Dissociation and interference in composers' stories about music: the renewal of musical discourse

Jonathan Impett

Chapter accepted for publication in *Sound Work: Composition as Critical Technical Practice*, ed. Jonathan Impett. (Leuven University Press, 2021)

Introduction

The notion of composition, the role and figure of the composer, have retained significant cachet in a wider context of music in which hierarchies of genre, style or practice have been substantially dissolved. The composer is afforded a unique place despite the various challenges of contemporary culture: challenges from music philosophy to the concept of work, from sound art and improvisation to the idea of pre-determining any aspect of musical phenomena or to the social hierarchy thus implied, or from the democratising of cultural values to the exceptional status of art music. This changes little if we broaden the category of composition to include the work of individual sound artists or solo improvisers, for example. We will therefore use the term 'composer' here to refer to all such artists who take responsibility for conceiving and producing a musical phenomenon that has some degree of boundedness and identity, regardless of how reproducible it might be or at what remove the composer stands from a listener's experience. On some level, at some point, they com-pose – they put together. 'Creative' is used here as a shorthand term, a veil for a multitude of sins. It does not imply subscription to any romantic notion of inspiration or genius, of 'work' or sole authorship; it rather stands for a human, inventive, adaptive, situated, distributed, practiced craft behaviour.

There is no shortage of detailed technical discussion within particular areas of creative musical practice, nor of reflection on their socio-aesthetic nature and implications. But otherwise, exchange between artists and between genres, and the engagement of both musicology and criticism, seem to balk at passing beyond the immediate sonic surface – ironically, perhaps, a reification by omission of the work concept. Beyond very specific discourses (of style, genre, practice, technique or technology) little attention is paid to the ways in which a musical phenomenon is constituted. Attention glances off into other aspects. Expert discourse tends to self-referentiality, public discourse to description and reportage. It is as if the growing awareness of the embodiment, materiality, individuality and cultural specificity of musical experience has engendered a sort of skin-deepness in our understanding of composition.

This situation is compounded by a wider Western encouragement of individualism, a tendency that conditions the production, reception and evaluation of both creative and intellectual work. When uniqueness and novelty are highly prized, there is little incentive for artist or critic to focus on the commonalities of the work of making art, as Badiou has observed (Badiou 2006. See also Badiou 2001 on the distorting effects of over-valorising difference). A further challenge to discourse has emerged with the imperative to substantiate

art's claim to be a vital mode of human knowledge production, and to be able to do so in particular cases. Personal and critical accounts avoid the musically substantive, technical reports are just that, and both analytical and cognitive treatments separate the object from the context of its production. Technical, theoretical, personal and social stories are told around the creation of music, but largely in ways that contribute to cultural fragmentation. A discourse gap has opened up around the topic of composition, in both public and expert spheres. In both areas, a critical discourse for music requires us to tell better stories about its generation: stories of creation that are more honest and situated in their particularity, and that at the same time afford constructive engagement and commonality.

By whatever pattern or sequence of decision or circumstance a musical experience comes about, the act of listening is performative – intentionally or otherwise - and its object is, at that point, determinate. And this act of listening is itself swept into other waves of narrative: personal, cultural, critical, technical, 'factual'. In each act of listening – acoustic or imaginative, in 'real time' or compressed and reordered in the imagination – the listener shares in the process of construction, of emergence. The experiential phenomenon is fragmented and redistributed as soon as it takes place – indeed, as soon as it is anticipated. Creation and listening are both acts of imagination. They are united in sharing the experience of a time and place framed and inscribed. Neither are linear, neither are constituted only by the time and sonic phenomenon at hand. In the century following Cage and Beckett, perhaps we have learned to listen to the artist's act of listening, to share this emergence of the putting-together. It is a commonplace of art criticism that the paint on canvas embodies the moment of its application (Berger 1972, 31), and that the viewer's eye senses the movement of the brush in the artist's hand (Clark 2018, 197). Gesture in performance has been widely discussed (King and Gritten 2016), but in the case of score-based music, this is largely predicated on gesture as reflected in the notation – which is highly unlikely to be the result of the same gesture (let us leave to one side the particular case of keyboard composers, the predominance of which in the Western canon tends to obscure the general case). This points to a blindness to longer time-frames in both visual art and music. The object in question embodies the actions of the artist over a much wider timespan. The planning of Picasso's *Guernica* documented in Dora Maar's photographs is as sequential and contingent as the application of paint itself. Likewise, a musical phenomenon (a composition in our broader sense) bears the traces not only of its direct inscription but of its conceptual and technical emergence. And it shares these traces with the listener – whether in a consciously almost-observable linear form (*The Musical Offering*, the *Piano Etudes* of Ligeti, for example) or in a more layered, complex manner that constantly challenges the ascription of formal narrative. The role of anticipation in the activity of musical sense-making is widely accepted (Huron 2008). Such predictive behaviour can only be predicated on a continuous modelling of how the music is constituted – an interpretation of the present musical surface in terms of a broad-ranging set of experience, knowledge and understanding. Following Noë we might think of this as an act of human organisation in which the listener becomes a co-participant (Noë 2015). A useful discourse, then, might involve its interlocutors in such a continuous process, irrespective of style or technique.

I have argued elsewhere that we might understand composition, in its Western art-music context, as an iterative process of inscription (Impett 2016a). Inscription onto sound

may have complex relationships with contributing inscriptions into notation, recording or text, or the *idea* of any of these, and these relationships are multiply distributed across time. A generative thought is thus likewise an act of inscription, encoded or recoded in whatever terms constitute the framework for such a thought to articulate itself. The tools of this inscription – notation as an abstract convention, for example, but also the material modes of its instantiation - are best understood as technologies (Impett 2016b). The technological environment of any given moment determines not only the tools and modes of inscription but the conceptual models and operations they afford. Such a technological milieu conditions the modes of inscription, the kinds of manipulation, that can be imagined (Impett 2020).

A generation ago, Philip Agre responded to a discourse-gap in his own area of artificial intelligence (AI) with an approach he termed Critical Technical Practice (CTP) (Agre 1997a). I will show how composition (in the broad sense described above) has much in common with the computational design Agre was discussing, and that the CTP he proposed might provide important indications for the development of more common, constructive and critical discourse in and around the creation of music.

