

7

Musical Imagination Situated: Baroque Bowing through the Lens of 5E Approaches

Emilien Dereclenne

University of Technology of Compiègne

Introduction

Proponents of 5E approaches (enacted, embodied, embedded, extended, ecological) recently started to study imagination and creativity, emphasizing its embodied, enactive and situated nature (Van Rooij et al. 2002, Hutto 2008, 2015; Rucińska 2014, 2016; Gallagher 2017; Hutto and Myin 2017; Dereclenne 2019, Van Dijk and Rietveld 2020). Put briefly, the idea is simple: the material and cultural environment mediatize enactive and relational processes whereby phenomenal imaginative experiences and works of art co-emerge, as the two sides of a same coin. In such a non-representationalist, enactive and relational (instead of externalist, see Di Paolo 2008) perspective, artefacts like tools, instruments, technologies, user interfaces, external representations (pictures, maps, models etc.) cannot be understood as mere external and *a posteriori* means or concretizations of *a priori* and purely internal and representational cognitive acts. Instead, they constitute, as ontological and dynamical parts, imaginative and creative processes.

In this paper I will illustrate this thesis about imagination in the particular case of musical imagination. By doing so, I intend to highlight what the instrumental and technological constitution of musical imaginative and creative practices means as concerns embodiment. Ezequiel Di Paolo dully emphasized it (Di Paolo 2020; see also Dereclenne 2019), taking the material and technological environment into account, and with it, the transactional or relational nature of cognition, leads to important changes in the way we conceive, as enactivists and embodied cognition theorists, the central dimension of embodiment. Fundamentally, the body cannot be taken as

an absolute, as if referring to its biological and affective dimensions was sufficient to solve the problem of consciousness and of the human mind. The body, with its intrinsic tendencies and affectivity, remains essential in cognition, for sure. But, in the case of humans in particular, the body constantly extends to the social, as well as to the material and technological environment. In Bernard Stiegler's words (Stiegler 1994), the body always is "prosthetic", extended and reconfigured through its constant interactions with technologies. In this perspective, cognition, as well as imagination, if embodied, cannot be understood independently from the history of transactions with the socio-technological environment. And understanding how imagination appears in individuals and collectives, demands a reflection on how instrumental and technological mediations enable, constitute and transform specific kinds bodily engagement with the world.

In Section 1, I will start in a sketch of the contemporary enactive approach to imagination, focusing on its interest in revealing the extensive technological constitution of imaginative and creative processes. In Section 2, elaborating on my own experience as a former professional baroque cellist, I will show how given instrumental and technological devices shape musical imagination and creativity. I will show that taking the technological constitution of imagination seriously helps explaining imagination in a way alternative to classical internalism and representationalism. Finally, in Section 3, drawing both from this analysis and from Merleau-Ponty, I shall draw some conclusions about the necessity to think embodiment without reducing it to purely biological, affective and emotive aspects.

I. Enactive Imagination

There is a belief, widely shared among today's cognitive scientists, according to which, when talking about cognitive activities, it is necessary to speak about mental representations (Gardner 1985, pp.6). As concerns imagination, representationalism seems inevitable, all the more that its formulation perfectly corresponds to imagina-

tion as defined in folk psychology. It is a commonsense platitude. Imagination is the faculty we have to possess, manipulate and product mental images of things that are absent or nonexistent. Instead of perceiving real things, we mentally visualize fictional and fanciful ones. What happens when, in the intimacy of our closed eyes, we imagine a unicorn, enjoy fiction, make up a story, consider counterfactual truths and so on? According to representationalism, we form particular kinds of mental representations. Mental representations are variously related to — although also different from — other kinds of mental representations, such as beliefs, percepts, memories, desires, hopes, expectations etc.

There are important debates, internal to representationalism, about the nature of images understood this way. Are they propositional (Langland-Hassan 2012, 2015, 2019), sensory (Kosslyn 1975, 1981; Gregory 2013, 2016), experiential (Currie et Ravenscroft 2002; Goldman 2006; Dokic and Arcangeli 2015) or iconic (Kind 2001, 2016)? Can imagination be reduced to more primitive mental states like desires, beliefs and son on? Or is imagination *a sui generis* process, a “primitive mental state type (or group of types), irreducible to other mental states” (Kind 2016 pp.2; see also Kosslyn 1976, Langland-Hassan 2020)? But in all cases imagination appears as an internal and representational process.

In Tim Ingold’s words, representationalism and internalism about imagination leads to defining creativity as “an unknown X factor, located somewhere in the mind-brain, that accounts for the spontaneous generation of the absolutely new” (Ingold 2014, pp.124). Boden (1988; 1990) for example describes imaginative creativity in terms of internal combinatory, exploratory and transformational processes. Combinatory creativity refers to the new ways we combine pre-existing ideas, those ideas existing in the form of representational entities; exploratory creativity lies in the way we explore the new potentialities of a pre-given conceptual space; and finally, transformational creativity is the capacity we have to change our conceptual space, the way we think. In such a representationalist and internalist perspective,

material culture (physical objects, behaviors, norms and rituals embodied in physical objects) is separated from the imaginative and creative process itself.

Fighting to death with representationalism and internalism about imagination, proponents of 5E approaches recently started to study imagination, re-emphasizing 1) the contribution of historical and cultural factors, and the role of the practical and technically constituted contexts in which actions and thought occur; 2) the non-representational and, above all, the dynamical nature of imagination taken as a biological and instrumental mode of engagement with the world.

Elaborating on Lambros Malafouris' Material Engagement Theory (2013), Hutto (2015) for example defines "kinematic imagination" in terms of non-representational and prelinguistic instrumental thinking. Instrumental thinking involves an imaginative and nonverbal capacity to mentally rehearse memories of action-perception patterns. Early humans of the Middle Paleolithic, those capable of instrument making (see the example of the Levallois flake), were able to engage in imaginative rehearsals consisting in "visual-motoric perceptual reenactments" (Hutto 2008, pp.84). As Medina (2013, pp.229) emphasizes, this enactive imagination has to do with our constant embodied and practical engagement with things. It consists in the imaginative reenactment of "our experience as engaged actors acculturated into social practices" (Medina 2013, pp.319).

