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Music contact and language contact: A proposal for comparative research

Abstract: The concept of convergence, from the study of language contact, provides a model for better understanding interactions between cognitive systems of the same type (for example, in bilingualism, subsystem instantiations of the same kind of knowledge representation and its associated processing mechanisms). For a number of reasons, musical ability is the domain that allows for the most interesting comparisons and contrasts with language in this area of research. Both cross-language and cross-musical idiom interactions show a vast array of different kinds of mutual influence, all of which are highly productive, ranging from so-called transfer effects to total replacement (attrition of the replaced subsystem). The study of music contact should also help investigators conceptualize potential structural parallels between separate mental faculties, most importantly, it would seem, between those that appear to share component competence and processing modules in common. The first part of the proposal is to determine if the comparison between the two kinds of convergence (in language and in music) is a useful way of thinking about how properties of each system are similar, analogous, different and so forth. This leads to a more general discussion about the design features of mental faculties, what might define them "narrowly," for example.

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1 Introduction

When cultures come into contact their artistic traditions interact, the exchange between musical forms being among the most interesting for reasons that will be explored in this proposal for further research. Among the different resulting genres that could be considered, it is the modern popular music of Africa and its counterparts that emerged among the different African-American[1] populations

1 "African-American," for the purposes of this paper will refer to African-origin cultures and populations of the Americas, North, South and Caribbean. Just as the abstraction "American" is used in this article to refer to the vast diversity of cultures of the New World, "African" is to be

beginning in the 16th century that most clearly reveals the massive productivity of music contact. The scope of the exchange, Africa-Europe via the Americas, may in fact have no parallel in history: in terms of extension in time (across the centuries from the period of Arabic Iberia continuing to the present day) and the diversity of styles and genres produced and diffused in all six inhabited continents, with commercial vocal music recorded in perhaps hundreds of languages. Derived popular musics with the same roots in the European-African interchange have been and still may be, internationally, the most widely celebrated, considering only one dimension of the interchange: the axis beginning with the blues and jazz genres of North America (Kubic, 2005) passing through today's many Afro-Caribbean forms, *cumbia* and related dance musics of greater Colombia, and extending to southern Brazil (Béhague, 2007).

In trying to formulate most clearly the research problems of contact between two or more musical idioms or traditions, subserved by different tonal systems, the best analogy comes from the fields of language contact and bilingualism. In the study of the different types of interaction, combination and emergence of languages, one way to begin would be to distinguish between two broad categories. A new language can arise from a bilingual or multilingual setting in which speakers develop an interlanguage pidgin (rudimentary protolanguage-type system) for communication. Children, who receive the pidgin as their mother tongue input during the formative years of the so-called critical period, generate a creole, a fully formed language. Examples include complete sign language creation from markedly impoverished experience (Goldin-Meadow, 2007; Senghas, 2005), as in the case of Nicaraguan Sign Language, and the formation of autonomous spoken languages from pidgin origins – Haitian Creole, by many accounts, corresponding to the same pattern of new language formation (see Bickerton, 2004, for a glimpse into some of the debate). Setting aside other possible scenarios for now, a second source of new language creation is combination or convergence, the interaction between two completely formed language systems, typically again in the context of widespread bilingualism. The emergence of new language varieties is accompanied by significant transfer at any and even all subsystem levels – phonology, morphology/syntax, and the interface with semantics; Myers-Scotton (2006), Thomason (2001) and Winford (2008) provide a survey of key concepts in the field of language contact. During convergence, interestingly, the linguistic subsystems usually do not combine in equal proportions. For example the pho-

taken the same way. In the musicological literature, generally, this shorthand is understood similarly as a very broad category, often omitting the important but assumed delimiting modifier "Sub-Saharan." Readers are advised that all of these categories suffer from the same imprecision and potential abuse and confusion as does the category "Western."

nological structures of words may be largely contributed, or "imposed" by one language, while morphology and syntax from the other language are left intact, in this case termed "relexification." As an example, Muysken (1997) describes Spanish-Quechua combination in the formation of Media Lengua, again, not an example of a creole that emerged from pidgin (our first category of new language creation).

Another way to frame this distinction would be to think of pidgin-to-creole construction, termed "nativization," as first language (L1) development, and the second category (resulting in language systems also known in the literature sometimes as "creoles") as a kind of second language (L2) learning, as Winford (2008) proposes in the case of convergence. Clearly, music contact, on this analogy, corresponds to the latter, in which the uneven contribution of the respective musical subsystems is probably what typically characterizes the process of integration/convergence that gives birth to a new musical idiom. And as in language contact, where L2 learning is often accompanied by L1 attrition, an analogous unfolding replacement of competence in a primary music system (M1) by a second (M2) is a possibility that can be proposed for discussion.

In the same way as in language contact, one of the most interesting aspects of cross-music system interaction is how widely varied it is from one contact situation to another; and in particular how degrees of asymmetry (of different kinds: social and internal/cognitive) almost always determine in some measure the shape and tendency of the interchange. Thus, in both cases, convergence does not imply any sense of mutuality, equality, or balanced integration, especially when the social and material resource aspects of contact are deeply asymmetrical. What is interesting in music system interaction though is more than a simple analogy with convergence in language contact. In addition to (linguistic) grammar serving as a model for studying other cognitive systems, and vice versa, what architectural parallels might be revealed in future research among the different faculties? Culicover (2005) raises this important question regarding which cognitive domains (making reference to the concept of modularity) might be shared between the Faculty of Language and the Faculty of Music. Ultimately, the problem of such parallels leads us to consider the possibility of homologous structures.