Composition and knowledge

The notion that composition might be understood as a knowledge-producing activity has been much contested (Croft 2015). How has this perceived need for composition to explain itself come about? Briefly, the shape, terms and dynamics of the Western knowledge economy are transformed over the last half-century. In science, the 'objectivity' of empirically-derived knowledge increasingly requires critical context. The range of loci and modes of manifestation of knowledge has expanded to incorporate notions of embodiment, situation and distributedness (Chemero 2009, Clark 1997, Hutchins 1996). And earlier cultural hierarchies and value systems have (justly) dissolved to the extent that implicit or explicit evaluation of artistic production is polarised, in general terms, to an account of popularity (using metrics of income generation, public engagement or internet attention) or of something broadly understood as research. There is an odd contraflow here: as the sciences of brain and cognition observe the roles of modes of knowledge that resist verbalisation and quantification, art – at least in an academic context – is increasingly called upon to specify and quantify its contribution as knowledge production. A further challenge arises from the disjunction between knowledge as immanent experience and knowledge that allows for explicit and shared interrogation or use. What is lost between these poles is a public sphere of critical discourse, and it is perhaps to this that the reflection of composers might usefully contribute.

Wider understanding of the activity of composition has evolved beyond earlier caricatures of creativity as either instinctive, inspired poetic act, impenetrable to interrogation, or formal technical execution divorced from emotion or sonic imagination:

> *... we find his faculties working with such a glorious freedom as scarcely any other artist has attained. This is not to say he was fluent. [The composer in question] was never that on paper; least of all in these later years, when he*

was increasingly bothered by inertia in beginning a new composition. But once the momentum was up he found himself stimulated, not hampered, by the formal, technical side of his art. He could freely utter his profound mind and pour out his great heart, because he was now at last an emancipated artist, in full command of his medium. (Schauffler 1946, 368)

it will be relatively easy to show how his music is an admirable unity of pre-determined elements. [. . .] Construction is in the essence of [another composer's] nature. He distrusts 'divine inspiration', for mysticism is foreign to his temperament. Composition means for him the controlling and placing of every smallest element in a musical design according to a pre-conceived plan. (Smith-Brindle 1961, 248)

Such absurd mid-twentieth century perspectives (on Beethoven and Nono) have of course been superseded and nuanced in musicology, criticism and the cultural imagination. A fundamental and potentially constructive tension remains at the heart of the composer's craft, however. The incapacitating vertigo of the composer faced with infinite possibility is described by Ferneyhough (1995, 22). The sense of responsibility to make a decision that is 'right' on some plane is persistent – a decision that is consistent with some essence of the musical object in question, in terms of an originating concept, an aesthetic or technical theory, a poetic image, a present situation or Haydn's 'deo gratias'. We might see the practice of composition as a continuous deferral of the partially-arbitrary. To paraphrase Agamben, the emerging musical object resists its own persistence (a timely warning to those inclined to assume 'works' at this point: such emergence may take place over months or minutes) (Agamben 2019, 28). This resistance can be read into the object as a surplus; it contains the seeds, the potential of what the object is not, signs to the paths that the artist chose not to take. These will be an integral part of a CTP in music. Each decision, every encounter with a constraint, assumption or attractor constrains certain dimensions of freedom and adds others. One 'problem' is solved and another emerges. Matthias Gross describes the processes of science and technology analogously, as the production of provisional models that have some human salience in a given context, that must crucially remain open to the surprises they might bring forth or the new areas of ignorance they might circumscribe (Gross 2010). The map of the total space of possibilities is drawn only as that space is explored. The turns of that trajectory remain inscribed in the 'object' experienced by the listener. If this process of deferral ever seemed to be resolved in the shape of the score to be 'interpreted' by performers, this was only by temporary cultural consensus that blinded us to the perpetual reinscription of music through acts of instantiation and imagination.

The path is nonlinear and polyphonic, its turns multiple, parallel and potentially contradictory. They may be acts of physical, material inscription – notation, performance, coding, producing. They may be the acknowledgement of cultural assumption or practical constraint. Equally – and more often – they may be moments of emergent perception or imagination, acts of identification of figure, action, process, concept, relationship or technique. The sequence of these turns, their particular context and parameters, map out the

sonic, referential and imaginative space that the performed experience will inhabit – the space some related version of which may form itself in the minds of performers or listeners (or even musicologists). Giorgio Agamben refers to the *potentiality* of the aesthetic object (Agamben 1999), Manuel Delanda to the *potential* energy and dynamics of physical or simulated systems (Delanda 2011, 4). We might adopt their notions to conceive of the emerging map of compositional possibility as a 'space of potential'.

Such decisions are not only at the stage of inscribing a note in a score or of an improviser's action. Sketch studies tend to prioritise staff notation and coherent, contiguous, recognisable passages. Except where they can be mapped directly through to a final surface, graphical materials, matrices, numbers etc. tend to be presented as the humus layer from which compositional material will grow. The very term 'pre-compositional' – often used to refer to material not directly descriptive of the final musical surface - is misleading. It suggests that the act of composition proper begins with some kind of description of the musical outcome, however tentative; it implies a directional narrative, a linear trajectory from concept to performability. Boulez voices just this perspective in a late lecture: 'Why erect, at whatever level of sophistication, a kind of array of coordinates? To make the birth of the idea possible, placing it in space and time, giving it the possibility of developing within a given context.' (Boulez 2018, 565) Boulez's analysis of the situation is itself sophisticated, of course; the 'array of coordinates' – numerical, in his example, and thus affording numerical operations – not only provides a matrix for the gestation of the 'idea', but also stands as a 'foreign body' to counteract 'inbuilt automatisms' of material or musician. As he begins to discuss specific examples – Messiaen, Carter – his tone changes slightly: 'The network generates the idea …' (Boulez 2018, 566). Inscription and imagination are in an intimate dance.

