the-road that emerge of their own accord, and in ways not even the pathways of practice can contain.

Only in the unstated pulse of time’s flow prior to its metric delineation, can cognitive processes invisible (and indifferent) to a million years of neuro-evolution, take hold of the music. Thus, the secret to the highest levels of jazz performance lies in the sacrifice of intentionality, in the gift of silence, where hums along the ancient wiring of the brain can induce the well-trained body to act spontaneously, with the joyous freedom of a child, yet with the mastery of an adult, and in accordance with the hums within the ancient wirings of others, yet without the visceral fear of a hunted rabbit.

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**Notes**

1 We should also situate this line of inquiry into silence as gift exchange as distinct from Lewis Hyde’s definition of art as a gift rather than as a commodity, still situates the work of art in the cultural field as an object of exchange, albeit an exchange that differs from that of commodity fetishism (Hyde, 1983). See also Cage, 1961.

2 Jacques Derrida, 1992. Derrida writes: “The relationship of the gift to the ‘present’, in all the senses of this term, also to the presence of the present, will form one of the essential knots in the interlace of this discourse” (Derrida, 1992, p. 10).

3 I refer particularly to Foucault’s writings on The History of Sexuality (1980, 1985, 1986). See also: The Birth of Biopolitics: Lectures at the College de France 1978-9 (2008). On Cognitive Capitalism, see: Neidich (2010, pp. 539–581). See also the three volumes of Psychopathologies of Cognitive Capitalism (De Boever and Neidich, 2013; 2014; 2017).

4 For a pointed discussion of jazz and democracy, see Crouch (1995). On jazz and ideology during the Cold War, see Davenport (2009); Crist (2009, pp. 133–174); Vodovnik, 2017.

5 See Prigogine’s books and articles beginning in 1944: Prigogine and Defay (1944- 46); Prigogine and Wiame (1946). We should note Alan Turing’s (1952) influence on Prigogine, connecting bifurcation and non-linear equations to emergent processes like morphogenesis, leading to a series of articles by Prigogine and others (1952-56), anticipating the empirical discovery of bifurcating dissipative processes far-from-equilibrium, beginning with the Belosouf-Zhabotinski chemical reaction (B/Z research published 1959; 1964). See also Prigogine’s own narratives (Prigogine 1980; Prigogine and Stengers, 1984).

6 Henri Poincaré (1906). This is the first mention by a scientist/mathematician of entropy suggesting an evolution towards greater orderliness, as a metaphor for mathematical creativity, ironically, in a narrative about how Poincaré’s attempt to combine some of the constituents of phase space came together in a “flash” of “illumination”. See my discussion of Marcel Duchamp’s artistic rendering of Poincaré’s model of creativity in his final master work Étant Donnés: 1. the Waterfall; 2. the lluminating Gas, in Rosenberg (1994). Manuel DeLanda (2002) and myself (Rosenberg, 1999) have argued for the central role of phase space in the ontology and epistemology of Gilles Deleuze. Simondon’s influence on both Deleuze and Guattari is substantial. See, for example Deleuze and Guattari (1987, pp. 261–262 and 408–410). Simondon’s central work Individuation in Light of Forms and Information, Vol. I and II (1958, 1964, 2020b) does not, however, acknowledge the work of Prigogine.

7 See Simondon (2020a, pp. 327–396); Kuiper (2004, pp. 33–62); Melamed (2009, pp. 17–82), Balibar (2020).

8 Neidich (2010, pp. 539–581). See also: Psychopathologies of Cognitive Capitalism (2013, 2014, 2017). See Lazzarato (2002).

9 Rosenberg (1993).

10 Berliner (1994); Monson (1996). See my more detailed discussion in Rosenberg (2019, pp. 338–343). See also the empirical and theoretical grounds for competing forms of time cognition in Varela (1999a).

11 Take the apocryphal statements by Charlie Parker and John Coltrane: “first learn everything you can about music, and then forget everything and just play”; or Sonny Rollins’ actual quotation: “Don’t play the music, man. Let the music play you” (Rollins, 2014). These statements are empirical, not poetic, and can be explained by reference to recent research in the neuroscience of jazz improvisation. See Rosenberg (2019).

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