Review of Tracy Redhead: *Interactive Technologies and Music Making: Transmutable Music*

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This is a book very much of our time, as the combination of rapid technological change and its social reception influence a sense of the inevitability of innovation, and the replacement of the traditional and formerly accepted by the new and up to date. Given the fresh and contemporary subject matter, and the feeling of urgency conveyed in the advisory and pedagogical sections of the book that set out clearly how those with access to the appropriate equipment can become active players in the aesthetic and procedural advances described, Redhead takes considerable pains to place her view of music within a historical context in which the subject of her study represents a future that has emerged from the revolutions of a relatively recent past.

Transmutable Music (TM) is presented by Redhead as more than a niche within the field of electronic music, as may have been the case with, for instance, musique concrète or spectral composition. Rather, it embraces a form of self-referential fluidity that is responding to the manner in which all musical material has become data, and its control and dissemination are available to variation that breaks down or, at least, reconstitutes the relationship between composer, performer, producer and listener. This process is presented as having begun (pp. 23–27) with the influence of three figures: Edgard Varèse, James Tenney, and Curtis Roads. Varèse speculated on the unique musical forms that each work of music could assume, and imagined the interaction of performers connected electronically while separated in space. Tenney, working with early computers, imagined forms derived from layers that could be combined from elements organised in hierarchical levels. Roads built on the implications of such principles in considering the potential of a work's form being approached through both "bottom-up" and "top-down" perspectives.

From consideration of these forerunners, Redhead proceeds (p. 36) to define and characterise transmutability. The operations on which this new musical paradigm was founded include the nature and ubiquitous employment of MIDI, the practices and specialised equipment of DJ-ing, the technical potential available to the user of a Digital Audio Workstation (DAW), and the musical orientation of programs and control parameters built into iPads and mobile phones.

Once this introductory definition has been laid out, the hybrid nature of the book becomes apparent. While it may be enjoyed by the general reader seeking a broad introduction to its subject, it increasingly introduces for the intending student of its concerns tutorial and procedural advice in the manner of a primer. In turn, this is supported both by the book's own Companion Website and by copious footnotes that permit the practically inclined user to visit a range of other websites where exemplary material, programs, and specialised material can be accessed that aids the acquisition of the skill-set that is required to create TM of one's own. The Companion Website, one suspects, represents a critically significant element of the publication. A book of this kind is likely to begin to date within years, if not months: the capacity to update and extended its coverage and novelty through use of the Website provides a distinct support for its utility and longevity.

Redhead combines the investigation of "how to" with significant advice on evaluation, of one's own practice, of the reception of one's efforts by listeners and – the true innovation – of the evaluation of active contributors to transmutable operations on the outcomes of their own influence on the music. There is indeed a new aesthetic at work here, which Redhead explores alongside the tutorial details described: the directions in which technology and, especially, AI are proceeding to define new educational and cultural assumptions regarding practitioners' intentions, the hardware required to realise them, and the role of the listener as co-creator. This novel stance parallels the relationship assumed with the reader, who early in the book is invited, should they wish, to proceed to the tutorial material (p. 13), while also being advised (p. 36) to read the preparatory background with care in order better to comprehend what follows. This dialogue between the author as guru and instructor is both a strength of the book and, inevitably, given the rate at which technology develops, a position that may change rapidly. Hence the significance of the Companion Website, which renders for the book itself a facility for transmutability.

On commencing scrutiny of the exercises through which technical operations are taught in Chapters 4–11, one is struck by the many occasions on which the procedures involved refer to traditional elements of music: melodies in specific keys and time signatures; conventional orchestrations; standard links between narrative/emotional requirements and commonly encountered musical equivalents. This is partly explained in recognising users' needs to work with the familiar prior to encountering the more complex and innovative. But it also reminds us that, at least in one of the most accessible forms in which transmutable musicking is likely to be met, game music, a great deal of influence is apparent from composers such as Wagner, as well as medieval European music and traditional Japanese drama. Indeed, there is increasing popularity in re-experiencing such scores in the fixed form in which they are often performed live to audience of afficionados in the concert hall. This strange new relationship between traditional influences and innovative treatments of material is of course only part of the story: there are other motivations and contexts that are responding to the potential of transmutability that have both different acoustic starting points and quite independent user expectations. Nevertheless, Redhead's regularly expressed imperative regarding practitioners' evaluation of listeners' and partners' responses defines a thread in the book that relates to aesthetics and, in turn, to musical philosophy. Aesthetic innovation in the operations described gives rise to myriad creative directions made available by the technology and its applications. But issues that define the relationship between creator-performer and listener retain the requirement that the latter's role involves recognition, preference and acceptance if the product is to be successful in retaining their attention.

TM thus values listener feedback (p. 39; Ch. 4) in contributing to shape this communicative relationship: "to help provide better experiences and assist the artist in making sure their work can be understood". This contrasts strongly with the aesthetic art-for-art's sake position assumed in the post-war period in which Varèse achieved his mature work and the Darmstadt School saw new works emerge that paid little heed to the reception of audiences. The key to this difference may be that, within the TM experience, the listeners' feedback is not confined to providing applause, or even approval, but may take the form of intervening in the progress of the work itself, in several different ways that are made available by the medium employed. If listeners do not like a work, are they empowered to improve it? Categories of potential feedback are provided and discussed, and one imagines that aspects of AI will further accelerate the provision of new possibilities.

However novel the nature of data variation in TM, there is clearly an extent to which universal perception and production expectations continue to define musical experience (p. 44), especially in terms of the "vertical" and "horizontal" axes that designate the unfolding of simultaneous events over time. This relationship is, nevertheless, itself open to new interpretations and departures as simultaneous AI processing of data permits TM consequences that may combine sound streams innovatively.