Drawing upon Ryle's idea according to which imagining is a doing (Ryle 1949), Gallagher defines imagination in embodied, enactive and ecological terms, as a form of active engagement with affordances (Gibson 1979), understand, with action possibilities (Gallagher 2017, pp.193). When imagining how a tune goes for example, we "make ready for those notes in a hypothetical manner" (Ryle 1949/2009, pp.245). Not that we manipulate any mental representation of a tune going this or this way. Rather, we actively engage in the simulation of a given possible action, that of humming. "We do what we would do if we were going to hum the tune, but simply stop short of actual humming" (Gallagher 2017, pp.193).

Gallagher notes that, defined this way, “imagination is not something that happens first in the head; it’s rather something that involves embodied action, using toys, props, artifacts, instruments, and so on” (Gallagher 2017, pp.193; see also Rucińska 2014, 2016 on playacting). Gallagher even assumes that the extended nature of imagination understood in terms of bodily and practical engagement with affordances exhibited by material things, “needs to be the starting point for the analysis of imagination” (Gallagher 2017, pp.193fn). He explains:

“Hutto makes this clear when he links his radical enactivism with material engagement theory (MET) and the work of Lambros Malafouris (2013). I think this needs to be the starting point for the analysis of imagination. Engagement in pretend play, or in working with material things, such as stone tool making, is where the imagination starts. ‘Stone tools are not an accomplishment of the hominin brain, they are an opportunity for the hominin brain—that is an opportunity for active material engagement’ (Malafouris 2013, pp.169)” (Gallagher 2017, pp.193).

The strength and originality of Lambros Malafouris approach to imagination lie in how he combines Ingold’s material anthropology with the enactive approach. In a very enactivist verve, as well as in a way very close to Goodman (Goodman 1988) pragmatist approach to imagination, Malafouris defines imagination in terms of practical (productive, descriptive, communicative, perceptive) engagement with material images. According to him, material images (drawings, paintings, digital images and so on), their production as well as the manipulation of the tools and materials used for their production (pencil, paintbrush, chalk, charcoal, pastel and so on), afford new ways to explore, perceive, act and think:

« I propose that images like the ones we see, already 30,000 years before present, at the caves of Chauvet and Lascaux *before* and *beyond* representing the world they first *bring forth* a new process of acting within this world and at the same time of thinking about it. This thinking however, should not be understood — at least not in the first instance — as that of the ‘higher level’ abstract or symbolic

type. This thinking should be understood in the more basic ‘lower level’ sense, namely, as a new form of active sensorimotor engagement (O’Regan 1992; O’Regan & Noë 2001; Noë 2005; Hurley 1998). It should be understood as a new form of perceptual learning on a par with the ‘bringing forth’ or ‘bringing out’ of a figure by embellishing the natural formation of the rock. Or, alternatively, a practice-induced change in the human ability to perform certain ‘unnatural’ perceptual tasks » (Malafouris 2007, pp.295).

Like perception (Chemero 2009), imagination is embodied and situated. And it is temporally extended (Van Dijk and Rietveld 2020) in the sense that these action possibilities, constitutive of our imaginings, are enacted through the history of our perceptive, descriptive and productive interactions with material things. Put another way, material images establish a relation between the phenomenal subject and the world. But this relation, instead of being representational and contemplative, is co-participative and enactive. The painted image is, Malafouris says, a “perceptual device”. But perception, instead of being a process of representing, is a process of probing the outside world. Whether we speak of painted images or of visual and moving images like those a 19th century optical theater (see Hayden White 1973) or a modern camera make possible — in all cases, material images and their production are prosthetic extensions and transformations of perception, action and thought. They enable, enhance, diversify the way we perceive and enact the world. They create specific dispositions and sensibilities:

« Cultural knowledge and innovation are not intracranial processes; they are, rather, infused and diffused into settings of practical activity and thus they are constituted by experience within these settings through the development of specific sensibilities and dispositions, leading people to orient and think about themselves within their environment in specific and often unexpected ways” (Malafouris 2013, pp.116).

Material images and how we engage in their production, shape the mind. To use Malafouris words, oil painting or manipulating a camera refer to different kinds of

“skillful interactive engagement” with the world (*Ibid.*), whereby specific imaginative dispositions and sensibilities appear in individuals and collectives. Minds and sensibilities are “constructed by perceiving”, as well as by producing material images (Malafouris 2007, pp.295).

In brief, imagination is not a faculty we have to mentally manipulate and spontaneously produce *sui generis* mental states called “mental images”, as if mind and imagination were independent from agent-world transactions. Rather, imagination refers to how we engage in practical contexts that are constituted by instrumental and technological mediations. This means something very important, which I intend to illustrate in Section 2, namely, that an ontogenesis of cognition and imagination in particular, is inseparable from an ontology of social and technical transactions and, ultimately, from an ontology of technical and social mediations, understand, external representations (material images, instrumental performances, models etc.) and the tools of their manipulation and production (tools, instruments, softwares and so on). Again, understanding how imagination appears in individuals and collectives, at the same time needs to be a reflection on how social and technological mediations enable, constitute and transform imagination through the history of agents-world transactions. Let us see, then, how traditional acoustic and contemporary electronic musical technologies shape specific musical practices and sensibilities.

II. Musical Imagination Extended.

2.1. Baroque Bowing

Musical imagery is often considered as the ability we have to hear and recreate sounds in the mind, even when no sounds are audible. According to this view, Mozart, who appreciated composing for singers he befriended with, knew the sound of their voices and creatively combined auditory images of those sounds. But music and sound are two different things. And reducing the former to the latter is misleading. It amounts to ignoring what singers and composers still know as a fundamental

evidence, namely, that the question is not just about sound, but about bodily instrumental and vocal capacities and skills. Composers do not compose for the sound of a voice, but for a voice. They do not compose for the sound of the piano, but for a set of technical skills by which it is only possible to play such or such passage on the piano.

