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Bruce Caldwell’s observation that “[b]y the 1960s Hayek was seeing complex orders everywhere” is something that struck a cautionary note in our thinking about jazz (Caldwell 2000, p. 19). Indiscriminate use of the concept (known as “concept creep” in the psychology literature) would of course empty it of meaning, a fate that has befallen many a key term in social philosophy. However contested a concept may be, theorists should be able to: (a) point to the logical independence of spontaneous order (in other words, a given concept shouldn’t be analyzable in terms that presuppose that very concept); (b) pick out and identify all and only the things to which the concept applies (that is, the extensional and intensional adequacy to use philosophical jargon); and (c) explain the functional adequacy as to why one would need a given concept (what work or role would a given concept have to fulfill?). We therefore think it useful to briefly expound upon what we understand the concept to be.

The notion of spontaneous order is inextricably part and parcel of the five-faceted cornerstone to Hayek’s philosophy of social science: the other facets being complexity, the dispersion of knowledge, rationality and methodological individualism. Spontaneous order connotes the idea that as a result of innumerable and perpetually dynamic (tacit and explicit) interactions among multitudes of agents, sociality and culture are emergent phenomena. The idea is that so-called “emergent” phenomena cannot be reduced to their constituent parts without remainder; the corollary being that the consequences of the interaction between the constituent elements cannot be predicted. Spontaneous order is closely related to emergent phenomena in other domains (notably in biology, physics and computational intelligence) and is variously termed as self-organization and complex adaptive systems: all variants have a similar logical form.

For Hayek spontaneous orders are essentially information systems. A healthily functioning spontaneous order or communications mechanism promotes “computational” efficiencies, a complex coordination mechanism for diverse wants, preferences, interests and goals. Tampering with this mechanism is at best going to deliver unforeseen consequences; at worst, unforeseen negative consequences most notably the corrodimg of sociopolitical freedom. Hayek’s early invocation of spontaneous order had Marxist and socialist centralizing (top-down emergent) tendencies as his target. Later this concern morphed into taking to task the general Cartesian constructivism or rationalism (“conscious” aforethought) that inheres in much of sociopolitical theorizing, orthodox economics included. The upshot is that for Hayek there is a necessary link between the dispersion of knowledge and sociopolitical freedom in complex societies, or, in the current argot, knowledge economies.

The standard criticism leveled against Hayek’s conception of spontaneous order is that there is a perceived tension in that spontaneous order is deemed incompatible with patterns of traditional behavior that Hayek recommends. To a large degree this aspect loses its force if one grants Hayek the idea that a truly spontaneous order naturally embodies the resources (customs, laws and morals) for both the preservation of existing patterns of behavior but also to accommodate the development and acceptance of other novel patterns of behavior. Though the market is a paradigm example of a spontaneous order, for Hayek, it had no special ontological status—it is one spontaneous order among many (science, law, democracy, language being other prominent orders—see diZerega 2013).

With this in mind we are confident that jazz as a sociocultural phenomenon is a star instantiation of spontaneous order (Koch 2013). A word of caution. The spontaneous order that is jazz does have a double aspect: the socio-cultural-historical soup from which it emerged (Marsh 2017) and the structural dynamic of the music itself with its own internal tensions between tradition and revolution, often congealing around one individual such as Louis Armstrong, Charlie Parker, Ornette Coleman, and the last notable, Miles Davis.

While the discussion that follows does not take place under the rubric of aesthetics per se, it does have intimate implications. Jazz music presents specific challenges and aporia (puzzles) for the philosophy of music: our present interest here, the ontology of jazz, ontology being a key dis-
In general terms, ontological thinking about music asks questions such as “what’s the relationship between live performances of ostensibly the same work, the *sine qua non* of music being performance?,” “in what sense does interpretation or novelty relate to musical notation?”; “how does an interceding technology or recording relate to notation and performance?” and so on and so forth. Though jazz is not necessarily improvisational, theorizing on the ontology of jazz has typically centered around the nature of improvisation—and this we take as one of the distinctive features of jazz as a spontaneous order.

Roberto Zanetti’s discussion is through and through concerned with ontology, in particular, improvisation. Zanetti distinguishes between a traditional schema (a prescriptive one), and an informative model. Zanetti takes the view that jazz music can be based on a different, not pre-determined kind of structure, which he terms the informative model. This, he claims, allows one to abandon an inveterate prejudice, i.e. that jazz is anarchic; moreover, it allows a better understanding as to what criteria one should employ in evaluating the creativity at stake in jazz performance. Zanetti does not want to establish a qualitative hierarchy between the prescriptive and the informative model, but would only like to highlight the fact that they give rise to different productive paths in making music.

Stefano Ferrian emphasizes a raft of philosophical concepts that would be familiar to anti-rationalist theorists such as Ryle, Hayek and Oakeshott: rule-following, improvisation, conversation, tacit knowledge. Ferrian’s conception of “conversation” brings to mind Oakeshott’s (1991) famous discussion in which conversation is understood as:

- perpetually provisional and should not be disconcerted by the differences or dismayed by inconclusiveness;
- as “voices” that do not compose a hierarchy: there is no one centralized symposiarch or arbiter, merely a multiplicity of interdependent equals;
- not having a predetermined course; it’s value is intrinsic, not instrumental;
- an unrehearsed intellectual adventure in which one imaginatively enters into a “flow of sympathy”;
- a manifold profusion of persons, ideas, identities, events, and the associations they form circumstantially meeting and addressing one another in a plurality of languages of self-disclosure and self-enactment.

Ferrian bemoans the pedagogical “hardening of the arteries” so to speak thereby constraining the scope for the genuine development of individuality. This may well be the inevitable manifestation of the cyclic life-cycle of cultural institutionalization. It may well also be because of the depreciation of the liberal arts and humanities generally, caught between a rock and a hard place. On the one hand, higher education institutions are encouraged to be functional to market requirements; while on the other hand, so much of the university is given over to ideological indoctrination, activism masquerading as legitimate inquiry—i.e. the emphasis being on not how to think but what to think.

Troy Camplin and Kevin Currie-Knight argue that the process of jazz music provides a compelling analogy for understanding distributed theories of cognition and systems approaches to biology. They have picked up on the non-Cartesian body of literature, a loose and internally fluid philosophical and empirical coalition comprising the Dynamical-, Embodied-, Extended-, Distributed-, and Situated approaches to knowledge and cognition. Indeed, the very precondition of knowledge is a generalized exploitation of the epistemic virtues accorded by liberal/civil society’s *distributed* and extended manifold of spontaneous orders and forms of life, giving context and definition, to intimate, regulate, and inform action. Though they don’t specifically invoke the term *enactivism* (yet another non-Cartesian externalist approach to knowledge and cognition), their discussion is consonant with it in their emphasis on the *know-how* that emerges from recurrent sensory-motor coupling and looping between the organism and the artifactual environment.

Michael Granado closes out this issue with his metaphysical discussion, putting the concept of emergence at the very heart of his paper. Granado rightly understands randomness to not only be an essential feature of the universe but also the source of constant creativity, be it viewed in theological terms or scientific terms—and jazz as a superb instantiation of this open dynamic—offers a suggestively apt analogy as a clue to possible consilience. The intelligent design vs. evolution debate has of course been the subject of some of the bitterest conflicts in public policy. Rather than relying on the usual raft of great Victorian thinkers who had much to say on the idea of emergence in all its forms (George Henry Lewes, J. S. Mill, C. D. Broad, Samuel Alexander), Granado focuses on the somewhat neglected American Victorian, Joseph LeConte.

Three concluding points are in order.
First, emergence is one of the slipperiest of concepts in the philosophy of science and, for that matter, in the philosophy of social science.

Second, it should also be noted that drawing a distinction between spontaneous and constructed orders is not as clear cut as some suggest.

Third, the desire for innovative activity to persist from its inception on a permanent basis is unrealistic. Inasmuch as activities are engaged in by a large population, they tend over time to be structured in a way that satisfies the broad population. Given that there are sub-groups that prefer new concepts and of subgroups that prefer static behaviors, there will always be competing forces. Analysis of this by van der Molen (1989, pp. 162-166) has shown that the changing nature of a social environment can lead from a static control oriented authoritarian environment to an innovative turnover event. Eventually all will revert to a status quo adaptive environment. The upshot is that there is a natural cyclic environment in which we exist and that cyclic change is the reality of our lives—from cell to society, and that of course includes jazz too.

While the discussion that follows might well be deemed controversial, we consider this a first tentative step, an opening gambit, an invitation to others to follow up in later discussion.

NOTES

1. David Stove (1985, 2000), ever the delicious philosophical provocateur, views the "Jazz Age" (the 1920s, when an overly mannered and somewhat effete form of jazz music became mainstream) as an attitude infusing an irrationalist Cole Porterean “anything goes” view of science; Popper, Kuhn and Feyerabend being the pre-eminent targets of his scathing disapprobation. Stove, we think, should rather have focused on the French avant-garde of the 1920s and 1930s (they happened to coopt jazz—see Jackson 2003) which properly sewed the intellectual seeds for the vulgar postmodern relativism that Stove found so distasteful and whose constructivist and associated authoritarian tendencies have now come into full bloom.

2. There are now even dedicated conferences on the philosophy of jazz: http://jpic.fm.

REFERENCES

I. INTRODUCTION

This article deals with jazz improvisation, attempting to find a way to define a model through which it could be conceived, developed and practiced. To begin with, we will investigate the traditional schema through which musical ontology has always considered musical entities, i.e. a prescriptive one. Later on, we will focus on a dynamic conception of formula—i.e., patterns that are able to express the musician’s individuality in a given performative context—and sketch the difference between figural and generative models. Particular emphasis will be given to the distinction between formula and mere licks, that can be defined as conventional, fixed and ossified formulas. In conclusion, we will see how jazz music can be based on a different, not pre-determined kind of structure, which we may call informative model. This allows us to abandon an inveterate prejudice, i.e. that jazz is an anarchic music, and, in addition, to better understand what criteria should we refer to in evaluating the creativity which is at stake into a jazz performance. I do not want to establish a qualitative hierarchy between the prescriptive and the informative model, but I would only like to highlight the fact that they give rise to different productive paths in making music.

II. MUSICAL ENTITIES WITH PRESCRIPTIVE MODELS: THICKNESS AND THINNESS

It may not be true for improvisations, and it may not be true for certain kinds of electronic music. It may not be true in the absence of a notational system. Indeed, it may not be true for most of the world’s music. But for a great deal of the most valued music of the West, since the development of a sophisticated musical notation, it seems to be true that there are musical works, and that there are performances of them (Kivy 1987, p. 245).

Kania (2014) offers us an important springboard to reflect on the role of the so called “high-order music ontology” over (approximately) the last five decades. The core questions of this philosophical area are commonly sketched as follows:

- what kind of things are musical works?
- what criteria do we need to identify and recognize them?
- what is their mode of existence?

As Kivy claims, it seems that the presence of an object called “work of art” and instances of it called “performances” is taken for granted, at least in Western music. In other words, if we do not suppose that these kind of things may have some sort of existence (concrete, abstract or fictional), investigating issues of music ontology could be problematic, if not useless. Leaving aside the undeniable accuracy and depth of Kivy’s inquiries in this field, I think that these lines reveal something that few ontologists of music (in which Kivy is certainly included) are inclined to admit: music ontology, as it has been conceived since its birth, can tell us very little (i.e., “it may not be true” for too much) of...
the musical experiences that technological, social and intercultural practices enable (Born 2005). Even so called “comparative ontology” (Kania 2014) which tries to apply the categories that traditional research has developed in the analysis of Western classical music to other genres (such as rock, jazz, folk and pop), faces the same difficulties. As a consequence, many scholars have raised doubts about the usefulness of the notion of a work of art (Kania 2011; Brown 1996, 2000a) and the philosophical tool usually linked to that, the type/token model. Others have been even more radical and have called into question the whole concept of music ontology (Thomasson 2006; Ridley 2003, 2004). Maybe it would be excessive and to some extent harmful to throw away decades of philosophical enquiry on music, but it is certainly true that a traditional point of view on today’s musical practice does not help us enough, and that the role of concepts such as work/performance, composition/rendition and composer/interpreter should be sharply reduced. This is particularly relevant in musical contexts involving the complex and the much debated notion of improvisation in which most of aforementioned high-order music ontology assumptions seem to be lacking. However, before focusing on improvisation, it could be useful to make explicit the model that underlies nearly all the ontological perspectives that consider the ordinary musical event as consisting in a more or less faithful rendition of a pre-existent entity or structure (Hagberg 2002, p. 189), whether or not we call it a work of art or not.