The implication that this 'idea' has assumed or will assume figural form has long roots in eighteenth- and nineteenth-century compositional theory. It receives a full treatment in Reicha's encyclopaedic composition manual of 1826, but continues to haunt Schönberg in his teaching over a century later: 'The two-or-more-dimensional space in which musical ideas are presented is a unit.' (Schoenberg 2006, 15). There appears to be a cultural assumption that the Cartesian space of figure is the state in which the actions or decisions of the composer are most readily apprehended as such. This is a crucial area in which sound practice of all kinds has moved ahead not only of public critical discourse, but of that of artists themselves. The space of figure, even with all its supplementary parameters, was never the whole story, but with recording media and computational tools of composition, modes of representation and manipulation have proliferated to challenge such persistent assumptions.

By having little trace of such abstractions – in the case of earlier music – or by linearising this mode as 'pre'-compositional in more recent instances, we obscure the possibility that for music this situation has always obtained. Sketch studies tend to construct a goal-directed, linear narrative of increasing focus and detail. At what point in the compositional process any such descriptive or prescriptive thought might become externalised is, in terms of the conventional discourses of music, one of the key parameters of genre or style. What are these turns in the path, when does an idea become an idea? Precisely at these moments of inscription – external or internal, conscious or otherwise – each with their own context and motivation. Even in the case of score-based music, the path from

intention to score is nonlinear and multimodal. Plans, ideas, materials, process and constraints all exist in multiple modes and representations. Technical, theoretical, personal and social stories are told around the creation of music, but largely in ways that contribute to cultural fragmentation. They intervene at multiple and parallel points in the iterative, recursive process of emergence of the 'object'. It is precisely the inevitable *incompleteness* of every representation that affords the plasticity necessary for this process. The nature of the nonlinearity, of the narrative of the process is further conditioned by the media involved, and particularly with the role of computational elements.

Dalibor Vesely analyses the transformation of architectural practice brought about by the use of digital tools. He describes a situation of 'divided representation', in which the architect can operate on his project either from a traditional descriptive perspective or as process, as the product of multiple abstractions (Vesely, 2006). They can work with a 'recognisable' representation of the object in question – an inevitably reduced image from a particular perspective – or with the processes and data that might generate the design – a more complete representation in many respects, but one that affords less cognitive transparency. The practice of parametric design stands even farther back from the object itself. It builds a model of requirements, constraints and affordances within which the brief can be satisfied; a solution is effectively induced (Schumacher 2009). Scaling presents an additional dimension of distance and mediation in music. Complex visual compositions retain some intelligibility when reduced to outline; storyboarding gives an impression of the development of a moving image. Reduced representation of musical form gives little indication of sound or temporal development. Of course, a creative practice may encompass many different approaches, many modes of inscription; this is what Agre's critical technical practice invites us to consider.

We might broaden the canvas on which we understand this process and refine our distinctions. Decisions – externalised or otherwise, explicit or implicit – are performative acts. They are also moments of inscription – inscription into common cultural experience and individual memory. Both have their own nonlinear remediating effects as they contribute to the subsequent transmission of a particular performance moment. By the same token, moments of determination, decision or inscription within what is normally understood to be the compositional process are also acts of performance. They are actions that transform the space within which the artist works. The distribution of decision-making through time and through modes of inscription is thus a key characteristic of any musical phenomenon. Distributed creativity is widely acknowledged as a vital component of contemporary practices (Clarke and Doffman 2018, Redhead and Glover 2018). We would rather suggest that distribution of decision, agency and constraint is key to understanding *all* kinds of music practice. Edwin Hutchins' *Cognition in the Wild* remains a paradigmatic presentation of the distribution of action through technology, practice, social structure and circumstantial affordance (Hutchins 1996).

All such moments of inscription/performance are modulated by and embody aspects of their environment: the current state and concerns of the artist in question, constraints of time or resource, aspiration and expectation. Whatever moment or mode of inscription/performance we experience, therefore, is the product of multiple networks and dynamics. Which of these 'belong' specifically to that experience and its direct history,

which can be ascribed to the artist(s) and which to external forces? The boundaries cannot be drawn clearly. Whether composer in an opera house, improviser in a club or artist-researcher at a conference, the context brings clear constraints and expectations, and the artist has a career they presumably wish to advance. The act of listening is thus a further moment of inscription, through the nonlinear, infinitely complex mediation of the listener's own attention, motivation and experience. This level of activity is perhaps the plane on which 'creators' and 'listeners' find common cause, the space in which useful critical discourse might emerge. But it requires creators to tell better, more honest stories.

Philip Agre and *critical technical practice*

Over nearly two decades of his writings, Agre takes issue with the unquestioned fundamental assumptions of AI and with the lack of acknowledgement of its socio-cultural context. He observes that AI researchers discuss their work as if it were the inevitable realisation of a particular theoretical or technical stance. Despite developments in the understanding of knowledge and invention as situated, embodied, distributed and contingent, such work is presented shorn of narrative, taste or contingency. In this way it is unable to fully reflect either on its own working or on the wider assumptions it may embody or effect it may have – whether technical-intellectual or social-political. He identifies the need for '… a critical technical practice: a technical practice within which such reflection on language and history, ideas and institutions, is part and parcel of technical work itself.' (Agre 2002, 131) In some ways, AI research has retreated into the situation first challenged by Agre in the late 1980s. Many instances of machine learning are prime examples of 'black box' technologies; little is learned of their real-world context from investigating their inner workings, few researchers re-invent or re-investigate the wheels and cogs with which they function, and access to and ownership of the ideas, computing power and data is highly political.

The relationships of music creation with technology are many, complex, and distributed across multiple time-periods and various cultural structures – but they are inescapable. It is commonplace for somebody to say that they like music but don't 'understand' it; there is a natural sense that some kind of technique is at work. To create a structure any more complex than simple repetition of rhythmic groove and melodic hook requires some kind of technical operation. The technologies of inscription – whether wax tablet (Owens 1997) or computer – are implicated in any such operation, material or conceptual. Agre refers to technical practice, not technological. The distinction is significant; the notion of technical practice implies the negotiation of a relationship with technologies. Critical technical practice emerges in relation to the development of *instances* of artificial intelligence. That is, these are artefacts, not merely the application of theory. They are bounded, have identity and some kind of cultural place. They pose new questions, produce new theory *in their making*.