From this point of view, fully understanding cross-idiom interaction between music systems will, in the end, require consensus on a model of cultural origins coextensive with a model of human biological origins: that modern musical and linguistic competencies might be traced to ancient precursors in the earliest and most primitive epochs of the evolution of our species. The speculative hypothesis that will serve this review as a tentative framework for conceptualizing music system interaction is that the relevant primal abilities emerged during the same

formative period that gave impetus to language emergence, once, in the founding lineage of ancestral humans. Some of the branches of this evolved line separated to colonize Europe, Asia and continents beyond; others colonized the remaining regions of Africa. The "reencounter," years later, under the unhappy circumstances beginning in the Middle Ages for the latter, brought ("back") together languages and musical idioms that had diverged, as it seems to the naked ear, radically. However, as a consequence of the above hypothesized shared cognitive origin, an underlying "core musical grammar," including a foundational tonal competence (as yet poorly understood in its details), is proposed here, tentatively, as subserving all musical ability cross-culturally. What Kubic (1994) has described as the "return trip" to Africa (then to disperse again by other means) was founded on patterns of music (knowledge) held in common. This shared inheritance, as it comes to be better understood, might one day be able to give account for convergence between musical idioms (on the surface seemingly very dissimilar), analogously to the way that shared ancestral linguistic competencies might account for cross-language convergence in bilingual and multilingual interaction. This working assumption may be incorrect in some important aspects; but for the purposes of the following discussion it will serve as a proposal for studying how musical idioms, which developed apart from each other historically, came together. More generally, the analogy between bilingualism and "bimusicality" in this instance might help us conceive of future studies on whether, or in what way, language and music are separate faculties and on the question of which component modules they might share. For experimental evidence (for a "dual mental and affective [sensitivity]" resulting from passive exposure alone) and discussion supporting their *bimusical hypothesis*, see Wong et al. (2009).

2 The Atlantic Triangle

European contact with Sub-Saharan African peoples predates by many centuries the discovery of the New World. The first black African slaves in Iberia were sold to the Arabic emirates by North African traders during the Medieval period (Blackburn, 1997: 49–54, 79–82; Casares, 2005; Furio, 2006). Many were, or became, full-time musicians and most probably participated in the most important musical fusion in Western Europe ever, including up to the present day, featuring the influence of Arabic and other North African-origin genres. During the 15th century, prior to the colonization of the New World and the appearance of the other two legs of the "Atlantic Triangle," the Portuguese slave trade resulted in a great expansion of the African population in both Spain and Portugal. By the 16th century, a number of Afro-Iberian musicians had achieved wide recognition de-

spite segregation and discrimination, as in the case of guitarist Antonio Ribeiro Chiado, born (ca. 1520) in Evora (Budasz, 2007). Southern Renaissance Spain, with Europe's largest deportee immigration from Africa, was likely to have received early influence in its song and dance, e.g., the popular *guineo* and *zarambeque*. Subsequent African influences between the colonies and the Peninsula went in both directions (Martín Casares & Barranco, 2009). In the Caribbean and beyond – coastal regions, both Atlantic and Pacific, Mexico, Central and South America – hybrid forms took root deeply and rapidly with the expansion of slavery. Among the frequently commented upon salient features to appear were aspects of rhythmic variation and phrasing of the responsorial style (Pérez Fernández, 2003).

Sublette (2004) summarizes how two poles of African influence unfolded, separately, in the Americas, distinguishing between the lower British colonies, to be the southern United States, and Spanish Cuba. The broader framework of the relevant musical distinctions flows from a peculiar circumstance of history, in three parts:

- slave capture networks from different regions, capturing, in turn, both Arabic influences (northern regions – Sahelian and Savannah), and southern indigenous musical idioms, from the "forest regions" (more "indigenous" – isolated, so to speak – in the sense that among them were musical traditions that had not made contact with the Mediterranean cultures),
- significantly greater continuing influx to Cuba of exile musicians from intact ethnic and language groups (the slave trade came to an end legally 65 years later than in the United States, with abolition not attained until 1886, more than 20 years after the Emancipation Proclamation), and
- the starkly contrasting circumstances of social integration (in Cuba, the famous *cabildos* [community/parish councils] allowed for the maintenance of ethnic/linguistic and cultural identities, versus systematic dispersion and assimilation in the U.S.).

According to Sublette, the Afro-Cuban population in particular traces its roots primarily to a single historical area drawing from four regions: Congo-Angola, Cameroon (the Carabalí), Yoruba, and Dahomeyan, plus the important migration from Haiti at the beginning of the 19th Century. The Haitian musical contribution (the so called *tumba francesa*) came to be most interesting as it transported and preserved clearly perceivable African tonal/melodic patterns. Traditions and customs associated with the *cabildos* and other culturally conservative communities are exceptional in how they contributed to the preservation of languages and musical genres of African origin well into the 20th century, portrayed graphically in the first novel of the prominent Cuban musicologist and writer Alejo Carpentier

([1933]1990). Not coincidentally, in line with Carpentier's approach to the study of music (Montoya Campuzano, 2005), the focus in this paper on popular and traditional genres can be compared to that of the research current known as *evolutionary aesthetics* (Brown & Dissanayake, 2009) in regard to its interest in essential and foundational properties.

3 African music prior to Arabic-European influence

Unlike in Latin America, for example, as late as the final decades of the 20th Century it was common that many rural communities south of the Sahara still practiced traditional music that had not been influenced to any important degree by foreign idioms. Today this may still be the case. While in many areas Arabic and European tonality came into contact with indigenous music from early times (most notably the former), in the non-Islamicized regions of Sub-Saharan Africa consistent and penetrating foreign influence did not make its mark until the late 19th Century. Thus, the opportunity for beginning to understand the processes of convergence in their different historical moments is vastly enriched by the possibility of long-term empirical comparative fieldwork where communities have preserved their musical heritage intact, so to speak. The assumption is that a significant continuity can be traced between this heritage, influenced minimally by foreign contact from the Mediterranean, and the early pre-contact musical forms (Kubic, 2005). The precursors (back 500 years) of the modern traditional music of this region were what participated for the first time in the converging idioms, first in the Antilles, then to expand throughout the greater Caribbean.