The model is based on a prescriptive conception of the musical phenomenon, according to which a performance is commonly intended as a rendition of a given pattern (Dodd 2007; Kivy 1983, 2002). The way in which this pattern is instantiated allows us to decide if the performance is correct or not. In other words, performance is a medium through which we can have access to a certain musical piece that is, in principle, detached from the specific rendition we hear in a particular occasion. From this perspective, the ontology of music has developed the type/token model in order to preserve the identity of a musical structure despite its repeatability (Bertinetto 2012b) and, secondly, to justify the expressive freedom left to interpreters. Roman Ingarden, for example, intends expressive features as the result of a “fill-in the gaps” activity: for him, musical scores are constitutively partial, because it is impossible to note down every sound inflection on a pentagram (Ingarden 1989). Consequently, the main task of the interpreter is to complete the spaces of indetermination that musical scores open up. Nicholas Wolterstorff (1975), in turn, identifies musical artworks with the notion of “norm-kind”, i.e. an entity that admits both correct and incorrect performances. This allows Wolterstorff to maintain a certain degree of flexibility in sketching the relation between a musical artwork (a kind) and its performances (the tokens) (Wolterstorff 1975, p. 131). Genuine performances do not simply instantiate the kind through a proper sound sequence, but are produced with an idea of what should be done in order to have a correct rendition of it. Wolterstorff here is claiming that despite the fact that one makes every effort to obtain a correct performance for a particular piece, it can well happen that one does not succeed. Nevertheless, this does not prevent us from identifying our rendition as one of that musical artwork, i.e., of that norm-kind. Even if Wolterstorff does not consider correctness as a sufficient condition to produce genuine performance of a musical artwork, he maintains that it is at least necessary. This is particularly clear in all those scholars (in which Wolterstorff could be undoubtedly included) who see the relation between a musical piece and its renditions in terms of shared properties (Dodd 2007, p. 201). Julian Dodd extends this reasoning to its most extreme consequence: according to him, the creative process carried out by an artist simply consists in selecting the properties that a performance must possess in order to count as a correct rendition of the composed piece. Furthermore, the only properties that can fulfil this task are the structural-sonic ones played with the timbre that the composer has previously establish: that is why Dodd’s view can be understood as timbral sonicism. It should be clear that sonicist theories, both pure and timbral, end up by reducing the creative process to a matter of selection, and this “may not be true” for the great majority of the musical practices we come across in our artistic experience.

Not only in jazz—which is commonly viewed as the “natural realm” for musical improvisation—but also in some contemporary classical composers such as Stockhausen and Cage, improvisation plays a central role in creating a musical piece. In all these contexts, selecting properties does not seem to be the most important feature, because improvisation is a creative activity that does not give rise to a re-performable entity. Stephen Davies, in his well-known book Musical Works and Performances, focuses on the difference between composition and improvisation:

Improvisation are not musical works, I say. Does this mean that improvisers are not composers? Here I think one can say what one likes, so long as the issues are clear. It is plain that composition and impro-
visation involve similar processes—inviting tunes, organizing material, trying to unify the manifold. If “composer” is like “swimmer” or “driver”—if it names the person who creates a certain kind of activity—improvisers are composers. On the other hand, if “composer” is more like “fletcher” or “wheelwright”—if it names the person who creates a certain kind of product; namely, a musical work—improvisers are not composers, I say (Davies 2001, p.15).

Although in this passage Davies reduces the gap between work/performance context and improvisational activity, there is a also prescriptive element in his conception. According to him, a musical artwork can be thin or thick:

If it is thin, the works’ determinative properties are comparatively few in number and most of the qualities of a performance are aspects of the performer’s interpretation, not of the work as such. The thinner they are, the freer is the performer to control aspects of the performance. [...]. By contrast, if the work is thick, a great many of the properties heard in a performance are crucial to its identity and must be reproduced in a fully faithful rendition of the work. The thicker the work, the more the composer controls the sonic detail of its accurate instances. [...]. Works of performance, however thick they are, are always thinner in properties than any of their accurate rendition (Davies 2001, p. 20).

With the thinness/thickness argument, Davies describes the relation between a work and its instances in terms of shared properties: the more features they have in common, the thicker a work is. But when he tries to argue that a performance is always thicker than the related work, regardless of its thickness or thinness, Davies’ claim is more problematic. In fact, there is a slight difference between referring thickness/thinness to a work and to a performance of it: if for a work being thick/thin means to be more/less binding as regards the production of instances, this couplet of concepts do not have exactly the same meaning when referring to performances. How is precisely a performance itself supposed to be binding, if its determinative properties are already established in the correspondent work? We can presumably say that performances of particularly thin works could be regarded as more relevant in assessing the determinative properties of the work they refer to, in comparison to performances of thicker works. But in a work/performance framework, “binding” seems more appropriate if related to the first, rather than to the second. To make a very partial proposal, it could be said that a performance exhibits, displays or shows some properties, and that these properties are liable to be indentified and evaluated according to different criteria, depending on the musical context in which this performance takes place (Davies 2009).

In improvised performances, though, the basis on which their features are judged is not a pre-established work, but a more flexible model. Despite the fact that many scholars recognize that it is impossible to improvise from scratch (see Young and Matheson, 2000; Alperson 1984, p. 22; Tirro 1974, p. 286) the myth of spontaneity concerning this kind of musical practice is far from losing its strength.” As we shall say, however, the originality of an improvisation depends on a model, but we should make clear what kind of model we are talking about.

IV. GENERATIVE AND FIGURAL MODEL: THE MOVING FORMULA

The use of a model in jazz improvisation is constantly related to the possibility of making variations of it. Variation, as Giannattasio notes, could be intended as an intentional questioning of the form (Giannattasio 1987, pp. 239-250). In this huge work I processi improvvisativi nella musica. Un approccio globale, Vincenzo Caporaletti (2005, pp. 47-51) distinguishes two kinds of model: generative and figural. While the former offers us the constructive aspects through which the variation can emerge (in the most common cases, they are harmony, modes and scales) (Davies 2001, p. 12; Baker 1979, pp. 1-2)11 the latter allows us to detect the variation perceptually, and is often identified with a certain melodic-rhythmic outline, that represents a sort of springboard moving from which the variation is distinguishable, due to the fact that it comes from a “regular”, “standard” and clearly defined context.12 It is considerably harder to maintain the distinction between the two models in music making, since playing on a scale or mode using repeated items can well generate a melody, in most cases a seducing and attractive one, which in jazz practice is often called lick.

We could define a lick as a fixed melodic phrase, repeatable by the musician any time they want to make their performance more fluent, recognizable and easier to memorize for the audience (Ware 1977, p. 15). We should make every effort to distinguish between the mere performative expedient, deprived of any individual touch: in other words, licks and formulas.13 More precisely, these are sound pat-
terns able to connote the individual style of a musician, who builds them gradually up through continuous practice on the instrument. The fact that formulas are thought and developed in a performative context—not only repeating them mechanically, rather transforming them depending on the concrete musical situation—gives them an intrinsically dynamic character that is far from the concept of lick. It could well be that a musician uses licks in the generative process giving rise to a formula, especially in their apprenticeship. But it is not sufficient to repeat a lick several times to make it become a formula.

Nevertheless, many scholars (Owens 1974; Kernfeld 1983) have confused the notion of a formula with that of a lick: they claim that without “formulas” playing jazz becomes nearly impossible, and this is due to the fact that there is no score, and musicians need to have a sort of script, allowing them to follow the structure of the piece being performed. The result of such a view is that jazz pieces literally consist of fixed “formulas” put together, one beside the other, and this is precisely the way in which Thomas Owens describes the creative processes followed by Charlie Parker in his improvisations. His study is a rich and detailed catalogue whose task is to store all the melodic patterns which have made Parker performances so remarkable. But this is not a correct point of view on Parker’s legacy, because Bird often uses the technique of “contrafact” to build his pieces, which consists in using the same harmony changing the melody. It is clear that Owens’s “storing” activity is rather useless: firstly, because it would be an endless task. Secondly, because from this perspective Parker’s unique talent is reduced to a matter of mere memory, that is obviously necessary in learning to play jazz, but not sufficient. On the contrary, other scholars tried to dismiss this mechanic interpretation of formula in jazz music: Treitler, for example, in an important study on Gregorian chant, connects the concept of formula with the notion of reconstruction: a formula, he claims, is far from being a fixed and calcified item, but is rather something flexible, borderline, “between reproduction of a fixed, memorized melody and the extemore invention of a new one” (Treitler 1975, p. 11).

As far as melodic aspect is concerned, in such a context, it is really hard to use traditional musical concepts as «melodic coherence» (Kernfeld 1996, p. 83; Martin 1996, pp. 34-38). Similar notions, in fact, were elaborated in order to analyze the relationship between melody and harmony, fundamental in evaluating the rate of creativity in western classical music. But in jazz practice the story is rather different: here the creativity of a musician must be valued in terms of getting attuned to a concrete musical situation whose guidelines are totally unpredictable. Hence, the form that a certain musical passage assumes has not to be detached from the generative—i.e., performative—context in which it is built up, accepted or refused and, potentially, developed. Moreover, it has not to be neglected the fundamental notion of interplay, that many scholars have deeply investigated, and the extreme consequences that this aspect may have on the difference between melodic and harmonic sphere.

Let us examine a small example from Jazz at the Plaza, Straight no chaser. In this astonishing piece, played at an impressive speed, the harmonic scheme offered by the piano and the bass is soon completely de-structured, especially in Coltrane’s and Adderley’s solos. They play extremely fluid and ungraspable chromatic figures, creating a surreal atmosphere emphasized by the fact that in the central section of both solos the pianist stops playing, as if Bill Evans wanted them to perform more freely, without any rhythmic-harmonic comment. In this track is impossible to separate the melodic line from the harmonic framework, and this happens not only because in the middle of the piece there is no explicit harmony at all, but also because Coltrane and Adderley do not simply play a melody on a sequence of chords. The two saxophonists build an over-arching, dynamic and interactive layer which is neither melodic nor harmonic, but is able to widen the horizon between the two, until it completely fades away.

This little and partial analysis of Coltrane improvisational style shows that the core of jazz creativity consists not in playing fixed and unchangeable licks along a harmonic background, but rather in making these patterns interact with all the elements of the performative situation: “the player will find that few tunes fit neatly into one formula or another but rather combine two or more formulas, often in modified form.” (Baker 1998, p. 27). This does not mean that spontaneity in jazz only lies in the sequencing and linking of different “formulas”, as Brown (1981, p. 354) writes. While performers juxtapose different licks, they transform them into something else, with their particular touch, developing in the best cases, an individual style. And in jazz music, which counts on the ability of single performers faced with relatively few and extremely famous repertoires of standards, rather than on composers, their unique artworks and interpreters, building a style in accordance with a certain tradition, represents perhaps the most important aspect. The result of our analysis is then a dynamic conception of the formula: we should not say that jazz
pieces are made of formulas, but rather that formulaic items regulate the musical discourse, allowing us to recognize the milestones it includes: i.e., in case of bebop, the chorus, the solos and the reprise (Brownell 1994).

Nevertheless, our insisting on the fact that formulas are not fixed and petrified does not imply that jazz is an art form committed to a total anarchy. Several aesthetic inquiries have highlighted the importance of normativity in this kind of music. Georg Bertram, for example, talks about a “normativity without norms,” (Bertram 2010, p. 36): i.e., in our terms, a context in which the link between different passages are not prescribed in advance, but are constantly exhibited, re-negotiated and renewed in every single performative situation. As Alessandro Sbordoni notes, two complementary dimensions incessantly intertwining with one another are involved in the improvisational processes: the first one, that we may define as vertical, is about the relation between the productive imagination of the single artist and the musical material, whose result is a standing-out style. The second one, that we may term horizontal, includes the simultaneous and extemporaneous contributions of those who participate in the performance: through their reciprocal relations, it is possible to sketch the shared, productive and creative goals which make a performance successful. Here we are facing not an absolute lack of normativity, but only a different one, which does not pre-determine what notes should be played, but offers to performers a range of possibilities ready to explore. As Bertinetto writes (2014, p. 139), the peculiarity of jazz is not to reformulate its normative boundaries in all particular performances, so that they reflect, in a reduced scale, a historical development typical of a musical genre. In every jazz performance, rather, this historical development is directly shown as the music goes on: jazz sessions are not pale mirrors of an abstract artistic path: they tangibly exhibit a process where macro- and micro- levels never cease to intermingle.

V. MUSICAL ENTITIES WITH INFORMATIVE MODELS, DIFFERENT RANGES OF POSSIBILITIES

As we have just seen, jazz is far from being coextensive with a realm of absolute arbitrariness in which unchangeable formulas are randomly put in a row. On the contrary, this musical practice exhibits a discourse whose bases are the constant mutation, reworking and rephrasing of some essential patterns, scales, modes or chord sequences. The simpler a formula, the easier it can be memorized by the performer and, possibly, reshaped to make it sound attractive to those who participate to the musical event—both the audience and the other performers. As has already been said, memory should not be underestimated, because it is only through this faculty that musicians can recover the most interesting passages throwing them into the performance flow again. This opens up an important feature of jazz creativity: we will consider jazz having an informative model. What does it mean, and in what does it differ from the prescriptive model?

A preliminary (and banal) observation that could be made is that a musician, in building a jazz performance, does not know in advance what will be played: not only because there is no written score (or, when there is one, it is handled with a considerable freedom), but also because jazz is not a tradition of re-performable works, at least in the sense typical of other kinds of music, such as western classical tradition and even folk. This might seem odd, since neither are there scores in folk music: but the goal of traditional oral music is to preserve the structure of a social practice as accurately as possible, not to produce original and interesting performance, and this could be achieved even in absence of scores. In other words, jazz uses a different kind of inscription of the musical text, neither completely based on western notation, nor on oral transmission. Hence, in the informative model, the form of the musical piece is determined from the inside layer, i.e. directly into the performative situation in which it takes place, and does not depend on an external entity, a pre-composed work of music. It coheres with the “theory of information” from which it takes its name, the informative model consists in a pattern which does not prescribe what pitches must be played, but offers a high rate of potential choices. Let us analyse this: it insists on the choices being made from the players, rather than on the structure of a text (written or not) that comes before the performance. The text of a jazz piece, therefore, is developed at the same time in which the main decisions on what in western music are called “expressive features” are made. In other words, to use Giannattasio’s terminology again, the shape given to the sound, which makes it rough, bright, delicate, growling and so on, is not a variant: i.e. an expressive, suprasegmental feature added (and, as a consequence, not essential) to a certain pitch but represents a formal and essential variation which directly constitutes the text.