An interesting literature focuses on “experiential imagination” (see Kind 2016) as the proper nature of musical imagination. Experiential imagination refers to proprioceptive (Currie and Ravenscroft 2002), agential (Goldman 2006, 2006b; Dokic et Arcangeli 2015) and emotive (Medina 2013) imaginative experiences. Imagining that I play Beethoven’s Waldstein Sonata on the piano, consists in the mental rehearsal of sensory-motor behaviors, and is even observable in the activation of the same brain-structures involved in the concrete execution of the sonata (Dokic & Arcangeli 2015; see also Mellet et al. 1998; Zatorre 1999; Kosslyn et al. 2001; Lotze et al. 2003, Zatorre and Halpern 2005).

Worth noting, however, imagining playing Beethoven’s sonata is non neutral to technics, that is, both to instrumental practice and to the very material life and making of the instrument. Instruments afford specific action possibilities that are constitutive of musical experiential imaginings. Does the pianist play on a very sharp, with absolute brilliant clarity Steinway, or on a Bösendorfer, with a warmer and richer tone, remarkably well-structured? Heavier key actions can also create a depth of tone and much richer sound than a light key piano. And this changes everything regarding the kind of rhythmic, affective and expressive values the pianist will forge.

Let me take another example, that of baroque bowing. As a cellist, instead of pressuring my bow on the string, I just use the weight of my arm. I let my arm fall in the string. Pressuring implies a tiring muscular exertion that does not produce the deep sound, and the smooth and volatile articulations I am looking for. The rosin on the hair bow increases the adhesion to the string. The wood of the bow, of the bridge and of the sounding board of my cello, and my own fingers, hand, wrist, elbow and

shoulder, bend and resist at the same time. The proportion of these bending and resisting, weight of my arm in the bending-resisting taut string, determine the sound, its density, color and power, between violence and fading, plenitude and uncertainty, resonance and penetration. The resistance phenomenon is a striking and omnipresent one in instrumental practice. Musical articulations and the instrumentalist's touch, whether it is on clavier, bowed or plucked string, or wind instruments, depend on this proportion of resistances. The resistance is proportional to the strings tension and the way and the time the sound lives, lies in the real-time management of these proportions.

But these proportions and the way it is possible to play with them, change according to the concrete instrumental device I choose. Coming back to Gallagher's affordance-based conception of imagination, specific instrumental devices afford specific imaginative experiences. Let us say I have the choice between four different bows. Two of my bows are made in baroque style, one is classical and the fourth is a modern one. The baroque ones have a concave shape. The first one is a Cangelosi, made in Florence in 2002 according to a 18th century Italian model. It is a light, reactive bow, Snakewood for a soft, rich and nervous sonority. The second one is close to a viola da gamba bow. Longer than the Cangelosi, this baroque bow is made in a heavier Pernambuco wood. It provides a more powerful and homogeneous sound, but less precise and less sharpened articulations. The sound is like merging. The classical bow is convex and light at its tip. Classical repertoire, sharp articulations, the sound is less resonant, more penetrating. The modern bow is convex the same. As well as the classical one, and unlike the two baroque ones, the modern bow makes it possible to accentuate the bowing attack at the tip of the stick, with almost the same power and clearness as on to the frog. Heavier at the tip than the classical bow, the modern helps compensating the loose of weight in outstretched arm. The sound is sharper and more powerful than with any other bow, more penetrating than resonant. The baroque bows are particularly well suited to little spaces and little audiences,

while the modern one is adapted to great spaces and audiences. With the Cangelosi bow, I can play Vivaldi, Boismortier, Barrière or even Boccherini's sonatas for solo cello and continuo (a second cello and a harpsichord). The modern bow gives me the possibility, if used properly, to penetrate the sound space in such a powerful way that I may play the solo part of a cello concerto over a seventy musicians orchestra. The question I ask to myself is: "are my neighbors at home?" More seriously, "which musical repertoire and musical intentions am I concerned with?"

If, as Gallagher emphasizes, imagining consists in engaging, whether concretely or virtually (in the form of simulated actions) with action possibilities, then, the spectrum of what I can imagine as a cellist, differs according to the instrumental device I choose. This, by the way, is a well-known and fundamental principle of organology. Organology is a branch of musicology. It refers to the study or science (*logos*) of the links between instruments (*organa*) and musical styles. Organology explains how new instrumental and technological devices gave rise, through history, to new musical, imaginative and stylistic experiences. Organology is an essential part of musical education, especially for those among musicians we call "historic musicians". Historic musicians specialize in early music: in medieval, Renaissance or baroque musical styles. The very essence of their historical approach to musical interpretation lies in a process of trans-historical reenactment. They aim at reenacting past composers' imaginative patterns, drawing not only, but directly from the study and practice of past or re-historicized musical instruments.

All does not hold on the bowing only. The way the cello is made is a highly determining factor too. Is it a Franco-German modern cello, industrially made in the 90's, high fingerboard inclination, Belgian bridge and metal strings attuned in A 440Hz (maximum string stretching and sound penetrating power)? Or a re-historicized 1730 Austrian cello, low fingerboard inclination, gut strings attuned in A 415 Hz (for a more resonant sound)? From an instrumental device to another, radically different musical and imaginative worlds open their doors. Not that I need a ba-

roque cello in order to play Bach instead of contemporary composers like Kodaly or O'Connor, nor that playing Bach with a modern or an electric cello is absurd. Rather, given the instrument making, I will forge and express different kinds of musical intentions while playing these musical pieces. As Georg Gadamer (1960) would say, Bach's musical texts are full of promises to be fulfilled. But I add that these promises do not come from the text only, but also and even essentially from the instrumental practice and making.