In their study of differing conceptions of scale cross-culturally, researchers have devised experimental procedures that incorporate musicians into the evaluation of hypotheses, playing an active role, for example, in the demonstration of tuning, on both traditional and electronic (experimental) instruments. The projects in Central Africa are most relevant for our purposes. Working with synthesizers, equipped with familiar instrumental fittings, proposals for correct tuning are taken directly from community musical practice with special attention focused on rejections and other negative responses. Progressively, musicians and investigators strive to approximate a model of the scale system that structures the community's musical intuitions (Marandola, 2004). For this group of investigators, scale is not conceived of as an isolated constituent of a system, but as: "pitch areas that are observed consistently in the musical expression of a cultural group" (Voisin, 1994: 85). As in all cultures, the fundamental conceptions

of both performers and listeners are implicit (the fundamental conceptions of both must be the same within the community), difficult to describe verbally, except by individuals who have received formal musical training in the idiom under consideration. A recurring theme in evaluating the experimental findings is the idea of equivalence among measured or perceived differences (e.g., by a "foreign" listener or by an indigenous listener provided with the opportunity to attend to these differences). The more general idea suggested by this theme is about essential categories in the mental model of scale and tonality that are music idiom-specific, but that in the final analysis would be of the same kind cross-culturally.

In the four-part polyphonic song of the Bedzan Pygmy, the details of specific conceptions suggest that we tentatively set aside some features common to European and Asian musical traditions as possible candidates for a set of universal (i.e., essential) properties. For example, according to the researchers, octave correspondence does not always impose a pitch space constraint on scales. In a piece extending beyond an octave, the scale observed in the lower register is typically not replicated in the higher register. In addition, scales are modified as musicians retune, and pieces are systematically sung and played with a different scale with each performance, termed "mobility of tuning" (Fernando, 2007), these instances apparently judged to be equivalent by performers and listeners at a more general or abstract level.

On the analogy of the perception of phonemes in speech, the authors of the study ask the important question regarding "dispersion" of pitch degrees. Rather than margins of deviation from a fixed standard, this kind of variation should perhaps be viewed as inherent to the system. Each interval may have flexible limits, by implication, to a greater degree than in other traditions, such that when they are exceeded (in the "margin") ambiguity or course-graininess arises, exceeded further, a different pitch perceived, one that might be judged to be out of tune. Thus, perfect consonance doesn't seem to be a fixed conception for purposes of actual performance, preference, for example, observed in the execution of pieces for a short octave (a "large major seventh"). The resulting "roughness of consonance" can be considered as constituting a "thickness built into the Central African system itself" (Voisin, 1994: 89). Interesting, apparently contradictory, judgments in this domain were reported. In considering proposals related to equipentatonic tuning, musicians experimentally judged the sequence of intervals of 240 cents ($\times 5 = 1200$ of the "perfect octave") to be the best scalar pattern, even though they prefer "short" or "augmented" octaves in performance. Again, investigators ask: which versions of a scale and within what range of variation are pitch degrees taken as equivalent (Fernando, 2004; Marandola, 2004, Voisin, 1994), and what principles underlie the relevant processing mechanisms?

In the discussion of the "flexibility" in judgments of equivalence, it is important to keep in mind that the claim is not about the ability to discriminate (e.g., a major second from a minor third), but rather about which categories are taken as significant, which are attended to in a given tonal system. Returning to the analogy of phonological processing, speakers of American English are fully capable of discriminating (when required and directed to do so) among the three allophones of /t/ in "tomato" and "witness" (aspirated, tapped and stopped), but they rarely attend to these realizations of the phoneme in actual language use. With the application of interactive methods based on systematic reflection on positive and negative examples, similar to methods employed by linguists, the internalized musical grammar of participants in cultures with previously unfamiliar idioms (to researchers) can be gradually described, part by part.

Returning to this theme in a survey of methodological advances, Arom & Voisin (1998) address the overarching question of a distinction between underlying musical competence and the actualization of this knowledge in performance. Similar to the problem mentioned above of contrasting criteria regarding conceptions of the octave, it appears that participating in controlled experiments led traditional musicians to reflect in a new way upon their culture's scalar system, such that an "ideally tuned" model came to be the object of explicit awareness. According to the authors, participants called attention to a discrepancy between the tuning and timbre of the synthesized models and the less perfect recordings of their own instruments. In a situation where they attend to the task of model construction in collaboration with researchers, musicians "distinguish between their ideal [abstract] concept and its . . . realization" (p. 269).[2]

The previously cited projects point to primary foundations laid down by earlier and concurrent fieldwork by ethnomusicologist Simha Arom carried out in four regions of the Central African Republic – studying the Zande people (east), the Banda-Dakpa, Banda-Linda and Sabanga (center), the Gbaya (west), and the Ngbaka people and Aka Pygmies (southwest). His founding contribution to this line of work was the elaboration of the above-mentioned interactive-participatory experimental method that approached the complexity of traditional musicians'

2 Arom & Voisin (1998) emphasize the broader objective of their work: "[The] problem of cognitive representation remains unresolved. Researchers need to understand how the concept of scalar systems reflects mental representations. The members of a musical tradition recognize and evaluate scalar intervals as a function of what they know to be correct. A scientific observer needs to understand their intuition as reflection of an internalized . . . system" (p. 257). In regard to the problem of equivalence judgments and the attribution of "field of variance proper to each degree of the scale" the goal is to "determine the *mental template* of the scalar system the musicians carry within them" (p. 258).

conceptions with the idea of distinguishing between: knowledge (of a musical grammar, an implicit theory) and awareness (of how it is implemented, the grammar/theory's outward manifestation). The goal is to: "determine the ultimate reference used by the musician as a *model*; this is a condensed (in fact "minimal") formula with respect to which all variations are produced, and which summarizes all of the . . . characteristic features, and *only these*" (Arom 1991: xxi).