The peculiarity of such a model emerges if we compare it with Roman Ingarden’s perspective, one of the most widespread theories dealing with the problem of identity of mu-
sical works. A fundamental issue which Ingarden wants to investigate is why should a musical artwork be unique if it allows different renditions. The answer depends on his original interpretation of the role of scores in musical practice: a notated text gives rise to different possibilities of instantiating it, but to preserve the identity of a musical artwork through different performances Ingarden writes that these possibilities are extremely limited (Ingarden 1989, pp. 240-241). This could be due to the fact that a written score, as Caporaletti (2005) argues, implicitly conveys a visual representation of the musical piece for which it stands a score, in particular, identifies every sound frequency with a symbol having an accurately measured, chronometric duration.

It could be argued that visual representation of musical phenomena aims at strongly limiting and disciplining the paths through which the text has to be developed, because there is a perfect correspondence between a symbol (with a given duration) and a single sound frequency. This view by musicologist Jean Molino, considerably reduces the impact of such a perspective:

We are so accustomed to the rationalization of the musical system that we believe that a note cannot be defined otherwise than on the basis of a precise frequency value: before the rationalization of musical systems, their elements worked exactly as those of linguistic systems still work nowadays, i.e. using all the ranges of variation allowed by the configuration of every system (Molino 2005, p. 488).

What is important to focus on in jazz practice is not the single note which has to be played with the appropriate nuance, but rather a nebula of pitches that open up to the performer, again, a high rate of possible choices to be made in order to inform the musical piece. Thus, such a nebula of possible sounds has to be explored by the performer, and it is not possible to establish in advance a correct way to do it. This happens not because jazz is included in the oral tradition, but because of the conception of limit typical of this musical world. In jazz, the notion of limit is related to the way in which the text is built: i.e. to the core of the process that generates a tradition. It does not make sense to talk about “wrong notes” (Bertinetto 2014, pp. 122-132) in themselves, i.e., notes that are not prescribed by the score, or, to say it better, notes that are melodically incoherent with a harmonic framework that cannot be changed. Instead, we can say with Miles Davis that “there are no wrong notes in jazz. Only notes played in the wrong place. This is to say that musical pieces built through an informative model are able to dynamically modify the rules according to which a note could be wrong or not: i.e. inappropriate to be included in a certain context, in a given moment, having this or that stylistic features. It could well happen, therefore, that a note played at a given moment E1 may sound wrong, while at E2 the performer, changing for instance the chord underneath it, can make it right. Consequently, what in musical pieces are conceived through a prescriptive model, a mistake remains a mistake, without possibility to erase or correct it, in musical pieces defined by an informative model a mistake becomes an occasion to in-form, to re-form the piece.

As Stephen Davies says, jazz improvisation “aims at the presentation of real-time music making constrained only by the grammatical conventions of a style.” (Davies 2001, p. 19). On the contrary, musical practices based on a prescriptive model, such as western classical music or popular music, place limits in order to exclude some notes from the content of the text itself, and the only rate of choice left to the interpreter concerns expressive aspects, the speed, and other secondary aspects. In this latter case, a limit traces a path which comes to a determinate sound frequency—that one, and not another—is eligible to take part into the musical text. In jazz, the limit is a frontier to cross, which does not open up the text itself, but rather a way of playing, a language, a stylistic tradition: i.e. the conditions to having a text at all. Furthermore, these conditions are always revisable and modifiable in the course of performance, which represents the place where jazz creativity can be conceived and, more precisely, practiced.

NOTES

1 This obviously happens because comparative ontology uses the same categories of the traditional one. Some doubts about a similar practice can also be read in Kania 2014.
2 See also the debate between Brown and Kania (Brown 2011, 2012; Kania 2012).
3 For a critical point of view on this model, see Bertinetto 2012. For a limited validity of the type/token model see Alperson 1984.
4 This doesn’t seem true for the concept of performance which we will examine in the final part of this paragraph.
5 I leave aside the issue of intentionality which is of fundamental importance in Ingarden’s theory, but it
would too long to deal with here. We will go back to Ingarden’s view in the last paragraph.

6 Wolterstorff (1987) writes that not every musical phenomenon must be considered through the duality work/performance.

7 On the contrary, Peter Kivy embraces the so-called pure sonicism, in which every timbral aspect is automatically excluded from the definition of a musical artwork. These aspects are sharply re-evaluated in Levinson 1990, pp. 63-88, 77-78.

8 Concerning the difference between avantgarde research on improvisation and jazz practice see Sparti 2007, pp. 182-207.

9 An example of the perdurantism of this myth can be found in Brown 2000, pp. 111-125, 117-119.

10 This can also be said of originality in general: see Pareyson 1966, pp. 25-32.

11 We will see the extent to which the mastering material of different styles is important in jazz practice.

12 It is worth noting that our sense of model is slightly different from that of Caporaletti: he focuses on what elements give shape to the model, while the purpose of our dichotomy (prescriptive/informative) is to clarify the relation between the model and the musical text resulting from that.

13 For a general but effective view on this topic’s relation to jazz improvisation, see Gillespie 1991, pp. 147-164.

14 See for example the case of Chick Corea, who developed his improvisational style on Bud Powell’s licks, or that of Charlie Parker, who did the same using Lester Brown’s records. See Caporaletti 2005, p. 131.

15 On contrafacts, see Bertinetto 2013, pp. 101-132; Caporaletti 2005, p. 308.

16 “By acquiring facility with these formulas and committing them to memory, the player greatly eases the task of learning to improvise on new tunes” (Baker 1988, p. 27).

17 A similar view on improvisation can be found in Lewis 2004, pp. 131-162). Here he distinguishes between the Eurological and Afrological approach to improvisation: while the former “insists on ephemerality”, the latter “considers improvisation in terms of re-appropriation, reworking and transformation of received materials” (Bertinetto 2012, pp. 1-22).

18 For instance Monson 1996.

19 This track can be found in The Miles Davis Sextet, Jazz at The Plaza, Columbia 1958.

20 A critic against this view is Gushee 1981, pp. 151-169.


22 A. Sbordoni, Comporre interattivo. Una valida prospettiva, in Id. (a cura di), Improvisazione oggi, LIM, Lucca 2014, pp. 89-95, pp. 90-91.

23 Nevertheless, there are scholars who tend to deny that improvisation is the main feature of jazz music basing their claims on the fact that many jazz musicians such as Duke Ellington made a great deal of use of scores: see Chevan 1997; Knauer 1990, pp. 20-38.

24 See Arbo 2013, p. 27.

25 On this notion, see Ferraris 2009, pp. 43-45.

26 Ingarden, 1989a, p. 67.

27 “The jazz improviser must grasp the information supplied by the rhythm section to put syntactical order to the language statement, and grammar of the jazz solo” (Tirro 1974, p. 288).


29 “Nous sommes tellement habitués à la rationalisation du système musical que nous croyons qu’une note ne peut se définir que par la valeur exacte d’une fréquence : avant la rationalisation des systèmes musicaux, leurs unités fonctionnaient exactement comme fonctionnent encore les unités des systèmes linguistiques, c’est-à-dire en utilisant toutes les marges de variation premises par la configuration de chaque système”.

30 Molino attributes the high rate of potential choice which we talked about only to oral cultures. But we have to consider that even oral cultures can be considerably binding (See Arbo 2013, p. 27). For critical remarks on the idea of including jazz in oral culture, see Caporaletti 2005, pp. 135-150.

31 See the interesting reflections on the notion of kairôs in Goldoni, 2013, p. 145.

32 For a clever insight into these problems, see Bertinetto forthcoming.

33 In this latter case, especially as far as lyrics are concerned.

34 Cadenzas in classical music represent a partial exception (Brown 2011b, p. 59). Although, it is worth noting that in the presence of a cadenza improvisation is prescribed, but it does not give rise to an informative model of creating music. See Bertinetto 2012b, p. 114.

35 On the relation between jazz and ordinary conversation, see Monson 1996.
REFERENCES

I am a musician and a composer and I have spent most of my life studying the instrumental techniques and the musical theory of several codified musical genres.

This experience has brought me to the view that the academic attitude is nothing but a modern musical ghetto whereby teachers share a received knowledge with students that receive it passively and uncritically—since it is assumed to be correct. A scholarly system when applied to music often even determines human tastes.

For example the Western musical distinction between consonant and dissonant taught in basic theory and referring to intervals, is a kind of a psychological violence that overrides the fact that each ear is different because something that sounds consonant to one’s ear can sound dissonant to others’ ear. If we accept the definition that music is the art of expressing one’s inner feelings through the modulation of sound we should understand and teach music as a way of sharing knowledge but by making use of individual perspectives and visions, instead of merely teaching music as the banal application of rules.

Frank Barrett (1998), for example, wrote about the interaction between rules and creativity in jazz suggesting that certain cognitive processes focus on self-monitoring and focused attention while others may be associated with defocused, free-floating attention that permits spontaneous unplanned associations, and sudden insights or realizations. The latter kind of musical interaction relies on a set of rules or structures that are minimal and which allow maximum flexibility of association embracing errors and open-ended outcomes. Thinking about the implications for organizational learning, Barrett contends that “too much reliance on learned patterns (habitual or automatic thinking) tends to limit the risk-taking necessary for creative improvisation; on the other hand too much regulation and control restrict the interplay of musical ideas” (Barrett 1998, p. 607).

In this article I propose a distinction between rules and directions and I develop some thoughts on the way jazz is taught today. I am convinced that today’s jazz education all too often puts forward a conception of rules that in fact hinders any kind of communication between musicians. My proposal is that we should teach people how to reach a common understanding, rather than what phrases to play. The kind of rules—or directions—that permits this kind of interaction are not specific but general. David Liebman (2009) explains why we should be concerned about jazz education:

To me the most important lesson learned in jazz playing is how to cooperate and work within a group situation while maintaining and exploring individuality.

But I wonder, is today’s jazz education still promoting individuality? There is a big difference between jazz that grows as a spontaneous order in a specific context/area and the institutionalization of rules that become too rigid to permit any creative change.

### Teaching Jazz and the Institutionalization of Power

How is jazz taught today? Is jazz education of any use? One of the biggest challenges for a teacher, or better yet, a mentor, is how to share their knowledge without invading the “choice area” of the student. In fact, jazz, and music in general, can make minds more elastic, focused and trained. But we should stop and think about what is the method to develop and share the knowledge that is contained in jazz music. Most academic jazz courses around today offer a fixed mechanism of learning through rhythmical, melodic and harmonic kinds of patterns. The problem is not the pattern itself: what is fundamental is how we present the pattern to our students. Our life is full of patterns and routines we repeat day in day out.

A teacher should show a student how to “walk” properly but afterwards the student should be free to develop their...
own path-making personal choices. This means that sharing a technique shouldn’t provide any content. The content should be developed by the student. This is not generally the case with the current way of teaching jazz which is typically a dogmatic drilling of techniques and their applications.

When I was young and had not yet learned the “right” notes to play, improvisation was natural and joyful and playing an instrument represented a passageway into the universe of sound where I experienced something of the eternal in my daily life. Later, when I went to school to study jazz, improvisation became more of a technique for applying the correct scales to chord changes. (Fewell 2016)

Nowadays we teach students not only how to “walk” but also what’s the right path to follow. This outlook simply smothers personal taste and constrains self-determination—the most important aspects to individual development. Therefore, through jazz education, we are controlling and inhibiting the would-be musician.

As I have been a student in a jazz academy I am well-placed to provide a personal account. What I discovered over the years is that there was a total lack of empathy in the sense that the musicians around me displayed an inability to play without the rigid application of rules. Whenever I found myself in a rehearsal room for an “improvised session” with other students there were nothing but questions such as: “which song/tune?” or “what key?” Students spend years studying and practicing standard music patterns which work fine in predetermined situations where everyone knows the rules of the game. This game can repeat itself all over again precisely because individuality has been suppressed. Moreover, this game will always deliver the same result, since the result is predetermined. The “scholarization” of jazz, as I call it, based on fixed schemes, means that everyone follows a standardized way to express oneself.

The inhibition to freely express one’s personality is a direct result of the scholarization of jazz. Consider this: when one takes a couple of little kids and ask them to play random instruments, a cacophony ensues. The children will certainly not ask one anything about the “modality”; they will just play and express themselves freely. So one has to wonder how is it possible that a trained musician will come over as handicapped if you ask them to play freely? The answer is this: because today’s scholarized jazz education teaches musicians the way one must play rather than of the means of how to play. We’re teaching the content and not the way to let one develop his or her own personal content.

Today’s jazz is taught in a way that freezes the hierarchy between the teacher and the student. This is why, most of the time, we hear technical players that sound almost the same, simply because they limit themselves to the same known choices, which means to not take risks or personal decisions. When we teach patterns as the definitive way to play jazz, we are in effect merely producing copies. This has not always been the case. Historically, jazz was one of the most “contaminated” of genres. The kind of jazz that emerged before the 1970s was a result of interactions between personalities who were composers. From the 1970s up until now, mainstream jazz has been reproduced by performers who play a decoded kind of jazz where the rules of the game were already predetermined. The first jazz era rested upon individuals who, in fact, wouldn’t had the chance to describe themselves as composers in today’s institutionalized era, an era when the composer needs to be an academic scholar. Instead, music has often found pioneers among amateur musicians who were more open-minded and free to develop themselves instead of merely developing prefabricated musical genres. These amateur musicians often invented the musical genres we hand down to our students today.