Agre distinguishes between two kinds of technology: those that 'are employed in a specific site' and others 'so ubiquitous … that we have no idea how to begin reckoning their effects upon society …' (Agre 1997a, 131). Both perspectives are relevant here. He refers to *borderlands* – areas in which relationships with technologies are fluid, dynamic, ambiguous and evolving: 'Each of the borderlands is a complicated place; everyone who resides in them

is, at different times, both an object and an agent of technical representation, both a novice and an expert' (Agre 1997a, 132). His particular context is the use of digital technologies – equally relevant to contemporary musicians – but the notion of borderlands affords a wider perspective encompassing musicians' relationships with notations, instruments, techniques and formalisms of all kinds. Agre continues: 'Above all, every resident of them is a translator between languages and worldviews: the formalisms of computing and the craft culture of the "application domain"' (Agre 1997a, 132). This process of translation is central to CTP. Ignoring for a moment the wider critical context, every process of music creation involves a continuous and complex shifting between different modes of conception and representation – symbolic, theoretical, physical, sonic – each with their own practices, habits, affordances, references and implications. In the case of music, then, this is less a matter of translation than transduction; not just recoding, but the mapping of one kind of pattern of energy or behavior onto another kind. Not every current technology figures in any given situation, of course; on the other hand, a technological milieu is a complex network constituted of all of its components, real and imaginable.

Musical and digital objects

The artefacts of music – textual, media, sonic – have much in common with the artefacts of the digital world, with the virtual or digital objects we now seek to understand, and with our new world of augmented materiality (Massumi, 2002). They exist in a unique state of materiality/immateriality: while they are intensely bound to direct experience, to technologies, techniques and materials, this physicality can exist in multiple instantiations; they can be manipulated, engaged with and acted upon as cultural abstractions. In cultural terms, music is the area of human activity in which we deal with the virtual, with the constructive relationship between human affect and abstract structures or formal systems. The notion of *digital object* both challenges any residual assumed materiality of the tool and reminds us that digital artefacts as we make them and as we use them are not entirely abstract. Indeed, they are not at all abstract, even when used to invoke percepts that are quite separate from any associated physical 'reality'. Geoff Cox has shown how computer programming is both aesthetic and performative (Cox and MacLean 2012). Code is both script and performance, he says, and like the speech acts to which code is often compared, it is distributed and networked. The act is constituted in the interaction between subject and others, an interface that brings a high degree of indeterminacy. This suggests a critical, indeed a political dimension: '… the act of coding is a deliberate action across cultural and technological fields' (Cox and MacLean 2012, 15). Sometimes – as Yuk Hui demonstrates with his analysis of the Facebook-style FOAF (friend-of-a-friend) code – a construct born in such a context can itself become part of a major cultural shift (Hui 2016, 2). Both musical and software constructs inhabit, contribute to and potentially transform the social, technological, economic and political milieu of their use. The conception, design and construction of either kind of object is thus inherently a critical act, whether the designer chooses to recognise this or not.

Friedrich Kittler drew attention to the situated nature of the digital object in his provocative essay *There Is No Software*: 'All code operations … come down to absolutely

local string operations, that is, I am afraid, *to signifiers of voltage differences*' (Kittler 1997, 150). Only code written directly in the lowest-level assembly language of a particular machine can have any claim to abstraction as software, he says; in the general case, code is written in a language that brings its own forms and affordances, translated for any given machine and operating system environment, and instantiated as action with a user by means of some kind of sense-engaging interface. Remoteness of the user in space or time from the software action does not change this situation. There is no access to or manipulation of the physical phenomena at the root of computing or music except through codes, languages or models, however informal or unreflected.

Kittler observes that hardware development is in an eternal Si syphean struggle to achieve the infinite precision and connectivity that is its implicit end goal. A more constructive path, he proposes, is not to pursue the ever-greater minimalization of noise but to fully embrace it, performing computation on non-programmable machines, 'a physical device working among other physical devices' (Kittler 1997, 154). The operation of such physical computing depends entirely on its particular material properties; generalisation as in the conventional Turing / von Neumann machine model is no longer possible. 'The inverse strategy of maximising noise would not only find the way back from IBM to Shannon, it may well be the only way to enter that body of real numbers originally known as chaos' (Kittler 1997, 155). As a manifesto, this resonates strongly with aspects of sound art: the crucial importance of particular materiality, the impossibility of 'pure' transmission of a message from sender to receiver, the irrelevance of generalised rules of form production.

Recent developments in AI bring another significant analogy with the condition of musical objects. The technology of machine learning allows particular instantiations of software to evolve their own 'knowledge', their own set of behaviours with respect to certain kinds of data. Such digital objects can thus be understood from two perspectives: as the initial software construct with its non-specific, unrealised potential, or as the trained system that has constructed a model of its world and evolved an appropriate repertoire of responses. David Berry terms these as 'compute-computed' and 'compute-computing' (terms derived from Spinoza's 'natura naturans' and' natura naturata'), which he describes as 'constitutive' and 'operational' states (Berry, 2017). In its constitutive state, a musical object is complete within the terms, abstraction and limits of a particular technology of inscription: a score, a textual instruction, a computational construct for sound processing or generation. By virtue of necessarily being shared, objects in this state themselves afford aesthetic contemplation and cultural currency. The mediating states of music – scores, specifically – may have less cultural currency than was once the case, just as the aesthetics of computer code are not universally accessible. Such public mediating inscriptions are less common in other arts; Michael Craig-Martin – mentor of two generations of British artists – articulates the situation in the visual arts thus:

> *One should think of works of art as involving two fundamentally different*
> *ideas. The first is the idea that incentivizes the artist to act, that is, to make*
> *a particular work. I am using the term 'idea' in a very broad sense here. I*
> *mean whatever mix of intention, instinct, thought, imagination,*

observation, curiosity, memory and bravado the artist needs in order to initiate the making of a work.