The instrument has its own weakenings, constraints and colors. We often talk about the unique "grain" of the instrument, which makes the very soul of a given interpretation, and thanks to which music differs from a pure auditory, disembodied and dematerialized information. This accidentality, this unexpected instrumental variability and the way it determines musical performance, is the very mark and destiny of baroque musicians. The baroque instrument essentially differs from the modern one due to its higher degree of accidentality. String tension decreasing increases accidentality and unexpectedness. The baroque instrument is more sensitive and less docile, more capricious and uncertain than the modern one. The gut string and the metal string offer two different sets of practice conditions. They determine different imaginative, gestural and imaginative attitudes and behaviors. The gut string is sensitive to humidity (to sweating), to dryness, to temperature, detunes in the middle of the performance. Never the same and always determining, the gut string illustrates what this instrumental power is, and, above all, the irreducibility of my imagination to pure and voluntary mentality. There is a variability and accidentality intrinsic to material things, let us say, a material life of things that counts as the very living form of musical images.

Quoting Ingold, "to imagine, as anthropologist Stuart McLean puts it, is "to respond creatively to the creativity of the world's ceaseless self-transformation" (McLean 2009, pp.231). This correspondence — this answering to a world that, in its relations and processes, also answers to us — is the generative dynamic that

moves life forward, and which leads by aspiration”¹. In Ingold’s Simondonian terms (Simondon 1958; see Ingold 2013), a pencil in my hand, as well as a bow, is a “transducer”, that is, a technical mediation that “converts the kinetic quality of the gesture — its *ductus* — from the register of bodily movement and awareness to that of material flux” (Ingold 2013a, pp.128). And, if imagination consists in a material process of image genesis, *depending on how the transducer behaves, I imagine differently*. Chalk, charcoal and pastel offer specific kinds of material engagement, that is, various imaginative and stylistic possibilities. In such a perspective, transducers acquire a determining and even revealing function, for the reason that images reveal themselves in the very moment we manipulate those transducers. The images we draw are not clear entities which we manipulate mentally and realize afterwards, as pieces of a pre-designed and representational puzzle. Rather, Imagining and drawing is designing a puzzle we do not pre-visualize, following lines that still need to be drawn in order to be seen:

“From here it is but a short step to the conclusion that drawing that tells is a correspondence, of kinaesthetic awareness and the line of flight. In this correspondence, as Bryson says (2003, pp.154), the ‘mark on paper leads as much as it is led’, alternately sewing the line into the mind and the mind into the line in a suturing action that grows ever tighter as the drawing proceeds. Thus the drawing is not the visible shadow of a mental event; it is a process of thinking, not a projection of a thought (...). Instead of dictating a thought, writes Pallasmaa², ‘the thinking process turns into an act of waiting, listening, collaboration and dialogue [in which] one gradually learns the skill of co-operating with one’s own work.’ Co-operating with one’s work – now there’s a good definition of correspondence! This thinking, this imagining, goes on as much in the hands and fingers as in the head” (Ingold 2013a, pp.128).

In the language of an embodied and affordance-based conception of imagi-

1 Ingold, « The creativity of the undergoing », 2014, pp.134.

2 Pallasmaa, J. 2009. *The Thinking Hand: Existential and Embodied Wisdom in Architecture*. Chichester: Wiley, pp.111.

nation, when a cellist imagines, she engages, whether concretely or virtually, in a specific expressive gesture. And the very affordances constitutive of her imaginings ultimately are enacted through her bodily engagement with the instrument.

2.2. Answering a Classical Objection

A classical objection against this kind of radically embodied and situated account of cognition concerns off-line cognitive phenomena (Clark and Toribio 1994). As a matter of fact, there are cases in which musical imagination is more likely to be characterized as a kind of disengagement or detachment from the material world.

To this objection, the classical answer consists in asserting that abstract imaginative phenomena require explanations in terms of traditional internalist and representationalist accounts. A considerable body of research focuses on musical imagery in terms of internal (in the brain) and representational processes. Research employing fMRI (functional magnetic resonance imaging) and MEG (magnetoencephalography) show that musical imagery and perception activate similar regions in the auditory cortex (Zatorre, Evans and Meyer 1994). When musicians imagine performing, activity is also found in the same premotor and supplementary motor areas that are activated during performance (Zatorre 1999, Lotze et al. 2003, Zatorre & Halpern 2005). For his part, Holmes (2005) contends that, when practicing, elite musicians form mental representations of the music, searching for ways to translate their representations into reality. Holmes suggests that music performance requires a mental representation of the desired performance goal, as well as a representation reflecting the current performance (see Clark, Williamson and Aksentijevic 2012).

In the same way, composers are able to hear “in their head” very precisely what they want to obtain, in rhythmic, harmonic and melodic terms. An electronic music composer for example, spends hours in her sound banks, scrolling and looking for a sound matching as much as possible with her musical ideas, a sound she will design afterwards by means of technological devices and softwares. The ability she has to

compose mentally might be acquired through practice, by means of technical / technological mediations: playing an instrument, learning composition technics, using a pen and paper, or a software for computer assisted music composition. But at first glance, in the very moment she imagines and creates in the intimacy of her closed eyes, her imaginings do not consist in concrete bodily and technological engagement. Her imagination seems detached, decoupled from the world, and even, disembodied.

Some contend that 5EA-style explanations are reserved for cases of “lower-level” cognition (Brooks 1991, Clark 1997), i.e., online sensorimotor engagement with the world like those I described above. Accordingly, in the case of higher level, representation-hungry imaginative acts (reading, conceptualizing or composing a musical piece for example), 5EA-style explanations would need to be combined with representationalist accounts.