At this point in the review of the research, it is necessary to summarize in detail Arom's discussion of scale systems from his (1991) authoritative *African polyphony and polyrhythm*. As we will see, while this study appears to present another side of the coin from that of the previous studies (in regard to "universal properties"), the respective results and observations are entirely congruent, forming part of an integrated and unified model. First of all, approximations toward understanding the traditional music of Central Africa from a point of reference in music theory as it developed in Europe is not an unreasonable way to begin. For example, fieldwork here, added to other evidence, has supported the idea of a multiple and distributed origin of polyphony, including independent part movement, from widely different musical cultures around the world. Regardless of how narrowly one might define polyphony, the complex multipart song examined by ethnomusicologists can be analyzed along the same basic dimensions as European art music. At first glance, this assertion seems surprising (Parenthetically, it should be kept in mind that in Africa, most probably exemplifying a broader cross-cultural universal, melody is primary over harmony as is vocal music over instrumental.). While Pygmy polyphonies may be exceptional in some important ways (e.g., the incorporation of contrapuntal movement), they are not extraordinary in every respect; for a full analysis, see Fürniss (2006). Apparently of remote origin, their interlocking style may have influenced singing in harmony widely over an extended area (Kubic, 1996). Thus, Arom types all Central African multipart singing that involves independent parts as *ostinato with variations*, a kind of cyclical repetition not conflicting with Western definitions (p. 215). The Pygmy songs, in this case, happen to be remarkably close to the *passacaglia*[3] form in their internal structure and underlying repeating motif. Similar to

3 *Passacaglia* presents a short *basso ostinato* melody that serves as a model for continuous variation in the other voices. In Europe, of Spanish origin, *passacaglia* was popularized in the 17th Century as dance music (similar to the *chacona*), but was familiar to listeners from contact with similar forms with roots in earlier music of Arabic Iberia. Thus, a three-way interaction comes together, again: the corresponding indigenous forms from Central Africa (Sublette, 2004, pp. 78–83), the musics of (non-Arabic) Europe and that of the Arabic and Berber peoples.

(European) Medieval counterpoint,[4] the voice parts employ divergent and contrary movement and imitation (p. 42). More generally, and throughout the region, the most common plurivocal form utilizes parallel movement (homophonic song), quoting Jones (1959: 217): "[All] over the continent south of the Sahara harmony is in *organum*[5] and is sung either in parallel fourths, . . . fifths, . . . octaves, or . . . thirds." Contrapuntal singing, of the Pygmies, for example, could be thought of as a subset that adds the feature of independent movement of voices in cross-rhythm.

Another widely shared feature among Sub-Saharan musics appears to be the use of the anhemitonic-pentatonic scale system; intervals are generally unequal (either full tones or minor thirds). Scale identity appears to be important in maintaining the autonomy of repertoires and genres, this contributing to the preservation of the traditional musical genres. For example, the xylophone may be associated with the pentatonic while harps with an equihexatonic scale (Arom, 1991, 24). On the question of properties that are typically associated with the tonal space of scales, Arom argues that the octave clearly is a fundamental unit (cf. observations of Fernando, 2007, above), while the conceptions of a tonic and hierarchical harmonic organization are not easily comparable to the European tradition. But, returning to the proposal about the dimensions of melody and harmony (the former, by hypothesis, primary over the latter), establishing a hierarchy among the scale degrees, and a tonal center, would depend on melodic criteria – as opposed to harmonic (Arom, 1991, p. 220). Perception of melodic contour has it that scales are arranged in descending order, instruments tuned from the highest pitch to the lowest. In melodies, notes of highest pitch are emphasized with greater intensity (pp. 20–23), all of this seeming to be compatible with observed cross-cultural tendencies regarding the cycle of rising tension and resolution (Jackendoff & Lerdahl, 2006).

By all measures, further research to confirm this last series of hypotheses still needs to be conceived properly. To be kept in mind is a basic starting point that, essentially, tonality is not a consideration of musical notation making explicit the peculiar tonal scheme of any one musical tradition (Tracey, 1958), but rather of

4 Another interesting analogy to Medieval European counterpoint is the hocket technique, described by Nketia (1962), in Ghanaian folk music; see James (1999) for other examples of resemblance with Medieval music. Perhaps originating as a way to overcome limitations of range in certain instruments, hocketing developed as a polyphonic and cross-rhythm resource for the purpose of integrating separate instrumental parts "interlocked" within the framework of a single scale, melody emerging from the ensemble of voices.

5 *Organum*, in Europe from the Middle Ages, consisted, in the early stages, of a basic melody with an added voice in parallel harmony (transposed typically at an interval of 4th or 5th, beginning and ending on a unison).

unconscious competencies of human musical grammar. With African scale structures varying widely, ranging from 2 to 7 pitches, the introduction of Christian gospel song, for example, successfully exploited the recourse of bi- and polytonality, with and without modulation, in its integration of foreign and autochthonous tonal systems – the latter from both the folk and classical court genres (Adedeji, 2005). Modulation in this case is analogous to the bilingual convergence phenomenon of codeswitching, and polytonality (without modulation – i.e., parallel lines in different scale systems) analogous to bimodal/bilingual (in sign/speech) language processing. The main idea here has been that converging idioms (like in bilingualism) try to find points of contact in their respective grammars of tonality that support this kind of merging. Along both dimensions of music performance, melody and harmony, the African research briefly outlined in this section found evidence that enough core grammatical properties are shared among all the idioms involved to allow for the processes of combination to proceed naturally and spontaneously.