RULES AND IMPROVISATION

What’s most important about rules is being able to discriminate the quality of the rule, one worthy of respect. I want to suggest that while rules and guidelines are two separate worlds, sometimes we can find some hidden rules smuggled in with the guidelines or directions. While the rules are there in order to control our impulses, one cannot improvise by way of a mere application of rules. Is there any kind of rules that can let us express freely? Rules are and should be important in a musician’s life during those endless hours spent on practicing. Rules can be fundamental in acquiring a proper mastery of the instrument. It is here that I propose a distinction between rules and directions. The concept of a rule brings along a hierarchical point of view which reveals the will to control the ones who should follow the rules. This mechanism creates different levels of power. The “teacher” who accepted and learnt the rules himself, is the one who “owns the rules” that should be learnt by the student and should accept the rules unquestioningly. In fact, a mere application of rules makes any kind of evolution impossible since every rule is based upon an obsolete
kind of knowledge handed down from the past and music, as the arts in general, should be actual to be honest. It is my contention that a good teacher should show just what the possible directions are available at a given moment. The distinction between rules and directions provides a different perspective: a direction is non-instrumental in character.

From this perspective it is more appropriate to indicate to a person who shares the knowledge as a guide or a mentor, rather than a teacher or a master. The position of power held by the person who shares the knowledge is critical to the results we can expect. There's a big difference between the sharing of an experience and the passing on of a prescription. A good guide is the researcher who puts new questions on the table because perhaps an answer can be found in a different perspective. There is no hierarchical relationship in this situation because the guide shares the knowledge as one would with an open argument where the student can also be an active participant.

The posing of questions without having the answers to hand is at the base of an evolutionary process that is not in any way meant to reject the rules. Within this perspective, the existing rules are just a starting point for discussing new points of view which can be developed, from time to time, by the student as well. The answer is open-ended and should not be specified by the guide's opinion. If the destination is specified, one will get there fast but one will be denied the possibility to assimilate things and have a full experience of the journey. If a direction is indicated, one will have to negotiate the way by oneself.

Whenever a musician confronts an impulse, there are some possible responses: first, the musician already knows how to react, or second, the musician does not know how to react but will probably be able to negotiate the situation better if familiar with the “question/answer process” (I will expand on this process below). Finally, the musician can find the answer in their “book of rules”, a passive way to react to an event. In such a case, there is no real decision and it is an easy way to deny any responsibility. Here’s an easy analogy: try to imagine that the question could be represented by the topography of the surface on which we stand. The musician can adapt better to a novel kind of situation if they have walked on many different surfaces in the past.

From this perspective, musical genres are just different kinds of surfaces. One can readily walk on a beach and in a forest but maybe one has never walked on a rocky surface. Of course, my ability to adapt to different surfaces is connected to my talent in walking but also on my experience in walking on different kinds of surface. Knowledge (taken as a kind of tacit experience) is the key to adapting as fast as possible. Consequently, the best solution is to know how to walk in any possible way. This is difficult to express propositionally when trying to cover the countless possible situations. Knowledge that does not include the unexpected as a possibility is useless in the real world.

Since music is a way to communicate, we should think about how conversation, similar to an improvised music session, works. The question is “what are the useful rules to make a conversation possible?” A fundamental rule of conversation is to listen before answering. At this point an answer can follow as an original idea or, on the other hand, by a vulgar application of rules that often seem out of context. If we extrapolate this metaphor of conversation to a musical interaction, we can conclude that:

- Experience is a kind of constraint release.
- If one does not have any reason to respond or if a response is not already in ones available options, just keep silent and try to find a good response to the idea or musical “question” presented.
- To be focused in a conversation or in a musical improvisation means to be balanced. One should not try to offer a forced answer to a question.
- What is really difficult is to maintain balance in a silent situation. Most of the time the context is the first source of pointless ideas and questions. A musician should prioritize the questions to be answered and ideas to be addressed.

What is more important than rules is the role of the musician. Experience can teach us how to let the music flow in the best way possible. Great players always say that the “music flows by itself”, it “simply happens”: this attitude can be easily suppressed with a mere application of rules. Ideally, rules should help the development of one’s personal experience (becoming the person one wants to become) and self-determination (deciding how to go about it). Unfortunately, rules are also an easy way to control people and that’s exactly the way jazz music seems to be developing these days. To meet up “for a jam” in the jazz era meant research and conversation. Today, in most cases, a jam session means nothing but the application of all those decoded rules to “improvise” properly, the right scales on chord progressions. One is not considered a poet if one just publically recites old poems each time: a poet supposedly writes their own poems. We teach people to become pris-
Improv is nothing but a sequence of questions and answers. What makes the difference in this process is the vocabulary of the subjects involved in the conversation. We think as we speak, which means that the quality of our ideas is directly connected to our vocabulary. An educated vocabulary means that there might be many ways to answer a question. The flip side is that education can be a powerful tool to control people’s minds. This occurs when one couples a vocabulary with given ideas which is exactly what happens with the chord progressions where students have spend years practicing prefabricated answers, consequently nullifying any chance to develop a personalized perspective. At some point though, prefabricated answers become the students’ personal perspective.

This process develops when the vocabulary hides the content. If we want to promote individualism, we should educate and train people to acquire and develop a personal perspective. It is not a mystery that educational organizations generally promote given content. These days, the main subject of the conversation we call jazz mostly offers prefabricated answers making the conversation predictable. This has nothing to do with what we call individualism or subjectivism. This is what happens when the vocabulary is also the carrier of the content.

A staid vocabulary makes people predictable while destroying the possibilities of an original movement to emerge. One of the most important things for a musician in a group setting is to listen to other musicians, which becomes difficult if one has already put answers in the students’ mind. If the answers are already there, that musician will only hear what is happening through the prism of what he or she already knows. On the other hand, if we can share a rich vocabulary that is devoid of categorization, content or stereotypes, we can reach a space where a real conversation can take place with unpredictable results, making it possible for an individualized perspective to take shape.

A genuine conversation makes it possible to find an accord between different vibrations, the basis of unity, while different vibrations form the basis of motion. To find unity in different vibrations is the biggest virtue for a modern musician. A genuine conversation is in never-ending motion: on the other hand, a faux “conversation” made out of predetermined questions and prefabricated answers is immovable—this is what Oakeshott and Hayek had in mind regarding their critique of rationalism. This conversational idea is what jazz is all about, or at least it is an important part of it. It’s an emerging movement based on ideas in perpetual motion. A good musical education should teach people how to reach an accord (an emergent agreement) with themselves and with their vibrations finding real inner contact with their deepest feelings. This idea can, after all, be found in the etymology of the word música which is the art of expressing inner feelings through the modulation of sound.

Jazz, Vision and Abstraction

Playing music is just one of the innumerable ways to express one’s feelings. Rules, taken as the content, can become an obstacle to letting the musician share their vision freely. If we assume that everyone is different, it becomes impossible to specify a single rule that should work for a large number of individuals. The flow of emotions should be natural rather than as a result of an application of rules. The problem comes when someone tries to codify this natural flow, making for an apriori and moribund dynamic: rules merely become the content.

This is exactly what happens with jazz. In the golden era, music was a natural flow of musicians’ feelings and perspectives but once codified, it became nothing more than a mere application of the right pattern or scale on some chord progression. The most important thing to be taught is to develop a personalized way to express one’s feelings and share one’s perspectives, a view that sharply contrasts with the popular tendency of teaching a standardized way of approaching one’s inner voice. There are just two options: agree or disagree. Dissent for a future agreement/(and or synthesis) is the origin of jazz, dissent here meaning the creation of an alternative to mainstream consciousness which is, in fact, at the base of what we call evolution. Evolution is driven through random interactions and collisions. On the other hand, predetermined orderly interaction makes any kind of action predictable because people are trained to react in some specific ways that are often quite different from a natural reaction which is often unpredictable. To view jazz as a mere application of rules is the best way to make it disappear.

It is my impression that at some level, the process of categorization legitimizes various forms of collective tension— i.e. in-group vs. out-group. The trick is to create exclusive groups that limit the interaction among people with the
The institutionalization of jazz has been advanced through the teacher-student relationship and has reduced any chance for the student to challenge the rules since the teacher usually acts like as a high priest revealing to his students a dogmatic kind of knowledge through the mantra: “listen and repeat”. This approach empowers the teacher who is looking for disciples while, on the other hand, puts the student in the comfortable passivity of receiving knowledge without questioning or thinking. It is my impression that through the current way of teaching jazz, we efficiently annihilate any kind of ability to play with all the musicians that have been “educated”.

A common idea among good improvisers is that you “need to forget yourself while playing”, otherwise one will just show off one’s musical chops. As a river flows without the idea of flowing, so too good improvisers play without thinking of playing. How is this possible? To do a certain exercise as long as you can. Lacy himself used to practice the same interval the whole day long, trying to take c and c# and practice it for 8 hours. What is the result of this exercise? Abstraction.

Abstraction is my advice to neuralize the problems I’ve identified in the teaching of jazz today. Abstraction is a good way to acquire a different perspective of the same sound. The ability to abstract is fundamental in order not to feel excessively limited. A simple exercise like this will work with sounds instead of reading scales and their applications on chord progressions. The musician should be an expert on the sound of their instrument. Repetition is fundamental to train one’s ear which is the only medium between one’s inner vision and what is happening beyond. This connection can be recalled anytime instantly without the need to think about it. The ability to abstract means bringing action to an instinctive level.

Taking decisions means assuming responsibility and managing errors. These are some of the most important aspects of a free-thinking person. These two aspects are mostly absent from the game if the musician already knows what is coming next in the chord progression. In such a case, the audience witnesses nothing but an exercise. Way too often we teach people that to play an instrument is much like solving a riddle. But this attitude simply makes it impossible for a student to search for and articulate their perspective. Rather, it incentivizes the musician to conform to a bigger more commonly shared perspective. As an antidote, Steve Lacy in his book *Findings* (1995) exhorts repetition in the following sense: practice the same interval as long as you can. The musician should be an expert on the sound of their instrument. Repetition is fundamental to train one’s ear which is the only medium between one’s inner vision and what is happening beyond. This connection can be recalled anytime instantly without the need to think about it. The ability to abstract means bringing action to an instinctive level.

### NOTES

1. Neurologists have found that music reinforces the neuronal connections in the human brain: https://www.youtube.com/watch?v=S0kCUs0g9Q&t=3s

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Understanding is often significantly aided with metaphor and analogy. In this paper, we will argue that the process of jazz music provides a powerful analogy for understanding distributed theories of cognition and systems approaches to biology.

Fields like cognitive science and biology often conceive of a difference between “nature” and “nurture”—between organism and environment or between the brain’s cognitive process and the environment it thinks in. Distributed theories of cognition and systems biology both propose a unique take on the interaction between “nature” and “nurture,” essentially arguing that these two cannot meaningfully be separated. Distributed theories of cognition suggest that cognition is shaped by an interaction between brain and external tools that aid the brain’s cognitive process (be it a calculator, cell phone, or paper and pencil). Systems biology similarly conceives of phenotypic development as a deeply interactive process where genotype and environment interact: organisms develop a certain way because of their environments and environments are shaped by organisms.

We believe the metaphor that aids in understanding these interactive approaches to cognition and biology is jazz music, a music which often depends on each musician affecting what the other plays through a process of improvisation. Thanks to its improvisatory element, jazz music is the result of deep interactions between musicians who both affect and are affected by what the other musicians play. In the same way, distributed theories of cognition and systems biology treat the phenomenon they examine (the cognitive process and biological systems) as the result of deep interactions between elements that both shape and are shaped by each other.

Before ending this introduction, we should discuss why we believe it important to analogize theories of distributed cognition and systems biology to jazz. Much research has been done on the importance of analogy and metaphor to human cognition (Lakoff and Johnson 1980; Hofstadter and Sander 2014) as well as the crucial role analogy and metaphor play in academic disciplines. Mathematics, for instance, has deep roots in (and may be impossible for humans to understand without) bodily metaphors, such as > as bigger or more and < as smaller or fewer (Lakoff and Núñez 2000). Economists attempt to illuminate economic exchange with analogies to a marketplace or a zero- (or non-zero-) sum game (McCloskey 1995). The genome is understood by analogy, sometimes as a building block, other times as a blueprint or pure information (Keller 1995).

Why does analogy and metaphor pervade human thought and help us understand otherwise abstract or intricate concepts? Analogy and metaphor help us assimilate new information into our mental schema by highlighting parallels between things that are easier for us to understand (or that we already understand) in order to make sense of what we don’t yet understand. For instance, understanding how memory works is tricky, so we may look for analogies that link how memory seems to work to memory storage devices we are familiar with. Memory, Plato believed, could be best understood by thinking of it like a wax tablet that experience can write on. Some minds (with good memories) have stronger wax that can hold symbols longer than others (with weak memories) whose wax is less durable. More recently, psychologists have made analogies of human memory to dual processing computers, where the analogy serves as a conceptual framework for thinking about memory and a hypothesis (human memory works the way computer memory works) to help guide future research (Roediger 1980). No one, of course, believes that human memory is a wax tablet, that experience literally writes on that tablet, or that humans store memories exactly the way computers store information, but pointing out possible sim-
ilarities between human memory and these devices helps us make sense of memory by analogizing what we understand or can easily see to what we don’t quite understand or can’t easily see.

This is our intent in analogizing theories of distributed cognition and systems biology to jazz. The most intuitive way for many people to think about human cognition is as something the brain does, and about biological development as something organisms do. Explaining both of these instead as interactions among parts of a system may be difficult, as such explanations challenge deeply held intuitions. Jazz may provide a more familiar model for understanding a system where the result (the music) is the process of a deep interaction between parts of a system (musicians). This, in turn, may provide a useful scaffold for understanding cognition and systems biology as similarly interactive processes.