However, recent works in the field of 5E approaches started to answer this representation-hungry challenge in non-representationalist terms. In an enactive and ecological language, Kiverstein and Rietveld (2018) strikingly defend a strict continuity of lower and higher levels of cognition. They propose thinking offline cognitive acts in terms of temporally extended activities in which agents skillfully coordinate to a multiscale landscape of affordances (2018, pp.149; see also Bruineberg & Rietveld 2014; Rietveld & Kiverstein 2014; Van Dijk & Rietveld 2018; c.f. Van Dijk & Withagen 2016). This line of argument leads to approaching concrete cases of abstract imagination in their practical and temporal context (Van Dijk and Withagen 2016; Van Dijk and Rietveld 2020), and to define them as radically situated.

On this way, coming back to Gallagher’s affordance-based conception of imagination, Van Dijk and Rietveld define imagination in terms of engagement with affordances that are continuously constituted through agents’ constant interactions with their social and technical environment. Van Dijk and Rietveld explain:

“We need not think of these moments as “representing” something absent or non-existing but can rather think of them as an experience of participating in an ongoing, still indeterminate, process. Rather than “detaching” from the process, imagination is more fruitfully thought of as opening up the participating individuals further to other affordances that the multi-scaled process of making also provides” (Van Dijk and Rietveld 2020).

Re-situated in the all context of human practices, imagination engages us as acculturated agents and is irreducible to simply having an image in one’s head. And these phenomenal and private experiences we have when imagining how a tune goes for example, are nothing but resonances of our daily engagement with the material world. In this sense and again, imagination is not a faculty we have to spontaneously produce *sui generis* mental states called “mental images”. Mental images appear in individuals and collectives through agent-world transactions independently from which there would be no imaginative experiences.

Furthermore, images represent nothing. Rather, they engage us as sensorimotor and affective bodies in participative processes with others. To take Ryle and Gallagher’s example again, imagining “how” a tune goes is engaging with action possibilities. But, as a matter of fact, there are plenty of different possible ways for tunes to go. And the “how” is enacted in terms of action possibilities through coordinated technological, social and institutional practices. Rehearsing and refining a musical performance for example, is participating to a multi-scale and social process of affordances genesis. Building one’s own musical language in the context of contemporary electronic composition amounts to spending hours sharing with other composers and performers through social media, watching YouTube tutorial videos, and so on. Musical forms stem from ways of writing music, whether in the classical manner, or through softwares and plugins. They also stem from ways of interacting with other musicians and listeners, whether in band, in chamber or symphonic orchestras, in concerts, in dancing clubs and so on. World class cellist Tormod Dalen (2016) strikingly combined embodied approaches with his expert practice of the baroque cello

and of baroque dance, to show how different contexts of embodied practices, from baroque courtship behavior to baroque theater and dance, enact specific ways to compose, to interpret and to listen music. His analysis focuses on how the practice of French-style court dance, widespread in Bach's time, influenced the composer's writing of his six cello suites.

III. The Extended Body

To put it in a few words, creativity has nothing to do with a disembodied and de-embedded faculty to spontaneously produce mental images of things. Kant defined genius in terms of a transcendental ability "which science cannot teach nor industry learn" (Kant 1790, § 49). Artists, says Kant, are genius in the sense that they find unexpected and impressive ways to express feelings and images. And their genius is a gift that can neither be explained nor acquired. It is transcendental! In his time, Nietzsche (1878, §155) criticized this transcendentalism, arguing that such a romantic definition does not show the true, vital and somehow indecent and unethical nature of art and creation.

Let us add that such a Kantian definition is mystifying for the reason that it eludes, beyond its biological and affective dimension, the essential relation of genius with industry. By "industry" here I do not mean hard work only. Rather, I mean the all social and technological system of practical engagement: a whole thought-situation (Gallagher 2016) extending to multiple timescales and practical contexts, embodied and technologically mediatized.

In this sense, I would like to stress again that approaching musical imagination through the lens of 5E approaches and material anthropology, leads to emphasizing the technological relativity of the body.

Enactivists use to refer to Merleau-Ponty and Goldstein to emphasize the affective, emotional and biological dimension of embodiment. In Merleau-Ponty's perspective, indeed, the lived body is the center of emotion and expression. However,

as put by Merleau-Ponty himself, in the case of human beings at least, embodiment is as much a cultural as a biological phenomenon. It is a common platitude for any enactivist, the instrumentalist never just moves his physical body (*Körper*) or refers to it objectively. Rather, as says Merleau-Ponty, the instrumentalist is affectively and pre-objectively conscious of what her instrument requires and “obtains” from her. The instrument polarizes both her gestures and the musical and motor intentionality constitutive of her musical imagination. The “melodic character” of the musician’s motions (Merleau-Ponty 1945, pp.107) as well as its direction and coherence, all lie in the way her body is emotionally affected by his instrument. The organist, for instance, imagines through her instrument, which offers her specific intentional, imaginative and expressive horizons:

“During the rehearsal — just as during the performance — the stops, the pedals, and the keyboards are only presented to him as powers of such and such emotional or musical value, and their position as those places through which this value appears in the world” (Merleau-Ponty 1945, pp.146-147).

This, by the way, leads Merleau-Ponty to defining embodiment in terms irreducible to mere biological tendencies and affective-emotive processes. According to him, the human body essentially appears as a prosthetic body, that is, a body extended to and constituted by the technical environment. The essence of the human body lies in its cultural and technical accidentality. Merleau-Ponty stresses this idea in his *Phenomenology of perception*:

“The use that a man makes of his body is transcendent with regard to that body as a mere biological being (...). It is impossible to superimpose upon man both a primary layer of behaviors that could be called “natural” and a constructed cultural or spiritual world. For man, everything is constructed and everything is natural, in the sense that there is no single word or behavior that does not owe something to mere biological being — and, at the same time, there is no word or behavior that does not break free from animal life, that does not deflect vital behaviors

from their direction [*sens*] through a sort of *escape* and a genius for ambiguity that might well serve to define man” (Merleau-Ponty 1945, pp.195).