4 Explaining convergence

The previous section leads us to consider a proposal made by Kubic (1985) years ago regarding the mechanism of convergence as it may be applied within the component of musical competence that we just considered: scale patterns. Convergence in this domain may even culminate in the full replacement of one tonal system by another. The basic idea picks up from where we left off, on: (1) how the musical grammar of performers and listeners, their "inner tuning model," projects structure on "chaotic stimuli" (p. 45), and (2) the variation from one musical culture to another on perception of equivalence (one particular aspect of the grammatical knowledge of #1). As in speech, where L1 phonological competence provides a template for processing L2 sound patterns, the M1 tonal schema associated with indigenous scales frames perception of foreign musics (M2). It apparently frames how M2s are processed, without, crucially, disrupting them to the point of significant misperception; see Krumhansl (2004) and the discussion in Section 5. In judging (accepting as equivalent or rejecting) European diatonic scales, the "dispersion" (to borrow Voisin's term) or "margin of tolerance" from ideal tuning of pitch degrees might depend, for example, on whether M1 is equipentatonic or equiheptatonic. Of course, the converse for a listener who's M1 corresponds to a diatonic system would obtain in the same way (p. 48). Conceivably, this kind of interaction between "native" and "foreign" tonal systems also played a central role in the birth of new music in the Americas, as well as in Africa.

Kubic compared traditionally heptatonic (e.g., northern Congo) and pentatonic cultural regions and the different patterns of interface with European tonality. New forms of urban popular music emerged rapidly in some of the coastal regions and cities of the interior in large part due to a closer correspondence with indigenous seven-tone scale systems. Among the most prominent examples are *highlife* from Ghana and Congolese *soukous* (*rumba*), the latter emerging in the 1930s with significant influence of Cuban dance music. But by the same token, pentatonic areas had little difficulty, for example, in creatively assimilating genres of African-American music of the 20th century that had shifted away from "the three common chords" (diatonic I, IV, V), the American blues scales previously having received an African inheritance from the "Sudanic belt" (p. 51), now "repaid"; see the discussion in Oliver (1970), Sublette (2004) and Tallmadge (1984). This example appears entirely parallel to Adedeji's (2005) observation of compatibility cited in the previous section.

Central to the research problem that we are considering in this section regarding the process of convergence, Kubic proposed stages of adaptation based on changes in the margin of tolerance in scale perception. Upon initial significant exposure to the foreign system, the scale degrees of melodies are processed through the filter of the indigenous tone system, depending on circumstances, some M2 pitches and entire phrases falling within an acceptable range, perceived as not unfamiliar. With ongoing and consistent contact, the margins begin to shift; tolerance increases. With time, pitches previously judged as out of tune are now heard as equivalent, becoming "variants [each one] of a singular toneme" (Kubic, 1985, p. 55). A final stage might see the development of a bimusical-bitonal competence, or even of a replacement of M1 tonality by the former M2 tonal scheme as the primary/default system. Bitonal (M1/M2) musicians, hypothetically, possess a balanced distribution of competence, while in the replacement scenario M2 develops as the dominant or preferred system. Only in the most extreme cases of replacement would the former M1 tonality be actually perceived as foreign.

Falsifying evidence that would prompt us to disfavor the convergence hypothesis (based on a unitary emergence of musical competence) parallels in many ways the same for similar proposals for convergence in language. Spontaneous contact-interaction typically results in hybrid and mixed idioms, most importantly when these new forms are created by musicians without formal training (analogous to non-literate bilingual speakers in language contact). But if music contact, under comparatively favorable conditions of cultural exchange, fails to generate a well formed new idiom, such a result could be examined as presenting potentially disconfirming evidence.

Similar to grammaticality judgment by native speakers (L1) and L2 learners, perception studies that elicit assessment of tonal patterns in M1 and M2 (in the

second case, how listeners perceive hierarchical relationships in a foreign idiom) have established objective and reliable methods for evaluating cross-music processing; see the discussion below of the work of Krumhansl (1990, 2004). Hypothetically, findings of parallel perception of tonality in M1 and M2 (some index of sensitivity to tonal pitch space in a foreign M2 idiom) would be compatible with the convergence hypothesis. Failure to perceive any trace of hierarchical structure in a (traditional tonal) M2 – processing it as completely atonal or nonmusical – would argue against convergence as proposal so far. As a footnote, it's interesting why these kinds of experiment cannot be replicated in the linguistic domain with a completely unfamiliar foreign language. This difference between the kinds of mental grammar that structure musical and linguistic competence may be why fusion and hybridization appear to be more productive in music, especially among the popular genres (Steven Brown, p. c.).

5 The hypothesis of a shared primal foundation

If the above empirical tests confirm it, the productivity of convergence and other kinds of extensive cross-system interaction, we could conclude, follows from basic congruencies among corresponding cognitive domains, at some level. Along these lines, findings from research on the acoustics of speech and music are compatible with the theory of a common origin of language and music, founded in ancestral human vocal expression and communication. The subsequent separation of language and musical competences, by hypothesis, coincided with the evolutionary separation of the lineage of *Homo sapiens* (Mithen, 2009). Alternatively, language emerged from a musical-type ability, or vice versa, music from proto-language, in all scenarios, human vocalization underlying the unfolding processes of formation and subsequent divergence. Readers will take note of this unifying assumption (or lack of clear differentiation) among the three proposals. In any case, features (sub-component modules) that are still shared between the two modern independent human faculties of language and music suggest plausible proposals about their interdependent emergence and about how they are related cognitively today (Brown, 2000; Christiansen-Dalsgaard, 2004; Levman, 1992).

A team of researchers led by D. Purves at Duke University has focused on explaining musical competence, specifically aspects of tonality, from a biological perspective (as outlined by Trainor, 2008, for one), in how it is linked to the sound patterns of language. These studies, showing evidence for a close acoustical relationship between pitch space of tonal music and the sound patterns of speech, are consistent with the above-mentioned theory of a remote origin of

proto-language/proto-music among the immediate ancestors of early humans. Such a genesis, if shown to be plausible, would be based on a primitive coinciding of pre-linguistic and pre-musical cognitive structures. A coincidence as well, for the object of inquiry in this study, is the growing consensus on the approximate geographic locus of this remote origin, in Eastern Africa.