First, we will explain how jazz relies on the kind of interaction that makes it difficult or impossible to separate what each player contributes from the overall music itself. We will argue that each player affects and is affected by what others play in a way where the resulting music becomes more than the sum of its isolated parts. The remaining sections then explain theories of distributed cognition and systems biology as well as how each of these are analogous to the interactive nature of jazz music.

JAZZ AS AN INTERACTIVE PROCESS

Jazz music generally gives pride of place to improvisation within a minimal song structure. In contrast to concert (i.e., classical) music, where musicians generally play from a written-out score telling them what notes to play and how, jazz tends to have a less determinate structure, allowing room for musicians to determine what and how to play. Different “forms” of jazz will differ in how much improvisational freedom they give to musicians—it ranges anywhere from more structured “third stream” that fuses classical and jazz elements, to entirely avant garde free jazz where musicians are free of virtually any preconceived structure. On the whole, though, jazz music tends to feature ample space for improvisation from its musicians.

The balance many forms of jazz strike between preconceived structure and improvisational freedom are best seen by looking at a jazz “lead sheet”—the type of sheet music from which a jazz musician (particularly in a small ensemble) will likely play [image below]. In contrast to the detailed sheet music a concert musician will use, with all notes and inflections spelled out for her, the lead sheet contains a minimal structure: a melody and a chord structure (with sparse dynamic markings) written over a set number of measures. The rhythm section (generally drums, bass, and chordal instruments like guitar or piano) will play the chord progression and repeat it as many times as the song demands (a 12 bar blues chord progression, for instance, may be repeated any number of times, while soloists take turns soloing over it). The melody is generally played the first few times the chord progression is played (what musicians call the “head” of the tune), and each subsequent repeat of the chord progression will feature soloists taking turns soloing over the progression. Finally, the song concludes with a final repeat of the chord progression with the “lead” instrument repeating the melody over the progression one last time.
This, of course, leaves considerable space for improvisation within a minimal structure. The only things proscribed are the key and time signatures the piece is to be played in, a melody (to be played once or twice at the beginning and end of a song), and the chord progression of the song. All else is generally left up to the musicians to create “in the moment.” The rhythm section knows what chord progression to play, but have significant room to improvise; the drummer may have an indication of what kind of groove to play (e.g., a swing, funk, or bossa nova pattern), but can add accents and hits anywhere she feels appropriate; the bass player knows the chord progression to use in constructing her bassline, but can improvise what notes she feels appropriate, and so on. Soloists have even more freedom. They know the chord progression they are to play over and (sometimes) how long their solo is roughly supposed to be, but beyond that, soloists are free to construct the content of their solo “in the moment.”

For our purposes, it is most important to see this space for improvisation as a chance for group interaction. Jazz is best seen as an interactive process where musicians improvise together, where each musician improvises, but in a way where each guides and is guided by what the others play. As an example, the piano player may play a chord progression in a particular syncopated rhythm, which the trumpet player may incorporate into her own solo, and the way the trumpet player incorporates that rhythm might inspire the alto saxophonist (who has the next solo) to play in a certain comparable or contrasting style. A drummer who plays a laid back and slightly-behind-the-beat style will likely influence the other musicians to adapt their style to hers, which may encourage her to continue playing the song in that style.

In her study of the workings of jazz rhythm sections (drums, bass, and accompanying chordal instruments like guitar), Monson suggests that “at any given moment in a performance, the improvising artist is always making musical choice in relationship to what everyone else is doing” (Monson 1996, p. 27). The same, of course, can be said of interactions within the rhythm section. Not only might the notes the soloist plays affect the chord voicings and rhythms the accompanists use and vice versa, but what any member of the rhythm section plays might affect what the others choose to play. And what those members play may go on to affect what the other members play, etc.

Monson profiles several ways that different instrumentalists can influence what other instrumentalists might play. Pianists, who accompany the soloist by playing the chord progression of the song, will often be able to tell when other musicians are not on the same page regarding the song (e.g, the bass player seems to be off by one or two beats in the song). In an interview, pianist Michael Weiss describes “a situation where somebody gets lost or not everybody is sure they’re in the same place, let’s say in a fast tempo, very fast tempo tune. When the piano player plays a chord deliberately on a certain beat, everybody will respond to that more than almost anything else” (Monson 1996, p. 51). Bass players, for their part, can often affect what others in the band play by altering their baseline in various ways: they can, for instance, change the register or octave of their bassline (which may affect the register or intensity other musicians play with) or create a pedal-point, where instead of a walking bass line, the bassist repeats the same note (the pedal-point) over the other accompanists changing chords (Monson 1996, pp. 29-43). About the way drummers can affect, and may be affected by, what other instrumentalists play, Monson writes:

A particular feel played by the drummer signals the bassist that certain bass lines are appropriate and others are not. Likewise, a particular groove tells the pianist that certain types of comping are expected and others are not. These relationships work in reverse as well. A certain style of comping, or a certain base line will tell the drummer which time feel would be most appropriate. Musicians listen carefully for musical details such as these (Monson 1996, p. 52).

While jazz is not unique in having a style that relies on this type of interplay between musicians, it makes very heavy use of such interplay, as evidenced by the lead sheet above. The less formally structured the jazz, the more each musician is free to shape and be shaped by what other musicians are playing.

Jazz music is the result of individuals improvising within a common formal structure and the interaction among musicians within that structure. In terms of structure, most jazz has a time signature, a key signature, a set of chords that are to be played and soloed over, and a melody that is to be played (at least) the first and last time the chord progression is played. (Some jazz forms, like big band, has more structure than this and other forms, like avant garde “free jazz,” has less. Virtually all jazz has at least some type of structure that holds the music together.) Musicians are generally not supposed to deviate from this structure. The drummer knows that the key signature is to be x, the rhythm section...
and soloists know that the chord progression is supposed to be \( y \), and while each musician may improvise, the improvisation generally occurs within, not beyond that structure.

The musicians themselves also constrain what can (or will) go on in the music. First, the instruments used by the musicians impose their own constraints; there are certain chord voicings that cannot be played on the piano due to how the keys are placed relative to the size of the pianist’s hands, and certain note combinations that will be exceedingly difficult to play on an alto saxophone owing to the required fingering. The musicians also bring with them a finite skill set as well as stylistic preferences like key signatures they are most comfortable playing in, “licks” they prefer, and the timbre they produce on their instrument that gives them an identifiable “style.” All of these factors constrain what can or will be produced when the musicians play together.

Beyond that structure, though, musicians are quite free in the range of things each can play. The drummer knows that she should play in \( \frac{3}{4} \) time and keep a steady pulse on the ride cymbal and hi-hat, but she is free to plug in whatever fills and accents she likes over top of that. The soloists know the chord sequence (and maybe the stylistic tendencies of their accompanists), but they are relatively free to play whatever note combinations agree with that chord sequence. Where the structure allows interaction by keeping everyone on the same proverbial page, the improvisatory space “beyond” the structure is what allows for the feedback/feed-forward interactions.

Jazz music (except in the case of solo performance) is the result of these interactions. While individual musicians give rise to the music, the music itself is not reducible to the result of different musicians contributing their distinct parts, because all of the parts are constantly shaped in real time by what the other musicians play. In other words, for instance, if a jazz quartet were to play a song twice—one with one pianist and a second time with another pianist, it is unlikely that the two versions would sound indistinguishable (or close to it) except for a different piano part, unlike how a concerto played once with one oboist and then with another oboist would likely sound almost the same both times. The pianist not only affects her own piano part in the song, but things beyond it such as the mood/energy of the song and how the soloists play their parts.

Nor does interaction between players consist only of causal relations, where one player may influence or cause another to play a certain way. In jazz music there are also constitutive relations, where one player’s role is partly constituted by what others are doing. For instance, not only do accompanists (causally) help shape what soloists play, but also form the chordal and rhythmic background in which the solo takes place, becoming, in some way, a crucial (constitutive) part of the solo without which the solo could hardly take place without accompaniment. The drummer and bass player may (causally) affect how the other plays her part, but to some degree, each provides a pulse and groove that the other “locks into;” in that way, the two instruments help to constitute a sound that is greater than either alone and constituted by both.

Jazz relies critically, then, on social interaction and it is difficult or impossible to “reduce” the resulting jazz music to individual contributions from individual musicians. The resulting music is irreducibly social. We believe that jazz’s dependence on social interaction can serve as a good analogy for at least two strands of contemporary science and philosophy: distributed theories of cognition and systems approaches to biology. Both of these seek to reframe phenomena that used to be explained reductionistically (cognition, phenotypic development) as irreducibly interactive processes.

**DISTRIBUTED THEORIES OF COGNITION**

Cognitive science and neuroscience typically conceive of cognition as taking place in the brain, and while these fields may grant that things and environments outside the brain may affect the seat of cognition, the brain is still the sole cognizer (for instance, see Churchland 1986 and Baars and Gage 2007). Proponents of distributed theories of cognition argue that tools and environments that affect thinking should be considered part of the cognitive process. Contra standard theories of cognition, advocates of distributed theories of cognition (DTC) believe that cognition is distributed to include not just the brain, but those things/environments that interact with the brain to perform cognitive tasks.

While theories arguing that cognition is distributed in some form or another have long existed (Clancey 2009; Gallagher 2009), the idea gained much attention when Clark and Chalmers published an essay arguing for the idea of the “extended mind” (Clark and Chalmers 1998). They argued that external devices used in the cognitive process count as part of cognition when they perform functions that the brain could potentially have performed. In other words, if the brain had done it, the function would uncon-
troversially count as part of the cognitive process, leading Clark and Chalmers to argue that the same should be true if that function were performed outside of the brain. In an important sense, this means that cognition should be viewed as an interaction between the brain and certain tools, like calculators or notebooks, that the brain uses in the cognitive process.

Clark and Chalmers illustrated with a thought experiment about Inga and Otto, who both need to remember where the Metropolitan Museum of Art is. Inga has a strong biological memory, so she searches her brain for the address and finds it quite easily. Otto has memory problems, so he writes important things in his notebook, and consults his notebook to retrieve the address. Clark and Chalmers argue that drawing the line of cognition at what occurs in Otto’s and Inga’s brain is ultimately arbitrary, for in each case information was stored in a network (brain or notebook) and the individual used that network to retrieve the information.

Other examples may be illustrative. Someone can perform the same mathematical calculation using only her brain, her brain with paper and pencil, or her brain with a calculator. In the first of these cases, the brain is a key player, but in the latter two, the cognition seems to consist of an interaction between her brain and the tools in her environment. In another example, research (Lupyan 2012) suggests that verbalizing one’s thoughts affects cognition in several ways. Repeating an item’s name can aid a person’s ability to find that item in her visual field (Lupyan and Swingley 2012). Linguistically categorizing and naming things aids our ability to think about them in various ways that Lupyan calls the Label-Feedback Hypothesis, where our categorization of a thing affects our sense of differentiation between categorized things and other things, which in turn affects our abilities to further differentiate (Lupyan 2012). A third example (Menary 2007) is a phenomenon likely familiar to many writers: that the act of writing has a marked effect on thinking. When a person writes something down, this externalizes and cements a thought so that the author can look at and examine the thought in a way she couldn’t otherwise. In each of these cases, proponents of DTC would argue that some external part of the environment (paper and pencil, verbalized speech, something to write on/with) not only supports or enhances cognition, but becomes part of the cognitive process itself.

To see why, we might take a closer look at one of these examples: solving a math problem with paper and pencil. When a person does this—suppose he is adding three digits to two digits—he uses the paper and pencil to externalize and make visual what would have to be kept in short-term memory. He writes the addends down so that he does not have to hold them in mind while performing the steps of addition. He adds the first column, then writes its sum down (and might carry a remainder to another column) so that he need not hold this (or the addends) in his head while moving to the next column, etc.

There are two ways one can describe this. The first is the traditional way, where the cognition happens in the person’s head and the paper is used to write down the results of cognition and serve as a visual aid to each step in the cognitive process. In this view, the paper is an aid to the cognitive process without being part of the cognitive process. In another view, that favored by advocates of DTC, this traditional description overlooks the interaction between the brain and the paper/pencil in a way that makes these difficult or impossible to disentangle. The paper/pencil is part of the cognitive process largely because the existence of these tools causes the brain to operate differently than it would had the problem to be performed only in the head. Also, the paper serves as a storage device in a way that is similar to how short-term memory would if the problem were done solely in the head. The interaction between brain and paper/pencil is so strong and mutually reinforcing that if you take the paper and pencil (or the brain!) away from the equation, the cognitive process looks entirely different. This, in much the same way that parts of the brain interact so deeply that removing one part would drastically affect the entire cognitive process. Proponents of DTC can rhetorically ask what, besides an arbitrary line drawn between the intracranial and the extracranial, makes these two situations meaningfully different.

In the same way that jazz is an interactive process, proponents of DTC argue that cognition is an interactive process. They favor the idea that the calculator or notepad is part of cognition because the interaction between brain and tools are what give rise to the cognition, in the same way as the interaction between musicians gives rise to the shape any particular jazz song takes.

Does the fact that cognition is shaped by brain and tools interacting mean that the tools are part of (rather than an aid to) cognition? Is it best to say the paper/pencil aids the cognition that goes on in the head, or are they so intertwined in the cognition that they become a part of it?