… The second idea in art is that elicited by the finished work. It speaks for itself. Even the artist/maker has to respond to the reality of the finished work. People often think they will get closer to the work's true 'meaning' they more they know about the artist's original idea. This is not true. Works of art are not straightforward embodiments of their initiating ideas. They are themselves new ideas and their function is to act as primary objects, initiators of ideas, emotions, perceptions. (Craig-Martin 2015, 259)

'Works' may indeed not be straightforward embodiments of their initiating ideas, but active reception and critical response must be grounded in some kind of creative empathy. However autonomous the experienced phenomenon becomes, it inevitably bears some trace of the path of its separation. Whether through nature or culture, the process of creation is more instinctively reconstructible in visual art than in music. By and large, the mediating states of visual art afford visual representation; those of music are largely not sonic. A better understanding of this complex path must be part of a more useful discourse for music.

Elements of a Critical Technical Practice
Intermediation and Actor Network Theory
What Agre proposes is certainly not a formal method, rather an informal methodology or perhaps an ethos. It is, he says, crucially different from introspection, which in most cases would tend to reinforce the boundaries of its own framing. He developed his own approach that he called 'intermediation' – the recording of sequences of thought or action in both everyday life and more focussed work 'that seemed relevant to some technical concern' (Agre1997a, 146). The term derives from the fact that Agre found it most useful to identify such moments at an intermediate stage of abstraction. He was particularly interested in routines, in patterns of behaviour at all levels of time, detail and awareness. This is crucially distinct from autoethnography, in that Agre's approach has no aspiration to autobiographical 'truth' or balance; the objects and objectives of CTP still derive from the work in question. In this respect it might rather be considered a meta-creative process. This is not to deny that the many flavours of autoethonography have a key critical component in common with CTP. As Jones, Adams and Ellis point out in their comprehensive survey, 'One characteristic that binds all autoethnographies is the use of personal experience to examine and/or critique cultural experience. … autoethnographers intentionally highlight the relationship of their experiences and stories to culture and cultural practices, with many authors choosing to launch a critique of this relationship in their work' (Jones, Adams and Ellis 2013, 22) 'Fundamentally, autoethnographers aim to show 'people in the process of figuring out what to do, how to live, and the meaning of their struggles (Bochner & Ellis 2006, 111).

Lessons from autoethnography are relevant, therefore, but in most cases it is the author that remains at the centre of such reflection - not the emergence, the taking-form of their work. The worlds of visual art, of sculpture and architecture have been much better at

acknowledging the materiality of the creative process, even if the very weight of this materiality sometimes blinds to the role of other elements. The history of musical modernism is replete with instances of composers explaining their technical innovation or their aesthetic stance on the basis of specific works. Some – from Schönberg through Stockhausen, Nono, Cage and Boulez to Grisey, Ferneyhough and Lachenmann – become indispensable documents of the craft and stand next to the major works to which they relate. Others retain continued currency because of their radical or prophetic nature. Many more are self-referential - the work justifies the theory or technique and vice-versa – with little critical reflection on the real motivation, context or implications of the process. Anecdotal accounts are of passing interest except to biographers. Coherent self-analysis of the actions and decisions of composition from a broader perspective is rare. Nico Muhly offers a valuable exception in a 2018 'Diary' column in the *London Review of Books* - i.e. tellingly not addressed to an expert readership. He begins: 'When I talk to me colleagues, I am of course happy to hear about their sex dramas and squabbles with the landlord. But what I really want is shop talk: what kinds of pencil are you using? How do you find this particular piece of software? Do you watch the news while you work? I find these details telling' (Muhly 2018). Muhly continues to describe his way of responding to a commission, his processes for organising heterogenous kinds of materials and his practice of reconstructing a familiar physical working space in unfamiliar environments around the world. His article makes no claim to critical thoroughness or to comprehensively documenting a particular work, but such practical self-awareness must be fundamental to a new discourse of musical creativity.

A more thoroughgoing methodology might adopt a model such as Actor Network Theory (ANT) as a way of connecting what are conventionally presented as the 'musical' aspects of composition with the myriad other factors that contribute to the process of creating music. Indeed, we might paraphrase Latour and describe this as a process of 'reassembling the musical', suggest that we should not start with the 'musical' but end with it. Particularly resonant for the present project is Latour's assertion that: 'Dispersion, destruction, and deconstruction are not the goals to be achieved but what needs to be overcome. It's much more important to check what are the new institutions, procedures, and concepts able to collect and to reconnect the social' (Latour 2005, 11). On his view, ANT has constructive, generative potential, alongside its social-critical and analytical power. It would seem an ideal tool with which to contribute to the generation of new discourse.

ANT has many resonances with and important lessons for a critical technical practice. It traces associations, rather than looking for preconceived kinds of structure. It acknowledges the heterogeneity of actors: the roles of social structures, of patterns of behaviour, of ideas and of objects, including those that may be taken for granted, become 'invisible'. Latour emphasises the role of physical environment:

> The first solution is to study innovations in the artisan's workshop, the engineer's design department, the scientist's laboratory, the marketer's trial panels, the user's home, and the many socio-technical controversies. In these sites objects live a clearly multiple and complex life through meetings, plans, sketches, regulations, and trials. Here, they appear fully mixed with

> *other more traditional social agencies. It is only once in place that they*
> *disappear from view.* (Latour 2005, 80)

The heterogeneity of elements is fundamental to ANT: 'Objects too have agency' (Latour 2005, 63) is Latour's assertion. An earlier explanation of his term 'actant' is useful in this regard: 'something that acts or to which activity is granted by others' (Latour 1996, 373). This reveals the asymmetry of networks, not only in the nature of agents but in the apparent – or projected – direction of influence. Actants might play a mediating role in a relationship, rather than acting directly. Distance – geographical or in time – is no measure of the effect of an encounter. To this we might add a notion of *conceptual* distance. There is no 'truth'-test; apparent *mis*-understandings may be equally instrumental. Latour insists on the need to observe actions as much as stable connections. These need not be intentional or conscious; an apparently passive response to a given situation or an unreflected assumption become actions as they participate in the network. In this respect, Latour's actions might be considered equivalent to the moments of inscription discussed above; such networks are dynamical, evolving.