Researchers studied the parallels between the sound patterns of speech and music. It is the production of vowels that gives speech its tonal quality. They are distinguished by the vocal tract resonant frequencies, called formants,[6] associated with each one. When the vowel sounds were analyzed to indicate their component formants they showed significant parallels with the common intervals that form scales across musical cultures worldwide (comparing the ratio between the first and second formant for vowels and the ratio of musical intervals). Thus, the resonant frequencies of speech predict the pattern of scales and pitch perception, foundation of the mental structures of tonality (Ross et al., 2007; Schwartz et al., 2003).

According to the authors, three near-universal aspects of tonal expectation in music still require a satisfactory explanation: (1) the partition of the continuous dimension of pitch into discrete intervals, (2) a preference for a relatively small subset of pitches, considering the large number of possibilities afforded by auditory discrimination and (3) similarities cross-culturally regarding consonance ordering. Here, the starting point for conceptualizing the problem of musical universals is proposed by pointing to the inherent ambiguity of acoustical stimuli: its "physical characteristics alone cannot specify the generative source" (Schwartz et al., 2003: 7160). For humans, attending to these "sources" is important; for early humans, plausibly, attending to them and responding appropriately was important for survival and reproduction. As a solution, percepts are constructed

6 Formants are the resonant frequencies of a speech sound (the "pitch" of the speech sound is how frequency is perceived). In the spectrum of a vowel (graph of the "vowel space" at a moment in time along two dimensions), frequency is plotted in relation to amplitude (acoustic energy or intensity), for example: (1) frequency along the x-axis (marked off in kilohertz) and (2) amplitude along the y-axis (in decibels). Formants are shown as concentrations ("peaks" on the graph) of acoustic energy at the different frequencies (Schwartz et al., 2003). This graph can then be called an "intensity/frequency spectrum." Speech sounds, and notes played on musical instruments, are not pure tones (as produced by a tuning fork) of one frequency, but rather are complex sounds that consist of several frequencies: a fundamental frequency (of maximum energy, produced in speech by vibrations of the vocal folds stretched across the larynx) plus a series of overtones (harmonics), which are multiples of the fundamental frequency, with successively decreasing energy. The resonances of the vocal tract enhance the speech sounds originating in the larynx. Each vowel sound differs from the others in regard to its formant pattern, the pattern of concentrations, "peaks," of acoustic energy across these frequencies.

by the acoustic system as it processes the naturally occurring sounds that are most relevant biologically. In the case of tonal percepts, these would have been formed by computations, from one generation to the next, on associations between sound stimuli and possible sources. For the researchers, *human vocalization* (in language, or proto-language we might add) stands out, from the vast diversity of relevant sources in nature, as the principal source, over evolutionary time, which is directly related to tone. The vocal organs happen to be specialized (came to be specialized) for producing tonal patterns; thus, tonality evolved in response to the harmonic properties of sound produced by the vocal tract in our species (Gill & Purves, 2009; Schwartz et al., 2003).

In a related study, Bowling et al. (2010) focused on how affective states, in how they are expressed in speech, are related to major and minor tonal patterns. An analysis of the fundamental frequency and formant frequencies of excited and subdued speech showed important parallels with the implied fundamentals of tonic thirds and sixths that distinguish, respectively, major and minor modes. Again, the hypothesis is that the ability to perceive tonal patterns, correlated with emotional state, was adaptive for our ancestors. This ability is manifested in the special attraction and sensitivity, acquired without awareness or instruction by modern day children, to vocalization with musical characteristics (Bowling et al. 2010; Gill & Purves, 2009). Findings from research (not related to musical perception) of five-month-old infants' identification of vocalization source are consistent with this hypothesis (Vouloumanos, et al. 2009).

From a different line of research come findings also pointing to evolutionary antecedents in language and music implying that some of the subserving neural structures might share a common origin. Similarities between the processing of speech and musical sound coincide with evidence that the same brain regions are activated, areas traditionally associated with language processing. As Besson et al. (2011) remark, this should not be surprising as both "language" and "music" are not undifferentiated "entities"; rather each is comprised of "several levels of processing" (p. 2). At the level of sound patterning (frequency, timbre, intensity, duration, meter, etc.), we should expect to find significant parallels. Experiments that compare musicians and non-musicians (e.g., assessment of the effect of musical expertise) consistently show superior performance of the former on tests that measure the ability to detect, in speech, variation in pitch, segmental cues and tone (in an unfamiliar tonal language), intonation (sentence-level), vowel duration and metric structure (Besson et al. 2011; Delogu et al. 2010; Marie et al. 2011).

Different models (not necessarily counterposed in all respects) come forward for consideration to account for these parallels. Within the domain of phonology (also internally diverse) neural resources are called upon in speech perception

and production that are shared with corresponding functions in musical perception and performance. For example, some component structures could be dedicated to both language *and* music, forming part of each faculty, separate today in modern humans while still sharing specific neural resources (as well as domain-general ones). Speculatively, this "sharing" stands as the vestige of a remote common emergence. Alternatively, the enhanced sensitivity on the part of musicians to acoustic features of speech can be explained by access to common processes that are domain-general, also compatible with the idea of a common origin. The second account appears to be favored by Besson et al. (2011). In any case, both models accept the participation of domain-general competencies and processing mechanisms in both musical and linguistic ability, the difference perhaps being one of the degree of this participation.