Theorists like Adams and Aizawa (2008) argue against D/ETC on several grounds, but the most relevant one for our purposes is what is known as the coupling-constitution
fallacy. They argue roughly that while the paper may aid cognition, allowing or causing the brain to perform certain functions is not strong enough to say that the paper/pencil plays a constitutive role, becoming an actual part of the cognitive process. Robert Rupert (2009) argues similarly that even if we acknowledge the interaction between brain and paper/pencil, there are strong pragmatic reasons (like the success science has already had operationalizing cognition in the brain) to retain our "commonsense" notion that what is going on is the brain thinking with aid from external devices.

Another interesting element of this debate for our purposes is how far DTC theories might extend the bounds of cognition. If elements in the external environment that play a crucial role in cognition can be called parts of cognition, where should line be drawn? Some (like Clark and Chalmers) take a conservative approach arguing that external tools can only count as cognitive if (a) the person has reliable access to them, (b) the person can be said to have ownership of those items, and (c) that the items take over roles that could have occurred in the brain. Some argue that these criteria are too conservative (Menary 2012) or arbitrary (Rupert 2012). Others (Gallagher 2008; Jaegher et al. 2010; Menary 2013) argue for more liberal modes of DCT in various ways by arguing that even social institutions like the scientific community, legal, and educational institutions interact enough with brains to be considered part of cognition. By their lights, it is difficult to see how the smartphone that allows me to access a GPS service is part of my cognition (because I own it) but the GPS cloud and the community of drivers contributing traffic updates to it (neither of which I own) are not part of my cognition. Those who argue for more liberal interpretations of DTC might also find it difficult to understand why items can only count as part of my cognitive process if they replicate what my mind could have done on its own; why not anything that aids cognition?

We do not intend to resolve or weigh in on either the constitution/coupling problem or the problem of where to draw the bounds of cognition. We just want to note that both seem to stem from the common issue of how much interaction with a brain is sufficient to mean that something is now part of the cognitive process. The more we learn about the brain, the more we discover that cognition consists of modules within the brain interacting with each other. Thus, if cognition is an interaction between or among modules in the brain, it doesn’t seem a stretch to think that extracranial items interacting with those modules could also be considered part of cognition. Yet, most of the debate around the merits of DTC and “how far” reveal how difficult (critics would say problematic) this step is to make.

Advocates of DTC describe the interaction that produces cognition in the same way one might describe the interactive process as jazz. Suppose the cognition in question involves writing a paper using a word processor (Menary 2007). Just as with jazz, this situation contains constraints (imposed by the word processing program, the brain, and the ability of the brain to interact with the program) with substantial room within those constraints for interdependent interaction. Each brain is constrained by its structure, defining what it can (and can’t) do, and the cognitive process is also constrained by what environment the cognition is operating in. In this case, the word processor has certain abilities and limitations that govern how one can interact with it.

Yet, within those constraints, the brain and environment have ample room for interaction. For instance, knowing the capabilities of the word processor may affect the brain’s thought process. Seeing the written words on the screen may prompt thinking on where to go next which in turn affects what gets written down next, etc. About this situation (thinking affects what gets written, and what gets written affects subsequent thought), Menary (2007, p. 628) argues the following:

1. All the components in the system play an active causal role.
2. They jointly govern behaviour in the same sort of way that cognition usually does.
3. If we remove the external component the system’s behavioural competence will drop, just as it would if we removed part of its brain.
4. Therefore, this sort of coupled process counts equally well as a cognitive process, whether or not it is wholly in the head.

We believe points 1 and 3 to be highly analogous to jazz. 1 finds its analogy in the interactive nature of jazz music. In the same way that the soloist and accompanist (or players in a rhythm section) interact with each other in a way that affects all involved, the word processor and the brain interact with each other to such a degree that they both affect the cognitive process. Point 3 is analogous to the thought experiment in the previous section meant to show that each musician, if removed, would deeply affect how the song was played. Removing the word processor from the process of
writing has a similar effect to removing, say, the drummer or alto saxophonist from the grouping of musicians.

Points 2 and 4 are less applicable to the jazz setting, but for a potentially instructive reason: 2 and 4 center around the idea that what elements are part of the cognitive process is not always clear in any given case. Whether the word processors we are using to type this article (or the internet, which has helped us find information that contributed to the paper) are part of our cognition may be a matter of dispute. But whether any of the jazz musicians who contributed to a resulting jazz song are part of the jazz music would not be in dispute. If Menary or others want to make the case that the word processor is part of the writer’s cognitive process, he must tell a story to argue the word processor’s importance to the cognitive process in a way that no one would have to tell a similar story about the importance of the flutist’s solo to the jazz tune. We accept that as “jazz” describes the interaction and its result, all of the musicians involved contributed to the process interactively.²

Yet, discussions about DTC center around precisely those types of discussions; all will (we hope) admit that the word processor plays a large role in shaping the writing process, but the question is still asked whether the word processor is part of the cognitive process or just an aid to the cognitive process.

Why do these discussions occur in the domain of cognition but not in jazz? Admittedly, there is one aspect of DTC that may not be analogous to the domain of jazz. In DTC, there is one necessary component to cognition to which all others play a supporting role: the brain. Clark notes that “in taking extended cognition seriously, [we need not] lose our grip on the more or less stable, more or less persisting core biological bundle that lies at the heart of each episode of cognitive soft assembly” (Clark 2008, p. 116). Without the bass (or any other) player, the jazz will surely sound different, but jazz can still be played. Proponents of D/ETC argue, though, that removing the brain from the process—unlike removing the word processor—means the process is no longer cognitive. The brain, they argue, may not be a sufficient condition for consciousness, but it is a necessary one in a way that is not analogous to jazz.

Thus, while not an exact analogy, the interaction of jazz can certainly help explain how proponents of DTC view the interaction of the brain and external tools to form cognition. Jazz musicians interact to form jazz music in a way where removing any of the musicians affects the resulting song, which renders each musician an inextricable part of the music-making process. This is much the same as how a word processor, paper and pencil, or calculator interacts with the brain in a way where removing the external tool would deeply affect the process of cognition, possibly enough to render the tool itself part of the cognitive process.

PARALLELS TO BIOLOGY

Similarly, there are parallels within biology that further demonstrate the kind of mutually coordinated activities we see in jazz, in that biological systems are the result of deep interactions between organisms and environments, each affecting how the other develops. Organisms shape environments and environments shape organisms in a way that, just like with jazz and DTC, make the variables difficult if not impossible to fully disentangle.

One example of such interactions between organisms and environment is the coordination of individual, independent myxameobae cells into slime mold. Myxameobae have two basic forms: individual cells and a sexually reproducing “slug” form. When there is plenty of food around, the myxameobae live as single cells, but if food becomes scarce, they coordinate their actions to form a slug that will crawl across the landscape, eating and searching for a place where it can send up spor stalks to spread its spores into the wind in the hopes that the spores will find food elsewhere. Of interest to us is how the cells coordinate into the slug form.

When a myxameoba begins to starve, it begins to release a chemical called cGMP, a common signalling molecule in biological organisms. Myxameobae have receptors for cGMP on their surface; the more receptors that attach for cGMP, the more likely the cell is going to move in that particular direction. That means that the higher the cGMP concentration in the environment, the more likely the cell will move in that direction. The more cells that are starving, the more cGMP is released into the environment, meaning the cells will move in the direction of more cells. As a result, the slug form tends to be quite varied in its actual structure, rarely looking like a single solid slug, but looking like a network or having various textures, stretching and moving across the environment in various ways. Once enough of these cells accumulate, a macroorganism emerges which can be seen very easily by the naked eye. In fact, they can be several inches or more across, spreading across forest floors, logs, etc.

With the myxameobae releasing this cGMP into the environment, drawing them toward each other, one should ask exactly where the single celled organisms end and the
polycellular organism in the slug form begins. To what degree is the environment itself part of the slime mold? One can also ask to what degree is the cGMP a “tool” the cells are using to accomplish their goals. Lack of food results in the release of cGMP into the environment, and this molecule then causes the organisms to move in the direction of highest concentration of that molecule. Is the molecule part of the emergent organism? The coordinator? What, really, is the difference? It is a product of the organisms, a tool of the organisms, and an exteriorized part of the organisms, the purpose of which is to coordinate the actions and interactions of the single cells to create the slug form so that more food can be acquired more quickly and easily, and the organisms themselves spread to other environments to protect at least some of them from complete starvation.

Moreover, the myxameoba also release more cGMP the more cGMP they run into. This contributes to coordination in a positive feedback loop. The more cGMP there is in the environment, the more they move toward it, and the more they release. That allows them to come together, to seek each other out and coordinate their actions. And all of this is done through something released into the environment. Each myxameoba directs and is directed by each of the others in the environment.

This process is analogous both to DTC and the interactions among jazz musicians. Just as there is no obvious or non-arbitrary way to decide where the single-celled becomes the poly-celled organism, it is often hard to tell when an aid to cognition is so central to cognition that it becomes part of cognition. When an author writes down an idea, he has externalized the idea so that he can now look at the idea as an external observer, which may cause him to reject or expand on the idea in a way he wouldn’t have could he not have written the idea down. Is the paper and the fact that the idea can be written down an aid to cognition or part of the cognition? Like with the cGMPs relation to the slug, it seems hardly to make a difference: the paper and brain (and hand as the intermediary) function in a feed-forward loop, the one shaping and being shaped by the other.

This also fits with how jazz often operates, as can be seen when a band spontaneously changes a tune’s pulse, which generally starts with one player deciding to change her pulse, which gradually influences others to follow suit. As an example, a jazz tune in a typical 4/4 time signature is usually played with a “full-time” pulse, where each of the four quarter notes are equally emphasized: 1 2 3 4, 1 2 3 4. Yet, sometimes musicians (usually in the rhythm section) can choose to change the tune’s pulse, maybe by bringing in a “half-time” pulse, where one only emphasizes two of the four quarter notes: 1 2 3 4, 1 2 3 4. When one musician changes the pulse this way, other musicians will often pick up on this change and decide to modify their approach similarly; for instance, a bass player may change her walking bassline from four notes per measure to two notes per measure to line up with the half-time pulse. As new musicians decide to adopt the half-time pulse, other musicians are more likely to follow suit until all musicians are now playing in this half-time pulse.

Like with the cGMPs, a feed-forward loop begins, where the more members adopt this half-time pulse, the more each musician responds to her environment (where others are playing this pulse) by adopting the new pulse. While the process is certainly less deterministic than the single-celled organisms who produce cGMP, each musician’s choice to adopt the half-time feel or not depends largely on what other musicians are doing. Thus, it becomes difficult to suggest that any member of the band decided individually to adopt the half-time pulse, because each musician is taking cues from other musicians and giving other musicians cues.

Another example from biology involves the mechanism of RNA editing, where environmental effects cause nucleic acids to be inserted into the RNA. What we call “environmental effects” are really in fact molecules or the addition of energy in the form of photons or vibrations that are then transformed by proteins in the cell membranes to chemical reactions on the inside of the cell membrane that are, typically, the beginning of a chemical cascade that ends with a particular internal change. This internal change can be the turning on or off of a gene, the alteration of RNA (messenger RNA to make a protein, an RNA enzyme, or one of various other kinds of RNA) already created by an active gene, or the transformation of a protein already made by the RNAs. The internal mechanisms of the cell are thus so fundamentally influenced by the environment that it becomes difficult to truly separate the two. To return to the specific example of altered RNA, the RNA coded by the DNA is altered so that the new RNA is different from the original gene. Environmental factors affect the kind and degree of additions and subtractions of nucleic acids to the RNA to make the new molecule that will in turn make a protein that allows the organism to best respond to the environment. Obviously, altering already-existing proteins is the fastest response, altering RNA is a medium response, and turning genes on and off is the slowest response to the environment, and each of these are going to be needed for...
different environmental factors, depending on the adaptive needs of the organism.

In other words, genes and gene products interact with the environment in complex ways. Genes are turned on and off in reaction to chemical signals within the cells, which are themselves initiated from chemical or physical forces from the environment. The simplest model would be for a chemical in the environment to attach to a protein on the cell surface, which in turn sends a chemical signal to a gene regulatory protein, which in turn switches a gene on to produce a mRNA that in turn produces a protein that can either provide a structural or enzymatic reaction to the environment.

But this simplest model is in fact a rare occurrence in nature, and typically only in the simplest of organisms, like bacteria. As noted above, there are actually many different ways a cell can react to the environment that essentially act as extensions of the genetic code of the DNA. For example, there can be what is known as alternative splicing of RNA molecules. The RNA molecule in question is entirely coded by the DNA, but it can be cut and rearranged in different ways based on environmental signals indicating which RNA product is required. That is, the DNA produces a large number of these RNA molecules, which then will alter (through self-splicing) or be altered (by RNA-splicing structures within the cell) based on the changes in the environment signalling what is needed. This makes the cell more responsive to the environment, since the RNA simply has to be cut and pasted in a certain way rather than completely created. In addition, there is also a mechanism known as RNA editing, where nucleic acids can be inserted into the RNA. Thus, the RNA coded by the DNA is altered so that the new RNA is different from the original gene. Again, environmental factors affect the kind and degree of additions and subtractions of nucleic acids to the RNA to make the new molecule that will in turn make a protein that allows the organism to best respond to the environment. Where is the “genetic code” therefore held? In the chromosomes? In the chromosomes and the cytoplasm? Or in the chromosomes, cytoplasm, and environment?

Another way to see the interaction of genetics and environment to the phenotype is to look at the role of both in sculpting behavioral traits. By definition, behavioral traits are traits governing behavior, which is a reaction to the environment. For any behavioral trait (and most which have been studied are heritable to some degree, having a genetic component), there will be what scientists call a reaction norm: a spectrum of ways that trait can express.