A critical technical practice certainly has much to learn from ANT therefore, but there are limitations. Two in particular are already problematised by Latour. First, he raises the issue of 'context' – the catch-all for factors that appear too complex or trivial to trace. He recommends us to eliminate any apparent border between the initial area of interest and its wider environment – to proceed 'by foot', to painstakingly pursue potentially relevant detail however distant physically or temporally. Here, the perspective and judgement of the viewer, the reporter – the sociologist, in Latour's case – come into play, if the map is not to be larger than the territory. Second, he acknowledges the challenges presented by the articulation of complex temporal relationships and sequences. Interactions take place between actants functioning across time-scales from the momentaneous to the historical, and interactions themselves are neither synchronous nor synoptic (all visible for a single point) (Latour 2005, 201).

Both issues point to a necessary distinction between critical technical practice and ANT. Understanding or knowledge, however historical, obtain in the particular present, the situated moment in which they play a role. A CTP traces the narrative of such moments as they relate to an instance of technical work, however mediated or indirect. Clarity as to the nature of the instance of practice in question is crucial to retain focus and to avoid perpetual relativising and proliferation: a score, a performance, a particular articulation of a concept or theory, a recording or an installation in its place. Independently of any residual notion of 'work', a musical experience is particular and bounded. We might think of its emergence as a pattern of processes of 'individuation' in Simondon's terms, to 'seek to know the individual through individuation rather than individuation through the individual' (Simondon 2005, 24). Evolving relationships and understandings are at work across multiple parallel and interacting temporal planes; in CTP their traces are revealed at moments of consolidation, of decision, or inscription. Benjamin Piekut provides a perceptive survey of the potential of ANT for musicology (Piekut 2014), but however radical the departure from convention, the musicologist's perspective remains closer to that of the sociologist. CTP demands a new voice – a first-person presence in discourse. In the case of CTP and composition, the

composer is explicitly both subject and critic. Latour acknowledges this situation to an extent in ANT, but there as a challenge to overcome; here, this reflective nature defines the very voice of CTP.

But there is also an important reflexive component to composition that ANT is less equipped to address. Richard Sennett calls this the 'material consciousness' of the craftsman – the response to materials modulated by particularity, contingency or happenstance (Sennett 2008, 119). Nurturing this consciousness is a large part of the training of musicians; maintaining and developing it is the mark of a mature musician. Sennett observes the way in which such personal actions lead to changes in cultural practice. He identifies the speciation of type-forms – of paradigms of cultural object – and domain-shift – how principles from one activity are applied to another (Sennett 2008, 125-7). Such transformations also happen continuously within individual practice, and from a CTP perspective these are of fundamental interest. The materiality of music creation is, in general terms, internalised to a greater extent than in, say, the plastic or visual arts. The mechanisms and habits a composer (still in our broadest of senses) develops to achieve critical distance from such internalised actions strongly characterise an artist's practice, as do the ways in which an artist chooses to reveal them to others or to themselves. They reflect models and paradigms that all have critical implications. The sources of these models are not mystical; they arise from the artist's perception or reception of their own environment. Reflection on such mechanisms and models is therefore integral to a notion of CTP in composition.

Dissociation and interference

Agre later refers to what he describes as 'dissociation' in the way AI researchers speak about the oppositions implicit in their work. His examples include mind versus world, mental activity versus perception, and abstract ideals versus concrete things. 'Dissociation has two moments: an overt distinction between the two terms and a covert conflation of them' (Agre 2002, 132). Agre's language reflects his reforming mission:

> *dissociation is not consciously avowed. It must be sought in the internal tensions of texts and in the dynamics of technical work. Dissociation occurs in many ways, none of which is fixed or stable. To the contrary, much of the history of AI can be understood as attempts to comprehend and manage the signs of trouble that originate in dissociation and that AI practitioners can recognize within the conceptual system of the field.* (Agre 2002, 132)

The notion of 'covert theorising' reappears regularly through Agre's writing. The discourses of music creation may appear more diverse, more personal, than those of computer science, but this is an equally valid component of CTP in the context of composition. Sennett's 'domain-shift' is one possible manifestation. In general, we are not looking for 'signs of trouble' in bringing CTP to composition – although some Adornian criticism could be read in these terms – but rather the production of new concepts, of new kinds or instances of musical thought. Alertness to the implied negative connotations is a necessary corrective, and such clarity a vital part of reflection.

The phenomenon underlying Agre's dissociation also has an important productive role, one affording ontological generation as well as covert theorising. Michel Serres' early work explores the nature of both exact and human sciences by studying their evolution and interaction. He refers to the various assemblages of paradigms, theories, assumptions and practices of any given moment as 'models', and describes the wealth of often incommensurable models at play in the modern world as the 'encyclopaedia'. Their domains of study he calls 'regions'. Most often, he points out, the most recent model in any given region is accepted as the most 'truthful', and its predecessors as curiosities of historical-cultural interest. Thought within a single such region, however coherent or complex, will remain self-referential: '… every region has (is) its philosophy, blind in one sense and reflexive in another …' (Agre 1972, 30). Within the world of the new encyclopaedia, new knowledge emerges from the intersection of regions – not from their synthesis or reconciliation but from their *interference*.

Why is this different to a Kuhnian paradigm shift, the emergence of a new model as its predecessor becomes increasingly unable to account for observed phenomena? Because here we are interested in the state of interference that produces that shift: in its texture, its dynamics, its inner rhythm. Interference is not an occasional phenomenon, one to be sought out in particular circumstances - it becomes the very mode of thought, of the perception of knowledge. Every encounter is inevitably an act of transfer, of transformation, of translation. They constitute a complex space to which there is no inherent linear or hierarchical order; the task of creative thought is to identify the potential of interference. The background to thought is therefore also constituted of interference; noise is the source of new signal:

> *Background noise is the ground of our perception … No life without heat, no matter, neither; no warmth without heat, no logos without noise, neither. Noise is the basic element of the software of all our logic, or it is to the logos what matter used to be to form. Noise is the background of information, the material of that form.* (Serres, 1995; p.7)

Serres considers the objects of science – of physics, specifically – and identifies three states of knowledge in historical sequence. First the geometric or 'Cartesian' state of figure or shape, analogous the two-dimensional musical idea described by Schönberg. Then the physical state known through properties such as molecular structure or transmission of energy; here we might posit a parallel with the waveform, spectral, acoustic or statistical representations of the computational manipulation of sound. The third, that appropriate for our present state of knowledge, he describes as a nexus of communication and information – a state that encompasses the previous two. The object not only affords description, has physical or energetic properties and behaviours, but also bears the traces of the forces and events that produced it, with which it has come into contact, that have transformed it. The locus of knowledge is 'interegionality, meditation on interference' (Serres, 1972, 158).