The body of the organism and the organist’s body are one and the same, yet intrinsically different. Merleau-Ponty refers to musical values constitutive of the organist’s imagination. The organist, says he, feels those values in her instrument. So to speak, the instrument appears as an extension of the instrumentalist’s musical intentionality. “The performer is no longer producing or reproducing the sonata: he feels himself, and the others feel him to be at the service of the sonata; the sonata sings through him or cries out so suddenly that he must dash on his bow “to follow it”” (Merleau-Ponty 1988, pp.151). All goes as if musical values, intentions and images were inter-subjective before being intra-subjective. In this sense, in Merleau-Ponty’s words, they are to be explained in terms of a chiasmic ontology. The flesh of the lived body, that of the audience and that of the instrument merging in the form of dynamical and individuating processes.

How to understand this chiasmic relation between bodies and the instruments of their musical expression? Following what has been said in previous sections, and walking in the footsteps of Di Paolo’s enactive perspective (Di Paolo 2020), musical values are not given from the start, out there in the objective world, in the instrument, as if objects possessed and displayed their own meaning independently from organisms’ activity. Neither are they to be found “in the subject”, as if subjectivity and meaning existed before individuation, independently from technological manipulations and inventions — in the form, for example, of *a priori* and purely biological conditions of sense-making. Instead and again, they result from the history of individual-world transactions, whereby musical images and values emerge as intrinsically embodied, instrumental/technological and social phenomena.

Combining, in such a stimulating way, Gilbert Simondon’s (one of Merleau-Ponty’s student) powerful philosophy of individuation (Simondon 1958) with

the enactive approach, Di Paolo stresses this historical aspect of embodiment. Whether social or technological, agents-world transactions change the body through time, reconfiguring its sensorimotor patterns. Never the same, always reconfigured, the human body is historical. It is intrinsically relative, in the sense that a kind of transactional (social, technological) accidentality makes its very essence:

“Notice how the idea of sensorimotor becoming changes our conception of bodies. We are not only speaking here of organic bodies, but also about their relational and self-individuating modes of operation in the world. Sensorimotor bodies are assembled by processes of networked relations between precariously equilibrated sensorimotor schemes, they are literally made by organize potential and actual enactments.

In a precise sense (operational closure of relations between schemes in a repertoire), sensorimotor bodies are *enacted* into existence. They bring forth a world of significance by acts that simultaneously change bodies and environment. This mode of becoming is a *sensorimotor unfinishedness*, not merely an opening to changing demands and circumstances but a constructive activity by which sensorimotor bodies and their co-defined environments change historically at behavioral, developmental, and evolutionary scales. In the human case, developing sensorimotor bodies are open-ended and path-dependent or non-ergodic (Di Paolo 2020).

Two ideas to keep in mind. First, human bodies “are *enacted* into existence”. This formula leads to it desubstantializing the body and emphasizing its transactional accidentality. The body is “constructed” through enactive processes that only take place in the form of transactional processes with the social and the technological environment. The body is historical, and cannot be separated from the concrete practical contexts of its sensorimotor life. Second human bodies are unfinished. Unfinishedness here, if we follow Simondon’s ontology, needs to be taken in its historical and ontological sense. Historically, the enactive process never ends. As long as the body lives, it engages in its enactive construction.

Ontologically speaking, the body is unfinished in the sense that it extends beyond its biological boundaries, to the social and technological world (see Di Paolo

2020). Sensorimotor patterns, affectivity, emotivity emerge from transactions and, above all, *exist in the form of* social and technological transactions.

Let me explain this. As a matter of fact, technical objects are not just coupling devices between an autonomous organism and its external environment. For sure “the tool and the instrument mark the beginning of the mediation between the organism and the milieu : the relation primitively binary becomes triangular through the insertion of the middle term. At this level, the essence of the mediation is mainly constituted by the function of coupling” (Simondon 1958/2005b, pp.89). Technologies prolong and transform the biological functions of the organism (the stick helps pushing, the rope helps pulling), protects the organism from external aggressions and so on (Simondon 1968/2005b, pp.89).

However, technical objects do not enhance the living’s capacities only. Technical objects also have their own intrinsic logic, according to which agents manipulate them and inventively transform their own sensorimotor patterns. So to speak, technical objects constitute human bodies. As I emphasized, a human body always need to be thought as “prosthetic”.

Worth noting, however, to say that the human body is a prosthetic body, does not amount to saying that technical objects are prostheses for the human body only. In words likely to be found in Ingold and Malafouris’ works, it also amounts to saying that the human body itself is a prosthetic extension of a living material and technological world, that is, something of which existence is an extension of technological devices.

Technical objects have their own ontological status and deserve their own ontology (technology properly speaking). They exist independently from agents, according to their intrinsic operative structure and normativity. In Simondon’s terms, technical objects have their own “auto-correlation” (Simondon 1958/2005b, pp.92). In such a perspective, no ontology of the human body is plausible independently from a rigorous ontology of its technological prostheses. And if cognition and imagination

are embodied, they need to be studied as intrinsically social and material-technological processes.

On this way, Simondon understands technology in terms likely to be found in Ingold and Malafouris' works, as a kind of reflexive psychology or archaeology of the mind, sort of a backwards reflection on past imaginative and inventive processes through the study of given technological traces. As put by Jean-Yves Chateau quoting Simondon, ““invention is the mental, psychological aspect of a specific mode of existence”, that of the technical object ; it is the subjective correlate (*a parte subjecti*) of its concretization, of its concretizing genesis” (Chateau, in Simondon 1968-1976/2005, pp.18). Put another way, invention, both a schematic or imaginative process of invention and a material and technological process of genesis, does not come from the subject, independently from the object. The object has its own mode of existence, its own concretizing genesis and imagination refers to a kind of relational participation whereby the genesis of the object equals the genesis of phenomenal imaginative experiences.