As an example, of the most studied (and most controversial) traits shown to have a genetic element is general cognitive ability (g), where researchers estimate has anywhere from a heritability of .3 (weak heritability) to .8 (strong heritability) (Croston et al. 2015). Any individual will have a certain reaction norm of ways their g could develop: for purposes of simplification, a floor and ceiling below or above which their IQ (which measures g) cannot go. But how g expresses owes quite a bit to epigenetic and environmental factors (like the attachment formed between mother and child, environment the child is raised in, or the education she receives) (Bjorklund 2006).

To make the line between where nature ends and environment begins harder to draw, humans and other animals have the capacity for niche construction: the shaping of one’s environment to best fit the traits one has. We can imagine a child whose genome makes a high IQ (measuring g) more likely than a lower IQ. That child may show intellectual promise in school such that teachers give the child extra practice on activities that enhance the child’s IQ. The child may also gravitate toward the type of intellectual activity that would raise IQ over time. Thus, the environment may affect how the child’s g develops, but the child also acts on her environment, arranging it (deliberately or not) to best suit (and potentially raise) the child’s g. Kim Sterelny has convincingly argued that humans engage in cultural niche construction by creating environments for our children (from house to schoolhouse) that shape human intelligence (Sterelny 2007, 2012).

We should note that the structure at work with traits and reaction norms is similar to the structure of jazz and distributed theories of cognition. In an earlier section, we discussed how jazz generally has a certain form to it best represented by the lead sheet, which instructs the musicians on such things as the key and time signatures as well as the chords which make up the song and the melody of the song’s first and last repetition. DTC has some fixity to its structure also, defined by the capacities of the brain(s) and environmental tools available. This is analogous to a reaction norm, where the genome sets a limit on the number of ways a trait can express. Yet, as with jazz and DTC, everything beyond those fixed limits is made up by the deep interaction of organisms and the environment.

CONCLUSION

Where the standard account of cognition sees cognition as something the brain does, distributed theories of cognition
Thus, the variables appear separable because they appear separable while much of the interaction between them remains hidden from obvious view.

One reason jazz provides a good metaphor, then, is that the interaction is, in a real sense, there for all to hear and is often recorded. One can listen to a jazz record and hear many of the interactions we’ve described in this paper. One can hear that the drummer’s rhythm, the pianist’s chord voicings and the trumpeters’ tone effect the feel of the overall song, which in turn affects how each musician plays. One can hear a drummer’s shift to a half-time groove was likely affected by another musician’s phrasing (using half notes rather than quarter notes), which in turn affects other musicians’ decisions to adopt the same half-time feel. Unlike watching the person thinking with a calculator (where the variables are evident but the interaction is hidden), jazz music allows us to hear the interaction, sometimes quite vividly.

This, we think, makes jazz an ideal metaphor to provide a conceptual base with which to understand the projects of distributed theories of cognition and systems approaches to biology. All three domains depict systems where the results of the system come from a deep interaction of the system’s parts, where the parts interact by both affecting and being affected by other parts simultaneously.

**NOTES**

1. This is clearly illustrated by thinking about the difference in an author’s thought process when using only a typewriter versus using a word processor. In the former situation, the author likely knows that the writing will have to be done more or less chronologically and that moving a passage from one spot to another (cut and paste) will be difficult or impossible. With a word processor, it is much easier to write down thoughts “out of order” and order them later that may not be possible with a typewriter. Thus, the medium and its anticipated capabilities may affect how the brain processes a task.

2. In fairness, some writers go beyond arguing that the musicians alone contribute to the jazz music. Myers (2013) has argued that changes in record technology (e.g. limitations on how long a record could be) as well as cultural and geographical climate have had substantial effects on the sounds of jazz. Several books have been written profiling landmark jazz records and the conditions under which they were recorded, partly ar-
guing that these conditions substantially affected the resulting sounds (e.g. Kahn 2000; Kahn 2002). These arguments are more analogous to discussions about whether the books in my office or the internet are a part of my cognitive process.

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God, it seems, loves jazz. Spontaneity, randomness, and an eclectic mixture of influences collide to create a distinct piece of music that captivates, inspires, and awes. Jazz is a genre, historically, which has been “characterized by continuous change and reinvention” (Goldmark et al. 2012, p. 10). According to legendary jazz musician J.J. Johnson, a fundamental component of Jazz has always been its “restlessness.” Jazz, “won’t stay put and it never will” (Johnson 2009, p. 250). This unwillingness to remain stationary, or maintain form, is oftentimes embodied musically in the form improvisation, the ability of a jazz musician to play “off the cuff,” or to deviate “off course,” oftentimes in an unknown or undetermined direction. The same can be said of the Darwinian understanding of nature: Nature is in a constant state of flux, change, adaptation, and evolution, never “staying put” and always changing. If God is in any way responsible for the natural world, then it stands to reason that these random qualities must be an integral aspect of God’s creative process. Philosophically and theologically speaking, this seemingly random quality of nature presents problems for the monotheistic traditions of the West. To use the words of Daniel Dennett, “If redesign could be a mindless, algorithmic process of evolution, why couldn’t the whole process itself be the product of evolution…all the way down?” (Dennett 1995, p. 63). What role, if any, does God play in the natural world?

Generally speaking, Judeo-Christian theology has upheld the belief that God is somehow involved with the natural world, and that some element of teleology or divine planning is exhibited in nature. Teleology is especially pertinent with regards to humanity, particularly when it comes to the origin of human beings and their special status amongst creation. Post-Darwin, the fundamental issue facing the Christian doctrine of creation becomes: how can the seemingly random process of Darwinian evolution be reconciled with the belief that humans occupy some sort of divinely appointed place in nature? What role, if any, does evolution play in God’s creative act? If evolution is the means by which God created, as is often claimed, then how exactly does this happen and what does it imply about God’s character?

This article presents a historical and philosophical account of evolutionary theology with an emphasis on emergence. Emergence, in this context, refers to the development or origin of meaning within a meaningless system. This subject has its genesis in the late nineteenth century and the responses of two American scientists to Darwinian evolution will be outlined to provide context. First, this paper will outline the response of Asa Gray who, although he was one of Darwin’s first supporters, recognized the implications of Darwin’s theory for teleology. Second, the attempts by the scientist/theologian Joseph LeConte, who sought to reconcile evolution with creation, will be examined. While LeConte will be analyzed in a particular historical context, his position is generally representative of evolutionary theology. Finally, the latter portion of this paper will culminate in an attempt to draw an analogy between jazz and the doctrine of creation to illuminate the relationship between
God, evolution, and emergence. If Darwinian evolution is to be taken seriously, while simultaneously maintaining some semblance of God as creator, then it becomes necessary to re-evaluate traditional theological assumptions. I propose that the doctrine of creation, post-Darwin, is an aesthetical evaluation of nature, and that Jazz provides an apt analogy that illuminates salient features of the doctrine.

THE PROBLEM

A major point of controversy following the release of Darwin’s *Origins of the Species* (1859) was the philosophical and theological implications stemming from the process of natural selection. Especially concerning were the ramifications of Darwinian natural selection on the argument for design, best represented by William Paley in his 1802 magnum opus *Natural Theology or Evidences of the Existence and Attributes of the Deity*. At the heart of Paley’s argument was the adamant presupposition that things in nature were created for a specific function, and that the structure of the thing reflected said function. The purpose of the eye, for example, is to see. Paley draws a parallel between machines/tools and organisms, and in this case a parallel between the eye and a telescope: “They are both made upon the same principles; both being adjusted to the laws by which the transmission and refraction of rays of light are regulated” (Paley 1850, p. 391). When one examines a telescope, he or she assumes it has been created to fulfill a certain purpose; likewise, argues Paley, one may infer from this analogy that the eye was created by God for the purpose of seeing. As Michael Ruse points out, Darwin actually accepted the basic assumption of the design argument, “namely that organisms are design like” (Ruse 2001, p. 112). Unlike Paley, Darwin’s designer is nature which operates by the mechanism of natural selection, in which there is no premediated plan or teleology, rather than a God who intentionally creates. Natural selection, according to Richard Dawkins, is the “blind, unconscious, automatic process that Darwin discovered,” and which “has no purpose in mind” (Dawkins 1986, p. 5). Darwin had effectively removed any form of divine guidance or teleology from nature.

The removal of teleology from nature deeply troubled many of Darwin’s contemporaries, including the renowned American botanist and Darwin supporter, Asa Gray (1810-1888). Gray avidly defended Darwin, and yet firmly believed that Darwinian evolution via natural selection was compatible with the existence of a divine designer. Gray admitted that, post-Darwin, natural theology had been fundamentally and irrevocably altered and that “design can never be demonstrated” as it had been done historically, a la William Paley and the watchmaker analogy (Gray 1877, p. 70). Nevertheless, he continued, the “presumption of a [designer]” may be inferred from nature in “arrangements which strike us as adaptive or intended to produce a certain result” (ibid). In other words, to use the example of the eye, while each step in the process of the eye’s formation is explainable in exclusively naturalistic language, the end result, the completely formed and functional eye, is nothing short of miraculous. The proliferation of accumulated natural examples of this kind provided a sort of general inductive argument and served as and provided a “conviction which practically we are unable to resist” (Gray 1877, p. 71). Gray’s argument rests on the supposition that God performed the original creating act, and that in evolution the “impulse which [results] in the variety or new form was given at a point beyond observation,” i.e. God (Gray 1877, p. 75). In other words, God physically manipulates the variation that is the driving force behind evolution in order to achieve a teleological end. Consequently, a particular end result of the evolutionary process, such as the eye, is evidence of God and divine intervention into the natural world.

In addition to his understanding of divine guidance to achieve variation, Gray believed that God directly intervened in creation at certain points. As a general rule, Gray claims that “the whole inquiry transcends its powers only when all endeavors have failed” (Gray 1877, p. 95). In other words, an appeal to divine intervention is only justified when all other scientific explanations are exhausted. As Darwin himself noted, in this very important respect, Gray “does not by any means go all the way with me” (Darwin 1893, p. 303). However, while Darwin may be perturbed by Gray’s insistence on divine intervention, he himself is to blame. In a notorious passage from his 1860 version of the *Origins*, Darwin states that “probably all the organic beings which have ever lived on this earth have descended from some one primordial form, into which life was first breathed by the creator” (Darwin 1860, p. 484). Gray, in line with Darwin, limits special creation to inexplicable moments in evolutionary history, namely the creation of organic life and the creation of humans. To use the words of Gray, “There seems a great likelihood that one special origination should be followed by another upon fitting occasion (such as the introduction of man)” (Gray 1877, p. 95). Yet, by his own criteria, Gray leaves open the possibility that an adequate scientific explanation for the origins of modern humans from lower life forms is possible; and, if such an
Nevertheless, after reading Darwin’s *Origin of Species*, the creation of the universe and the creation of life/humanity. As LeConte laments, Newtonian science “pushed [God] further and further away from us until…now finally Evolution finishes the matter, and pushes Him entirely out of sight” (LeConte 1880, p. 28).

In order to resolve this problem, LeConte insists on reconciliation between God’s direct agency and natural law; thereby reformulating the modern doctrine of creation. LeConte advocates a return to the “old ideas of direct agency” which lead to a new understanding of God’s relationship with the physical universe by postulating a “God not far away and beyond our reach, standing outside of, and above Nature,” but rather, a God who is “within” nature (ibid). Furthermore, LeConte states that God “is imminent, indwelling, resident in nature…in every molecule and atom, and directly determining every phenomenon and every event” (LeConte 1888, p. 297). LeConte walks the fine line between pantheism and panentheism in his attempt to retain God’s action in the material world while simultaneously emphasizing God’s ontological distinction from physical reality. LeConte presents a God who acts from within and whose regular actions are synonymous with natural law. Accordingly, there is no need for divine intervention because God neither exists nor acts outside of natural processes.

LeConte never posits divine intervention, but rather suggests that God works through the natural process of evolution while concurrently maintaining that human beings are theologically significant. Unlike previous theologians however, LeConte claims this significance evolves, or rather, emerges from nature. Humanity’s significance lies in its consciousness, and God, according to LeConte, “is revealed only in consciousness” (LeConte 1878, p.778). Although LeConte argues that the origins of consciousness is explainable naturalistically, he nevertheless upholds a fundamental distinction between inert matter and consciousness claiming that “the two sets of phenomena belong to different orders…so different that it is impossible to construe the one in terms of the other” (LeConte 1878, p. 790). Consciousness emerges from lifeless materialistic mechanisms but cannot be reduced to these processes. For LeConte, this signifies that there is indeed something unique about humanity and humanity’s place in nature.

Concerning the organic evolution of humanity, LeConte affirmed a completely naturalistic process of human evolution; that is to say, LeConte never evoked special creation or divine intervention in the evolutionary history of humanity. LeConte believed that he was able to avoid the problem of divine intervention and teleology because in the
process of organic evolution, “we find a gradual process of development headward, brainward...[we] find increasing dominance of higher over lower” (LeConte 1888, p. 171). Evolution is geared toward intelligence, not because God is pushing it toward that direction, but rather because it is built into the mechanism itself. LeConte’s basic assumption, one that seemed to be biologically coherent at the time, was that intelligent life forms were notably higher on the evolutionary scale. Thus, human intelligence and consciousness are the result of adaptive traits that emerged out of the evolutionary process, due to the fact that these traits offer tremendous evolutionary advantages. In other words, there are no specific instances in the evolutionary timetable in which God intervenes into the process to “guide” or “direct” it towards a particular goal; nevertheless, the process itself is geared toward human life, utilizing purely naturalistic means and therefore retaining a sense of purpose.