Musical metaphors abound in Serres' writing, from his early essay on Xenakis to his late book on music. His emphasis on the role of noise - of the constant stimulus from inner and outer environment - and his concept of objects or materials as interfaces of informational transformation both offer useful tools for critical technical practice in music. Serres' notion

of interference is particularly resonant if we take modulation in sound synthesis as an analogy: the emergence of a new artefact from the interference of other signals, an artefact with its own behaviour, its own affordances and properties that are not intuitively predictable from the source signals. If we interpret Agre's dissociation in the light of Serres' interference, acts of dissociation become the very stuff of composition; a critical technical practice might seek to trace and articulate them, to expose them to critical reflection.

Conclusion

To return to the analogy between musical and digital objects, we might consider the generation of music as a process of encoding a motivation. This seed of motivation has no form until it begins to be encoded, but there is no inherent inevitability as to the form it will take; that will be conditioned by the modes of encoding adopted or assumed, their sequence and relationships. The 'note' – a fuzzy but highly plastic and useful notion - is a paradigmatic example of such a mode of encoding. The self-perception of the seed of motivation itself is likewise conditioned by other forms of encoding: social, professional, economic. Of course, these codes are living, evolving things, themselves reconceived with every instantiation. They afford various perspectives or ways of understanding: cultural, cognitive, music-theoretical. But they have in common the fact that they can be traced to technological-scientific-cosmological models. This is true for what appear to be music-psychological frameworks: from the blacksmith's hammers of Pythagorus or the monochord of theorists from Boethius to Rameau to the computer-calculated spectra of Grisey. But it is equally true of social contexts, for example: the court, the concert hall, the internet. These can all be regarded as technologies, as modes of inscription predicated on other technologies. Each 'idea', each decision, every acknowledgement of or response to a circumstance or constraint, the embodiment of every cultural assumption, is an encoding. And each encoding is a subscription to a model, a paradigm of some kind.

Over a decade ago, Georgina Born called for a new, interdisciplinary 'relational musicology', in response to the fragmentation of modes of music study and their aggregate incapacity to respond to the cultural-intellectual context of the twenty-first century (Born 2010). In that lecture, Born points to Stephen Feld's proposal of 'a critical anthropology of music intended to overcome the music/social dualism by analysing "sound structure as socially structured".' The present call for a critical technical practice requires precisely that the 'musical', the 'technical', the 'aesthetic' and the 'social' are considered as a single field. Born analyses different modes of interdisciplinarity to consider how the various modes of music study might work together: the 'comforting' mode of integration, the 'imperial' mode of subordination, and '… the agonistic-antagonistic mode, which suggests that addressing music as immanently cultural and social requires a break – an epistemological and ontological shift in our understanding of all musics, an approach that is irreducible to the addition of the antecedent (sub)disciplines, since all will be changed in the process' (Born 2010, p. 231).

The ethos of critical technical practice suggests that the creators of music have a vital part to play in generating this new discourse. As Agre proposed for the computer scientist, this is now the task, the obligation of the musician. To act responsibly in terms of their own

work, of course, but also to provide a bilateral path between their thought and act and public and expert discourse. Born identifies four topics which she suggests 'may be generative for emergent redefinitions of the field [of relational musicology]: questions of the social, technology, temporality and ontology' (Born 2010, 231). The social, the technological and the temporal have all figured importantly in this discussion; we might add topics such as distribution, inscription and environment. Born suggests that 'A non-relativist, relational musicology can proceed from the comparative study of distinct ontologies of music'. The fundamental understanding of critical technical practice in a musical context is that any musical creation embodies *multiple* ontologies: ontologies that are cultural, cognitive, historical, imagined or appropriated, the ontologies of materials, circumstances, encodings and technologies. Their bringing-together has narratives, conflicts and contradictions, context and contingency. The reconciliation, or rather the non-reconciliation of multiple ontologies is a universal human challenge. One of the fundamental roles of music is to offer a space and experience in which to confront this, and the most useful contribution composers can make to discourse is to unfold their negotiation of this space as broadly and honestly as possible. Such an approach is necessary if the creators of music themselves are to play their vital part in the 'fully relational and reflexive, social and material conception of all musics' called for by Georgina Born (Born 2010, 242). Agre summarised his project thus: 'Technology at present is covert philosophy; the point is to make it openly philosophical' (Agre 1997b, 240). Our point, then, is to make music openly philosophical by sharing the actants and agents, the noise and interferences that produce it, in order that it might find place in shared discourse.

References

Agamben Giorgio. 1999. 'On Potentiality.' In *Potentialities: Collected Essays in Philosophy*, edited and translated by Daniel Heller-Roazen, 177–84. Stanford, CA: Stanford University Press.
Agamben, Giorgio. 2019. *Creation and Anarchy: the Work of Art and the Religion of Capitalism*, translated by Adam Kotsko. Stanford: Stanford University Press.
Agre, Philip. 1997a. 'Toward a Critical Technical Practice: Lessons Learned in Trying to Reform AI.' In *Social Science, Technical Systems, and Cooperative Work: Beyond the Great Divide*, edited by Geoffrey C. Bowker, Susan Leigh Star, William Turner and Les Gasser. Mahwah, NJ: Lawrence Erlbaum Associates.
Agre, Philip. 1997b. *Computation and Human Experience.* Cambridge: Cambridge University Press.
Agre, Philip. 2002. 'The Practical Logic of Computer Work.' In *Computationalism: New Directions*, edited by Matthias Scheutz, 129-142. Cambridge MA: MIT Press.
Badiou, Alain. 2001. *Ethics: An Essay on the Understanding of Evil.* Translated by Peter Hallward. London: Verso.
Badiou, Alain. 2006. 'Third Sketch of a Manifesto of Affirmationist Art.' In *Polemics*, translated by Steve Corcoran, 133-148. London: Verso.
Berger, John. 1972. *Ways of Seeing.* London: Penguin.
Berry, David M. 2017. 'Prolegomenon to a Media Theory of Machine Learning: Compute-Computing and Compute-Computed.' *Media Theory*, [S.l.], v. 1, n. 1, Oct. 2017, 74-87.