An important area of research related to these hypotheses will be the relationship between musical tonality and lexical tone (in languages that implement this phonological feature, coincidently again, the majority of languages of Sub-Saharan Africa); in addition to the above-cited investigators, Patel (2008) calls attention to this potentially interesting connection. In tonal languages, linguistic pitch contrasts are perceived along discrete categories, variation distinguishing among words just as vowels and consonants do. For the author, the most interesting cases are languages with level tones, typically contrasting no more than three pitch levels – five is a maximum, rarely attested. Overall, pitch range increases with the number of level tones, with the minimum interval being between 1 and 2 semitones, maximum: 4 semitones. Importantly, pitch contrasts are flexible, interacting with intonational contour and speakers' individual range, maintaining the same proportion as the pitch contrasts vary by context and speaker's vocal range (pp. 39–45). Thus, the study of the parallels between the sound patterns of speech and music needs to consider this other dimension, of a parallel that is even closer, despite the critical distinction between linguistic tone and musical tone – pitch intervals in the former are not fixed (Patel, 2008, p. 460). An interesting question is how in singing (in a tone language) does linguistic tone interact with melody (Schellenberg, 2009; Wee, 2007)? Related here as well is explaining musicians' superiority over non-musicians in identifying tones in an unfamiliar language (Delogu et al. 2010; Lee and Hung, 2008). The reader will again recognize these questions as an aspect of the broader research problem about shared domains between faculties (especially when both are engaged at the same time) and their interfaces; see Stevens (2004) for relevant findings and discussion. In the evolution of human verbal abilities, might have lexical tone, in addition to and in interaction with intonational contour, been an important feature of the (hypothetically) integrated origin of language and music?

Actually, two (related) proposals of homology have been suggested so far: (1) the shared unitary emergence of language and music, in turn logically implying (2) a common evolutionary trunk for the diversity of tonal systems in music across all human cultures. However, multiregional origin theories (see de Salle & Tattersall, 2008, for discussion) aside for now, it could be possible to sustain (2) while rejecting (1). Thus, just for argument's sake, we can set aside, for now, the unitary emergence of language and music proposal (1). One proposal (McDermott & Hauser, 2005), so far, seems reasonable, although not uncontroversial: The least plausible hypothesis would be that *all* musical properties, including those restricted to tonality, are subserved by domain-specific modules with an origin traced to music-specific adaptations. Cognitive-general structures must also participate as constituent components of a Faculty of Music, whatever this turns out to be. But, it also seems unlikely (given the accumulating evidence outlined in their review of the research) that human musical ability contains within it, no specialized component structure that is specific to it. From this point of view, the "biological adaptationist" and "general-purpose mechanism" positions are not mutually exclusive. Stevens & Byron (2009) is a survey of investigations on universals of music processing that leaves open the question of which components might be domain-specific and which might be domain-general. Nevertheless, tonal hierarchy of some kind, and its implementation in melodic contour as described in their cross-cultural examples, comes close to presenting itself as a candidate for being specialized for music.

Following the logic of the proposal for research in this section, we have to take as an accident of history that it came to be that the European/Arabic and African contact of the Atlantic triangle resulted in the great convergence in popular music that we are taking as an emblematic example. If peoples of different musical cultures had been enslaved and transported to the New World the respective tonal systems (and other components of music, excluded from the discussion at his juncture) would have entered into the same kind of interaction (e.g., the diatonic scales of Europe and the tonal structures of the Indian sub-continent). In the same way, again, the accident of evolution that places the (hypothetical) origin of language and music in Eastern Africa is not relevant to the broader research problem at hand either, in reality a true coincidence in regard to our goal of understanding the mechanisms of convergence. The reason for this is that all traditional ("folk" and "popular") tonal systems would be homologous, a proposal that depends on the assumption of unitary origin of the "common trunk" for music hypothesis (#2 above). In the end, the proposal is independent of observations that musical idioms may share one or another or many similar surface features with one another, that two idioms may be relatively "closely related" or relatively "distant." Such observations are not completely irrelevant to the

proposal, of course. Some music contact interactions that result in convergence may be more in synchronization than others due to an affinity of this kind. But such similarities could also be explained by analogous historical development, music-culture diffusion, and so forth.

What the essential and foundational properties of tonality might be is then posed as a necessary research task. Jackendoff & Lerdahl (2006: 45–60) suggest that these may be reducible to two, from which other related properties may be derived:

1. the constraining force of pitch space in a passage of music (or succession of pitch spaces), expressed by musicians and apperceived by M1 listeners in descending or ascending order as a scale. As we saw from the small sample of ethnomusical research in Section 3, actual scales incorporate all variety deviation and modification (both of the explicit kind, as in "accidental notes," and fluctuation within the range of tolerance, not normally subject to awareness in performance). The internal structure of the scale, what makes it cohesive, allows these deviations to be integrated completely into melodies that are accepted as well formed, without the deviations themselves judged to be out of tune.
2. The essential structural feature of scales is the tonic or tonal center. Whether its presentation is implicit or explicit (e.g., drone) "the tonic is felt as the focus of pitch stability, . . . pitch space [is] arrayed in relation to the tonic" (p. 45).

Note that considerations of harmonic progression and consonance/dissonance do not figure among the hypothetical primary properties (as was alluded to in Section 3). Manifestly, this "vertical" dimension is important only in some of the world's musical cultures (e.g., in Sub-Saharan Africa in Pygmy polyphony, elsewhere in xylophone harmony, etc.).

The first possible implication to follow from the key hallmarks (1) and (2) is that the processing of scale structure and tonic in melodic groupings creates the sensation of tonal tension and relaxation, in cycles of setting outward from the tonal center followed by recuperation – "motion away" and "motion toward." Pitch space, anchored by the most stable degree of the scale, creates expectations based on tonal attraction; relatively unstable pitches "attracted by" more stable ones (p. 51). The illustrative contrast to all of the above is the genre of modern art music that systematically strives to undermine the perception of tonal center and pitch space, appropriately described as atonal. The interesting research question here is if a traditional musical genre could be identified as atonal, in this sense. If one exists (such that its musical compositions systematically eschew tonality) would members of the musical culture respond in a commensurate (non-tonal)

manner to the experimental presentation of tonal scales as described, for example, by Krumhansl (2004) – e.g., not recognize the internal structural features of pitch space organization?