THE ANALOGY OF JAZZ

Presently, while creationism may indeed still be a live hypothesis for many believers, it is at best scientifically untenable and at worst antithetical to science as a discipline. Subsequently, if the doctrine of creation is to remain a viable option for believers in light of evolution, then its pre-scientific definition must be accepted. Since there is no credence in speaking of God’s direct physical intervention in the creation of biological organisms, the theologian must do so metaphorically and often times by way of analogy. An apt analogy, particularly as it pertains to understanding God’s role in creation, is Jazz. In this analogy God is a jazz musician, and God’s creative act is most akin to an improvised solo. This analogy will serve as a stark departure from, and an illuminating juxtaposition to, the early nineteenth century conception of God, the watchmaker.

Improvisation is a controversial subject in jazz literature, and its precise nature is still disputed. Nevertheless, spontaneity in the form of an improvised solo remains deeply connected to jazz and, historically speaking, it may be said that “jazz is an improvisatory tradition” (Kania 2011, p. 395). Contrary to its use in the vernacular, improvisation does not entail that the musician is “making it up,” or simply creating notes and beats ex nihilo. Ornette Coleman, jazz musician, composer, and one of the fathers of free jazz, explains the concept of improvisation in a 1997 interview with the French philosopher Jacques Derrida. Coleman explains, “When I was doing free jazz most people thought that I just picked up my saxophone and played...without following any rule, but that wasn’t true” (Coleman 1997, p. 320). Using the example of a song he wrote, Coleman explains that deviating from the sheet music in jazz is the individual musician’s interpretation of the piece. Jazz, as Langston Hughes described it, is a form of “communication.” “Jazz is a heartbeat,” (Hughes 2002, p. 369) and the musician speaks his/her heart to the audience via music. Colman goes on to explain that in the act of improvisation “the musicians are trying to reassemble an emotional or intellectual puzzle,” and that this puzzle is given “tone” through their respective instruments (Coleman 1997, p. 322). In other words, the musician is given a piece of music which they interpret, and the interpretative act of transforming the written piece into meaningful notes lies at the heart of improvisation.

While there is undoubtedly a structured component to jazz, insofar as the musician is not playing random notes, there is an element of the improvised act that is arguably unscripted. As the physicist/jazz musician Stephon Alexander explains, “Improvisation is an in-the-act-moment,” and the spontaneity of the improvised act comes from the musicians’ interpretation of the piece at that particular time (Alexander 2016, p. 62). On this point there is considerable overlap between jazz, philosophy, and theology, specifically when it comes to the issue of “forced choice” and its close philosophical counter part of “bad faith” found in the writing of Jean Paul Sartre (Brown 2000, p. 114).

In Being and Nothingness, Sartre distinguishes between the “popular” concept of freedom defined as “obtain[ing] what one has wished,” and the philosophical concept of freedom defined as “determine[ing] oneself to wish (in the broad sense of choosing)” (Sartre 1956, p. 621). The distinction is important, according to Sartre, because one is free regardless of the outcome; that is to say, one is free regardless of whether or not one obtains the object or outcome of one’s desire. Freedom lies in the volition of the individual, the act of “choosing” itself. For example, consider a recent high school graduate who has decided to pursue a college education. Sartre claims that the freedom of the individual lies not in the outcome, whether or not the individual is accepted into college, but rather in their ability to make the decision in the first place. However, this freedom is not always perceived as a good thing by humans. As Sartre famously says in Being and Nothingness, “Man is condemned to be free.” Freedom carries negative implications, i.e. we are “condemned,” because of the responsibility it implies, and man is “responsible for everything he does” (Sartre 1989, p. 350). Humans don’t want to be free, that is, free
with respect to our actions or beliefs. As the Inquisitor says in Fyodor Dostoyevsky’s *The Brothers Karamazov*:

Thou wouldst go into the world, and art going with empty hands, with some promise of freedom which men in their simplicity and their natural unruliness cannot even understand, which they fear and dread—for nothing has ever been more insupportable for a man and a human society than freedom (Dostoyevsky 2009, p. 197).

Since humans don’t want to be free we impose self-limiting restrictions on our actions, what Sartre calls “bad faith.” Bad faith is a type of psychological determinism which “determines the way the world and the people within it appear, shaping all our thoughts and actions as agents in the world” (Elwyn 2012, p. 601). Bad faith can be understood as a type of “self-deception” in which an individual knowingly, or unknowingly, limits his or her freedom (Heldt 2009, p. 54). Returning to the previous example, suppose that our high school graduate is rejected from her dream school. She would be acting in bad faith if, upon rejection, she concluded that college was not an option and subsequently gave up her pursuit. Bad faith serves as something “to take refuge in, as the ideal toward which we can flee to escape anguish” (Sartre 1956, p. 40). Psychological determinism is a facade designed to mask the heinous anxiety bubbling just beneath the surface of our actions. Our graduate might convince herself that college is no longer an option in order to escape the anxiety of conducting further research, retaking entrance exams, or simply waiting another year. Thus, a truly free act is one laden with anxiety. However, this is not to suggest that humans are completely free. We are limited in our freedom by our historical, social, and economic status. To use the words of Matthew Eshleman, Sarterean freedom “finds its limits in the freedom of Others” (Eshleman 2008, p. 4).

The Jazz musician faces the dilemma of Sarterean freedom when playing a solo. The musician’s freedom is limited by the particular “head” the band has decided to play. In order for the song to be audibly coherent the band must stick to this standard rhythm, melody, etc. until it is time for the solo where the improvisation takes place. Here the Jazz musician faces freedom. The musician is forced to make a choice, to “lead” the band down a particular audio path, a path which will hopefully lead back to the original head. This distinction lies at the heart of the difference between improvisation and composition. The soloist does not have the luxury of time; he or she must “plunge ahead and do something” (Brown 2014, p. 64). In this sense, a traditional musical composition may be understood as an example of bad faith. Limitations are placed on the musician, he or she is forced to play a particular song in a particular way with little or no deviation. The musician’s freedom is hinged, due to arbitrarily imposed self-limitations. Contrariwise, the improvised solo creates space for freedom, room for the musician to explore. Yet, as Sartre makes clear, this freedom comes at a cost. There is little “risk” involved in performing a standard music composition, aside from failing to meet the technical proficiencies. However, as will be demonstrated below, there is considerable risk in the improvised act.

Music historian Ted Gioia regards improvisation in jazz as a “retrospective model.” Due to the spontaneity of the jazz solo there is no standard blueprint the musician can follow, but this does not somehow mean that the solo is formless or auditorily meaningless. As Gioia (1992, p. 63) explains:

The improviser may be unable to look ahead at what he is going to play, but he can look behind at what he has just played; thus each new musical phrase can be shaped with relation to what has gone before. He creates his form retrospectively.

Here lies the crux of the analogy. The aesthetical form of the improvised solo emerges out of the spontaneity of the performance. The solo may have an end goal, to merge back into the head, but there is no predetermined path, no blueprint, the musician can follow to get to the end. Nevertheless, the song must go on, the musician has to play and plunge forward. The musician makes one anxiety laced decision after another and must be fully conscious of the fact that failure is a sustentative and ever-present reality. The aesthetical quality of the performance is only knowable retrospectively, after the musician has arrived, or not arrived, at the desired goal.

Yet, how do we makes sense of this retrospective aesthetic judgment? At this point the analogy begins to break down, for the song may be said to have purpose/intent in its basic structure even if room is made for improvising. The same cannot be said of Darwinian evolution. Nevertheless, it remains feasible to speak of the doctrine of creation as an aesthetic judgement if we do so in Kantian terms. Kant, in his *Critique of Judgement*, discusses the possibility of teleology with respect to nature. Organisms in nature do contain a teleological end or purpose insofar as evolution “selects”...
certain traits for survival and, as Kant notes, it may be said “that a thing exists as a natural end if it is (though in a double sense) both cause and effect of itself” (Kant 2007, p. 199). In other words, nature may have a purpose, but the reason or cause for this purpose lies within itself and not some supernatural agent. Although seemingly paradoxical, organisms contain their own end or purpose. As mentioned above, the purpose/function of the eye is to see. So we as humans perceive nature as “acting” according to particular ends, and yet this teleological assumption has no objective basis. Nevertheless, these teleological assumptions are useful for making generalizations about nature. As Kant says, science often conceives of a “unity of nature in accordance with empirical laws,” and that these laws must “necessarily be presupposed and assumed, for otherwise no thorough-going interconnection of empirical cognitions into a whole of experience would take place” (Kant 2007, p. 214).

While these teleological assumptions may have no objective reality in nature per say, Kant notes that they nevertheless contain a transcendental quality. This perceived purposiveness of nature contains a subjective quality to it as well because, as Manfred Baum notes, it “rests on the transposition of human rationality of action to the effects of nature” (Baum 2013, p. 27). Humans transpose rationality into nature and hence it becomes possible to read purpose into a purposeless system. This, according to Kant, makes aesthetical judgement possible. As Ryan Johnson explains, “The aesthetic part, rather, occurs in the judgement of the relation between the subject and the object” (Johnson 2011, p. 118). Aesthetical judgements, therefore, have a subjective as well as an objective element to them: aesthetical judgements deal with the relationship between the subject, the human who is transposing their rationality, and an object, a thing existing in the external world independent of that rationality. One appreciates the beauty of a painting, or piece of music, due to the feeling that it gives the individual. The same may be said of nature. Aesthetic pleasure from nature is, scientifically speaking, typically derived from some sense of “systematicity” or ability to be quantified (Deligiorgi 2014, p. 27).

Back to the analogy, the doctrine of creation may be viewed, in light of evolution, as an aesthetical judgement on God’s symbolic solo. According to Kant, it is aesthetically possible to read purpose into purposeless nature, due to the transcendental nature of human reason. The doctrine of creation becomes a positive affirmation of nature’s purposefulness without interjecting a God of the gaps. Going back to Gioia, the improvised piece is judged retrospectively. After the solo is complete, the astute listener determines the success or failure of the musician. Did the risk pay off? Was the musician able to return to the head? Was the song auditorily coherent? The answer to these questions, and more, constitute the judgement of the listener. The same may be said of God’s creative act. Its meaning emerges out of the purely material process of Darwinian evolution. Furthermore, the creative act carries the same sort of risk as the improvised solo. God runs the risk of failing and, if the fossil record is any indication, God has failed, millions of millions of times. Taken at face value, there is nothing blatantly beautiful about nature red tooth and claw, but interpreted retrospectivity it begins to take on form, beauty, and meaning. It seems the doctrine of creation post Darwin has taken on new meaning, yet remains just as bold in its claims about reality and God. There is no longer any divine intervention, no preordained tinkering with the biological mechanisms that created life. Nevertheless, there remains the positive affirmation of meaning and purpose. The claim that human existence cannot be reduced to the cold and indifferent processes of nature. It is to look at nature, and our place in it, as beautiful.

Darwinian evolution may have a form or process in natural selection, but this process is random and devoid of any inbuilt or foreordained teleology. God may have a head or chorus in mind as an endpoint, but it must be conceded that this end goal may never be reached. God is in the same boat as the improver insofar as God must act, plunge forward, and create. At this point the divine and human condition share a striking similarity insofar as we both bear the burden of freedom and face anxiety laced choices. God, like humanity, is condemned to freedom. There is no guarantee of humanity, or even of an intelligence that might be able to acknowledge its creator, and yet the creative process of evolution churns out beings at an unfathomable rate, bringing into existence millions of creatures only to take millions more out of existence. And yet, in spite of the odds, humanity exists. This being the case, it becomes possible for the individual to look back at humanity’s sordid evolution with awe and to affirm its inherent purpose.
NOTES

1 I call this view “typical” because it was a widely held position by the mid nineteenth century, see Ronald Numbers 2006).

2 The word traditional here must be interpreted loosely. Historically, the doctrine of creation has had many rich and robust articulations. Nevertheless, what is meant by “traditional” in this context refers to the relationship between God and the world (universe) that emerges with the scientific revolution in the fifteenth century. God is often understood as existing outside the physical universe, yet nevertheless periodically intervening in the universe and human affairs. God is the originator and maintainer of natural law who alone holds the power to circumnavigate said laws, i.e. miracles. God, in this sense, acts from without and intervening when necessary. It is this conception of God that Le Conte is reacting against.

3 Based on the testimony of historian and philosopher of science Michael Ruse, it was ruled in the 1981 case McLean v. Arkansas Board of Education that Creationism did not meet the basic criteria of being a science. For a detailed explanation of why creationism/intelligent design is not scientifically tenable see Miller 1999.

4 For an outline of the debate, see Brown 2014.

5 A head, in jazz terminology, is a set melody consisting of several courses. The basic structure of a jazz song typically consist of the following: Head (chorus), Solo (where the improvising takes place), and head. For an explanation of terms see http://www.jazzinamerica.org/lessonplan/8/2/203

6 At the very least, it may be said that there is no widely acknowledged objective basis for teleology in biology. However, the complete rejection of teleological thinking is not a given; for example, in his The Paradox of Evolution: The Strange Relationship between Natural Selection and Reproduction physiologist Stephen Rothman argues for the legitimacy of naturalistic teleology.

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david.andersson@rmit.edu.vn

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http://cosmosandtaxis.org

Books for review should be sent to:
Laurent Dobuzinskis
Department of Political Science
Simon Fraser University
AQ6069 - 8888 University Drive
Burnaby, B.C.
Canada V5A 1S6

Design and typesetting: Claire Roan, UBC Studios, Information Technology, The University of British Columbia.