Conclusion

Does cognitive science needs to become a branch of organology? In this paper I defined with 5E approaches and material anthropology imagination in terms of transactional and enactive becoming. I emphasized two ideas. First, cognition and imagination in particular need to be studied through the close analysis of concrete imaginative and transactional practices. Second, embodiment is more than a mere biological phenomenon. It also is a social and technological phenomenon. In the perspective I defend, embodiment cannot be taken as an homogeneous biological phenomenon. Rather, it is something intrinsically relative, invented and crafted. Following Shannon Sullivan (1999; 2001), this amounts to acknowledging the feminist aspect of Merleau-Ponty's ontology. Let me quote Donna Haraway's *A Cyborg Manifesto*:

“From *One-Dimensional Man* (Marcuse 1964) to *The Death of Nature* (Merchant 1980), the analytic resources developed by progressives have insisted on the necessary domination of technics and recalled us to an imagined organic body to integrate our resistance. Another of my premises is that the need for unity of people trying to resist worldwide intensification of domination has never been more acute. But a slightly perverse shift of perspective might better enable us to contest for meanings, as well as for other forms of power and pleasure in technologically mediated societies (Haraway 1984/2016, pp.14).

Here is how I proposed to think imagination and the articulation of life and subjectivity to technology: by refusing to refer to such an “imagined organic body”, as well as to account for individuation in the terms of a relation between such a theoretical body and an inert, ultimately dominating technological world. There is something like an essential technological relativity and accidentality of life, the body and subjectivity. And musical imagination is a good illustration of it.

References

- Brooks, R.A. 1991. “Intelligence Without Representation”. In *Artificial Intelligence*. 47 (1-3). pp.139-159.
- Bruineberg, J., & Rietveld, E. 2014. “Self-organization, free energy minimization and optimal grip on a field of affordances”. *Frontiers in Human Neuroscience*. 8. pp.599.
- Chemero, A. 2009. *Radical embodied cognitive science*. Cambridge: The MIT Press.
- Clark, A. 1997. *Being there: Putting brain, body, and world together again*. Cambridge, MA: MIT Press.
- Clark, A., & Toribio, J. 1994. “Doing without representing?” *Synthese*. pp.101., pp.401-431.
- Clark, T., Williamon, A., and Aksentijevic, A. 2012. “Musical imagery and imagination: the function, measurement, and application of imagery skills for performance”. In Hargreaves, D., Miell, D., Macdonald, R. (eds.), *Musical imagination: multidisciplinary perspectives on creativity, performance, and perception*. Oxford, UK: Oxford University Press.

Currie, G. & Ravenscroft, I. 2002. *Recreative minds: Imagination in philosophy and psychology*. Oxford, UK: Oxford University Press.

Dalen T. 2016. "Zum Spielen und zum Tantzen', a Kinaesthetic Exploration of the Bach Cello Suites through Studies in Baroque Choreography". In *Journal for Artistic Research*. 11. <http://doi.org/10.22501/jar.103350>.

Di Paolo, E. 2018. "The enactive conception of Life", In A. Newen, S. Gallagher, L. de Bruin (eds), *The Oxford Handbook of Cognition: Embodied, Embedded, Enactive and Extended*. Oxford University Press. pp.71-94.

Di Paolo, E., Cuffari, E. C., and De Jaegher, H. 2018. *Linguistic Bodies: The Continuity between Life and Language*. Cambridge, MA: MIT Press.

Di Paolo, E. 2020. "Enactive becoming". *Phenomenology and the cognitive sciences*.

Dokic, J., Arcangeli, M. 2015. "The heterogeneity of experiential imagination". In Metzinger, T., Windt, J. M. (Eds). *Open MIND*: 11(T). Frankfurt am Main: MIND Group.

Gadamer, H.-G. 1960/2004. *Truth and Method*. London/New York: Continuum.

Gallagher, S. 2012. "Multiple aspects in the sense of agency". *New Ideas in Psychology*. 30(1). pp.15-31.

Gallagher, S. 2016. "Pragmatic interventions into enactive and extended conceptions of cognition". In Madzia, R., Jung, M. (eds) *Pragmatism and embodied cognitive science*. Berlin/boston: De Gruyter.

Gallagher, S. 2017. *Enactivist interventions: Reconceiving the mind*. Oxford, UK: Oxford University Press.

Gallagher, S. et Crisafi, A. 2009. "Mental institutions". *Topoi*. 28. pp.45-51.

Gallagher, S., Zahavi, D. 2020. *The Phenomenological Mind* (3rd edition). Routledge.

Gibson, J. J. 1979. *The ecological approach to visual perception*. Boston, MA: Houghton Mifflin.

Goldman, A. 2006. *Simulating minds: The philosophy, psychology, and neuroscience of mindreading*. Oxford, UK: Oxford University Press.

Goldman, A. 2006b. "Imagination and Simulation in Audience Responses to Fiction," in *The Architecture of the Imagination: New Essays on Pretense, Possibility, and Fiction*. ed. Shaun Nichols. Oxford: Oxford University Press. pp.41-56.

Haraway, D. 1984/2016. *A Cyborg Manifesto*. University of Minnesota Press.

Holmes, P. 2005. "Imagination in practice: A study of the integrated roles of interpretation, imagery and technique in the learning and memorization processes of two experienced solo instrumentalists". Unpublished MA Dissertation: University of Sheffield. UK.

Hutto, D. 2008. *Folk Psychological Practices: The Sociocultural Basis of Understanding Reasons*. Cambridge, MA: MIT Press.

Hutto, D. 2015. Overly enactive imagination? Radically re-imagining imagining. *Southern Journal of Philosophy*. 53 (S1): pp.68-89.

Hutto, D. D., & Myin, E. 2017. *Evolving enactivism: Basic minds meet content*. Cambridge, MA: MIT Press.

Ingold, T. 2013. *Making: Anthropology, archaeology, art and architecture*. Abingdon: Routledge.

Ingold, T. 2014. "The creativity of undergoing". *Pragmatics and Cognition*. Vol. 22(1). pp.124-139.

Kant, I. 1790/2007. *Critique of Judgement*. Oxford, UK: Oxford University Press.

Kiverstein, J.D., Rietveld, E. 2018. "Reconceiving representation-hungry cognition: an ecological-enactive proposal". In *Adaptive Behavior*. 26(4). pp.147-163.