A second implication flows from the probability that the tonic, the most stable degree, projects a hierarchy within the pitch space; that other points of stability and attraction in the distribution of scale degrees are important in forming the scale (i.e., not any sequence of random intervals set to an arbitrary tonic suffices for the construction of scales in the mind). Recall from the conclusion to Section 4 that one of proposed tests of the convergence hypothesis depends on clearly conceptualizing this kind of mental grammar of tonal music. Krumhansl (1990) and her associates have conducted cross-cultural experiments that have attempted to describe just such a grammar as it is revealed in the hierarchical organization of scales. The assessments that they have devised would be of the same kind that could test the convergence hypothesis. For example, in traditional European and North Indian music, the fifth scale tone is perceived as the second most stable. Across all musical cultures, the second and subsequent points of stability vary from one idiom to another; but in general, as melodic groupings unfold, sounded events appear to be interpreted in a context-dependent way, corresponding to their function in the tonal organization of melodies. In applications of the so-called probe tone technique, listeners rated which tone best completed a diatonic scale, for example. Rated as "most expected" was the tonic, followed by the fifth, third, the remaining scale tones, with non-scale tones last. In other experiments, subjects showed poor memory for unstable pitches and tended to confuse them with more stable ones. As phrases begin to suggest a shift in key, listeners perceive a new tonal center (p. 283). Overall, unconscious knowledge of scale structure (what Arom called the "musical grammar" in Section 3) constrains judgments of well formedness and of relatedness among tones.

In regard to our interest in the convergence between musical idioms, the researchers' findings from comparative studies of M1 and M2 listeners are the most interesting. For example, the probe tone judgments of listeners familiar with traditional Western, Balinese and North Indian music were compared – comparing response patterns to the familiar versus the unfamiliar idioms. Surprisingly, listeners' M1 grammar did not systematically distort their processing of the novel idiom. Rather, ratings for both M1 and M2 passages correlated highly with key features of the respective tonal hierarchies. Naïve M2 listeners apparently were able to attend to frequency of occurrence of musical elements to successfully approximate native M1 interpretation. This is especially noteworthy considering that many intervals in the three contrasting systems are not shared in common (i.e., in the M2 the pitches themselves are often novel). As Krumhansl summarized: "the results showed that listeners can set aside . . . expectations and hear

pitch events in style-appropriate terms quite independently of their musical experience" (1990: 286). Importantly, this finding was consistent for each group of subjects in "both directions": North Indian or Balinese to Western, and vice versa. The same underlying question that concerns us in this discussion (how to explain convergence – so far, where it is plainly evident) was asked: "What principle enables listeners to abstract tonal functions in novel musical styles" (p. 286)? Perhaps the findings of converging perception in these studies of cross-idiom tonal processing are due to strong structural parallels between the Asian and Western tonal systems. A more demanding test would then compare more "distantly related" (traditional) musical cultures.

6 Conclusion

The proposal for research that we have been considering has singled out the idea of convergence between musical idioms as a key to better understanding shared properties (related to the renewed interest in both the humanities and the sciences in speculation about origins and universals). It is not surprising, then, that the assessment of this kind of combination and fusion came to be biased – in a positive direction. Admittedly, the bias was even unqualified and one-sided. So, a perusal of Agawu's (2003) study of external influence on African musics might lead one to conclude that it offers a sharply discordant point of view from the approach in my proposal to study European-African contact in this domain. Chapter 1 opens with a seemingly categorical rejection of the "uncritical" acceptance by Sub-Saharan popular music of [Western][7] tonality, in particular the colonizing force of "tonal harmony" as the foreign influence that has been most pervasive and "ultimately the most disastrous" (p. 8), alluding to a hybridization that came to be "mixed" and "impure" (p. 15). But rather, this assessment appears to be about to where musicians *should* look for new artistic directions and about what still remains unappreciated and unexploited, as in the "harmonic resources available to traditional African music" (p. 10). The rejection is however strongly

7 It should go without saying that "Western tonality" denotes only one of the implementations of pitch hierarchy and tonal center among the traditional and vernacular musics of the world (although it should be recognized that the term is often restricted, in common usage, to descriptions of the major and minor diatonic scales). In this article, *Western* should be written in quotes (as should *African*). For example, Arabic music forms part of the Western tradition with deep roots dating back to the early Middle Ages. By the same token, direct Arabic influences in African music, integral to the conquests, population movements and convergences of the "Atlantic triangle," are only mentioned in passing, deferred to a future and more complete discussion.

tempered, implicitly, in the spirited review in chapter 6 of Ghanaian *highlife*, suggesting a more positive overall appraisal of converging genres and tonal systems, as is evident as well in subsequent observations in chapters 7 and 8.

The final disposition of this controversy notwithstanding (not directly relevant to our topic in any case), a more important proposal is drawn out by the author throughout his study, culminating in chapter 8 where we are initially caught off guard by its title: "How not to analyze African music." Under the theme of "contesting difference," it is pointed out that ethnomusical and ethnographic accounts of deep-going variation and peculiarity may make for interesting reading; ultimately, however, they plateau at a superficial understanding for many students of culture. Thus, a distinction needs to be made between local culturally bound inflection, historically rooted ethnic and national preference and convention, on the one hand, and essential cross-cultural musical competencies, on the other. From this point of view, "European knowledge and African knowledge" in this domain are both drawn from a common underlying knowledge. Instead of from a "presumption of difference," the analysis of African music should, according to Agawu, proceed from a theoretical platform of consensus, not excluding any investigative method because of where it may have been first perfected or because it may not embrace the seemingly obligatory context-dependence of many "ethno"-oriented approaches. Readers of *The Linguistic Review* no doubt find familiar this thread of arguments and qualifying considerations, in a similar way as in the discussion of the parallel concepts related to convergence in language and music in the previous sections. Why that is perhaps suggests something special about how the faculties of language and music are related, the broader research problem that examples of convergence point to. Approaches to the study of language and music that presume unconstrained difference across cultures will tend to look upon examples of fusion and intersection from a different viewpoint than the one outlined in this review of the research. In contrast, the idea of "contesting difference" (while in no way devaluating difference) gets us to think about diversity from a viewpoint that also looks for essential properties.

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