Bochner, Arthur P. and Carolyn S. Ellis. 2006. 'Communication as autoethnography.' In Dean Gregory J. Shepherd, Jeffrey St. John and Ted Striphas (editors), *Communication As…: Stances on Theory*, 110-122. Thousand Oaks, CA: Sage.

Boulez, Pierre. 2018. 'Writing and Idea.'In *Music Lessons: The Collège de France Lectures*, *-*. London: Faber and Faber.

Born, Georgina. 2010. 'For a Relational Musicology: Music and Interdisciplinarity, Beyond the Practice Turn: The 2007 Dent Medal Address.' *Journal of the Royal Musical Association*, Vol. 135, No. 2 (2010), 205-243.

Chemero, Anthony. 2009. *Radical Embodied Cognitive Science*. Cambridge MA: MIT Press.

Clark, Andy. 1997. *Being There: Putting Brain, Body and World Together Again*. Cambridge MA: MIT Press.

Clark, T.J. 2018. *Heaven on Earth: Painting and the Life to Come*. London: Thames and Hudson.

Clarke, Eric F. and Mark Doffman, eds. 2018. *Distributed Creativity: Collaboration and Improvisation in Contemporary Music*. New York: Oxford University Press.

Cox, Geoff and Alex MacLean. 2012. *Speaking Code: Coding as Aesthetic and Political Expression*. Cambridge MA: MIT Press.

Craig-Martin, Michael. 2015. *On Being an Artist*. London: Art/Books.

Croft, John. 2015. 'Composition is not research.' *Tempo*, Volume 69, Issue 272 April 2015, pp. 6-11.

Delanda, Manuel. 2011. *Simulation Science: the Emergence of Synthetic Reason*. London: Continuum.

Ferneyhough, Brian. 1995. 'Form – Figure – Style: an Intermediate Assessment.' In *Brian Ferneyhough: Collected Writings*, edited by James Boros and Richard Toop, 21-28. London: Routledge.

Gross, Matthias. 2010. *Ignorance and Surprise: Science, Society, and Ecological Design*. Cambridge MA: MIT Press.

Hui, Yuk. 2016. *On the Existence of Digital Objects*. Minneapolis: University of Minnesota Press.

Huron, David. 2008. *Sweet Anticipation: Music and the Psychology of Expectation*. Cambridge MA: MIT Press.

Hutchins, Edwin. 1996. *Cognition in the Wild*. Cambridge MA: MIT Press.

Impett, Jonathan. 2016a. 'Making a mark: the psychology of composition.' In *The Oxford Handbook of Music Psychology,* edited by Susan Hallam, Ian Cross and Michael Thaut, 651-666. Oxford: Oxford University Press.

Impett, Jonathan. 2016b. 'Notation as technology'. Presentation at IRCAM, Paris. https://medias.ircam.fr/x437e31

Impett, Jonathan. 2020. 'Intuitive technology'. To appear in *Springer AI & Society*.

Jones, Stacy Holman, Tony E Adams and Carolyn Ellis, editors. 2013. *Handbook of Autoethnography*. London: Routledge.

King, Elaine and Anthony Gritten. 2016. *New Perspectives on Music and Gesture*. London: Routledge.

Kittler, Friedrich. 1997. 'There is no Software'. In *Essays: Literature, Media, Information Systems*, edited by John Johnson, 147-155. Amsterdam: G+B Arts International.

Latour, Bruno. 1996. 'On actor-network theory: A few clarifications.' *Soziale Welt*, 47. Jahrg., H. 4 (1996), 369-381.

Latour, Bruno. 2005. *Reassembling the Social: An Introduction to Actor Network Theory*. Oxford: Oxford University Press.

Massumi, Brian. 2002. *Parables of the Virtual. Movement, Affect, Sensation.* Durham NC: Duke University Press.

Muhly, Nico. 2018. 'Diary.' *London Review of Books*, 25 October 2018, 38-39.

Nöe, Alva. 2015. *Strange Tools: Art and Human Nature*. New York: Hill and Wang.

Owens, Jessie Ann. 1997. *Composers at Work: The Craft of Musical Composition 1450-1600.* New York: Oxford University Press.

Piekut, Benjamin. 2014. 'Actor-Networks in Music History: Clarifications and Critiques.' *Twentieth-Century Music*, Volume 11, Issue 02 (September 2014) 191-215.

Redhead, Lauren and Richard Glover, eds. 2018. *Collaborative and Distributed Processes in Contemporary Music-Making.* Newcastle: Cambridge Scholars Publishing.

Schauffler, Robert Haven. 1946. *Beethoven: The Man who Freed Music*. New York: Tudor Publishing Co.

Schoenberg, Arnold. 2006. *The Musical Idea and the Logic, Technique, and Art of its Presentation*. Edited and translated by Patricia Carpenter and Severine Neff. Bloomington: Indiana University Press.

Schumacher, Patrik. 2009. 'Parametricism - A New Global Style for Architecture and Urban Design.' *AD Architectural Design - Digital Cities*, Vol 79, No 4, July/August 2009, 14-23.

Sennett, Richard. 2008. *The Craftsman.* London: Penguin.

Simondon, Gilbert. 2005. *L'individuation à la lumière des notions de forme et d'information,* Paris: Éditions Jérôme Millon.

Serres, Michel. 1972. *L'Interférence. Hermès II*. Paris: Éditions de Minuit.

Serres, Michel. 1995. *Genesis*, translated by Geneviève James and James Nielson. Ann Arbor: University of Michigan Press.

Smith-Brindle, Reginald. 1961. 'Current chronicle: Italy.' *The Musical Quarterly,* 47 (2): 247–55.

Vesely, Dalibor. 2006. *Architecture in the Age of Divided Representation: The Question of Creativity in the Shadow of Production.* Cambridge MA: MIT Press.