Kosslyn, S., Ganis, G., Thompson, W. 2001. "Neural foundations of imagery". *Neuroscience*. 2. pp.635-42.

Lotze, M., Scheler, G., Tan, H.R., Braun, C., Birbaumer, N. 2003. "The musician's brain: Functional imagining of amateurs and professionals during performance and imagery. *Neuroimage*. 20. pp.1817-29.

Malafouris, L. 2007. "Before and Beyond Representation: Towards an enactive conception of the Paleolithic image" (Book chapter).

- Malafouris, L. 2013. *How things shape the mind*. Cambridge: MIT Press.
- Medina, J. 2013. “An enactivist approach to the imagination: embodied enactments and ‘fictional emotions’”. In *American Philosophical Quarterly*. 50(3).
- Mellet, E., Petit, L., Mazoyer, B., Denis, M., Tzourio, N. 1998. “Reopening the mental imagery debate: Lessons from functional anatomy”. In *Neuro-Image*. 8. pp.129-39.
- Merleau-Ponty, M. 1945/2012. *Phenomenology of Perception*. London, Routledge.
- Merleau-Ponty, M. 1988. Unpublished working notes from *The Visible and the invisible*.
- Nietzsche, F. 1878/1996. *Human, All Too Human*. Tran. Hollingdale, R.J. Cambridge: Cambridge University Press.
- Rietveld, E., & Kiverstein, J. 2014. “A rich landscape of affordances”. *Ecological Psychology*. 26(4). pp.325-352.
- Rowlands, M. 2003. *Externalism: Putting mind and world back together again*. Chesham, England: Acumen.
- Rucińska, Z. 2014. Basic pretending as sensorimotor engagement? In J. M. Bishop and A. O. Martin (eds.), *Contemporary Sensorimotor Theory, Studies in Applied Philosophy, Epistemology and Rational Ethics*. Vol. 15: pp.175-87. New York: Springer.
- Rucińska, Z. 2016. “What guides Pretense? Towards the interactive and the narrative approaches”. *Phenomenology and the Cognitive Sciences*. 15(1). pp.117-133.
- Ryle, G. 1949. *The Concept of Mind*. London: Hutchinson.
- Simondon, G. 1958a/2005. *L'individuation à la lumière des notions de forme et d'information*. Grenoble, Jérôme Millon.
- Simondon, G. 1958b/2012. *Du Mode d'existence des objets techniques*. Lonrai, Aubier.
- Simondon, G. 1961/2006, « La mentalité technique ». *Sur la Technique*. PUF.
- Simondon, G. 1964-1965/2006. *Cours sur la perception*. Chatou, La Transparence.

Simondon, G. 1965-1966/2008. *Imagination et invention*. Chatou, La Transparence.

Simondon, G. 1968-1976/2005. *L'invention dans les techniques. Cours et conférences*. Paris, Le Seuil.

Steiner, P. 2008a. "Délocaliser les phénomènes mentaux: la philosophie de l'esprit de Dewey" (Delocalizing mental phenomena: the philosophy of mind of Dewey). In *Revue internationale de philosophie*. 3(245). pp.273-292.

Steiner, P. 2008b. "Sciences cognitives, tournant pragmatique et horizons pragmatistes" (Cognitive sciences, pragmatic turn and pragmatist horizons). In *Tracés*. 15. pp.85-105.

Steiner, P. 2010. "The bounds of representation: a non-representationalist use of the resources of the model of extended cognition". In *Pragmatics and Cognition*. 18(2). pp.235-272.

Steiner, P. 2011. "Enaction, pragmatisme et minimalisme représentationnel" (enaction, pragmatism and representational minimalism). In Bault, N., Chambon, V., Maïonchi-Pino, N., Pénicaud, F.-X., Putois, B., Roy, J.-M. (eds.). *Peut-on se passer de représentations en sciences cognitives?*. pp.191-210. Bruxelles-Paris: De Boeck.

Steiner, P. 2014b. "The delocalized mind. Judgements, vehicles, and persons". *Phenomenology and the Cognitive Sciences*. 13 (3): pp.437-460

Steiner, P. 2016. "Embodied Cognitive Science, Pragmatism, and the Fate of Mental Representation". In Madzia, R., Jung, M. (eds) *Pragmatism and embodied cognitive science*. Berlin/Boston: De Gruyter.

Steiner, P. 2019. "De l'action à l'expression: Wittgenstein, les phénomènes mentaux et les sciences cognitives" (From action to expression: Wittgenstein, mental phenomena and cognitive science). In *Archives de Philosophie*. 82. pp.361-382.

Sullivan, Sh. 1999. *Perspectives on embodiment: the intersections of Nature and Culture*. Routledge.

Sullivan, Sh. 2001. *Living across and through skin: transactional bodies, pragmatism and feminism*. Indiana University Press.

Van Dijk, L., & Rietveld, E. 2018. "Situated anticipation". *Synthese*. (in press). pp.1-37.

Van Dijk, L., Rietveld, E. 2020. "Situated imagination". In *The Phenomenology of the cognitive science*.

Van Dijk, L., & Withagen, R. 2016. "Temporalizing agency: Moving beyond on- and offline cognition". *Theory and Psychology*. 26(1). pp.5-26.

Van Rooij, I., Bongers, R., & Haselager, W. 2002. "A non-representational approach to imagined action". *Cognitive Science*. 26(3). pp.345-375.

Zatorre, R.J. 1999. "Brain imaging studies of musical perception and musical imagery." In *Journal of New Music Research*. 28. pp.229-36.

Zatorre, R.J., Halpern, A.R. 2005. "Mental concerts: Musical imagery and auditory cortex". *Neuron*. 47. pp.9-12.

Zatorre, R.J., Evans, A.C. & Meyer, E. 1994. Neural mechanisms underlying melodic perception and memory for pitch. *Journal of Neuroscience*. 14. pp.1908-19.