Scrutiny of the processes provided to teach readers how to develop their own handling of TM's potential brings to mind historic precedents for informing composers and arrangers of new sonic opportunities. For instance, Berlioz's *Treatise on orchestration* (1844) introduced systematic evidence for the potential of relatively rare new instruments, as well as recent examples of writing for traditional instruments that would have been unfamiliar to his initial readers. Did the potential for employing such resources similarly affect composers' sense of the representation of sound in the vertical/horizontal axes? Certainly, new textures would have been obtainable, and possibly more complex rhythmic presentation as well as longer sustained sounds. Readers of Redhead's book who avail themselves of the Companion Website and plentiful web-based sources of sounds, video resources and programs are better equipped than the readers of Berlioz's day to access and practically understand the musical realms that a new musical technology opens up to them. The incentive to employ their own DAW and install the software recommended (e.g. Max, Ableton, etc., as well as more sophisticated Open Sound Control programs) invites readers to explore this world themselves. But the ghost of Berlioz remains an appropriate comparator, given the extent to which many of the musical gestures employed for the video game examples suggest the influence of leitmotif technique and its Wagnerian connection to events, appropriate to heroes' quests and the opposition of dragons and other supernatural foes.

The emotional/cognitive links that underpin such revisiting of previous compositional values are in the same way calculated to alleviate boredom in game music that is founded on the use of loops that may be relieved through the employment of variation and surprise, though these need to remain supportive of and even inconspicuous to the gamer/listener. Unlike the audience of a Berlioz tone-poem or a Wagner opera, the gamer will be aware that their own interaction shapes the direction the music takes, and that this may represent a different pathway to others that could have been selected.

There is therefore a clear extent to which TM is uniquely suitable as a means of eliciting new and even unexpected musical outcomes, whether or not the system is related to a game or visual stimulus, or is responding to some other form of user interaction. One anticipates a spectrum of user-outcome consequences ranging from the relatively direct transitions of game playing, in which events and musical material more-or-less coincide, through to a musical equivalent of chaos theory, and the known/unknown realm of particle physics, replete with an enchanting uncertainty of consequence – the sonic equivalent of Schrödinger's cat. Redhead implies such a universe (p. 158): "The core of TM lies in its capacity for change. To assess such music, one should consider the degree of change in the music's final output". But manipulation ensures "that the music is heard and experienced in many ways" (p. 15): "… each listening instance is a distinct auditory event".

A textual parallel to such variance appears on p. 129, where, having been introduced to the Musimaths of Gareth Loy, we encounter Gareth Joy. This highly pleasing transmutation leads to a focus on graphical user interfaces (GUI) that follows mention of the music-theoretical influence of Guido d'Arezzo (p.130), introduced in relation to Loy's analysis as The Gildo Method. Brava!

But serious matters await consideration, including that of placing TM within the preceding tradition of music-making globally so as to anticipate its further development and what awaits the next generation. If the arts represent the means by which our species has documented its survival, at least through the efforts of those self-selected to do so, what musical future does TM prepare us for? Is it too fanciful to consider the sonic world appropriate to the transmuted diurnal cycle depicted in Susan Harvey's novel *Orbital*, or perhaps the lengthy extraterrestrial voyage required to take mankind to Mars? Redhead states (p. 156) that "the full potential of transmutable music remains untapped".

The processes that may be applied to evaluating TM are further explored in Chapter 7. Hierarchical levels of operation and definition are coherently set out to guide the reader through compositional tasks and their performative potential for transmutable outcomes. A significant basis for this being achieved (pp. 158–164) is the exemplification at each level (represented by the values 0, 1, 2, 3) of the application involved. 0 represents an absence of any change of effect; 1 is "simple"; 2 is "compound"; and 3 is "complex". The iteration of the consequences of such evaluations for each parameter involved in an operation across the procedures detailed contributes to the understanding of both the outcomes obtained and a sequential presentation of the technical conditions that made the more advanced levels possible. This would result where all four components (content, experience, architecture and control system) are rated "3".

This same framework for evaluation can be applied as an analytical tool to discern how existing musical works were achieved. Examples of such evaluations are provided for the initial levels, presenting a platform for exploring the achievement of "compound" and "complex" criteria in action as they contribute to approaching transmutability.

This next level on the pathway towards achieving TM has received considerable stimulus in practice from the technical innovations that were previously called upon by DJs in live re-mixing, and in the new phenomenon that we have already explored, video gaming, as well as in the introduction into DAWs of the software that permits the achievement of variation within the four parameters of content, experience, architecture and control system. At these higher levels, acronyms abound, such as "libpd" ("Library of Pure Data"), and the reader will be grateful for the excellent Glossary provided, as well as availing themselves of the websites given in the footnotes.

The step-by-step instruction provided in the later chapters, together with the web support available to the reader, takes the TM novice through an accumulating experience of the kinds of program and DAW set-up that they need to master for TM creation to fall into their grasp. Once their handling of their own platform has been achieved, the possibility can be explored of linking to the dynamic properties of mobile phone sensors in order to share active control of musical outputs with listeners/participants.

One anticipates that a thorough, active reading of Redhead's book accompanied by completion of the tutorial tasks will lead on to a longer engagement with both the book's own Companion Website and the programs and instructional material additionally accessible. Whether or not this engagement heralds a new generation of composers and arrangers achieving exceptional new outcomes we must wait to judge. But if it does so, they will have been provided with an excellent guide to their initial understanding of the processes involved in TM.